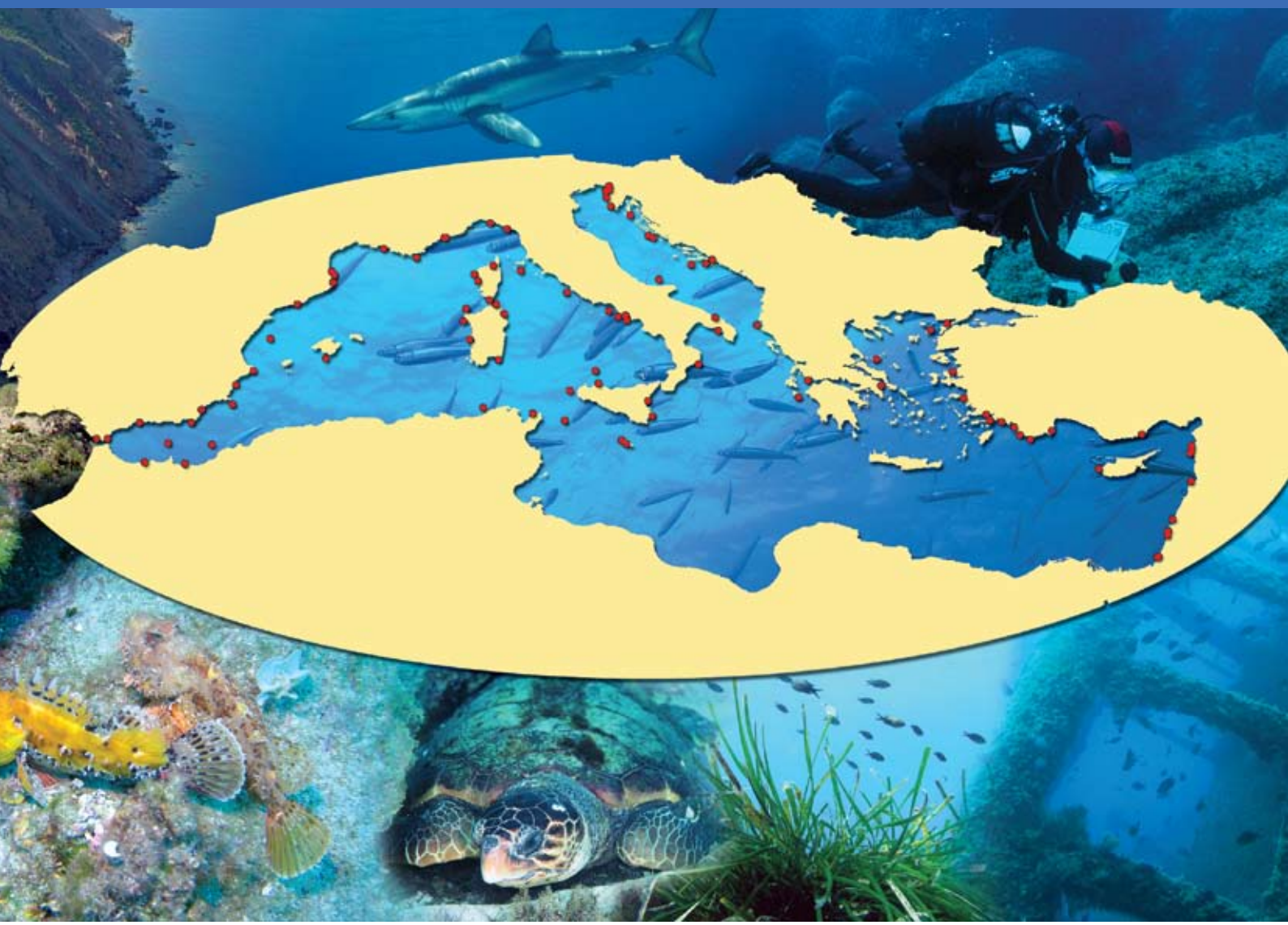
# Status of Marine Protected Areas in the Mediterranean Sea

A collaborative study by IUCN, WWF and MedPAN

With the support of the UNEP Regional Activity Centre for Specially Protected Areas (UNEP RAC/SPA)



MedPAN

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IUCN

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1 Network of Managers of Marine Protected Areas in the Mediterranean

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# List of acronyms

| | |
|---|---|
| **ACCOBAMS** | Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area |
| **CBD** | Convention on Biological Diversity |
| **CFP** | Common Fisheries Policy |
| **COP** | Conference of the Parties |
| **EEZ** | Exclusive Economic Zone |
| **EU** | European Union |
| **EC** | European Commission |
| **FAO** | United Nations Food and Agriculture Organisation |
| **GFCM** | General Fisheries Commission for the Mediterranean |
| **IUCN** | International Union for Conservation of Nature |
| **MAP** | Mediterranean Action Plan |
| **MedPAN** | The Network of Managers of Marine Protected Areas in the Mediterranean |
| **MPA** | Marine Protected Area |
| **n.m.** | nautical mile |
| **RAC/SPA** | Regional Activity Centre for Specially Protected Areas |
| **SAC** | Special Area of Conservation |
| **SAP BIO** | Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region |
| **SCI** | Sites of Community Importance |
| **SPA** | Specially Protected Area |
| **SPAMI** | Specially Protected Area of Mediterranean Importance |
| **SSC** | Species Survival Commission |
| **UNCLOS** | United Nation Convention on the Law of the Sea |
| **UNEP** | United Nation Environmental Programme |
| **UNESCO** | United Nations Educational, Scientific and Cultural Organization |
| **WCPA** | World Commission on Protected Areas |
| **WDPA** | World Database on Protected Areas |
| **WSSD** | World Summit on Sustainable Development |
| **WWF** | World Wildlife Fund |

# Foreword

The MedPAN, Network of Managers of Marine Protected Areas in the Mediterranean, created in 1990, regained momentum in 2003 at the initiative of the Port-Cros National Park and WWF France, the network's present coordinator. Its aim is to facilitate contact and exchange of experience between managers of Mediterranean marine and coastal protected areas, to contribute to the training of managers and to foster and support concrete, development, management or awareness building actions in a protected area or in a group of protected areas. Furthermore, at its level of competence, it supports the development of marine and coastal protected areas in the Mediterranean.

In 2006, the need for a thorough assessment of all the Mediterranean MPAs became apparent, in order to determine their number, the surface areas they cover and the features of their management. The survey presented here, ensuing from cooperation between the MedPAN network, WWF-France and the IUCN, is therefore the first of its kind in the Mediterranean and is the outcome of two years of efforts to collect, analyse and publish the data. The study is based on questionnaires sent to MPA managers and the MedPAN network's standing amongst Mediterranean MPA managers ensured a high rate of response.

The conclusions reached are plain: the present system of Mediterranean marine protected areas is not representative and the objectives set by the Biodiversity Convention for 2012 will most likely not be attained. The management effectiveness of Mediterranean marine protected areas must be improved. Furthermore, marine protected areas are threatened by substantial external pressures at local, regional and global levels.

What can be done to reverse the trend? New marine protected areas must be established particularly to protect the habitats that are not represented in the present network, notably, in the high seas and in the deep seas. In the coastal zone, where most of the present protection is focussed, countries of the southern and eastern Mediterranean should in future be better represented. In European countries, the strengthening of the Natura 2000 network in the sea constitutes a priority. In terms of management effectiveness, the development of management plans should be generalized to all MPAs and support should be provided to the most fragile MPAs in terms of governance, financial resources, training, technical and material support (diving equipment, buoying, geographic information systems, etc. Monitoring the network's development should also be reinforced on the regional level through the establishment of a single database and the improved use of IUCN categories. In order to encourage recognition of the marine environment by states and the public at large, managers and competent institutions should be encouraged to apply for international recognition of MPAs (SPAMI labels, 'Man and the Biosphere", etc.). Finally, regional initiatives must be implemented to control the pressures applied on marine protected areas, for instance with regard to the prevention and monitoring of introduced species.

The mission of the MedPAN network's permanent secretariat, which should be established by the end of 2008, will be to pursue these objectives. This it will do in partnership with the regional actors that have long been active in this field, the Regional Activity Centre for Specially Protected Areas, WWF and IUCN, the ACCOBAMS agreement, the GFCM and the scientific community.

**Bernard CRESSENS**
Conservation Director, WWF-France

# Foreword

It would make no sense to transform the Taj Mahal into a toxic dump, to build a shopping mall on top of Athens' acropolis, or to mow down all the wildlife in the Serengeti plains to make pet food. So why are humans not so wise also with the Mediterranean? There is probably no sea on Earth where the combination of unique and universally recognised natural and cultural values characterising the Mediterranean must coexist with extraordinarily intense and pervasive human pressures, which increasingly threaten to send all those values into oblivion. One would imagine that humanity is fully alert and mobilised to address such threats, to find solutions to conflicts, and to ensure that the Mediterranean's unique features are not lost. Undeniably this is happening, however actions are half-hearted and results still frustratingly meagre. In spite of commitments, habitats continue to degrade year after year, and charismatic species disappear under our very eyes. Success stories hardly come to mind. The loss is environmental and cultural, but economic as well. We shouldn't forget that the Mediterranean is one of the world's most coveted tourist destinations.

Marine protected areas (MPAs) have gained world recognition as effective tools to protect the marine environment, and are much in favour in the Mediterranean, where about a hundred of them have been declared during the recent decades to grant special protection to sites perceived to contain the most valuable marine habitats and species. Embattled by the complexities of saving their sea as a whole, the Mediterranean nations have resolved to carve out their remaining crown's jewels from the marine wasteland, and struggle to conserve them through MPA designations.

However, even within the narrow limits of such triaging strategy, much progress remains to be done. Problems concern the designation process as well as management issues. With the sole exception of the Pelagos Sanctuary, all Mediterranean MPAs are coastal, and no true deep-sea MPAs exist. Worse still, about three quarters of them are located along the basin's northern shore, highlighting the lack of MPAs declared in the southern and eastern countries, thus depriving unique habitats and species of much needed protection. Mediterranean MPAs all work as separate entities, and no functional network has appeared yet on the horizon. More than half of the region's MPAs have not adopted a management plan - many of them because a management body was never appointed. This means that more than half of the Mediterranean MPAs could be considered paper parks, significantly downsizing the firepower of the region's conservation arsenal. Most importantly, effective marine conservation throughout the Mediterranean is still constrained by crippling heterogeneities in the region's governance, institutional structures, wealth distribution, social capital, and the knowledge environment.

There is, however, reason to cheer up in spite of such a grim scenario: solutions to the problems which have so far marred Mediterranean MPAs are clear and within reach, providing that political action follows political commitment. First, a proper assessment of knowledge strengths and needs should be undertaken for the entire basin. Second, new MPAs should be established to supplement existing ones, to create geographically and ecologically balanced networks targeting valuable habitats representing the different

Mediterranean ecoregions. Third, existing MPAs must be made to work properly by addressing issues related to their governance (e.g., by improving MPAs' legal status and institutional infrastructure where needed) and management (e.g., by supporting the endowment of MPAs with adequate management bodies and structures, management plans, and means of implementation). To achieve this result, partnerships among all the players in the field – including governmental and non-governmental organisations – should be strengthened, roles assigned, and consensus built.

A fundamental prerequisite to such effort is the creation of a baseline to measure progress, and herein lies the great value of "Status of Marine Protected Areas in the Mediterranean Sea" by IUCN and WWF/MedPAN. Equally important, this report is the distillation of the collective effort of a very large number of organisations and individuals who share a strong commitment to conserve the Mediterranean natural and cultural heritage through the establishment of MPAs. The appearance of the IUCN-WWF/MedPAN report bodes well to Mediterranean conservation. Let's not miss this wonderful opportunity.

**Giuseppe Notarbartolo di Sciara**
Regional Coordinator, IUCN WCPA–Marine Mediterranean & Black Sea Region

# Chapter 1

# An overview

## The Mediterranean Sea, a global biodiversity hot spot under human pressure

The Mediterranean Sea is an important ecological area for the unique diversity of life hosted in its waters, the high number of endemic species,, and critical areas for the reproduction of pelagic species. For example, the Mediterranean encompasses the main spawning grounds of the Atlantic bluefin tuna, unique breeding areas of the great white shark, and sea turtles such as loggerhead and green turtles regularly nest along the eastern shores. Areas of high oceanographic productivity host a particularly rich cetacean fauna, the eastern part of the Mediterranean is one of the last refuges for the Critically Endangered Mediterranean monk seal. Furthermore, keystone species and critical areas such as seagrass and coralligenous assemblages are found along shallow coasts, while deep sea waters support unique and sensitive fauna . This natural heritage has deeply influenced the development of many different human populations, transforming this basin in a rich and heterogeneous mosaic of cultures.

Over thousands of years, the Mediterranean region has sustained human development, settlement, commerce and resource exploitation and the sea is thus representative of extreme conditions, resulting from this persistent historical impact. In the recent decades, human pressure has intensified and fishing, pollution, tourism, and coastal development are recognised as the main drivers of biodiversity changes, along with the exacerbating effects of climate change.

## Marine protected areas: a tool to manage and protect species, habitats, and ecosystems

These human threats must be mitigated if current trends of biodiversity loss are to be reversed. The vision of the Barcelona Convention is one of healthy ecosystems, populations and economies founded on conservation and sustainable use. Ecological networks of effective marine protected areas (MPAs) are the cornerstone of any strategy for achieving this vision. In several conventions and treaties[2], countries committed to reinforce the efforts to protect Mediterranean biodiversity.

MPAs are effective tools for providing lasting protection, enabling restoration and ensuring careful use of this natural heritage. If they protect sensitive environments and threatened species, they also contribute to increasing the productivity of fishing areas, regulating the different uses of the sea, fostering sustainable tourism and creating new job-generating activities. A step beyond creating individual MPAs is to establish o a network of MPAs. Through interconnections and interdependencies, individual MPAs of this network contribute positively to each other's integrity by decreasing overall vulnerability.

## About this survey

This work is a collaborative effort of IUCN, WWF and MedPAN[3], to present the first evaluation of the status of marine conservation in the Mediterranean.

The main aim of the present survey was to provide an updated baseline to assess progress towards developing an ecologically representative and coherent network of MPAs in the Mediterranean Sea. Specifically, results of this survey were used to measure Mediterranean progress towards the targets of the Convention for Biological Diversity. These results are presented four years prior to the 2012 deadline to establish

2 Convention on Biological Diversity, Convention for the protection of the Mediterranean Sea against pollution (Barcelona Convention), UN World Summit on Sustainable Development

3 International Union for Conservation of Nature (IUCN), World Wide Fund for Nature (WWF), and the Network of Managers of Marine Protected Areas in the Mediterranean (MedPAN).

representative, comprehensive and effectively managed MPA networks and two years before the 2010 deadline to protect 10% of global ecoregions. In addition, the percentage of protection in the Mediterranean region can be used as an indicator to assess the progress in meeting Millennium Development Goal 7: Ensuring Environmental Sustainability.

The specific objectives of the study included:

- Updating information regarding the quantity, type and distribution of Mediterranean MPAs and making this information available online through the MedPAN database http://www.medpan.org.

- Assessing the following characteristics of Mediterranean MPAs:

  - General data and features;

  - Habitats and species currently under protection and conservation status of key ones;

  - Main threats of Mediterranean MPAs;

  - Strengths and weaknesses of management as well as level of capacity/effectiveness of the MPA .

The survey was carried out with the support of the UNEP Regional Activity Centre for Specially Protected Areas (RAC/SPA), the arm of the Mediterranean Action Plan regarding Mediterranean protection. It is offered as a resource to MPA managers, institutions, scientists and decision-makers, but also the general public to know better the work done in the region on marine conservation. It has been prepared over 2007 and 2008, and reflects the progress made up to September 2007 in the Mediterranean.

This study is innovative in several aspects. It is the first survey of Mediterranean MPAs that includes a review of the management characteristics that is based on data collection through a questionnaire. It involved the participation of MPA management bodies and agencies from 18 of 21 countries bordering the Mediterranean. This has been made possible due to the networking activities of MedPAN, under the coordination of WWF, which has contributed to create a community of MPA managers in the Mediterranean, and to the scientific and technical networks of IUCN. This report provides quantitative and qualitative information on MPAs, specifically for understudied areas such as the eastern and southern part of the basin. It also develops a first list of MPAs based on a set of criteria that were applied in a similar manner to all Mediterranean countries. Finally, we identified several challenges towards the establishment a network in the Mediterranean and discussed how they can be overcome through strategic MPA network planning and design.

## Key findings

### *1. CBD target of protection of 10% is not likely to be achieved in the Mediterranean*

Marine protected and managed areas in the Mediterranean cover 97,410 km² or approximately 4% of the Mediterranean. Excluding the Pelagos Sanctuary (87,500 km²), the area covered by coastal MPAs amounts to only 9,910 km², which is 0.4% of the total surface of the Mediterranean Sea. Cumulative no-take area that has been reported is 202 km², or 0.01% of the total surface of the Mediterranean.

### *2. The current Mediterranean MPA system is not representative or coherent*

All MPAs are located in coastal waters under national jurisdiction, with the exception of the Pelagos Sanctuary, the only high-sea MPA to date in the Mediterranean. MPAs are mostly located in the northern shore of the Mediterranean with the exception of a few sites in Algeria, Morocco, and Tunisia, Israel, Lebanon and Syria. Results revealed disparities in MPA distribution where major Mediterranean Sea habitats and biomes are not included in and where spacing between protected sites may be too wide to ensure larval exchange of most marine organisms amongst the network of protected sites.

### *3. Management in Mediterranean MPAs needs to be more effective*

Results showed that management is still not adequate in approximately half of the MPAs of the region. Some of the reasons behind this include lack of a management plan, information on natural resources, enforcement and surveillance, human and financial resources, facilities and equipments such as boats, visitor centres, and diving equipment. In addition, ecological and socioeconomic monitoring is not common practice in the Mediterranean.

Specifically, implementation of MPAs should be progressed in the southern and northeastern Mediterranean. Results from these areas revealed major needs and challenges related to management capacity. Some did not have any staff and were insufficiently equipped, indicating low capacity and potential for management. On the other hand, northwestern MPAs were very heterogeneous. Many of them were excellent cases of management and can be considered MPA case studies for best practice, while others can be defined as paper parks. Results of this survey confirm the trends observed for extensively studied MPAs of the northwestern Mediterranean and for other regions of the world, where the level of success and MPA continuity depends on the quantity and quality of the management team and their opportunity to work in adequate conditions.

### *4. Perceived status of habitats and species within the MPAs*

Data on status of habitats and species under protection and management suggests that ecological information was not easily accessible for many MPAs. However, a high proportion of managers perceived negative trends in key habitats, such as seagrass beds and coralligenous communities, and critical areas such as fish spawning aggregations and feeding grounds. The only notable population increase was reported for the dusky grouper, *Epinephelus marginatus* and the brown meagre, *Sciaena umbra*. On the contrary, the Mediterranean lobster, *Palinurus elephas* and the red coral, *Corallium rubrum* were reported by managers to have shown a considerable decrease.

### *5. Local, regional, and global pressures threatening Mediterranean MPAs*

Mediterranean MPAs are affected by multiple anthropogenic threats from the associated and adjacent land and marine waters that might influence their

effectiveness. More than half of MPAs were affected by anchoring, invasive plants, overfishing, noise pollution, solid waste, oil or diesel degassing or oil spill, plant/animal composition changes caused by climate change and urbanization or artificial construction. MPAs are also facing the threat of introduced and invasive species . In particular, *Caulerpa racemosa* and *Asparagopsis armata* were the most frequently reported invasive algae in Mediterranean MPAs.

## Recommendations

This report aims to contribute to conservation actions: it helps in clearly identifying what and where priorities of action are needed to effectively address the issues and protect Mediterranean biodiversity and ecosystems. It also proposes recommendations to build a more regionally and structured effort to establish an MPA network.

### *Towards the development of a coherent network of MPAs in the Mediterranean*

Establishing new MPAs to supplement existing ones is critical so as to create a geographically and ecologically balanced network. This requires identifying a subset of priority areas for conservation in the Mediterranean through a hierarchical approach ( cascading from ecoregions, to priority conservation areas, to ecologically critical habitats, to key species areas). It will also be necessary to provide the political effort to drive this process and to move MPAs higher in the conservation agenda. Resource distribution, governance and legal frameworks, capacity building, and scientific and technical exchange should be improved to support countries in achieving their conservation goals.

### *To improve management effectiveness*

A network of MPAs would succeed if the individual MPA will meet its conservation objectives. To achieve this, Mediterranean MPA need to have adequate management bodies; make widespread use of management plans and support their implementation; perform detailed and accurate natural resource inventory and assess their geographical distribution; assess management effectiveness; provide for human resources and training; explore innovative financing mechanisms for secure financial resources, equipment and facilities; implement effective surveillance combined with education and awareness-raising programmes in areas where a need is identified.

*Tabarka Tunisia © Imène Meliane*

# Chapter 2

# Introduction

## 2.1 Background

Only in the last decade has there been recognition that marine ecosystems worldwide are suffering massive and acute declines in biodiversity and irreparable alterations to ecosystem functions (Boersma and Parrish 1999, Millennium Ecosystem Assessment 2005). The capacity of oceans to recover from global perturbations and, thus, to maintain ecosystem goods and services is rapidly weakening (Worm et al. 2006). Global changes, pollution, overfishing, introduced species, and habitat degradation have been identified as the principal causes of marine biodiversity loss and thus priorities for conservation intervention (Jackson et al. 2001, Norse and Crowder 2005, Dulvy et al. 2006).

### The Mediterranean: a threatened Sea

The Mediterranean Sea and region has undergone many environmental and cultural changes as a result of extensive human activities sustained over thousands of years, including human development, settlement, commerce, and resource exploitation. Currently, there are 601 cities with a population of more than 10,000 inhabitants along the Mediterranean coasts (European Environment Agency 2006). In addition, the resident population of the coastal regions is 143 million, with this figure doubling during the summer months as 175 million tourists a year visit these shores (Blue Plan 2005). As a consequence, the associated human impact has altered original Mediterranean landscapes and local cultural traditions resulting in many marine species being listed as endangered (IUCN 2007).

Pollution is one of the greatest problems in this semi-enclosed sea. Limited flow with adjacent Atlantic waters permits a complete exchange of water only once every seventy years. Hazardous waste substances discharged by the 21 Mediterranean countries can circulate for years (IUCN 2008a). Evidence of pollution due to industrial and agricultural waste, heavy metals, and persistent organic and solid material can be found in all trophic levels of marine organisms. For instance, 250,000 tonnes of oil are regularly discharged during shipping operations, accidents, and routine discharges (European Environment Agency 2006). The effects of such hydrocarbons are detectable in the short- to long-term and their impact can range from genetic alteration to direct poisoning of marine organisms (Galil 2006).

*Oil spill in El Estrecho Natural Park, Spain © El Estrecho Natural Park*

In the last century, fishing has rapidly increased in the Mediterranean (Zenetos et al. 2002), transforming almost completely this once artisanal activity into the unsustainable industrial exploitation of natural resources (Goñi et al. 2000). The majority of Mediterranean commercial fish stocks are over-exploited (Farrugio et al. 1993, FAO 2006). Overexploitation implies a change in the structure of the populations, with small size dominance, loss of biomass and decrease in fecundity and recruitment (Murawsky 2000). Atlantic bluefin tuna, *Thunnus thynnus,* has been exploited in the Mediterranean Sea for thousands of years during its spawning migration into this enclosed sea. Only in more recent decades have these stocks have become heavily overfished, due in part to overcapacity of the current fishing fleet (Fromentin and Powers 2005). Several species of shrimp, *Aristeus antennatus* and *Parapenaeus longirostris*, mullet, *Mullus surmuletus*, and sardine, *Sardina pilchardus*, have been declared fully exploited locally (FAO 2006). Illegal and destructive harvesting has caused serious declines in characteristic Mediterranean species such as the red coral *Corallium rubrum* (Santangelo 1993, UNEP/MAP/RAC/SPA 2007) or the depletion of rocky shore as in the harvesting of the date-mussels *Lithophaga lithophaga* (Fanelli et al. 1994). Furthermore, negative effects of fishing are not only limited to targeted species. Significant impacts to demersal communities are caused by habitat-destructive trawling gear. Other fishing gear such as longlines and driftnets result significant in the incidental by-catch of turtle, sharks, and cetacean (for a review, see Tudela 2004, Tudela et al. 2005). Sixty percent of Mediterranean cetaceans and 40% of shark and ray species are threatened with extinction (Reeves and Notarbartolo di Sciara 2006, Cavanagh and Gibson 2007). Lastly, the depletion of top predators in the Mediterranean Sea (such as monk seals, sharks, tunas, swordfish and grouper) is thought to have contributed directly to cascade effects in trophic food webs, altering the ecology of many areas of the Mediterranean (Sala 2004).

Climate change is recognised as one of the greatest threats to the world and has been largely attributed to the rapid increase in greenhouse gases ($CO_2$ being one of the most significant contributors) in the last three to five decades. The effects of climate change can be seen on all scales of marine ecosystem processes. The predicted consequences on the world's oceans include seawater acidification and warming, sea level rise due to melting

*Incidental by-catch of sperm whale © TUDAV*

polar ice caps, and the alteration of air and water currents. In the Mediterranean Sea, effects of global warming seem to be linked with the constant increase in sea surface temperature (SST) recorded from the 1980s (Bethoux et al. 1998, 1990, Lelieveld 2002) and also in deeper waters (Diaz-Almela et al. 2007). There are various ecological consequences of these climate changes. Species composition – and therefore ultimately ecosystems – may change through space and time as warmer-water species distribution ranges expand and colder-water species ranges shrink (Occhipinti-Ambrogi and Savini 2003). An unusual mass mortality event of the red coral *C. rubrum* in the north-western Mediterranean was also attributed to a severe temperature anomaly (Garrabou et al. 2001). In addition, the projected increasing atmospheric $CO_2$ may reduce ocean pH (ocean acidification) and carbonate ion concentrations (Bates et al. 2008). This process is expected to affect marine organisms, such as cold-water corals, coralline algae, sea urchins and plankton, which depend on calcium or aragonite to build their shells or skeletons, and in turn, provide essential fish habitat or important food sources to higher trophic level predators (Orr et al. 2005, Hall-Spencer et al. 2008).

The physical loss of characteristic habitats of the Mediterranean is one of the most visible consequences of human pressure. The abundance and distribution of seagrass meadows, critical habitat for the refuge, reproduction and feeding of 25% of Mediterranean flora and fauna species (Delbaere 1998), has drastically declined due to bottom trawling, coastal physical modifications, and pollution. Densities of the most common species, *Posidonia oceanica*, have decreased by up to 50% compared to original distributions (Airoldi and Beck 2007). Likewise, fragile ecosystems such as coralligenous communities are highly impacted by global warming, pollution, trawling and SCUBA diving (UNEP/MAP/RAC/SPA 1999, 2003b, Ballesteros 2006). This highly diverse and heterogeneous biocenosis is inhabited by unique species of sponges, gorgonians, corals, bryozoans and tunicates. In addition, submarine canyons, cold seeps, cold-water coral reefs, seamounts and brine pools are threatened by uncontrolled bottom trawling fishing (Cartes et al. 2004). Coastal areas have been subjected to drastic alterations in the last few decades. As a consequence, natural environments are being replaced with artificial constructions for urbanization, tourism and other economic activities. This trend can be seen both in the northern more developed Mediterranean coast and in the southern Mediterranean where tourism is expected to grow at an unprecedented pace in the next decade. Predictions are that 50% of the Mediterranean coasts may be completely transformed as a

*Coastal urbanisation Mar Menor, Spain © Gomei N.*

continuous metropolis with an irreversible modification of coastal environment and associated ecological processes (Blue Plan 2005).

The introduction of non-indigenous species is emerging as one of most important ecological and economic threats to the Mediterranean Sea. The principal vectors of species introductions into the Mediterranean are the waterways of the Suez Canal (leading to Red Sea species migration), hull fouling, and ballast water associated with shipping, and aquaculture (Flagella and Abdulla 2005). Currently, 99 fishes, 63 crustaceans, 137 molluscs, and nine macrophytes have been listed that are considered non-native to the Mediterranean (CIESM 2002a, 2002b, 2004, Boudouresque and Verlaque 2002). The impacts of introductions are ecologic, economic and social, and are visible in many Mediterranean areas where they have outcompeted native species, becoming invasive species (CIESM 2002c). Notorious examples are the invasion of two species of green algae of the genus *Caulerpa* which outcompete seagrass species (Galil 2007), or the jellyfish and algal blooms which affect fishery, aquaculture and tourist activities (Galil 2000, Streftaris and Zenetos 2006). The rate and success of species invasions can be exacerbated by the level of degradation of habitats and the impact of aliens can also be greater (Galil 2000, Occhipinti-Ambrogi and Savini 2003).

### *The Mediterranean Sea: a heritage to conserve*

In spite of all of this historical abuse, Shi and collaborators (2005) identified the Mediterranean Sea as a biodiversity hotspot for the unique diversity of life hosted in its waters. The threats that have been mentioned must be mitigated if current trends in biodiversity loss are to be reversed. Compared to other regions of the world, and considering its small dimension (less than 1% of the world's ocean area, Farrugio et al. 1993), the Mediterranean is one of the world's conservation priority areas for its high number of threatened and endemic species; for its biodiversity that greatly changes among numerous different ecosystems; and also for the escalating human pressure over the centuries (Myers et al. 2000, Mittermeier 2004, Shi et al. 2005).

The current species complexity of the Mediterranean Sea is the result of the combined effect of different geological events. It is hypothesized that only a small number of species survived the Messinian episode (circa 5 million years ago) when the Mediterranean basin sealed and almost completely desiccated. Subsequently, marine organisms re-colonised the region from the Atlantic Ocean. Alternating warm and ice ages of the Quaternary resulted in species immigration from the tropical waters (during the warm ages) and boreal waters (during the ice ages) of the Atlantic. Recently, Indo-pacific species have entered from the Red Sea through the Suez Canal (1869). Consequently, many different species have colonized the different geographical, seasonal and deep niches (Bianchi and Morri 2000, Boero 2003). Furthermore, the submarine relief of the Sicily Channel creates two different basins where the deep-sea fauna evolved independently (Cartes 2004). In the Mediterranean around 12,000 species were recorded (8,000 animals, 1,500 macrophytes, and 2,500 other taxonomic groups) of which 25-30% endemic to the Mediterranean (Bianchi and Morri 2000, Boudouresque 2004, Briand and Giuliano 2007, Bianchi 2007). Although species richness is lower than in tropical seas, the topology and structure of Mediterranean food webs are comparable in their complexity (Sala 2004). This complexity is reflected in a recent biogeographical classification which identifies seven marine ecoregions in the Mediterranean Sea according to unique ecological and physical characteristics of the coastal and shelf areas (Spalding et al. 2007).

The unique biodiversity of the Mediterranean Sea includes a number of protected, rare, and key species that have been globally or regionally classified as threatened or under risk of extinction (Abdulla et al. in press). Examples of distribution and information of significant species include the following:

- The Mediterranean encompasses the main spawning grounds of the Atlantic bluefin tuna, *Thunnus thynnus*, in the Balearic archipelago, southern Tyrrhenian Sea, Levantine Sea and south Turkey (Medina et al. 2007, Fromentin and Powers 2005).

- About 2-3,000 loggerhead, *Caretta caretta*, and 350 green turtles, *Chelonia mydas*, regularly annually nest in the Mediterranean (Broderick et al. 2002). The coasts of Turkey, Greece, Cyprus and Libya are the most important nesting areas for *C. caretta*, with few sites in the western Mediterranean; whereas *C. mydas* nest almost exclusively in the Easter Mediterranean, mainly in Turkey and Cyprus (Margaritoulis 2003, Canbolat 2004).

- The great white shark, *Carcharodon carcharias*, a species listed in the Barcelona and Bern Convention and classified Endangered in the Mediterranean by the IUCN Species Survival Commission, has unique breeding grounds in the Sicilian Channel waters (Tudela 2004, Abdulla 2004).

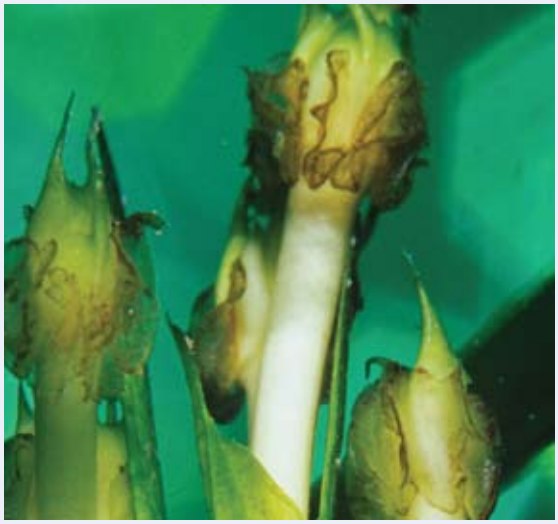
- Protection measures have allowed the recovery of specific species close to extinction such as the Audouin's gull, *Larus audouinii*, endemic to the Mediterranean region, whose breeding populations occur in the western Mediterranean in coastal / island sites in Spain, Corsica and Sardinia (UNEP/MAP/RAC/SPA, 2004).

- The oceanographic features of the Corso-Ligurian Basin result in an area of high productivity that hosts a particularly rich cetacean fauna such as most (3500 individuals) of the fin whale population *Balaenoptera physalus* of the Mediterranean (Notarbartolo di Sciara et al. 2003).

- The eastern part of the Mediterranean, especially the Aegean Sea, hosts the majority of the small and heavily fragmented population of the Mediterranean monk seal *Monachus monachus* (Dendrinos et al. 2007). This mammal is classified as Critically Endangered (the greatest danger of extinction level) on the global IUCN Red List. In the Mediterranean Sea, only about 600 individuals remain in remote areas (Gucu et al. 2004, Dendrinos et al. 2007).

- Seagrasses are the first biodiversity hotspot of the Mediterranean; between its leaves and rhizomes in fact live, feed, reproduce and hide a variety of invertebrates and vertebrates (Gambi et al. 2006).

*Monk Seal Monachus monachus in Foça, Turkey © SAD AFAG*



*Flower of Posidonia oceanica, Natural Reserve of the Straits of Bonifacio, France © E. Volto, O.E.C.*

*Caretta caretta, loggerhead turtle hatchling on the Cirali beach. Mediterranean Sea, Turkey © WWF-Canon / Michel GUNTHER*

They are also keystone species by providing oxygen and nutrient production, coastal protection (Duffy 2006). Three seagrass species can be found in its shallow waters: *Posidonia oceanica*, endemic to the Mediterranean, *Cymodocea nodosa* and *Zostera* spp..

- One of the most beautiful and productive ecosystems of the Mediterranean is the coralligenous assemblage. It is made up of hard corals and its age may range from 600 to 7000 years BP (Sartoretto et al. 1996). This highly diverse and heterogeneous biocenosis is built by a high number of species algae, sponges, gorgonians, corals, bryozoans and tunicates and it is dwelling community as many other taxa such as crustacean, molluscs, or fishes of every ages can live into its complex structure (Ballesteros 2006, UNEP/MAP/RAC/SPA 2003b).

- Vermetid reefs are the most important biogenic constructions affecting the spatial complexity of intertidal Mediterranean shores, hosting a very diverse community (Molinier and Picard 1953). These biogenic reefs are built by sessile gastropods, the vermetids *Dendropoma petraeum* and *Vermetus triquetrus* endemic to the Mediterranean, and are mainly concentrated in the eastern part of the basin (Antonioli et al. 1999).

*Coralligenous assemblage with Gobius auratus © Andrea Molinari*

## 2.2 Marine Protected Areas and MPA Networks

Among complementary management tools (i.e. pollution control, sustainable exploitation and development), Marine Protected Areas (MPAs) have been advocated as the most effective conservation and management tool to cope with this unprecedented alteration of marine ecosystems and mitigate its effects (Lubchenco et al. 2003). Positive effects of MPAs, provided the presence of areas where all extractive activities are excluded, have proven useful even beyond their boundaries (for a review of MPA effects, see Halpern and Warner 2002, Halpern 2003, Gell and Roberts 2003, PSICO 2007, Claudet et al. 2008). MPAs present a last remaining refuge for threatened species, prevent habitat damage and allow the development of natural biological communities. If effective, MPAs allow the spillover of adults and juveniles that can re-colonise adjacent areas, revitalize depleted fish stocks or restore degraded environments. Recovering a single key species or habitat adds significantly to overall productivity and stability of the ecosystem and a healthy area is more able to withstand stresses.

Several definitions of Marine Protected Area have been formulated and applied in different conservation and management contexts (Annex 1). The international definitions that have been used are:

- *"Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment*". (Resolution 17.38 of the IUCN General Assembly, 1988, reaffirmed in Resolution 19.46, 1994);

- *"Any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna, and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings"* (Convention on Biological Diversity, 2003).

- A IUCN definition will be presented for approval at the World Conservation Congress, Barcelona October 2008 and also apply to MPAs "*A clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*".

In the Mediterranean, as well as at a global level (Wood et al. 2008), the type of protection applied within MPAs is very diverse and reflects cultural and political differences existing among the countries. The majority have been classified as multiple-use marine areas (Harmelin 2000, Badalamenti et al. 2000, Francour et al. 2001). Multiple-use marine areas seek a balance between biodiversity protection and continued human use. Historically, also in the Mediterranean, designation was primarily driven by the presence of charismatic species and unique features or opportunity more than on a holistic ecological approach (Francour et al. 2001, Fraschetti et al. 2002, 2005). Establishing a network of interconnected sites is a step beyond the more traditional approach of design MPAs as single independent entities. The creation of an ecological network of effective MPAs is the fundamental basis for strategies that aim to protect biodiversity of a whole ecoregion and provide ecosystem services for people inhabiting it (Airame et al. 2003, Roberts et al. 2003, Meir et al. 2004, Rodrigues 2004, Agardy 2005). A recent definition of a coherent network of

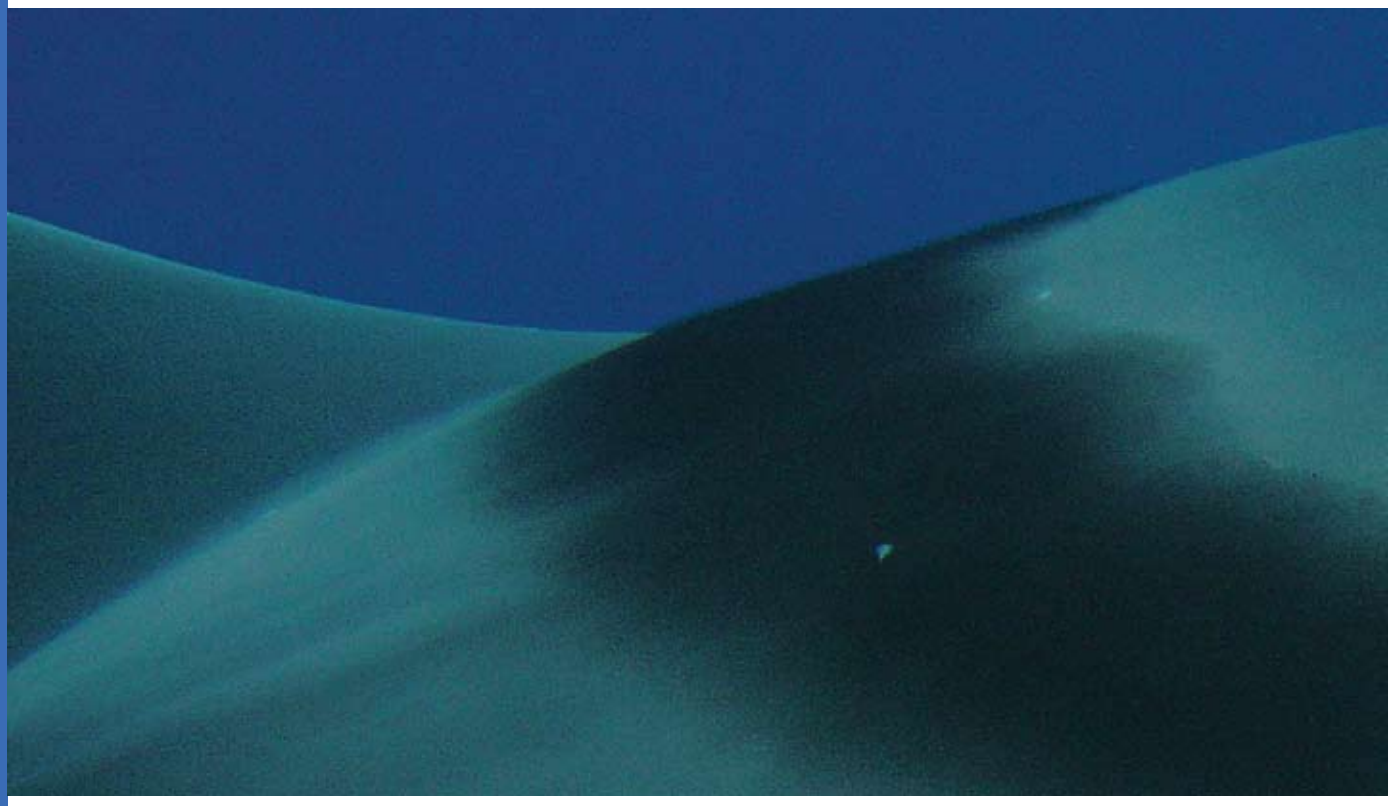
MPAs is "*a collection of individual marine protected areas operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels, in order to fulfil ecological aims more effectively and comprehensively than individual sites could alone. The network will also display social and economic benefits, though the latter may only become fully developed over long time frames as ecosystems recover*" (IUCN WCPA 2007). Principle criteria that should underpin the establishment of a coherent network include: representativeness, effectiveness, connectivity, replication, and adequate size and shape of MPAs (see Annex 2 for further description of these criteria). In the present document, we refer to network of MPA according with these criteria, otherwise we refer to system of MPAs as a term to describe "*conglomeration of individual MPAs or networks under a strategically planned, and harmoniously operated, multi-institutional framework*" (Notarbartolo di Sciara 2005).

## 2.3 Legal framework for the establishment of a network of MPAs in the Mediterranean

Designation and management of MPAs and MPA networks in the Mediterranean is driven by a range of international, regional, and national obligations and initiatives. The leading international legislation for multilateral cooperation is the Convention on Biological Diversity (CBD). All Mediterranean countries ratified the CBD and agreed on the law that compels them to reduce the biodiversity loss. Then, the CBD Programme of Work on Protected Areas indicated the actions needed to achieve these obligations. Under the Convention, governments committed to reach a target of protecting at least 10% of each ecoregion by 2010, and establishing ecologically representative networks of MPAs by 2012. Based on the best available scientific knowledge, these targets have been recognised worldwide as instruments to promote the health of the sea. The commitments of the CBD were also reaffirmed under the UN World Summit on Sustainable Development, the IUCN V$^{th}$ World Parks Congress, and the Evian Summit of the G8 Group of Nations. In addition, the Habitat and Bird Directives are the legal framework of references for European countries to establish an ecological network of protected areas, Natura 2000. In order to designate the sites to be included in Natura 2000, the European Directives were ratified at national level. For further reading on the relevant legislation and regional initiatives that are used for MPAs and MPA networks, please refer to Annex 3, which presents the context for the Mediterranean Sea.

*Sarpa salpa © Andrea Molinari*

# Chapter 3



# Methodology

Two types of indicators are important to assess progress in meeting CBD 2010 targets: a) the level of protection, i.e. what is the spatial extent and distribution of marine protected areas; b) management effectiveness, i.e. if protected areas are achieving their conservation and / or regulatory objectives (Chape et al. 2005). The methodology used to assess these two indicators includes two different approaches. First, the identification of existing MPAs was performed through a review of existing data. Second, by means of a questionnaire, a detailed survey was developed to collect from MPA managers preliminary data on spatial extension and distribution of MPAs, habitats and species under protection, threats, and management effectiveness.

## 3.1 Identifying of existing MPAs

The geographical scope of the survey encompasses the entire Mediterranean Sea. From the perspective of the Law of the Sea, this includes marine waters under the national jurisdiction of the riparian Mediterranean[4] countries as well as international waters. From a worldwide perspective, the Mediterranean is widely considered as a coherent biogeographic province. The biogeographic classifications by Spalding et al. (2007) were used in this report. According to these classifications, the marine seas of the world are classified into 12 realms, 62 provinces, and 232 ecoregions. The Mediterranean Sea is part of the Temperate Northern Atlantic Realm; it is identified as a province and includes seven ecoregions: Adriatic Sea, Aegean Sea, Levantine Sea, Tunisia Plateau / Gulf of Sidra, Ionian Sea, Western Mediterranean and Alborán Sea.

Information on Mediterranean MPAs are scattered and not easily accessible. There is no a reference list agreed by international organizations, NGOs, national institutions, experts, MPA representatives as well as users (Notarbartolo di Sciara 2005). This is partially due to the lack of criteria that would allow georeferenced and standardised listing of MPAs in areas under national or international jurisdiction.

### *Criteria to identify MPAs for the survey*

A list of MPAs in the Mediterranean was published by MedPAN in 2005 and used three criteria to identify MPAs: a legal basis under its country's law, regulation of the uses at sea and a designated management organization (Mabile and Piante 2005). According to these criteria, 76 MPAs were identified. For the current update, these criteria were revised to also include areas that are officially protected but do not yet have a designated management authority.

Moreover, the lists of MPAs produced by RAC/SPA have been taken into account as reference list. RAC/SPA undertakes a survey through national focal points with to update the list of protected areas in each Mediterranean country (latest update was 2007). It was possible to extract from this survey a significant but non-exhaustive list of Marine Protected Areas and marine Natura 2000 sites in the Mediterranean. Inconsistencies with the previous MedPAN list included the following items:

- In the absence of criteria for the RAC/SPA list, reporting was not standardised. For instance, some European countries provided the list of their marine Natura 2000 sites while others did not do so;
- For unknown reasons, some declared MPAs were not reported to RAC/SPA;
- The distinction between marine and coastal areas was in several cases unclear (and some countries

4 21 countries are concerned. They include : Albania, Algeria, Bosnia Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria, Tunisia and Turkey, to which should be added Gibraltar (United Kingdom), and the Palestinian Territories.

included coastal protected areas whereas others did not);

- Some areas reported in the RAC/SPA survey were not officially declared yet.

In order to apply IUCN or other international definitions (see section 1.2) at the regional scale, the definition needs to be operationalised in a way that is relevant to the area of study without losing compatibility with the global definition. Moreover, a number of constraints emerge working with different countries, including the availability and quantity of data, different national legislations, difficulty in accessing data and contact information (language issues in particular) as well as the time necessary to do the research.

For these reasons, specific operational criteria were used to identify MPAs to be contacted for the study. MPAs included in the present survey were:

- All areas that include intertidal *and* subtidal terrain, together with their overlying waters and associated flora, fauna, historical and cultural features, which has been reserved by law to protect part or all of the enclosed environment. Protected Areas with only strictly intertidal areas, lagoons, and deltas without any strictly marine parts were excluded from the present list. The reasons of this temporary exclusion consisted in the difficulties encountered in identifying these sites as they are not considered as MPAs in many countries and therefore not listed in most national MPA databases. In addition, protected lagoons and deltas without any strictly marine parts, were not listed in this survey[5];

- All MPAs with a legal basis (creation decree or any other legal text, even for areas that are designated for a finite duration), while marine areas managed without any legal protection framework were not included;

- Fisheries management areas that have an official objective of biodiversity conservation beside the management of fisheries resources.

It is important to note that the criteria used to draft the present list should not to be considered as a definition of Mediterranean MPAs.

### *Data sources*

On the basis of these criteria, information was collected from a number of public documents and sources of information such as:

a) Reports of international organizations;
b) International databases (MedPAN database, RAC/SPA list, MPA Global, World Database on Protected Areas);
c) National institutional reports and databases;
d) Scientific literature;
e) Grey literature;
f) MPAs communication products (i.e. flyers, web site, publications);
g) Internet websites;
h) Laws and other legal texts;
i) Maps.

For further details on the data sources that were used, see Annex 5.

## 3.2 Survey and questionnaire design

The questionnaire used in this survey was based on similar questionnaires designed to evaluate management effectiveness or to develop databases of Protected Areas. The main sources used were:

5 For further details on conservation tools and managed areas applied in the Mediterranean but not included in the survey see Annex 4

- Rapid Assessment and Prioritization of Protected Areas Management, originally designed for assessing management effectiveness of PAs in forests and it aims for broad-level comparisons among many Protected Areas (RAPPAM; Ervin 2003);

- "How is your MPA doing?", the widely used publication for evaluating MPA management (Pomeroy et al. 2004). In the questionnaire, only those indicators relative to data likely available in the MPAs of the Mediterranean were included;

- European network of Protected Areas Natura 2000 (European Commission 2006);

- The list of Specially Protected Areas of Mediterranean Importance (UNEP/MAP/RAC/SPA 2002);

- Regional directory of Mediterranean Marine Protected Areas (Mabile and Piante 2005);

- Global database of Marine Protected Areas (Wood 2007).

The questionnaire was designed to survey managers´ perceptions of Mediterranean MPAs. Managers were asked to fill the questionnaire on the basis of the scientific data available or on the basis of their experience. In the absence of an official management body, focal points of the competent MPAs authority or scientist working in the MPAs were asked to fill the questionnaire (e.g., some MPAs of Israel, Turkey, Slovenia, and Syria).

Forty-three questions, in six sections, were included in the questionnaire. Details of the questionnaire and the questions that were used are available in Annex 6. In the first three sections, managers were asked general questions regarding the features and regulation of MPAs. These included questions on contact details, legal status, international recognition, government publication in which the legal MPA designation was published, designation status, administration, management body, consultative committee, surface area, IUCN category, geographical and spatial data (GIS), type of zoning and its regulation, and objectives of the MPA.

The fourth section of the questionnaire referred to threats affecting MPAs. We asked respondents to describe the intensity, frequency and probability of a number of threats related to overfishing, alien species, pollution, habitat destruction, and climate change.

In the fifth section, managers were asked for information relating to the ecological characteristics of MPAs. Questions provided information about the different main substrata, habitat and seascape (hereafter referred to as "features"), and species. The species included in the questionnaire were:

- Species listed in the Annex II (Endangered or Threatened Species) and Annex III (species whose exploitation is regulated, hereafter referred to as "Exploited Species") of the Protocol concerning SPAMI (1999)

- Species previously assessed in Mediterranean MPAs (hereafter referred to as "Other relevant species"; Mabile and Piante 2005).

- A list of 28 introduced species. The list includes introduced species previously assessed in Mediterranean MPAs and other introduced species common recorded in the Mediterranean (CIESM 2002a, 2002b, 2004, Boudouresque and Verlaque 2002, Mabile and Piante 2005).

Before the beginning of the survey, the questionnaire was tested with six MPA

managers. We asked them to assess the appropriateness of the questions, accessibility of the terminology used and the time needed to complete the questionnaire. The questionnaire was then modified on the basis of their feedback[6]. Questions were translated into French, English, or Italian. It was not possible in this first edition of the survey to translate the questionnaire in all the native languages of the Mediterranean countries.

A letter was sent by e-mail explaining the aim of the initiative and inviting participation. The invitation letter was sent to MPAs managers, who were asked to complete the questionnaire within a period of three months (from May to July 2007). A follow-up telephone call explained the objectives of the survey, and helped clarify certain issues to the managers. The questionnaire was made available online on the MedPAN website and was sent as a Word document for managers that did not have a consistent or reliable Internet connection.

Results of the survey were presented during the First Conference of the Mediterranean Marine Protected Areas Network (October 2007, on Porquerolles, France), organised by MedPAN, the Port Cros National Park and WWF France, in partnership with the IUCN Centre for Mediterranean Cooperation and UNEP RAC/SPA. Participants included managers of Mediterranean MPAs, representatives of Mediterranean governments, non-governmental organisations, and scientific experts from WCPA – Marine (IUCN World Commission on Protected Areas). Comments and feedback were collected from the discussion and used in the conclusion chapter of the present report.

Questionnaire responses can be consulted in the online databases of Mediterranean MPAs at: http://www.medpan.org.

## 3.3 Questionnaire response rate

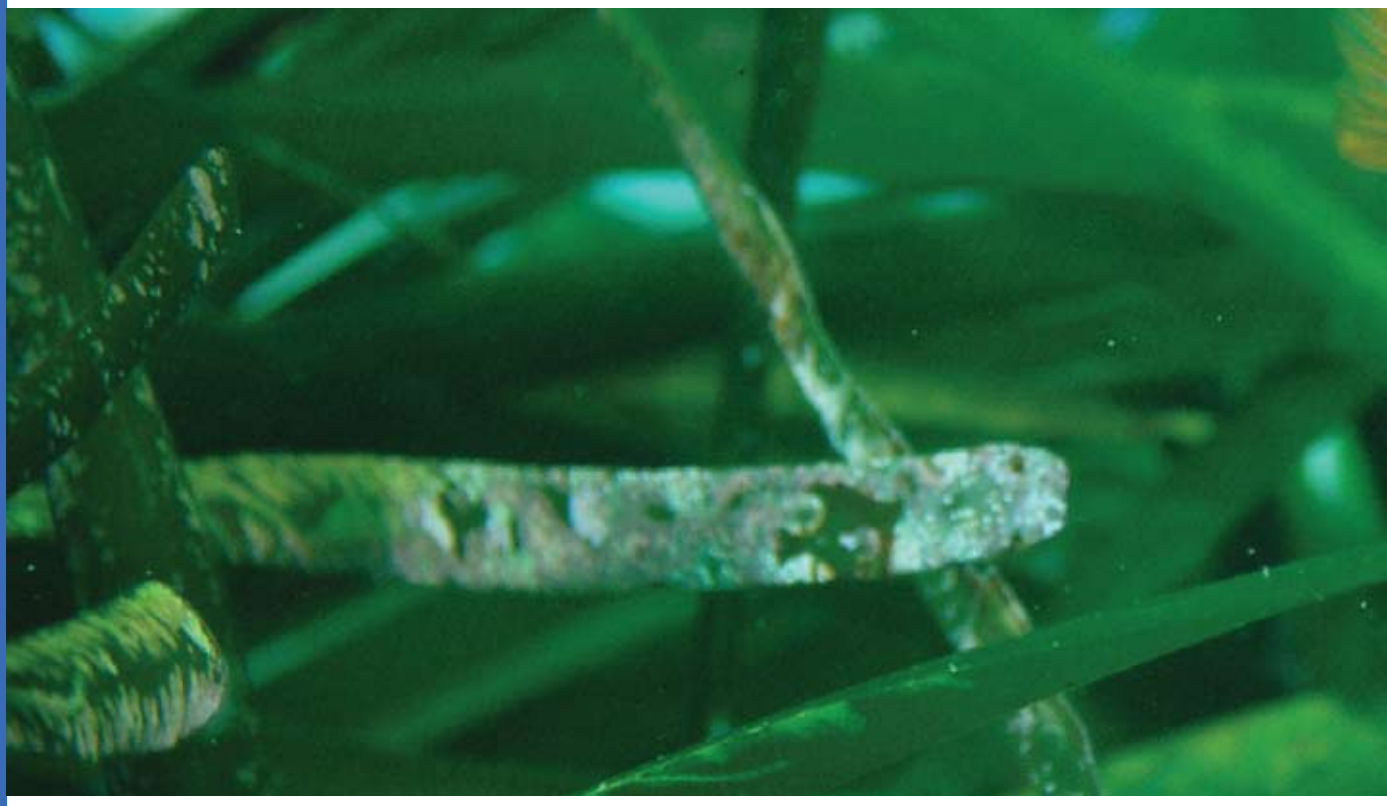
The 90.4% of managers of the Mediterranean MPAs were contacted to participate at the survey (85 MPAs, see below)[7]. Of these, 73% responded to the questionnaire (62 questionnaires), although not all responses were complete. Additional information on general features of MPAs (i.e. marine surface, date of institution) was included in the analysis by using verified data (see Section 3.1.2). There was a significant difference in response rates between MPA managers that were partners of the MedPAN network and non-partner managers[8]. Among the 20 MedPAN partners 95% did answer the questionnaire. The response rate of non-partners was 57.7%. Not surprisingly, this shows that soliciting data is easier when it is done in a familiar framework that promotes a sense of ownership.

## 3.4 Analysis of data

Feedback from the questionnaire was analysed utilising different statistical methods. In most cases, responses were analysed with a descriptive approach based on the percentage frequencies. Results have been thus summarised and groups of MPAs compared according to different criteria. In other cases, patterns in the data were analysed with specific statistical tests to infer conclusions about the MPAs of the Mediterranean based on the MPA managers that responded to the questionnaire. For a further description of how data has been analysed, which statistical methods have been applied, and which criteria were adopted to group MPAs, see Annex 8.

6 The whole questionnaire is reported in Annex 6.
7 Due to lack of viable contact information, the questionnaire could not be sent to nine MPAs. See Annex 9.
8 $Chi^2=15.78$, $p<0.0001$.

# Chapter 4



# Results

According to the criteria defined in Section 3.1.1, 94 MPAs exist in the Mediterranean (as of August 2007). The full list of MPAs is reported in Annex 8. MPAs were first established in the Mediterranean in the 1960s[9]. Figure 1 shows the number of MPAs established in the Mediterranean between 1960 and 2007. The rate of creation of new MPAs increased rapidly in the beginning of 1990s.

Three main themes became evident from the analysis of the responses of the questionnaires. It is clear from the results of this study that MPA designation is not evenly spread throughout the Mediterranean Sea; countries are far from achieving the 2010 or 2012 CBD target for marine protection; management is generally not effective; and MPAs are under multiple global, regional, and local threats.

## 4.1 CBD target of protection of 10% is not likely to be achieved in the Mediterranean

Results of the survey suggest that the rate of MPA designation and the overall area of protected sites is too low to reach CBD target of protecting at least 10% of the Mediterranean Sea.

The marine protected and managed area in the Mediterranean cover 97,410 km² or approximately 4% of the Mediterranean[10]. Excluding the Pelagos Sanctuary (87,500 km²), the area covered by coastal MPAs amount to only 9,910 km² [11], which is 0.4% of the total surface of the Mediterranean Sea[12]. This figure includes multi-use areas as well as no-take zones and reflects state legal protection using MPAs but does not necessarily mean management effectiveness (see below).

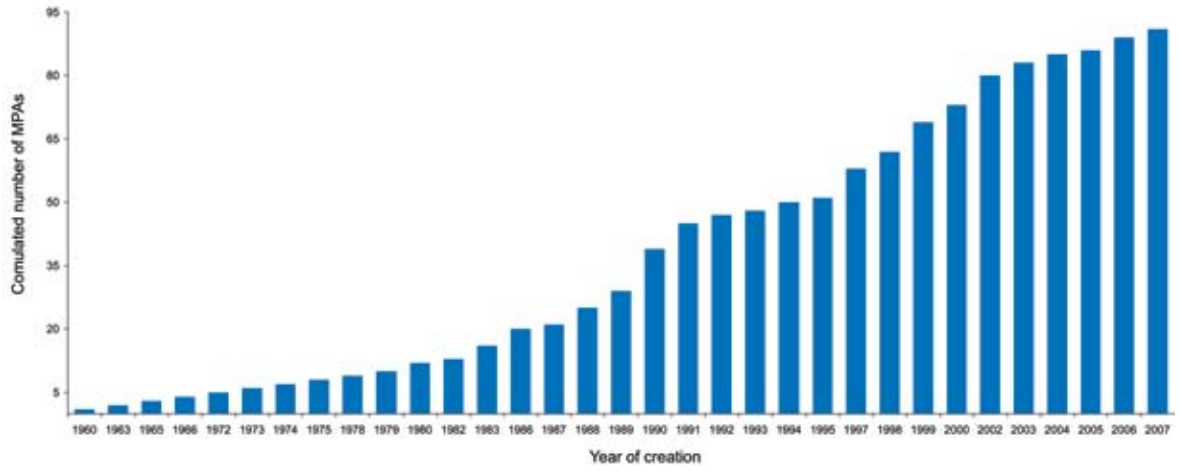



*Figure 1. Cumulative number of MPAs established in the Mediterranean between 1960 and 2007, including the Pelagos Sanctuary and the three deep-sea sites of biodiversity interest of GFCM (three MPAs, for which we had no data regarding their date of establishment, were not included in this graph).*

9 Establishment of the Mljet National Park (Croatia) in 1960; establishment of the Port-Cros National Park (France) in 1964.
10 This percentage is slightly overestimated since the calculation takes in account the fact that the Pelagos Sanctuary includes coastal MPAs (2% of the Pelagos area).
11 This figure refers to the marine areas of the 89 MPAs which data are available.
12 The total area of the Mediterranean Sea is: 2,510,000 km² (Blue Plan 2005).

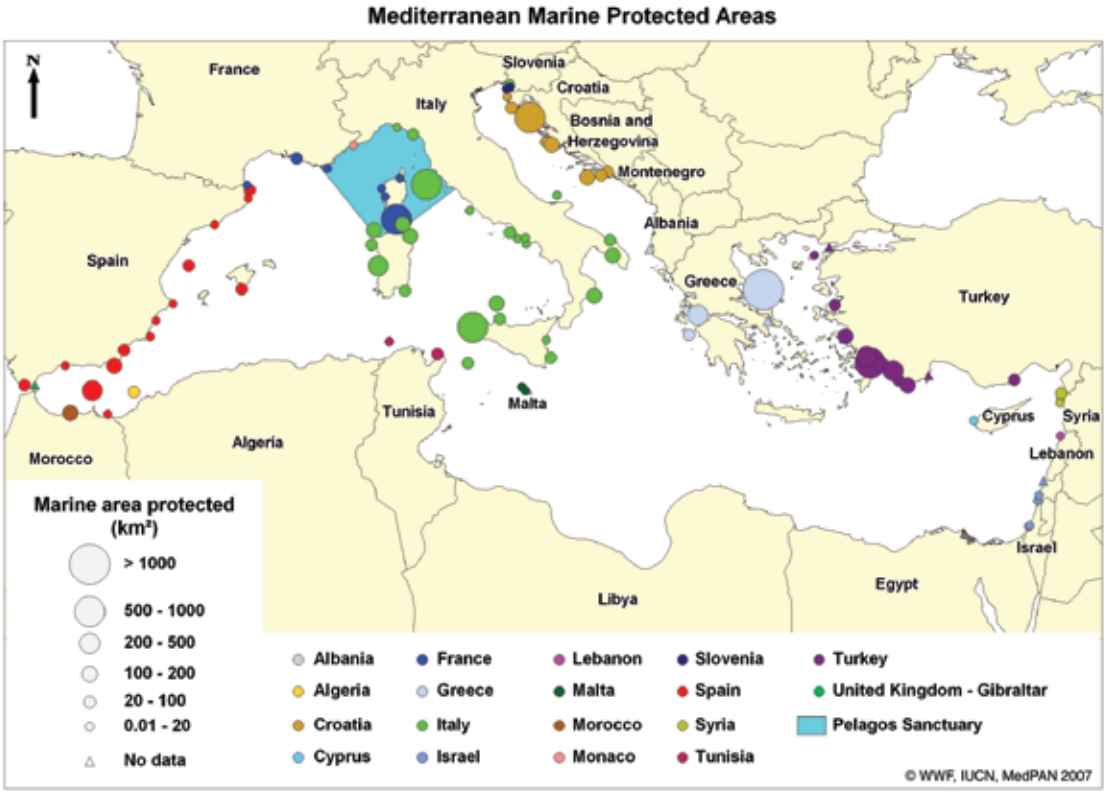



*Figure 2. Distribution of Mediterranean MPAs. Relative size of each MPA is shown according to different class sizes. Different colours represent different countries.*

If we consider specifically no-take areas, respondents from 41 MPAs reported the use of and spatial extent of no-take areas within the MPA, while this information is not available for the other 53 MPAs. Cumulative no-take area that has been reported is 202 km², or 0.01% of the total surface of the Mediterranean Sea or 2.2% of the total surface of the 41 MPAs. All no-take areas are located within national jurisdictions. The average area of no-take zones of MPAs in coastal waters is 5.4 km².

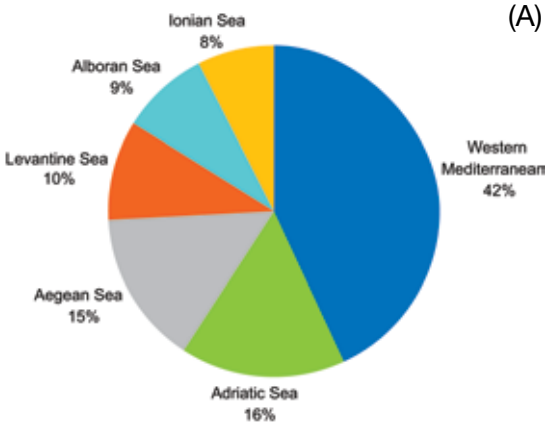
## 4.2 The current Mediterranean MPA system is not representative or coherent

Results revealed incoherence in the MPAs distribution as examples of all Mediterranean Sea habitats and biomes are not represented inside MPA, and spacing among them is too wide to provide larval exchange for most marine organisms.

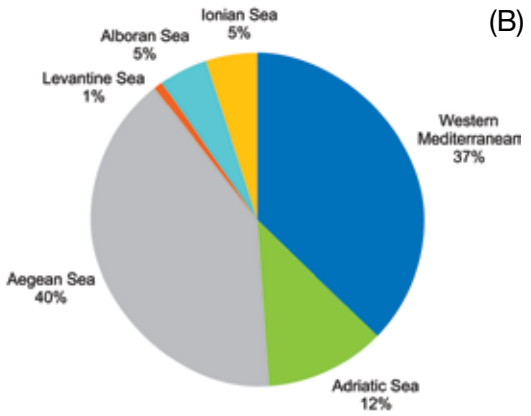
### *Existing MPAs are not completely representative of Mediterranean habitats*

All MPAs are located in coastal waters under national jurisdiction, with the exception of the Pelagos Sanctuary, the only high-sea MPA to date in the Mediterranean. As shown in the map of Figure 2, MPAs are mostly located in the northern shore of the Mediterranean. In 2007, the distribution of MPAs along the Mediterranean coast shows stark differences between ecoregions and between countries. Here we use the Spalding et al. (2007) ecoregions as a reference to assess comprehensiveness of MPA in the Mediterranean Sea. The greatest number of Mediterranean MPAs, 40 MPAs (42.5%), is found in the Western Mediterranean and the rest are equally distributed among the other ecoregions (Fig. 2, 3A). The Aegean Sea is the ecoregion with the largest surface under protection or management (4,013 km²;

(A)




(B)




(C)


*Figure 3. Relative number (A) and surface area (km2; B) of the Mediterranean MPAs according to the ecoregions classification by Spalding et al. (2007; C; Adriatic Sea (1), Aegean Sea (2), Levantine Sea (3), Tunisia Plateau / Gulf of Sidra (4), Ionian Sea (5), Western Mediterranean (6), and Alborán Sea (7)). The Pelagos Sanctuary was excluded from the analysis of the surface area.*

40%) due to a particularly large MPA[13]. In contrast, the Tunisian Plateau / Gulf of Sidra ecoregion has no MPA and only one percent of the Levantine Sea is protect (Fig. 2, 3). The Western Mediterranean and Aegean Sea account for 76% (7,688 km$^2$) of the protected marine surface of the Mediterranean. It is important to note that, although the Western Mediterranean and Aegean Sea ecoregions each have around 40% protection, many of the deepwater habitats are underrepresented because MPA are primarily coastal.

The current system of MPA is not representative of the diversity of the ecosystems of the basin as some ecoregions are very poorly represented. Mediterranean habitats and critical areas were adequately represented only by MPAs from the Western Mediterranean ecoregion (Fig. 4). For example, 62% of MPAs include "feeding grounds for key species within their borders", and 78% is currently protecting "fish spawning aggregations". However, more than half of these MPAs are from the Western Mediterranean and none from the Aegean Sea (Fig. 4). The same pattern is shown by the analysis of other habitats reported by a high number of MPAs such as "seagrass beds" (present in 84% of MPAs) and "coralligenous assemblages" (in 73% of MPAs). These habitats are not reported by MPAs from both Aegean and Levantine Sea (Fig. 4). Only lagoons are equally represented in MPAs from all ecoregions (Fig. 4). Moreover, few MPAs (11%) reported high sea features such as "cold coral reefs", "cold seeps", "hydrothermal vents", "canyons" and "sea mounts".

To date, 18 Mediterranean countries have designated MPAs. The number of MPAs per country varies considerably, from 25 in Italy to none in Montenegro, Bosnia and Herzegovina, Libya or Egypt; although these last two countries have a significant coastline (Fig. 5 and Tab 1). As data on

13 National Marine Park of Alonnisos in the Northern Sporades (2,035 km$^2$)

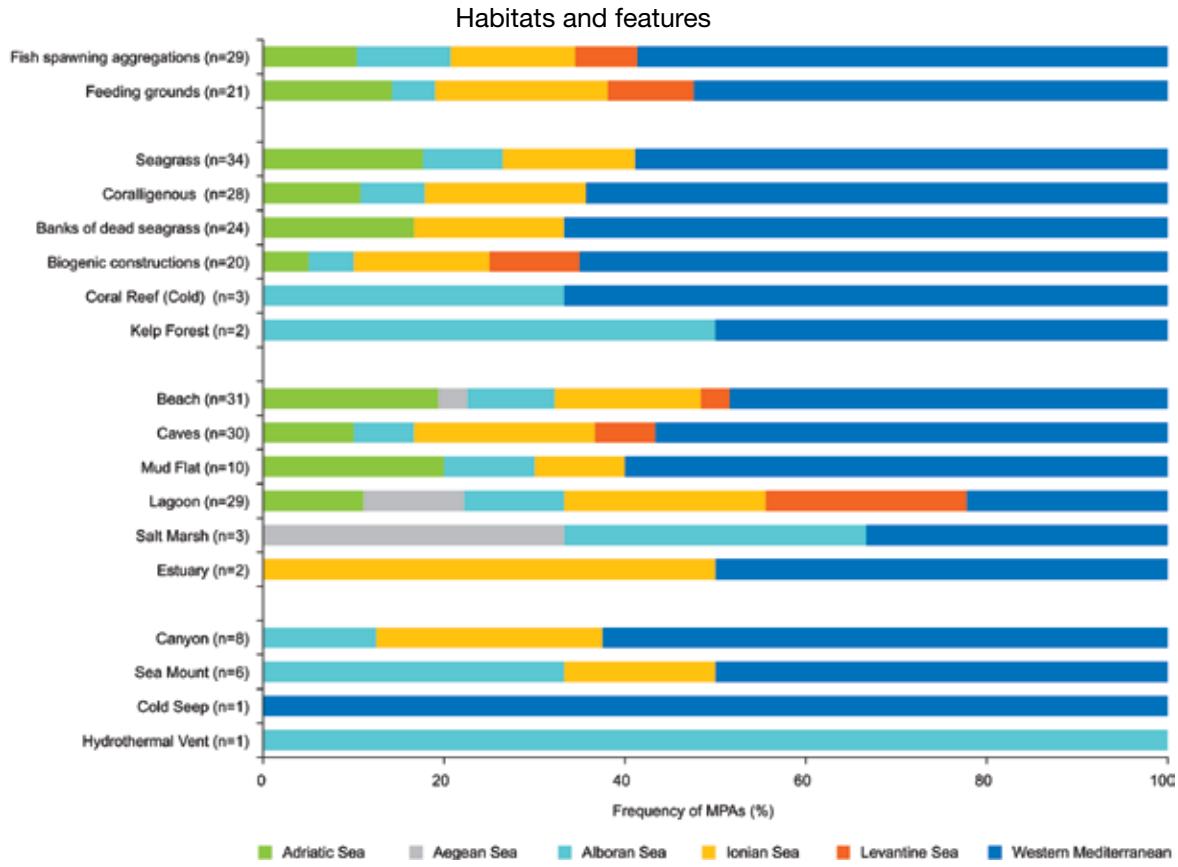



*Figure 4. Percentage of all Mediterranean MPAs of the different ecoregions where the presence of different types of habitats and features was reported. The number of MPAs that reported the presence of each feature in the area is indicated in brackets.*

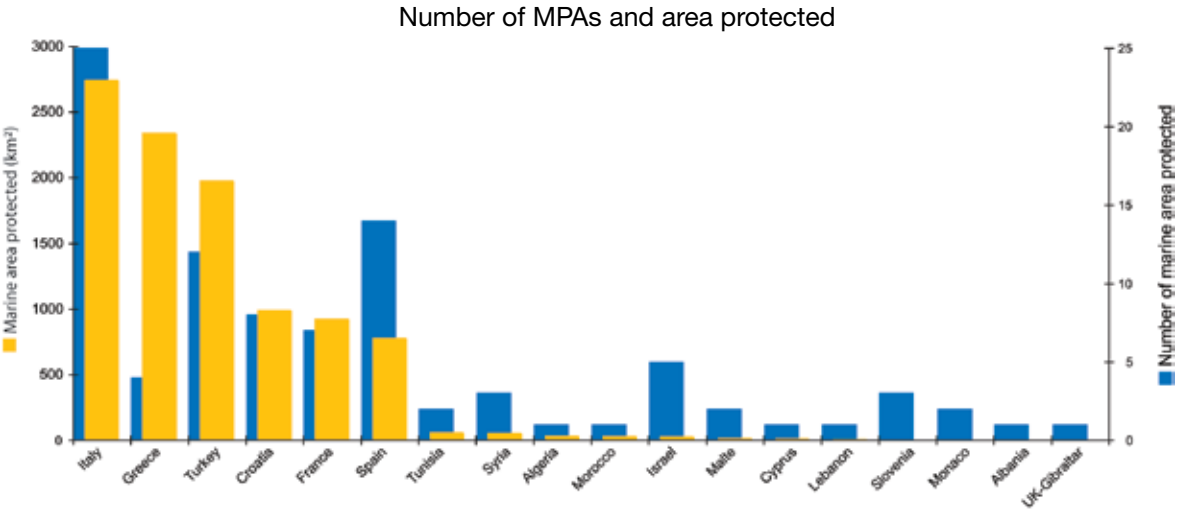



*Figure 5. Number of MPAs (blue bars) and total marine area protected (km²; yellow bars) of each Mediterranean country.*

the surface area of territorial sea and the marine internal waters are not available for the Mediterranean, the marine surface areas protected or managed through MPAs was compared to the coastal length of each country by creating an index that may allow an approximate comparison across countries (Tab 1).

*Table 1. Comparison of the number of MPAs, area protected or managed and the coastal length of Mediterranean countries*

| Country | Number of MPAs | Total marine surface area protected or managed by Mediterranean MPAs (km²) | Coastal length (km) | % of coast protected or managed * |
|---|---|---|---|---|
| **Italy** | 25 | 2,738.18 | 7,375 | 3.04 |
| **Greece** | 4 | 2,336.55 | 15,021 | 13.19 |
| **Turkey** | 12 | 1,972.55 | 5,191 | 23.59 |
| **Croatia** | 8 | 981.54 | 5,835 | 19.43 |
| **France** | 7 | 916.91 | 1,703 | 20.11 |
| **Spain** | 14 | 772.33 | 2,580 | 22.26 |
| **Tunisia** | 2 | 51.50 | 1,298 | 23.13 |
| **Syria** | 3 | 50.00 | 183 | 7.44 |
| **Algeria** | 1 | 27.00 | 1,200 | 6 |
| **Morocco** | 1 | 23.30 | 512 | 13.13 |
| **Israel** | 5 | 17.97 | 179 | 0.56 |
| **Malta** | 2 | 11.06 | 180 | 3.28 |
| **Cyprus** | 1 | 5.50 | 782 | 16.52 |
| **Lebanon** | 1 | 3.98 | 225 | 18.29 |
| **Slovenia** | 3 | 1.25 | 47 | 15.49 |
| **Monaco** | 2 | 0.52 | 4 | 23.24 |
| **Albania** | 1 | ND | 418 | ND |
| **UK - Gibraltar** | 1 | ND | ND | ND |
| **Bosnia and Herzegovina** | 0 | 0 | 23 | |
| **Egypt** | 0 | 0 | 950 | |
| **Libya** | 0 | 0 | 2,025 | |
| **Montenegro** | 0 | 0 | 293 | |
| **Deep Sea** [1] | 3 | 15,666 | - | - |
| **International (Pelagos)** | 1 | 87,500 | - | - |

ND: No data

*Surface area protected or managed / coastal length * 100. [1] Three GFCM deep-sea sites of particular ecological interest

The number of MPAs has also been compared to the surface area under protection (Fig. 5). Italy has the highest number of MPAs and also ranks first in km² protected or managed. Greece protects or manages over 2,300 km² of marine area solely due to 4 MPAs, one of them being the largest MPA on the Mediterranean coast[14]. Turkey, with 12 declared MPAs, has established legalisation for nearly 2,000 km² of marine surface. Comparing cumulative no-take area of each Mediterranean country shows the variability between countries (Fig. 6). Italy and Spain include a higher number of small no-take areas (> 0.06 km²), whereas Morocco and Croatia are characterised by a few large ones (>11 km²).

14 National Marine Park of Alonnisos in the Northern Sporades (2,035 km²)

*Lavsa Island, Kornati National Park, Croatia © Kornati NP Offic; Croatian State Geodetic Agency*

There is also a difference between EU and non-EU countries in the number of MPAs that have been designated. Countries of the European Union have established a higher number of MPAs[15]. In particular 60 MPAs belong to the 8 EU (including Gibraltar-UK) and 34 MPAs to the 9 non-EU countries. This difference is reflected also in the greater surface protected area for EU MPAs (6,782.3 km$^2$, without Pelagos sanctuary) compared to non-EU MPAs (3,127.8 km$^2$).

### *Spacing among Mediterranean MPAs is too wide to maintain larval connectivity*

The average spacing between Mediterranean MPAs is 55±5.7 km (n = 93, Pelagos sanctuary was not included). Indeed, 62% MPAs are spaced more that 20 km apart (Fig. 7). Using a precautionary approach, this distance is too large for larval dispersal of most non-sessile animals and effective fish spill over (Shanks et al. 2003, Mora et al. 2006). However, using a larger connectedness distance of 20-150 km (Palumbi 2003, Cowen et al. 2006, Wood et al. 2008), 92% of MPA are potentially connected to at least with another MPA[16].

## 4.3 Management in Mediterranean MPAs needs to be more effective

Results of the survey showed that management is unlikely to be adequate in approximately half the MPAs of the region. Some of the reasons behind this include lack of: a management plan; information on natural resources; enforcement and surveillance; human and financial resources; facilities and equipments; and significant decrease of in size and abundance of key habitats and species.

### *Existence and status of management plans*

Responses were received to the management plan section of the questionnaire from 57 (92%) managers. Of these, 26 (42%) respondents stated that there is a management plan in place for their MPA, whereas 13 (21%) indicated that their management plan is under development (Fig 8). These results showed that MPA management planning is in the process of becoming a relatively common practice in the Mediterranean region. However, a remaining 18 (29%) respondents still have

15 $Chi^2 = 7.269$; $p < 0.01$
16 For further details on connectivity see Annex 8

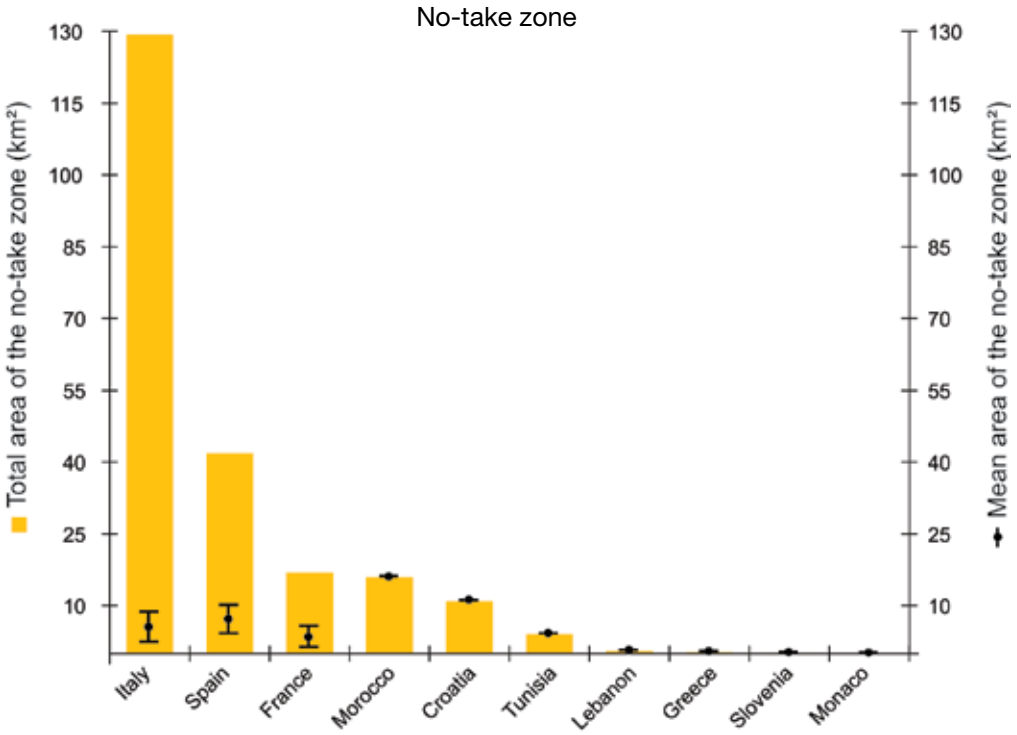



*Figure 6. Cumulative (bars) and mean (point) area (km²) of no-take zones of MPAs of each Mediterranean country.*

not developed any management plan. Major differences between countries in this matter can be observed. The lack of management plans is particularly striking in the eastern countries.

### *Monitoring and evaluation*

In order to examine whether management system is monitored in the Mediterranean MPAs, the questionnaire included questions on the employment of ecological monitoring programme, studies on management effectiveness, and socioeconomic analysis.

Habitats and species monitoring does not appear to be common practice in the Mediterranean. Among the managers that answered the questionnaire, only 24 (39%) stated that there are regular monitoring programmes to support management objectives set up in their MPA, and only in 14 MPAs (or 23%) managers plan to carry out studies to assess the effectiveness of their management.

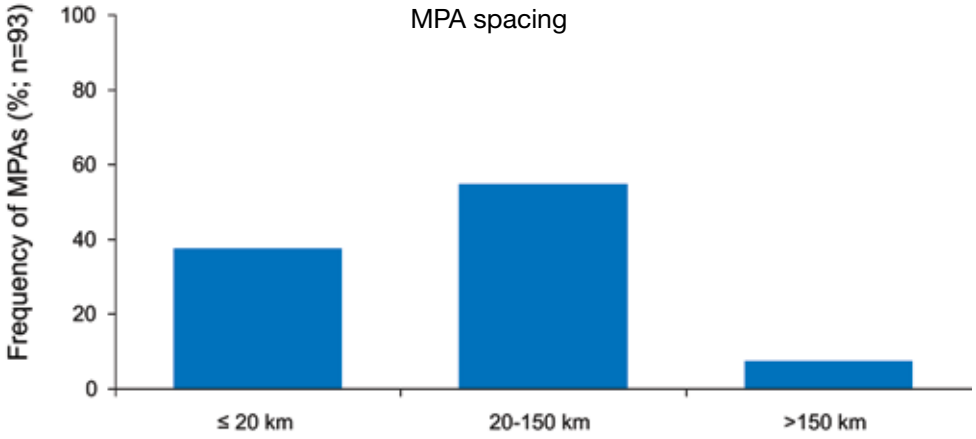



*Figure 7. Percentage of MPAs located: ≤20km; 20-150km; and >150km away from its nearest neighbour. The Pelagos Sanctuary was excluded from the analysis.*

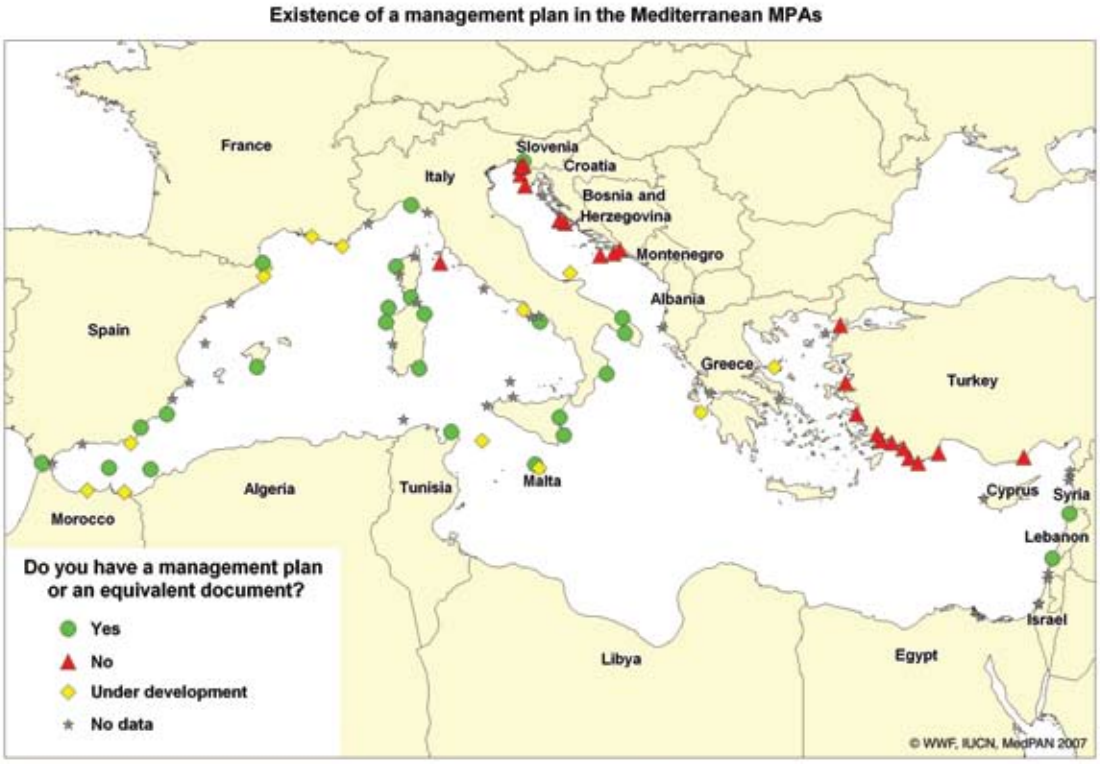



*Figure 8. Distribution of responses among MPAs related to the question "Does your MPA have a management plan or an equivalent document?". The Pelagos Sanctuary which does not appear on this map has also developed a management plan.*

Almost half of the managers of the present survey (48.4%, or 30 MPAs) reported that a socio-economic analysis had been carried out in or around their MPA.

### *Information availability on habitats and species*

To evaluate the ecological information available frome availability of information, and the actual status of habitat and species. so lack a management plan, what would be the tota MPAs on the conservation status of the natural resources, managers were questioned on: changes in the abundance of relevant marine features and habitats, changes in the population size of protected species, and presence and absence of species. Data on the ecological characteristics are based on qualitative perception and knowledge of managers.

Data on status of habitats and species under protection and management show that ecological information is not easily accessible for many managers. Very few MPAs reported information on the increase or decrease of different marine features and habitats within the protected area. The percentage of MPA managers that reported lack of information ("don't know") ranged between 49 and 98% (Fig. 9). Similarly, trends in the size of the population were described for very few species. Respondents provided data for 106 Endangered / Threatened and Exploited species with a high proportion of "don't know" responses (average 60%; Fig. 10). Moreover, all but three MPAs which had access to data on the status of habitat and species were located in EU countries.

### *Perceived changes in habitats and species inside MPAs*

Among respondents, a high proportion indicated negative trends in crucial habitats, for example decrease in

seagrass beds was perceived by 22% of respondents and coralligenous communities by 11% (Fig. 9). In addition, 11% of managers reported a decrease in fish spawning aggregations and 7% in feeding grounds. On the other hand, increase of banks of dead seagrass was reported in 9% of MPAs. It is worth noting that a decrease in beaches was reported by 17.8% of respondents and may point to a trend in coastal erosion (Fig 9). On the whole, results showed that the majority of responses reported no changes of area extension of different habitats within MPAs (Fig. 9).

The only species for which a qualitative perceived increase was reported in a notable number of MPAs was the dusky grouper, *Epinephelus marginatus* and the brown meagre, *Sciaena umbra* observed in around 25% of MPAs (Fig. 10). All but one of these MPAs include a no-take zone, low occurrences of illegal activities in the area reported almost always by their managers; and the MPAs were equipped with a medium or high number of surveillance boats. On the contrary, the Mediterranean lobster, *Palinurus elephas* and the red coral, *Corallium rubrum* were reported to have shown a decrease in a considerable number of MPAs. Populations of loggerhead turtle, *Caretta caretta* were seen as increasing in 12% of MPAs and without change in 15% of MPAs; the long-lived pen shell, *Pinna nobilis* increased in 20% of MPAs, and the giant limpet, *Patella ferruginea* increased in 13% of MPAs (Fig. 10). Moreover, six MPAs reported the observation of the Critically Endangered Mediterranean monk seal, *Monachus monachus*, and two respondents (Capo Carbonara, Italy and Alonissos-Vories Sporades, Greece) reported an increase of the population having been observed in the MPA.

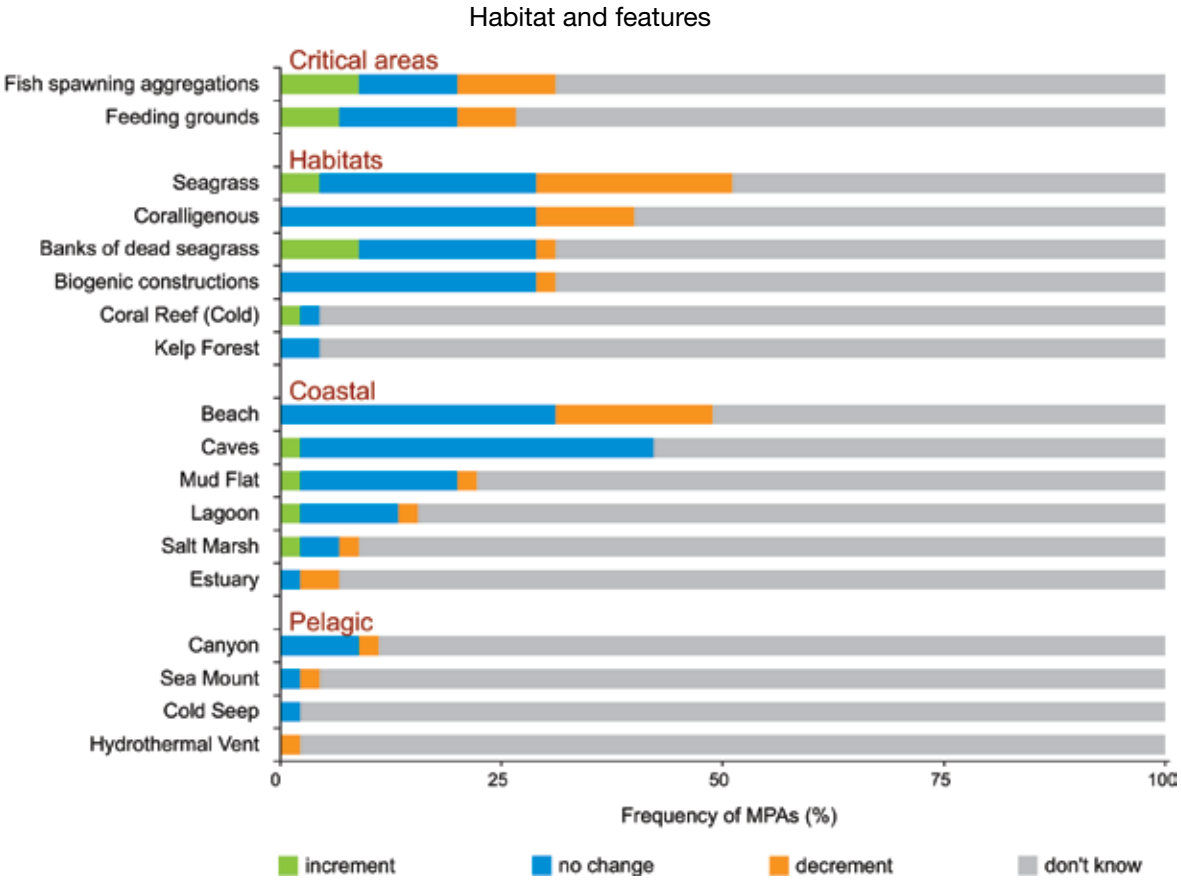



*Figure 9. Percentage of MPAs where changes ("increase", "decrease", "no changes" and "don't know") in the surface area of habitats and features where reported (n=45) over the last 5 years.*

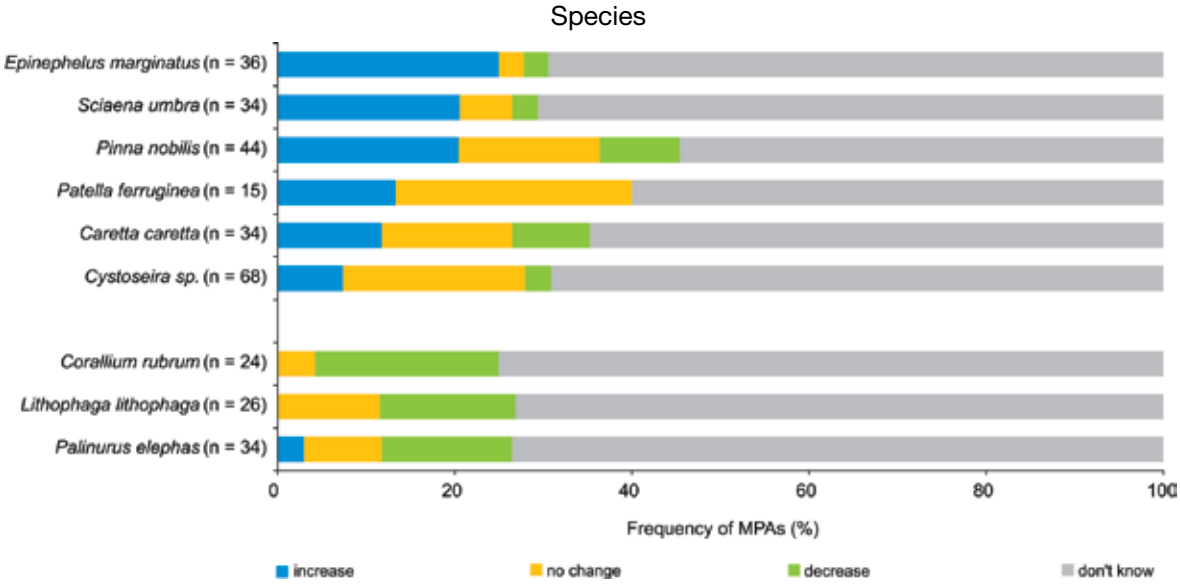



*Figure 10. Relative number of MPAs that reported population trends ("increase", "decrease", "no changes" and "don't know") of different taxa of species over the last 5 years. In brackets the number of MPAs that gave information for each taxon.*

To test for differences in the species protected[17] among Mediterranean MPAs, we utilised a multivariate approach. The non-metric multidimensional scaling (nMDS) analysis was used to calculate the level of similarity among each pair of MPAs based on the presence/absence of species[18]. Results suggested several trends that may be associated with geographical location or ecological factors of a MPA. In the first nMDS plot each MPA were grouped according to the number of species reported by managers. MPAs were thus classified in three groups which ranged from high species richness (highly clustered points in the centre) to low species richness (peripheral and more dispersed points, Fig. 11A). The low species richness resulting in this last group (7-53 species) may not reflect the actual number of species present in the MPA. On the contrary, it may suggest the dearth of data available for managers. To explore if the geo-political

*Giant limpet Patella ferruginea, Natural Reserve of the Straits of Bonifacio, France © E. Volto, O.E.C.*

17 The protected species utilised in the analysis were the ones listed in the Annexes II and III of the Barcelona Convention.

18 See Annex 8 for a further description of the analyses.

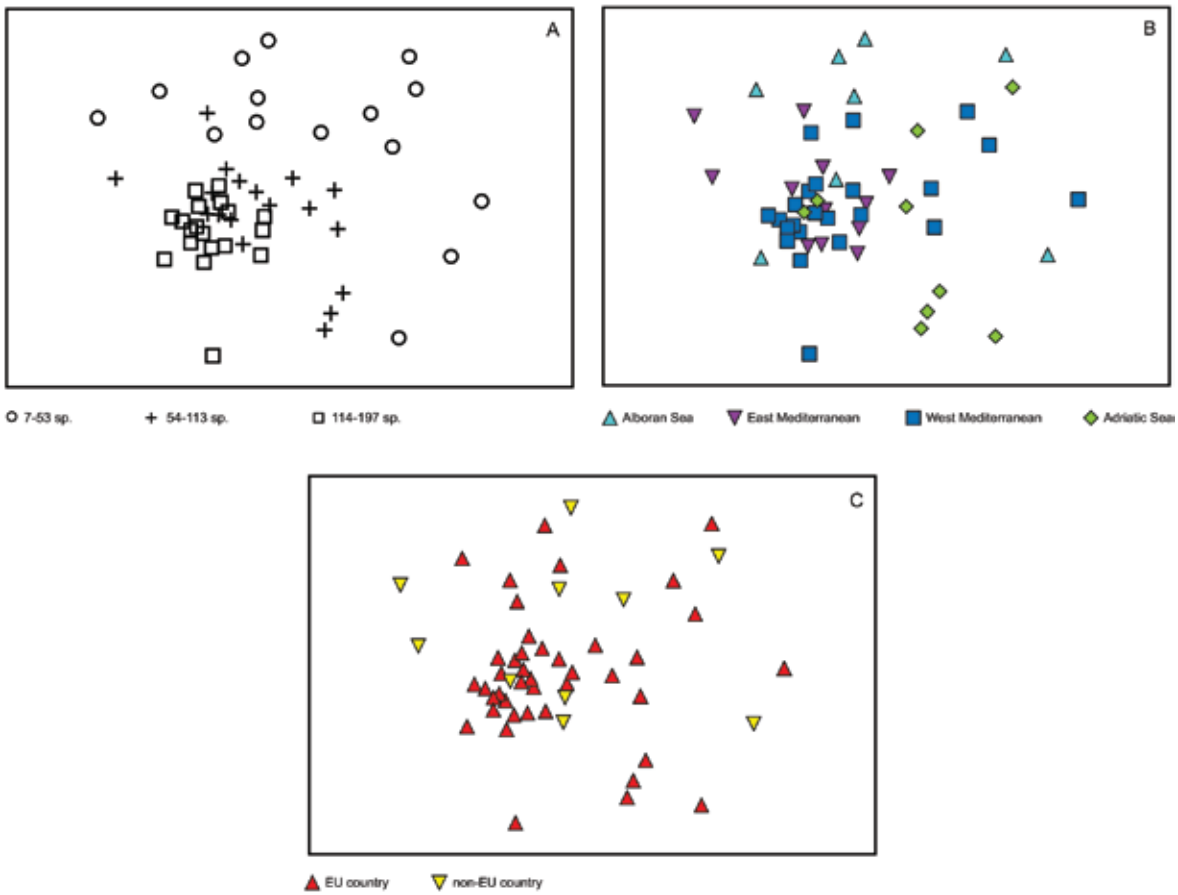



*Figure 11. Non-metric multidimensional scaling (nMDS) plot of protected species (Annex II and III) recorded in 52 MPAs. MPAs with similar species compositions are plotted near to each other; MPAs with dissimilar in species composition are plotted further away (distance between points increasing with the level of dissimilarity). Sites are labelled according to the number of species recorded in each MPA (A), Mediterranean Ecoregions (B) and EU and non-EU countries (C). Stress = 0.22. Ecoregions classification by Spalding et al. (2007) was used, pooling Levantine (n. of MPAs=2), Aegean (n=3) and Ionian Sea (n=7) into the East Mediterranean. Species listed in Annex II and III and "other relevant species" were included to create the three level of number of species reported in the questionnaire by each MPA.*

affiliation influenced the number of species reported, we replotted the same data according to the ecoregion each MPA belonged to (Fig. 11B). The group of MPAs with small species richness had approximately the same number of representatives of four ecoregions. In contrast, if points were relabelled according to EU / non-EU status we can see that non-EU and EU MPAs reported a different number of species (Fig. 11C). Even though the nMDS plot suggests a modest relationship between samples (stress = 0.22), results of the analysis confirmed the graphical pattern by showing a statistical difference between MPAs of EU or non-EU countries and between the three levels of species number reported by MPAs[19]. This means that for each group of species richness (few, moderated, high number of species), non-EU MPAs showed a different presence/absence of species compared to MPAs of the EU. The difference was likely driven by the fact that, overall, non-EU MPAs indicated a smaller number of species (57.5±9) compared to EU MPAs (97.9±7.3)[20]. Species richness was not correlated with the year of designation or the MPA size[21].

19 Crossed ANOSIM; "EU/non-EU"; R = 0.315; p = 0.02, "number of species" groups: R = 0.372; p = 0.001, all Pairwise tests p = 0.001.
20 ANOVA; FEU/non-EU = 5.04; p = 0.029, $F_{Ecoregions}$ = 1. 97; p = n.s., $F_{EU/non-EUxEcoregions}$ = 0.5; p = n.s.
21 Spearman Correlation; Year of institution = 0.095; p = n.s., Marine surface = 0.145; p = n.s.

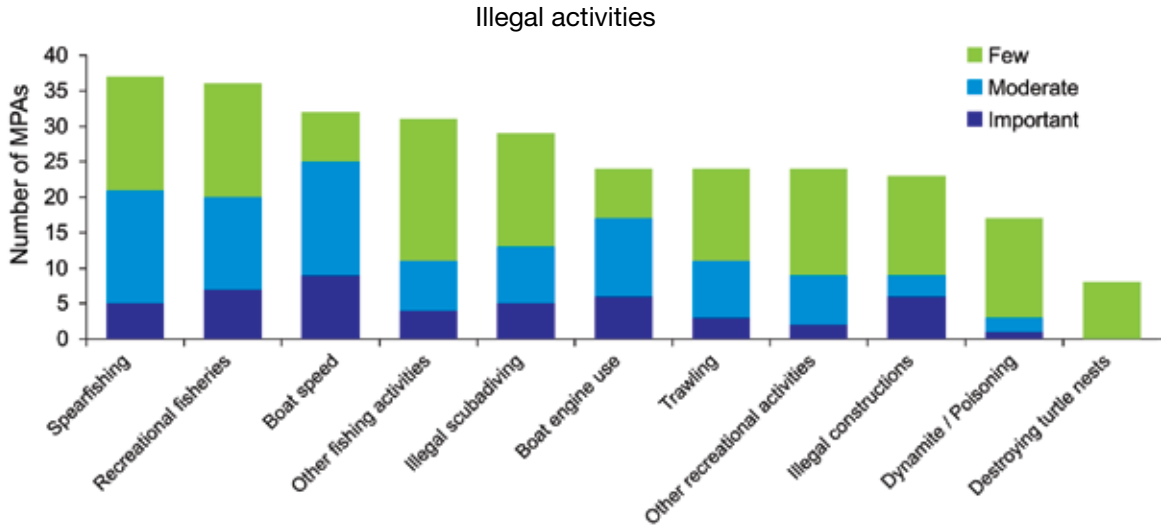



*Figure 12. Illegal activities reported to occur in Mediterranean MPAs (n = 45).*

### *Compliance with MPA regulations: known illegal activities, law enforcement and surveillance*

Surveillance and law enforcement is one of the important instruments to of achieving compliance. On the issue of enforcement, we first asked managers to assess the level of illegal activities in their MPA. This question received a high rate of answers: 75.8% of managers who responded to the questionnaire responded to this section (n = 47). In their response, MPA managers emphasized many illegal activities. Illegal activities were generally considered as being few by the majority of respondents (Fig 12). The types of illegal activities that do occur, however, are varied, and included "spear fishing", "recreational fishing", "high boat speed", "other fishing activities" and "scuba diving activities" (Fig 12). They were reported by 50-60% of respondents. Less common illegal activities included "trawling", "illegal constructions", "boat engine use" and "other recreational activities" (reported by 40-50% of respondents). The "use of dynamite and poisonous substances" by fishermen was reported in 17 MPAs (36.2%) in the Mediterranean. In the Eastern Mediterranean, where MPAs shelter marine turtles nesting beaches, the "collection or destruction of turtle eggs" was reported by 8 (13%) respondents.

To evaluate the surveillance capacity of the MPA, the questionnaire included questions on the availability of means and staff to implement surveillance, and the perception of managers on the efficacy of surveillance. Surveillance capacity ranges from 0-10 boats per MPA, representing an average of 1.8±0.3 boats per MPA, and 1.8±0.4 per 10 km² of marine area. These figures include boats that are the property of the MPA or provided by an external organization (such as the Coast Guard), but exclude data for Pelagos Sanctuary due to its very large size and unique surveillance structure[22]. The MPAs located in the western part of the Mediterranean are substantially better equipped (in terms of number of boats) than the rest of Mediterranean MPAs . The absence of surveillance boats in Turkish MPAs is also notable. On average, 4.5±1 people were dedicated to surveillance for every MPA site[23]. When we compared the number

22 The Pelagos Sanctuary has access to 60 boats (0.01 boat/10km²) and 99 people (0.01 people /10km²)
23 Range: 0-50 surveillance staff

of staff to MPA areas, we found that an average of 4.3±1.1 people were available for the surveillance of 10 km² of marine area. According to managers, in less than half MPAs (44%) surveillance team persecuted offenders quite effectively (n = 62). However, 37% did not answer the question while 19% noted ineffective prosecution of offenders.


*Coast Guard, Zakynthos National Park, Greece / © C. Piante*

Marker buoys are particularly important for coastal MPAs, in particular in areas where a lot of people live and have some activities at sea. When MPA limits are visible, the zoning and therefore the regulations are perceived in a more clear way by stakeholders, and in particular fishermen. However, 45 % of the managers (or 28 MPAs) pointed out that their MPA does not have visible markers or buoys at sea.

On the sensitive question relating to the communities support to the MPA, a third of managers did not answer (34%, or 21 MPAs). Interestingly, 58% considered that local communities support their MPA fully ("yes" answer) or mostly ("mostly yes" answer). Only 8% of the respondents considered that they face a lack of support from local communities.

### *Staff employed*

In the Mediterranean MPAs an average of 5.2±1 people were employed on a permanent basis (range: 0-40). Due to the fact that many MPAs boundaries also include land, it is possible that the figures reported include staff employed primarily for terrestrial management activities. The number of staff dedicated to marine management activities may therefore be lower than what these figures imply. The employment of temporary staff was reported in large portion of MPAs (37%, n = 23), primarily during summer, when tourism peaks in the Mediterranean, and more staff are needed to handle the increase in visitors. On average, 5.5±1.4 people were employed on a seasonal basis (range: 0-50) which represents a doubling of staff during high seasons. Approximately two thirds of the managers responding to the survey considered that in general staff was sufficiently or mostly sufficiently trained.

### *Facilities and equipment*

Among the 62 managers who answered the questionnaire, 58 provided data on their facilities and equipment. Questions were asked on offices, buoys, boats, diving equipment, Geographic Information Systems (GIS), visitor centre as well as the perception of managers on the level of their facilities and equipment.

Office space was reported as available and adequate for the majority of management organisations (82% or 51 MPAs; Fig 13).


*Figure 13. Distribution of responses to the questions related to the availability of "office for the management body", "visitor centre", "diving equipment", and "GIS" (n=62).*

However, beyond this, the availability of essential facilities and equipment was only reported by half of the respondents. Consequently, 34% (22 MPAs) of managers suggested their MPA was not adequately equipped and 26% (or 16 MPAs) of them did not answer this section of the questionnaire.

Infrastructure at most MPAs is reportedly inadequate to support visitors or tourists: almost 60% (or 36) of MPAs do not have a visitor centre (Fig. 13). The use of diving equipment for monitoring purposes to assess or to evaluate effectiveness was common in 52% (n = 32) of MPAs, though still 37% of MPAs did not have access to such equipment (Fig. 13).

GIS can be extremely useful toll for storing, retrieving, processing and displaying spatial data is particularly useful. For example, it enables the user to merge marine habitat maps with other information, such as human uses and threats and is important support for decision-making. Half of Mediterranean MPAs (or 33) have GIS system while the other half did not utilise this tool for management (Fig. 13).

The total number of boats at the disposal of managers, including surveillance boats, was on average 2.5±0.3 boats per MPA[24] (n= 58). It is important to note that 27% of the MPAs pointed out that they do not have any boat at their disposal[25].

### *Funding and business planning*

Regarding the amount of funding available for management, only 26 respondents mainly from France, Italy, and Spain, disclosed the amount of their average yearly budget. On average, the annual budget of MPAs over the last 3 to 5 years was 730,000€ per year[26]. Results show that 34% of managers are satisfied with their funding while 32 % are not. For the years to come, the distribution between satisfied and unsatisfied answers was nearly the same, however the number of respondents decreased. Developing and applying a business plan was a practise applied in 40% of MPAs (or 25), the rest of managers did not have a business plan or did not respond to this question.

### *Overall management effectiveness evaluation*

Management effectiveness is best measured at the scale of individual MPAs, in terms of the extent to which their management objectives have been met.

24 Range: 0-10 boats
25 This estimate does not take in account the Pelagos Sanctuary.
26 Range : 0-4,000,000€; although this result is not representative of all Mediterranean MPAs

In this context, the information collected during the present survey does not constitute a full management effectiveness evaluation, but it can be used as an indicator of management capacity that, in turn, can ensure greater effectiveness. We used Principal Components Analysis (PCA) to analyse responses related to the management characteristics of MPAs and to attempt to identify patterns in management effectiveness indicators among MPAs from different geopolitical areas of the Mediterranean. A total of 27 variables for 62 MPAs were used in the PCA (see Annex 8)

Results indicated that 58.9% of the total variance can be explained by two principal components (PCA Axes 1 and 2)[27]. The second axis made only a slight contribution to overall variability (6%). From the graphical representation it can be seen that the first axis separated the MPAs of different countries of the Mediterranean along a gradient of potential management effectiveness (Fig. 14). The higher negative values of the first axis are associated with higher overall scores of all management indicators, whereas the higher positives values with lower overall scores. Thus northwestern MPAs (France, Italy, Malta, Monaco, Spain; left side of the plot) seemed to have higher management capacity compared to the ones in northeastern countries (Croatia, Greece, Slovenia, Turkey). MPAs from south and

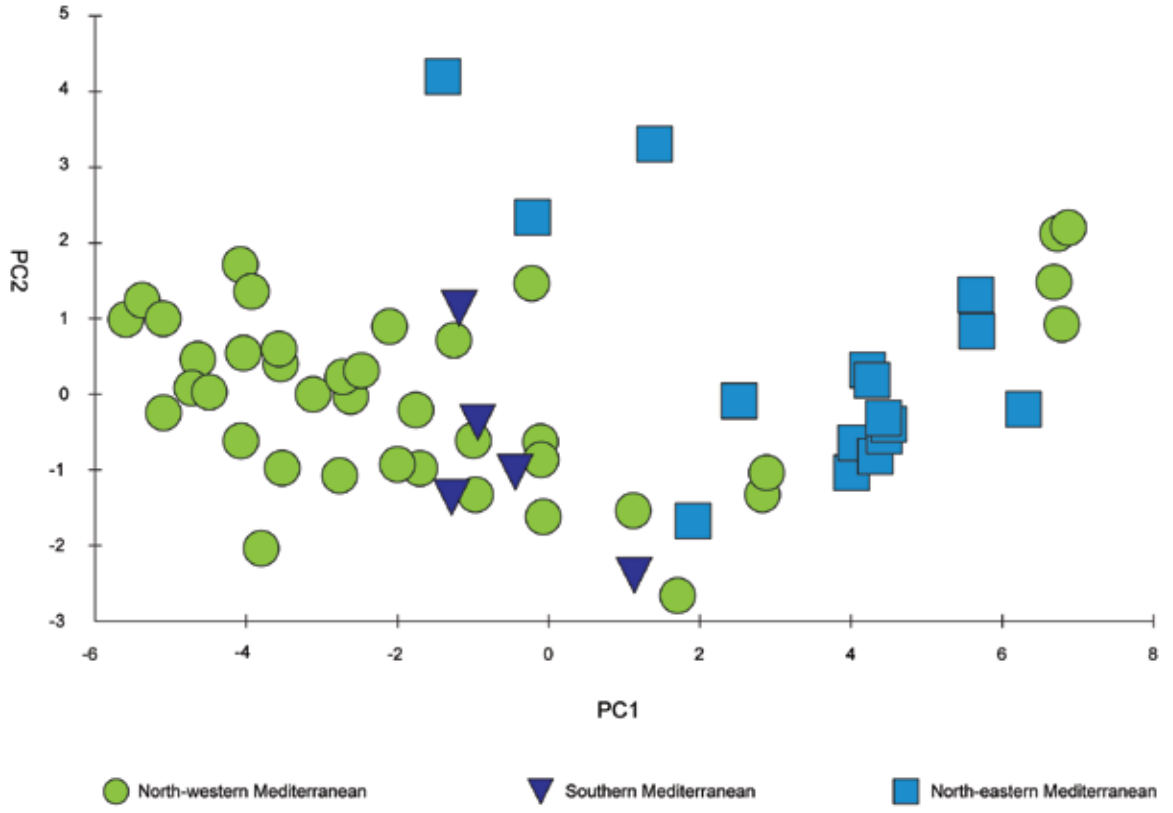



*Figure 14. Results of the Principal Component Analysis on potential management effectiveness. The first Principal component (PC1) represents a gradient of management capacity and its higher negative values are correlated with better human and equipment resources needed to undertake management and surveillance tasks. In the plot, each MPA was labelled according to the geographical area of the Mediterranean it belongs to (north-eastern, north-western and south countries).*

27 KMO = 0.826; Bartlett's Test of Sphericity Chi2=1560; df = 351; p = 0.01.

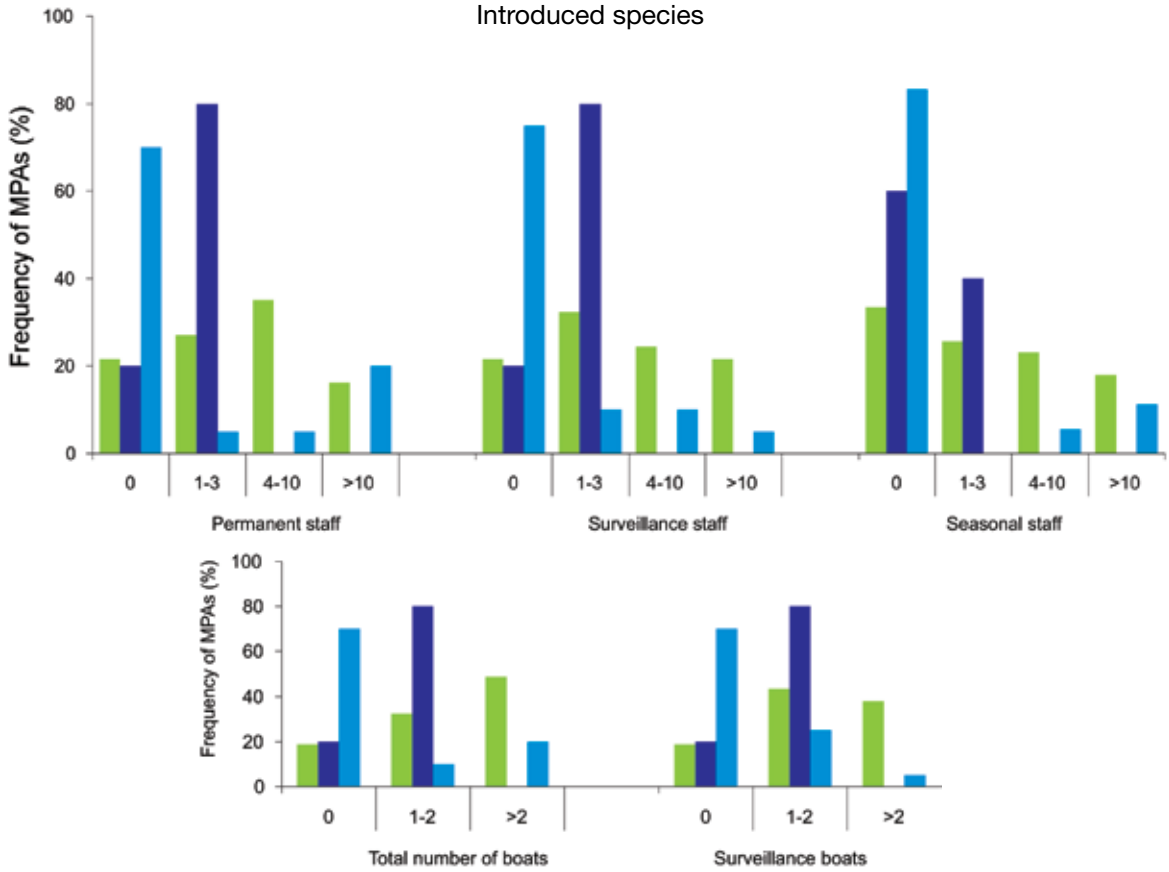



*Figure 15. Distribution of the responses to those questions used as variables in the Principal Component Analysis and that resulted the most correlated to the first component (number of permanent and seasonal staff and number of surveillance boats and total number of boats). In the graph, MPAs were grouped according to the geographical area of the Mediterranean it belongs to (north-eastern, north-western and south countries).*

east countries (Morocco, Algeria, Tunisia, Israel and Lebanon) were intermediate. However, it is worth noting that MPAs of the northwestern region were distributed along the complete first axis. This indicates that MPAs that are potentially less effective are not restricted to a certain region of the Mediterranean[28].

In order to reduce all management indicators to fewer composite indicators, the variables that were most strongly correlated with the first principal component were identified[29]. These indicators may be representative of the overall potential effectiveness and it would therefore be useful to include them in future surveys. Management variables that were weighted highest on the first component are related with staff (seasonal, surveillance and permanent staff) and boat fleet (surveillance and total number of boat). MPAs were thus described by using these management indicators. In most of the cases (>75%), northeastern MPAs did not have at their disposal boat or staff for surveillance or day to day management (Fig. 15). On the contrary, MPAs of the northwestern countries were more heterogeneous and displayed a variety of management conditions. These MPAs had many, moderate, few or no staff employed. However, the majority of the sites of these countries (82%) owned at least one boat and almost half of them (46%) had more than two boats (Fig. 15). Finally, the MPAs of the south-eastern countries showed intermediate management conditions (Fig. 15). Most MPAs of this group (80%) could depend on one or two boats and one or two personnel for management or surveillance activities (Fig. 15).

28 Although results might be biased by the low rate of answer recorded for some MPAs, they show important trends.
29 Score > 0.7

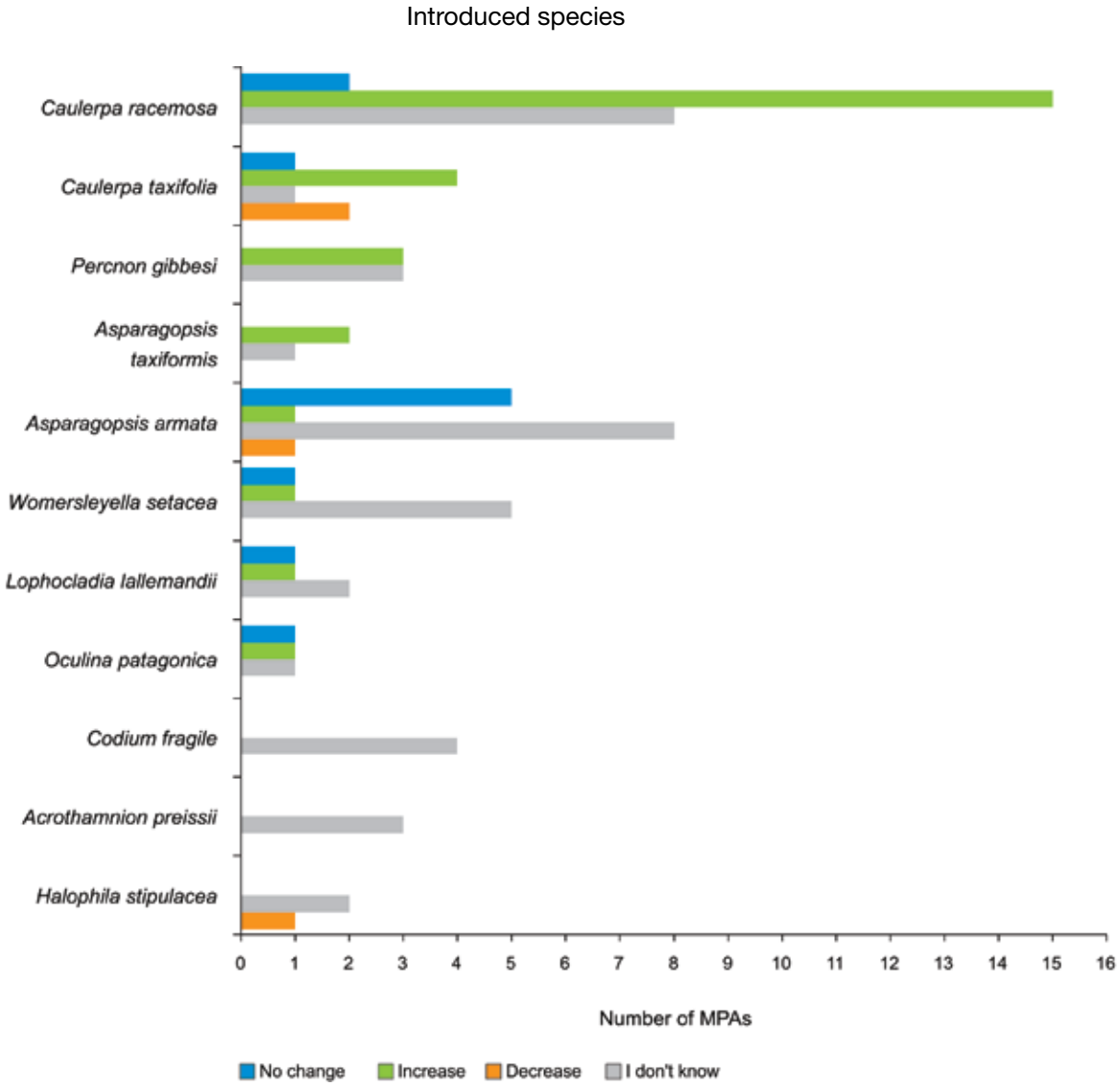



*Figure 16. Number of MPAs where reported changes in the population of six of introduced species were reported. Only data for species that were reported in more than three MPAs were presented.*

## 4.3 Local, regional, and global pressures threatening Mediterranean MPAs

Mediterranean MPAs are affected by urgent threats from the associated and adjacent land and associated marine waters that might influence their capacity for marine resource and biodiversity protection. To evaluate risk and potential impacts, we focussed on one dominant marine threat, the presence of marine introduced species, whereas other common threats affecting MPAs were addressed in lesser detail.

### *Introduced and invasive species*

Almost 63% (39) of managers provided their perception of the presence of at least one introduced species within the MPAs, however only 27 (43%) answered to section on the status of the species population. The list of species reported as present in Mediterranean MPAs is shown in Table 2. The most frequently reported introduced species were two algae *Caulerpa racemosa* and *Asparagopsis armata* well known as invasive species (Tab 2), the former showing an increasing trend in the last five years (Fig. 16). The crab

*Table 2. Number of managers that reported the presence of introduced species in their MPAs.*

| | Introduced Species | n. of MPAs |
|---|---|---|
| Chlorophyta | *Caulerpa racemosa* | 25 |
| Rhodophyta | *Asparagopsis armata* | 15 |
| Rhodophyta | *Womersleyella setacea* | 7 |
| Chlorophyta | *Caulerpa taxifolia* | 6 |
| Crustacea | *Percnon gibbesi* | 6 |
| Chlorophyta | *Codium fragile* | 4 |
| Rhodophyta | *Lophocladia lallemandii* | 4 |
| Rhodophyta | *Acrothamnion preissii* | 3 |
| Rhodophyta | *Asparagopsis taxiformis* | 3 |
| Magnoliophyta | *Halophila stipulacei* | 3 |
| Cnidaria | *Oculina patagonica* | 3 |
| Phaeophyta | *Feldmannia irregularis* | 2 |
| Pisces | *Stephanolepis diaspros* | 2 |
| Pisces | *Pagellus bellottii* | 1 |
| Pisces | *Sargocentron rubrum* | 1 |
| Pisces | *Siganus luridus* | 1 |
| Pisces | *Siganus rivulatus* | 1 |
| Tunicata | *Microcosmus squamiger* | 1 |

*Table 3. Number of introduced species reported by respondents of MPAs of different ecoregions of the Mediterranean.*

| Ecoregion | Mean number (±SE) of introduced species | Number of MPAs |
|---|---|---|
| Adriatic Sea | 1.2±0.2 | 6 |
| Aegean Sea | 1 | 1 |
| Alborán Sea | 2.3±0.6 | 6 |
| Ionian Sea | 2.7±1.1 | 7 |
| Levantine Sea | 3 | 1 |
| Western Mediterranean | 2. 7±0.5 | 18 |

*Percnon gibbesi* was recorded in six MPAs. All fish are includes Red Sea species, with exception of the Atlantic *Pagellus bellottii* (Table 2). Among the introduced algae and seagrasses reported by MPAs, six species are well-known invasives: *Asparagopsis armata, Lophocladia lallemandii* and *Womersleyella setacea, Caulerpa racemosa, Caulerpa taxifolia* and *Halophila stipulacea* (Boudouresque and Verlaque 2002). The number of introduced species reported by different MPAs ranged between 1 and 3 and was not correlated with geographical location in the Mediterranean basin[30], although this pattern may be biased by the low response rate received from some regions (Tab. 3). Uncertainty and lack of information regarding marine introduced species was high in the MPAs we surveyed as in average half the MPA managers (54.8%) did not know the status of the introduced species reported in the MPA (Fig. 16)

The potential threat from invasive species perceived by managers reflected the trend

30 Kruskal Wallis Test, $Chi^2 = 4.37$; p = n.s. This pattern might be biased by the low rate of answer recorded in some regions.

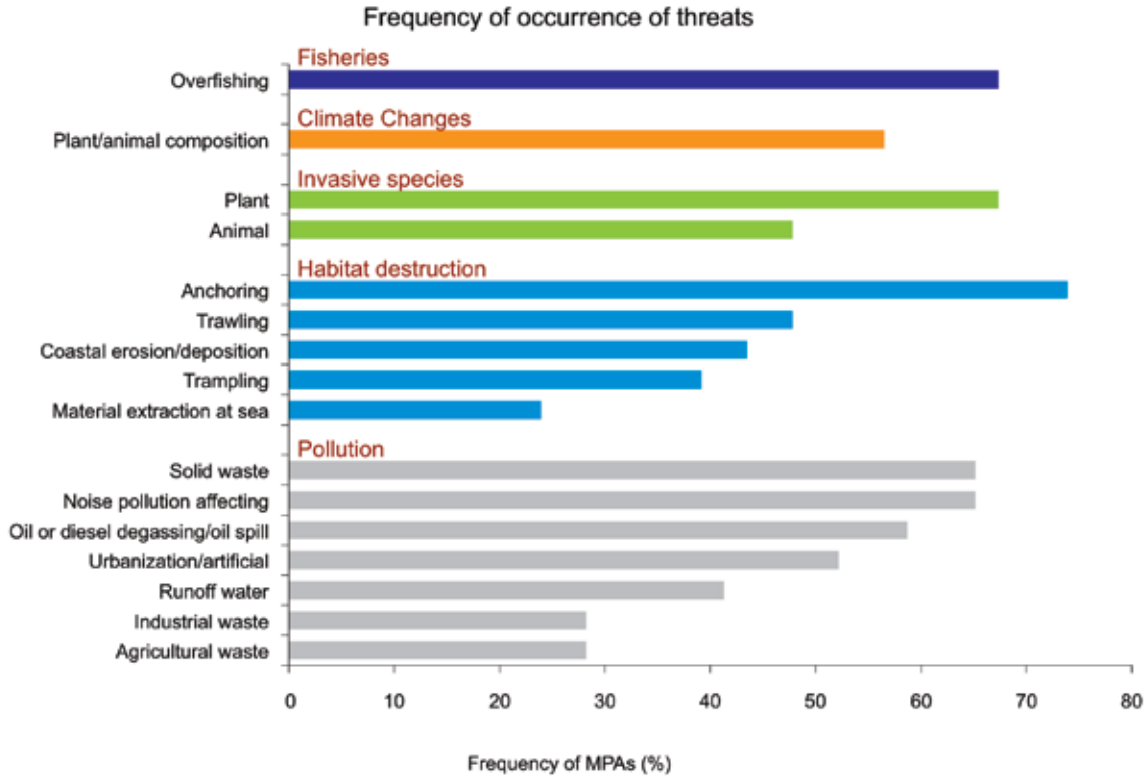



*Figure 17. Reported frequency of occurrence of threats (% of MPAs, n = 62).*

we observed for the records of introduced species. In this case also, managers highlighted a higher occurrence and risk from introduced plant species rather than from introduced animal species (Fig 17, 19). The presence of new species of fish may in fact have been seen as a resource, mainly for fishing (Galil and Zenetos 2002). On the contrary, the presence of algal invasive seemed recognized as a potential threat for the general health of the MPAs.

### *Perception of threats*

The present survey indicated that managers were aware of human impacts occurring in their MPAs. All 46 respondents indicated the presence of multiple threats[31]. More than 50% of respondents stated that their MPAs were negatively affected by "anchoring", "overfishing", "noise pollution", "solid waste", "oil or diesel degassing or oil spill", "plant/animal composition changes caused by climate change" and "urbanization or artificial construction" (Fig. 17).

There was general agreement between responses that the current level of overfishing is currently low or moderate within the MPAs (Fig. 18). However, the risk of "overfishing" in terms of probability and consequences was perceived to be significant or intolerable in many of them (43%, Fig. 19). The risk of "plant/animal composition changes caused by climate change" was reported as negligible or moderate by 40% of the MPAs (Fig. 17). This threat was the most difficult to evaluate as 36% of managers did not report any information about the effect of climate change on community composition (Fig. 18, 19). Among

31 On average, MPAs reported 8±0.7 different types of threats (out of 16).

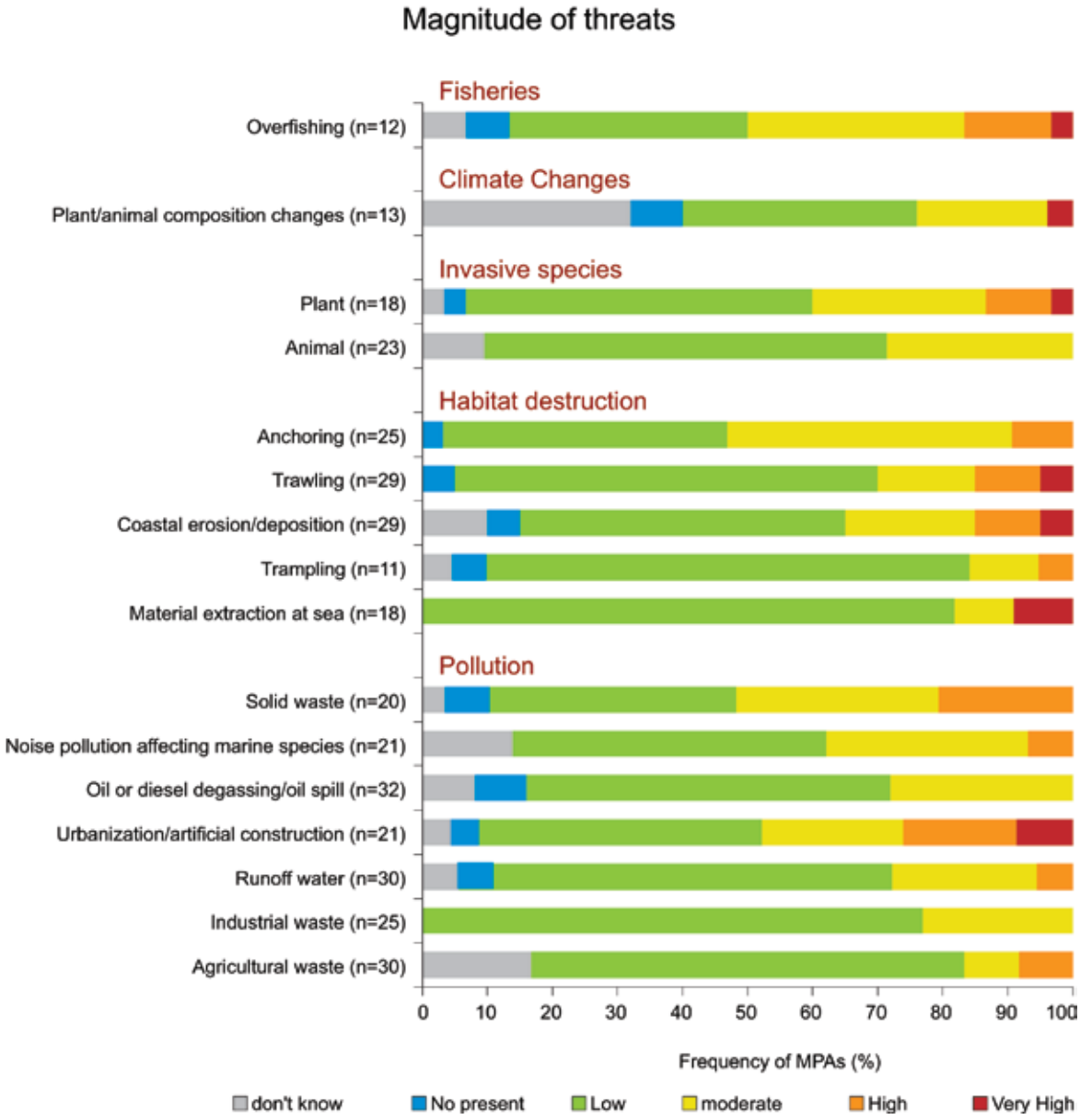



*Figure 18. Reported magnitude of threat. The number of MPAs where the threat was reported is indicated in brackets.*

possible threats that may lead to habitat destruction and modification, mechanical damage caused by boat "anchoring" was the threats reported by the majority (74%) of MPAs (Fig. 17). Although the number of occurrence of "anchoring" damage was mostly viewed as low or moderate (Fig. 18), it is interesting to note that it was perceived as one of the threats with the highest level of risk for MPAs (47% of respondents indicated the risk for this threat as significant or intolerable; Fig. 19). On the contrary, pressures such as "material extraction", "trawling" and "coastal erosion", that clearly would have higher destructive impact on environments, have less risk associated with them (Fig. 18, 19) due to their lower level of probability of occurrence in MPAs (63%, 72%, and 40% of MPAs reported it as low probability respectively, Fig. 19). "Solid waste" and the presence of "urbanization/artificial construction", including over-urbanization, have been

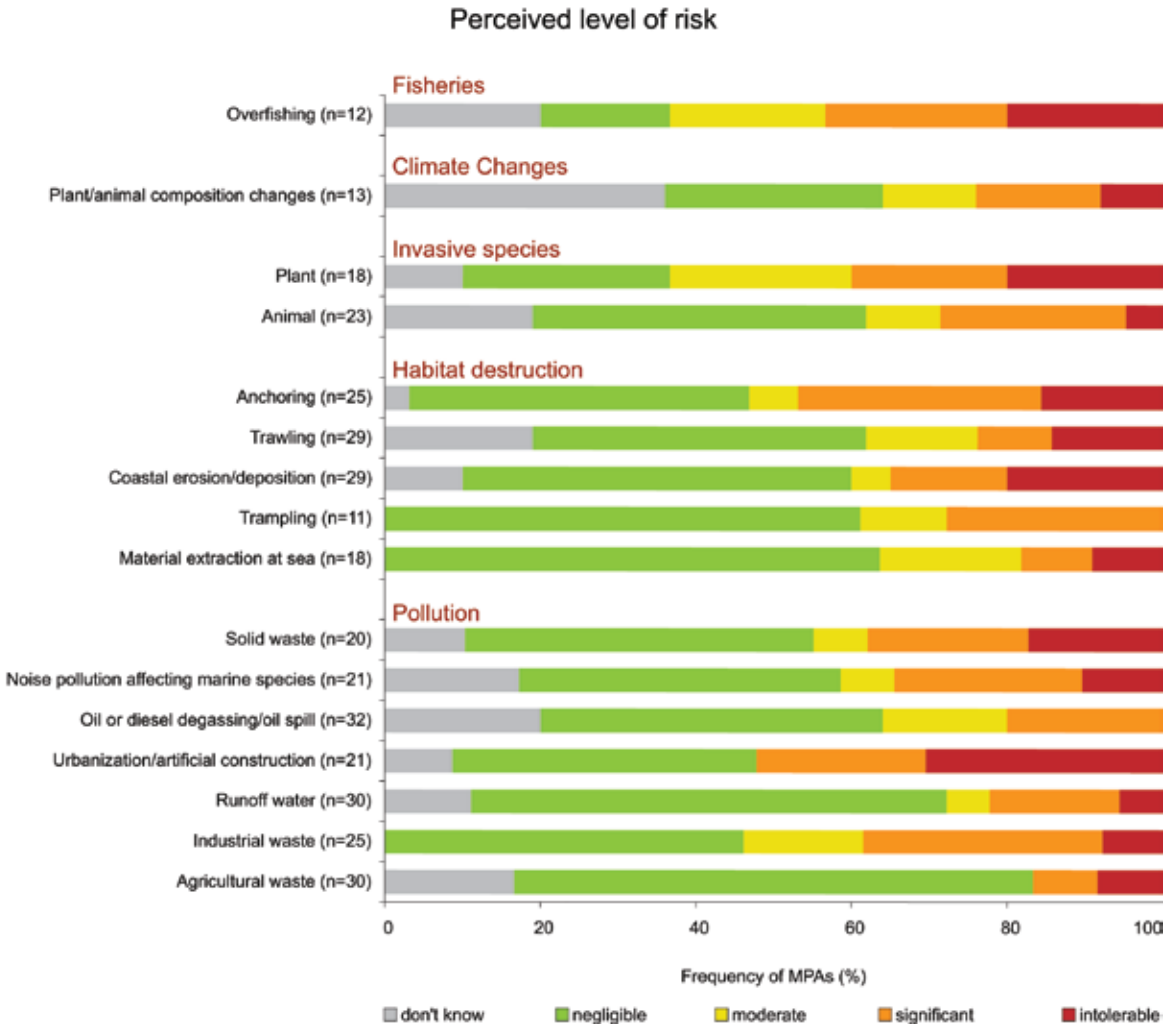



*Figure 19. Perceived level of risk imposed by a given threat. The number of MPAs where the threat was reported is indicated in brackets.*

reported as some of the most frequent sources of pollution by managers (Fig. 18). In particular, the risk associated with the presence of man-made structure on coastal habitats received the highest score among threat of pollution (52% of respondents reported it as significant / intolerable, Fig. 19). Risk of impact was perceived high also for those threats that might have origin outside the MPA borders such as the case of pollution come from industry waste that was considered at high risk in more than half of MPAs (Fig. 19)

Pooling together the results of the risk index for all analyzed threats, we grouped MPAs according to a qualitative risk classification (intolerable, significant, moderate, negligible, no data; see Figure 20). Distribution of perceived risk among Mediterranean MPAs did not show a particular geographical pattern. MPAs with overall perceived higher level of risk could be found in both western and eastern Mediterranean coasts. Likewise, MPAs where managers perceived a low risk or threat in their jurisdiction were distributed throughout the entire basin.

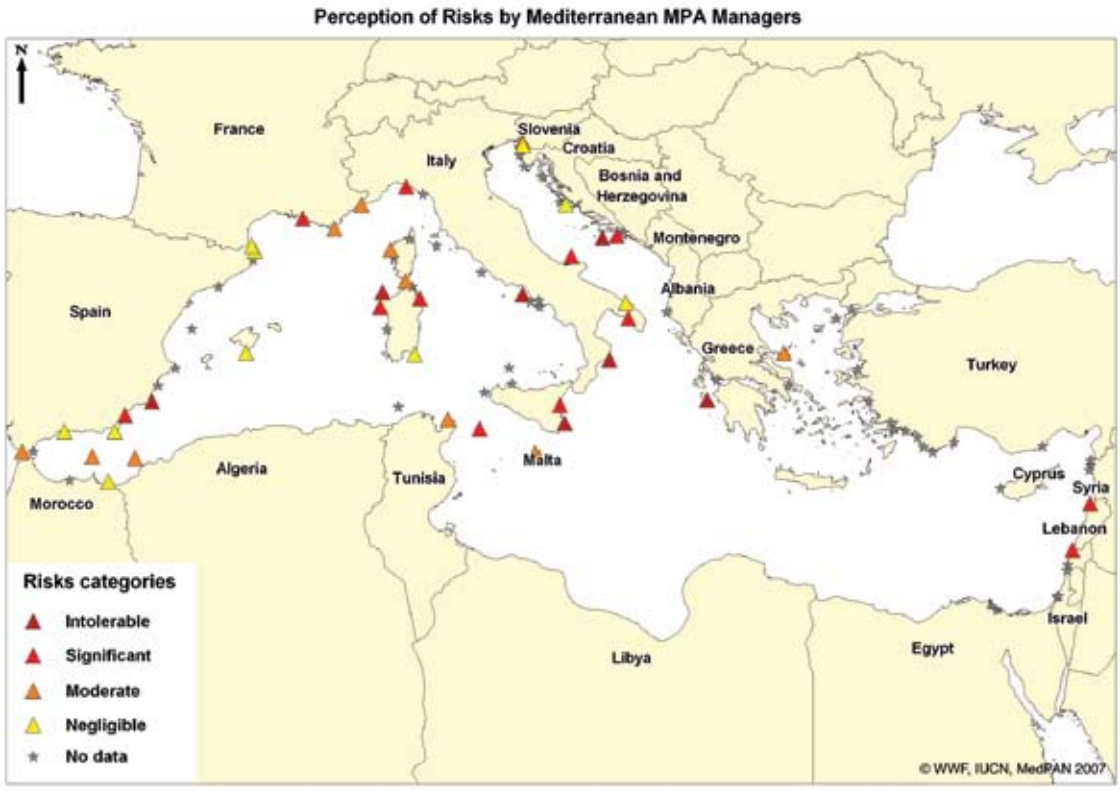



*Figure 20. The geographical distribution of MPAs, classified according to their overall perceived level of risk to external threats.*

# Chapter 5

# Discussion and Conclusions

The Mediterranean Sea is a key biodiversity area (Shi et al. 2005). It hosts unique marine endemics and a high beta-diversity, it is critical area for the reproduction of pelagic species and, over the millennia, it has been recognised as natural and cultural heritage for humans (Mediterranean Action Plan 1975, Bianchi and Morri 2000, Broderick et al. 2002, Tudela 2004, Medina et al. 2007). The natural wealth of the Mediterranean Sea is a result of a multitude of features and habitats which coexist in a space highly influenced by its complex geological history and bizarre orography. One third of its coastline is arid, whereas the other part is surrounded by young mountains with a vast system of river basins and wetlands intrinsically connected with the sea (CIESM 2006, IUCN 2008b). Due to the effect of this enclosed sea, the Mediterranean climate is peculiar to the region and its area is restricted to a narrow costal strip (Bolle 2003). Throughout the centuries, this mild climate and its natural richness have influenced the populations by transforming this basin into a world crossroads. It is evident that the sea had a huge role in developing and maintaining the cultures of the Mediterranean region, and in turn those cultures have influenced world civilization.

However, the marine life of the Mediterranean Sea has also experienced intensive human pressures for thousands of years and, in the last century, this impact has escalated to extreme proportions. Environmental quality of the waters worsens, overfishing persists, invasive species abound, coastal habitats deteriorate and biodiversity loss is at a peak. This situation is likely to be exacerbated by the various impacts of climate change on marine ecosystems (Bates et al. 2008).

During recent decades, scientists, conservationists and civil society have urged nations to take action to enhance the conservation and sustainable management of the Mediterranean Sea through the development of a Marine Protected Area network (Notarbartolo di Sciara 2005, Port Cros Declaration 2007[32], UNEP/MAP /RAC/SPA 2008). This report is a step forward in understanding the current level of marine conservation and protection in the Mediterranean. It aims to increase both the quantity and quality of information on MPAs, particularly for understudied areas such as the eastern and southern part of the basin. Prospects of achieving CBD targets of effective protection of at least 10% of the Mediterranean ecological region by 2010 are dim MPAs in all ecoregions throughout the Mediterranean, as well as considerable improvements in management effectiveness over the next two years. This will be possible only if there is strong and consistent commitment of such a strategy by nations, NGOs, scientific institutions, and the public.

## 5.1 CBD target of protection of 10% is not likely to be achieved in the Mediterranean

The percentage of the surface area protected in the Mediterranean Sea is 3.88%. However, it is important to note that without the Pelagos Sanctuary this proportion precipitates to 0.4%. At the global level, approximately 2.35 million km$^2$, equivalent to 0.65% of the world's oceans and 1.6% of the total marine area within Exclusive Economic Zones (EEZs), are currently protected (Wood et al 2008). Most are found in inshore waters, with total coverage representing 1.4% of the global coastal shelf area (Chape et al. 2005), widely recognised as not being ecologically representative. International targets are unlikely to be met for at least several decades and, at current rates governments would not achieve 10% coverage until 2069 (Wood et al. 2008, Day 2007). Currently, in the Mediterranean,

32 The Port-Cros Declaration was agreed during the first Conference of the Mediterranean Marine Protected Areas Network held in October 2007 in the Port-Cros National Park (France).

the level of marine protection is higher than global trends (3.88% versus 0.65%) despite still being far from the 10% of the commitment. On the contrary, the percentage of the Mediterranean area protected as "no-take" (0.01%) is much lower than the low global value of 0.2%. Only 0.08% of the world's oceans and 0.2% of the total marine area under national jurisdiction is 'no-take' (Wood et al. 2008) and this small percentage is noticeably low compared to the recommended 10%-30% of strictly protected areas. In specific regions or habitats, conservation policies comprise larger proportions of full protection such as the global network of coral reef MPAs that covers 18.7% of the world's coral reef habitats and the 1.4% of this habitat lies inside no-take MPAs (Mora et al. 2006).

## 5.2 The current Mediterranean MPA system is not representative or coherent

From a regional perspective, the current MPA system is not representative of all habitats and ecosystems. The majority of Mediterranean MPAs are currently located on the coast. High sea ecosystems are only represented by the Pelagos Sanctuary in the northwestern Mediterranean. Deep-sea ecosystems are currently protected only in three areas where bottom-trawling is formally banned under GFCM. Moreover, among the coastal sites currently protected or managed, 69 MPAs (or 73.4%) are located along the basin's northern shore, highlighting the lack of MPAs in the southern and eastern seashores. In particular, along the southern Mediterranean coasts only four MPAs have been established and none have been designated in the entire Tunisian Plateau / Gulf of Sidra ecoregion. Yet, these under-represented regions and habitats are ecologically distinctive due to their particular oceanographic and biogeographic conditions (Abdulla et al. in press). A large number of MPAs in the Mediterranean may be also ecologically isolated, as the spacing of the existing MPAs is likely too wide to ensure ecological connectivity among MPAs and viable functional maintenance of marine metapopulations (Shanks et al. 2003, Kinlan and Gaines 2003, Mora et al. 2006), and, especially, as often ecological information such as water currents and larval behaviour has not been taken into account during MPA design (Fraschetti et al. 2005). Consequently, the set of MPAs established in the Mediterranean cannot be defined as an ecological network (see Annex 2), but as an initial system upon which a coherent network should be designed.

*Egypt coastline between Marsa Matruh and Salum*
*© A. Abdulla*

## 5.3 Management in Mediterranean MPAs needs to be more effective

In a first evaluation of the management of marine and coastal areas in the Mediterranean, it was concluded that Mediterranean MPAs suffer from five principal problems: lack of support for MPAs due to inadequate information about their benefits to the community; insufficient funding; lack of personnel or insufficiently trained personnel; inadequate institutional support due to competition between agencies or to their exploitation oriented focus and insufficient information on the marine ecosystem on which to base sound management decisions (Lopez Ornat 1997). A decade later, most MPAs have not been able to cope with these difficulties. Results of the present survey show that many MPAs are currently insufficiently managed and can be referred to as "paper parks"[33]. In general the current system of MPAs should increase the implementation of management systems to effective contribute to marine conservation of the Mediterranean.

In particular many MPAs:

- Still lack management plans, clear goals and objectives, and mechanisms in place to periodically assess whether objectives are met;
- Do not carry out analysis to understand the socio-economic context of the surrounding communities;
- Do not qualitatively assess or quantitatively monitor natural resources which the site aims to protect or the results of management interventions. When monitoring is performed, they reported a decrease in the abundance of protected species, such as the Mediterranean lobster and the red coral, and in the area coverage of critical habitats within such as seagrass beds and coralligenous communities;
- Have insufficient human resources and training;
- Have low financial resources, equipment and facilities (offices, boats, visitor centres, diving equipment, GIS) and therefore cannot manage properly, even in a basic manner, their marine area;
- Have low or no law enforcement, lack marker buoys at sea, surveillance boats and staff, and offenders are insufficiently prosecuted.

Specifically, implementation of MPAs should be emphasised in countries of the southern and northeastern Mediterranean. These areas revealed major needs and challenges related to management capacity[34]. Issues refer to a combination of all factors mentioned above. Nevertheless, our results indicate that the best indicators to monitor potential MPA effectiveness were the human and equipment resources needed to undertake management and surveillance tasks. Many MPAs in the southern and northeastern Mediterranean did not have any staff and were insufficiently equipped, indicating low capacity and potential for management. On the other hand, northwestern MPAs were very heterogeneous. Many of them were excellent cases of management and can considered best practice case studies for other MPAs, while others can be defined as paper parks. Although the low response rate did not allow a regional evaluation of the managers' perception on the status of the habitats and species, it is worth noting

33 Paper park is also defined as "under-managed protected area", i.e., an area where "current protection activities are insufficient to halt degradation" (IUCN, 1999).
34 For a more detailed discussion of these challenges see Marshall and Abdulla (in press)

that the increase in species populations, especially flagship species such as the dusky grouper (*Epinephelus marginatus*) and brown meagre (*Sciaena umbra*) or the endangered pen shell (*Pinna nobilis*), was reported in MPAs with a medium/high capacity of surveillance and enforcement. Result of this survey confirms the trends observed for extensively studied MPAs of the northwestern Mediterranean and for other regions of the world, where the level of success and continuity of MPAs depends of the quantity and quality of the management team, their opportunity to work in adequate conditions and the level of the enforcement (Francour et al. 2001, Guidetti et al. 2008, Harmelin-Vivien et al. 2008).

Particular attention should be paid to the lack of management plans in many Mediterranean countries and the influence of this lack in the overall implementation of MPAs. The importance of MPA management planning is widely acknowledged in the literature (Agardy 1997, Francour et al. 2001, Salm et al. 2001). A specific planning process is required prior the beginning of the management of a MPA and it should produce an official Management Plan (Salm et al. 2001). Reasons explaining the current situation in the Mediterranean are different for each country. For example, in Croatia, for example, the Physical Planning Law regulates the land use planning system and marine and coastal protected areas have been governed from their creation on the basis of a so-called "Physical Plan" that does not consider ecology or the social context of the MPA (Draganović 2006). Until recently, the law did not include the need for marine and coastal protected areas to develop management plans. This has changed and development of management plans is now becoming a priority in the country. In Turkey, no MPA management plans have been developed thus far as management efforts have focussed on terrestrial areas (pers. comm. Atila Uras). In Slovenia, MPAs were established according to the former Law on Natural and Cultural Heritage that did not foresee the need to formally define types of management as part of strategy for MPAs. Even with the new Nature Conservation Act, the preparation of management plans is not obligatory for smaller protected areas, which is the case for Slovenia MPAs (pers. comm. Robert Turk).

One of the challenges for marine conservation in the Mediterranean is the lack of ecological information in many areas

*Education and awareness raising activity © Nature Conservation Egypt*

(Boero 2003). Although marine science has a long history in the Mediterranean, there is a lot of discrepancy in data availability among countries. This disparity is mainly driven by regional differences in research tradition or in the development of scientific facilities and capacities (Boero 2003). This is also true for Marine Protected Areas, where natural resources currently under protection have not been surveyed or monitored equally by different MPAs of the same country or those of the region. For many marine species and habitats residing in the MPAs few data are available in the literature regarding richness, distribution, abundance or health status. Gathering data from the experience and professional knowledge of practitioners is an approach that can complement scientific knowledge (Fazey et al. 2005). Our results show however, that the lack of human and financial resources do not allow basic and regular assessment and monitoring and, consequently, decision makers have no access to ecological information of the natural resources they are managing. Inventories of species in many MPAs appear to be inadequate and this seems particularly critical for non-European counties. A stable collaboration between scientific steering committees and Mediterranean MPA staff has been advocated to cope with this situation and thus to base management decision on scientific information (Francour et al. 2001). The same remark can be made about the scant of socioeconomic information. In many Mediterranean countries, population density in coastal areas is very high and this factor is a crucial element for the MPAs of the basin. The need to understand the socioeconomic context of stakeholders involved or influenced by a MPA is thus essential for effectively assessing and managing the area (Pomeroy et al. 2004). Monitoring and evaluation should be continuous and should begin with the implementation of management as it is the base for daily decisions of managers (Salm et al. 2001). However, in the Mediterranean, performing socioeconomic studies as a management tool is still not a common process as half of MPAs has never employed it. Insufficient public involvement, awareness on marine conservation issues, and consultation processes with relevant actors have been considered the main drivers of lower compliance in several Mediterranean MPAs (Badalamenti et al. 2000, Guidetti et al. 2008).

All the above issues can determine the failure of the existing MPAs and undermine the ecological effectiveness of the whole system. However, the inadequate process of design and establishment of MPAs may likely be a crucial additional cause of the low effectiveness of Mediterranean MPAs. Often, such design did not address the real threats occurring in the area and was based on poor ecological and scientific information (Francour et al. 2001, Fraschetti et al. 2005, Guidetti et al. 2008).

## 5.4 Local, regional, and global pressures threatening Mediterranean MPAs

Mediterranean MPAs are affected by multiple anthropogenic threats which may limit the resilience[35] of individual MPAs. Perception of risk associated with these threats does not change according to ecological or political regions of the Mediterranean. Invasive plants, overfishing, noise pollution, solid waste, oil pollution, plant/animal composition changes due to climate change and urbanization were reported as common menaces by managers. Mediterranean MPAs reflect global trends. Organic pollution (such as oil spill) and coastal development were considered the greatest

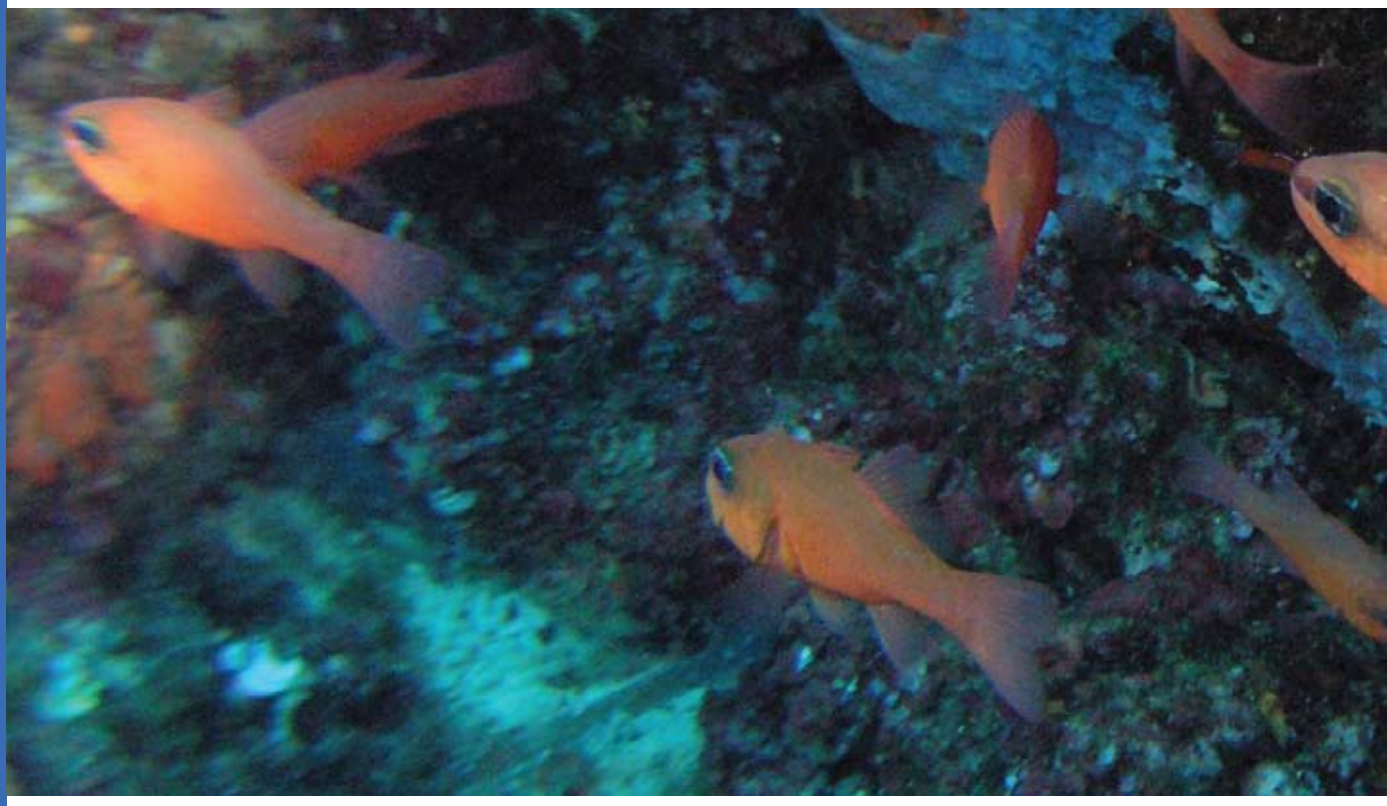
35 Resilience is the capacity of a system to absorb or recover to disturbances and changes of environmental conditions.

threats and the ones that have the longest recovery times and climate change and invasive species the threats with the largest scale of occurrence (Halpern et al. 2007). In addition, risks associated with solid waste, the presence of urbanization or artificial construction and anchoring have been perceived as very important by many MPAs. It is possible that these results are linked with effects of mass tourism in Mediterranean MPAs, usually associated with bad waste management, the unsustainable construction of facilities, and mechanical damage of seabed caused by boat anchoring. The negative trends affecting seagrass beds and coralligenous assemblage is perceived by many MPA managers. These trends may be likely connected to boat anchoring and SCUBA diving (Milazzo et al. 2002). To mitigate these damages a more strict regulation should be combined with more education activities and facilities for tourists (Milazzo et al. 2002, 2004).

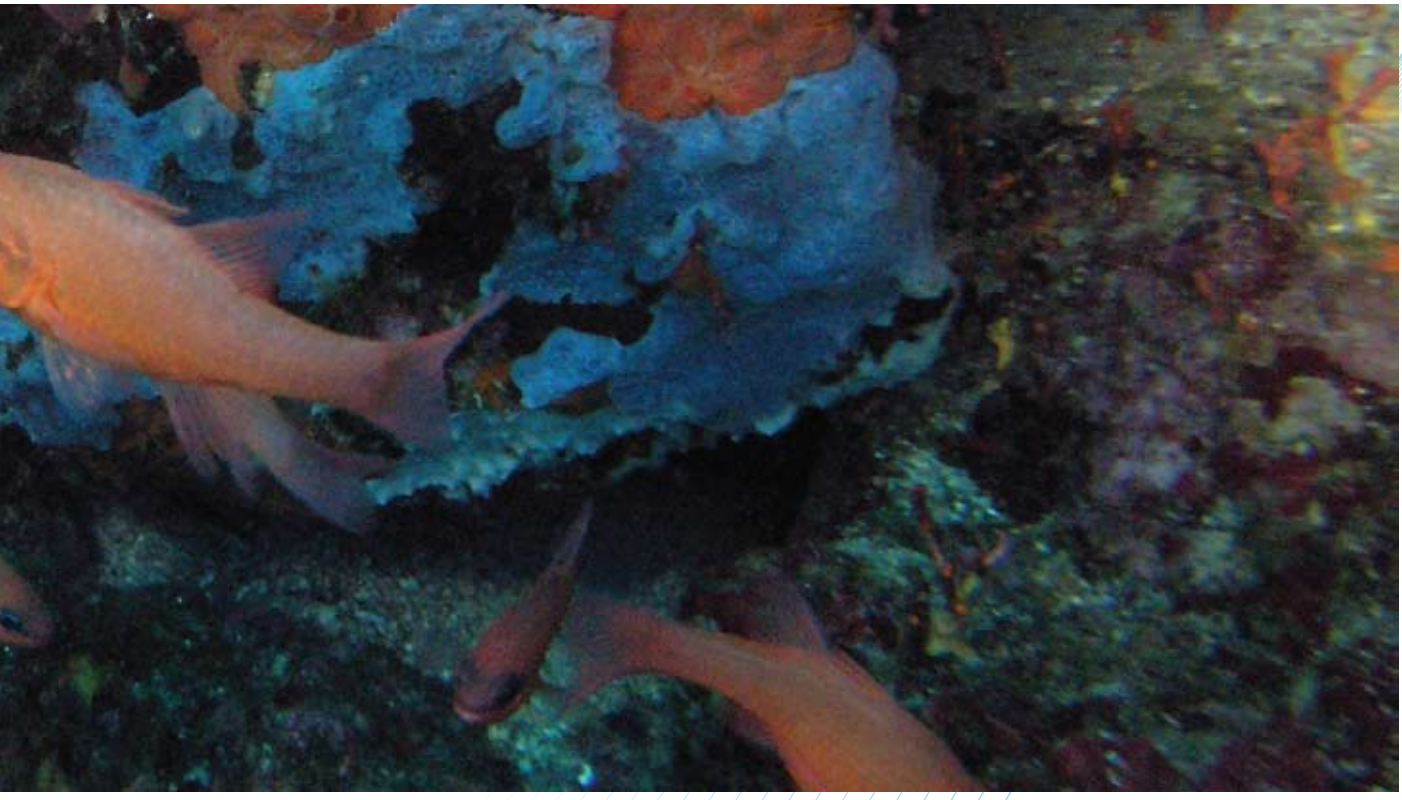
Identifying and monitoring external threats to MPAs represent one important tool for managers to predict the risk associated to specific threats and to plan actions to mitigate the effects (Halpern et al. 2007). For example, our results demonstrate that introduced species are not sufficiently monitored as few MPAs were able to respond to this section of the questionnaire. Introduced species might became invasive and thus a menace in the colonized area since they are able to outcompete natives and replace keystone species or change community composition (Galil 2006). If harmful invasives become widespread, the benefits of MPAs may be dramatically reduced which, in turn, will severely impact source of incomes associated with the area such as tourism and fisheries. Our results showed that introduced species recorded in Mediterranean MPAs are known in the literature as Mediterranean invasive. For example, the ship-transported crab *Percnon gibbesi* is one of the most invasive decapods to recently enter the Mediterranean and now able to colonize subtidal rocky fissured habitat (Cannicci et al. 2004, 2006). The tropical fish species recorded in the MPAs are invasive and among the most common fish species on the eastern Mediterranean coasts (Galil et al. 2002, Harmelin-Vivien et al. 2005). Likewise, among introduced algae, six species have been defined as invasive macrophytes for the Mediterranean: *Asparagopsis armata, Lophocladia lallemandii* and *Womersleyella setacea, Caulerpa racemosa, Caulerpa taxifolia and Halophila stipulacea* (Boudouresque and Verlaque 2002).

*Whale watching © Andrea Molinari*

# Chapter 6



# Recommendations



The need to increase the number of protected habitats in underrepresented Mediterranean areas and to achieve an effective management is thus apparent. The IUCN WCPA – Mediterranean Marine group reminded that Mediterranean MPAs should be planned with the concept of an interconnected network in the rationale (Notarbartolo di Sciara 2005). Moreover, the IUCN WCPA – Marine Summit, despite warning that the 2012 target would not be met, called to re-double efforts to establish and implement national and high seas MPA networks by 2012[36].

Finally, at the 15th UNEP Conference of Parties to the Barcelona Convention[37], RAC/SPA, ACCOBAMS, IUCN, WWF MedPO, WWF/MedPAN reiterated the importance and urgency of developing a representative, effective network of MPAs in the Mediterranean Sea. There are two broad areas where action is needed: to develop a coherent network of MPAs and to improve the management of existing MPAs.

## 6.1 To support development of a coherent network of MPAs in the Mediterranean

Establishing new MPAs and SPAMIs to supplement existing ones, is critical so as to create a geographically and ecologically balanced network and will require the following seven steps:

A. Identifying a subset of priority areas for conservation in the Mediterranean through a hierarchical approach (e.g. cascading from ecoregions and smaller scale bio-units, to priority conservation areas, to ecologically critical habitats, to key species areas);

B. Designing an integrated network of Mediterranean MPAs which will involve the establishment of new areas where needed based on recognised ecological criteria (Annex 2);

C. Enhancing and improving resource distribution, governance and legal frameworks, capacity building, and scientific and technical exchange between north and south;

D. Providing the necessary political effort to drive this process and to move MPAs higher in the conservation agenda;

E. Conducting systematic surveys of marine biodiversity in underrepresented or poorly studied regions (e.g. southern and eastern Mediterranean) and biomes (e.g. the high seas and the deep sea);

F. Furthering knowledge of the potential causal factors for the discrepancy in protection among different areas of the basin, that may include aspects of governance, institutional structures, wealth distribution, and social capital;

G. Strengthening existing systems, partnerships and collaborations among institutions, NGOs, scientific communities and all relevant stakeholders.

## 6.2 To improve management effectiveness

The results of this study provide clear guidance on priorities for action needed to improve regional MPA management. These include the need to:

36 IUCN WCPA – Marine Summit, Washington DC, 10-12 April 2007, A call for action
37 Almeria, Spain. 16th January 2008

A. Guarantee adequate management bodies;

B. Make widespread use of management plans and support their implementation;

C. Perform detailed and accurate natural resource inventory and assess geographical distribution of habitats and critical areas;

D. Define monitoring programmes (with biological and social elements and indicators) and establish favourable conditions for their implementation;

E. Provide for human resources and training;

F. Explore innovative financing mechanisms for secure financial resources, equipment and facilities;

G. Implement effective surveillance combined with education and awareness-raising programmes in areas where a need is identified.

## 6.3 Regional initiatives to support a viable network of MPAs

In addition, some specific and complementary actions should be undertaken to facilitate and improve marine conservation at local and regional scale and to better monitor progress of the network.

### *Enhance the Marine Natura 2000 network in the Mediterranean*

In the very short term, the development of the Natura 2000 network at sea in the seven EU Mediterranean countries will significantly contribute to increasing the coverage of the network as it includes 324 marine Sites of Community Importance and 51 Special Protection Areas with a marine part (Annex 4 and 10). Despite the fact that many marine Natura 2000 sites are currently not managed and can consequently be considered as "paper parks", these figures show that the Natura 2000 network is an important leverage for the Mediterranean MPA network as a whole, especially as the coastline of the concerned countries represents 60% of the total Mediterranean coastline. Although Member States are only now creating the necessary legal and administrative framework to apply the Habitats and Birds Directives beyond their coastlines, one of the challenges for EU biodiversity policy is the establishment of a conservation network of marine and coastal areas under Natura 2000. Nonetheless, very few Natura 2000 sites have been identified in the high sea and this represents the most significant gap in the current Natura network. The reasons for this gap is partially due to the lack of scientific knowledge on species and habitat types in offshore environments (Gubbay 2005) and the complex multi-lateral governance structures needed for high seas MPAs.

### *Define the criteria to identify MPAs at regional level*

In the Mediterranean, MPAs include a wide range of sites for multiple-use purposes (see Annex 4 and 10) and national legislations utilise different definitions of MPA. The practical objective behind this need is to harmonize reporting of MPAs common to all Mediterranean countries and to define criteria for the establishment of a regional network. A non-exhaustive list of issues that should be harmonised includes:

- Distinction between Marine Managed Areas and Marine Protected Areas
- Marine Protected Areas without a legal basis (i.e., managed areas);
- Protected areas that include "intertidal-only" areas;

- Protected lagoons and deltas, as well as Ramsar sites, without any strictly marine parts;
- Fisheries reserves where fishing is fully or partially forbidden with the objective to manage fisheries resources only (and not to conserve biodiversity);
- Areas protected under the fisheries law with the purpose to protect biodiversity;
- Marine Natura 2000 sites;
- Deep-sea sites protected under GFCM in 2006.

Utilising the UNEP Protocol Concerning Specially Protected Areas and Biodiversity in the Mediterranean as a platform, an official Mediterranean MPA list should be developed utilising a list of agreed upon criteria. Such criteria could be presented to and tabled for discussion and approval at the 16th Meeting of the Parties to the Barcelona Convention in 2009.

### *Develop a unique regional Mediterranean MPA Database*

A common and agree database should be developed with the main objective of monitoring the progress of the network and promoting the circulation of information. Database setup should be consistent with global best practice, such as the World Database on Protected Areas (WDPA)[38] which provides the only comprehensive global inventory of the world's protected areas, and "MPA Global", which focuses specifically on MPAs. Geographical information system (GIS) should be incorporated into the database, including spatial information for sites. A GIS would allow spatial assessments, combining the protected areas information with other data layers, such as species or habitat information to identify important or vulnerable Mediterranean areas.

Currently, information concerning biodiversity conservation, distribution of vulnerable species and habitats, and protection effectiveness is still disparate, dispersed and not always accessible. The access to these data is crucial for decision-makers, researchers, managers and practitioners to develop future conservation initiatives based on reliable data. The Mediterranean MPA Database should therefore be a partially public tool. A consortium should be considered in the Mediterranean Region as the international WDPA, including organizations active in the field of MPAs in the Mediterranean Region, such as RAC/SPA, WWF/MedPAN, IUCN, ACCOBAMS, GFCM, the European Union and others.

### *Improve use of IUCN categories for Mediterranean MPAs*

The need for standardized definitions for protected areas and their different levels of protection has led to the development of IUCN management categories and subsequent adoption by a number of countries (Lopez Ornat et al. 2007). Considering the great number of different terms used in the Mediterranean to designate MPAs, the use of the IUCN category system can be particularly useful for standardising zoning categories and for comparison and monitoring progress in conservation and protection at a regional level. An analysis of the progress of the MPA network through the IUCN categories would provide an interesting analysis of the type of protection applied on sites and would contribute to assess whether the network reaches its objectives, in particular for Category Ia Protection.

38 WDPA is a consortium of international conservation organizations, which members include the American Museum of Natural History, BirdLife International, Conservation International, Fauna and Flora International, IUCN, The Nature Conservancy, UNEP-WCMC, the Wildlife Conservation Society, the World Resources Institute and WWF. http://www.unep-wcmc.org/wdpa/index.htm

Lopez Ornat et al. (2007) suggest that in the Mediterranean governmental protected area agencies, or the World Conservation Monitoring Centre in their absence, have assigned most marine protected areas to Category IV due to the fact that MPAs may be a nursery areas for specific species or can protect important habitat. The author concluded that the designation of many MPAs in Category IV should be reviewed, case-by-case, and possibly considered as Categories V and VI. Prohibition of commercial fishing and the regulation of traditional fishing, common in many MPAs, are similar to the concept of Category V (Seascape conservation or recreation) and Category VI (Resource Reserves), and can be applied in those MPAs where the main management instruments are selective fishing regulations. On the other hand, in some cases the use of the IUCN category does not correspond to the real official regulation of human activities at sea as referred to in the management plan or in relevant legislations (Laffoley et al. 2007[39]). This suggests that the system is not currently operating as an effective or reliable classification system.

Guidelines for applying IUCN Protected Area management categories are currently under revision (previous version: IUCN 1994). The drafting is based on the discussions of the Category Summit (Almeria, Spain, 2007) and on an extensive review by members of the WCPA Steering Committee. It will provide more detailed guidance in applying categories in specific biomes and other specialised areas, such as the marine environment. The new guidelines will be presented at the 4th IUCN World Conservation Congress (Barcelona, 2008).

In the Mediterranean, the challenge will be, on the basis of these new guidelines, to bring support to governmental agencies so that they register their MPAs using an appropriate IUCN category. In the future, specific effort has to be made by EU countries on the assignment of the IUCN categories to marine Natura 2000 sites. Currently, according to the type of management that is implemented on these sites, Natura 2000 sites may belong to any of the IUCN categories (Lopez Ornat et al. 2007).

### *Encourage managers and countries to apply for international recognitions for MPAs*

So far, the only international recognitions attributed to Mediterranean MPAs are Natura 2000, SPAMI and important Bird Area (Annex 10). The dearth of international recognition might be linked with the low level of knowledge of the value of MPAs in biodiversity conservation in many Mediterranean countries. A number of initiatives are advancing this: 4 new SPAMIs were added to the SPAMI list during the 15th Conference of Parties to the Barcelona Convention (January 2008). Kornati National Park and Telascica Natural Park are currently applying to the World Heritage Site label. The Emerald Network aims at developing its network at sea in the Mediterranean countries that are parties to the Bern Convention (pers. com. Hervé Léthier). These initiatives should be supported and advertised at the regional level to create momentum and enthusiasm for increased MPA use.

In addition, to answer to the request of more rigorous guarantees of management performance[40], internationally recognised certifications should be introduced in Mediterranean MPAs. Evaluation of management effectiveness and eco-management (all environmental aspects of the MPA's activities, management and

39 Dan Laffoley, Jon Day, Louisa Wood and Brad Barr. 2007. IUCN Categories – their application in marine protected areas. A WCPA - Marine paper.
40 Vth World Congress on Protected Areas, 2003

services) can increase the transparency and accountability of MPAs, enhancing community support and fund raising.

### *Launch preventive actions and regular monitoring of introduced species*

For MPAs, the invasion of introduce species represents a major threat. Institutions and decision-makers should address this issue urgently to create conditions to manage this problem regionally in MPAs. In particular, it is important to:

- Raise the awareness of MPA managers to the potential impacts of introduced species;
- Enhance the capacity of staff to include introduced species in the monitoring programme introduced species in order to early detect new species occurrence;
- Introduce specific preventative actions to reduce the possibility of increased infection by vectors.

## 6.4 Conclusion

The benefits of MPA networks are now well known and regional seas around the world are taking steps toward establishing regional networks. From a global perspective, the Mediterranean is one of the few regions of the world where countries are cooperating under a coherent and legal framework to develop a network of MPAs (Agardy 2005). The Mediterranean adopted the first Regional Seas Programme of UNEP to protect marine biodiversity and started the effort to address conservation challenges with a regional approach (Barcelona Convention 1976). However, the geopolitical complexities of the region and its disparate cultures have all along delayed the proper execution of these commitments. In the recent years however, institutions, together with regional programmes of conservation organisations, national cooperation agencies, dedicated scientists have contributed to achieving real outcomes (UNEP/MAP/RAC/SPA et al. 2008).

This report is a contribution to strengthen the momentum to develop a MPA network based on the existing system of MPAs in the Mediterranean. We hope it will contribute to debate and action, with the final goal to sustainably manage the Mediterranean Sea, to ensure healthy ecosystems and healthy coastal populations.

# Annex 1

## Other definitions of Marine Protected Area and types of Managed Areas

In the Mediterranean context, usually MPAs are defined utilising the IUCN and CBD definitions (see Chapter 1.2). Other definitions, which we can refer to, are:

- The U.S. definition is: "*any area of the marine environment that has been reserved by federal, state, tribal, territorial, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein*" (Executive Order 13158).

- The Australian federal government's definition for a protected area is: "*an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity and of natural and associated cultural resources, and managed through legal or other effective means*" (EPBC Act 1999)

From these definitions we can discern various protection levels and included biota.

- A MPA has some form of protection, usually legal but not necessarily (as in the U.S. case);

- The level of protection varies from complete no-take reserves (where human extractive activities or impact are not permitted) to multiple-use MPAs (where human activities are allowed and regulated).

- MPAs always include the marine environment and associated organisms (strictly marine, intertidal and subtidal levels), but some definitions also include terrestrial sections (such as coast or island). According to the CBD definition (Chapter 1.2), a marine and coastal protected area can also contain coastal and intertidal ecosystems (such as intertidal wetlands, lagoons, swamps, beaches).

- Conservation measures for cultural resources may be integrated in the objectives of an MPA, taking into account human values such as historical or aesthetic features (such as archaeological sites, lighthouses, hulks).

In addition, managed areas for sustainable use of natural resources, Fisheries Management Areas, may contribute to the overall goal of conservation of marine biodiversity. No-fishing or restricted fishing areas in the Mediterranean are generally referred to as Fishery Reserves (Badalamenti et al. 2000). These are spatially bound areas where harvesting of marine resources is regulated (according to gear types, fishing duration, seasons or geographical location), or totally forbidden. However, considering a fishery reserve as an MPA is controversial. The management of fishery harvest may be seen as a form of protection for target species, and a fishery reserve can be assigned to Category VI -Managed Resource Protected Area of the IUCN classification (Kelleher & Kenchington 1992). With the exception of trawl-ban areas (Pipitone et al. 2000), the main aim of fishery management approach is to sustainably exploit commercial fish species by regulating harvest to the level of maximum sustainable yield of the fish stock. Such management does not

necessarily or consistently address the aims of maintaining the health of a marine ecosystem. However, the implementation of the Ecosystem Based Management to fisheries, which takes into account biotic, abiotic and human components of ecosystems and their interactions, can promote a complementary approach to marine conservation (Browman and Stergiou 2004).

# Annex 2

# Ecological criteria for a MPA network

To develop coherent ecological networks, designation of MPAs should take into account the ecological criteria listed below. It is important to note, however, that these criteria refer to no-take areas, where sources of disturbance are minimised.

**Effectiveness** – Positive reserve effect on the whole ecosystem is guaranteed provided that single MPA unites are effective in meeting their set objectives. Ecological and socioeconomic monitoring is a prerequisite to evaluate whether the MPA meets clearly established conservation objectives.

**Representativeness** – The network should reflect an adequate representation of all biodiversity typologies (species, community, endemism, and genetic diversity), physical structures (landscapes, habitats and habitat heterogeneity) and vital functional areas (ecological and evolutionary processes) characteristic of the region. As a precautionary approach, all biogeographic regions have to include the whole range of local diversity especially when information is locally scarce. Recent scientific research indicates that no take, protected areas should cover at least 20-50% of the representative characteristics of a biogeographic region.

**Connectivity** – Considering that the risk of extinction increases with the distance between two populations, a coherent network should reduce the distance between MPAs to ensure and enhance the exchange of larvae, propagules, migratory species, and gene flow, specific to the ecology and biology of the different species of interest.

**Replication** – To enhance long-term viability, the features mentioned before should be replicated within the network and distributed through space. This replication will provide insurance against the failure of a single MPA and the system can reduce the overall effect of impacts that may occur in one part of the region. In addition, replication of features increases the level of connectivity.

**Size and shape** – Depending on the conservation objective, MPAs will be differently sized and shaped. Larger areas can protect a higher number of species, habitats and landscapes, support a larger population or fragmented habitats, and reduce the boundary effect[41]. On the other hand, large MPAs are difficult to manage and control. A series of interconnected MPAs, that individually may be too small, together can seed each other and have an effect beyond boundaries.

For a more comprehensive review see: Supplement of Ecological Applications: Marine Reserves (2003, V. 13S) and WCPA/IUCN (2007).

41 Boundary (or edge) effect is the reduction of spillover due to the increasing of the fishing pressure along the reserve edges.

# Annex 3

# Legal framework and instruments for the establishment of a network of MPAs in the Mediterranean

A thorough outlook on the current relevant international legislations, convention, agreements and other initiatives concerning MPA networks is presented.

## A3.1 Global instruments and initiatives

### *United Nations Convention on the Law of the Sea (UNCLOS)*

The United Nations Convention on the Law of the Sea (Montego Bay, 1982) divides the oceans in different zones of jurisdiction, where different States have different rights:

- Every State has the right to establish the breadth of its territorial sea up to a limit not exceeding 12 nautical miles (n.m.), measured from baselines determined in accordance with this Convention[42]. Ships of all States enjoy the right of innocent passage through the territorial sea[43].

- From 12 to 200 nautical miles, the coastal State can declare an exclusive economic zone (EEZ), where it has sovereign rights for the purpose of exploring and exploiting, conserving and managing natural resources and jurisdiction over marine scientific research and the protection and preservation of the marine environment[44].

- From 200 nautical miles outwards, the so-called regime of the high-seas applies, where all States have the right for their nationals to engage in fishing, subject to their treaty obligations and the rights, duties and interests of other States[45]. States shall cooperate with each other in the conservation and management of living resources in the areas of the high seas[46].

According to the zone of jurisdiction where they are established, the legal framework for the creation and management of MPAs and MPA networks is therefore significantly different. *"MPAs can be located in different marine jurisdictional zones (maritime internal waters, territorial sea, contiguous archaeological zone, exclusive economic zone, fishing zone, ecological zone, continental shelf, high seas, seabed beyond the limits of national jurisdiction). (…) The legal regime applicable to MPAs maybe established under domestic legislation (the most common case) or directly under an international treaty. From an international law perspective, the legal regime for MPAs depends on the extent of the powers that the State(s) concerned may exercise over the marine area in which they are established. The further from the coast a MPA is located, the greater the need to consider issues related to the international law of the sea and to secure international cooperation and agreement"* (Shine and Scovazzi, 2007).

42 Part II, Section 2, Article 3.
43 Part III, Section 3, Article 17.
44 Part V, Article 56 and 57.
45 Part VII, Section 2, Article 116.
46 Part VII, Section 2, Article 118.

The Mediterranean is a semi-enclosed sea, from the point of view of UNCLOS. Mediterranean coastal States which have ratified UNCLOS are therefore expected to cooperate with each other in particular to coordinate the management, conservation, exploration and exploitation of the living resources of the sea and to coordinate their rights and duties with respect to the protection and preservation of the marine environment[47]. More specifically, how is the Convention of interest for the issue of MPA creation and MPA networks, especially in the high seas? MPAs are not specifically addressed in the Convention; nevertheless, nothing in the text precludes their adoption (de Fontaubert 2001). In fact, Part XII of UNCLOS is devoted entirely to the protection and preservation of the marine environment[48], while a whole section is devoted to the conservation and management of the living resources in the high seas[49]. By combining the directives on fishery regimes and conservation of the marine environment, States have the legal instruments to establish strong conservation measures in high seas based on the existing scientific knowledge (de Fontaubert 2001).

To date, 17 Mediterranean States plus the European Union have ratified UNCLOS. The four countries in the region that have not ratified UNCLOS to date are Israel, Libya, Turkey and Syria.

### *Convention on Biological Diversity*

The Convention on Biological Diversity (CBD; Rio de Janeiro, 1992) is the leading international legal framework for the creation and management of protected areas. Article 8(a) calls specifically for the establishment of protected area systems to protect biodiversity. The Convention recognised and transform into international law a need previously recognised in other international initiatives such as the 17th IUCN General Assembly (San Jose, Costa Rica) that, as early as 1988, called on international bodies and all nations to establish a global representative system of marine protected areas[50].

In 1998, the Parties to the CBD adopted a programme of work on marine and coastal biodiversity known as the "Jakarta Mandate". It was not until 2004 (CBD COP7) that a substantial amount of new text regarding Marine and Coastal Protected Areas was incorporated into the programme of work. Parties formally recognised the UN World Summit on Sustainable Development (WSSD) target[51] of "*the establishment and maintenance by 2010 for terrestrial and by 2012 for marine areas of comprehensive, effectively managed, and ecologically representative national and regional systems of protected areas that collectively, inter alia through a global network, contribute to achieving the three objectives of the Convention and the 2010 target to significantly reduce the current rate of biodiversity loss at the global, regional, national and sub-national levels and contribute to poverty reduction and the pursuit of sustainable development*"[52]. A target was settled that there should be *effective conservation of at least 10% of each of the world's ecological regions by 2010.*[53] A further commitment was made in 2006 at the Eighth Ordinary Conference of the Parties to the CBD (COP8) to protect at least 10% of the marine area under national jurisdiction.

The CBD commitments undersigned by states were developed in other international

47 Part IX, Article 123.
48 Part XII, Articles 192, 193, 194
49 Part VII, Section 2.
50 Recommendation 17. 38 (Protection of the coastal and marine environment)
51 Plan of Implementation of the World Summit on Sustainable Development (2002, Section IV, paragraph 32(c)).
52 Programme of Work on Protected Areas
53 COP 7 Decision VII/30 Annex II Goal 1

initiatives. The most important are the following:

- Few months after the signature of the CBD, the IV World Parks Congress (Caracas, Venezuela, 1992) also called for the establishment of a global network of MPAs[54].

- In 2003, the V World Parks Congress (Durban, South Africa) called for the endorsement of the WSSD's target, specifying that "*these networks should be extensive and include strictly protected areas that amount to at least 20-30% of each habitat*".[55]

- In 2003, the G8 Group of Nations committed to work towards marine conservation and, specifically, to "*establish ecosystem networks of marine protected areas, consistent with international law and based on scientific information by 2012 in our own waters and regions*"[56];

All of 21 countries bordering the Mediterranean have ratified the Convention on Biological Diversity.

### *Thematic agreements and initiatives*

#### *Convention on Wetlands of International Importance especially as Waterfowl Habitat*

The Convention on Wetlands (Ramsar, 1971) aims at conserving wetlands and their flora and fauna. According to the Convention wetlands under the scope of the Convention may include marine areas up to a 6-meter depth[57]. Each Contracting Party shall designate suitable wetlands within its territory for inclusion in a List of Wetlands of International Importance[58]. All 21 Mediterranean Countries are Contracting Parties to the Ramsar Convention on Wetlands.

#### *Convention Concerning the Protection of the World Cultural and Natural Heritage*

The protection of the natural environment is clearly in the scope of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Convention (Paris, 1972). Under this convention "natural heritage" are:

- natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;

- geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;

- natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty[59].

Each State Party to this Convention shall ensure the identification, protection,

54 Recommendation 11 (*Marine Protected Areas*)
55 Recommendation v. 22 (*Building a Global System of Marine and Coastal Protected Area Networks*)
56 Evian summit - Marine Environment and Tanker Safety - A G8 Action Plan Paragraph 1.13
57 The Convention defines wetlands as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres" (Art 1.1).
58 (Art 2. 1)
59 Art 2

conservation, presentation and transmission to future generations of the cultural and natural heritage, as referred to above, situated on its territory[60]. All 21 Mediterranean Countries are Contracting Parties to the UNESCO World Heritage Convention.

### *Convention on the Protection of the Underwater Cultural Heritage*

The aim of the UNESCO Convention on the Protection of the Underwater Cultural Heritage (2001) is to ensure and strengthen the protection of underwater cultural heritage. To date, 4 Mediterranean States are bound by this Convention: Croatia, Lebanon, Libya, and Spain.

### *Biosphere Reserves*

Biosphere reserves are sites recognized under UNESCO's Man and the Biosphere Programme which innovate and demonstrate approaches to conservation and sustainable development. Biosphere reserves have three inter-connected functions:

- Conservation: landscapes, ecosystems, species and genetic variation
- Development: economic and human and culturally adapted
- Logistic support: research, monitoring, environmental education and training

They are internationally recognized, nominated by national governments and remain under sovereign jurisdiction of the states where they are located.

In the Mediterranean, there are few Biosphere Reserves including a marine protected area[61]. The first Mediterranean Intercontinental Biosphere Reserve (Morocco-Spain) was established in 2006 in the Alborán Sea.

### *Convention on the Conservation of European Wildlife and Natural Habitats*

The aims of this Convention (Bern, 1979) are to conserve wild flora and fauna and their natural habitats, especially those species and habitats whose conservation requires the cooperation of several States. Particular emphasis is given to endangered and vulnerable species, including endangered and vulnerable migratory species[62]. The Contracting Parties to the Bern Convention include all the European Union states, European states which are not members of the European Union and some African states. In the Mediterranean, apart from the seven EU countries and the EU, contracting parties include Albania, Croatia, Monaco, Turkey, Morocco and Tunisia. Algeria is an observer. The Contracting Parties shall take measures to maintain the population of wild flora and fauna at, or adapt it to, a level which corresponds in particular to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements and the needs of subspecies, varieties or forms at risk locally[63].

### *The Emerald Network*

The Emerald Network is an ecological network made up of "areas of special conservation interest". It was launched by the Council of Europe as part of its work under the Bern Convention. It was

60 Art 4 ; List of UNESCO heritage sites http://whc.unesco.org/en/list (September 2007)
61 Mediterranean Biosphere Reserves with a marine part include: Miramare (Italy), Tuscan Archipelagos (Italy), Cabo de Gata Nijar (Spain).
62 Chapter 1, Art. 1
63 Chapter 1, Art. 2

decided by the Standing Committee in 1989[64] and actually implemented in 1996[65]. The Emerald Network is based on the same principles as Natura 2000 (see below). It represents *de facto* its extension of the Natura 2000 to non-Community countries. In EU candidate states, the Emerald Network was responsible for the preparations for the Natura 2000 programme. But in contrast to the Natura 2000 network, membership of the Emerald Network is optional. Apart from EU Mediterranean countries, pilot projects to implement the Emerald Network have taken place in the following Mediterranean countries: Albania, Bosnia & Herzegovina, Croatia, Montenegro and Turkey.

## A3.2 European Union legislation and initiatives

Currently binding EU instruments concerning MPAs and MPA networks include the Habitats and Birds Directives, the Common Fisheries Policy, the Water Directive and the Marine Strategy Directive. Following the enlargement of the EU in 2004, EU now includes seven countries with territorial waters in the Mediterranean: Cyprus, France, Greece, Italy, Malta, Slovenia and Spain.

### *Habitats and Birds Directives*

The 1979 Birds Directive[66] is the EU's oldest piece of nature legislation. It creates a comprehensive scheme of protection for all wild bird species naturally occurring in the EU. The 1992 Habitats Directive[67] serves as a basis for EU's nature conservation policy. It is built on two pillars: the Natura 2000 ecological network of protected sites and the strict system of species and habitat protection. The directive protects over 200 habitat types and over 1000 animals and plant species listed in the Annexes I and II, including several Mediterranean marine habitats and species. The Habitats Directive requires the designation of Special Areas of Conservation (SAC) for the protection of habitats and species of Community Importance. Together with Special Protection Areas (SPA) for wild birds provided for the Birds Directive, these are to form the European Natura 2000. Conservation measures for marine Natura 2000 sites are the same as those defined for terrestrial sites and "*will aim at maintenance or restoration of species and habitat for which the site has been designated, to favourable conservation status*". Measures have to be applied by the competent authorities according to the type human activities to be regulated and to the specific site. Legislation (i.e. Habitats and Birds Directives) does not specify the content of a management plan; however, guidelines for its development have been provided for Member States, who are required to enact their own national legislation to implement Directives (European Commission 2006). The Habitats Directive has been started to be applied beyond 12 n. m. limit of Member States, specifically in the EEZ (De Santo and Jones 2007).

The European Community is a contracting party to the CBD and has therefore prepared an EU Biodiversity Strategy and Biodiversity Action Plans which aim to integrate biodiversity considerations into other Community policies. Marine biodiversity issues are addressed by the Biodiversity Action Plan for both Natural Resources and Fisheries. The first action identified in this EU Biodiversity Action Plan is to accelerate efforts to finalise the Natura 2000 network, and in particular in the marine environment. This states: "*complete marine network of Special Protection Areas (SPA) by 2008; adopt lists of Sites of Community Importance (SCI) by 2008 for marine;*

64 Recommendation No. 16 (1989)
65 Resolution No. 3 (1996)
66 Council Directive 79/409/EEC on the conservation of wild birds
67 Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

*designate Special Areas of Conservation (SAC) and establish management priorities and necessary conservation measures for SACs [by 2012 for marine]; establish similar management and conservation measures for SPAs [by 2012 for marine]*".

### *Water Framework Directive*

The EU Water Framework Directive[68] adopted on 2000 establishes a framework for the Community actions in the field of water policy. It sets precise environmental objectives that member states should reach in order to reach a good water quality in 2015. Coastal and inland marine waters, as well as estuaries, are in the scope of the directive and should achieve good ecological status[69]. The Directive specifically mentions protected areas[70] for which Member States shall achieve compliance with any standards and objectives.

### *Common Fisheries Policy*

The Common Fisheries Policy (CFP) is the European Union's instrument for the management of fisheries and aquaculture. States of the Community agreed to apply common policy in the area of fisheries, which means common rules adopted at EU level and implemented in all Member States. Since 1 January 2003, the European Union has had a new Fisheries Policy[71].

The Communication from the Commission on the Reform of the CFP – Roadmap (2002) states that *"More effective conservation and management of fisheries resources is a clear priority of the Common Fisheries Policy. (…) The aims of the Commission's new approach to fisheries management are:*

- *to refocus management on a more long-term approach to securing sustainable fisheries with high yields;*
- *to manage fishing effort in line with sustainable catching opportunities, which will require an immediate and significant reduction of fishing effort;*
- *to incorporate environmental concerns into fisheries management, in particular by contributing to bio-diversity protection;*
- *to move towards an eco-system-based approach to fisheries management;*
- *to make the best use of harvested resources and avoid waste;*
- *to support the provision of high-quality scientific advice. "*

Under the CFP, the word "marine protected area" is not used as such. However, the type of measures that can be established to limit fishing mortality and the environmental impact of fishing activities include the establishment of "*zones and/or periods in which fishing activities are prohibited or restricted including for the protection of spawning and nursery habitats*" and "*specific measures to reduce the impact if fishing activities on marine eco-systems and non target species*". Further, a precautionary approach (such as closure measures) may be applied in the event of a serious threat to the conservation of

68 Directive 2000/60/EC
69 'Ecological status' is an expression of the quality of the structure and functioning of aquatic ecosystems associated with surface waters, classified in accordance with Annex V. (Article 2)
70 (Article 4, 1, (c ))
71 Council Regulation (EC) No 2371/2002 of 20 December 2002 on the conservation and sustainable exploitation of fisheries resources under the Common Fisheries Policy

resources or to the ecosystem[72]. This last approach has begun to be explored as biodiversity conservation tool with mixed success (De Santo and Jones 2007).

### *Marine Strategy Directive*

The 6th Environmental Action Programme of the Community[73] requested the Commission to prepare a Thematic Strategy to deal with the protection and conservation of the marine environment. The Commission adopted the Marine Thematic Strategy in 2005[74], which states that "*the objective of the strategy is to protect and restore Europe's oceans and seas and ensure that human activities are carried out in a sustainable manner*" and proposed a Marine Strategy Directive[75], whose objective is "*to achieve good environmental status of Europe's marine environment by 2021*".

The Directive establishes European Marine Regions and Sub-regions as management units for implementation. The Marine Regions defined in the Mediterranean include:

- in the Western Mediterranean Sea, the marine waters covered by the sovereignty or jurisdiction of Spain, France and Italy;
- in the Adriatic Sea, the marine waters covered by the sovereignty or jurisdiction of Italy and Slovenia;
- in the Ionian Sea, the marine

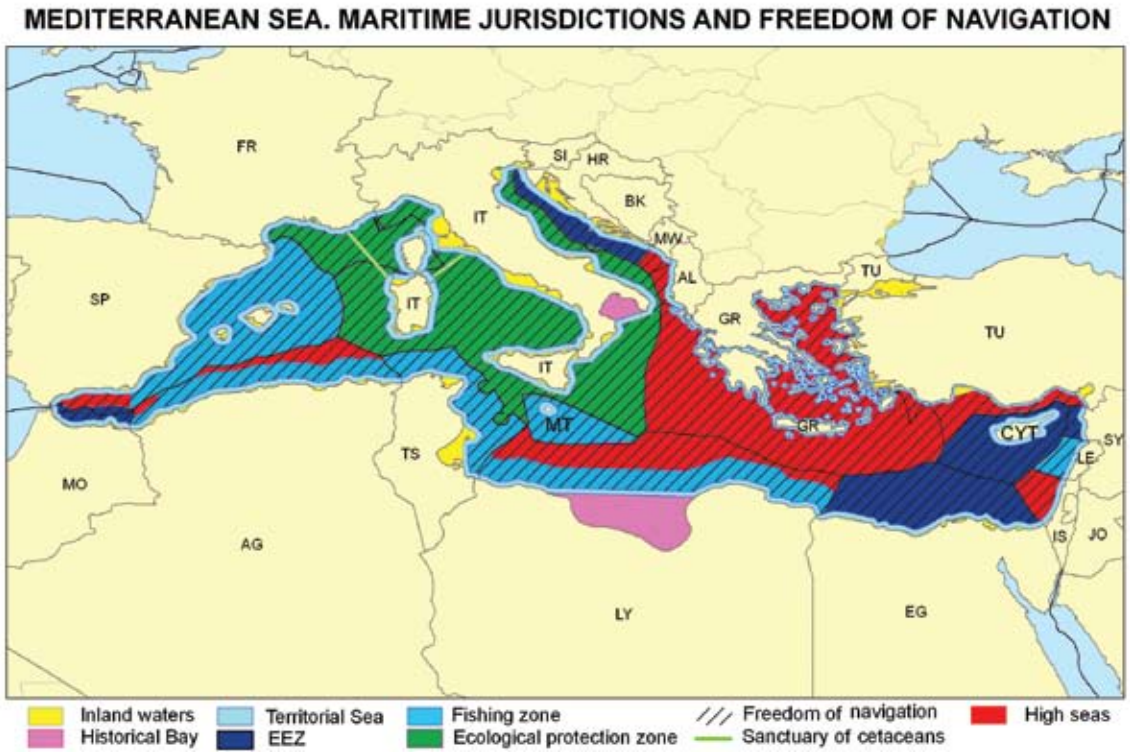



*Figure 21. One potential representation of the maritime jurisdictions in the Mediterranean Sea. Kindly provided by Suárez de Vivero, Juan L: "Atlas de la Europa marítima. Jurisdicciones, usos y gestión". Barcelona, Ediciones del Serbal, 2007, p. 39.*

72 Council Regulation (EC) No 2371/2002 of 20 December 2002, Chapter II, Article 2 and 4
73 Decision N° 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the 6th Community Environment Action Programme.
74 Thematic Strategy on the Protection and Conservation of the Marine Environment COM(2005)504
75 Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). Official Journal of the European Union, 25.6.2008. L164:19-40.

waters covered by the sovereignty or jurisdiction of Greece, Italy and Malta;

- in the Aegean-Levantine Sea, the marine waters covered by the sovereignty or jurisdiction of Greece and Cyprus[76].

Member States are required to develop Marine Strategies for their marine waters in each marine region. The Marine Strategy constitutes the environmental pillar of the maritime policy[77] of the EU.

## A3.3 Mediterranean regional tools and initiatives

For many years, one of the distinctive features of the Mediterranean has been the general restraint shown by coastal States in exercising their rights to extend national jurisdiction over waters in the Mediterranean (Chevalier, 2005). However, a trend is currently developing among Mediterranean States to extend their maritime jurisdictional areas beyond the limit of the territorial sea (12 n.m., except for 6 n.m. in Greece and Turkey) (Scovazzi 2005). *"As no sea point in the Mediterranean is located at a distance of more than 200 n.m. (corresponding to the external limit of the EEZ) from the nearest land or island, the high seas will disappear from the Mediterranean once the trend towards extending coastal States' jurisdiction has been completed. This is an important element when discussing the appropriate legal regime for future MPAs in the region"* (Shine and Scovazzi 2007). Consequently, the current situation of Mediterranean MPAs is to be understood in the context of this very specific sea governance background. Figure 21 shows one possible representations of the current status of maritime jurisdictions in the Mediterranean Sea.

### *Mediterranean Action Plan and the Barcelona Convention*

In 1975, 16 Mediterranean countries and the European Community adopted the Mediterranean Action Plan (MAP), the first Regional Seas Programme under the umbrella United Nation Environmental Programme (UNEP). In 1976, these Parties adopted the Barcelona Convention. Seven Protocols addressing specific aspects of Mediterranean environmental conservation complete the MAP legal framework:

- Dumping Protocol (from ships and aircraft)
- Prevention and Emergency Protocol (pollution from ships and emergency situations)
- Land-based Sources and Activities Protocol
- Specially Protected Areas and Biological Diversity Protocol
- Offshore Protocol (pollution from exploration and exploitation)
- Hazardous Wastes Protocol
- Integrated Coastal Zone Management.

In 1995, the Contracting Parties adopted an amended version of the Barcelona Convention of 1976, renamed Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean that has entered into force on 2004. The preservation of

76 Article 3.
77 On 7 June 2006, the European Commission adopted a Green Paper on a Future Maritime Policy for the European Union.

the region's biodiversity, rare or fragile ecosystems, species of wild fauna and flora and their habitats, is one of MAP's main areas of interest and action. The Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean commits the Contracting Parties to support actions to protect and enhance natural and cultural heritage and to incorporate the conservation of biological diversity into their national policies[78]. Several MPAs have been established and are being implemented by the UNEP RAC/SPA centres[79].

In particular, the Protocol provides for the establishment of a list of Specially Protected Areas of Mediterranean Importance (SPAMI) under which the Parties agree "*to recognize the particular importance of these areas for the Mediterranean*" and "*to comply with the measures applicable to the SPAMIs and not to authorize nor undertake any activities that might be contrary to the objectives for which the SPAMI were established*"[80]. To date, 20 marine SPAMI have been designated in the Mediterranean (see Annex 5).

According to the Protocol, the objectives of specially protected areas are "*to safeguard:*

- *representative types of coastal and marine ecosystems of adequate size to ensure their long-term viability and to maintain their biological diversity*
- *habitats which are in danger of disappearing in their natural area of distribution or which have a reduced natural area of distribution as a consequence of their regression or on account of their intrinsically restricted area;*
- *habitats critical to the survival, reproduction and recovery of endangered, threatened or endemic species of flora or fauna;*
- *sites of particular importance because of their scientific, aesthetic, cultural or educational interests*"[81].

The Protocol is completed by three annexes, adopted in 1996 in Monaco:

- Common criteria for the choice of protected marine and coastal areas that could be included in the SPAMI list (Annex I)
- List of endangered or threatened species (Annex II)
- List of species whose exploitation is regulated (Annex III).

The Protocol does not foresee specifically the creation of a marine protected area network in the sense of the CBD. However, recommendation II.B.2 to the Parties adopted in 2005 to *"(…) consider the creation of new marine protected areas in coastal waters, and in particular in the high seas, (…) based on the available scientific knowledge, accordingly to the commitments of the seventh Conference of Parties of the CBD, and to other applicable international regulations"*[82]. In 2007, recommendations to the Contracting Parties in relation to Marine Protected Areas mainly emphasized the issue of high

78 Art. 5 Barcelona, 1995
79 These are: the Action plan for managing the Mediterranean monk seal; the Action plan for the conservation of marine turtles in the Mediterranean; the Action plan for the conservation of cetaceans in the Mediterranean; the Action plan for the conservation of marine vegetation in the Mediterranean; the Action plan for the conservation of bird species listed in Annex II to the SPA/BD Protocol; the Action plan for the conservation of cartilaginous fishes (Chondrichthyans) in the Mediterranean; the Action plan relating to the introduction of species and invasive species into the Mediterranean Sea
80 Art. 8, parag. 3
81 Art. 4
82 COP14

sea SPAMIs: "*Collaborate to create High Seas SPAMIs, embracing appropriately sensitive habitats beyond national jurisdiction, as well as multiparty SPAMIs including high seas areas, in collaboration with pertinent institutions*"[83].

The RAC/SPA coordinates the Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean Region (SAP BIO), the concerted strategy of the Contracting Parties to implement the 1995 SPA Protocol. It is the result of a long process of consultations carried out during the 2001-2002 period, including the Contracting Parties to the Barcelona Convention and a large number of international and/or regional organizations. The SAP BIO provides a logical base for the conservation of the Mediterranean marine and coastal biodiversity. As regards, MPAs, its objectives include to "*foster the improving of knowledge of marine and coastal biodiversity*" and "*improve the management of existing, and favour the creation of new, Marine and Coastal Protected Areas*" (UNEP/MAP/RAC/SPA 2003a).

As regards more broadly the management of coastal areas, MAP, through its Priority Actions Programme/ Regional Activity Centre is working to integrate sustainable management into planning and development activities by implementing Integrated Coastal Area Management in various areas of the Mediterranean[84].

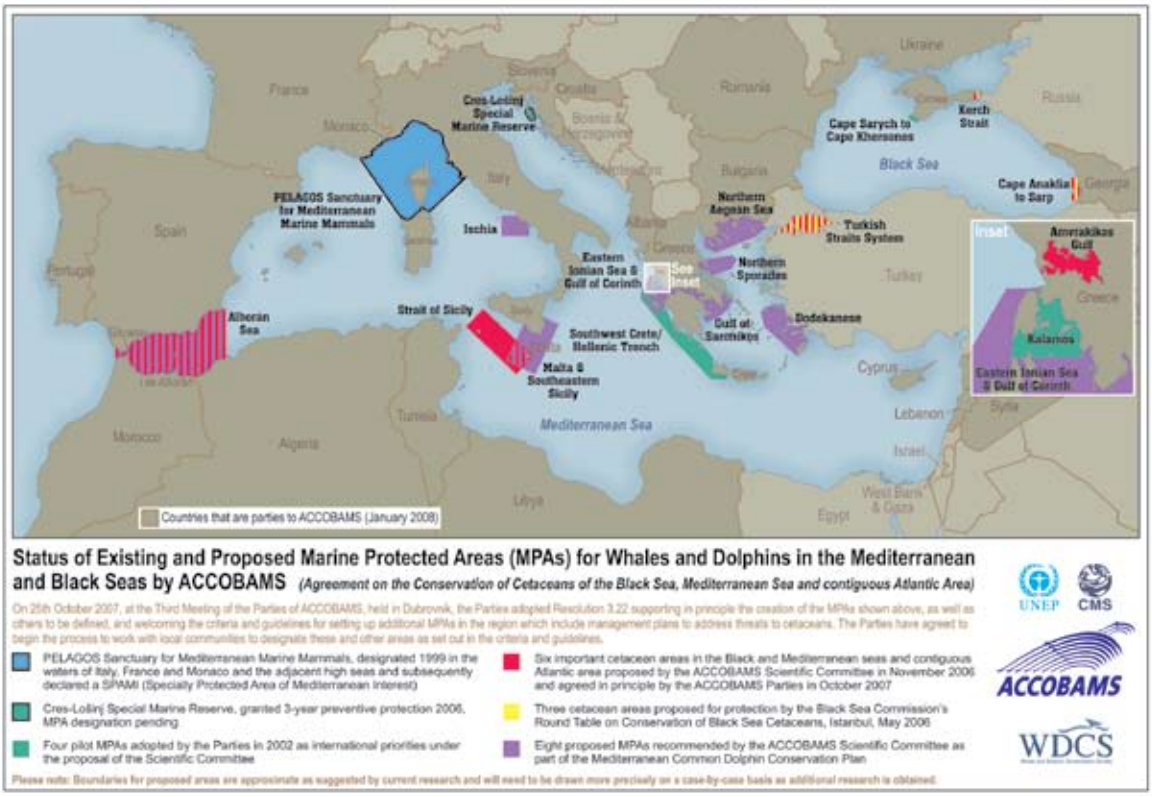



*Figure 22. Map of existing and proposed Marine Protected Areas for Whales and Dolphins in the Mediterranean and Black Seas by ACCOBAMS. Map prepared by Lesley Frampton and Erich Hoyt (Whale and Dolphin Conservation Society) and available at: http://www.cetaceanhabitat.org*

83 II. P. 4

84 Since 1990, 11 Coastal Areas Management Programmes projects have been completed in Albania, Algeria, Croatia, Egypt, Greece, Israel, Lebanon, Malta, Syria, Tunisia, and Turkey. Four more are currently being implemented in Cyprus, Slovenia, Spain and Morocco.

### *Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)*

ACCOBAMS (Monaco, 1996) is a regional agreement which was adopted within the framework of the Convention on Migratory Species (CMS). The purpose of the Agreement is to reduce threat to cetaceans in Mediterranean, Black Sea waters and a Contiguous Atlantic Area and improve the knowledge of these animals. The issue of how to proceed with Marine Protected Areas was discussed during the second meeting (Istanbul, 20-22 November 2003) of the Scientific Committee of ACCOBAMS:

*"ACCOBAMS provides for the use of marine protected areas (MPAs) as a tool for the conservation of cetaceans, both in the text of the Agreement:*

- *Article II, 1, "Purpose and conservation measures. Parties shall take co-ordinated measures to achieve and maintain a favourable conservation status for cetaceans. To this end, Parties shall (…) co-operate to create and maintain a network of specially protected areas to conserve cetaceans."*

and in its Annex II, the "Conservation Plan":

- *Article 3, "Habitat protection. Parties shall endeavour to establish and manage specially protected areas for cetaceans corresponding to the areas which serve as habitats of cetaceans and/or which provide important food resources for them. Such specially protected areas should be established within the framework of the Convention for*

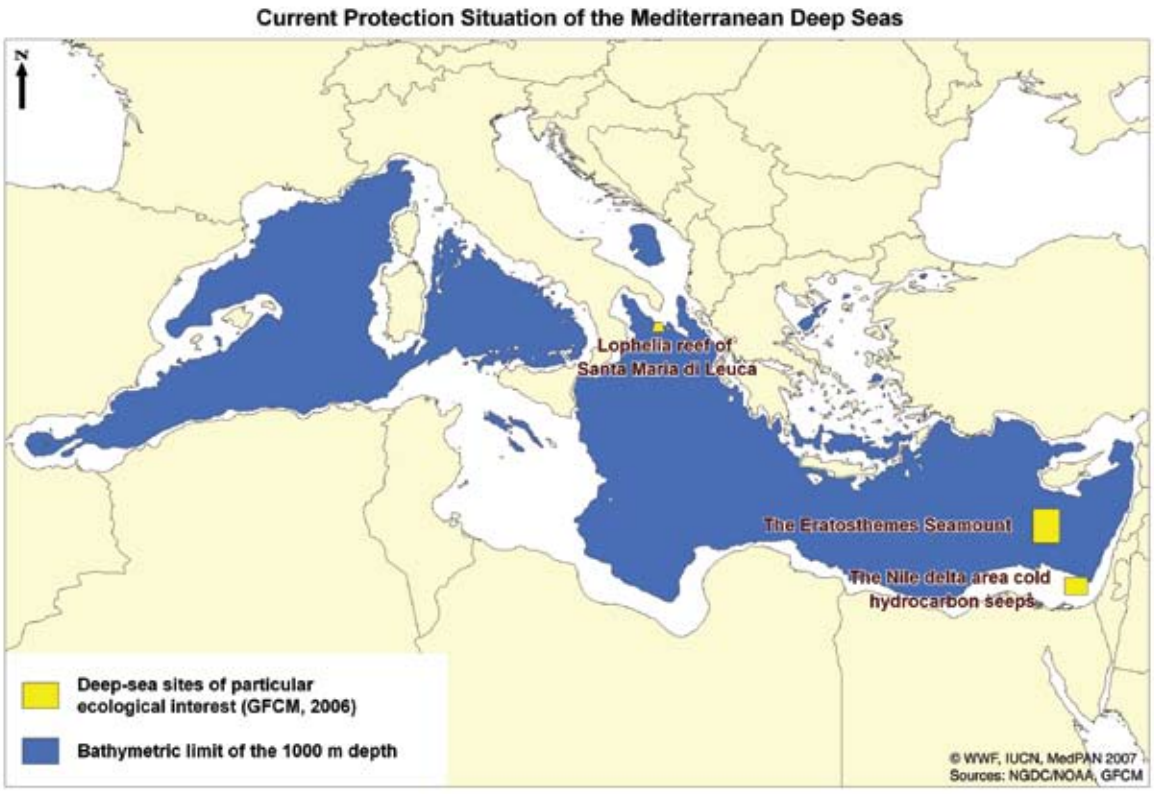



*Figure 23. Deep-sea sites of particular ecological interest (GFCM, 2006) and bathymetric limit of the 1000 m depth.*

*the Protection of the Mediterranean Sea against Pollution, 1976, and its relevant protocol, or within the framework of other appropriate instruments*" (Notarbartolo di Sciara 2003).

The 3rd Meeting of the Parties to the ACCOBAMS (Dubrovnik, October 2007) adopted a specific resolution on MPAs for cetaceans[85] that *(…) encourages Parties to contribute to the international effort to achieve the 2010 and 2012 targets set by the CBD (…) Recommends that the Parties give full consideration, and where appropriate cooperate to the creation of marine protected areas for cetaceans in areas of special importance for cetaceans in the Agreement coverage area, within the framework of the relevant Organizations, and invites non-Parties to do the same*.

In particular, 18 new areas have been recommended by the ACCOBAMS Scientific Committee for the creation of MPAs dedicated to the conservation of marine mammals in the Mediterranean, as summarized in the Figure 22. To date, 16 Mediterranean countries are contracting parties to the ACCOBAMS agreement. The Mediterranean countries that have not ratified the Agreement include Bosnia & Herzegovina, Egypt, Israel, Montenegro and Turkey.

In addition, two MPAs dedicated to the conservation of marine mammals have been established in the Mediterranean:

- Pelagos Sanctuary for Marine Mammals created with a separate Agreement in 1999[86] by France, Italy and Monaco (Notarbartolo di Sciara et al. 2008). The Sanctuary covers an area of 87,500 square kilometres and is the first international High Seas Marine and
- Lošinj Dolphin Reserve, established in 2006[87].

### *Regional fisheries organizations*

The General Fisheries Commission for the Mediterranean (GFCM) was established in 1949[88] under the auspices of the FAO to coordinate activities to promote the development, conservation, rational management and best utilization of living marine resources in the Mediterranean and Black Seas and connecting waters. It now has 24 Members[89]. A Sub-Committee on Marine Environment and Ecosystems advises the Scientific Advisory Committee of GFCM on issues relating to Marine Protected Areas.

During its 29th session of the GFCM held in Rome from 21-25 February 2005, the GFCM recommended to adopt a measure to ban trawling below 1,000 meters (Fig. 23)[90]. GFCM also banned driftnets, with the intent of making the whole Mediterranean driftnet free. In 2006, three ecologically important deep-sea areas have been identified as sites of particular ecological interest following a decision adopted during the annual

85 MOP 3, Resolution 3. 22
86 The Agreement entered into force on 21 February 2002 after ratification by the three countries.
87 Regulation of the 26th of July 2006, Ministry of Culture of the Republic of Croatia, UP/I-612-07/06-33/676, 532-08-02-1/5-06-1. The Losinj Dolphin Reserve is protected as Special Zoological Reserve and as such is subject to the strictest type of protection regime. Initially, the area receives "preventive protection" with protection from the development of any new human activities, for a maximum of three years. This will allow the establishment of a management body and the preparation of a management plan for the permanent Reserve. After these three years the designation will become permanent through a Decree of the Government.
88 Agreement of 24 September 1949, in force from 20 February 1952 and amended in 1963, 1976 and 1997 (FAO, Basic Texts, III, No. 7, 3rd ed. , 1977).
89 Albania, Algeria, Bulgaria, Croatia, Cyprus, the European Union, Egypt, France, Greece, Israel, Italy, Japan, Lebanon, Libya, Malta, Monaco, Morocco, Romania, Serbia and Montenegro, Slovenia, Spain, Syria, Tunisia and Turkey.
90 Recommendation GFCM/2005/1

meeting in Istanbul. The recommendation of GFCM is to protect: (a) the deepwater coral reef off Capo Santa Maria di Leuca, Italy, in the Ionian Sea, which is home to the rare white coral, *Lophelia pertusa*; (b) a chemosynthesis-based ecosystem, offshore from the Nile Delta; and (c) the Eratosthenes seamount, south of Cyprus, which hosts rare coral species (Fig. 23)[91]. The deep sea sites of particular ecological interest identified by GFCM cover 15,666 km² that is 0.62% of the total area of the Mediterranean Sea. This resolution thus marked a significant step towards the emergence of the GFCM as an effective authority for fisheries management and the protection of marine environment and ecosystems in the international waters of the Mediterranean Sea.

### *The MedPAN Network*

MedPAN, the Network of Managers of Marine Protected Areas in the Mediterranean, was created in 1990 with the support of the World Bank. The two principal objectives at its creation were:

- the exchange of experiences among the managers of marine protected areas;
- the development and refinement of management tools.

The MedPAN network operated from 1990 to 1996, with one thematic seminar and four publications each year. The lack of human and financial resources left the network in a dormant state since 1996, but its value was reaffirmed by the United Nations in the spring of 1999 via RAC/SPA. The Port Cros National Park applied for a new statute for MedPAN in 1999, transforming MedPAN into a non-profit organization under French law[92], with administrative offices hosted in the Port Cros National Park buildings. The RAC/SPA provided secretarial services for the association, and the executive responsibilities of the network were filled by the Port Cros National Park and the Federation of French Regional Natural Parks. The statutes of the new association clearly stated the vocation of the MedPAN network:

- *"Enhance the contacts and experience exchanges among the managers of coastal and marine protected areas;*
- *Assist in the training of managers;*
- *Make the know-how acquired by each manager available to other managers, with the vision of sustainable development;*
- *Develop and support concrete actions for the planning, management and public awareness of a protected area or a group of protected areas;*
- *Enhance the development of coastal and marine MPA's, depending on the skills of each MPA"* (Piante 2003).

In 2001 the Port Cros National Park proposed that the WWF-France take on coordinating and raising funds for the MedPAN network. A feasibility study was carried out in 2003 and refocused the network on marine protected areas (Piante 2003). A three-year project was developed and coordinated by WWF-France from 2005 to 2007 and funded by the EU Interreg IIIC zone South initiative. It brought together 23 partners from 11 countries around the shores of the Mediterranean, of which 14 partners are European (France, Italy, Greece, Malta, Slovenia, Spain) and nine partners from non-European countries (Morocco,

91 Recommendation GFCM/2006/3
92 Association Law 1901

Tunisia, Algeria, Croatia, Turkey). These partners manage more than 20 marine protected areas and are working towards the creation of several new sites.

During the project, several thematic workshops were held each year on management issues common to all marine protected areas. The network funded the carrying out of studies and the development of methodological tools. The network aims at becoming a permanent organization starting from 2009 onwards.

# Annex 4

## Other types of conservation instruments and managed areas not included in the survey

**Marine Natura 2000** sites were not included in the MPA list although they fit the definition used in the present survey. A high number of Natura 2000 sites are located within the boundaries of existing MPAs and therefore their surface area often partially overlaps. As we could not access GIS data for all MPAs and Natura 2000 sites in each country, it was impossible to measure the level of overlap between Natura 2000 sites and other types of Marine Protected Areas. The only tool we can use is a comparison of the areas protected as MPAs or as sites under the Habitats and Birds Directive[93] in each EU Mediterranean countries (Cyprus, France, Greece, Italy, Malta, Spain and Slovenia, Fig 24).

The Natura 2000 Barometer[94], published by the EU in June 2007 (see Annex 3) identified 324 Marine Sites of Community Importance (Habitats Directive) and 51 Special Protection Areas (Birds Directive) with a marine part in the Mediterranean. Numerous sites have been designated

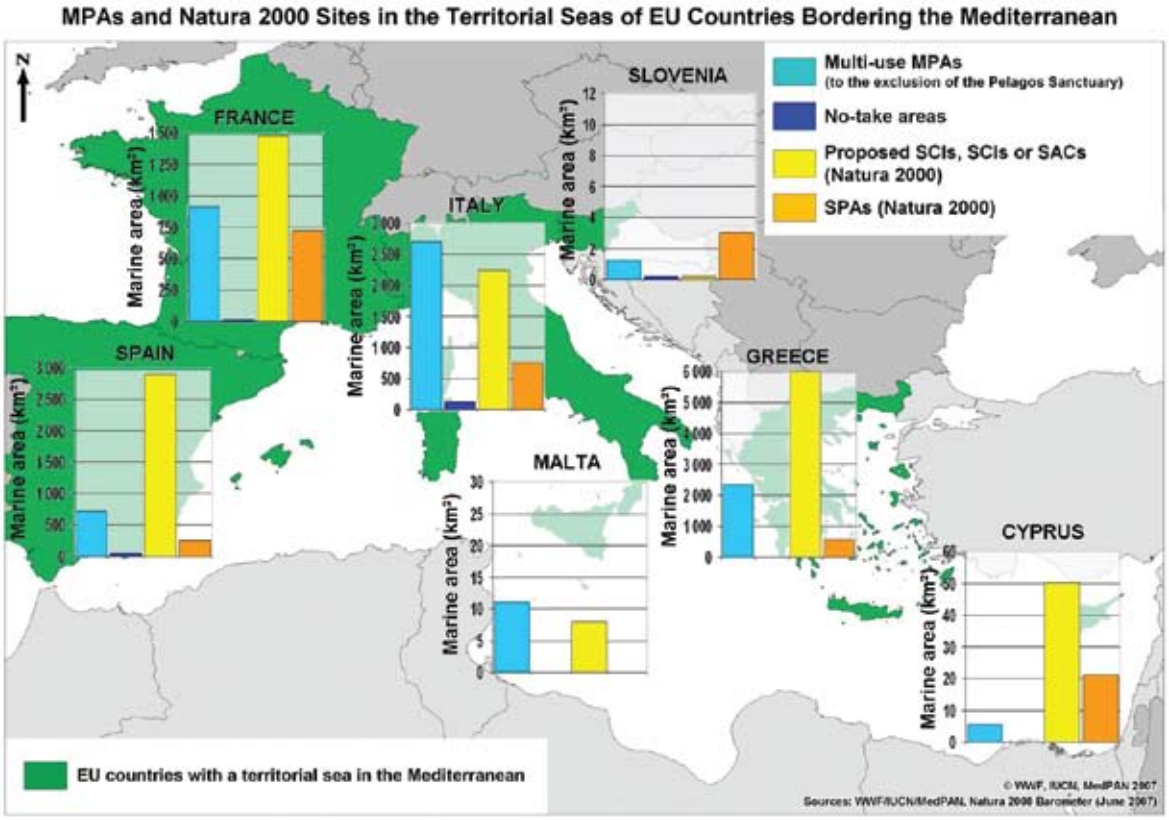



*Figure 24. Comparison between Natura 2000 sites and the other types of MPAs. Surface area of MPAs, no-take zones, SCI (including also pSCI and SACs) and SPA sites are shown for each EU country (note that the axis scales are different in the graphics).*

93 whether at SCIs, pSCIs or SACs stage.

94 The Natura 2000 Barometer is managed by the European Topic Centre for Biodiversity and based on information officially transmitted by Member States.

*Table 4 - Nature 2000 sites - Marine Sites of Community Importance (SCI) in the Mediterranean EU countries (update of 30 June 2007)*[95]

| Country | Length of Mediterranean coast line (km) | Total number (Terrestrial and marine) | Total area (terrestrial and marine) (km²) | N° of sites in which a marine part is noted | Marine Area (km²) | Terrestrial area (km²) | % marine area *vs* total area |
|---|---|---|---|---|---|---|---|
| Cyprus | 782 | 36 | 711 | 5 | 50 | 661 | 7. 03 |
| France | 1,703 | 1,335 | 52,156 | 24 | 1,480 | 46,564 | - |
| Greece | 15,021 | 239 | 27,641 | 102 | 5,998 | 21,643 | 21. 70 |
| Italy | 7,375 | 2,281 | 45,059 | 160 | 2,244 | 42,816 | 4. 98 |
| Malta | 180 | 27 | 48 | 1 | 8 | 40 | 16. 67 |
| Slovenia | 47 | 259 | 6,360 | 3 | 0. 2 | 6,359 | 0. 00 |
| Spain | 2,580 | 1,430 | 123,382 | 29 | 2,893 | 118,165 | - |
| **TOTAL** | | | | **324** | **12673. 2** | | |

Source: European Topic Centre on Biological Diversity (July 2007) except for the length of coastline (Benoit and Comeau 2005)

*Table 5 - Nature 2000 sites - Marine Special Protection Areas (SPA) in the Mediterranean EU countries (update of 30 June 2007)*

| Country | Length of Mediterranean coast line (km) | Total number (Terrestrial and marine) | Total area (terrestrial and marine) (km²) | N° of sites in which a marine part is noted | Marine Area (km²) | Terrestrial area (km²) | % marine area *vs* total area |
|---|---|---|---|---|---|---|---|
| Cyprus | 782 | 7 | 788 | 1 | 21 | 767 | 2. 66 |
| France | 1,703 | 369 | 45,804 | 10 | 719 | 42,543 | - |
| Greece | 15,021 | 151 | 13,703 | 16 | 567 | 13,136 | 4. 14 |
| Italy | 7,375 | 590 | 37,671 | 18 | 763 | 36,909 | 2. 03 |
| Malta | 180 | 12 | 14 | 0 | 0 | 14 | 0. 00 |
| Slovenia | 47 | 27 | 4,656 | 1 | 3 | 4,653 | 0. 06 |
| Spain | 2,580 | 563 | 97,123 | 5 | 255 | 96,488 | - |
| **TOTAL** | | | | **51** | **2,328** | | |

Source: European Topic Centre on Biological Diversity (July 2007) except for the length of coastline (Benoit and Comeau 2005)

according to both the Birds and the Habitats Directives, either in their totality or partially, therefore numbers given may not necessarily add up. It is interesting to note that the area covered by the areas under the process of being established as Natura 2000 sites is 12,673 km², which is an area superior to the cumulative area of other types of established MPAs in the whole Mediterranean (Tab. 4 and 5).

**Fisheries reserves** are areas where fishing is fully or partially forbidden with the objective to manage fisheries resources only. This conservation-oriented management was not included

95 The Natura 2000 Barometer is based on the information officially transmitted by Member States. Numerous sites have been designated according to both the Birds and the Habitats Directives, either in their totality or partially; the numbers given may therefore not necessarily add up.

*Tab 6 - Non exhaustive list of fisheries reserve or managed areas in the Mediterranean*

| Country | Site Name | Marine Area (km²) | Date of creation | Sources |
|---|---|---|---|---|
| France | | | | |
| | Cap Roux | ND | ND | |
| | Golfe Juan | ND | ND | |
| | Beaulieu sur Mer | ND | ND | |
| | Roquebrune-Cap-Martin | ND | ND | |
| | Calvi | ND | ND | |
| | Bastia | ND | ND | |
| | Ile Rousse | ND | ND | |
| | Piana-Porto | ND | ND | |
| | Propriano | ND | ND | |
| | Porto-Vecchio** | ND | ND | |
| | Saint Florent | ND | ND | |
| | Bonifacio** | ND | ND | |
| | Cap Couronne** | ND | ND | |
| | Carry-le-Rouet** | ND | ND | |
| Italy | | | | |
| | Trawl ban area - Gulf of Castellammare (northwest Sicily) | ND | 1989 | Badalamenti et al. 2002 |
| | Santa Croce Bank (Campania) | ND | 1993 | Tunesi et al. 2007 |
| | Santa Maria di Castellabate (Campania) | 44 | 1972 | Tunesi et al. 2007 |
| | Wreck of the Off-shore platform Paguro (Romagna) | ND | 1995 | Tunesi et al. 2007 |
| Malta | | | | |
| | Malta Fisheries Management Zone | 10,700 | 2004 | Schembri 2007 |
| Spain | | | | |
| | Bahia de Palma | 24 | 1982 | |
| | Freus d'Eivissa | 136 | 1999 | |
| | Illa del Toro | 1 | 2004 | |
| | Illes Malgrats | 1 | 2004 | |
| | Islas Columbretes* | 44 | 1990 | |
| | Llevante de Mallorca (Cala Ratjada) | 59 | 2007 | |
| | Masia Blanca* | 3 | 2000 | |
| | Migjorn de Mallorca | 223 | 2002 | |
| | Norte de Menorca | 51 | 1999 | |
| | Tabarca* | 15 | 1986 | |

*ND: No data*

** Taken in account in the MPA list of the present survey as they also have the objective of protecting biodiversity*

*** Fisheries reserves included within MPA boundaries*

in the survey, as regional or national lists are not yet available. In table 6, a non exhaustive list is reported as baseline for future updating. Fisheries Reserves should be fully listed and surveyed, taking in account that they are likely to have positive effects on marine biodiversity and habitats in general and not only on fish resources that they aim to protect. However, in some countries where the legal framework enabling the creation of MPAs is not available yet, the fisheries law is sometimes used to protect marine areas that may be contiguous or not to coastal protected areas and in that case, the objective is not only the management of fishing resources but rather the protection and conservation of biodiversity. This is the case for instance of the marine areas around La Galite (protected as a natural reserve as far as the terrestrial area is concerned) or Zembra and Zembretta (protected as a national park as far as the terrestrial area is concerned) in Tunisia which are protected under the fisheries law as the MPA law is not available yet. The two Tunisian MPAs have been also declared SPAMIs. Other countries may also use fisheries law as a tool to start protecting endangered species and their

*Tab 7 Major nesting sites of Chelonia mydas and Caretta caretta in the Mediterranean (Source: WWF, 2005, Global MPA database 2007). Abbreviations: ACS: Archaelogical Conservation Site; MPA: Marine Protected Area; Nat2000: Natura 2000 site; NCS: Nature Conservation Site; NMP: National Marine Park; SPA: Specially Protected Area; WCA: Wildlife Conservation Area*

| Country | Nesting site | Protection Statut |
|---|---|---|
| Albania | Patok Area | |
| Greece | | |
| | Zakynthos | NMP, Nat2000 (GR2210002) |
| | Kyparissia Bay | Nat2000 (GR2550005) |
| | Lakonikos Bay | Nat2000 (GR2540003) |
| | Bay of Chania | Nat2000 (GR4340003-GR4340006) |
| | Rethymno | Nat2000 (GR4330004) |
| Turkey | | |
| | Dalyan | SPA |
| | Dalaman | - |
| | Fethiye | SPA, ACS |
| | Patara | SPA, ACS |
| | Kale | - |
| | Kumluca | - |
| | Belek | SPA, NCS |
| | Kizilot | - |
| | Demirtas | - |
| | Anamur | NCS, ACS |
| | Goksu | SPA |
| | Alata | - |
| | Kazanli | - |
| | Akyatan | WCA |
| | Sugozu | - |
| | Samandagi | - |
| Cyprus | | |
| | Lara/Toxeftra | MPA |
| | Chrysochou Bay | Nat2000 |
| | Alagadi | SPA |
| | North Karpaz | - |
| Syria | | |
| | Lattakia | - |

habitats: this is the case for instance for the monk seal *Monachus monachus* in Albania. Some fisheries reserve may also have general conservation objectives, such as the Spanish national marine reserves, and carry out management activities in that purpose.

**GFCM deep-sea sites of particular ecological interest** have not been taken into account in the list of MPAs of the present survey**.** GFCM adopted the agreement to prohibit trawling in the three deep-sea sites with the recommendation 2006/3; however these areas cannot be considered as strictly speaking MPAs so far. The three deep sea sites are: deepwater coral reef off Capo Santa Maria di Leuca, Italy, offshore from the Nile Delta, and the Eratosthenes seamount, south of Cyprus (Fig. 23).

**Protected marine turtles nesting beaches** were not included in the present survey as they are mostly terrestrial and intertidal and the area does not necessarily include any marine part. However, table 7 presents an initial list of the major nesting sites of the Mediterranean.

# Annex 5

# Review of existing lists of Mediterranean MPAs

**MedPAN Directory**

WWF-France and MedPAN have developed a Directory of Mediterranean MPAs (MedPAN Directory) with the intention of update it on a regular basis (see Chapter 2). The directory has two main goals: a) to develop baseline information of MPAs in the Mediterranean to be able to monitor the progress of the Mediterranean MPA network; and b) to serve as a communication and document sharing tool for Mediterranean MPA managers.

**MPA Global**

MPA Global is the database of the world's Marine Protected Areas (Wood, 2007). It is a collaborative project between the Fisheries Centre of the University of British Columbia, the Sea Around Us Project, WWF, United Nations Environment Programme - World Conservation Monitoring Centre (WCMC) and IUCN - World Commission on Protected Areas - Marine. This project has two main goals: a) to develop a global marine protected area baseline more robust than currently exists; and b) to develop alternative scenarios of global MPA networks using spatial modelling techniques. Most of the data of MPA Global are based largely on information of the World Database on Protected Areas (WDPA) managed by UNEP-WCMC, IUCN, and WDPA Consortium Members.

**National databases**

National and thematic databases have been developed in several countries. Through the use of Internet, governmental institutions and local organizations share many different forms of information on national protected areas. A comprehensive list of national MPAs can be found on the web pages of the Ministries of Environment or others official park authorities.

**Specially Protected Areas list**

In compliance with the Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD) Protocol, the Regional Activity Centre for the Specially Protected Areas (RAC/SPA) is responsible for establishing and updating databases on Specially Protected Areas of Mediterranean Importance (SPAMI), protected species and other subjects that come under the SPA/BD Protocol (Tab. 8). The SPAMI list can include sites which are important for the conservation of components of biological diversity in the Mediterranean; ecosystems specific to the Mediterranean area or the habitats of endangered species; areas of special interest at scientific, aesthetic, cultural or educational levels.

**Published reports**

In 2005, the IUCN Centre for Mediterranean Cooperation reviewed the marine managed areas in the West Mediterranean (Spain, United Kingdom (Gibraltar), France, Monaco, Italy, Malta, Tunisia, Algeria, Morocco, International) by developing a list of sites under protection. The report includes different categories of protection: MPAs, fishery management areas and marine areas of submerged cultural heritage (Broquere 2005).

COPEMED (Cooperación Pesca Mediterráneo), a FAO project which covers the Western and Central sub-regions of the Mediterranean (Morocco, Algeria, Tunisia, Libya, Malta, Italy, France and Spain). This regional cooperation worked on the formulation of recommendations and the definition of scientific criteria for a better management of the exploited resources in the Mediterranean and facilitated the works of the GFCM. The COPEMED inventory of Mediterranean MPAs is focused on fishery-managed areas.

*Table 8 List of the Specially Protected Areas of Mediterranean Importance (SPAMI). Source: RAC/SPA (Total number = 21)*

| Country | SPAMI Name | Date of creation |
|---|---|---|
| Algeria | | |
| | Banc des Kabyles Marine Reserve | 2005 |
| | Iles Habibas | 2005 |
| France | | |
| | Port-Cros National Park | 2001 |
| Italy | | |
| | Portofino Marine Protected Area | 2005 |
| | Marine Reserve of Miramare | 2008 |
| | Torre Guaceto Marine Protected Area & Natural Reserve | 2008 |
| | Tavolara - Punta Coda Cavallo Marine Protected Area | 2008 |
| | Plemmirio Marine Protected Area | 2008 |
| Spain | | |
| | Alborán Island | 2001 |
| | Cabo de Gata Nijar Natural Park | 2001 |
| | Fondos Marinos del Levante Almeriense | 2001 |
| | Mar Menor y Costa Oriental de la region de Murcia | 2001 |
| | Columbretes Island | 2001 |
| | Cap de Creus Natural Park | 2001 |
| | Medes Islands | 2001 |
| | Cabrera National Park | 2003 |
| | Maro-Cerro Gordo Cliffs | 2003 |
| Tunisia | | |
| | Kneiss Islands | 2001 |
| | Zembra et Zembretta National Park | 2001 |
| | La Galite Archipelago | 2001 |
| France, Italy, Monaco | | |
| | Pelagos Sanctuary for the conservation of Mediterranean marine mammals | 2001 |

In 2007 the 3rd Meeting of the Parties to ACCOBAMS adopted a resolution (Res. 3.22) welcoming guidelines and criteria for the selection and format of proposals for marine protected areas for cetaceans, and identifying a number of areas recommended by the Scientific Committee to be considered for the creation of MPAs[96] (Fig. 22).

96 http://www.accobams.org/2006.php/pages/show/47

# Annex 6

# Questionnaire designed for the survey

## 1. PERSON WHO IS ENTERING the DATA

| | |
|---|---|
| **Name of the MPA:** | |
| Name: | |
| E-mail: | |
| **Date of filling** | |

## 2. GENERAL FEATURES

| | |
|---|---|
| **Address:** | |
| **Contacts:** | |

### 2. 1. Designation information

Legal status (*select the relevant status*):

| | |
|---|---|
| Archaeological Protection Area | |
| Nature Protection Area | |
| Natural Marine Protected Area | |
| Marine Protected Area | |
| Protected area | |
| Marine and Coastal Protected Area | |
| Specially Protected Area | |
| Fisheries Marine Reserve | |
| Marine Nature Reserve | |
| Marine Park | |
| Marine Reserve | |
| Natural Monument | |
| National Hunting Refuge | |
| National Marine Park | |
| National Park | |
| Nature Park | |
| Nature Reserve | |
| Regional Natural Park | |
| Special Marine Reserve | |
| Fisheries Closed Zone | |

| | |
|---|---|
| Concession of Use of the Maritime Public Domain | |
| Managed Natural Reserve | |
| Marine Protected Zone | |
| Natural Marine Reserve | |
| Natural Reserve | |
| Biotope Protection Ordered Zone | |
| Landscape protection site | |
| Coastal Fisheries Conservation and Management | |
| Trawl ban area | |
| Underwater Reserve | |
| Other (specify: | |

International recognition (*Select the relevant information*):

| | | |
|---|---|---|
| SPAMI (Specifically Protected Area of Mediterranean Importance) | | Year: |
| Biosphere reserve | | Year: |
| European diploma | | Year: |
| Natura 2000 | | Year: |
| RAMSAR site | | Year: |
| World heritage site | | Year: |
| Special Protection Area | | Year: |
| Important Bird Area (IBA) | | Year: |
| Other (specify : | | Year: |

Foundation text:

Designation Status (select the relevant information):

| | |
|---|---|
| Formally designated = designated using legislation | |
| Informally designated = designated using non-statutory framework e.g. customary agreement | |
| Proposed = formally proposed in legislation | |
| Recommended = informally recommended (not using legislation) | |
| Degazetted = site degazetted i.e. designation no longer in effect | |

Legal references:

**2. 2 Administration and management**

Relevant administration:

Management body:

Consultative Committee:

**2. 3 Area**

Total Site Area (km2):

Terrestrial Area (km2):

Marine Area Surface (km2):

**2. 4 IUCN management category** (*explanation of the categories is reported in the Terminology section at the end of the questionnaire*)

| | |
|---|---|
| Ia | |
| Ib | |
| II | |
| III | |
| IV | |
| V | |
| VI | |
| None | |
| Unset | |
| Inapplicable | |

**2. 5 Spatial information**

Polygon available : Yes No

Latitude of central point of site

Longitude of central point of site

**2. 6 Zoning**

Is the MPA zoned for different uses? Yes No

Is any part of the MPA no-take? All Part None In progress

No take area (km2)

**2. 7 Objectives of the MPA** (*Select the relevant information*):

A. Biodiversity conservation

| | |
|---|---|
| 1. Provide refuge for threatened species | |
| 2. Prevent/Recover habitat damage | |
| 3. Develop natural biological communities | |
| 4. Enhance production of offspring | |

| | |
|---|---|
| 5. Facilitate recovery from human disturbances | ☐ |
| 6. Allow spillover of adults and juveniles | ☐ |

B. Long-term sustainability of social benefits

| | |
|---|---|
| 1. Protection of an underwater archaeological site | ☐ |
| 2. Sustainable management of fisheries | ☐ |
| 3. Sustainable management of tourism | ☐ |
| 4. Sustainable development of other economic activities | ☐ |
| 5. Environmental education and awareness-raising | ☐ |
| 6. Involvement of local stakeholders | ☐ |
| 7. Scientific research | ☐ |
| 8. Other. Specify: | ☐ |

## 3. REGULATIONS

Regulated activities:

Is the activity allowed, regulated or prohibited?

| | Core zone | Buffer zone | Peripheral area |
|---|---|---|---|
| Swimming | | | |
| Spearfishing | | | |
| Mooring, anchoring | | | |
| Navigation, sailing | | | |
| Recreational fishing | | | |
| Professional fishing | | | |
| Scuba diving | | | |
| Scientific research | | | |
| Other: specify: ☐ | | | |

## 4. THREATS

Select in the following list if each threat is: low, moderate, high, very high, don't know (*explanation of the terms used is reported in the Terminology section at the end of the questionnaire*):

| | | Intensity | Frequency | Probability |
|---|---|---|---|---|
| **Overfishing** | ☐ | | | |
| **Marine Alien species** | | | | |
| plant | ☐ | | | |
| animal | ☐ | | | |
| **Marine pollution** | | | | |
| solid waste | ☐ | | | |
| industrial waste | ☐ | | | |

| | | | | |
|---|---|---|---|---|
| runoff water | ☐ | | | |
| agricultural waste | ☐ | | | |
| noise pollution affecting marine species | ☐ | | | |
| oil or diesel degassing/oil spill | ☐ | | | |
| **Marine Habitat destruction** | | | | |
| trawling | ☐ | | | |
| trampling | ☐ | | | |
| anchoring | ☐ | | | |
| material extraction at sea | ☐ | | | |
| urbanization/artificial construction | ☐ | | | |
| coastal erosion/deposition | ☐ | | | |
| **Climate change** | | | | |
| plant/animal composition changes | | | | |

Have you recorded changes due to climate change in your MPA over the last 10 years? ☐

If yes, describe:

Literature concerning threats :

## 5. HABITATS & SPECIES

### 5. 1 Habitat types

**5. 1. 2** What are the major habitat types within your MPA? (*explanation of the terms used is reported in the Terminology section at the end of the questionnaire*)

**Marine Components**:
Select if present /absent:

| Marine Components | **Presence/Absence** | Surface (km2) |
|---|---|---|
| Subtidal | | |
| Intertidal | | |
| Marine | | |

**Substratum**:
Select if present /absent:

| **Substratum** | **Subtidal** | **Intertidal** | **Marine** |
|---|---|---|---|
| Mud | | | |
| Sand | | | |
| Gravel | | | |
| Rock | | | |

**Features**:
Select if present /absent and if the surface is in decrement, increment, no change, don't know:

| Feature | Presence/ Absence | Dominant | Surface increment/ decrement |
|---|---|---|---|
| Beach | | ☐ | |
| Mud Flat | | ☐ | |
| Salt Marsh | | ☐ | |
| Lagoon | | ☐ | |
| Estuary | | ☐ | |
| Canyon | | ☐ | |
| Caves | | ☐ | |
| Cold Seep | | ☐ | |
| Sea Mount | | ☐ | |
| Hydrothermal Vent | | ☐ | |
| Fish spawning aggregations | | ☐ | |
| Feeding grounds | | ☐ | |
| Coral Reef (Cold) | | ☐ | |
| Kelp Forest | | ☐ | |
| Seagrass | | ☐ | |
| Coralligenous | | ☐ | |
| Banks of dead seagrass | | ☐ | |
| Intertidal biogenic constructions | | ☐ | |

Literature concerning Habitats:

**5. 2 Specially protected species**

**5. 2. 1** What are the species listed in the Annex II of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean found in your MPA? Did you record an increase / decrease of the distribution of the species over the last 5 years in the core area of your MPA? (*Table with the species of the Annex II*)

**5. 2. 2** What are the species listed in the Annex III of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean found in your MPA? Did you record an increase / decrease of the distribution of the species over the last 5 years in the core area of your MPA? (*Table with the species of the Annex III*)

**5. 2. 3** What are the other significant species found in your MPA?

| *Tick where relevant* | P/A |
|---|---|
| MAGNOLIOPHYTA | |
| *Cymodocea nodosa* | |
| *Zostera* sp. | |
| CHLOROPHYTA | |
| *Acetabularia acetabulum* | |
| *Anadyomene* sp. | |
| *Caulerpa racemosa* var. *lamourouxii* | |
| *Halimeda* sp. | |
| *Halimeda tuna* | |
| *Penicillus capitatus* | |
| **PHAEOPHYTA** | |
| *Cystoseira* sp. | |
| *Dictyota* sp. | |
| *Fucus virsoides* | |
| *Padina pavonica* | |
| *Padina* sp. | |
| *Sargassum* sp. | |
| RHODOPHYTA | |
| *Hypnea cervicornis* | |
| *Lithophyllum byssoides (Nullipora byssoides)* | |
| *Peyssonnelia squamaria* | |
| PORIFERA | |
| *Crambe crambe* | |
| *Aplysina aerophoba* | |
| *Aplysina cavernicola* | |
| *Axinella* sp. | |
| *Euspongia officinalis* | |
| *Ircinia fasciculata* | |
| *Ircinia* sp. | |
| *Ircinia variabilis* | |
| *Oscarella lobularis* | |
| *Sycon ciliatum* | |
| CNIDARIA | |
| *Actinia equina* | |
| *Alcyonium acaule* | |
| *Alcyonium brionense* | |
| *Alicia mirabilis* | |

| *Anemonia sulcata* | |
|---|---|
| *Anemonia viridis* | |
| *Aurelia aurita* | |
| *Cerianthus membranacea* | |
| *Cervera atlantica* | |
| *Cladocora caespitosa* | |
| *Cribrinopsis crassa* | |
| *Ellisella paraplexauroides* | |
| *Eunicella cavolini* | |
| *Eunicella singularis* | |
| *Eunicella* sp | |
| *Eunicella verrucosa* | |
| *Merona ibera* | |
| *Paramuricea clavata* | |
| *Parazoanthus axinellae* | |
| *Scleranthelia microsclera* | |
| *Tima* sp | |
| ECHINODERMATA | |
| *Antedon mediterranea* | |
| *Arbaciella elegans* | |
| *Asterina gibbosa* | |
| *Brissus unicolor* | |
| *Coscinasterias tenuispina* | |
| *Echinaster sepositus* | |
| *Echinus melo* | |
| *Holothuria* sp. | |
| *Marthasterias glacialis* | |
| *Ophioderma longicauda* | |
| *Psammechinus microtuberculatus* | |
| *Sphaerechinus granularis* | |
| BRYOZOA | |
| *Myriapora truncata* | |
| *Pentapora sp* | |
| *Sertella beaniana* | |
| *Sertella sp.* | |
| *Turbicellepora avicularis* | |
| ANNELIDA | |
| *Hermodice carunculata* | |
| *Protula tubularia* | |

| | |
|---|---|
| *Sabella spallanzani* | |
| *Serpula vermicularis* | |
| *Spirographis spallanzani* | |
| MOLLUSCA | |
| *Aporrhais pespelecani* | |
| *Arca noae* | |
| *Astraea rugosa* | |
| *Bolinus brandaris* | |
| *Bolma rugosa* | |
| *Cerithium scabridum* | |
| *Cerithium vulgatum* | |
| *Clanculus corallinus* | |
| *Discodoris atromaculata* | |
| *Flabellina affinis* | |
| *Haliotis lamellosa* | |
| *Melarhaphe neritoides* | |
| *Osilinus turbinatus* | |
| *Murex trunculus* | |
| *Mytilus galloprovincialis* | |
| *Octopus vulgaris* | |
| *Ostrea edulis* | |
| *Patella caerulea* | |
| *Patella rustica* | |
| *Pinctada radiata* | |
| *Sepia officinalis* | |
| *Strombus decorus* | |
| TUNICATA | |
| *Halocynthia papillosa* | |
| CRUSTACEA | |
| *Balanus perforatus* | |
| *Dardanus arrosor* | |
| *Eriphia verrucosa* | |
| *Gnathophyllum elegans* | |
| *Maia verrucosa* | |
| *Pachygrapsus marmoratus* | |
| *Parapandalus narval* | |
| *Stenopus spinosus* | |
| PISCES | |
| *Apogon imberbis* | |
| *Auxis rochei* | |
| *Balistes carolinensis* | |

| | |
|---|---|
| *Boops boops* | |
| *Chromis chromis* | |
| *Conger conger* | |
| *Coris julis* | |
| *Crenilabrus sp.* | |
| *Dasyatis* sp | |
| *Dentex dentex* | |
| *Dicentrarchus labrax* | |
| *Diplodus annularis* | |
| *Diplodus cervinus* | |
| *Diplodus sargus* | |
| *Diplodus* sp. | |
| *Diplodus vulgaris* | |
| *Epinephelus aeneus* | |
| *Epinephelus costae* | |
| *Gobius cruentatus* | |
| *Hippocampus guttulatus* | |
| *Leucoraja melitensis* | |
| *Lipophrys adriaticus* | |
| *Salaria pavo* | |
| *Lithognathus mormyrus* | |
| *Lophius piscatorius* | |
| *Mola mola* | |
| *Mullus surmuletus* | |
| *Muraena helena* | |
| *Mycteroperca rubra* | |
| *Myliobatis aquila* | |
| *Oblada melanura* | |
| *Grammonus ater* | |
| *Pagellus acarne* | |
| *Pempheris vanicolensis* | |
| *Phycis phycis* | |
| *Platichthys flesus italicus* | |
| *Polyprion americanus* | |
| *Polyprion sp* | |
| *Diplodus puntazzo* | |
| *Raja clavata* | |
| *Sarda sarda* | |
| *Sarpa salpa* | |
| *Scorpaena scrofa* | |
| *Scorpaena sp* | |

| | |
|---|---|
| *Seriola dumerili* | |
| *Serranus cabrilla* | |
| *Serranus scriba* | |
| *Sparisoma cretense* | |
| *Sparus aurata* | |
| *Spicara maena* | |
| *Symphodus tinca* | |
| *Thalassoma pavo* | |
| *Trachinus* sp. | |
| *Uranoscopus scaber* | |

| | |
|---|---|
| *Xyrichthys novacula* | |
| AVES | |
| *Falco peregrinus* | |
| *Larus michahellis* | |
| *Neophron percnopterus* | |
| *Puffinus mauretanicus* | |
| MAMMALIA | |
| *Physeter catodon* | |
| OTHERS: SPECIFY: | |

**5. 3 Introduced species**

**5. 3. 1** What are the marine introduced species present within your MPA?

| *Tick where relevant* | P/A | Did you record an increase / decrease of the distribution of the species over the last 5 years in the core area of your MPA? |
|---|---|---|
| MAGNOLIOPHYTA | | |
| *Halophila stipulacea* | | |
| CHLOROPHYTA | | |
| *Caulerpa taxifolia* | | |
| *Caulerpa racemosa* | | |
| *Codium fragile* | | |
| *Ulva scandinavica* | | |
| PHAEOPHYTA | | |
| *Feldmannia irregularis* | | |
| RHODOPHYTA | | |
| *Lophocladia lallemandii* | | |
| *Acrothamnion preissii* | | |
| *Womersleyella setacea* | | |
| *Asparagopsis armata* | | |
| *Asparagopsis taxiformis* | | |
| *Bonnemaisonia hamifera* | | |
| CNIDARIA | | |
| *Oculina patagonica* | | |
| MOLUSCA | | |
| *Bursatella leachi* | | |
| *Crassostrea gigas* | | |
| *Tapes philippinarum* | | |

| | | |
|---|---|---|
| *Anadara inaequivalvis* | | |
| *Mercierella enigmatica* | | |
| *Rapana venosa* | | |
| CRUSTACEA | | |
| *Percnon gibbesi* | | |
| TUNICATA | | |
| *Microcosmus squamiger* | | |
| *Muggiaea atlantica* | | |
| PISCES | | |
| *Gambusia affinis* | | |
| *Pagellus bellottii* | | |
| *Siganus luridus* | | |
| *Siganus rivulatus* | | |
| *Stephanolepis diaspros* | | |
| *Sargocentrum rubrum* | | |
| OTHERS: SPECIFY: | | |

Literature concerning Species:

## 6. MANAGEMENT

### 6. 1 Management Plan

**6. 1. 1** Do you have a management plan or an equivalent document?

☐ Yes ☐ No ☐ Under development

**6. 1. 2** Is your management plan confidential / public?

☐ Confidential ☐ Public

**6. 1. 3** If public, do you agree to make it available to other MPA managers on the MedPAN Extra-net?

☐ Yes ☐ No

**6. 1. 4** Do you implement your management plan?

☐ Yes ☐ No

If no, explain why:

If yes:

- Beginning of implementation
- Duration

**6. 2 Research, monitoring and evaluation**

**6. 2. 1** Do you have a regular monitoring programme that supports your MPA management objectives?

☐ Yes ☐ No

**6. 2. 2** Did you carry out a study to assess the effectiveness of the management of your MPA?

☐ Yes ☐ No

**6. 2. 3** What are the main results / successes of the management of your MPA?

Describe:

**6. 3 Relations with local populations**

**6. 3. 1** Has a socio-economic analysis been carried out in/around the MPA?

☐ Yes ☐ No

**6. 3. 2** According to your perception, do local populations support the MPA?

☐ Yes ☐ Mostly yes ☐ Mostly no ☐ No

**6. 4 Enforcement and surveillance**

**6. 4. 1** Main illegal activities in your MPA: Select if the level is: important, moderate, few.

| **Illegal activity** | **Level** |
|---|---|
| Trawling | |
| Dynamite / Poisoning | |
| Spearfishing | |
| Recreational fisheries | |
| Other illegal fishing activities | |
| Illegal scubadiving activities | |
| Other illegal recreational activities | |
| Illegal constructions | |
| Collecting/destroying turtle eggs/nests | |
| Boat speed | |
| Boat engine use | |
| Other : describe… | |

**6. 4. 2** Number of surveillance boats either belonging to the management body or from outside:

**6. 4. 3** Number of staff dedicated to MPA surveillance whether internally to the management body or external:

**6. 4. 4** Are offenders effectively prosecuted?

☐ Yes ☐ Mostly yes ☐ Mostly no ☐ No

**6. 5 Staff**

**6. 5. 1** Number of permanent staff working on the MPA / year:

**6. 5. 2** Number of seasonal staff working on the MPA / year:

**6. 5. 3** Do you consider that the MPA staff is sufficiently trained?

☐ Yes ☐ Mostly yes ☐ Mostly no ☐ No

**6. 6 Equipment & Premises**

**6. 6. 1** Does the management body have offices?

☐ Yes ☐ No

**6. 6. 2** Are signs delimiting the limits of your MPA available at sea ?

☐ Yes ☐ No

**6. 6. 3** Total number of boats available including surveillance boats:

**6. 6. 4** Do you have (access to) diving equipment?

☐ Yes ☐ No

**6. 6. 5** Do you have a GIS available for your MPA?

☐ Yes ☐ No

**6. 6. 6** Do you have a visitor centre?

☐ Yes ☐ No

**6. 6. 7** All together, do you think you are well equipped and why?

☐ Yes ☐ Mostly yes ☐ Mostly no ☐ No

Explain why:

**6. 7 Funding** *(Answers to the following questions will remain confidential)*

**6. 7. 1** Average yearly budget of your MPA over the last 3-5 years?

- Local currency:
- Euros:

**6. 7. 2** Do you have a business plan to support your management plan?

☐ Yes ☐ No

**6. 7. 3** Has funding in the past 5 years been adequate to conduct critical management activities?

☐ Yes ☐ Mostly yes ☐ Mostly no ☐ No

If no, explain why:

**6. 7. 4** Is funding for the next 5 years  adequate to conduct critical management activities?

☐ Yes ☐ Mostly yes ☐ Mostly no ☐ No

If no, explain why:

Literature concerning management:

**6. 8 Other management initiatives:**

Describe:

# Annex 7

# Terminology used in the questionnaire

BANKS OF DEAD SEAGRASS Thick layer of dead leaf of sea grass material (usually leafs of the most commune species: *Posidonia oceanica*) deposed by waves along beaches. It is called also 'banquette' (Guala et al. 2006).

BEACHES The terrestrial interface area between land and a water body where there are accumulations of unconsolidated sediments like sand and gravel. These deposits are laid down by the action of breaking waves (Wood 2007).

BUFFER AREA Term used in this survey to refer to the area of the MPA near the boundary of the core area where some low impact activities are regulated; a transition zone between areas managed for different objectives.

CANYONS The edge of the continental margin is incised by submarine canyons that extend from the shelf to the deep sea floor. These erosional features were apparently formed by scouring out a portion of the shelf (Wood 2007).

CAVES Underwater marine cave inhabited by organisms adapted to shallow environment.

COLD SEEPS A cold seep (sometimes called a cold vent) is an area of the ocean floor where hydrogen sulphide, methane and other hydrocarbon-rich fluid seepage occurs. Similar to hydrothermal vent except that seepages are at the same temperature as the surrounding water (Wood 2007).

CORAL REEFS (Cold) Reefs are defined as any biologically created hard structures that rise from the sea floor. Cold-water coral reefs grow in deep cold water (4-12 °C, 50 to 2000m depth). Most commonly occurring species is *Lophelia pertusa* (Wood 2007).

CORALLIGENOUS ASSEMBLAGES Habitat present in the Mediterranean on hard rocky and/or biogenic horizontal substrata formed up to 100m in depth, in clear waters with moderate hydrodynamic action. Coralligenous concretions are found on rock faces or on rocks where calcareous organisms can build biogenic constructions (Ballesteros 2006).

CORE AREA (or no-take area ) Term used in this survey to refer to the area of the MPA in which all extractive or recreational activities are prohibited; total protection.

ESTUARIES Partially enclosed body of water where saltwater from the sea mixes with freshwater from rivers, streams and creeks. These areas of transition between the land and the sea are tidally driven, but sheltered from the full force of the ocean winds and waves by the coastline, marshes, and wetlands (Wood 2007).

FEEDING GROUNDS Term used in this survey to refer to areas where food is abundant and available and thus an area that attracts different taxa of animals (Froese and Pauly 2008).

FISH SPAWNING AGGREGATIONS Term used in this survey to refer to areas where many species of fish gather at specific times or seasons to spawn (Froese and Pauly 2008).

FREQUENCY Term used in this survey to refer to evaluate impacts on MPAs. The number of events and occurrences of the impact affecting the MPA.

HYDROTHERMAL VENTS Cracks of the ocean floor that emits jets of superheated water loaded with minerals and bacteria. The vents range in diameter from less than an inch to more than 6 feet. They are usually found at least a mile deep along the mid-ocean ridges (Wood 2007).

INTENSITY Term used in this survey to refer to evaluate impacts on MPAs. Spatial extent and / or strength of the impact affecting the MPA.

INTERTIDAL BIOGENIC CONSTRUCTIONS Intertidal reefs biologically created. In the Mediterranean biogenic constructions are mainly built by Vermetid gastropods (mainly *Dendropoma petraeum*) or by the coralline algae *Lithophyllum lichenoides*, the latter also called “trottoir” (Moliner and Picard 1953).

INTERTIDAL Term used in this survey to refer to the level of the sea comprising between the zone splashed and sprayed by the waves and the zone affected by waves, submitted to sea level variations caused by wind, atmospheric pressure and tides (Supralittoral + Mediolittoral)

INTRODUCED SPECIES A species whose range of distribution doesn’t include the site where the occurrence was recorded (Occhipinti-Ambrogi and Galil 2004).

INVASIVE SPECIES An introduced species whose growth of the population is very fast (Occhipinti-Ambrogi and Galil 2004).

KELP FORESTS Marine ecosystem dominated by large kelps (brown algae; Phylum Phaeophyta). These forests are restricted to cold and temperate waters (Guiry and Guiry 2008).

LAGOONS Broad, shallow estuarine system separated from the ocean by a barrier island, generally paralleling the shore line and limiting exchange with the sea through inlets (Wood 2007).

MARINE Term used in this survey to refer to the area that not include any coastal portion (no terrestrial)

MUD FLATS A flat area along the coast, covered with a thick layer of mud or sand (Wood 2007).

PERIPHERAL AREA (or multi-use area) Term used in this survey to refer to the area of the MPA where certain limitations are imposed on users.

PROBABILITY Term used in this survey to refer to evaluate impacts on MPAs. The likelihood that the impact can occur in the MPA.

SALT MARSHES It is a sand substrata of lagoons influenced by tides and waves. Usually it is covered by vegetation resistant to high salinity (Ramsar 2006).

SEA MOUNTS Large and isolated elevation rising above the sea floor (Wood 2007).

SEAGRASS BEDS Benthic community dominated by grass-like marine plants (Wood 2007).

SUBTIDAL Term used in this survey to refer to the level of the sea which is the immersed zone compatible with the life of the marine vegetation (Infralittoral)

**IUCN management categories**

CATEGORY I Protected area managed mainly for science or wilderness protection (I-a Strict Nature Reserves, and I-b Wilderness Areas).

CATEGORY II Protected area managed mainly for ecosystem protection and recreation (National Park).

CATEGORY III Protected area managed mainly for conservation of specific natural features (Natural Monument).

CATEGORY IV Protected area managed mainly for conservation through management intervention.

CATEGORY V Protected area managed mainly for landscape/seascape conservation and recreation (Protected Landscape/Seascape).

CATEGORY VI Protected area managed mainly for the sustainable use of natural ecosystems (Managed Resource Protected Area)

*For a fuller explanation, see Guidelines for Protected Area Management Categories, IUCN (1994).*

# Annex 8

# Analysis of data

In this annex we provide the full description of the methods utilised to analyse the responds of the questionnaire. The description includes the explanation on the criteria were adopted to group MPAs, how data was treated and the statistical analyses applied.

*Criteria to group MPAs*

Data collected from each MPA were grouped according to different factors. From a biogeographical point of view, we used the ecoregion classification recently proposed by Spalding et al. (2007). In order to reduce the variability in the underrepresented ecoregions we pooled Levantine (n. of MPA = 2), Aegean (n. of MPA = 3) and Ionian Sea (n. of MPA = 6) into the Eastern Mediterranean. To date, no MPAs have been designated in the Tunisian Plateau / Gulf of Sidra ecoregion. MPAs were also classified according to EU membership (EU/non-EU countries) and to geo-political regions (Northwest, NW: France, Italy, Malta, Monaco, Spain; Northeast, NE: Croatia, Greece, Slovenia, Turkey; South, S: Algeria, Israel, Lebanon, Morocco, Tunisia[97]).

*Spacing among MPAs*

Connectivity among sites allows for optimal maintenance of species population and biodiversity elements and is one of the principle criteria for designing coherent networks of MPAs (see Annex 2). In this study, spacing among MPAs was used to evaluate the potential ecological connectivity between sites in a network. To evaluate the spacing among MPAs, we measured the shortest sea distance (in km) from the boundary of any MPA to its nearest neighbouring MPA (these measurements took into account the shape of the coastline). The categories used for MPA isolation were $\leq$ 20 km; 20-150 km, and >100 km apart; following Mora et al. (2006) and Wood et al. (2008). Ecological dispersal distance in benthic marine animals is very diverse. It ranges from <1 km for some sessile invertebrates (corals, tunicates, bryozoans), 20 km (molluscs, crustaceans and fish larvae; Shanks et al. 2003) and up to 100 km (Palumbi 2003 and Cowen et al. 2006). It is important to note that ecological (direct) dispersal distances are shorter than evolutionary (genetic) dispersal distances (Kinlan and Gaines 2003). Moreover, connectivity is sensitive to oceanic conditions, larval behaviour patterns, and the physical features of different locations that influence the dispersion potential of the different species (Palumbi 2003). Therefore, utilising a precautionary approach, ecological connectivity of a network of MPAs may theoretically be maintained provided MPA sites are $\leq$ 20 km apart (the first three categories for MPA isolation; Shanks et al. 2003, Halpern and Warner 2003) and oceanographic characteristics are taken into account. However, other authors suggested that areas spaced around 20-150 km apart may maintain enough connection to ensure genetic exchange (Palumbi 2003 and Cowen et al. 2006).

97 Only the countries included in the analysis were listed.

*Information availability and status of habitats and species*

Normality of data distribution was tested with Kolmogorov-Smirnov test, whereas the homogeneity of variance was examined using Levene's test. When normality and/or homogeneity were not met for the dataset, non-parametric tests were applied. In particular, "number of species" was tested for correlation with "marine surface area" and "age of institution" by using the non-parametric Spearman correlation. All categorical data were analysed with the $Chi^2$ test. To test for differences in the mean number of species (species from the Annexes II and III and Other Important species) reported by different groups of MPAs, we applied a two-way Analysis of Variance (ANOVA) by using EU/non-EU countries and Ecoregions as fixed factors. Multivariate statistics were used to explore patterns in the presence or absence of species reported by each MPA. In order to have a homogeneous dataset, only the species listed in Annex II and III were included as they have been recorded in all MPAs under study. The Bray-Curtis coefficient was used to calculate a matrix of similarities between each pair of MPAs. One property of this coefficient is that frequent joint absence (many zeros) has no effect on the resulting value and thus it is widely used for ecological data (Clarke and Warwick 2001). Non-metric multidimensional scaling (nMDS) was then used to determine the rank order of these similarities. Using a two-way Analysis of Similarities (ANOSIM), we tested the null hypothesis of no multivariate differences among MPAs of different "number of species" (3 levels) and "EU/non-EU countries" (2 levels). Then a pairwise comparison was conducted to test for differences among "number of species" groups[98] (for a full explanation of the methodology, see Clarke and Warwick 2001).

*Overall management effectiveness evaluation*

Reponses to the management section of the questionnaire were analysed to understand the differences in management effectiveness among MPAs of different geographical areas of the Mediterranean Sea and to identify which variables can be used as indicators of potential management effectiveness. In particular, we included in the analysis data on: presence of management plan, management plan implementation, biodiversity monitoring, management monitoring, socio-economic studies, the support of the local community to the MPA, business plan, sufficient past funds, sufficient future funds, yearly budget, offices, visitor centre, marine signs delimitation, total number of boats, diving equipment, GIS availability, equipment perception, surveillance boats, surveillance staff, offenders prosecution, permanent staff, seasonal staff, and staff adequacy. Moreover, marine surface area, number of species (Annexes II and III and Other relevant species), year of establishment, international recognitions were incorporated as additional indicators of effectiveness. To standardise the different types of response to the questionnaire, all data were transformed into classes of response. In the analysis, each variable thus had a different weight for each MPA and ranged from minor to major weight. In case of continuous variables (i.e. number of permanent staff), a number of weighted classes were created (i.e. As the number of permanent staff ranged from 0 to 40 people, four classes were identified: 1 = 0 person, 2 = 1-3, 3 = 4-10, 4 = >10 people) and then the number representing the score of each class was divided by the number of possible classes (i.e. weighted classes for permanent staff 1/4 = 0.25, 2/4 = 0.5, 3/4 = 0.75, 4/4 = 1). Qualitative

98 The Bonferroni correction was utilised to adjust the critical significance level (alpha). The corrected alpha utilised was thus 0.05 / the number of tests (e.g. alpha = 0.05/3 = 0.016)

variables (e.g. no-answers, no, yes) were transformed into weighted classes as well (i.e. 0, 1, 2). Management indicators were then analysed using Principal Component Analysis (PCA) with Varimax rotation (Legendre 1998). Data were analysed using Bartlett's Test and Kaiser-Meyer-Olkin (KMO) was used to check the assumptions required to perform the PCA.

*Evaluation of the local, regional, and global threats*

The mean number of introduced species reported by each MPA was compared among groups of MPAs in the different ecoregions using the Wilcoxon Kruskal-Wallis test. Regarding the risk affecting MPAs, the perception of managers about the potential threat affecting the MPA was calculated following the matrix of risk developed by Stoklosa (2000) for Environmental Risk Assessments. Risk is characterized by at least the probability of an event and its associated magnitude or severity (Stoklosa 2000). The risk assessment is thus the process of estimating the probability and consequence of events. The Matrix of Risk integrates the value of Intensity and Probability in one index ranging from 1- 4 level of risk: Negligible, Moderate, Significant and Intolerable.

For each threat of each MPA, the values of Intensity and Probability in the questionnaire (Annex 6 and 7) were integrated into a single level of risk using the Matrix of Risk. Consequently, we can obtain an evaluation of the level of risk associated with each threat. For example, if MPA X reported two threats: "anchoring" with a level of intensity "moderate" and probability "very high", and "solid waste" with a level of intensity "low" and probability "moderate", the level of risk will be "intolerable" for anchoring (e.g. level = 4) and "moderate" for solid waste (e.g. level = 2). To assess the overall level of risk occurring in each MPA, all levels of risk of all threats reported were added together to obtain a single value of risk. In the case of MPA X this single value would be 6 (4+2). All values of all MPAs were categorised in four groups determined by the quartiles of the frequency distribution[99]. The four categories of risk were labelled again as: "negligible", "moderate", "significant and "intolerable". Differences in the mean level of risk were analysed with a two-way ANOVA with "Ecoregions" and "EU/non-EU" countries as fixed factors.

In the Result chapter, variability around average numbers is expressed in ± standard error (SE).

| **Matrix of Risk** | | Probability | | | | |
|---|---|---|---|---|---|---|
| | | not present | low | moderate | high | very high |
| Intensity | very high | 3 | 3 | 4 | 4 | 4 |
| | high | 2 | 3 | 3 | 4 | 4 |
| | moderate | 1 | 2 | 3 | 4 | 4 |
| | low | 1 | 1 | 2 | 3 | 4 |
| | not present | 1 | 1 | 2 | 3 | 3 |

*Matrix defining the four possible levels of risk: 1 = Negligible, 2 = Moderate, 3 = Significant, and 4 = Intolerable*

99 Each quartile divides the distribution (the total of the frequencies) into quarters (25%, 50%, 75%, and 100%). The first quartile includes thus one quarter of the distribution and third quartile includes three quarters of the distribution.

# Annex 9

# List of MPAs considered in the survey

| Country | Site name | Total surface (km²) | Marine surface (km²) | Terrestrial surface (km²) | Surface of the no-take zone (km²) | Date of creation | Questionnaire filled |
|---|---|---|---|---|---|---|---|
| **Albania** | | | | | | | |
| | Fisheries reserve in front of Karaburuni | ND | ND | ND | ND | 2005 | No Cont |
| **Algeria** | | | | | | | |
| | Habibas | 27.4 | 27 | 0.4 | 0 | 2003 | YES |
| **Croatia** | | | | | | | |
| | Brijuni | 33.51 | 26.51 | 7 | ND | 1983 | NO |
| | Kornati | 216 | 166 | 50 | 11 | 1980 | YES |
| | Lastovo | 195.83 | 143.12 | 52.71 | 0 | 2006 | YES |
| | Limski Zaljev | 6 | 6 | 0 | ND | 1979 | YES |
| | Losinj | 525.76 | 523.35 | 2.41 | ND | 2006 | YES |
| | Malostonski Zaljev | 48.21 | 48.21 | 0 | ND | 1983 | YES |
| | Mljet | 53.8 | 23.8 | 30 | ND | 1960 | YES |
| | Telascica | 70.5 | 44.55 | 25.95 | ND | 1988 | YES |
| **Cyprus** | | | | | | | |
| | Lara Toxeftra | 6.5 | 5.5 | 1 | ND | 1989 | NO |
| **France** | | | | | | | |
| | Bouches de Bonifacio | 794.6 | 792 | 2.6 | 12 | 1999 | YES |
| | Cerbère-Banyuls | 6.5 | 6.5 | 0 | 0.65 | 1974 | YES |
| | Côte Bleue | 98.73 | 98.73 | 0 | 2.95 | 1983 | YES |
| | Formation récifale de Saint Florent | 0.23 | 0.23 | 0 | 0 | 1998 | No Cont |
| | Grotte marine de Temuli/Sagone (Cog-gia) | 0.003 | 0.003 | 0 | 0 | 2000 | No Cont |
| | Port-Cros | 19.88 | 12.88 | 7 | 0.62 | 1963 | YES |
| | Scandola | 15.57 | 6.57 | 9 | 0.671 | 1975 | YES |
| **Greece** | | | | | | | |
| | Alonissos-Vories Sporades | 2,087.3 | 2,035 | 52.3 | 0 | 1992 | YES |

| Country | Site name | Total surface (km²) | Marine surface (km²) | Terrestrial surface (km²) | Surface of the no-take zone (km²) | Date of creation | Questionnaire filled |
|---|---|---|---|---|---|---|---|
| | Messolonghi - Aetoliko lagoons, estuaries of Acheloos and Evinos and Echinades islands | 441.84 | 212.35 | 229.49 | ND | 2006 | No Cont |
| | Schinia- Marathona | ND | ND | ND | ND | 2000 | No Cont |
| | Zakynthos | 103.4 | 89.2 | 14.2 | 0.26 | 1999 | YES |
| **Israel** | | | | | | | |
| | Rosh Hanikra | 9.6 | 9.6 | 0 | 0 | 1965 | YES |
| | Shiqma | 1.03 | 1.03 | 0 | ND | ND | No Cont |
| | Yam Dor Habonim | 5.74 | 5.32 | 0.42 | ND | 2002 | No Cont |
| | Yam Evtah | 1.37 | 1.37 | 0 | ND | ND | No Cont |
| | Yam Gador | 1.38 | 0.65 | 0.73 | ND | ND | No Cont |
| **Italy** | | | | | | | |
| | Archipelago di La Maddalena | 202 | 150.46 | 51.34 | ND | 1994 | NO |
| | Archipelago Toscano | 792 | 615 | 177 | 76 | 1989 | YES |
| | Asinara | 159.32 | 107.32 | 52 | 5.77 | 1997 | YES |
| | Baia | 27.26 | 27.26 | 0 | 0.79 | 2002 | NO |
| | Capo Caccia - Isola Piana | 26.31 | 26.31 | 0 | 0.38 | 2002 | YES |
| | Capo Carbonara | 85.98 | 85.98 | 0 | 3.32 | 1998 | YES |
| | Capo Gallo | 21.73 | 21.73 | 0 | 0.77 | 2002 | NO |
| | Capo Rizzuto | 147.21 | 147.21 | 0 | 5.85 | 1991 | YES |
| | Cinque Terre | 88.17 | 45.91 | 42.26 | 0.79 | 1997 | YES |
| | Gaiola | 0.42 | 0.42 | 0 | 0.06 | 2002 | NO |
| | Isole Ciclopi | 6.23 | 5.9 | 0.33 | 0.192 | 1990 | YES |
| | Isole di Ventotene e santo Stefano | 29.73 | 27.99 | 1.74 | 4.1 | 1997 | YES |
| | Isole Egadi | 539.92 | 539.92 | 0 | 10.67 | 1991 | NO |
| | Isole Pelagie | 58.3 | 32.3 | 26 | 0.8 | 2002 | YES |

| Country | Site name | Total surface (km²) | Marine surface (km²) | Terrestrial surface (km²) | Surface of the no-take zone (km²) | Date of creation | Questionnaire filled |
|---|---|---|---|---|---|---|---|
| | Isole Tavolara - Punta Coda Cavallo | 153.57 | 153.57 | 0 | 5.29 | 1997 | YES |
| | Isole Tremiti | 14.66 | 14.66 | 0 | 1.8 | 1989 | YES |
| | Miramare | 1.2 | 1.2 | 0 | 0.3 | 1986 | YES |
| | Penisola del Sinis | 329 | 329 | 0 | 5.29 | 1997 | NO |
| | Plemmirio | 25 | 25 | 0 | 0.8 | 2004 | YES |
| | Porto Cesareo | 166.54 | 166.54 | 0 | 1.73 | 1997 | YES |
| | Portofino | 3.46 | 3.46 | 0 | 0.19 | 1998 | YES |
| | Punta Campanella | 15.39 | 15.39 | 0 | 1.81 | 1997 | YES |
| | Secche di Tor Paterno | 13.87 | 13.87 | 0 | 0 | 2000 | NO |
| | Torre Guaceto | 33.27 | 22.27 | 11 | 2 | 1991 | YES |
| | Ustica | 159.51 | 159.51 | 0 | 0.6 | 1986 | NO |
| **Lebanon** | | | | | | | |
| | Palm Island | 4.245 | 3.983 | 0.262 | 0.5 | 1992 | YES |
| **Malte** | | | | | | | |
| | Zona fil-bahar bejn Rdum Majjiesa u Ras ir-Raheb (Marine Area between Rdum Majjiesa and Ras ir-Raheb) | 8.49 | 8.49 | 0 | ND | 2007 | YES |
| | Zona fil-bahar fl-inhawi tad-Dwejra, Ghawdex (Marine area in the limits of Dwejra, Gozo) | 2.57 | 2.57 | 0 | 0 | 2007 | YES |
| **Monaco** | | | | | | | |
| | Corail Rouge | 0.019 | 0.019 | 0 | 0.019 | 1986 | YES |
| | Larvotto | 0.5 | 0.5 | 0 | 0 | 1978 | YES |
| **Morocco** | | | | | | | |
| | Al Hoceima | 486 | 196 | 290 | 94 | 2004 | YES |
| **Slovenia** | | | | | | | |

| Country | Site name | Total surface (km²) | Marine surface (km²) | Terrestrial surface (km²) | Surface of the no-take zone (km²) | Date of creation | Questionnaire filled |
|---|---|---|---|---|---|---|---|
| | Cape Madona | 0.13 | 0.13 | 0 | 0 | 1990 | YES |
| | Debeli rtiç | 0.24 | 0.22 | 0.02 | 0 | 1991 | YES |
| | Strunjan | 1.33 | 0.9 | 0.43 | 0.2 | 1990 | YES |
| **Spain** | | | | | | | |
| | Acantilados Maro Cerro Gordo | 18.15 | 14.15 | 4 | ND | 1989 | YES |
| | Cabo de Gata Nijar | 496.3 | 121.17 | 375.13 | 14.35 | 1987 | YES |
| | Cabo de Palos Islas Hormigas | ND | 18.98 | ND | 2.69 | 1995 | YES |
| | Cabo de San Antonio | ND | 9.67 | ND | ND | 1993 | NO |
| | Cabrera Archipelagos | 100 | 86.8 | 13.2 | 7.2 | 1991 | YES |
| | Cap de Creus | 138.23 | 30.56 | 107.67 | 0.21 | 1998 | YES |
| | El Estrecho | ND | 92.47 | ND | ND | 2003 | YES |
| | Fondos marinos del Levante Almeriense | 63.16 | 63.136 | 0.024 | 0 | 1999 | YES |
| | Isla de Alborán | 264.63 | 264.56 | 0.07 | ND | 2003 | YES |
| | Islas Chafarinas | 5.11 | 4.59 | 0.52 | 0 | 1982 | YES |
| | Islas Columbretes | 44 | 43.81 | 0.19 | 17 | 1990 | NO |
| | Islas Medas | ND | 5 | ND | 0 | 1990 | YES |
| | Masia Blanca | 2.8 | 2.8 | 0 | 0.41 | 1999 | NO |
| | Tabarca | 14.63 | 14.63 | 0 | ND | 1986 | NO |
| **Syria** | | | | | | | |
| | Fanar Ibn Hani | ND | 10 | ND | ND | 2000 | NO |
| | Om Al Toyour | ND | 10 | ND | ND | 1999 | NO |
| | Ras El Bassit | ND | 30 | ND | ND | 1999 | NO |
| **Tunisia** | | | | | | | |
| | Archipel de la Galite | 19 | 4.5 | 14.5 | ND | 1994 | NO |

| Country | Site name | Total surface (km²) | Marine surface (km²) | Terrestrial surface (km²) | Surface of the no-take zone (km²) | Date of creation | Questionnaire filled |
|---|---|---|---|---|---|---|---|
| | Zembra & Zembretta | 50.9 | 47 | 3.9 | 4 | 1973 | YES |
| **Turkey** | | | | | | | |
| | Datça-Bozburun | 1474 | 763 | 711 | 0 | 1990 | YES |
| | Dilek Yarimadisi | 275 | 120 | 155 | 0 | 1966 | NO |
| | Fethiye-Göcek | 805 | 326 | 479 | 0 | 1988 | YES |
| | Foça | 228 | 73 | 155 | ND | 1990 | YES |
| | Gallipoli | 330 | ND | ND | 0 | 1980 | NO |
| | Gökçeada | 0.37 | 0.37 | 0 | ND | 1999 | NO |
| | Gökova | 576.9 | 306 | 270.9 | 0 | 1988 | YES |
| | Göksu Deltasi | 228 | 50 | 178 | 0 | 1990 | YES |
| | Kas-Kekova | 300 | 115 | 185 | 0 | 1990 | YES |
| | Köycegiz-Dalyan | 461 | 178 | 283 | 0 | 1988 | YES |
| | Olympos-Bey Mountains (Olimpos-Beydaglari) | 344.25 | ND | ND | 0 | 1972 | NO |
| | Patara | 189.18 | 41.18 | 148 | 0 | 1990 | YES |
| **UK - Gibraltar** | | | | | | | |
| | Gibraltar marine reserve | ND | ND | 0 | 0 | 1991 | NO |
| **Interna-tional (High Sea)** | | | | | | | |
| | Pelagos Sanctuary (France-Italie-Monaco) | | | | | | |
| | | 87,500 | 87,500 | 0 | 0 | 2002 | YES |
| ND: No data;<br>No Cont:<br>No contact information available | | | | | | | |

# Annex 10

# Additional information on Mediterranean MPAs

This annex provides results of the survey that were not included in the main discussion. The additional information completes the baseline of description and analysis of the Mediterranean MPAs.

## A10.1 General features of Mediterranean MPAs

### *Designation information and IUCN management categories*

Twenty-six different types of MPA designation were identified among the Mediterranean countries. The most commonly used types include: Marine Protected Area, Natural Reserve, National Parks and Specially Protected Area. Such a variety of types shows the lack of standardization at the national and Mediterranean regional level.

Rather than standardizing MPA designation types, the challenge is to categorize these different types so as to ultimately understand how they translate to actual levels of resource protection. The IUCN management categorization system was devised for this purpose. The analysis of the use of IUCN management categories shows a peculiar Mediterranean MPA situation. Few MPAs (17 %) have been assigned to Category Ia, Ib, III, V and VI. Category IV (Habitat/ species management area) is the most assigned category (39%) while Category II (National Parks) comes next (23%; for the description of the IUCN category see Annex 6). The trends observed at a regional level are repeated in most countries, where categories IV and II appear to be most numerous, as shown in Figure 25. It should be noted that 23% of the MPAs did not provide any information on this issue.

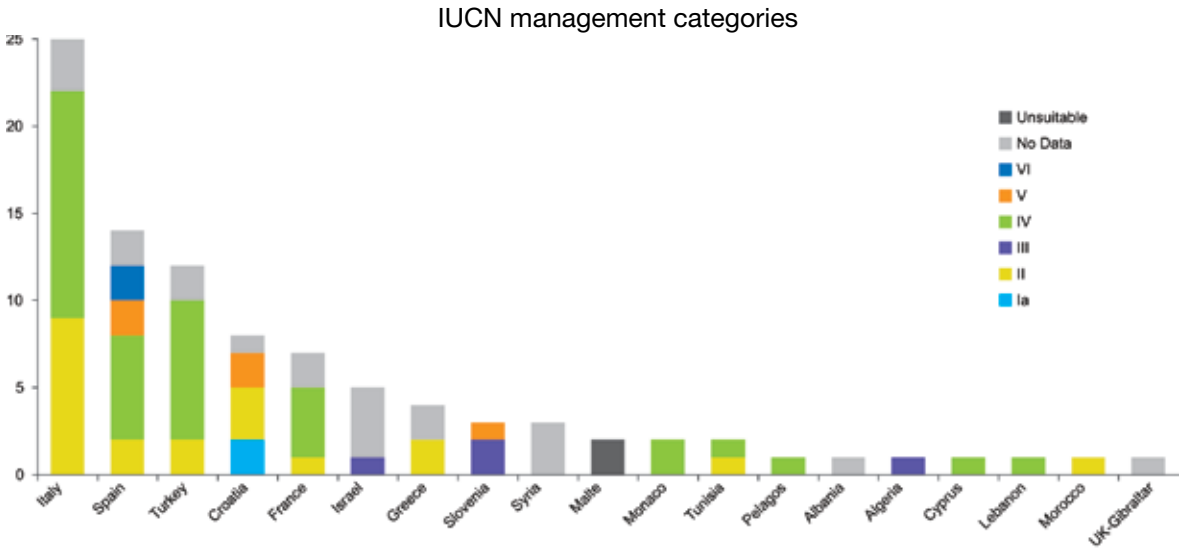



*Figure 25. Distribution of IUCN management categories among Mediterranean MPAs (A) and among countries (B; n=94). Ia: Strict nature reserve; Ib : Wilderness area; II: National Park; III: Natural monument; IV: Habitat/ species management area; V: Protected landscape/seascape; VI: Managed resource protected area*

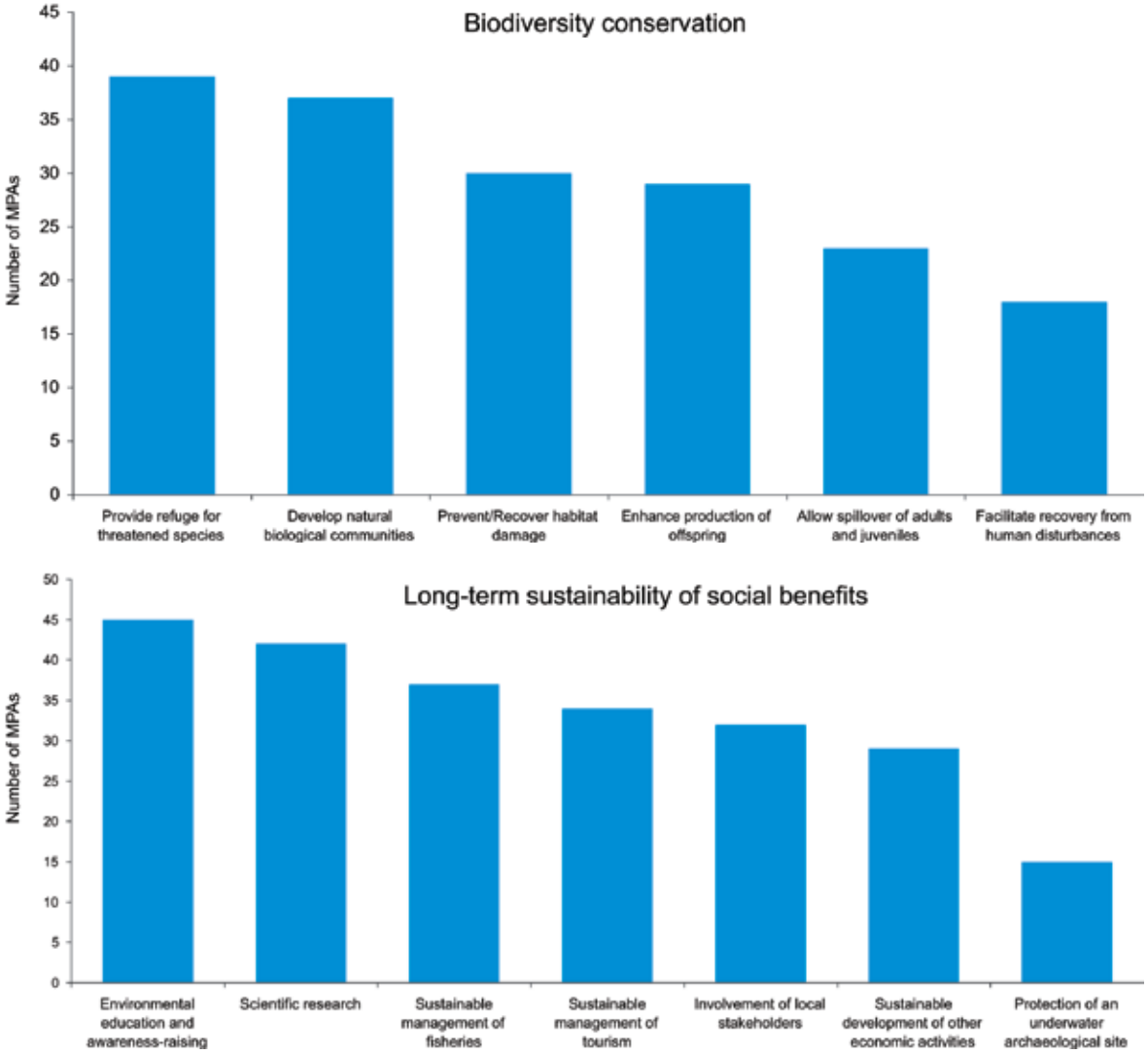



*Figure 26. Number of MPAs that reported the different management objectives included in the questionnaire. A: Objectives concerning biodiversity conservation; B: Socio-economic objectives.*

### *Management objectives of Mediterranean MPAs*

Although MPAs may be tailored to address site-specific circumstances, common trends regarding management objectives can be found at the Mediterranean scale. A list of management objectives was proposed in the questionnaire (Annex 6). Two categories were presented: biodiversity conservation and long-term sustainability of social benefits. All MPAs, with the exception of one, identified management objectives in both categories. MPA managers chose objectives of the long-term sustainability of social benefits more than objectives of biodiversity conservation (Fig 26). This suggests that Mediterranean MPA managers attach great importance to local communities and socio-economic issues.

Environmental education and scientific research were reported as top socio-economic objectives. Sustainable management of fisheries and of tourism were also mentioned as significant objectives, showing that these two economic activities are commonly taken into account in the MPA management (Fig. 26A). Regarding the objectives of biodiversity conservation, more than

80% of managers reported that the main objective of their MPA is to provide refuge for threatened species and to develop diversified natural biological communities. On the other hand, only 50% of managers reported "enhancing the production of offspring" and allowing the "spillover of adults and juveniles" as primary objectives of their MPA (Fig 26B).

Protecting an underwater archaeological site was identified by 31% of MPAs as a priority (Fig. 26A). Not surprising when we think of the archaeological richness of the Mediterranean coastal marine strip but which shows that the presence of archaeological remains was probably an important criterion used to designate a significant number of MPAs in the Mediterranean.

### *International recognition of Mediterranean MPAs*

Designations under one or several of international conventions are important for several reasons. They show how countries honour their commitments to international conventions and they may give value to a site thanks to an internationally recognised label. International recognition attributed to Mediterranean MPAs is shown in Figure 27.

With 324 marine Sites of Community Importance (Habitats Directive) and 51 Special Protection Areas (Birds Directive) with a marine part in the seven EU Mediterranean countries, Natura 2000 is to date the most attributed international designation in the Mediterranean. The

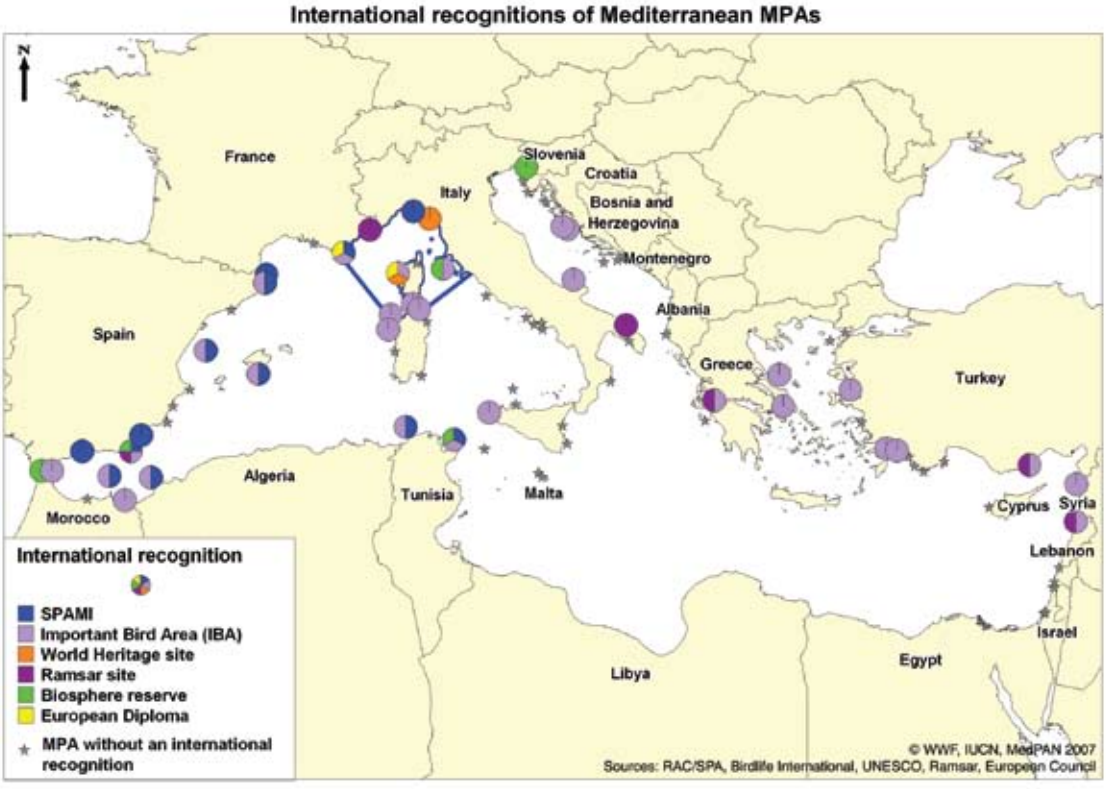



*Figure 27. Map of distribution of the international recognitions attributed to Mediterranean MPAs. Map does not include Natura 2000 sites as the number of sites was too high to be displayed on the map. After the end of the survey, Miramare Marine Protected Area (Italy), Plemmirio Protected Area (Italy), Tavolara - Punta Coda Cavallo Marine Protected Area (Italy) and the Marine Protected Area and Natural Reserve of Torre Guaceto (Italy) have been included in SPAMI list (15th COP of the Barcelona Convention, Almeria 2008).*

following is the UNEP recognition of Specially Protected Area of Mediterranean importance. Out of the MPA list included in this survey, 18 are listed in the SPAMI list[100]. Interestingly, most of them are located in the western half of the Mediterranean Sea[101]. With the exception of the "Important Bird Areas" designation, other types of international designations are uncommon among Mediterranean MPAs (Fig. 27).

### *Zoning and regulations*

Most Mediterranean MPAs are zoned for different uses. The most frequent type of zoning includes three zones. This is the case for 47% (or 45 MPAs) of the Mediterranean MPA. This includes a core zone that is "no-take", a buffer zone where harvesting is limited and activities are mostly regulated, and a peripheral area where the level of regulation is the lowest (see Annex 7). However, 30% (or 19 MPAs) of the MPAs only have two zones: a core zone and a buffer zone where the extractive activity (such as fishery) is regulated.

The analysis of data shows that the majority of Mediterranean MPAs allow some extractive activities, mainly fishing. Professional fishermen with some activities in MPAs are mainly artisanal fishermen. In the Mediterranean, amateur recreational fishing is essentially carried out by hook and line and by spear-fishing (Francour et al. , 2001). In the questionnaire that we used, spearfishing was set apart from the other types of recreational fishing activities because of its known high impact on demersal fish communities.

#### *Regulations in Core Zones*

Combining previous information (see Chapter 3.1.1) with the responses related to the regulation of the activities in the different zones, we found that 68 MPAs have a core zone, representing 72% of the total MPAs (n = 94). However, ten of them responded to allow or regulate extractive activities (professional or recreational fishing) within the core zone that per definition is "no-take" area. These MPAs were thus removed from the analysis[102]. In the core zone, the level of prohibition is relatively high for non-extractive activities as well (Fig. 28A). Among them, mooring and anchoring, known as being habitat damaging activities, in particular on *Posidonia* meadows, are forbidden in 87% of the core zones (n = 54 ) while scuba diving is forbidden in 76% of the core zones (n = 50). Scientific research is permitted in all MPAs, either in the framework of a regulation or freely allowed (Fig 28A).

#### *Regulations in Buffer zones*

The analysis shows that most activities taking place in buffer zones are regulated, except for spear fishing that remains prohibited in over 85% of the MPAs buffer zones (Fig 28B, n = 52). Other types of fisheries, that is professional fishing and recreational fishing are regulated in two-thirds of the MPAs buffer zones and prohibited in approximately one third. Non-extractive activities are mostly regulated.

#### *Regulations in Peripheral zones*

When MPAs have established a peripheral area, regulation is usually far less strict than

100 RAC SPA lists 17 SPAMIs has having a coastal or marine component. The difference of three with the 14 MPAs identified as being SPAMIs in this survey is explained as follows: one of this site is not a protected area (Mar Menor – Spain), the second is coastal only (Kneiss Island - Tunisia), the status of the third one is unclear as at the end of the survey, we had found no evidence that it was legally protected (Banc des Kabyles – Algeria). In addition, during the 15th Ordinary Meeting of the COP of the to the Barcelona Convention (Almeria - Spain, January 2008), Miramare Marine Protected Area (Italy), Plemmirio Protected Area (Italy), Tavolara - Punta Coda Cavallo Marine Protected Area (Italy) and the Marine Protected Area and Natural Reserve of Torre Guaceto (Italy) have been included in SPAMI list.

101 However, thirty SPAMIs are to be designated in the coming years, especially in the eastern basin (Benoit & Comeau, 2005).

102 Nevertheless, these MPA did not report the surface area of the core zone.

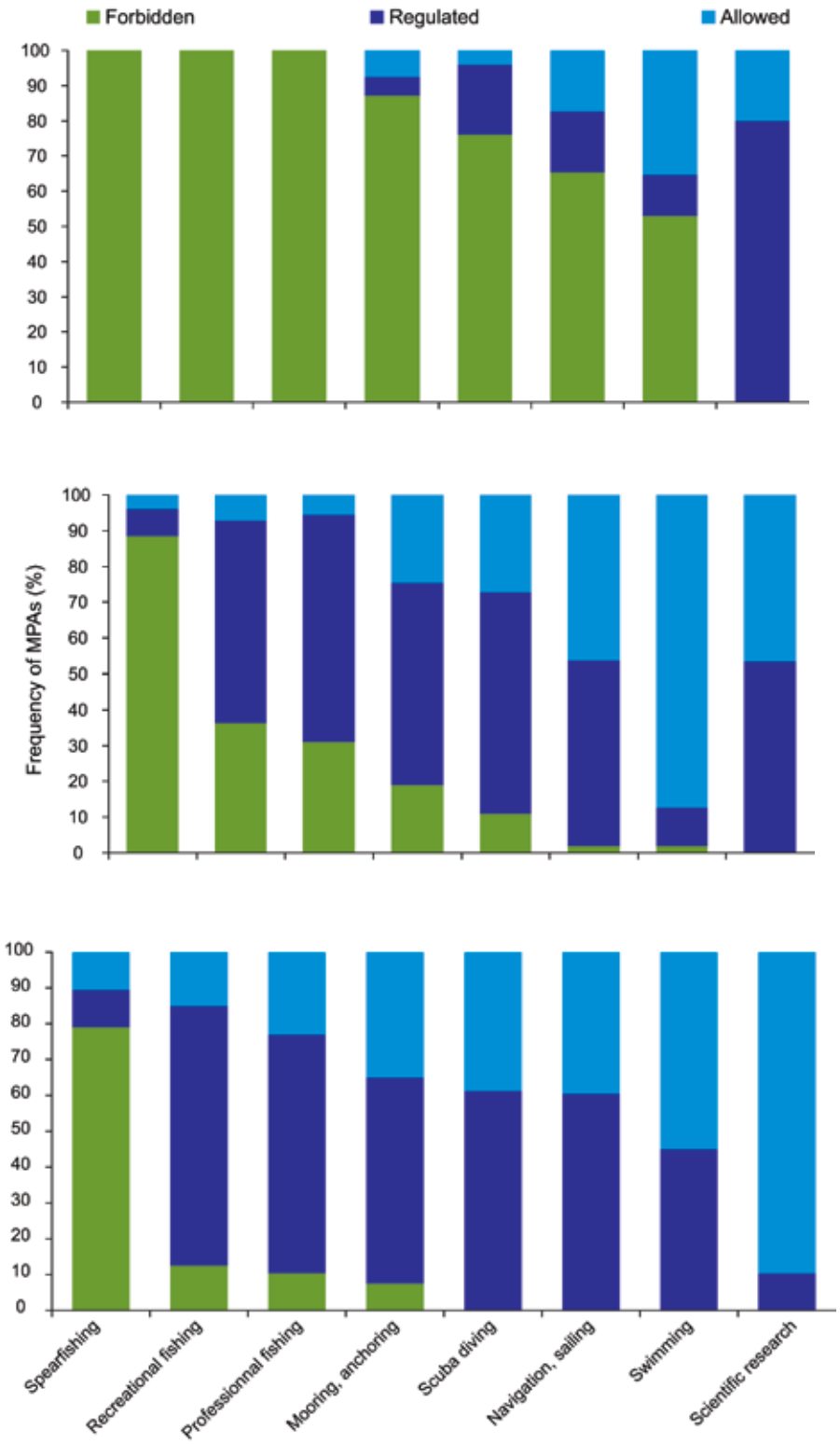



*Figure 28. Regulation of human activities in core (A) buffer (B) and peripheral (C) zone of Mediterranean MPAs (n = 94).*

in the 2 other zones (Fig 28C). However, results show that spearfishing remains highly prohibited in 79% of the MPAs peripheral zones (n = 40). Professional fishing and other types of recreational fishing are mostly regulated.

If we focus specifically on fisheries activities, our data reflects that negative impact of spear fishing is widely acknowledged by MPA managers while professional fishing (in most cases small-scale artisanal fisheries) is widely considered as being compatible with the MPA conservation goals as long as it is properly regulated. These results confirm at the scale of the Mediterranean what is already well known for the north-western part of the basin. A review of the regulation of professional fishery applied in north-western MPAs showed that this consist in the prohibition on certain types of fishing methods and the limitation of number of fishermen (Francour et al. 2001). As far as fishing is concerned, results show that both recreational and professional fishing are likewise regulated in MPAs. These results are difficult to interpret and may even be misleading in the absence of details about the ways recreational activities are regulated. They do not reflect the current concern that scientists and MPA managers express regarding recreational fisheries. Recreational fishing is a growing activity in the Mediterranean area (Cacaud, 2005). The conclusions of the MedPAN workshop on fisheries management in Mediterranean MPAs that was hold by the Natural Reserve of the Straits of Bonifacio in October 2006 (Frisoni et al. 2008) for instance reported that recreational fishing is very popular in some regions, utilising unexpected sophisticated technological gears. Moreover, this activity is not subjected to any legislation (i.e. boat speed, fishing quotas) and it has been proved to impact heavily on natural resources (Frisoni et al. 2008). Managers are worried about unregulated recreational fishing and suggest that it must be better regulated and controlled and, in some cases, prohibited (Harmelin 2000, Frisoni et al. 2008).

A better management of recreational activities should include also the impact of tourist frequentation. In the core zone of many Mediterranean MPAs, anchoring and scuba diving is still allowed despite of the fact that these activities might have strong negative consequences on the marine communities (Milazzo et al. 2002).

## A10.2 Ecological characteristics of Mediterranean MPAs

### *Component and Substratum*

Only 11 MPAs specified the area covered (in $km^2$) by the following marine components: “intertidal”, “subtidal” and “marine”. Due to the low response, the relative surface area of each type of substratum was not evaluated. In a relatively high number of MPAs tools for the spatial analysis are available (53% of MPAs have GIS; n=62). However, section of the questionnaire was not filled by many MPAs (79%) and this may imply that spatial mapping and planning is not frequently used.

On the contrary, information on MPA substrata was more accessible. This section was filled by 38 of MPAs. Rock and sand were the most frequent substrata at all levels, which presence was recorded by 63-73% of MPAs. Mud is present in around 21-24% of MPAs at intertidal and subtidal level, whereas 47% of MPAs reported the presence of mud in the marine areas.

### *Species*

A total of 311 species were included in the questionnaire and considered by managers during the survey. Of these, manager reported information of the presence of 81 species of the SAP BIO list of Endangered or Threatened species (Annex II, total number = 104) and 26

of the Exploited species (Annex III, n = 28). Species data were collected from 10 non-EU MPAs and 42 EU MPAs. Figure 29 shows Annexes II and III species that were reported by the majority of MPAs (more than 40% of MPAs). Most of these species are considered flagship species and include the seagrass *Posidonia oceanica*, the pen shell *Pinna nobilis*, the loggerhead turtle *Caretta caretta*, dusky grouper *Epinephelus marginatus*, the red coral *Corallium rubrum*, the Mediterranean lobster *Palinurus elephas*, the bottlenose dolphin *Tursiops truncatus.* Other species that were mentioned by managers were easy to be monitored (i.e. the date mussel *Lithophaga lithophaga* or the brown algae *Cystoseira* sp.) or very common in the Mediterranean Sea (i.e. the sea urchin *Paracentrotus lividus*).

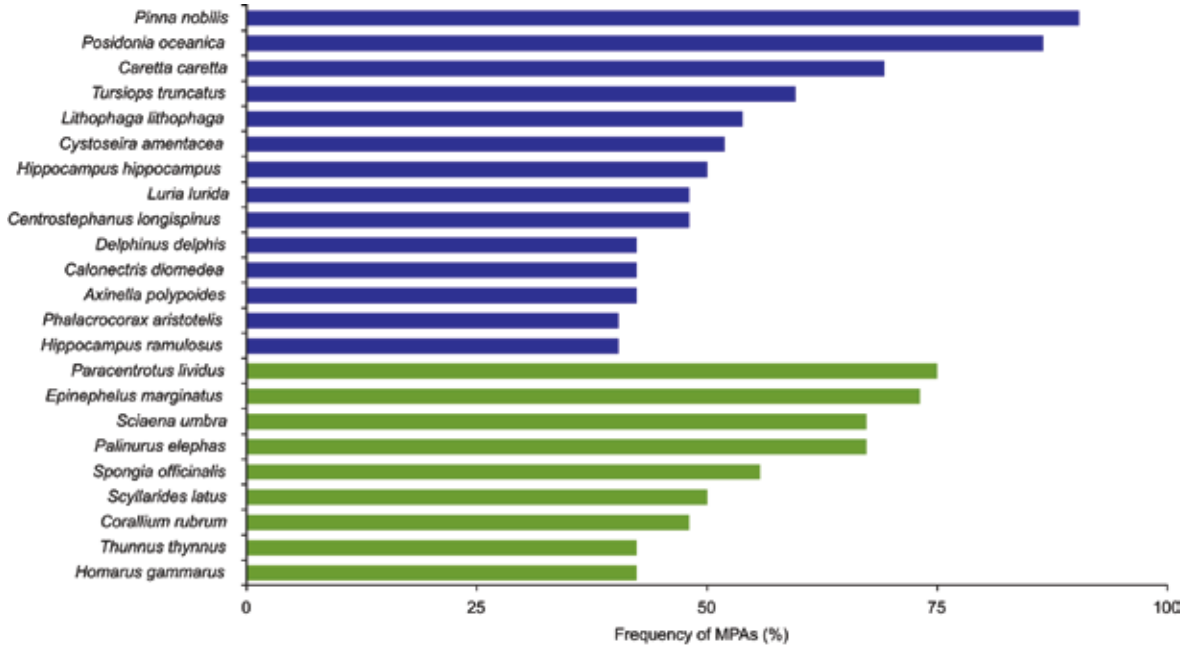



*Figure 29. Relative number of MPAs (%) where species of the Annexes II (in blue) and III (in green) were recorded. Only the species recorded in more than 40% of MPAs were included in this graph (n = 52).*

*Short-beaked common dolphins © Giovanni Bearzi Tethys*

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## MedPAN

MedPAN is the Network of Managers of Marine Protected Areas in the Mediterranean.
The goal of the network is:

1. To contribute to build and maintain a Mediterranean System of MPAs;
2. To improve MPA management and effectiveness;
3. To facilitate regional and international coordination of MPA activities.

Specifically, the network:

- promotes the sharing of experiences and good practices amongst managers;
- suggests solutions to management problems of marine protected areas;
- improves the capacity of managers;
- makes the role of marine protected areas known and encourage their recognition;
- disseminates messages common to all marine protected areas.

The network organizes thematic workshops and conferences on management issues common to all the marine protected areas. It funds studies and the development of methodological tools designed to help managers plan, manage and evaluate MPAs. It provides technical expertise and capacity building to MPAs. It disseminates MPA information through its website and its newsletter. It develops and funds regional MPA programmes.
The network also publishes the Directory of Marine Protected Areas in the Mediterranean.
The MedPAN Network is coordinated by WWF-France.

http://www.medpan.org

## WWF

WWF is one of the world's largest and most experienced independent conservation organizations, with almost 5 million supporters and a global network active in more than 100 countries.
WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption.

http://www.wwf.fr

## IUCN – Centre for Mediterranean Cooperation

IUCN, the International Union for Conservation of Nature, is the world's oldest and largest global environmental network - a democratic membership union with more than 1,000 government and NGO member organizations, and almost 11,000 volunteer scientists in more than 160 countries.
The Centre for Mediterranean Cooperation was opened in October 2001 and is located in the offices of the Parque Tecnologico de Andalucia near Malaga. IUCN has over 170 members in the Mediterranean region, including 15 governments. Its mission is to influence, encourage and assist Mediterranean societies to conserve and use sustainably the natural resources of the region and work with IUCN members and cooperate with all other agencies that share the objectives of the IUCN.

http://www.iucn.org/mediterranean

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