European Environment Agency

Europe's biodiversity
- biogeographical regions and seas

Seas around Europe

The Mediterranean Sea
- blue oxygen-rich, nutrient-poor waters

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CONTENTS

Summary

- The Mediterranean Sea is oligotrophic: it is rich in oxygen and poor in nutrients. Oligotrophy increases from west to east.
- The fauna and flora is one of the species richest of the world and there is a high rate of endemism.
- Introduced alien species are increasing in the eastern basin.
- Compared with the Atlantic, the Mediterranean marine communities have many different species with generally smaller individuals (Mediterranean nanism).
- Eutrophication in coastal areas has almost certainly resulted in an increase in fish catches of some pelagic fish species in the formerly low-nutrient waters of the Mediterranean Sea.
- The immunosuppressive effects of contaminants arising from agriculture, industrial activity and population growth may have contributed to the severity of mass mortalities among marine mammals in the Mediterranean Sea and the additional chronic effects of organochlorines could hinder, or even prevent, recovery of individuals from pathogenic disease.
- Introduction of alien species through ballast waters, fouling, import and invasion has resulted in the establishment of dense natural populations of species. However, the impact of some intruders like the tropical alga *Caulerpa taxifolia* has had catastrophic effects on the natural environment.
- Fishing has resulted in overexploitation of several fish stocks in the Mediterranean. Mortality of the monk seal is mostly associated with fishing. Overexploitation by intensive collection has led to a serious decline in some corals and many shellfish.

1. What are the characteristics of the Mediterranean Sea?

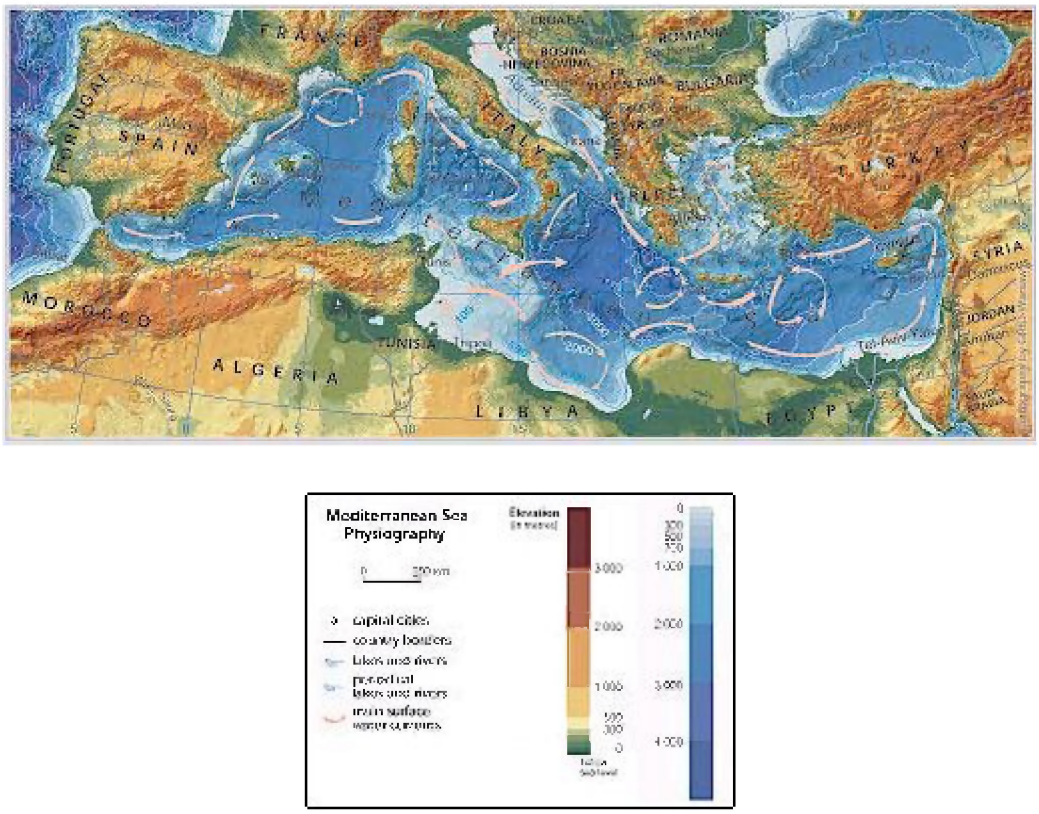
1.1 General characteristics

Table 1: Statistics for the Mediterranean Sea

Surface km^2	Coastal length km	Depth average m	Temperature average °C (W-E)	Salinity average ‰ (W-E)
2.5 million	46 000	1 500	15-21	36.2-39

The Mediterranean is the largest semi-enclosed European sea. It has a narrow shelf and in the north is mostly bordered by mountain chains sloping steeply into the sea, resulting in a narrow littoral zone and small drainage basin. The Siculo-Tunisian sill (400 metres (m)), separates two distinct zones, the western and the eastern basin, and acts as a geographical and hydrological frontier.

Map 1: The Mediterranean Sea physiography (depth distribution and main currents)



Source: EEA. UNEP/GRID Warsaw final map production.

1.1.1 Hydrography

Evaporation exceeds precipitation and river runoff. The sea is therefore a 'concentration basin' with an estimated freshwater deficit of about 2 500 cubic kilometres (km3) per year (EEA, 1999). This results in the water being saltier than in other European seas. The yearly average temperature and salinity for surface and deep waters is shown in Table 2. The distribution of surface temperature and pigments caused by chlorophyll, as derived from satellite images, is accessible online (http://www.cls.fr/mfspp/). The circulation pattern in the Mediterranean is shown schematically in Map 1.

Oxygen levels are almost saturated in the surface layer (6 millilitres per litre (ml/l) in winter and 4.8 ml/l in summer). In the deep water the oxygen concentration is around 4.5 ml/l in the western and 4.2 ml/l in the eastern basin. The main rivers are the Ebro, Rhone, Po and Nile.

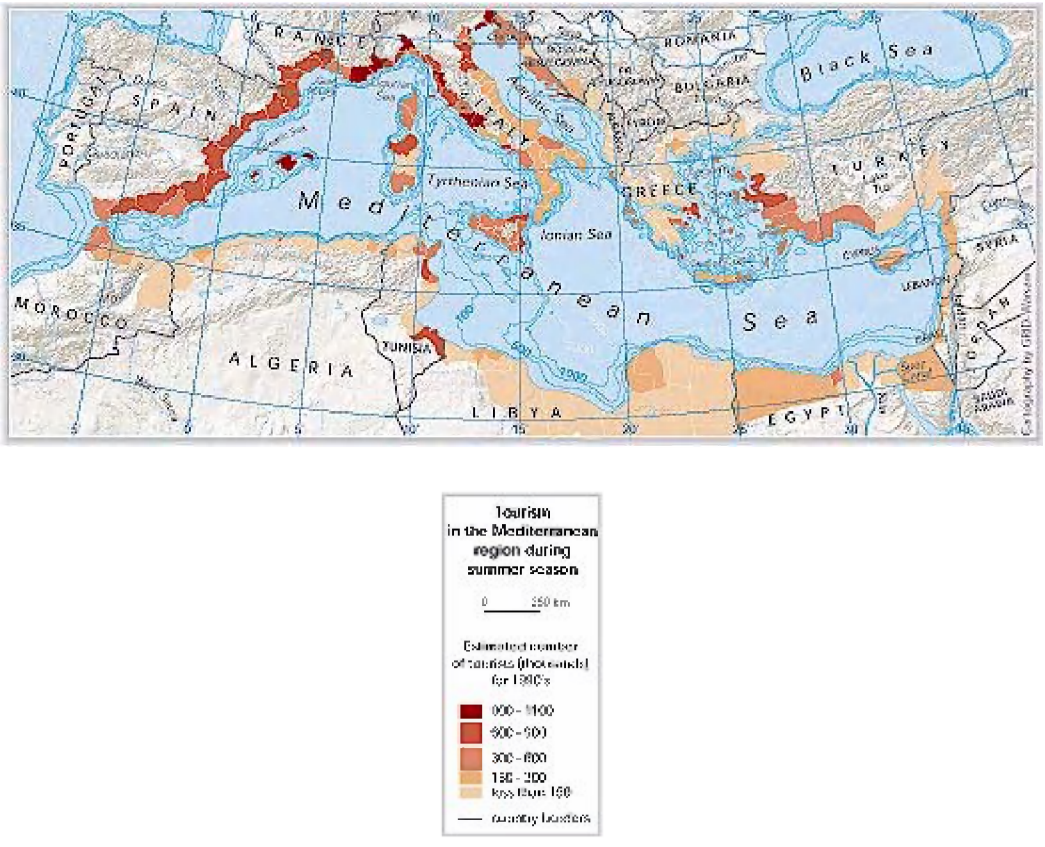
Table 2: Mean surface temperature (winter-summer) and salinity values in the surface and intermediate (200 - 1 000 m) layers of the Mediterranean Sea

Sea area	Salinity (‰)		Temperature °C	
	Surface	Layer at 200-1 000 m	Surface	Layer at 200-1 000 m
Gibraltar	36.2	38.4	15-20	13.5
Sicily Straits	37.5	38.6	14-23	13.8
Straits of Crete and south Aegean	38.7	38.8	16-24	14.9
Levantine	39.0	38.9	16-26	14.9

1.1.2 Population

The population of the Mediterranean countries is about 450 million. The population pressure is constantly increasing because of tourism. The mild climate and the natural and cultural heritage attract huge numbers – about one third of world international tourism – seasonally concentrated in the coastal zones, particularly on the shores of the north-western basin. Map 2 shows the estimated distribution of tourists during the peak period. 'Blue Plan' scenarios show the number of tourists increasing from 135 million in 1990 to 235–353 million in 2025 (UNEP-RAC, 1995).

Map 2: Estimation of tourism during summer season in the Mediterranean



Source: UNEP-RAC, 1995.

1.2 Main influences

• Eutrophication and pollution arising from agriculture, industrial activity, tourism and population growth.
• Introduction of exotic species through ballast waters, fouling, import and invasion.
• Fisheries and exploitation of living resources.

1.3 Main political instruments

• The legal framework for the conservation of natural habitats and species in the Mediterranean is provided by the Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona Convention) (1976), the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (1979), the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) (1979) and the RAMSAR Convention on Wetlands of International Importance especially as Waterfowl Habitat (1971).

The body responsible for the implementation of the Barcelona Convention in the Mediterranean is UNEP/MAP (Mediterranean Action Plan), through MEDPOL (Mediterranean Pollution Monitoring and Research Programme). CIESM (International Commission for the Scientific Exploration of the Mediterranean Sea) provides the scientific framework for the exploration of the Mediterranean.

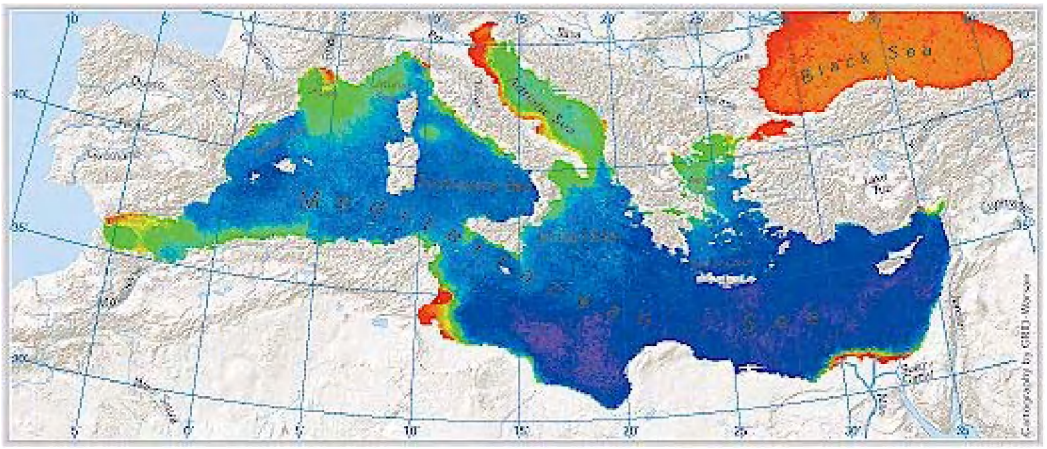
• For the European Union Member States along the northern shore of the sea, the EU Birds and Habitats Directives implement the conventions through the protection of coastal and marine habitats and species.

1.4 Biodiversity status

The Mediterranean fauna and flora have evolved over millions of years into a unique mixture of temperate and subtropical elements, with a large proportion (28 %) of endemic species (Fredj et al., 1992). The present-day variety of climatic and hydrological situations and Mediterranean-specific biotopes account for the great species variety, with few equals in the world, a result partly of the geological history of the area. A total of 10 000 to 12 000 marine species have been recorded (with 8 500 species of macroscopic fauna and more than 1 300 plant species). This rich biodiversity represents 8 to 9 % of the total number of species in the world's seas and new species are still being recorded, especially in hitherto unexplored water layers or areas.

Nutrient concentrations decrease from west to east resulting in variations in the structure of the pelagic food web. The SeaWiFS satellite image (Map 3) shows the clear, pigment-poor oligotrophic waters of the Mediterranean Sea compared with the eutrophic waters in the Black Sea. A clear west–east gradient in chlorophyll concentrations is depicted in the image, which is indicative of increasing oligotrophy towards the east. The main exception to the overall oligotrophic nature of the eastern Mediterranean is the highly eutrophic system of the north Adriatic Sea caused by municipal sewage and discharges of nutrients by the northern rivers.

Map 3: Mean chlorophyll concentrations in autumn 1998.

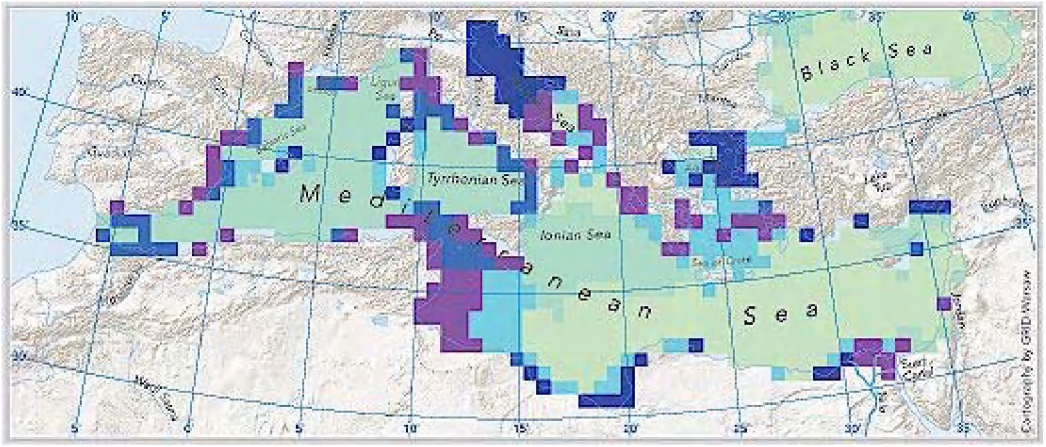


Source: NASA SeaWiFS Project and ORBIMAGE Inc.

Note: A composite of all data received during September, October and November derived from the SeaWiFS ocean colour sensor

A description of the great variety of ecosystems in the Mediterranean Sea was given by Peres and Picard (1958); it has since been amended by Augier (1982) and Bellan-Santini et al. (1994). The basic scheme of classification, based on depth, sediment type, hydrodynamics, light transmission and plant distribution, has been widely adopted by Mediterranean scientists. Compared with the Atlantic, the Mediterranean marine communities have more species with generally smaller individuals (Mediterranean nanism) having a shorter life cycle (Bellan-Santini *et al.*, 1994).
Map 4 is an example of species distribution along the Mediterranean Sea, considering only the species of importance to fisheries. The general pattern of species richness in the Mediterranean Sea is similar to that of chlorophyll concentration shown in Map 3.

Map 4: Distribution of selected species of interest to fisheries (shell fish, squid and octopuses, sharks, rays and bony fish)



Source: WWF, Mediterranean Marine Gap Analysis (S. Cirlaco and C. Franzosini)

1.4.1. Plankton and Benthos

• Plankton

Recent work has shown that primary production rates are on average three times lower in the eastern than in the north-western basin (Turley, 1999). Primary production rates integrated over the euphotic zone (maximum depth: 120 m) were low and about 40, 78 and 155 micrograms of carbon per square metre (mg C/m^2) per day in the eastern, central and western Mediterranean basins respectively (Gotsis-Skretas, unpublished data). The low primary production, combined with poor development of higher levels of the food chain, including low fish production, are characteristic features of the Mediterranean.
About 470 zooplankton species have been recorded in the Mediterranean coastal and offshore waters. In contrast to the Atlantic, the deep waters of the Mediterranean Sea are characterised by the absence of true deep sea (bathypelagic) species. Instead they are occupied by inhabitants of the intermediate layers (200–500 m), the so-called 'mesopelagic' fauna. The general increase in oligotrophy towards the east is also reflected in zooplankton abundance and biomass. According to the latest available data (June 1999) zooplankton abundance in the 0 to 100 m layer varies between 93 individuals/m3 (south Cyprus) to 898/m^3 in the Balearic Sea (Siokou-Frangou, unpublished data).

Table 3: Summary of the ratios of productivity in the western and eastern basins of the Mediterranean

	West/east ratio
Primary production	3.3:1
Bacterial production	1.8:1
Fish production	2.7:1

Source: Turley, 1999

• Benthos

ERMS (European Register of Marine Species) does not yet have a complete inventory of the benthic species in the Mediterranean Sea and least is known about the eastern basin. The geographical distribution of species is not included in the current compilation of the ERMS register. Table 4 is a compilation from various sources.

Table 4: List of Mediterranean invertebrate fauna

Species group	Species number
Sponges (*Porifera*)	622
Sea anemones, corals and jellyfishes (*Cnidaria*)	420
Sea mat, hornwrack (*Bryozoa*)	~ 500
Segmented worms (*Annelida*)	1 000
Snails, bivalves, squids and octopuses (*Mollusca*)	2 000
Starfishes and sea urchins (*Echinodermata*)	154
Little known groups	
Echiurida	6
Priapulida	3
Sipuncula	33
Brachiopoda	15
Pogonophora	1
Phoronida	4
Hemichordata	5
Arthropoda	~1 935

1.4.2. Large Fauna

- **Fish**

More than 600 fish species (including 81 cartilaginous fish such as sharks and 532 bony fish) have been recorded. Their distribution is not homogeneous: there are twice as many species in the western than in the eastern basin (Garibaldi and Caddy, 1998) (Map 4).

- **Reptiles**

There are three turtle species in the Mediterranean: the leatherback (*Dermochelys coriacea*), the green (*Chelonia mydas*) and the loggerhead turtle (*Caretta caretta*). The loggerhead is most affected by fishing activities (surface long lines). Since the turtle populations seem to be genetically isolated from the Atlantic Ocean, fishing mortality cannot be counterbalanced by immigration (UNEP-RAC/SPA, 1999c).

- **Birds**

Wetland loss and habitat degradation are recognised as serious threats for nine out of 33 breeding colonial waterbird species found along the Mediterranean coastline (Erwin, 1996).

- **Mammals**

Among the 22 species of whales (cetaceans) reported, 10 have only been sighted occasionally and are probably not true inhabitants. The other 12 species occur regularly, eight being common and four much less frequent (Beaubrun, 1994). Nineteen of the cetaceans and seals are listed in Annex II (List of endangered or threatened marine species in the Mediterranean) of the Barcelona Protocol concerning Specially Protected Areas and Biological Diversity.

2. What is happening to biodiversity in the Mediterranean Sea?

No species seems to have totally disappeared from the Mediterranean in recent years. However, some have disappeared from disturbed parts, especially in closed gulfs affected by industrial and urban pollution, and seem likely to become extinct in the near future. Moreover, ecosystems, for example the composition and structure of the pelagic and benthic communities, often change for the worse in response to increased human pressures. In the Venice lagoon for example, where 141 algal species were found in 1938, only 104 were found in 1962 and 95 in 1987. There are zones in the most polluted parts of the lagoon with no species at all (azoic).

The most characteristic habitat types of the Mediterranean are in the coastal zone, the *Cystoseira* biocenosis and the *Posidonia oceanica* beds (see case study), *Lithophyllum lichenoides* communities, which are sensitive to oil, coral communities, which are sensitive to erosion from deliberate tearing-off, and *Corallium rubrum*, which is sensitive to reduction in water transparency due to pollution and turbidity.

Case study - *Posidonia oceanica*

Seagrass beds are one of the most critical ecosystems in the Mediterranean. *Posidonia oceanica* beds or meadows have regressed considerably, in particular near the large urban centres: Athens, Naples, Genoa, Toulon, Marseilles and Barcelona. The time required for re-colonisation of the lost beds is estimated at about 3 000 years.

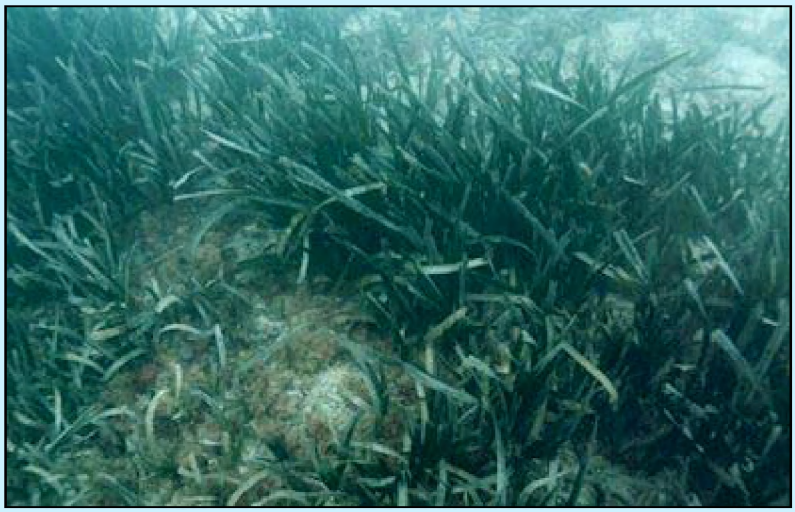
Posidonia oceanica is a slow-growing submerged marine flowering plant (not an alga), which forms vast underwater beds or meadows, housing and feeding very large numbers of other species. *Posidonia oceanica* is protected under the EU habitats directive. In addition to other threats, *Posidonia* beds are being invaded and choked by a fast growing tropical green alga (*Caulerpa taxifolia*), which was accidentally introduced to the northern Mediterranean in 1984, where it is now spreading rapidly. Possibilities for recovery are being studied.

Table 5: Deterioration of *Posidonia* meadows

Areas	Degree of deterioration	Causes
Ligurian Sea	20 %	Industrial and urban pollution Alteration due to sedimentationtrawling Competition from *Caulerpa* Coastal constructions Harbour developments Mooring of small boats - torn up by anchors
Alicante (Spain)	52 %	
Marseilles	About 90 %	
Toulon (France)	Completely disappeared	
Gulf Gabes (Tunisia)	Completely disappeared	

Source : UNEP-RAC/SPA, 1997a.

Photo: *Posidonia oceanica*



Source: P. Panayotides

2.1. Eutrophication

Eutrophication, resulting in massive phytoplankton blooms, occurs mainly in the Adriatic, the Gulf of Lion and the northern Aegean. Toxic algal blooms, which can be dangerous to humans, are local and sporadic.

2.2. Microbial contamination

Microbial contamination is mainly related to urban wastewater discharges and represents a potential risk to humans, especially through the consumption of poisoned shellfish. An incident of effect on dolphins is mentioned in Section 2.4 below on oil and contaminants. The situation has only partly been mitigated by building urban wastewater treatment plants in the EU countries along the coast. The demand from tourism for good bathing water quality has also pushed other countries into paying increasing attention to this problem. Nevertheless, about 90 % of municipal sewage is still untreated (EEA, 1999).

2.3 Fishing, exploitation of living resources and mariculture

Fishing has increased by about 12 % in the past decade, with high exploitation of both bottom-living (demersal) and big pelagic (tuna and swordfish) stocks. Overexploitation has led to a serious decline in the red coral (*Corallium rubrum*), the date mussel (*Lithophaga lithophaga*) and many invertebrates.
Mariculture, mainly of shellfish and some fish species, has expanded greatly over recent decades, from 39 575 tonnes in 1984 to 113 103 tonnes in 1994.

Photo: Red coral (*Corallium rubrum*)

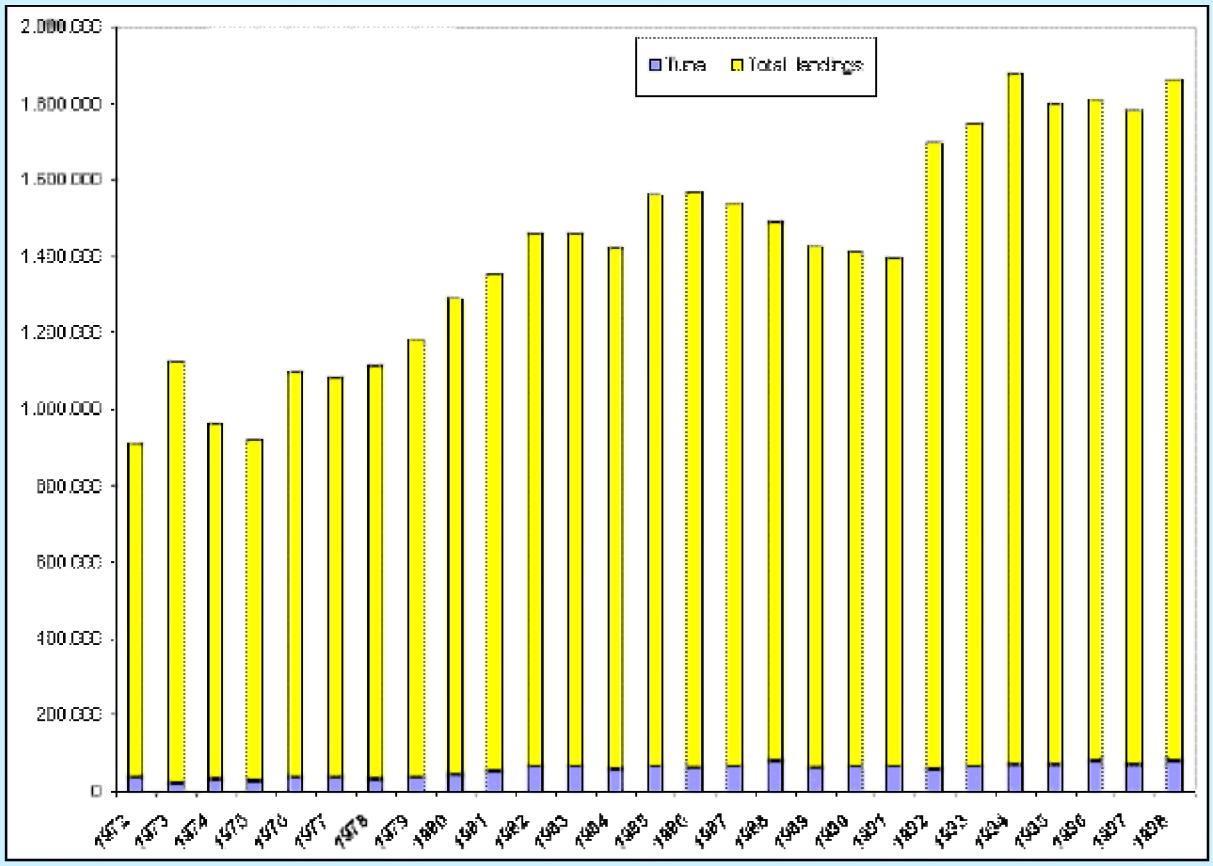
Source: C. Bratits.

Use of biodiversity resources

The Mediterranean Sea is one of the few marine areas of the world showing steady increase in landings of fisheries over the entire time series for all major marine living resource categories. The total fisheries landings from the area have increased from 0.877 million tonnes in 1972 to 1.393 in 1982, 1.635 in 1992 and reached 1.779 in 1998 (www.fao.org/fil circular). Increase of fish catches has been significant in sardines, especially in the northern Mediterranean, and sardinellas in the south.

These changes are not only due to increased fishing pressure, but are also partly due to increased nutrient inputs to a formerly low-nutrient sea providing a basis for more fish food (Caddy, 1997). A recent phenomenon has been the great increase in catches of large pelagic fish, driven in the case of bluefin tuna by high prices, and the consequent serious depletion of stocks. Concern has rightly been expressed about the stock status of bluefin tuna and swordfish.

Figure 1: Development of fisheries in the Mediterranean as assessed by total landings. Tuna catches are indicated separately



Source: www.fao.org

Case study - Monk seal (*Monachus monachus*)

The Mediterranean monk seal has been classified as endangered by IUCN (the World Conservation Union) since 1966. Ever since, it has enjoyed the highest priority in most conservation strategies and is currently protected by all available national and international legal instruments. Despite the early recognition, population numbers have continued to decline (dropping to about 300-400 individuals (data updated in 1998 in UNEP RAC/SPA, 1999a) from about 1 000 in the 1970s). In the Black Sea, the animal has been observed mostly along the Turkish coast. Although protection measures have been established since 1977, according to the latest studies only two of the 42 animals recorded in the 1987–1994 period remain alive (Map 5). Mortality is mostly associated with fishing. However, in many cases habitat destruction or alteration, development of tourism, industrial activity and human population growth are further threats.

Photo: The monk seal (*Monachus monachus*)

Source: P. Dendrinos (www.mom.gr)

Map 5: The monk seal (*Monachus monachus*) distribution: sites and number of seals

Source: ETC/MCE, data from UNEP RAC/SPA, 1999a.

2.4 Industrial and oil pollution

There is major industrial development (production of raw materials such as mercury, phosphates, chromium, lead, steel manufacturing) in France and Italy, followed by Spain, Federal Republic of Yugoslavia and Turkey, as well as submarine mining and drilling for oil and gas in the south (Libya, Algeria, Egypt and Syria). Although industries are scattered all around the Mediterranean basin, there are a number of hotspots generated by heavy industry complexes and large commercial harbours more specifically situated in the north-west. These harbours are being affected by toxic, persistent and bioaccumulative pollutants such as tributyltin (TBT).

There have been several reports of mass mortality of seals and dolphins since 1987 (UNEP/IUCN, 1994). The most recent of these concerns the striped dolphin (*Stenella coeruleoalba*) population of the western Mediterranean. After a spill of a contaminant in Valencia, in early July 1990, hundreds of dead dolphins were washed up along the Spanish, French and Italian coasts, as well as on North African shores. During the summer of 1991, several hundred dead and dying dolphins were washed up on the beaches of southern Italy and Greece. Although pathogens clearly triggered some of these deaths, and epidemics have been known to occur in wild marine mammal populations, the immunosuppressive effects of contaminants may have contributed to the severity of these incidents, perhaps by facilitating the spread of infection. This, and the additional chronic effects of organochlorines, could hinder, or even prevent, recovery of individuals from pathogenic disease.

2.5 Alien species

More than 500 species entered the Mediterranean between the opening of the Suez Canal in 1876 and 1978 (Por, 1978). In addition to the species that have entered from the south through the Suez Canal (known as Lessepsian migrants), others have been passively transported by ships (fouling on ship hulls or ballast tanks). Yet others have been imported for aquaculture and some have become successfully established for unknown reasons. CIESM (International Commission for the Scientific Exploration of the Mediterranean Sea) has recognised the need to compile all available information and has assigned a group of specialists to prepare the publication of an updated digital atlas for exotic species belonging to the groups of fish and shellfish (crustaceans and molluscs). According to updated information, the number of alien fish species has increased from 35 to 84, and that of molluscs from 60 to 125 (www.ciesm.org/atlas).

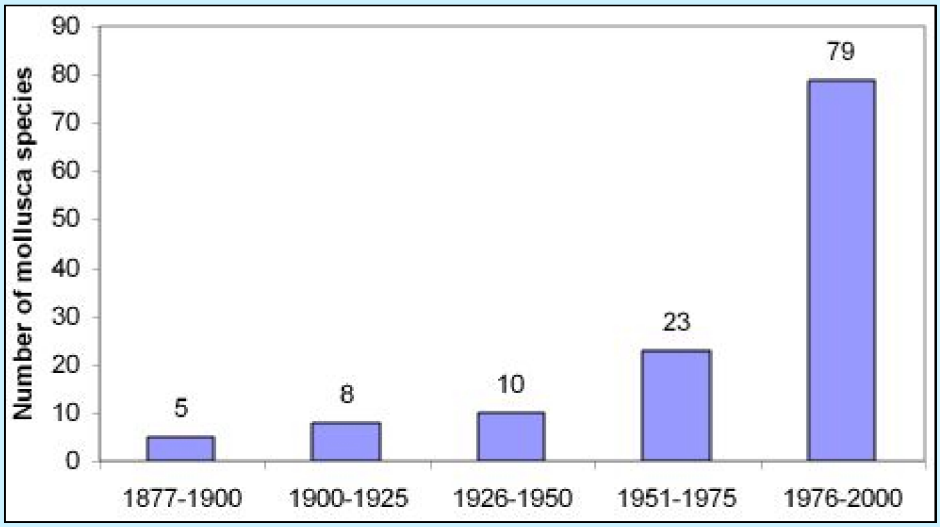
Some imported species have established dense natural populations of commercial interest. However, the impact of the intruders on the natural environment is usually negative, affecting activities such as fishing, aquaculture, shipping, public health and tourism as well as the equilibrium of the ecosystem. Some intruders have had catastrophic effects. The tropical alga *Caulerpa taxifolia* was recorded for the first time in the western Mediterranean in 1984. It contains a toxin which may hinder the growth of other organisms. Its rapid expansion in the basin, its distribution and ways of stopping its further spread have been

the subject of many research projects, workshops and discussions. According to recent observations, it has now reached the Adriatic and threatens the eastern Mediterranean (UNEP, 1998).

Case study - introduced molluscs

The number of mollusc species (snails, mussels, oysters, clams) in the eastern Mediterranean began to increase after the opening of the Suez Canal and the increase has accelerated recently due to human activity and introduction (Figure 2). Some 3-5 % of today's mollusc fauna consists of alien species introduced after 1975.

Figure 2: Time trend in the introduction of alien mollusc species



Source: Zenetos et al., 2002.

3. Policies at work in the Mediterranean Sea

3.1 Nature protection

3.1.1 International collaboration

There are several conventions, directives and action plans for nature protection in the Mediterranean Sea:

- The Bern Convention is being implemented in all the European countries, and the EU birds and habitats directives are implemented in the EU countries.
- Action plan for the conservation of cetaceans in the Mediterranean Sea (UNEP/IUCN, 1994; UNEP-RAC/SPA, 1998a; UNEP-RAC/SPA, 1998b).
- A special Agreement for the Conservation of Small Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic area (ACCOBAMS) was made in 1996 under the Bonn Convention.
- Action plan for the management of the Mediterranean monk seal (Monachus monachus) (UNEP-RAC/SPA, 1999a).
- Action plan for the conservation of Mediterranean marine turtles (Demetropoulos and Chadjichristophorou, 1995; UNEP-RAC/SPA, 1998c; UNEP-RAC/SPA, 1999b).

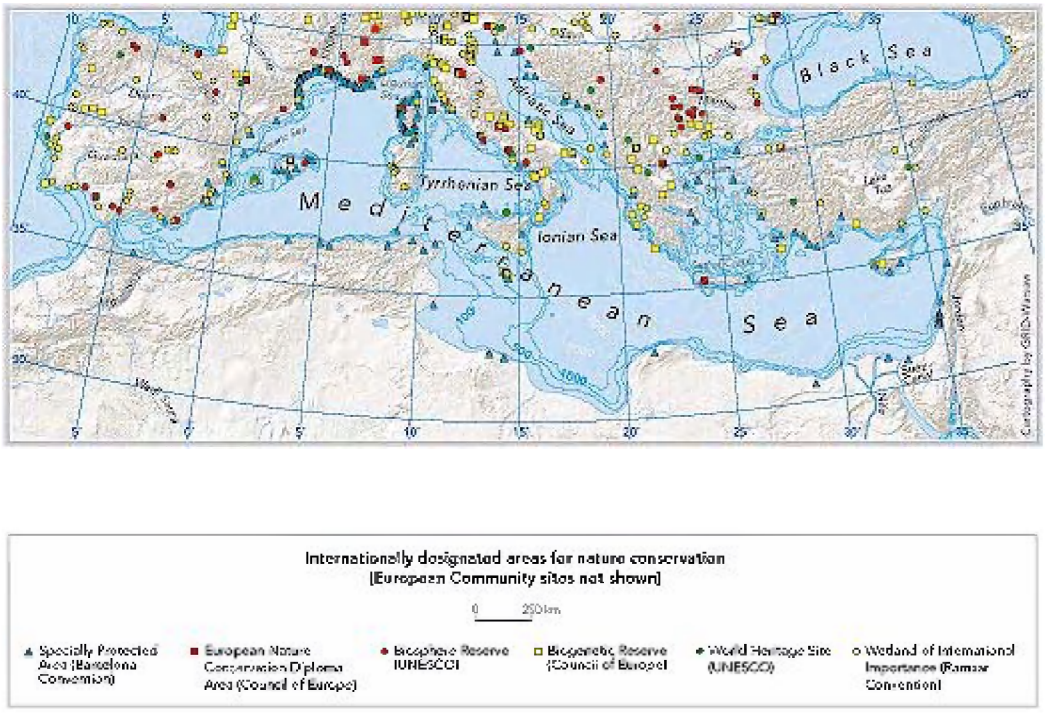
- Action plan for the conservation of marine vegetation in the Mediterranean Sea (UNEP-RAC/SPA, 1999d).

3.1.2 Protected areas

Internationally protected areas

There are 122 SPA (specially protected area) sites in the Mediterranean under the UNEP Protocol (UNEP-RAC/SPA, 1997b), 47 of which cover marine areas. Among the signatories of the protocol, only Italy has specific legislation for the establishment of marine protected areas. Most of the other countries have adopted legislative texts permitting the establishment of such areas, without detailed rules concerning regulation and management. The implementation of NATURA2000 (Table 6) and the Bern Convention in coastal and marine areas will help to strengthen protection and management.

Map 6: International nature protection areas in the Mediterranean Sea – specially protected areas (SPAs) of the Barcelona Convention



Source: UNEP-RAC/SPA, 1997b

Table 6: Main marine habitat types in the Mediterranean protected under the EU Habitats Directive

- Open sea and tidal areas
- Sandbanks which are slightly covered by sea water all the time
- Posidonia beds
- Estuaries
- Mudflats and sandflats not covered by seawater at low tide
- Coastal lagoons
- Large shallow inlets and bays Reefs

Source: http://www.europa.eu.int./comm/environment/nature/hab-en.htm

3.1.3 Red List species

There is no Red List of Mediterranean marine fauna and flora. The draft list of endangered or threatened species compiled by UNEP (1999) coincides with that of Annex II of the Specially Protected Areas Protocol under the Barcelona Convention, revised in the Bern Convention, 1998. Non-governmental organisations (NGOs), with support from the national environmental agencies, are involved in the protection of some of the most highly threatened species, often with some success. However, many of the rare species listed in the Specially Protected Areas Annex, especially those of commercial interest, are not adequately protected.

3.1.4 Protected species

Thirteen marine Mediterranean species are listed among the strictly protected fauna under the EU Birds and Habitats Directives, (NATURA2000) and the Bern Convention (Council of Europe, 1998).

3.2 Protection of marine resources by restrictions on fishing and hunting

Nature protection

An agreement has been signed by France, Italy and the Principality of Monaco for the creation of an international sanctuary for Mediterranean cetaceans in the sea close to these countries to protect cetaceans against direct catch and intentional disturbance. The cetacean species found in the sanctuary are: the fin whale *(Balaenoptera physalus)*, the striped dolphin *(Stenella coeruleoalba)*, the sperm whale *(Physeter catodon)*, the bottlenose dolphin *(Tursiops truncatus)*, the short-beaked dolphin *(Delphinus delphis)*, Risso's dolphin *(Grampus griseus)*, the pilot whale *(Globicephala melas)* and Cuvier's beaked whale *(Ziphius cavirostris)*.

Species protection

The General Fisheries Council for the Mediterranean (GFCM) has recently adopted the regulations on bluefin fisheries from the International Commission for the Conservation of the Atlantic Tunas (ICCAT) to apply to all member countries of the GFCM for swordfish and bluefin tuna. Legislation to protect the red coral *(Corallium rubrum)* and date mussel

(Lithophaga lithophaga) has been reinforced mainly in Italy, and other countries are slowly following this example.

3.3 Research and monitoring programmes

Pollution assessment across the Mediterranean, as the primary objective of the Mediterranean Action Plan, has been overtaken by measures for pollution control and integrated coastal-zone planning. As a second phase, an Action Plan for the Protection of the Marine Environment and Sustainable Development of the Coastal Areas of the Mediterranean was launched in 1995. New environmental parameters, currently measured only at the regional scale, have been added to help in achieving the objectives of this action plan.

Presently no monitoring of plankton, benthos or fish is undertaken at the Mediterranean scale. Research is sporadic, conducted in the framework of EU projects like the ones listed below (Internet addresses). Our knowledge of cetacean populations and of Mediterranean cetology is still in its infancy. Certainly much has to be done. Among the most well-studied species is the tropical green alga *Caulerpa taxifolia* which has been the focus of two European research programmes through the NGO GIS Posidonie (The spread of the tropical green alga *Caulerpa taxifolia* in the Mediterranean, 1992-1994; Control of the expansion of C. taxifolia in the Mediterranean, 1996-1999).

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NATURA 2000, habitat types:
http://www.europa.eu.int./comm/environment/nature/hab-en.htm

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http://gap.analysis@com.area.trieste.it (developed in GIS for EEA by Saul Cirlaco and Carlo Franzosini – Shoreline)

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http://www.monachus.org

Protected areas of Europe:
http://www.europa.eu.int./comm/environment/nature/spa/spa.htm
www.ossmed.org

The Observatory of the Mediterranean Sea has put a permanent forum on 'Marine Protected Areas of the Mediterranean Sea' into motion.

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