

GEOGRAPHICAL DIVERSITY AND DIFFICULTIES

As a sea between lands the Mediterranean is a great divide; it is an arena of common wealth and a vector of communication between the two shores. Its central presence gives the regional fringes around its rim a certain degree of climatic unity. Strictly speaking, it can be said that Mediterranean lands are defined by shared bioclimatic features, which correspond fairly closely with those of the olive region, but the term “Mediterranean basin” is also used to describe all of the regions whose rivers flow into the Mediterranean Sea.

SEAS, MOUNTAINS AND PLAINS

Almost an enclave, the Mediterranean has several openings (the Dardanelles, Gibraltar) through which its water, which is exposed to evaporation, is renewed. The sea is composed of maritime segments (the Tyrrhenian, Aegean, Ionian and Adriatic Seas) with their respective biocenoses (assemblages of organisms inhabiting a common biotope) and hosts 7% of the world’s marine species, some of which are endemic. Given the variety of soils, reliefs and micro-climates and the varying combinations of these factors, this biological diversity is also to be found on the land of the region, where there are 25,000 to 30,000 plant species, over half of which are also endemic. For in the glaciation period the vegetation in this region found resistance zones, and man adapted part of this plant – and animal – biodiversity to his needs. This made the Mediterranean area a vast centre for the dissemination of living species throughout the world (breeds of goats and sheep, varieties of cereals, fruit and vegetables), which today are unfortunately under threat, which is essentially anthropic: destruction of natural habitats, climate change, pollution, and economic activities.

Essential mountainous reliefs. Situated between the African and the European plates, the Mediterranean region is the site of intense orogenesis (mountain-forming movements). Many mountain ranges dominate the coastal plains, mountains which were often the refuge of persecuted communities – the Taurus, Mount Lebanon, Kabylia, Rif, Aurès, Sierra Nevada, Cevennes, Pyrenees, Alps, Apennines, etc. – but which are unfavourable for farming due to their steep slopes, despite the terrace farming techniques used in some areas. They act as water towers, however: by intercepting flows of humid air in winter and then storing them partly in the form of snow cover, they help to supply the rivers, some of which – such as the Tigris, the Orontes and the Euphrates – are essential to agriculture in semi-arid or arid regions. The geological history of the Mediterranean, where high tectonic activity is still detectable today (recurrence of earthquakes and active volcanism), has left a multitude of small islands in the middle of the sea: some of these islands also have mountain ranges, which in a context of water shortage are veritable reservoirs.

The plains. Vast plains stretch out below the mountain ranges. Besides the most extensive ones – those of the Po, Rhone, Ebro and Nile – other narrower plains along the coasts are very suitable for agriculture, since they have rainfall. The inland plains are less endowed and, in the southern Mediterranean countries, are rapidly becoming deserts. With low rainfall and high temperatures these zones form a veritable arid belt that hems in the southern and eastern Mediterranean region. It is thus no longer possible to farm the land unless, as in the Nile Valley, water resources are available in the form of surface water.

THE MARK OF ARIDITY

Temperatures vary widely and have considerable influence on vegetation through soil formation, evaporation and the metabolism of living organisms. With the exception of the maritime façades, the daily temperature ranges are sometimes very marked – excessive heat during the day and cold – or even frost – at night. This heat – with sometimes very high temperatures – increases evaporation and evapotranspiration thus reducing the performance of rain-fed agriculture, which is already limited in a large part of the basin. The contrast between the North of the basin and the other shores must also be underlined, for the low rainfall that is typical of the southern and eastern Mediterranean countries – with the exception of Turkey – is compounded by inter-annual and intra-annual irregularity, which again affects the southern and eastern shores.

This explains why water has been a vector of civilisation. Flooding in Mesopotamia and in the Nile Valley forced men to combine efforts to counter the disastrous effects, and the aridity of the region prompted them to design sophisticated techniques ranging from the khattaras of Marrakesh to modern dams. The share of surface water that is collected in dams is now the highest in the world. With over 80% of surface water collected in dams, the countries of North Africa and the Middle East by far surpass the other regions of the world, where the maximum storage rate achieved is 20%.

UNEVEN AGRICULTURAL POTENTIAL

Most of the humid or sub-humid region is on the northern shores; there are very few such regions in the southern and eastern Mediterranean countries. Suitable temperatures and rainfall of a least 600 mm a year are factors that promote

agriculture. Intensive mixed cropping predominates in the plains, while pastoralism tends to prevail as soon as the relief of the land becomes more rugged. The southern and eastern Mediterranean countries, i.e. the majority of the countries in the Mediterranean basin, are in the hyper-arid to arid region, where the virtual absence of water prohibits crop farming and small animal farming prevails. Intensive agriculture can be developed when water resources (rivers or groundwater) are available. This is the case in the Nile and Euphrates valleys, where the low rainfall is compensated by the availability of river water. It is also the case in southern Israel, where land in the Negev Desert has been developed by channelling water from Lake Tiberias in Galilee. Extensive cereal farming can be developed where rainfall is at least 350 mm (which is the case in some semi-arid zones); this has been done on the Anatolian Plateau, for instance, or in some of the high plains of the Maghreb. Dry farming, which is a very ancient technique that consists of alternating a wheat crop with tilled fallow land in a 2-year cycle, is the system most often used in this case.

THE CLIMATE THREAT

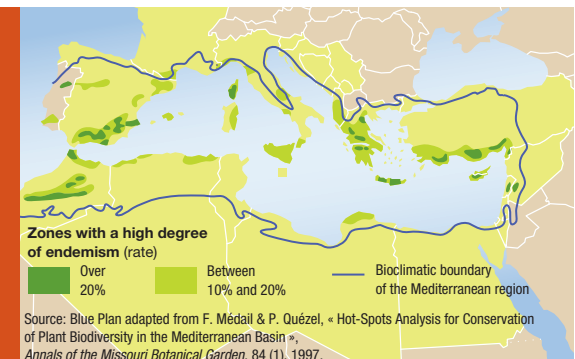
Climate change in the Mediterranean is one of the most threatening phenomena in a region that is already marked by aridity, and its consequences could prove to be tragic. The work of the Intergovernment Panel on Climate Change (IPCC) predicts a rise in temperature of 2°C to 5.5°C by the end of the century in a scenario of extremes. This could cause a rise in sea level and an increase in heat waves, which would make the Mediterranean basin one of the regions most affected by global warming. What is more, as far as water supply is concerned, rainfall, which is already scarce in the south and east, is liable to become even scarcer and more

THE PHYSICAL ENVIRONMENT



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The more remote a region is, the higher the degree of endemism to be found there. It is thus particularly high on islands, namely in Corsica, Crete, Cyprus, Sicily and the Balearic Isles, and it is the high-relief zones on these islands that are most subject to endemism. For where the island's isolation facilitates genetic drift in species, the remoteness of mountainous areas are a further contributing factor. The Sierra Nevada in Spain, the Rif and Atlas Mountains in Morocco, Mount Lebanon and certain reliefs in Greece and Turkey are areas where speciation is prevalent.

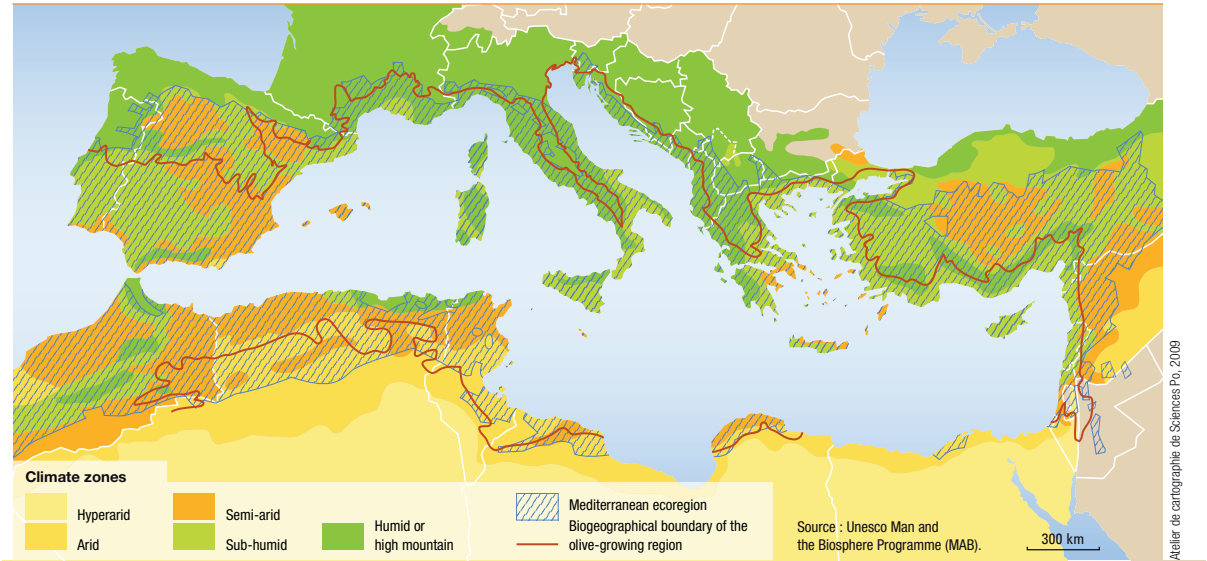


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sporadic. River discharge could drop, making agricultural production more difficult. Many rivers in the Mediterranean region are in fact supplied by both snowfall and rainfall: snow cover builds up during the winter and melts in the spring, thus releasing water into the rivers or groundwater aquifers. As temperatures rise winter precipitations could come more as rainfall, thus reducing the layer of snow cover. As a result, rivers could reach their low-flow levels earlier in the year, thus affecting irrigation schemes. Likewise, there could be more frequent flooding. Rain-fed crops would be the first to suffer from these climate developments due to less frequent and more sporadic rainfall – and these two phenomena are likely to be confirmed, particularly in the southern and eastern Mediterranean countries. As regards irrigated crops, higher temperatures could boost metabolism and thus bring better yields, particularly in more temperate zones, but in certain zones where temperatures could become excessive, particularly on the southern and eastern shores, growth could be arrested at crucial stages in plant development. Higher temperatures accelerate the reproduction cycle of insects and fungal parasites. The cycle can even be triggered earlier in the season. As a result, parasite pressure on agriculture is liable to increase. The same goes for animal farming. Furthermore, the trend to climate change can increase animal water and heat stress and multiply zoonoses. ■

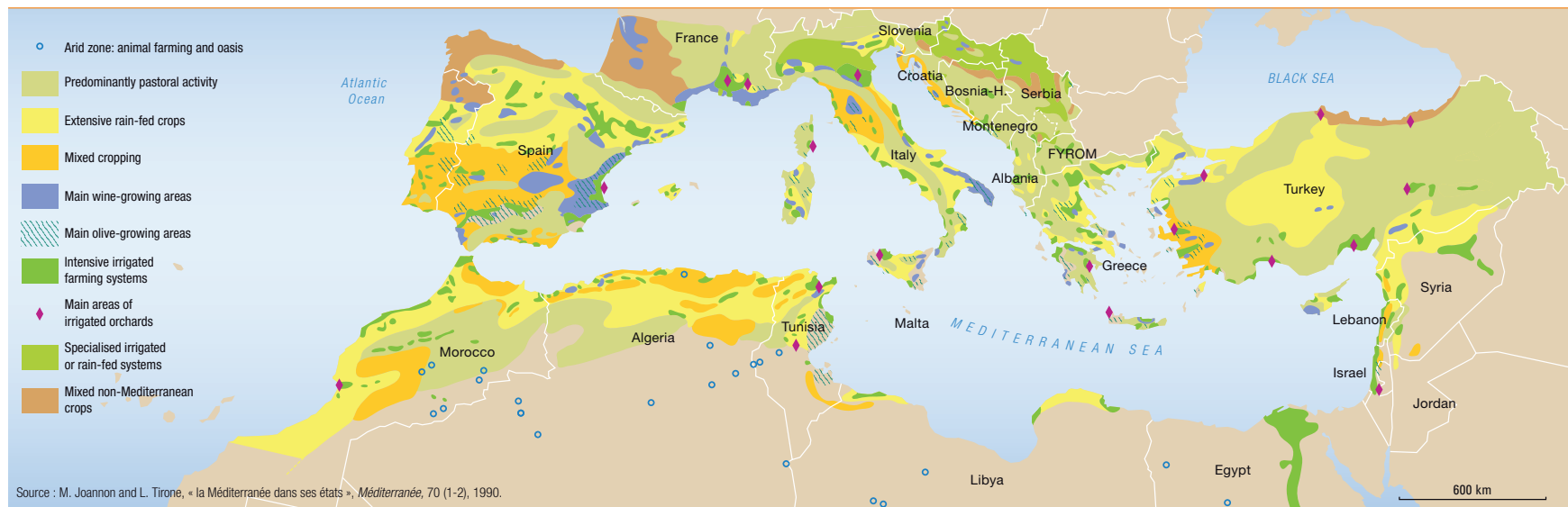
MEDITERRANEAN BIOCLIMATOLOGY



THE MEDITERRANEAN ISLANDS

There are some 3,000 islands in the Mediterranean, 200 of which are inhabited. Only nine of these islands have an area of over 1000 km²; these are, in increasing order of area: Rhodes (1,401 km²), Lesbos (1,630 km²), Mallorca (3,618 km²), Euboea (3,655 km²), Crete (8,259 km²), Corsica (8,660 km²), Cyprus (9,251 km²), Sardinia (23,818 km²) and Sicily (25,462 km²). Since they cover almost 85% of the total insular area in the Mediterranean, the area of the other islands is obviously very limited. Tourist pressure is often high, with the result that the islands are confronted with a problem of water resources, which is more or less serious depending on the size of the island and its geographical position as well as on whether or not there are mountain water reserves. In terms of water resource potential, the situation is most favourable in Sardinia, Corsica and Crete, whereas Malta is one of the islands facing major constraints. This water shortage is compounded by a land deficit, which means that agriculture is not an easy activity, particularly on the small islands.

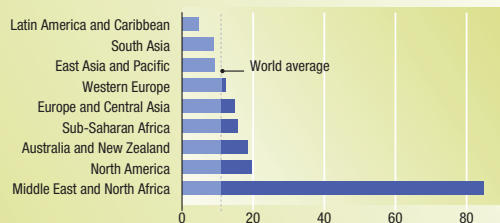
MAIN PRODUCTION SYSTEMS



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SURFACE WATER COLLECTED BY DAMS

Share of surface water collected by dams (%)

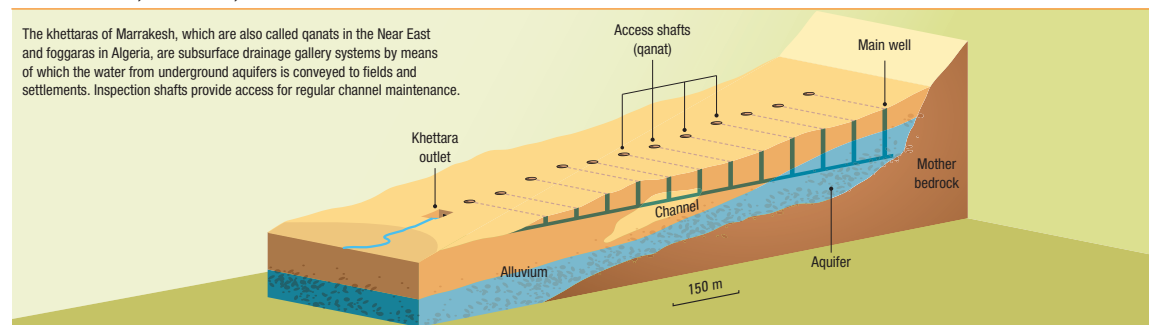


Source: Georges Mutin, « De l'eau pour tous ? », *La Documentation photographique*, 8014, Paris, La Documentation française, April 2000.

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KHETTARAS, QANATS, FOGGARAS

The khattaras of Marrakesh, which are also called qanats in the Near East and foggaras in Algeria, are subsurface drainage gallery systems by means of which the water from underground aquifers is conveyed to fields and settlements. Inspection shafts provide access for regular channel maintenance.



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