The endemic flora of Greece

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The total number of species in Greece is approximately 5800. This figure represents all native vascular plants and is surprisingly high for such a small country in Europe. Of these, c. 760 (c. 13% of the flora) are endemic, i.e., they occur only in Greece and nowhere else in the world. This is the highest degree of endemism for any country or territory of a comparable size in Europe and the Mediterranean area.

There are two main reasons for this high incidence of endemism:

1. the great age of the flora which has remained relatively undisturbed by glaciations which have wiped out plant life in the rest of northern Europe since the Miocene.

2. the dissected topography and variety of rock substrates (limestone, schist, granite, serpentine, etc) which have favoured speciation. It is the islands and high mountains which are particularly rich in local and regional endemics.

Endemic species are often of considerable taxonomic and phytogeographical interest and work is currently in preparation on an endemic flora of Greece. Three volumes are planned: the first deals with the Peloponnese, the second will cover Crete and the islands and the third, the rest of mainland Greece. It is noted that published and unpublished data on the many endemics in the Greek flora, correctly evaluated and compiled, are necessary for a sound and scientific basis for plant conservation and education.

Greek endemics belong to two broad categories — paleo-endemics and neo-endemics.

1. Paleo-endemics are generally taxonomically isolated species representing an evolutionary standstill, often with primitive characteristics, and usually found in rocky habitats. Examples are *Beta nana* (Chenopodiaceae) from the mountains of the Peloponnese, Sterea Ellas and Mt Olimbos, and *Anchusa cespitosa* (Boraginaceae) from the White Mountains (Levka Ori) of SW Crete. The islands and mountains have given shelter to ancient species which would otherwise be destroyed.

2. Neo-endemics, on the other hand, are more frequently encountered and have close relatives in adjacent areas or environments, occurring in groups in which active speciation is taking place. They have evolved unique traits, either in the process of adaptations to special conditions, or as a result of random genetic or population drift. Examples are the taxa comprising the *Scutellaria rupestris* group (Lamiaceae) and the *Nigella arvensis* complex (Ranunculaceae). The latter are annuals of the Aegean area and have been subjected to extensive biosystematic studies by Strid in 1970. There are distinct local variants on practically all the large islands, recognisable by a unique combination of features particularly with respect to the shape and colour of the floral parts.

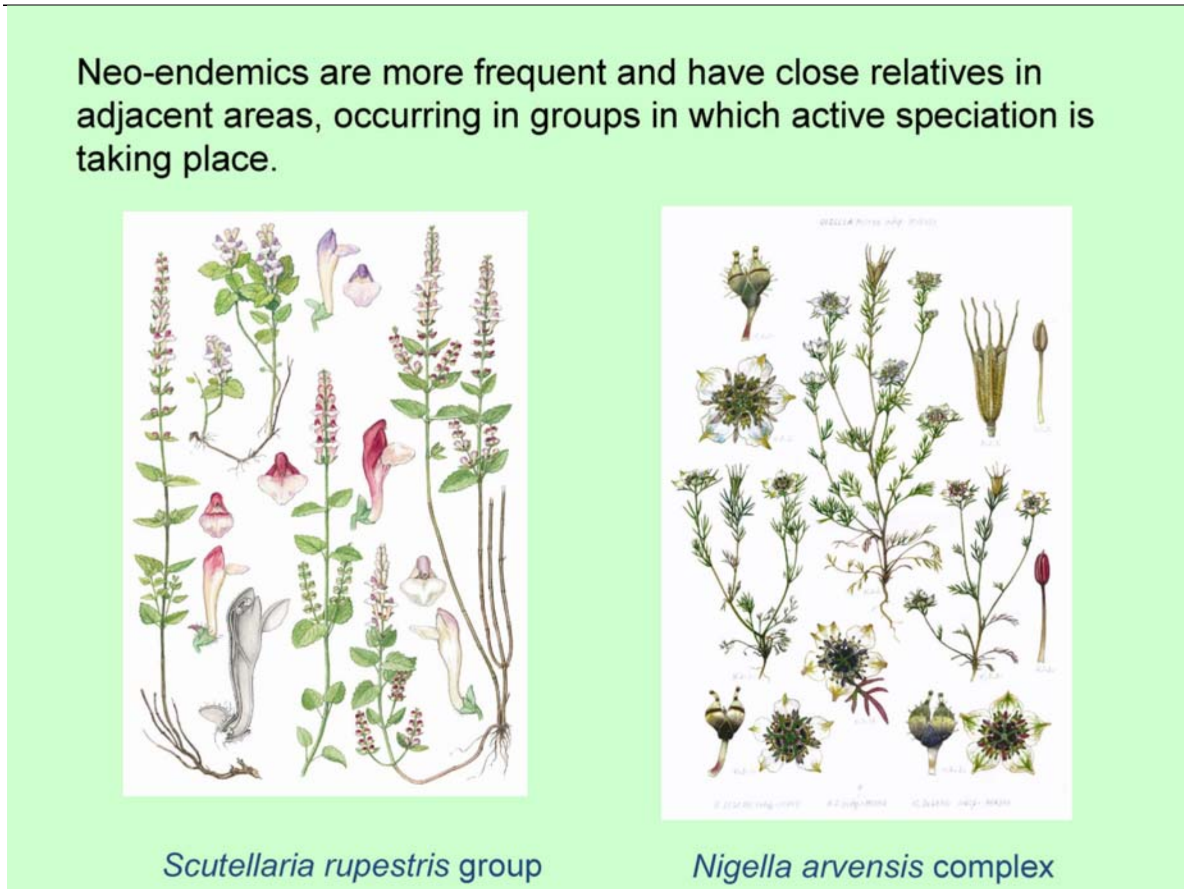

Figure 1. Neo-endemics are more frequent and have close relatives in adjacent areas, occurring in groups in which active speciation is taking place

Crete is the only territory in Greece combining isolation with high mountains, and therefore within Greece, and quite possibly for any comparable area in Europe, it is the region with the highest concentration of endemics. No less than 250 out of the c. 760 Greek endemics occur on Crete. Of these 250, 175 are restricted solely to the Cretan area. When you consider mountain taxa alone, a remarkable 36% is endemic to Crete as compared to 10% for the Peloponnese and 6% for Sterea Ellas. The figures are only 0.5% to 4% in the more northerly mainland phytogeographical regions. We can thus conclude that aridity and isolation have obviously contributed to the evolution and preservation of a number of local endemics, especially in the White Mountains where the number is highest.

You must not think that all endemics are rare or threatened. Indeed some of them are among the most common and most characteristic species especially on Crete, e.g., *Phlomis lanata*, *Ebenus cretica* and *Verbascum spinosum*. On the other hand, there are also species on Crete whose known occurrence in the world is restricted to less than 150 individuals. Examples are *Onobrychis sphaciotica* and *Nepeta sphaciotica*. Such species can well become extinct owing to breeding collapse, even if the habitats they occupy are not further disturbed.

Where are endemics found?

On the smaller islands, local endemics are mainly confined to cliff habitats, e.g., *Carlina diae* (from the island of Dia), *Helichrysum amorginum* (from the islands of Amorgos, Keros and Anidros) and *Aubrieta scyria* (on Skiros). On mainland Greece the highest concentrations of endemics are found in limestone or serpentine rock crevices and scree.

Serpentine (ophiolithic) rock occurs in many parts of Greece. The rocks are blackish or greenish-black when freshly broken, they weather easily developing a rusty-red or purplish patina and they produce extensive scree. The unusual chemical composition of the rocks and soils, with the high amounts of Magnesium silicate and heavy metals, makes them inhospitable to many species. However, there are plants which are strictly adapted to this kind of substrate and serpentine areas are specialized habitats which are important centres for floristic differentiation and speciation. There are probably 50 or 60 taxa, so-called "serpentine endemics" which are restricted to the ophiolithic areas of NW Greece, N & C Albania, C Bosnia and SW Serbia. Examples are *Bornmuellera baldacci, B. tymphaea, Leptoplax emarginata, Centaurea vlachorum, Silene haussknechtii, Alyssum smolikanum, Viola dukadjinica* and *Fritillaria epirotica*. Usually these serpentine endemics are not confined to a single mountain.

Triassic and Jurassic limestones are the most widespread substrate in the Greek mountains. Limestone mountains are generally dry and rainwater or snow melt-water disappears quickly into cracks and fissures. As previously mentiuoned, the Levka Ori or the White Mountains in SW Crete has the highest number of endemics with both paleo- and neo-endemics well represented. It is limestone, exceedingly dry and desolate in the summer. The spectacular Samaria gorge and the mountains above it also have some interesting endemics, e.g., *Staehelina petiolata* and *Symphyandra cretica*. Many of these endemics occur at low altitudes.

The large limestone massifs of the Peloponnese and Sterea Ellas, e.g., Taigetos, Killini, Chelmos, Parnon, Parnassos and Giona, also have a number of local endemics, mostly in rock crevices and screes at alpine levels. Olimbos in the NC and Athos in the NE have 21 and 13 species respectively. The mountains of granite and micaceous schist and other acid rocks in N Greece are rich in Central Balkan endemics but relatively poor in local endemics.

The Peloponnese has long been known as an area rich in regional and local endemics many of which were discovered by the classical collectors of the mid-19th century, e.g., Theodor von Heldreich and Theophanis Orphanides. Some have not been seen for a long time and thus feared extinct, e.g., *Dianthus androsaceus, Astragalus agraniotii, Adonis cyllenea, Helichrysum taenari* and *Micromeria taygetea*. However, all of them have been found alive and well within the last 20 years when floristic exploration in Greece intensified. Indeed some taxa were found to occur in great numbers with several thousands of individuals.

There are c. 330 endemic taxa in the Peloponnese. Approximately 110 of these are restricted to the region. The total flora of the Peloponnese (including Kithira) is estimated as 2630 species. Most of the endemics occur in the Taigetos and Parnon ranges in the south and on Chelmos in the north. The Gulf of Korinthos is a weak phytogeographical barrier and 46 Greek mountain endemics occur in both Peloponnese and Sterea Ellas whereas only 17 Greek mountain endemics are shared by Sterea Ellas and S Pindhos. The connections between Sterea Ellas and S Pindhos are thus weaker than between Peloponnese and Sterea Ellas and this is interesting because the mountains in Sterea Ellas and S Pindhos form a more or less continuous chain. Only four Greek mountain endemics are shared between Crete and Peloponnese, indicating the much weaker floristic connections.

Polyploidy is more frequent in species or groups of species in the Peloponnese than in related taxa occurring elsewhere in Greece. As speciation is often at the diploid level in geographically isolated populations, the Peloponnese seems to be an endpoint at least for some endemics. In other words, the Peloponnese is the region where many taxa have arrived in one of their final stages of evolution and can go no further. They are pushed to the uttermost and remain in a dead-end.

Grazing is often believed to be a major threat but this is a natural environmental factor which has existed for thousands of years. Plants are either able to withstand it, escape it or even depend on it. For the mountain endemics, most are prefectly safe. Overgrazing might threaten the existence of a few, very rare species in Greece but in general, plants face extinction only if they consist of one or a few very small populations, i.e., they are threatened only by their rarity.

You may well ask why should such a work as *The Endemic Plants of Greece* be necessary? As there are so many rare endemics in the Greek flora, conservationists tend to paint an alarming picture as to their case for protection. But unless you know something or quite a lot about these plants, you cannot take any intelligent steps towards protecting them. 520 of the endemics are listed as on the Red Data "endangered list" by the Council of Europe in 1986, i.e., they are rare or threatened. No one at the moment, knows the nature or extent of the threat, whether it is real or imaginary.

We would like to collate information, both published and unpublished, scattered or widely available, in order to have a scientific basis for knowledge about these endemics. In the work, for each taxon, reference to the original place of publication is given. Description, type citation, chromosome number (when known), habitat, substrate, altitudinal range, flowering and fruiting period, variation, affinities, history, information on pollination ecology, dispersal, economic uses if relevant, are provided. The distribution is accompanied by a dot map.

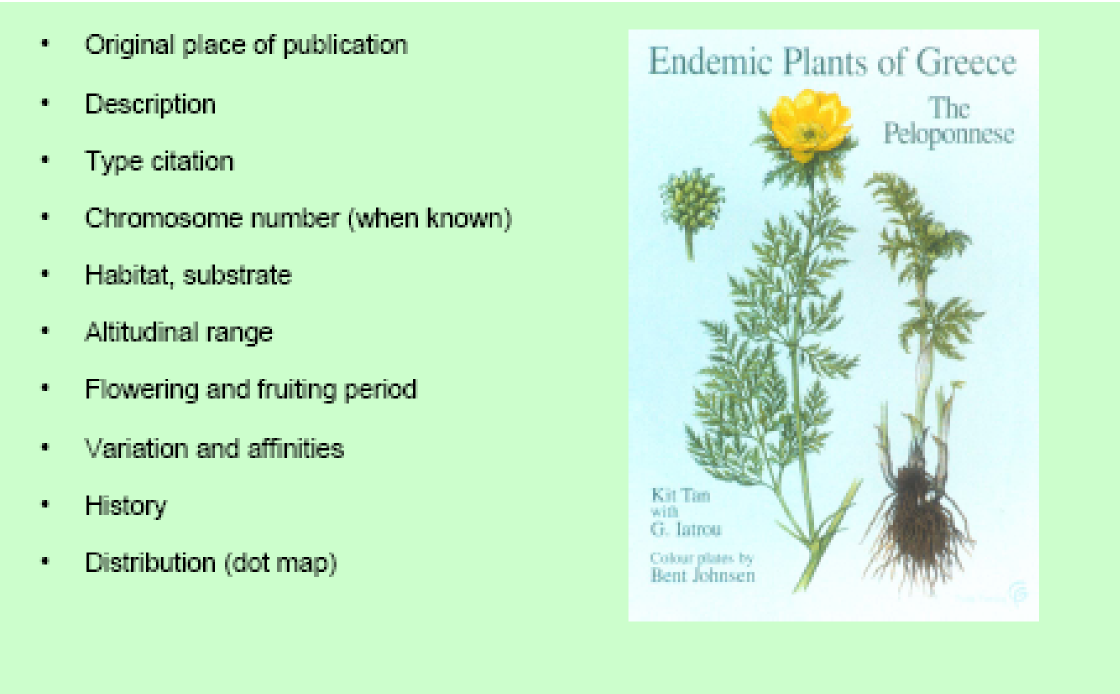

Figure 2. Scientific basis: collate information, both published and unpublished, scattered or widely available

It is a good idea to see the plants in their native habitats, study their ecology and distribution (this means fieldwork), study their closest relatives and affinities (taxonomy, cytology), see if they are growing or going (investigations on seed dispersal, viability, germination, pollination biology, etc.). Only then can the data, be it original or intelligently evaluated and compiled, be used on a sound and scientific basis. Unless we know what plants belonging to a particular group can be found, or had once existed, in a given area, and how to identify and name these plants, we cannot go any further in talking about conservation, natural resources, cultivation or education.

Volume 2 of this work will cover Crete and the islands, and Volume 3, the rest of mainland Greece. The work is meant to be both functional and decorative so 111 colour plates were prepared for the first volume and 111 for the second volume. Each family is represented in a colour plate depicting at least one taxon. This will not be a "coffee-table" work but a rather "covetable" work described as "excellent science married to excellent art, thereby producing excellent communication".

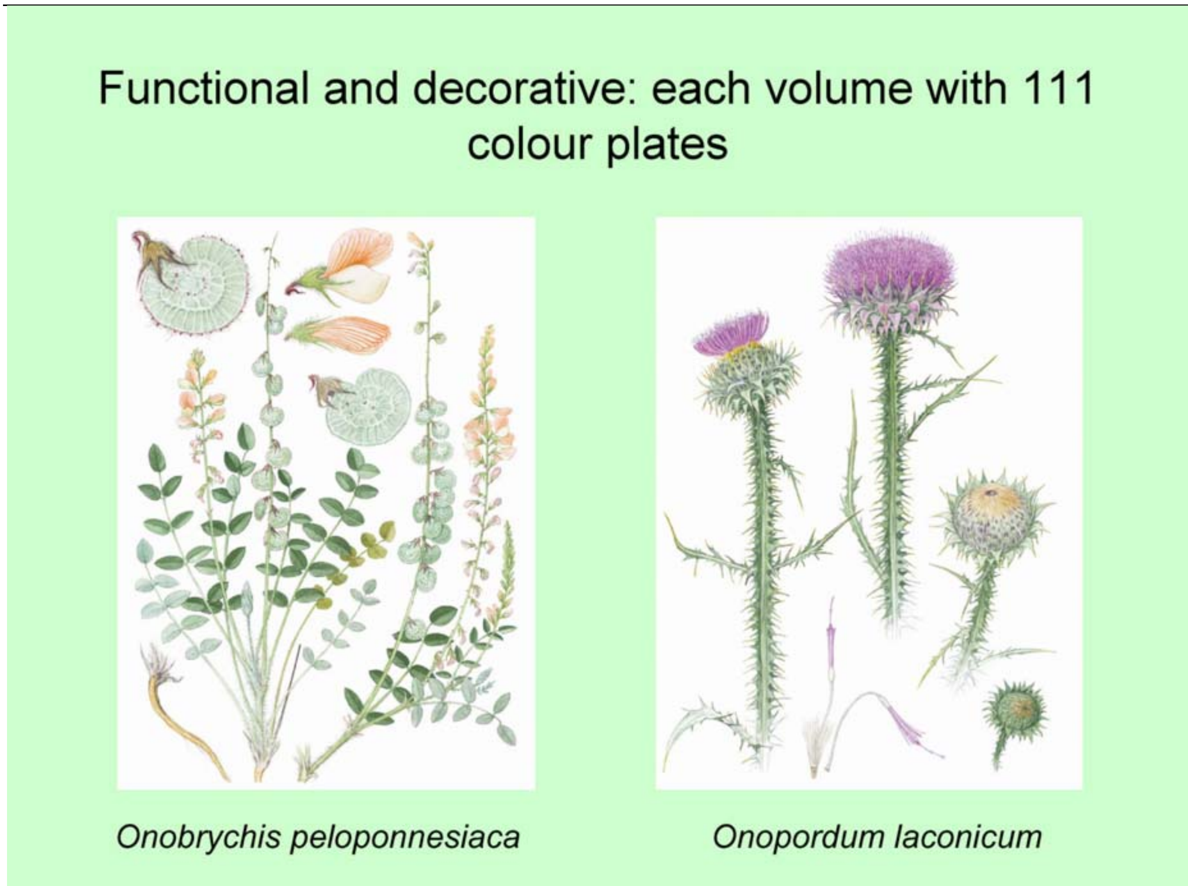

Figure 3. Functional and decorative: each volume with 111 colour plates