




med waves

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introduction

The Mediterranean is one of the most diverse marine environments in the world: with less than 1 percent of the world's ocean area, the Mediterranean is home to nearly 8 percent of known species and is recognised as one of the world's 25 biodiversity hot spots for biodiversity. The sobering fact, however, is that approximately one in five of the Sea's known species are endangered and 1 percent are already extinct.

The loss, fragmentation and degradation of habitats are a direct or indirect result of human activities such as unplanned urbanisation, unrestrained industrialisation and uncontrolled tourism development, all of which pose significant threats to Mediterranean marine species. Other crucial environmental pressures in the region include pollution, harmful algal blooms, invasive species, over-exploitation of marine resources and the impact of illegal and excessive fisheries.


Maintaining the ecological health and integrity of the sea and its coastal areas is key to the development of a sustainable future for the Mediterranean region. While, major Mediterranean habitats are highly vulnerable to human activities and pressures continue, hope can be found in the efforts being made to understand and protect the Mediterranean's rich biodiversity.

In this respect, Mediterranean countries have reaffirmed their commitment to establish marine protected areas and to protect biodiversity, including on high seas; to apply the leading principles of the ecosystem approach in relation to biodiversity; to address complex threats to biodiversity in an integrated manner, including climate change; and to facilitate, generate and disseminate scientific and technical knowledge and best practices on the management of marine and coastal protected areas and endangered species in cooperation with other competent regional organisations.

The International Year of Biological Diversity 2010 has marked a milestone in international efforts to protect and preserve biodiversity and to renew our efforts to meet the challenges ahead. In this edition of MedWaves we offer you a look at some of the major challenges confronting Mediterranean biodiversity as well as some of the measures being taken to safeguard the Sea's ecological health and integrity for future generations.

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Mediterranean monk seals, revered through the ages, in grave danger



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The Mediterranean: a global environmental hot spot

The Mediterranean Sea basin is both a global tourist destination of broad international appeal, a land associated with sun, fun and culture, and a recognized biodiversity hot spot. Approximately 30 percent of its fauna species are unique, as are approximately 60 percent¹ of its 15,000-25,000 flora species². The Sea contains at least 7 percent of all the marine species known worldwide³, up to 2,000 of which are endemic, according to the last Census of Marine Life⁴.

The largest of the world's five Mediterranean-climate regions, the Mediterranean Sea comprises approximately 0.82% and 0.32% of the surface area and volume of the world's oceans respectively. The more than 2 million km² Mediterranean Basin is situated at the intersection of two major landmasses, Eurasia and Africa, stretching west to east from

Portugal to Jordan and north to south from northern Italy to Morocco and encompassing approximately 5,000 islands.

Eight thousand years of human settlement has left a strong imprint on the Basin. With a current population of over 460 million, nearly 40 percent of whom live in the coastal zone, Mediterranean habitats are under constant and ever-increasing pressure. Less than 100,000 km² of wild vegetation remain. Coastal infrastructure, dam construction, land-based pollution, tourism, erosion, droughts,

¹ *State of the Environment and Development in the Mediterranean - 2009*, 70 (UNEP 2009) (Med SoE).

² *The Mediterranean: A Biodiversity Hotspot Under Threat* (IUCN 2008).

³ *Med SoE* at 70.

⁴ Costello MJ, Coll M, Danovaro R, Halpin P, Ojaveer H, et al. (2010) A Census of Marine Biodiversity Knowledge, Resources, and Future Challenges. *PLoS ONE* 5(8): e12110. doi:10.1371/journal.pone.0012110.



alien species and overexploitation of fauna and flora are all driving the decline of Mediterranean biodiversity.

Approximately 80 percent of the region's pollution comes from land-based sources, including agricultural wastes, airborne particles and river run-off carrying nutrients, pathogens, heavy metals, persistent organic pollutants, oil and radioactive substances⁵. More than half of the urban areas with population over 100,000 do not have wastewater treatment plants, and 60 percent of the wastewater produced in these areas is discharged directly into the sea. Similarly, over four out of five landfill sites in the South and Eastern Mediterranean countries are unsupervised. Rapid coastal urbanization coupled with increasing and unsustainable tourism development only adds to the pressures on the region's environment.

According to the IUCN Red List of Threatened Species, nearly 2,000 Mediterranean species of amphibians, birds, cartilaginous fishes, endemic freshwater fishes, crabs and crayfish, mammals, dragonflies and reptiles have been assessed to date⁶. They are among phyla with 2,600 species recorded in the region. At least 16 species are already extinct, including some endemics⁷. Although reliable data is not always available, IUCN has estimated that approximately one in five of all remaining species is threatened with extinction, including over half of all cetaceans and freshwater fishes, over 40 percent of all cartilaginous fishes,

more than one third of crabs and crayfish, and 29 percent of amphibians. In all, IUCN found that 5 percent of the Mediterranean species assessed are Critically Endangered; 7 percent Endangered and 7 percent are Vulnerable.

Much remains unknown about the Mediterranean's biodiversity. IUCN's evaluations focused on only 2 of the 12 animal phyla and four divisions of algae and plants recorded in the Mediterranean. These groupings are estimated to include at least 8,500 and possibly as many as 33,000 species. Indeed, the most recent Census of Marine Life estimated that approximately three-quarters of the Mediterranean deep-water species are unknown⁸.

Conservation initiatives in the region have produced positive results. In the five-year period from 2004-2009 UNEP identified 175 large biodiversity projects in the Mediterranean region, some of which have saved species from extinction⁹. If the Mediterranean is to conserve its extraordinary natural and cultural heritage and maintain its attractiveness as a global tourism destination, more and increasingly effective conservation programmes will be needed in the years ahead.

⁵ *Horizon 2020 – Elaboration of a Mediterranean Hot Spot Investment Programme (MeHSIP)* (European Investment Bank 2008).

⁶ *The Mediterranean: A Biodiversity Hotspot Under Threat* (IUCN 2008).

⁷ E.g., the Hula Painted Frog (*Discoglossus nigriventris*), the Canary Islands Oystercatcher (*Haematopus meadewaldoi*) and the Sardinian Pika (*Prolagus sardus*).

⁸ Costello et al.

⁹ *Med SoE* at 70.



Mediterranean cooperation to protect biodiversity

The United Nations Environment Programme's Mediterranean Action Plan - Barcelona Convention (MAP), the world's oldest regional seas programme, brings 21 countries bordering the Mediterranean basin together with the European Union to protect the Mediterranean's environment and jointly manage the resources on which the region and the world depends.

At the heart of MAP's mission is the protection of marine and coastal biodiversity. All parties to the Barcelona Convention recognize that maintaining the ecological health and integrity of the Sea and its coastal areas is essential to the development of a sustainable future for the Mediterranean region. The complex threats to marine and coastal biological diversity – pollution, coastal urbanisation, climate change, alien species, and unsustainable fishing – require a range of responses and, very often, the cooperation of multiple regional actors.

In 1995, the parties to the Barcelona Convention adopted the Specially Protected Areas and Biodiversity Protocol (SPA and Biodiversity Protocol) and agreed to establish a regional activity centre

for specially protected areas and biodiversity, RAC/SPA in Tunisia, to facilitate its implementation. The Protocol, one of the most advanced legal instruments of its kind, has enabled the identification of 104 endangered or threatened species in the region. These species are now included on the national lists of protected species in 18 Mediterranean countries¹, making the Protocol one of the most protective. The Protocol also strongly promotes the establishment of marine and coastal protected areas, including those of Mediterranean importance that may embrace or be wholly located in the high seas.

Implementation of the SPA and Biodiversity Protocol is based on a collaborative policy platform, the 'Mediterranean Strategic Action Programme for Biodiversity' (SAP/BIO), adopted in 2003. The SAP/BIO contains well-defined objectives and targets based on the Johannesburg Plan of Implementation and relevant commitments taken under the Convention on Biological Diversity. In addition to implementing the SPA and Biodiversity

¹ UNEP/MAP-PB, 2009 State of the Environment and Development in the Mediterranean, Athens. UNEP/MAP-SPA, 2003 SAP-BIO in the Mediterranean, Tunis

Protocol, MAP contributes actively to the ongoing United Nations General Assembly process related to biodiversity in areas beyond national jurisdiction.

Consistent with these actions, in 2008, the Parties committed to implementing ecosystem-based management in the Mediterranean, a process that will lead to a better understanding of ecosystem goods and services around the Mediterranean and will inform the process of establishing marine protected areas.

During a 2009 Conference of the Parties to the Barcelona Convention held in Marrakech, the Parties took a further step by adopting a “Regional Working Programme for the Coastal and Marine Protected Areas in the Mediterranean including the High Seas”. Work is already progressing under the Regional Working Programme to establish specially protected areas of Mediterranean importance embracing high seas. A large marine ecosystem project for the Mediterranean, implemented since 2009, will help strengthen marine protected area (MPA) management capacities.

Overall, 800 marine and coastal protected areas have been established in the Mediterranean, 25 of which are considered of “Mediterranean Importance”. A substantial number, 41 percent, of the Mediterranean’s MPAs are small, i.e., less than 1,000 ha, and only 15 percent are mainly marine. Most of these are located along the North-western Mediterranean’s shores.

The challenges ahead for the MAP countries remain high. The Mediterranean’s protected areas represent a mere 5 percent of the Sea’s total surface, far below the SAP/BIO’s 20 percent goal. And these areas do not yet represent the rich diversity of the natural marine heritage.

MAP, however, is confident in its ability to help the region’s countries address the challenges ahead. “By virtue of its mandate and its experience in the region MAP is uniquely positioned to foster regional

cooperation on priority issues affecting the Mediterranean environment,” says Maria Luisa Silva Mejias, MAP’s Deputy Coordinator and Officer in Charge. In particular, a number of key goals are in MAP’s sight:

- Keeping in mind the CBD Strategic Plan and the opportunities arising from the forthcoming Rio +20 process, the Parties to the Barcelona Convention are expecting to launch a revision of the SAP/BIO in 2011.
- MAP is working with the Mediterranean countries to support the creation of an effective Mediterranean MPA network by 2012, including high seas.
- MAP is assisting the countries in their efforts to apply the ecosystem approach and address complex threats to biodiversity in an integrated manner, including climate change.
- MAP is cooperating with other regional organisations to generate and disseminate scientific and technical knowledge on management of marine and coastal protected areas and endangered species, including topics related to species protected under the SPA and Biodiversity Protocol.

More generally, Silva points to MAP’s ability to provide the region with a platform for intergovernmental dialogue and political decision-making at the ministerial level; its coordination of the Mediterranean Commission on Sustainable Development, which serves as a forum for addressing sustainable development in the region; and its ability to harness the resources of a network of seven regional centres and programmes that have some of the world’s best technical expertise on the Mediterranean environment. These capabilities, Silva says, enable MAP to “act as a catalyst, foster regional cooperation, generate and disseminate knowledge and best practices, build capacity, and facilitate the efforts of all Mediterranean countries to achieve ambitious and concrete objectives.”



Conserving biodiversity through the MedPartnership

This year, UNEP's Mediterranean Action Plan (MAP), with the support of the Global Environment Facility, has joined forces with the World Bank, international and regional organizations, nongovernmental organizations and twelve Mediterranean countries¹ began implementing a new strategic partnership known as MedPartnership².

The partnership enables a coordinated and strategic approach to the policymaking, reforms and investments necessary to reverse degradation of the Mediterranean's marine ecosystem, coastal habitats and biodiversity. With total funding in excess of 1.5 Billion USD, including co-funding, the MedPartnership has two key elements: a UNEP/MAP led Regional Component that implements actions agreed by the countries (with 47 million USD funding), and the World Bank-led Investment Fund for the Mediterranean Sea Large Marine Ecosystem Partnership.

The harmonization of policy and reforms and the filling of knowledge gaps that will occur under the Regional Component of the MedPartnership will lay the foundation for implementation of the region's Integrated Coastal Zone management (ICZM) Protocol. With this objective in mind, the project has developed four major areas of emphasis: integrated coastal zone, water resource and aquifer

management; pollution from land-based activities, including persistent organic pollutants; and the conservation of biological diversity; and coordination and replication.

Promoting marine protection

MedPartnership will conserve the Mediterranean's biological diversity through activities executed by SPA/RAC, WWF Mediterranean Programme (WWF-MedPO) and FAO (funded at USD \$13 million) for the creation and better management of marine protected areas (MPAs) and the promotion of the sustainable use of fisheries resources in the Mediterranean through ecosystem – based management approaches.

Although Mediterranean countries have already established a number of MPAs, only 3.8 percent of the Mediterranean is under some kind of protection. If one MPA, the Pelagos Sanctuary, is excluded, the total area drops to only 0.4 percent. Of this number, less than half of the MPAs have a management plan and funding for management is generally insufficient. Part of the problem has been that many MPAs were created purely for species protection without adequately considering the opportunities

¹ Albania, Algeria, Bosnia & Herzegovina, Croatia, Egypt, Lebanon, Libya, Morocco, Montenegro, Syria, Tunisia and Turkey. The Palestinian Authority also participates.

² The formal name of the project is "Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem".

for potential synergies and multiple benefits available through multiple-use zoning/management and networks.

Nevertheless, it has been shown that MPAs help conserve marine habitats, particularly when they include a 'no take' policy for fisheries. A large study of Mediterranean MPAs found that protected areas helped to increase the abundance and biomass of individual fishes, raised the proportion of larger and older individuals, enhanced the fisheries yield outside the protected area, and increased the dominance of large predator species (Garcia-Charton *et al.*, 2008). Other studies have shown that increasing the duration and size of the protected area enhances these effects (Claudet *et al.*, 2008)³.

SPA/RAC aims to conserve regionally important coastal and marine biodiversity through the creation of an ecologically representative and effective Mediterranean MPA network (MedMPANet). The WWF-MedPO will complement these efforts by supporting country efforts to improve MPA management (MedPAN South).

MedPAN South kicked off its training efforts with a workshop in Tunisia at the end of 2009 that brought together over 40 participants from the south and east of the Mediterranean as well as trainers from the U.S. National Oceanic and Atmospheric Administration. "We may have seen a bit of history in the making, since trans-boundary information sharing went far beyond the Med," said Anna Ludlow, Capacity Building Officer for the MedPAN South project.

The Food and Agriculture Organization of the United Nations will promote the sustainable use of Mediterranean fisheries resources through ecosystem – based management.

"The MedPartnership brings together international and regional organizations, nongovernmental organizations and twelve Mediterranean countries in the largest ever international waters partnership,"

says Virginie Hart, Mediterranean Marine and Coastal Expert with the MedPartnership. "We are working closely with GEF, which has expressed interest in using this project as a prototype for large marine ecosystem projects."

The initiative will help countries to implement the priorities they agreed on in the framework of the 2003 Strategic Action Programme for the Conservation of Biological Diversity in the Mediterranean region (SAP BIO) and the Barcelona Convention's Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).

Some of the key results will include:

- Strengthened management of 5 MPAs (Turkey, Tunisia, Libya, Algeria and Croatia)
- Region-wide training for MPA managers
- Strengthened long-term financial sustainability for efforts in Montenegro, Croatia, Albania and Tunisia
- A minimum of 3 new MPAs with management plans (Montenegro, Croatia, Albania and Tunisia).
- Regional communication efforts focused on MPAs

On a broader more long-term level, the initiative aims to establish a truly representative Mediterranean network by promoting the protection of biodiversity features within the jurisdiction of as many of the Mediterranean's riparian countries as possible.

The MedPartnership's activities will help the region's countries work toward the targets of effectively conserving 10 percent of the world's ecological regions and establishing a global network of MPA systems set by the 6th Conference of Parties to the Convention on Biological Diversity.

For more information on the MedPartnership visit www.medpartnership.org.

³ See *10 Messages for 2010 – Marine Ecosystems* (European Environment Agency 2010).



Support grows for coastal zone management

The Mediterranean coastline is world famous as a destination for holiday makers, a place to relax and, for the lucky, a place to live. Approximately 46,000 km long, with nearly 19,000 km of island coastline the littoral zone comprises a variety of significant and yet fragile ecosystems such as beaches, dunes, reefs, lagoons, swamps, estuaries and deltas. The Mediterranean's rich history as a crossroads for humanity makes its cultural heritage as significant as its natural one, boasting 48 UNESCO world heritage sites.

Today's Mediterranean is a place of intensifying growth as fisheries, industry, agriculture and tourism have rapidly developed along the coastline. In 2008, the permanent population of the Mediterranean coastal states was approximately 460 million. Construction covers an estimated 40 percent of the coastal area. By 2025, the

population is expected to reach 520 million by 2025, with one third of this number living in the coastal regions.

Urbanization, industry and tourism development have brought with them significant pollution threats. Inventories have found 101 priority pollution hotspots, mainly resulting from land-based sources. In addition, significant threats to marine life are posed on a daily basis by shipping, fishing and aquaculture.

The Mediterranean countries have recognised the need for strategies and stakeholder-driven management processes to mitigate coastal vulnerability. In January 2008, the Contracting Parties to the Barcelona Convention signed the Integrated Coastal Zone Management (ICZM) Protocol. The Protocol provides an effective way to balance

economic, social and environmental goals and priorities, making it an innovative and important tool for long-term sustainable development of the Mediterranean coastline.

The ICZM protocol reflects the region's commitment to the objectives of the UN Johannesburg Plan of Action and Article 4, Paragraph 3 of the Barcelona Convention, which invites signatory parties to promote integrated coastal zone management. The protocol should ensure sustainable development of coastal zones through the protection and sustainable use of coastal areas, particular coastal ecosystems, coastal landscapes and islands; through the use of environmental assessments; and through the implementation of sustainable economic activities and the preservation of cultural heritages.

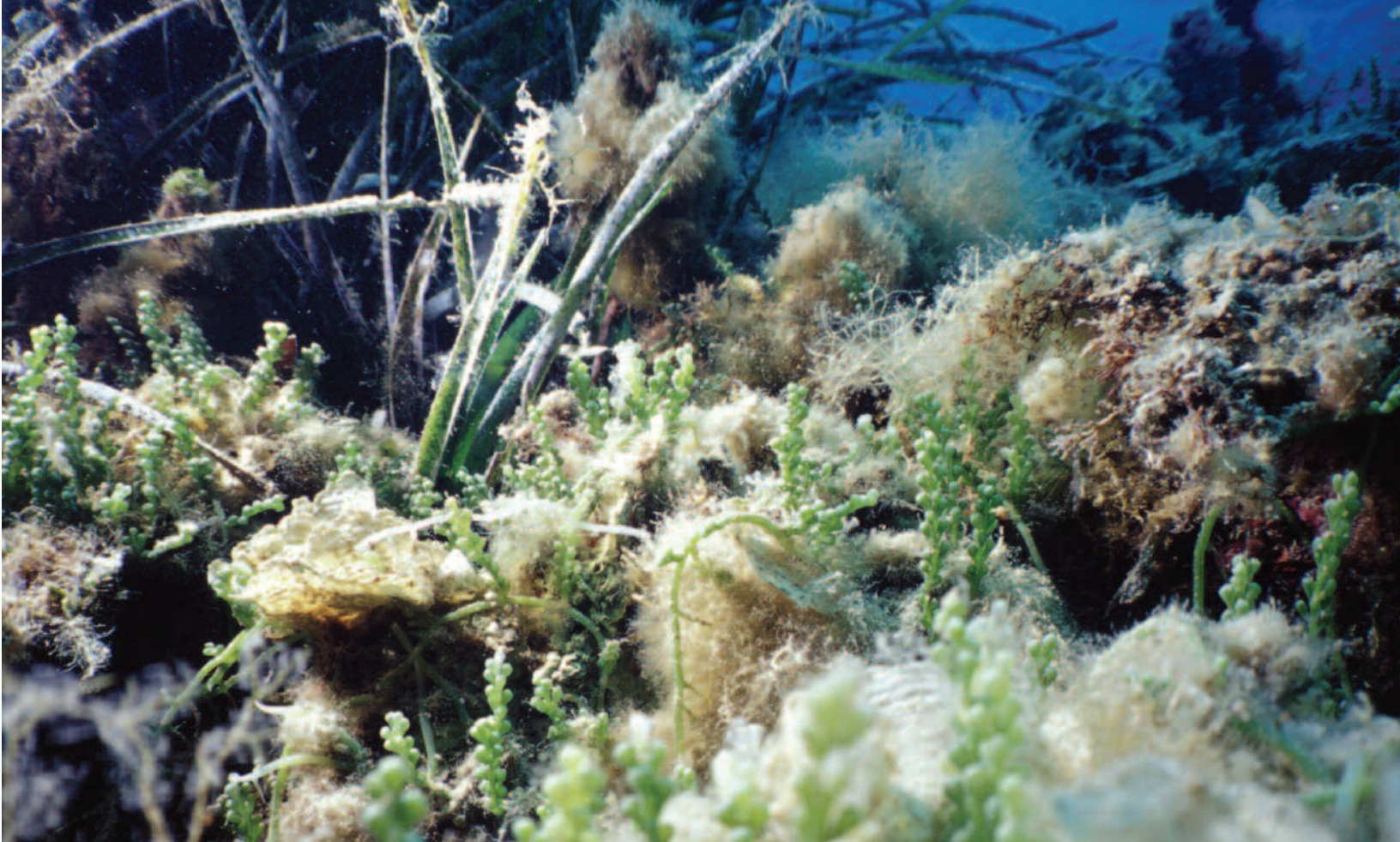
In September 2010, the European Union ratified the Protocol. The EU ratification, which was the fifth of six needed for the Protocol to enter into force, means that the Protocol becomes part of EU law and will have binding effects for all EU member states. Slovenia, France, Albania and Spain had already ratified the Protocol, and a number of other ratifications processes are currently ongoing.

At the time of the ratification EC Environment Commissioner Janez Potočnik said that the EU action "sends a strong signal of commitment from the EU to the protection and sustainable management of the Mediterranean coast".

"We all depend on the Mediterranean Sea. It is our shared responsibility", said Maria Luisa Silva Mejias, UNEP/MAP Deputy Coordinator and Officer in charge. "The new Protocol contains innovative tools to help States address threats to their coastlines. We are pleased with the EU's ratification and are optimistic about the Protocol's future implementation".

This EU ratification came just ahead of the 25 September observance in Slovenia of Coast Day 2010. Coast Day is held annually on 25 September, which is the day the first member state of the Barcelona Convention, Slovenia, ratified the Protocol. The event highlights the value of the Mediterranean coast and calls for active engagement in its management, including through ratification of the Protocol. This year's activities focused on national experiences and good practices involving the ICZM's participatory approach, institutional coordination and the roles of local authorities and stakeholders in responsible coastal planning and management.





Mediterranean countries step up fight against alien species

Alien species have the capacity to wreak havoc on ecosystems, setting off imbalances in the food chain and threatening the survival of native species. The Mediterranean Sea is no stranger to alien species, with estimates of 903 unwanted species in the Sea as of 2008. The principal source of alien species, which include animals, plants, viruses and bacteria, is the discharge of ballast waters from ships.

In June 2010, regional task force representatives of 18¹ Contracting Parties to the Barcelona Convention agreed on a set of eight strategic priorities to address the challenge of ballast water

and invasive species in the Mediterranean. The Parties also agreed to specific measures to put into effect the strategic priorities.

With more than 300,000 port calls per annum and more than 10,000 ships transiting through the Mediterranean each year, it is no surprise that the Sea is host to so many invaders. Large tankers and bulk cargo carriers, commonly operating in the Mediterranean, use a large amount of ballast water. “To ensure a ship's safety and stability

¹ Albania, Algeria, Croatia, Cyprus, the European Community, Egypt, Greece, Israel, Italy, Libya, Malta, Monaco, Montenegro, Morocco, Spain, the Syrian Arab Republic, Tunisia and Turkey.

during voyages ballast water tanks are loaded with sea water in one port, when the ship does not have cargo. This ballast water is then discharged in another port when the ship is being loaded with cargo,” explains Frédéric Hébert, Director of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC).

These discharges “can have a negative impact on the marine environment”, says Hébert. Indeed, invasive species are recognized as one of the greatest threats to biodiversity globally and the world’s oceans. By competing with Mediterranean native species for food and space and by modifying the habitat, invasive species can cause serious trouble for ecosystems and impact fisheries and aquaculture. They can also damage infrastructure such as water intakes, hurt tourism and pose health risks to humans, other mammals, fish and birds from toxicity. For example, the micro-algae *Alexandrium acatenella* produces paralytic shellfish poisoning toxins that have caused numerous human illnesses and deaths after consumption of infected shellfish.

“Research shows that the Mediterranean marine ecosystem and resources have been seriously affected by invasive species and remain at high risk of further invasion as maritime traffic escalates,” said Maria Luisa Silva, Officer-in-Charge of UNEP MAP. “Scientists estimate that one new species invades the Mediterranean every nine days”.

In addition to eight strategic priorities, the 18 Contracting Party representatives also agreed to



voluntary interim arrangements for ballast water exchange in the Mediterranean Sea consistent with the International Convention for the Control and Management of Ships’ Ballast Water and Sediment, which is not yet in force. The Convention must be signed by at least 30 countries representing at least 35% of the world’s fleet tonnage in order to come into force. Up to now the Convention has been signed by 27 countries, including six Mediterranean countries, representing 25.32% of the world’s fleet tonnage².

² Italy Slovenia and Croatia, meanwhile, have adopted a sub-regional ballast water regulation that established a mandatory reporting system for ships coming into their ports.



Posidonia Oceanica

— a cornerstone of Mediterranean ecological health

Posidonia oceanica is a unique, endemic species of Mediterranean seagrass that provides a host of ecosystem services that are crucially important to the region's ecological, physical and economic well-being. These silent underwater meadows provide habitat for a quarter of the Sea's endemic species and serve as the Sea's most important fish production areas. They also stabilize the shoreline, mitigate nutrient and sediment pollution, protect against beach erosion, help with water quality monitoring, encourage water transparency helpful for tourism, absorb carbon dioxide emissions and provide an understanding of historical environmental conditions that is useful for climate science¹.

"The importance of *Posidonia oceanica* to the Mediterranean environment cannot be overstated," said RAC/SPA Director, Abderrahmen Gannoun. "This international treasure, which remains largely hidden from our view, sustains life and is an important indicator of human impacts along and the Sea's coastal zone."

A cornerstone species for the development of Mediterranean ecosystems, *Posidonia oceanica* is also one of the Sea's most sensitive habitats.

¹ See "Posidonia Meadows Reflect Pollution Levels in the Mediterranean", ScienceDaily, July 17, 2010, <http://www.sciencedaily.com/releases/2010/06/100617075203.htm>



Although meadows have formed an almost continuous belt around the Mediterranean basin, with an estimated total surface area of 35,000 square km, *Posidonia oceanica* has been decreasing progressively during the last 30 years, particularly near urbanized coastal areas.

The major threats to *Posidonia oceanica*'s long-term viability come from coastal development, water pollution, invasive species, fishing, shipping and altered water currents. Because this submarine forest acts as a submerged breakwater, the destruction of seagrass can have immediate and irreversible impacts on the shoreline. Regrowth of a meadow, on the other hand, requires several centuries, making its destruction essentially irreversible.

The decline of *Posidonia oceanica* mirrors precipitous seagrass losses globally. Despite providing ecosystem services, including an estimated \$1.9 trillion per year in nutrient cycling, a recent study found that nearly one-third of the known seagrass area had disappeared, that 58 percent of remaining seagrass meadows were declining and that the rate of decline is accelerating, having gone from less than 1 before 1940 to 7 percent since 1990, with as much as 110 square kilometers disappearing each year².

In 2009, the Regional Action Center for Specially Protected Areas (RAC/SPA) of UNEP's

Mediterranean Action Plan completed the pilot phase of the MedPosidonia Project, a three-year initiative aimed at inventorying, mapping and monitoring *Posidonia oceanica* in four Mediterranean countries – Algeria, Libya, Tunisia and Turkey. Developed in furtherance of the Barcelona Convention's Action Plan for the Conservation of Marine Vegetation in the Mediterranean Sea with the support of the Total Foundation, the Project enabled the mapping of meadows of special interest and the strengthening of monitoring networks. These tools assist decision-makers and planners in the assessment of development options and in the siting of coastal infrastructure such as wastewater treatment outlets, ports, marinas and fish farms. Together with capacity building and awareness building activities, the Project has increased local understanding of the presence and evolution of *Posidonia oceanica* meadows and made it possible to strengthen biodiversity management programs. It is anticipated that the project's first phase which will be extended to other areas in the future.

"The MedPosidonia Project could serve as a model for the development of future seagrass and biodiversity projects," says RAC/SPA's Abderrahmen. "It is essential that we continue to promote local expertise and support national conservation efforts of this most important species."

² Waycott et al., *Accelerating loss of seagrasses across the globe threatens coastal ecosystems*, Proceedings of the National Academy of Sciences 106 (30) 2009.



Blue carbon: coastal vegetation & climate change in the Mediterranean

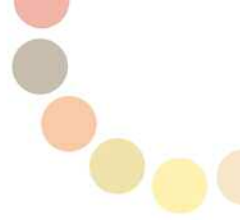
Vegetated coastal habitats are emerging as potentially very significant weapons in the fight to sequester carbon and mitigate climate change effects. Seagrasses, mangroves, salt-marsh plants and other coastal vegetation are known as “blue carbon sinks” because of their ability to absorb and remove carbon dioxide from the atmosphere. They also support a variety of essential ecosystem functions such as providing habitat and spawning areas for many species, improving water quality, buffering shorelines and producing oxygen.

Scientists believe that the carbon burial capacity of marine vegetated habitats may be far greater than the average burial rate in the open ocean. While covering less than 0.2 percent of the sea floor, blue carbon sinks play a major role in the ocean carbon cycle, contributing an estimated 50-71 percent of

the total burial of organic carbon in ocean sediments. Blue carbon sinks therefore rank among the biosphere’s most intense carbon sinks¹. In the case of seagrass meadows, carbon-containing particles become trapped in the leaves and, through their roots and rhizomes, are deposited as sediment on the seafloor, where they can be stored for long periods of time. Estimated to cover between 0.3-0.6 million km² globally, seagrasses have an impact beyond their extent because of their slow turnover time. Indeed, scientists estimate that seagrasses may be responsible for approximately 15 percent of total carbon storage in the ocean².

¹ Nellemann, C., Corcoran, E., Duarte, C. M., Valdés, L., De Young, C., Fonseca, L., Grimsditch, G. (Eds), *Blue Carbon - A Rapid Response Assessment* (United Nations Environment Programme 2009).

² Laffoley, Dd'A. & Grimsditch, G. (eds), *The management of natural coastal carbon sinks*, 23 (IUCN 2009).



The Mediterranean's endemic seagrass species, *Posidonia oceanica*, is currently thought to be the most effective seagrass species for long-term carbon storage, having a capacity to accumulate carbon beyond boreal forests and comparable to wetlands.

"*Posidonia oceanica* is invaluable and irreplaceable, a cornerstone habitat for Mediterranean marine ecosystems and a powerful climate mitigation tool," say Carlos Duarte of the Spanish Council for Scientific Research and a leading global expert on blue carbon sinks.

Despite their remarkably important roles in the health of local ecosystems and the global climate, blue carbon sinks are being destroyed every day. A recent assessment indicated that nearly one-third of the known seagrass area globally has disappeared, and that the rate of loss has grown quickly (to more than 7 percent per year) since 2000, with as much as 110 km² disappearing annually³. Overall, between one-third and one-half of the area covered of seagrass meadows and mangrove forests and a large, but unknown, fraction of the global salt marsh cover have disappeared due to anthropogenic activities⁴. As a result, over 25 percent of the CO₂ removal capacity of blue carbon sinks has been lost, along with their capacity to support marine biodiversity and provide other essential services.

Experts believe action is urgently needed and that there is enormous potential for win-win benefits of the kind being pursued through rainforest conservation. "By protecting and restoring blue carbon sinks, nations with extensive shallow coastal areas like those in the Mediterranean Basin can mitigate CO₂ emissions, sustain the value of essential

ecosystem services and improve the status of their coastal resources," says Gabriel Grimsditch of the United Nations Environment Programme. A number of steps have been suggested⁵. Governments can regulate activities responsible for the loss of blue carbon sinks – e.g., development, dredging, pollution from nutrients and sediments, erosion, deforestation, unsustainable fishing, etc. Efforts can be made to restore large-scale blue carbon sink areas that have been lost, particularly those with high sequestration potential. Although restoration is time consuming, meadows will eventually grow across the sea floor exponentially. Additional research on the conditions that result in high carbon sink capacity is also needed.

According to Grimsditch, UNEP and a wide range of scientists from academia, government and the NGO community are coordinating to tackle a number of questions such as how much blue carbon is being sequestered; the variability among ecosystems in carbon sequestration (i.e., between ecosystems at different latitudes and in different habitats, species, environments, etc.); how much sequestration is lost when ecosystems degrade and at what rate; how to develop a standardized method for verifying sequestration; and how to assess the socio-economic value of conserving and restoring blue carbon sinks.

"It is time that the climate benefits of blue carbon sinks be included in economic assessments and valued in our decision making processes," says Grimsditch. "We are losing an extraordinarily valuable resource and defense against climate change, and time is running out."

³ Waycott et al., *Accelerating loss of seagrasses across the globe threatens coastal ecosystems*, Proceedings of the National Academy of Sciences 106 (30) 2009.

⁴ Duarte, C.M., Middelburg, J.J., Caraco, N., *Major role of marine vegetation on the oceanic carbon cycle*, 2 Biogeosciences 1–8, 2005.

⁵ See, e.g., *The management of natural coastal carbon sinks*, at 27-28 and *Blue Carbon* at 69.



The high price of bluefin tuna

Many of us enjoy fresh fish or sushi. But at what cost? Consider bluefin tuna, fished in the Mediterranean for over 1,000 years, a magnificent fish weighing up to 700 kilograms. Today, bluefin is prized among sushi connoisseurs and can sell for more than €450 per kilogram; a single 220-kg fish once sold for €120,000 in Japan. But there is higher, hidden ecological cost of this delicacy: with every bite, the species appears to be in greater danger of extinction.

The lucrative global sushi market has stoked demand for the bluefin's nutritious red meat (Roman armies used to march on dried tuna), resulting in significant over-fishing. Scientists agree that recent harvesting has been several times higher than what is sustainable, and there is increasing concern that this iconic species, which man has marvelled at through the ages, is headed for a collapse.

The status of bluefin tuna, *Thunnus thynnus*, was the subject of a 4-8 October 2010 meeting of the Standing Committee on Research and Statistics (SCRS), science advisors to the International Commission for the Conservation of Atlantic Tuna, the intergovernmental body responsible for managing Atlantic tuna stocks. A year ago the SCRS determined that East Atlantic and Mediterranean stocks were now less than 15 percent of their pre-industrial fishing size. This year, the

Committee recommended maintaining the current allowable catch of bluefin tuna of 13,500 tonnes per year between 2011-2013. The SCRS said this limit would "likely allow the stock to increase" with at least a 60 percent chance of recovery by 2023.

The SCRS recommendation, which is to be taken up by ICCAT in November, immediately triggered reactions from fishermen and environmental groups alike. The Fishing, Trade and Consumer Affairs Association for Bluefin Tuna (APCCR) declared that there was "no possibility" that the fisheries would collapse and that the bluefin recovery plan provided for a "clear increase in stocks". Environmental groups, however, have strongly challenged the decision and the data underlying it.

"Bluefin tuna fishing nations are providing scientists with out-of-date, incomplete and often unreliable information," said Remi Parmentier, a Pew Environment Group observer at the meeting. "Because of these glaring gaps in data, scientists are essentially being asked to gaze into a crystal ball and pick a number for bluefin tuna catch limits. It allows fishing countries to assign bluefin tuna catch limits based on unfounded optimism instead of objective science. No species should have to rely on a crystal ball for its survival."

This impending ecological disaster has been developing ever since fishing went industrial after World War II. The pace of depletion has accelerated, particularly in the last two decades, thanks in part to government subsidies. Fishing in the Western and Eastern Atlantic and Mediterranean has extended into the Central Atlantic, where bluefin tuna from the east and west congregate. This expansion has encouraged fleets to grow, creating even more pressure for subsidies.

Among the most contentious issues is the discrepancy between catch quotas, which are intended to return the fisheries to a sustainable state, and actual catch levels. The first quota, set in 2002, established a limit of 32,000 metric tonnes for the years 2003-2006. These levels have been gradually ratcheted downward to 28,500 tonnes in 2008, 22,000 in 2009 and 13,500 in 2010. Declared catches reached or exceeded the targets for most of these years, and, because of significant underreporting, actual catches were undoubtedly much higher.

In 2007, for instance, ICCAT estimated that the real catch was 61,000 tonnes (47,800 for the Mediterranean, and 13,200 tonnes for the East Atlantic), in a year when the quota was less than half that (29,500 t). Overall, illegal, unregulated and under-reported fishing is believed to add another third to declared catches, and there are some indications that this portion may be increasing.

"Given the history of fish population collapses elsewhere, and their ecological and socio-economic consequences...it is perhaps surprising that authorities responsible for managing this population have not been more rigorous in supporting effective conservation measures," stated a 2009 report in *Conservation Letters*¹. The report observed that, "authorities have been unable or unwilling to resist political pressure by the bluefin tuna fishing industry to implement recommended measures."

ICCAT acknowledged in a 2010 report that its limits during the decade were "largely ineffective in controlling overall catch"². The SRCS expressed the risk, cautioning, as it has in the past, that "unless fishing mortality rates are substantially reduced in the near future, further reduction in spawning stock biomass is likely to happen leading to a risk of fisheries and stock collapse."³

The quality of the catch is as troubling as its volume. Spawning stock biomass (SSB) refers to adults (10 years into a typical life span of 40 years), which are crucial for replenishing the population. In recent years large 'spawners' have become the principal targets for fishermen, particularly those employing purse seine nets, which account for more than 60 percent of the total catch. Most of these spawners are then put into marine 'ranches' or 'fattening farms' to bulk up for maximum profitability. Although these trends have accelerated the impairment of the SSB, existing quotas would allow the capture of most or all adult bluefins⁴,

Ahead of the two-month Mediterranean fishing season this past spring, WWF said its own analysis showed the bluefin tuna that spawn -- those aged four years and older -- will have disappeared by 2012 at current rates." For years people have been asking when the collapse of this fishery will happen, and now we have the answer," declared Sergi Tudela, Head of Fisheries at WWF Mediterranean.

"You don't need a PhD in fisheries modelling to know that you don't take something out of its environment just as it is breeding," notes Dr. Susan Lieberman, Pew's international policy director.

ICCAT has adopted a number of measures to rebuild the bluefin population to a sustainable level by 2023. These included tightening quotas,

¹ MacKenzie, B. et al., *Impending collapse of bluefin tuna in the northeast Atlantic and Mediterranean*, *Conservation Letters* 2 (2009) 25-34.

² See *Report for biennial period, 2008-09, Part II - Vol. 2* at 120 (ICCAT 2010).

³ *Ibid.*

⁴ See MacKenzie, B. et al.

shortening the fishing season, increasing the minimum size of fish that can be taken, restricting individual vessel quotas, and instituting a program to put observers on board. NGOs and an increasing number of governments, however, support a suspension of fishing bluefin, particularly in the key Mediterranean spawning grounds, such as in the southern Balearics and the Sicilian Channels. “The right thing would be to impose a zero quota,” said Pew’s Lieberman last year.

A key question then is whether it is really too late to avoid a collapse. Because bluefin is a long-lived species it would take at least ten years before the population would show definite signs of recovery. The Conservation Letters report noted that, even if tuna fishing were banned in the northeast Atlantic and Mediterranean until 2022, “the populations will probably fall to record lows in the next few years, unless environmental conditions promote exceptionally high recruitment [reproduction],” observed the Conservation Letters report.

In March 2010, the government of Monaco tabled a proposal to have bluefin tuna listed as a threatened species under Article 1 of the Convention on International Trade in Endangered Species (CITES), which would have resulted in a ban on international trade of bluefin. It would have been the first time a major commercial fish was protected under CITES, but the proposal was ultimately defeated. At the time, Masanori Miyahara, the director of the Fisheries Agency of Japan, told the New York Times that, “Cites Appendix One is too inflexible... once a species is listed in a Cites appendix, it will never be delisted or down-listed as the history of Cites clearly shows”.

Bluefin tuna is already listed in annex III of the Specially Protected Areas and Biodiversity Protocol for the Mediterranean, which lists species whose exploitation is regulated. “Given that exploitation of this species has been subject to longstanding inefficient regulation, and that its population is declining at a pace qualifying them for endangered species status, the Parties to the Barcelona Convention may consider temporarily uplisting

bluefin tuna to Annex II [covering endangered or threatened species] until population recovery is ensured. Under Protocol procedures, the Parties are legally empowered to uplist and downlist species,” says Daniel Cebrian of the Regional Action Centre for Specially Protected Areas.

Strict limits or a suspension might just save the bluefin tuna industry. Although this is the logic of sustainability, many businesses remain focused on the prospect of short-term profit. As Andy Rosenberg of Conservation International says, “The difficulties associated with preventing declines in the first place or rebuilding depleted stocks are primarily due to the difficulty of reducing fishing pressure in the face of resistance by the fishing industry to strict management controls.”

For now, the future of the bluefin tuna, one of nature’s great wonders, is uncertain. EU states are bound under the Marine Strategy Framework Directive to ensure the recovery of Atlantic bluefin tuna by 2015 and to restore ecosystem health by 2020. NGOs are pressuring ICCAT, the EU and Mediterranean governments to suspend bluefin fisheries or lower quotas to more sustainable levels and to bring commercial fishing fleets around to a longer-term view. At the same time, the protection of marine areas is being pursued. In 2008, ICCAT members committed to protect spawning areas identified by the SCRS. And this past June, Contracting Parties to the Barcelona Convention adopted key sites, such as the waters around the Balearic Islands, north Levantine Sea and the Sicilian Channel, as priority conservation areas in a first step toward meeting commitments under the Convention on Biological Diversity to establish a coherent network of marine protected areas by 2012.

The name tuna derives from a Greek word meaning ‘to rush’, because of the fish’s ability to accelerate quickly and dart through the sea at speeds of up to 100 km/hr. The question now is whether the bluefin tuna is racing to oblivion.



The uncertain fate of Mediterranean sea turtles

It is midnight on the Greek island of Zakynthos in the Mediterranean. A sea turtle is wading ashore, ready to lay its eggs. Suddenly there is a blast of music from a beach front nightclub. The sand vibrates with the noise. The turtle, acutely sensitive to movement, turns round and returns to the sea, aborting her eggs in the water.

Off the coast of southern Turkey, at Kazanlı, another female turtle is swimming towards the shore. But the beach she was hatched on more than 25 years ago and to which she is now returning to nest and lay her eggs is disappearing due to erosion.

Meanwhile, further west, off the coast of southern Italy, a fishing trawler out after tuna and swordfish is pulling in its catch. A turtle is caught on the line and is dead by the time it's taken on board. The sea turtle is one of the earth's most ancient

creatures, in existence for about 150 million years. Yet now this reptile, which lives almost all its life at sea but nests on land, is facing an ever more precarious future, its marine and land based habitats under threat, its population numbers declining.

There are three species of marine turtle in the Mediterranean - the leatherback turtle (*Dermochelys coriacea*), the green turtle (*Chelonia mydas*) and the loggerhead (*Caretta caretta*). Two other species have been sighted occasionally: the hawksbill (*Eretmochelys imbricata*) and the Kemp's ridley (*Lepidochelys kempii*). Of these, only the green and loggerhead turtle nest in the Mediterranean: it is on these two species that conservation efforts have been concentrated. There is grave concern about both species. "Green turtles are on the brink of extinction and the loggerheads are not very much better off,"



says Lily Venizelos, director of the Mediterranean Association to Save the Sea Turtles (MEDASSET).

Though there is a substantial body of research on turtles in the Mediterranean, with large numbers tagged and tracked by satellite to try to map migratory patterns and breeding habits, there is still a dearth of knowledge on population size and of how these mighty animals live out the cycle of their lives.

"The quality of terrestrial mapping is excellent," says MEDASSET's Venizelos, "but we don't know as much about overwintering and feeding areas." As Brendan Godley, a marine biologist at the University of Exeter in the United Kingdom, put it last year, "The more we look, the more we find that highlights how complicated these animals are."

What we do know does not make for happy reading. Up to the 1970s Mediterranean turtles were hunted and killed for their flesh and oil, their carapaces sold as souvenirs. The population plunged: studies indicate the number of female green turtles nesting each year - limited to just a few sites on the southern coast of Turkey and in the eastern Mediterranean - is less than 400 while the annual breeding population of loggerheads is estimated at between 2,200 and 2,700.

Most of the trade in turtle flesh has now stopped, thanks to protective international agreements and legislation. Yet the outlook for this creature that survived the extinction of the dinosaurs is bleak.

Mass tourism is one of the main threats. Twenty one countries surround the Mediterranean, with 150m people living in coastal regions. Each year that coastal population swells with the influx of several million tourists.

Zakynthos in the Ionian Sea is one of the main nesting areas for loggerhead turtles. Between May and July the turtle will crawl onto the island's beaches and scoop deep holes in the sand to lay clutches of up to 100 soft, ping pong-ball shaped eggs. The eggs hatch in August with baby turtles rushing, en masse, towards the sea. This coincides with the peak of the tourism season. Though efforts have been made to carve out conservation areas, nesting sites are still trampled upon, while speedboats and jet skis threaten turtles in shallow waters.

Fishing, with all its modern equipment and combinations of bottom trawling, long lines and drift nets, has a big impact on turtle numbers. Every year many thousands of turtles of varying ages are caught as by catches. Some turtles are returned to the water alive but many perish.

Coastal erosion and the depletion of such resources as sea grass meadows – a favorite feeding ground for the green turtle – impact turtle numbers. Pollution, whether from industry or tourist rubbish, is another threat. Turtles can mistake a plastic bag for a jellyfish. One study of 54 dead loggerheads found that 42 had various forms of rubbish in their digestive tract. Climate change, with alterations in



sea and sand temperatures and rising sea levels, is a potential future threat to the turtle's survival.

Some progress on conservation has been made. In 1996, the Mediterranean countries confirmed their commitment to the conservation of marine turtles by including the five species of marine turtle recorded for the Mediterranean in the List of Endangered and Threatened Species annexed to the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean. UNEP's Mediterranean Action Plan (UNEP MAP) administers the Protocol, which is part of the Barcelona Convention. Sea turtles are also protected under the Convention on International Trade in Endangered Species of Flora and Fauna (CITES) and under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention).

In addition, UNEP MAP has developed an Action Plan for the Conservation of Mediterranean Marine Turtles (the Action Plan). UNEP MAP coordinates and monitors the various international agreements and legislation aimed at conserving the turtle, and UNEP MAP's Regional Activity Center for Specially Protected Areas (RAC/SPA) in Tunisia compiles research and undertakes a wide range of work

such as setting up rescue centers, encouraging fisher people to modify their fishing gear and, perhaps most important of all, raising public awareness of just how critical is the outlook for these magnificent creatures.

Important work to implement the Action Plan as well as the Strategic Action Plan for the Conservation of Biological Diversity (SAP BIO) has also been occurring on the national level. In 2008, for example, the Albanian Herpetofauna Society-H.A.S in collaboration with MEDASSET launched a conservation project in the Drini Bay and Patoku Lagoon in northern Albania. The three-year project, which is wrapping up this year, contributed to sea turtle and habitat conservation, population dynamics, migratory routes monitoring, capacity building, environmental education and awareness raising in Albania. Says Lily Venizelos, "Education of the public and particularly children is essential if we are ever going to build the awareness and sensitivity necessary to protect this magnificent creature. We must act now, before the sea turtle in the Mediterranean is just a memory."



Mediterranean monk seals, revered through the ages, in grave danger

Pity the Mediterranean Monk Seal, once a revered icon of Mediterranean culture, now one of the most endangered mammals in the world. Prehistoric rock painting shows them in south Spain. Monk seal head appears on some of the earliest coins, minted in 500 BC, and Homer and Aristotle mentioned this species. To ancient fishermen and seafarers, seeing a monk seal was a good omen. At that time, they were not hard to see: the seals congregated, bred and gave birth on beaches.

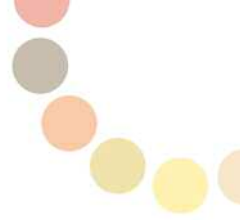
Times have changed. In the last centuries, monk seals have taken pains to avoid human contact as much as possible. Pregnant seals prefer coastal caves with aquatic entrances inaccessible from land, even though these are prone to heavy surf, tidal and storm surges, dramatically raising mortality rates. Today, just 50 percent of pups survive their first two months and most die in the first two weeks, according to the IUCN, which has listed monk seals as critically threatened for the last 14 years.

The main threats are stepped up conflicts with fisherman over dwindling fish resources, habitat

loss, due to rapidly expanded human population, also including tourism presence almost everywhere along coastlines, and ensuing pollution, with debris clogging formerly suitable caves. Fishermen deliberately kill seal as pests for the damage they cause to fishing nets and for rare raids on offshore fish farms.

As a result, the historical range and population of monk seals has declined dramatically. They are completely extinct in several former habitats, including the Black Sea, Bosphorus, the Dardanelles and the Sea of Marmara, and virtually all the West and Central Mediterranean. Indeed, nowadays they are estimated to be less than 500 individual seals scattered over a wide range. The sparse population itself is a threat, encouraging possible inbreeding and severely restricting natural genetic variability.

Two sites are considered viable population centers – one in the Aegean Sea, split between Turkey (with some 100 individuals) and Greece (with between 150-250), and one in the Atlantic Ocean on Cabo Blanco (Western Saharan coasts), with



another small group in Madeira archipelago. Being at opposite ends of the distribution range thwarts natural population exchange and leaves other fragmented subpopulations isolated in vulnerable groups of as few as 5 individuals.

Monk seals are susceptible to other threats, including disease and toxic algae. In the summer of 1997, two-thirds of the Cabo Blanco population was wiped out, either by an algae bloom or virus. Almost 14 years later there are estimated to be 200 individuals, still under the 1997 population. Captive breeding programs, meanwhile, have so far not taken place.

In September 1985, the Contracting Parties to the Barcelona Convention included the protection of the Mediterranean Monk Seal among their priority objectives for the Mediterranean Action Plan (Genoa Declaration, 1985). To assist the Mediterranean countries in achieving this objective, the Regional Activity Centre for Specially Protected Areas (RAC/SPA), in collaboration with Mediterranean experts and concerned organizations, prepared an Action Plan for the management of the Mediterranean Monk Seal under UNEP/MAP coordination. The main aim of the Plan was to reduce the adverse pressures and ensure the gradual recovery of the species through the implementation of a number of immediate and long-term actions. Since that time UNEP MAP and RAC/SPA have supported national and regional activities.

A 2009 RAC/SPA progress report on the implementation of the Action Plan¹ concluded that there is a lack of monitoring in a number of Mediterranean countries, especially in those with low density and that interactions between fisheries and monk seal are not reported. The assessment stated that more information exchanges, awareness building, training and social support is needed, as are mechanisms for coordinating and financing conservation actions.

According to Daniel Cebrian of RAC/SPA fisheries management measures are required around breeding areas, in order to sharply reduce interactions between monk seals and fisheries people. "The creation of a mosaic of fish nursery areas would also benefit local fisheries," says Cebrian. Cebrian also suggests that there is an urgent need to relocate pups born in exposed caves during seasons with the highest mortality risks and to restore populations to range countries while ensuring the enforcement of state-warranted protection measures.

Preservations efforts have been most active in the Aegean Sea, where WWF, for one, has programmes involving artisanal fishermen as guardians of the sea. In Turkey, WWF works in collaboration with the Turkish NGO, SAD-AFAG (The Underwater Research Society - Mediterranean Seal Research Group). Local fishermen have been enlisted to protect monk seal breeding caves and to increase fish stocks by creating no-fishing zones and patrolling against illegal fishing activities.

In Greece, the Alonissos Marine Park (extending around the Northern Sporades island) has been set aside as a monk seal preserve. The Park is the focus of the work done by the Hellenic Society for the Study and Protection of the Monk Seal (MOM), which has devised a challenging national action plan, including a broad range of objectives, from developing awareness to better law enforcement.

If the monk seal is to have a future in Greece "it will occur only if a significant portion of Hellenic civil society will attribute to the seals the value they deserve, and if saving monk seals from extinction will be seen as the epitome of reversing the devastating trend of loss of naturalness which is plaguing the Mediterranean, Greece included," notes the *National Strategy and Action Plan for the Conservation of the Mediterranean Monk Seal in Greece, 2009 - 2015* issued last year.

¹ Assessment of the implementation of the Action Plan for the management of the Mediterranean Monk Seal (UNEP 2009).