

## CHAPTER 2

# FAUNA, FLORA, AND VEGETATION IN ECOSYSTEMS: SOME ASPECTS OF BIODIVERSITY

### BIODIVERSITY IN MEDITERRANEAN ECOSYSTEMS

GIUSEPPE PIGNATTI & SANDRO PIGNATTI

*Dipartimento di Biologia Vegetale, Univ. di Roma "La Sapienza",  
Città Universitaria 00185 Roma, Italy*

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#### Abstract

The flora of the Mediterranean basin includes ca. 20,000 species of vascular plants and can consequently be regarded as one of the richest on the globe. The highest diversity is in general found in the Northern portion and on mountains, and appears concentrated in the belt with an optimal combination of warm temperatures and high rainfall. The topographical distribution of species is not uniform: climax vegetation has generally a feebly diversified flora; endemics mostly occur in extreme habitats (coasts, mountains), whereas the richest flora grows in environments influenced by man. The hypothesis of man-vegetation interactions in the garrigue is discussed.

#### The concept of biodiversity

Biodiversity deals with the result of evolution, one of the basic processes of life. Evolution consists in differentiation and selection of genotypes, of course, biodiversity cannot be measured only by the genetic distance between genotypes. Let us compare two couples of woody species: *Acer obtusatum* - *A. opalus* and *Pinus mugo* - *P. uncinata*. In the first case the only difference lies in the distribution of hairs on leaves, whereas in the second case the most impressive differences are in habitus and ecology (*P. mugo* has creeping stems and forms a compact heath, *P. uncinata* is an erect tree living in forests), and the small differences in morphological characters are not very significant. The genetic distance of the two couples is probably very small (both include closely related species and are probably monophyletic), but the process of diversification

appears much wider in *Pinus* than in *Acer*. In fact, in our opinion biodiversity can be considered as the expression of biological evolution focused on differences in morphology, physiology and ecology. The Mediterranean flora developed in a highly diversified environment and was strongly influenced by geological and climatic changes of the past, and more recently by the action of man. The plant life of this region can be discussed as an example of biodiversity in ecosystems.

### The Mediterranean basin

The Mediterranean zone consists of the Mediterranean sea, countless islands (large and small ones) spread over the sea, some major peninsulas and the surrounding regions; this zone is not limited by a clear geographical boundary and is characterized chiefly by a unitary climate. The total land surface can be estimated to amount to approximately 1,500,000 sq.km., to which ca. 3 million sq.km. of inland sea should be added.

The climate of the Mediterranean zone is a warm temperate one (yearly average temperatures: 14-18 °C) with an annual rainfall of ca. 400-1,000 mm; the rainfall is concentrated in the cold season, whereas summers are almost completely dry. The summer drought is the most relevant feature of Mediterranean-type climates (which occur in 4 other regions of the world: California, Chile, Western and Southern Australia, and South Africa); in this sense, the climate of the Mediterranean zone is very different from other warm temperate or subtropical climates (e.g. China, Japan, Eastern U.S.A., Argentina, Queensland etc.) which are characterized by dry winters and summer rain. Temperatures are relatively mild: in winter no monthly average below 0 °C, frost days and snowfall are exceptional; on summer days maxima over 40 °C are also exceptional. Because of the combination of high temperatures and drought, summer is a period of severe water stress for plants living in the Mediterranean area: in general the dry period lasts 3 months, sometimes longer (in the Eastern and Southern parts up to 5-6 months) or shorter (at the Northern boundary).

The flora of the Mediterranean zone is estimated at ca. 20,000 species (Greuter *et al.* 1984-1989), consequently it can be considered a very rich one. In comparison, the flora of the whole European continent (with a surface 6 times larger), comprises “only” 10,000 species (Webb 1984), i.e. the species density in the Mediterranean area is 12 times higher than that of Europe. In addition, the species total of the Mediterranean flora is not inflated by groups with swarms of agamospecies: the only group with a large number (ca. 200) of apomicts is *Limonium*, whereas *Hieracium*, *Taraxacum*, *Alchemilla* and *Rubus* are little represented in the Mediterranean flora.

For most botanists from Central European countries, the Mediterranean zone is the nearest area with elevated diversity, and many students come from the North to investigate its flora (e.g. the Englishman Sibthorp and later the Austrian Halacsy for the Greek flora, the German Willkomm for the Spanish flora, Davis for Turkey, Rikli from Zürich for the whole Mediterranean vegetation, and many others). On the contrary, no relevant investigations have been carried out in Central and Northern parts of the continent by botanists coming from Southern Europe.