



# THE MEDITERRANEAN: A BIODIVERSITY HOTSPOT UNDER THREAT

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The IUCN Red List of Threatened Species™



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# The Mediterranean: a biodiversity hotspot under threat

Annabelle Cuttelod, Nieves García, Dania Abdul Malak, Helen Temple and Vineet Katariya

## The diverse Mediterranean

The Mediterranean Basin is one of the world's richest places in terms of animal and plant diversity. This diverse region, with its lofty mountains, ancient rivers, deserts, forests, and many thousands of islands, is a mosaic of natural and cultural landscapes, where human civilization and wild nature have coexisted for centuries (Figure 1). The unique conjunction of geography, history, and climate has led to a remarkable evolutionary radiation that continues to the present day, as animals and plants have adapted to the myriad opportunities for life that the region presents. The Mediterranean is particularly

noted for the diversity of its plants – about 25,000 species are native to the region, and more than half of these are endemic – in other words, they are found nowhere else on earth. This has led to the Mediterranean being recognized as one of the first 25 Global Biodiversity Hotspots (Myers *et al.* 2000).

Besides this great richness of plants, a high proportion of Mediterranean animals are unique to the region: 2 out of 3 amphibian species are endemic, as well as half of the crabs and crayfish, 48% of the reptiles, a quarter of mammals, 14% of dragonflies, 6% of sharks and rays

and 3% of the birds. The Mediterranean is also hosting 253 species of endemic freshwater fish. Although the Mediterranean Sea makes up less than 1% of the global ocean surface, up to 18% of the world's macroscopic marine species are found there, of which 25 to 30% are endemic – an incredibly rich biodiversity for such a small area (Bianchi and Morri 2000). The Mediterranean's importance for wildlife is not limited to the richness or uniqueness of its resident fauna and flora: millions of migratory birds from the far reaches of Europe and Africa use Mediterranean wetlands and other habitats as stopover or breeding sites.

Figure 1. Map of the Mediterranean Sea and surrounding countries



## Box 1: Why is species conservation important?

Species provide us with essential services: not only food, fuel, clothes and medicine, but also purification of water and air, prevention of soil erosion, regulation of climate, pollination of crops by insects, and many more. In the Mediterranean, they provide a vital resource for the tourism and fishing industries, as well as having significant cultural, aesthetic

and spiritual values. Consequently the loss of species diminishes the quality of our lives and our basic economic security. From an ethical point of view, species are part of our natural heritage and we owe it to future generations to preserve and protect them.

### The Human Factor

In addition to its thousands of species of fauna and flora, the Mediterranean region is home to some 455 million human inhabitants, from a wide variety of countries and cultures. Considerable economic disparities exist within the region, with the GNI per capita of the Mediterranean EU countries (USD 20,800) being ten times that of the North African ones (USD 2,100) (World Bank 2006). Poor people depend heavily on natural resources and the loss of biodiversity is undermining the potential for economic growth, affecting the security of populations (food, health, etc.) and limiting their options. On the other hand, economic development increases the pressures on the environment and hence conservation challenges and options in the region are driven by these economic inequities.

The region also receives a large number of visitors: in 2005, 246 million people – 31% of all international tourists – visited the Mediterranean, particularly its coastal areas (Blue Plan 2008). Many visitors to the region are drawn by its natural

beauty, but heavy pressure from visitors and residents alike is causing severe environmental degradation. Urbanization, coastal development, pollution, and unsustainable exploitation of natural resources such as marine fish are just some of the many human activities that are leading to an ever-increasing number of Mediterranean species to be facing a high risk of extinction.

**“An outstanding centre of biodiversity but also one of the most threatened, mainly by human activity”**

### Assessing Mediterranean Species

Assessing the conservation status of species at the Mediterranean regional level is particularly relevant to regional policy instruments such as the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean or Barcelona Convention. It gives a timely overview of the status of biodiversity, and

provides sound scientific data to decision-makers for policy development and management of natural resources. These assessments will help Mediterranean countries to determine whether or not they have met their obligations, commitments and targets under international agreements, such as the target to reduce the rate of biodiversity loss by 2010 under the Convention on Biological Diversity (CBD 2002). Hence IUCN is coordinating a process to evaluate the conservation status of all vertebrates and selected invertebrate and plant groups in the Mediterranean region, including terrestrial, freshwater and marine species. In total, 1,912 species have been assessed to date (Table 1). Some taxonomic groups have been assessed at the global level (amphibians, birds, mammals and reptiles), while others have been evaluated regionally (cartilaginous fishes, cetaceans, crabs and crayfish, endemic freshwater fishes and Odonata (dragonflies and damselflies, later referred to collectively as dragonflies)). Although the global and regional assessments are not directly comparable

**Table 1. Numbers of species from Mediterranean countries assigned to each IUCN Red List category, by taxonomic group.** Assessments carried out between 2004 and 2008 by IUCN and its partners. Data Deficient means that there is not enough information to assign the species to one of the other Categories, and it does not imply that the species is not threatened.

IUCN Red List Categories	Amphibians <sup>1</sup>	Birds <sup>1</sup>	Cartilaginous fishes <sup>2</sup>	Cetaceans <sup>2,3</sup>	Crabs and Crayfish <sup>2,3</sup>	Endemic Freshwater fishes <sup>1,4</sup>	Mammals <sup>1</sup>	Dragonflies <sup>2,4</sup>	Reptiles <sup>1</sup>	TOTAL
Extinct <sup>5</sup>	1	1	0	0	0	8	2	4	0	16
Critically Endangered	4	6	13	1	0	45	5	5	14	93
Endangered	13	9	8	2	3	46	15	13	22	131
Vulnerable	16	13	9	2	2	51	27	13	11	144
Near Threatened	17	29	13	0	4	10	20	27	36	156
Least Concern	63	543	10	0	5	52	231	96	253	1253
Data Deficient	1	0	18	4	0	41	30	6	19	119
TOTAL	115	601	71	9	14	253	330	164	355	1912
Endemic	71 (62%)	16 (3%)	4 (6%)	0 (0%)	7 (50%)	253 (100%)	87 (26%)	23 (14%)	170 (48%)	631 (33%)

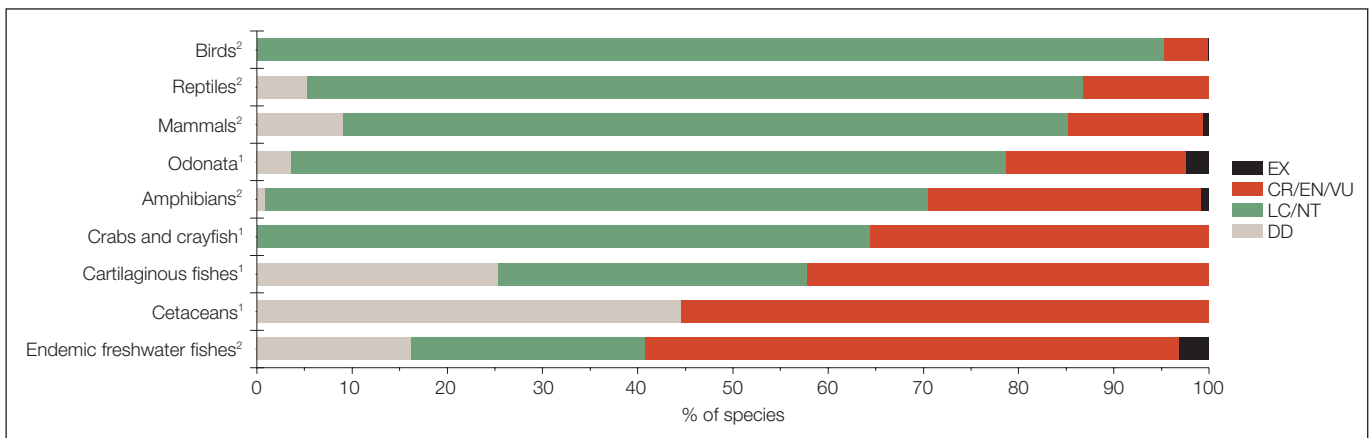
<sup>1</sup> Species assessed at the global level.

<sup>2</sup> Species assessed at the regional level.

<sup>3</sup> Preliminary data; still to be confirmed by the IUCN Red List Authority.

<sup>4</sup> Only the species occurring in river basins flowing into the Mediterranean Sea and adjacent Atlantic waters were included in the assessment (Smith and Darwall 2006).

<sup>5</sup> “Extinct” includes the categories Extinct, Extinct in the Wild and Regionally Extinct.



<sup>1</sup> Species assessed at the regional level  
<sup>2</sup> Species assessed at the global level

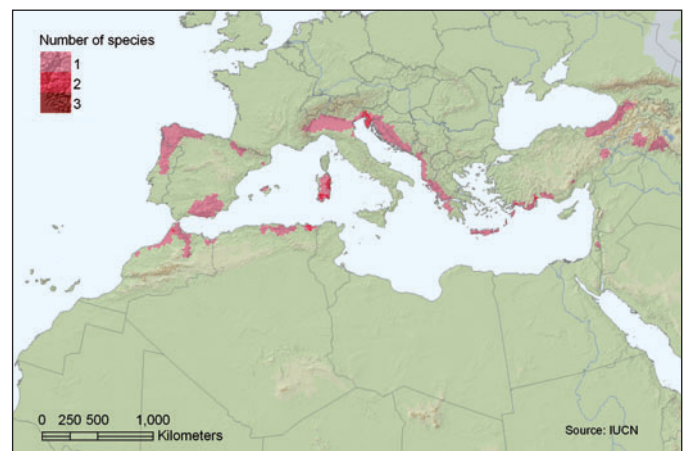
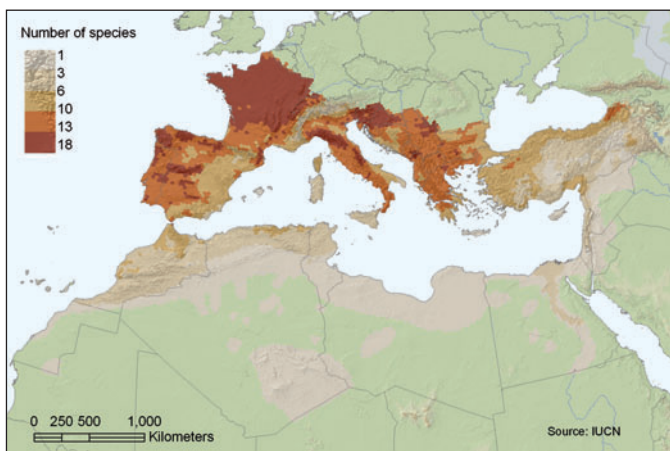
**Figure 2.** Percentages of Extinct, threatened, non-threatened and Data Deficient species in each major taxonomic group assessed.

with each other, they do give an indication of the different levels of threat faced by each taxonomic group.

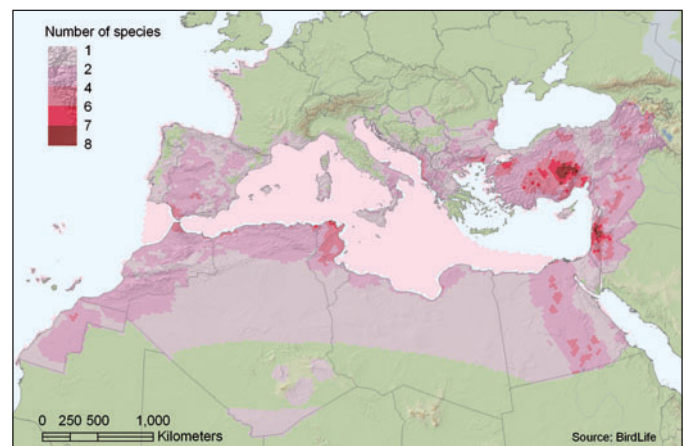
A closer look at the different groups shows that at least 56% of endemic freshwater fishes, 56% of dolphins and whales, 42% of sharks and rays, 36% of crabs

and crayfish, 29% of amphibians, 19% of dragonflies and damselflies, 14% of mammals, 13% of reptiles and 5% of birds are threatened with extinction. Overall, the proportion of threatened species in the Mediterranean (those classified as Critically Endangered, Endangered or Vulnerable), either at the global or at the regional level,

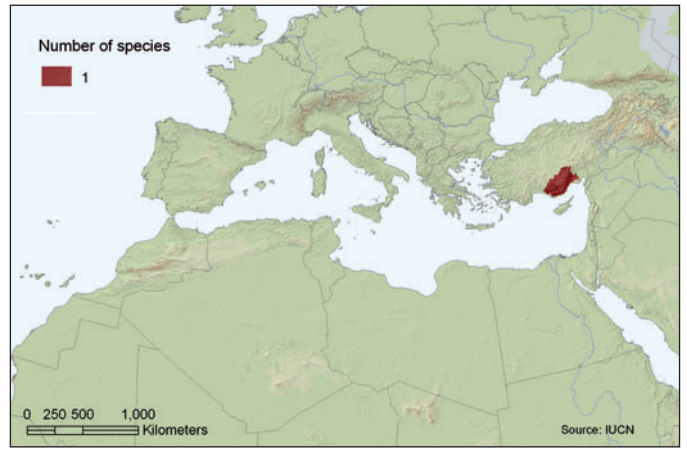
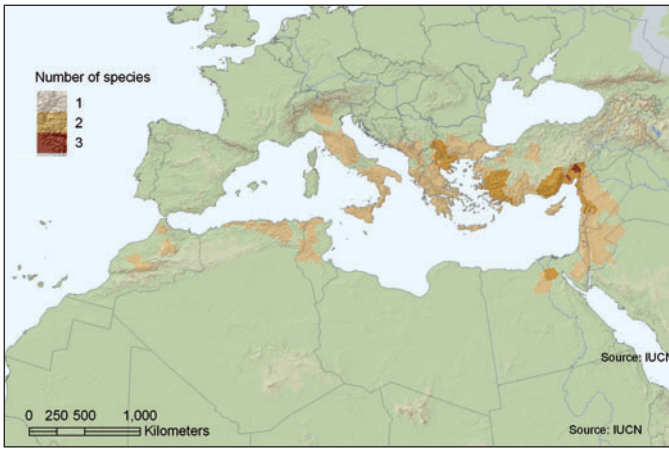
is about one fifth (19%) and about 1% of the species is already extinct in the region. These percentages will be higher if some of the currently Data Deficient species prove to be threatened. Sixteen species are already extinct in the region, including some endemics such as the Hula Painted Frog *Discoglossus nigriventris*, the



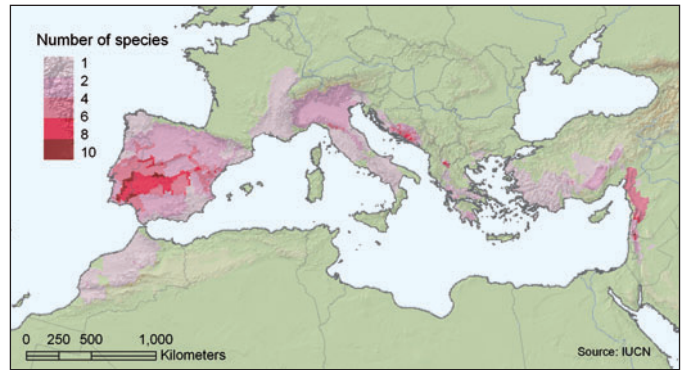
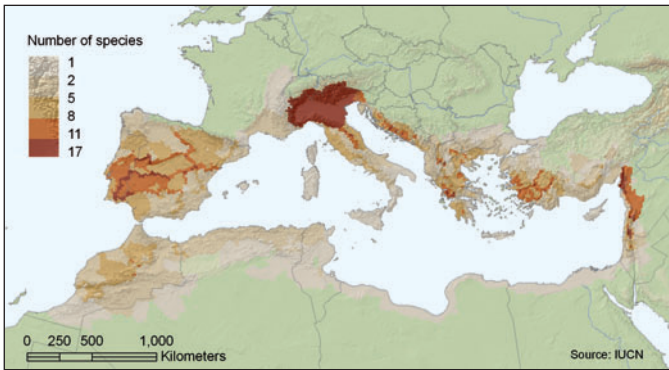
**Figure 3a.** Species richness of amphibians in the Mediterranean basin. **Figure 3b.** Species richness of globally threatened amphibians in the Mediterranean basin.



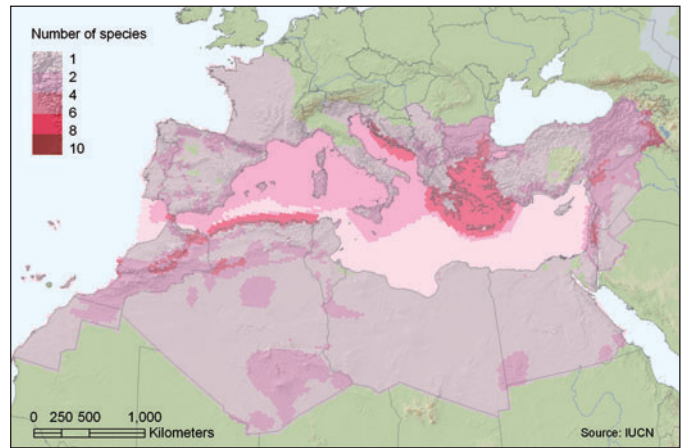
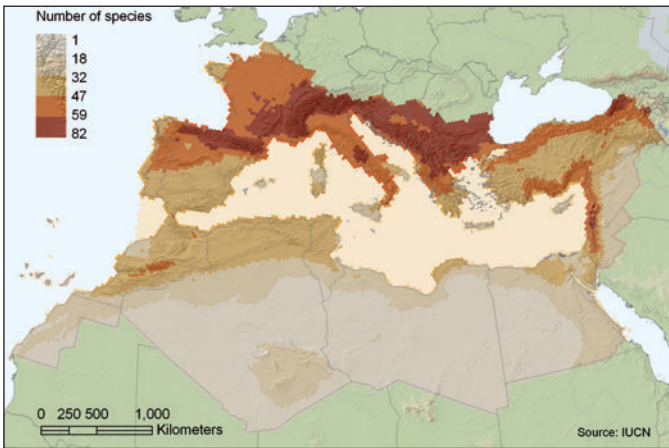
**Figure 4.** Species richness of globally threatened birds in the Mediterranean basin. (Map of bird species richness is not available).



**Figure 5a.** Species richness of crabs in the Mediterranean basin. **Figure 5b.** Species richness of regionally threatened crabs in the Mediterranean basin.



**Figure 6a.** Species richness of endemic freshwater fish in the Mediterranean basin. **Figure 6b.** Species richness of threatened endemic freshwater fish in the Mediterranean basin.



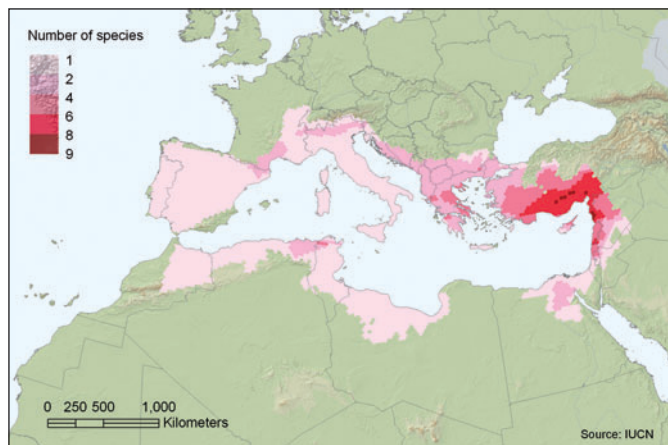
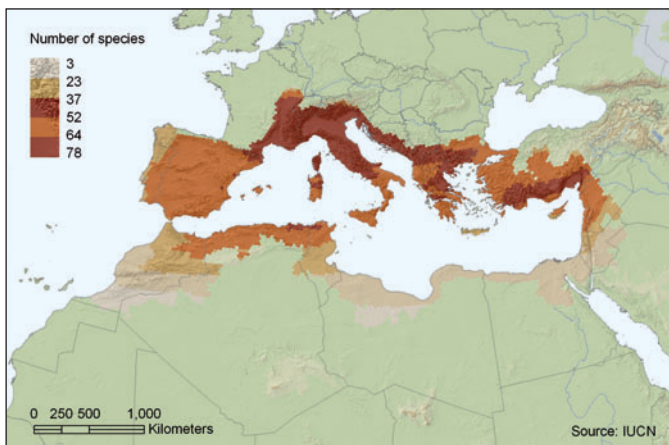
**Figure 7a.** Species richness of mammals (including cetaceans) in the Mediterranean basin. **Figure 7b.** Species richness of globally threatened mammals (including cetaceans) in the Mediterranean basin.

Canary Islands Oystercatcher *Haematopus meadewaldoi* and seven endemic freshwater fishes: *Tristramella intermedia*, *Tristramella magdelainae*, *Alburnus akili*, *Chondrostoma scodrense*, *Mirogrex hulensis*, *Telestes ukliva* and *Salmo pallaryi*. These extinctions signify the definitive loss of an important part of the world's biological heritage.

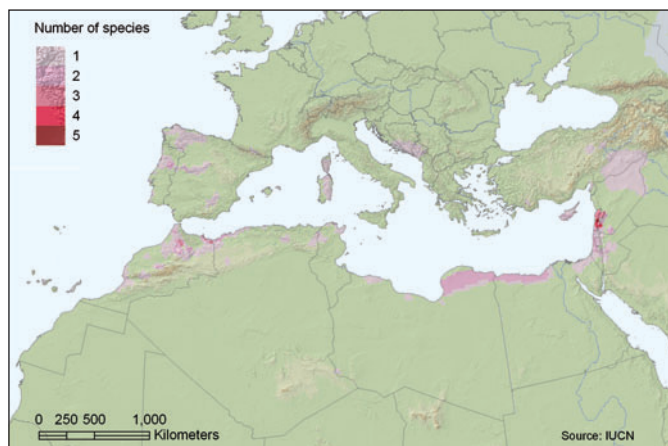
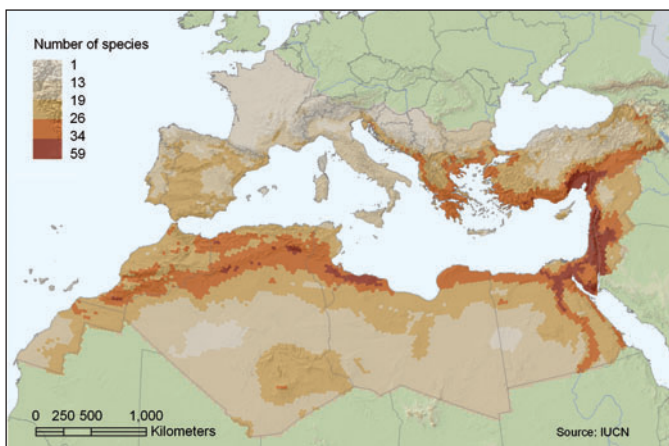
The geographic distribution of species richness and threatened species richness, highlighting regions with greater concentrations of species at risk that should be given particular attention, is presented for each taxonomic group in Figures 3 to 9.

### **Freshwater habitats**

In addition to invaluable "ecosystem services" such as food, water purification, flood and pollution control, and fertile sediment for agriculture, rivers and wetlands also provide irreplaceable habitats for thousands of species. But freshwater habitats are facing major threats: Mediterranean rivers contain more



**Figure 8a.** Species richness of dragonflies in the Mediterranean basin. **Figure 8b.** Species richness of regionally threatened dragonflies in the Mediterranean basin.



**Figure 9a.** Species richness of reptiles in the Mediterranean basin. **Figure 9b.** Species richness of globally threatened reptiles in the Mediterranean basin.

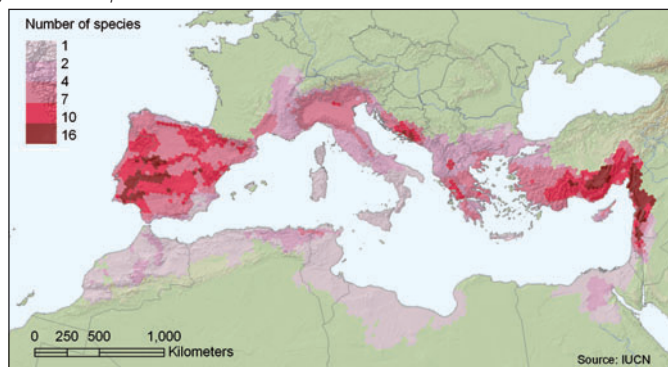
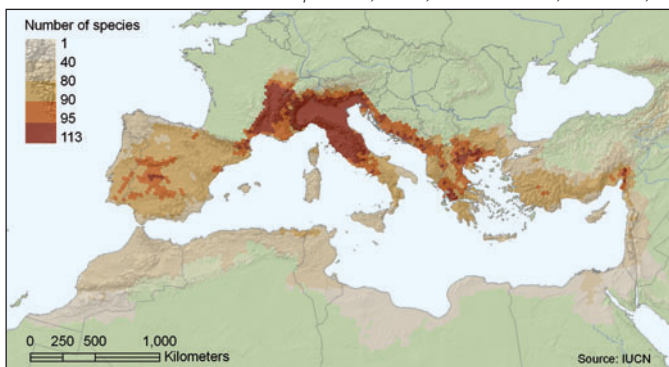
than 3,500 dams, sediment discharge is drastically reduced and water is diverted for energy production, irrigation or water supply, reducing therefore the original basin drainage area by about 78% (Poulos and Collins 2002). In most Mediterranean countries, water-use is approaching the limit of available resources (Blue Plan 2005) and several rivers are now seasonally dry.

**“Freshwater species contribute significantly to the economy, environment and livelihoods of Mediterranean societies”**

Of the species assessed, 547 amphibians, crabs, freshwater fishes, dragonflies, reptiles and mammals are dependant of freshwater habitat for at least some part of

their life cycle. The fact that 38% of them are threatened gives an indication of the worrying status of Mediterranean wetlands and rivers. Freshwater species have been mapped based on river basins flowing into the Mediterranean Sea and adjacent Atlantic Ocean river basins. Figure 10a provides an indication of patterns of high freshwater species richness, based on the species assessed to date, while Figure

**Figure 10a.** Species richness of freshwater amphibians, crabs, endemic fishes, mammals, dragonflies and reptiles in the Mediterranean basin. **Figure 10b.** Species richness of freshwater threatened amphibians, crabs, endemic fishes, mammals, dragonflies and reptiles in the Mediterranean basin.





Mediterranean freshwater-dependent species: Green Gomphid *Ophiogomphus cecilia* – Least Concern © Jean-Pierre Boudot. Pond Water-crowfoot *Ranunculus peltatus* – Not Evaluated © Serge Müller. *Economidichthys pygmaeus* – Least Concern © Ioannis Rousopoulos. Pyrenean Frog *Rana pyrenaica* – Endangered © Lars Bergendorf.

10b indicates concentrations of species at risk, in particular in the Iberian Peninsula, the Balkans, the western part of Greece and the area from Turkey down to Israel. More information about the conservation status of amphibians and endemic freshwater fish are detailed in Cox et al. (2006) and Smith and Darwall (2006).

Some species, such as various amphibians and dragonflies, are particularly sensitive to water quality and considered

to be good indicators of the health of freshwater systems. Monitoring the status of these freshwater species is therefore a key tool in the conservation of important Mediterranean wetlands.

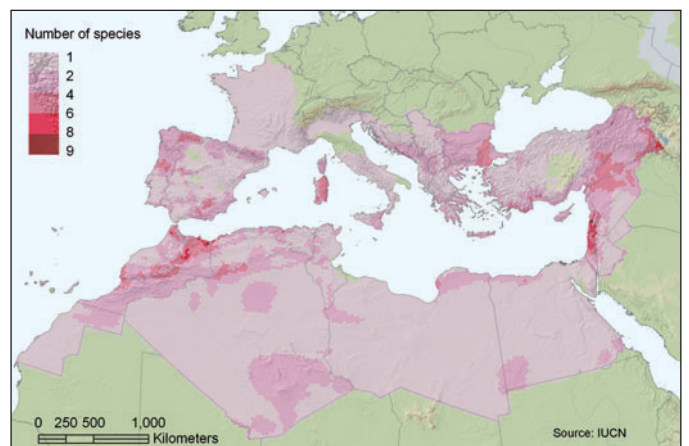
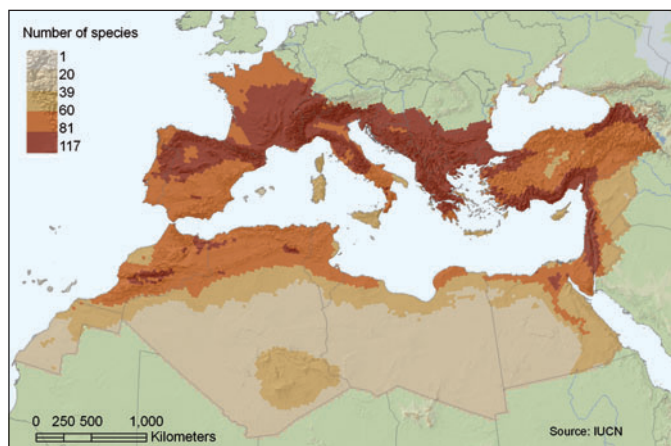
**Terrestrial habitats**

The Mediterranean region is made up of a mosaic of different terrestrial habitats, containing a diverse range of species, including 355 species of reptiles (Cox et al. 2006), 330 species of mammals, 106

species of amphibians, 158 species of dragonflies, about half of the species in the groups being endemic. There is also a high diversity of birds, invertebrates and plants. The initial results show that about 16% of the assessed terrestrial species are threatened with extinction.

Based on these results, terrestrial species richness is shown in Figure 11a. It's interesting to note the Hoggar mountain region, in the south of Algeria, which is an

**Figure 11a.** Species richness of terrestrial amphibians, mammals, dragonflies and reptiles in the Mediterranean basin. **Figure 11b.** Species richness of threatened terrestrial amphibians, mammals, dragonflies and reptiles in the Mediterranean basin.





## Box 2: Mediterranean island plants

With almost 5,000 islands and islets, the Mediterranean comprises one of the largest groups of islands in the world. Mediterranean islands display extraordinary features, with high rates of endemism, and act as a natural laboratory for evolutionary studies. Their particularities give rise to specific conservation challenges. Thus many of the endemic island plant species are confined to single small locations, they are extremely

vulnerable to habitat destruction, overgrazing, and urban expansion. The *Top 50 Mediterranean Island Plants* highlights some of the most threatened plant species of the Mediterranean islands, stressing particular situations and conservation needs (Montmollin and Strahm 2005).

## Box 3: Medicinal plants: Biodiversity that saves lives

North African people have ancient and rich traditions associated with the use of medicinal plants. Plant-derived products are used in the production of traditional medicines, cosmetics and perfumes. They are particularly important for people of the region, as they are sometimes the only source of medicine readily available. Mediterranean plants have been used in the development of modern pharmaceutical products and crop varieties, and about 70% of the North African wild plants in

the Mediterranean are known to be of potential value in fields such as medicine, biotechnology and crop improvements (UNEP 2006). Increased demand, coupled with unsustainable collection from the wild has led a number of important plant species to become scarce in areas where they were previously abundant. The regulation of their collection is therefore essential, to ensure that these valuable species continue to be available in future.

important refuge for numerous species. However, this map is only indicative, as plants and invertebrates, which account for most of the terrestrial species, have not yet been assessed. Figure 11b indicates some areas of particular concern, due to the high numbers of threatened species, in particular Morocco, the eastern rim of the Mediterranean basin and Turkey.

### Marine habitats

The Mediterranean Sea contains an immense diversity of life despite its small area. Of the world's 85 cetacean species, 23 are known to occur in the Mediterranean and the Black Seas. Some are just visitors, but nine species are known to be year-round residents in the Mediterranean (Reeves and Notarbartolo 2006). An additional marine mammal species is

encountered in the Mediterranean Sea: the Mediterranean Monk Seal *Monachus monachus* – the world's most endangered pinniped. Cartilaginous fishes (sharks, rays and chimaeras) are also present, with 71 species living and breeding in the Mediterranean Sea (Cavanagh and Gibson 2007).

Despite the general impression of homogeneity, under-sea ecosystems are very diverse, with submarine mountains, canyons and other specific hydrological features. As a consequence, marine species are not evenly distributed (Figures 12a and 12b) and some areas are of critical importance for the conservation of these species as they provide unique nursery and feeding sites.

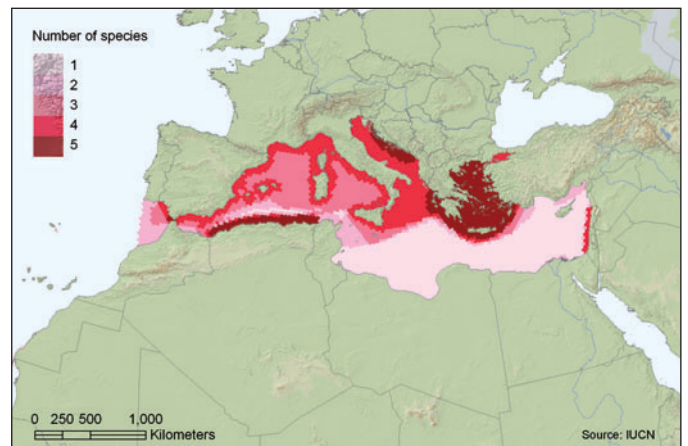
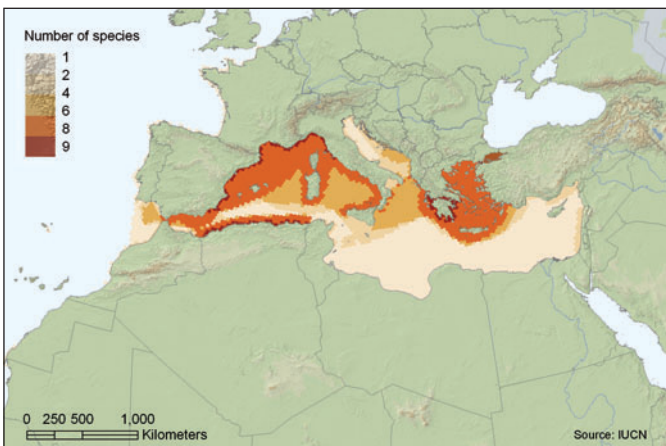
Sharks are the top predators of the Mediterranean Sea food chain: they regulate species abundance, distribution and diversity, and they help maintain the marine ecosystem's health and limit disease dispersal by taking sick or weak prey. Nonetheless, they are facing a particularly high risk of extinction. Accidental killing, intensive fishing activities and pollution are severe threats for these species, and the situation in the Mediterranean Sea is much bleaker than it is worldwide: 42% of the shark species are threatened in the region



*Mediterranean terrestrial species: Kythrean Sage Salvia veneris – Critically Endangered* © Yiannis Christofides. *Desert Horned Viper Cerastes cerastes – Least Concern* © Wolfgang Böhme. *Egyptian Vulture Neophron percnopterus – Endangered* © IUCN Spanish Committee. *Spanish Ibex Capra pyrenaica – Least Concern* © Pedro Regato.



Mediterranean marine species: Short-Beaked Common Dolphin *Delphinus delphis* – Endangered © Giovanni Bearzi/Tethys. Long-snouted Seahorse *Hippocampus guttulatus* – Data Deficient © TUDAV. Goose Foot Star *Peltaster placenta* – Not Evaluated © TUDAV. Giant Devilray *Mobula mobular* – Endangered © Maurizio Würtz.



**Figure 12a.** Species richness of marine mammals in the Mediterranean Sea. **Figure 12b.** Species richness of threatened marine mammals in the Mediterranean Sea.

in comparison with 17% globally, which has led to the Mediterranean being described as the most dangerous sea in the world for cartilaginous fishes (Cavanagh and Gibson 2007).

The analysis of marine mammals and shark species, as well as the first results for other marine fish species, displays a particularly striking feature of the marine ecosystem: about one third of species are assessed as Data Deficient; in other words, there is insufficient information to determine which Red List Category a species should be

placed in. Research at sea is logistically more difficult and more expensive than on dry land, even in a sea as much used as the Mediterranean. This means that the real number of threatened species could well be much higher and that species could be declining or perhaps even disappearing from our waters without us even noticing.

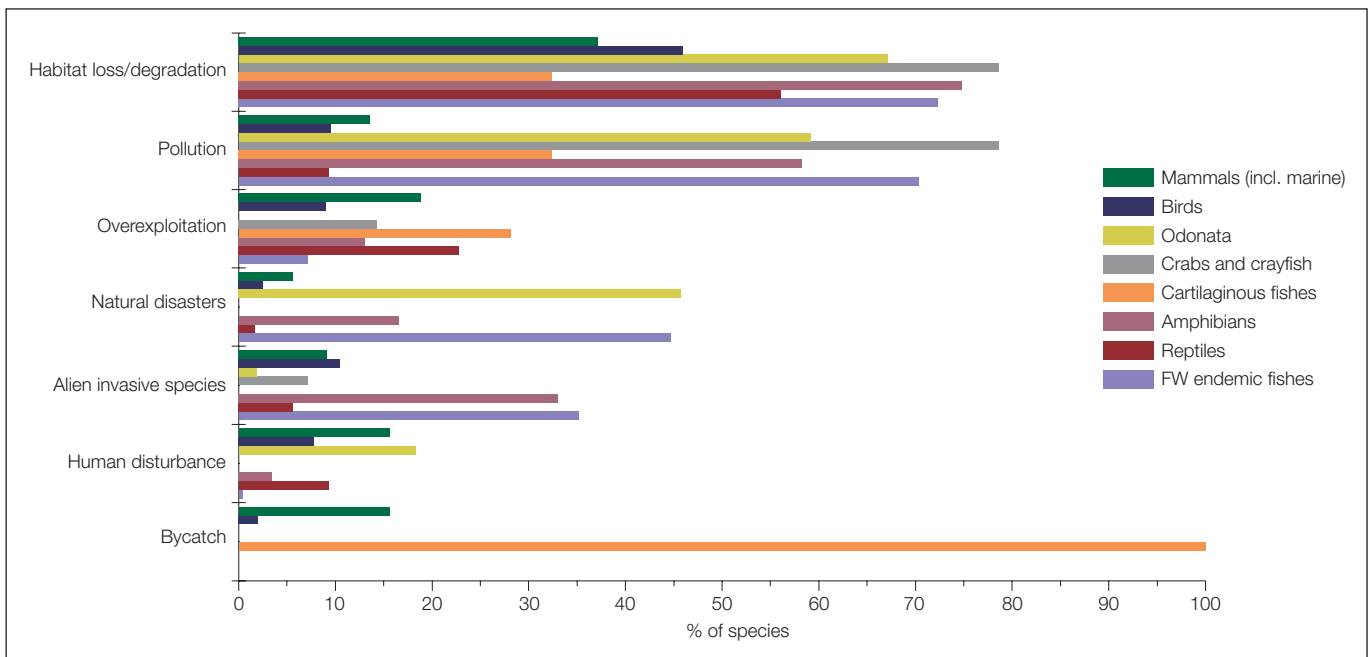
**The main causes of threat: why are so many species in peril?**

**Habitat Loss and Degradation**

As Figure 13 clearly shows, the loss, fragmentation and degradation of

**Box 4: The most important causes of threat for Mediterranean species (by order of importance):**

- Habitat loss and degradation
- Pollution
- Overexploitation (unsustainable harvesting, hunting and fishing)
- Natural disasters
- Invasive alien species
- Human disturbance
- Bycatch



**Figure 13.** Breakdown of the major threats to amphibians, birds, cartilaginous fishes, crabs and crayfish, dragonflies, endemic freshwater fishes, mammals (including marine mammals) and reptiles in the Mediterranean.



habitats as a direct or indirect result of human activities is the main threat to Mediterranean species. This applies to all taxonomic groups and to all parts of the Mediterranean region. Changes in land-use patterns, such as intensification or abandonment of agricultural practices, urbanization, industrialization or tourism development are some of the main causes of this degradation.

Infrastructure development is strongly affecting some of the most fragile habitats. For example, 32% of freshwater fishes are threatened by dam construction (Smith and Darwall 2006), which drastically alters hydrological processes, reduces the amount of water available downstream, blocks migratory routes and can impair reproduction (McAllister *et al.* 2001).

### **Pollution**

For the groups of species assessed so far, the second most important cause of threat is pollution. For example, chemical pollutants such as polychlorinated biphenyls (PCBs) are well known to affect the immune system, increasing sensitivity to illness, and causing increased mortality and impaired reproductive success. Mediterranean populations of

*Dam in Northern Spain.* © Kevin Smith.

Striped Dolphins *Stenella coeruleoalba* have suffered population declines due to morbillivirus infection, and it is believed that PCBs played an important role by compromising the immune system of the affected animals.

Another type of pollution is noise pollution: in the Mediterranean Sea, the increasing levels of noise due to marine traffic are harming cetaceans by impairing their ability to communicate and to locate their prey.

Solid waste is also a serious problem: discarded plastic bags have caused the death of many marine animals such as turtles, birds or dolphins that mistake the bags for jellyfish and die from ingesting them. Runoff of agricultural fertilizers causes eutrophication of coastal waters and can result in the formation of “dead zones”, where no oxygen is available and fish and crustaceans cannot survive (Diaz and Rosenberg 2008).

### **Overexploitation (Unsustainable Harvesting, Hunting and Fishing)**

Overexploitation is a serious problem for Mediterranean species, affecting many threatened plants, reptiles, fishes, and other species. Overexploitation is driven by several causes: for example, demand for traditional medicines is threatening some plants, seahorses and mammals species. Illegal trade is also of major concern in the Mediterranean: the Critically Endangered Egyptian Tortoise *Testudo kleinmanni* is, for example, heavily affected by the illegal national and international pet trade. Increased fishing activities and more efficient fishing boats and gear have resulted in the overfishing and consequent decline of some fish species. Overexploitation is likely to be of major importance for some Mediterranean species groups (e.g., marine fishes and medicinal plants) for which comprehensive assessments have not yet been completed.

### **Natural Disasters**

Many Mediterranean species are threatened by natural disasters or extreme climatic events, notably forest fires and droughts. The frequency of such events is expected to increase as a result of global climate change. Climate change models indicate that the Mediterranean

region will experience decreasing rainfall and increasing sea temperatures (Bates *et al.* 2008), which will have an impact on the distribution and survival of species. Information collected during the Red List assessment process shows that populations of North African freshwater species such as molluscs and dragonflies are already shifting their ranges northwards in response to rising temperatures and decreasing availability of water – and there is a limit as to how far north they can move, given that the Mediterranean Sea presents a major barrier to dispersal. Through a combination of climate change, increased water abstraction, and the construction of dams, some rivers in North Africa are now completely dry for parts of the year when previously they flowed year-round, and some springs have completely dried out. A number of range-restricted molluscs are already feared to have gone extinct.

### **Invasive Alien Species**

Invasive alien species are alien species which become established in natural or semi-natural ecosystems or habitat, are an agent of change, and threaten native

biological diversity (IUCN 2000). Their introduction can be deliberate, to satisfy human needs (food, pest control) or accidental (often as a result of increased globalization of transport). These invasive species can cause enormous damage to ecosystems, livelihoods and human health, and they are one of the most important causes of biodiversity loss, especially on Mediterranean islands. Due to a lack of information and awareness, the issue of invasive species and their effects is often underestimated and adequate prevention and mitigation measures are lacking.

### **Human Disturbance**

The Mediterranean is a densely populated region that receives large numbers of visitors each year, and direct disturbance by humans is an important threat to some animals and plants, including iconic Mediterranean species such as the Northern Bald Ibis *Geronticus eremita* and the Mediterranean Monk Seal *Monachus monachus*, both listed as Critically Endangered. Disturbance at breeding sites can be particularly problematic, as species may abandon their young.

#### **Box 5: The Water Hyacinth**

The Water Hyacinth *Eichornia crassipes*, originally from the Amazon basin in South America and introduced for ornamental use in garden ponds, is now widely distributed in the Mediterranean basin. Doubling its population every two weeks, it covers quickly rivers and water bodies, impeding boat traffic, competing with endemic aquatic plants and, by reducing the light available under the water, threatening the whole ecosystem (Lowe *et al.* 2000). Its control costs millions of Euros each year just in the European Mediterranean countries.

© Geoffrey Howard.

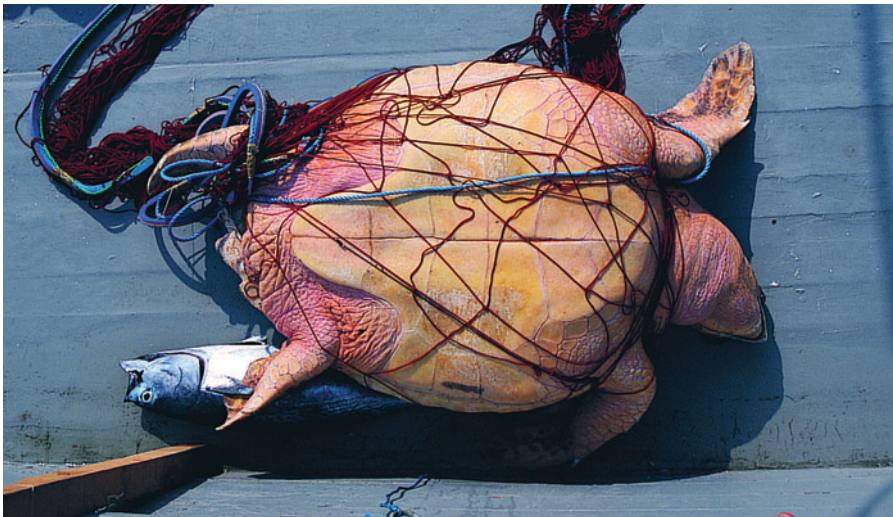


#### **Box 6: The Mediterranean Monk Seal**

The Mediterranean Monk Seal *Monachus monachus* is classified as Critically Endangered and is the most threatened pinniped species in the world. Only 350-450 animals survive, with the largest remaining population sited in the eastern Mediterranean, in Greece, western Turkey and some islands in the Ionian and Aegean Seas. Remnant populations are fragmented and declining. The main threats are linked to human activities and include exploitation, bycatch and persecution. More recently, tourism has grown to become one of the most significant hazards faced by monk seals, particularly in the eastern Mediterranean: as well as causing significant disturbance to individuals and breeding colonies, tourist activities increase the risk of vessel accidents, spills, transmission of disease, and the discharge of pollutants and waste near the seals (IUCN 2007).

### **Bycatch**

Most of the Mediterranean marine species assessed so far are affected by accidental capture in fishing gear, also called



A Loggerhead Turtle *Caretta caretta* trapped in a swordfish driftnet. This species is listed as Endangered. © TUDAV.

"bycatch". This is considered to be a major threat for sharks, rays, dolphins and marine turtles. All shark species are considered to be threatened by bycatch, but the large coastal species, which are more exposed to intensive fishing pressure, are thought to be the most seriously affected (Cavanagh and Gibson 2007).

### Conservation actions to prevent extinction

Numerous national, regional and international actions have been put in place to enhance species survival in the Mediterranean. Through the Mediterranean Species Assessment process participating scientists propose recommendations for targeted conservation actions that are needed to reduce species extinction risk and which can help Mediterranean states to monitor whether or not they are meeting their obligations under the regional and global conventions and multi-lateral agreements.

#### Box 7: Main conservation actions for Mediterranean species:

- Species protection
- Site protection
- Conservation of the wider environment
- Communication and education
- Monitoring and research

### Species protection

Improvement and enforcement of legal protection for threatened species and their habitats is the most urgent conservation

action to be taken at both regional and national levels. Many threatened species currently have no legal protection: for example, little more than a quarter (27%) of threatened sharks benefit from any form of protective legislation.

Species Action Plans can be an effective means of determining specific conservation actions that are needed and for promoting coordinated activities. The implementation

#### Box 8: The Mallorcan Midwife Toad

The Mallorcan Midwife Toad *Alytes muletensis* is a very rare species endemic to the island of Mallorca (Spain). It is threatened by predation by the introduced Viperine Snake *Natrix maura*, and competition for space with Perez's Frog *Pelophylax perezii*, as well as by habitat loss owing to the development of tourism and human settlements. A conservation and recovery plan is being undertaken by the Species Conservation Service of the Conselleria de Medi Ambient in Mallorca, with captive breeding and reintroductions taking place. Thanks to these measures, the species, initially assessed as Critically Endangered, has now been downlisted to Vulnerable.

Male Mallorcan Midwife Toad carrying eggs. © Richard Griffiths.



of action plans has significantly improved the status of some Mediterranean species, such as the Dalmatian Pelican *Pelecanus crispus* (Nagy and Crockford 2004). The Barcelona Convention (1976) defined action plans for key Mediterranean threatened species (such as the Monk Seal, the sharks or the marine vegetation). Mediterranean assessments can support this process by providing crucial information on threatened species.

The primary goal of species conservation is the preservation of viable populations of wild species in their original native range. However, in certain circumstances, in particular for the most threatened species, intensive management such as captive breeding may be necessary to ensure the survival of species that are close to extinction.

### Site protection

Site protection, for example through the designation of protected areas, is one of the most effective means of reducing global biodiversity loss. However, the goal of protecting at least 10% of each of the world's ecological regions by 2010 is still far out of reach, especially the commitment to create and sustain a coherent network of Marine Protected Areas (MPAs) by 2012 (World Sustainable Development Summit, Johannesburg 2002). In order to effectively safeguard all threatened species, especially threatened endemics, protected areas need to be designed as representative networks and to integrate a gap analysis assessing the adequacy of species coverage. In this respect, Mediterranean marine protected areas are notably under-developed and the southern and eastern parts of the area, despite their importance for the marine biodiversity, are insufficiently protected.

**“Integrating species data and spatial distributions into the planning and designation of protected areas allows the establishment of more efficient and representative networks.”**

## Conservation of the wider environment

Although protected areas are a key tool for protecting species, many plants and animals live outside these areas, often in semi-natural or man-made environments where coexistence with humans is the only option for survival, and where wildlife conservation is just one of many competing land-uses. For species to prosper in the wider environment, it is essential that biodiversity conservation is integrated into public policy in other sectors that impact on species and their habitats, notably agriculture, fisheries, forestry, urban planning, transport, water management, and so on.

Integrated River Basin Management (IRBM) takes an ecosystem approach to the management of rivers, associated wetlands and groundwater systems. River basins are dynamic systems, and any single management intervention has implications for the system as a whole. IRBM is the process of coordination, through stakeholder participation, of biodiversity conservation, management and water resource allocation decisions across the river basin as a whole to ensure that freshwater ecosystems are maintained whilst ensuring that human development needs are equitably met.

### Box 9: The Gizani

The Gizani *Ladigesocypris ghigii* is a fish species endemic to Rhodes, Greece, which is threatened by water abstraction and is classified as Vulnerable. It has been the subject of a LIFE-Nature project involving the study of its geographic range, life history, reproduction, nutrition, habitat preferences, genetics and threats. Conservation actions designed include an Action Plan focusing on the sustainable management of the island's water resources. This project has helped to ensure the future survival of this species, showing that good conservation practices can reduce a species' risk of extinction (Stoumboudi 2000).

## Communication and Education

Effective conservation cannot be achieved without the support of those people dependent on natural resources. Communicating about the status of their environment, its importance for humans,



Tajo National Park (Guadalupe, Spain). © Pedro Regato.

the main threats and the actions that could be taken to mitigate them is an essential part of sustainable development. The species assessments provide timely and reliable information on which such communication can be based. They promote synergies and collaboration between regional actors to enhance conservation efforts to halt biodiversity loss, as exemplified by the establishment of the first Intercontinental Biosphere Reserve between Spain and Morocco.

## Monitoring and research

A solid evidence base is necessary to determine conservation priorities and take appropriate action. The Mediterranean assessments provide a baseline against which future progress can be assessed, and provide a wealth of information on species status, population size and trends, distribution, habitat requirements, threats, conservation actions in place and needed, and other factors that will be of use to policymakers, conservation practitioners, natural resource managers and others. However, scientific information, especially in the marine ecosystem, is still lacking and research programmes are crucial to further develop the understanding and knowledge needed to underpin sound natural resource management.

## Key findings

- The regional assessments confirm the high diversity and endemism of Mediterranean plants and animals, but also underline the severe threats that these species face. Nine species groups have been comprehensively assessed to date (amphibians, birds, cartilaginous fishes, cetaceans, crabs and crayfish, endemic freshwater fishes, mammals, dragonflies and reptiles), and almost a fifth of these species are threatened with extinction, with 5% Critically Endangered, 7% Endangered and 7% Vulnerable.
- Freshwater ecosystems are under particularly severe pressure - over 56% of endemic freshwater fish species are threatened with extinction.
- The marine ecosystem is poorly known, with around one third of marine species assessed to date listed as Data Deficient.
- Assessment of additional groups of species in this biodiversity hotspot is ongoing, and results will soon be available for marine fishes, freshwater molluscs, butterflies and endemic plants.
- Mediterranean species are threatened with extinction as a result of human



Educational activity in Salum, Egypt. © Nature Conservation Egypt.

activities. Habitat destruction, pollution, unsustainable exploitation, and other threats are taking a heavy toll on the region's biodiversity. Climate change, which is predicted to cause increasing droughts in this already arid region, is set to be an increasingly significant threat in the future.

- Urgent action is needed to preserve the future of the Mediterranean. Sustainable management and legal protection of species and their habitats are the key conservation actions to be promoted in the Mediterranean region, but education and research are also needed.
- Conservation actions applied to date have had positive results and some species have already been saved from extinction. However, in a region like the Mediterranean, where biodiversity is so strongly influenced by human activities, biodiversity loss is a constant reality that will only be stopped when humans realize how much their present and future health and prosperity can be damaged when species disappear.

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