

4 Mediterranean Sea

Overview

The Mediterranean Sea is an intercontinental body of seawater between Europe, Africa and Asia that is bordered by 21 countries. It is one of the most popular tourist destinations in the world due to its beautiful landscape, mild climate and numerous beach resorts.

Location



Basic information

Surface area : 2.5 million km²

Volume : 3.7 million km³

Average depth : 1,500 m

Maximum depth : 4,982 m

Nature

< Background >

The Mediterranean Sea is approximately 3,800 km wide from west to east and has a maximum north to south distance, between France and Algeria, of 900 km. Its only connection to the open (Atlantic) ocean is through the narrow and relatively shallow Strait of Gibraltar, located between Spain and Morocco, which imposes a severe limitation on water exchange. The Mediterranean Sea is also connected to the Black Sea via the Dardanelles Strait and the Sea of Marmara, and since the late 19th century, to the Red Sea by the Suez Canal.¹

Mountain ranges (e.g. the Sierra Nevada, Alps, Dinaric Alps) are distributed along the northern side of the

Mediterranean. Since these mountains slope steeply into the sea, the drainage basin of the north side is relatively small. Furthermore, since the southern side is mainly covered by desert and only a few large rivers (e.g. the Nile, Rhone, Po and Ebro) flow into the Mediterranean, these combined factors tend to limit freshwater input.¹

Climate

The Mediterranean climate is subjected to both subtropical and mid-latitude weather systems, and is also partly influenced by the northern mountain ranges. The region is characterized by a windy, mild, wet winter and a relatively calm, hot and dry summer. Generally air temperature differences between winter and summer are limited to about 15 °C, although local meteorological and geographic factors can result in extreme conditions, such as on the coasts of Libya and Egypt where the air temperature can reach 50 °C.³

Topography

The Mediterranean Sea consists of a series of deep basins that are mostly well connected with each other. The maximum depths in the various basins range between 2,500 m and 4,982 m (in a narrow trench off southwestern Greece). A sill between Sicily and Tunisia, with a maximum depth of 400 m, divides the Mediterranean Sea into western and eastern region. In contrast to the relatively flat western basin the eastern basin is characterized by alternating deep depressions, submarine valleys, steep slopes, and over 700 islands and islets that are distributed along the Aegean archipelago east of Greece. Connection with the Atlantic Ocean is through the Strait of Gibraltar, which is 22km wide and has a sill depth of 320 m.^{2,3}

Hydrology

Annual evaporation exceeds rainfall and river runoff over most of the Mediterranean Sea, so that in general the Sea is characterized as having very high salinity (around 38). This highly saline water flows along the bottom of the Strait of Gibraltar and out into the Atlantic Ocean, where it can be traced throughout the central Atlantic. On the other hand, relatively less dense Atlantic water flows into the Mediterranean Sea in a surface layer. This incoming Atlantic water is eventually turned into dense Mediterranean waters through evaporation. The water sinks into the deep Mediterranean Sea, due to winter cooling, and exits the Mediterranean through the bottom of the Strait of Gibraltar. This cycle takes between 100 and 300 years.

Tidal amplitudes in the Mediterranean Sea are small and the narrow continental shelves prevent tidal amplification along the coast.^{1,2}

< Surrounding environment >

Coastline

Many parts of the coastline are comprised from rocky shores with high cliffs. Cliffs of over 150 m occur in Spain, and ‘megacliffs’ of over 1,000 m are in Croatia. These rocky shores are occasionally interrupted by small sandy beaches, associated with narrow valleys or small coastal plains surrounded by inland mountainous areas. Larger coastal plains with extended sandy beaches are found in regions with large rivers, such as the Rhone delta area in France, the Po plain in Italy and the entire coastline of northeast Africa.³

Biological diversity

The Mediterranean Sea can be characterized as having low biomass per-unit volume, due to low nutrient levels, but high diversity, with over 10,000 marine species recorded and with a large proportion (28%) of them endemic.

Although no species disappearance has been reported in the Mediterranean Sea, changes in species composition and richness have been determined for some areas, including the introduction of exotic species (e.g. the massive introduction of tropical species from the Red Sea after the opening of the Suez Canal). Currently, there are several endangered species reported in the Mediterranean Sea, including the Monk seals, red coral, sea turtles and colonial water birds.³

One of the most important habitats in the Mediterranean Sea is the large seagrass meadows (*Posidonia oceanica*) that occur at depths down to 40m in the western and eastern basins. The most extensive meadows are in Libya, Tunisia, Sicily, Sardinia, Corsica and the Hyeres Bay of France.^{1,3}

History and Culture

< **History** >

Some of the most ancient civilizations flourished around the Mediterranean. It was opened as a highway for commerce by merchants trading from Phoenicia. Carthage, Greece, Sicily and Rome were rivals for dominance of its shores and trade; under the Roman Empire it became virtually a Roman lake and was called *Mare Nostrum* (our sea). Later the Byzantine Empire and the Arabs dominated the Mediterranean. Between the 11th and 14th centuries, Italian city trading states, such as Genoa, Venice, and Barcelona, dominated the region. They struggled with the Ottomans for naval supremacy, particularly in the eastern Mediterranean. Products from Asia passed to Europe over Mediterranean trade routes until the establishment of a route around the Cape of Good Hope in the late 15th century.

With the opening of the Suez Canal in 1869, the Mediterranean resumed its importance as a link with the East. The development of the northern regions of Africa and the oil fields in the Middle East has increased trade in the Mediterranean. Its importance as a trade link and as a route for attacks on Europe resulted in European rivalry for control of its coasts and islands and led to campaigns in the region during both world wars. Since World War II the Mediterranean region has been of strategic importance to the United States and, until its dissolution, the Soviet Union.

< http://www.encyclopedia.com/html/section/MeditSea_History.asp >

Social Environment

< **Population** >

The population in the coastal region was 145 million in the year 2000, representing 34 % of the population of all Mediterranean countries. The population is expected to increase to 180 million by 2025, mainly due to the expected increase in the southern countries.

The population density in the coastal region averages 93.7 people per km² as opposed to 48.7 people per km² for all the Mediterranean countries.

Adding to the resident population the Mediterranean Sea is also host to approximately 150 million international and domestic tourists every year.

< <http://www.planbleu.org/firsta.htm> >

< **Land use** >

Almost 90 % of the urbanized lands in the Mediterranean are located along the coasts of Spain, France, Greece, Italy and the former states of Yugoslavia. Between large cities are tourist facilities, secondary residences for the citizens and recreation facilities. Consequently, few undeveloped areas remain along the northern side of the Mediterranean. Agricultural land is mainly concentrated in the coastal plains or former wetlands.^{1,3}

< **Industry** >

The major industries in the Mediterranean region are tourism, fisheries, agriculture, the oil industry and manufacturing.

Tourism

The Mediterranean Sea is one of the biggest tourist regions in the world. Many of the tourist destinations are concentrated along the coast, with a heavy dependence on the marine environment. The most popular season is summer.

Tourist revenue is of significant socio-economic importance for the coastal countries. For Cyprus and Malta, over 20% of their GNP is generated from tourism.

More than 6 million people are employed in the tourist sector and this figure is expected to increase with

the expected increase in tourists.³

Industry

There are many industrial activities scattered all around the Mediterranean coast. Major hot spots are concentrated in the northwest, generated by heavy industrial complexes and big commercial harbors. The main industrial sectors around the Mediterranean Sea include the chemical/petrochemical, metallurgy, waste treatment, paper production, paints and plastics industries.

Environmental Problems

< Water and sediment quality >

The state of the Mediterranean's open water is generally good but the coastal areas are subject to various environmental problems, including eutrophication and heavy metal, organic and microbial pollution. Land-based activities (urbanization, industry and agriculture) are considered to be the main sources of pollution.³

Eutrophication

Since the main body of the Mediterranean Sea is mostly oligotrophic, eutrophication is limited largely to specific coastal and adjacent offshore areas. Eutrophication is especially apparent in enclosed coastal bays (the Adriatic, Gulf of Lion and northern Aegean) that receive anthropogenically enhanced nutrient loads from rivers and the direct discharges of untreated domestic and industrial wastewater.

The most important cases of eutrophication occur along the northern and western coasts of the Adriatic Sea, due to the circulation characteristics, shallowness and excessive nutrient load from large rivers. An estimated 250,000 tonnes of nitrogen per year and 82,000 tonnes of phosphorus per year enter the Adriatic Sea, mainly via the Po and Adige Rivers.

Although the northern shores are the most affected, serious eutrophication problems also exist along the southern shores but they have not been properly reported due to poor monitoring programs of the southern Mediterranean countries.

Eutrophication problems are likely to increase in the future, due to rapid population expansion and inadequate environmental policies and enforcement.³



Mediterranean areas where eutrophication phenomena have been reported³

Heavy metals and chlorinated hydrocarbons

In the Mediterranean Sea, heavy metals arise mainly from natural processes, and anthropogenic activities have a relatively limited influence. However, there have been reports of high mercury concentrations in

coastal industrial zones, namely in the Tyrrhenian Sea, the Adriatic Sea, the Sardinian Channel and the eastern Mediterranean Sea. Mining and chlor-alkali plants are the main anthropogenic sources of mercury. Also, high levels of cadmium (over 1,000 ng/g) have been reported from gastropods in Israel, bivalves in Italy and limpets in Greece.^{1,3}

The majority of the organochlorine input into the Mediterranean Sea is from the atmosphere, with less than 20% from rivers. Generally, the organochlorine concentration in seawater is very low, but extremely high values of DDT have been reported from the sediments of the Rhone delta (675 ng/g).^{1,3}

< Other Environmental Problems >

Development of coastal zones

The Mediterranean coastal zones are currently experiencing increased pressures from rapid urbanization and the development of tourist facilities. Urbanization is of particular concern for the southern countries (e.g. Egypt, Turkey, Syria, Algeria, Morocco) since they are expected to grow rapidly over the next few decades and should soon overtake the population of the northern countries. Already urbanization has put increasing pressure on employment, housing and public services (water supply, roads and sanitation) of many southern cities.³

Tourism-related development in the coastal area is predicted to double over the next 20 years, leading to the reduction of natural sites and open spaces, substantial alteration of coastal landscapes and, conflicts on the use of land, water and other resources.³

< Environmental Protection Measures >

Mediterranean Action Plan (MAP) and Barcelona Convention

In 1975, the Mediterranean countries and the EEC adopted the Mediterranean Action Plan (MAP), and in 1976 they adopted the Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona Convention). The main objectives of MAP were to assist the Mediterranean Governments in the assessment and control of marine pollution, to formulate national environmental policies, to improve the ability of governments to better identify options for alternative patterns of development and to make better national choices for the allocation of resources.¹

Under the Barcelona Convention six protocols were established that deals with dumping, emergencies, land-based pollution, protected areas, offshore exploitation and hazardous wastes.¹

Monitoring

Under the coordinated Mediterranean Pollution Monitoring and Research Programme (MEDPOL), 18 countries in the region measure pollutant levels at hundreds of sampling stations. The main pollutants that have been measured are heavy metals, organochlorine pesticides, herbicides, organophosphorus compounds, hydrocarbons and pathogenic microorganisms.¹

Related organizations and NGO

Almost 100 Mediterranean NGOs are established MAP partners. They are the voice of the public especially at the local level and they have a significant influence on the citizens, media and policies.

Some of the NGOs involved in marine environment conservation are listed below.

- MEDCOAST < <http://www.medcoast.org.tr/> >
- MED Forum < <http://www.medforum.org/english/index.htm> >
- MEDASSET < <http://www.euroturtle.org/medasset/> >

References

1. UNEP: State of the Marine and Coastal Environment in the Mediterranean Region. MAP Technical Report Series No.100, UNEP, Athens, 1996.
2. Tomczak, M. and J. S. Godfrey (1994) Regional Oceanography: an Introduction. Pergamon, New York.

3. EEA (1999). State and Pressures of the Marine and Coastal Mediterranean Environment. Environmental issues series No.5. Copenhagen, European Environment Agency.