

## Phytogeographical notes on the Parnonas range in the Peloponnese, southern Greece

Fytogeografické poznámky k pohoří Parnonas v jižním Řecku

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Some phytogeographical notes on the Parnonas mountain range in the Peloponnese, southern Greece are provided. They include mention of phytogeographical elements, the high incidence of endemism and taxa widely disjunct in distribution. It is noted that many Central European and Balkan species have their southernmost localities on Parnonas. The floristic connections between Parnonas and nine other Greek mountains are demonstrated and a brief account of earlier floristic exploration in the area is given.

**Key words:** Endemism, floristic connections and exploration, phytogeography, Parnonas mountain range, Peloponnese, southern Greece

### Introduction

Parnonas or Parnon is a limestone range in the eastern Peloponnese extending for some 40 km in the direction NNW–SSE from c. 37°20'N 22°30'E to 37°00'N 22°50'E. It approximately parallels the Taigetos range which is c. 30 km to the southwest and also lies parallel to the eastern coast of the Peloponnese (Fig. 1). The rounded summit of Megali Tourla (the highest peak) is situated in the northern part of the range; at 1935 m it is 472 m lower than Profitis Ilias, the highest peak on Taigetos but the Parnon ridge is well above timberline and is distinctly alpine in character. The middle slopes, especially in the north, are extensively wooded with forests of *Abies cephalonica* J.W. Loudon and *Pinus nigra* Arnold. *Castanea sativa* Miller dominates near the village of Kastanitza in the northeast at altitudes of c. 700–1000 m; this locality is one of the southernmost natural occurrences of the species in Greece. At low and moderate altitudes in the south, especially near the monastery of Eloni and along the road from Leonidio to Kosmas, the mountain slopes are steep and rocky with many interesting chasmophytes including local endemics. *Juniperus drupacea* Labill., usually a small tree and a species of great phytogeographical interest, is scattered along the range, especially in the north; it forms pure stands or, more often, is mixed with *Abies cephalonica* which it resembles from a distance.

The Parnonas range is traversed by a number of forest roads. Access to the summit area is most convenient either from the north, along a track branching off from the road between Agios Petros and Moni Malevis, or from the village of Vamvakou in the northwest. Both roads lead to the refuge of the Hellenic Alpine Club, situated at c. 1450 m in an opening of coniferous forest. In the south the mountain range is intersected by the main road from Leonidio to Kosmas and Sparti, and several forest tracks branch off from here.

## Floristic exploration

The first botanist to collect extensively on Parnon (then known as Malevo) was Th. Orphanides who visited the area at least four times, in 1850, 1852 (?), 1856, 1857 and 1870. His material is deposited in several European herbaria with the most complete set probably at the Boissier herbarium in Geneva. New taxa discovered on these expeditions include *Matricaria rosella* (Boiss. et Orph.) Nyman, *Silene laconica* Boiss. et Orph., *Trisetum laconicum* Boiss. et Orph., *Veronica glauca* Sm. subsp. *peloponnesiaca* (Boiss. et Orph.) Maire et Petitm. and *Astragalus agraniotii* Boiss. Th. von Heldreich visited Parnonas in July 1844 probably in connection with his expedition to Taigetos that same year. A few specimens dated 1896 and bearing the labels *Heldreich Herb. Graec. Normale* may have been acquired from their collector Chr. Leonis. These can be seen in the herbaria G, LD and WU.

No collections have been recorded from the mountain during 1897 to 1929, and only a few during the successive 50 years. The latter include gatherings by S. C. Atchley (BM, K), F. G. Guiol (BM), C. Goulimis (ATH) and L. Pinatzis (G, K, W, etc.). Herbarium abbreviations are according to Holmgren et al. (1990).

K. H. Rechinger visited the area in May 1964 and collected c. 200 numbers; his specimens are at C, G, W, etc. More recent collections include c. 500 numbers gathered by J. Persson (GB) in 1968, 1969 and 1970, mostly at high altitude. E. Stamatiadou (ATH) collected c. 130 numbers on Parnonas in July 1971. From 1978 to 1997 the area has been visited by a number of botanists including C. Baden & R. Franzén (C), E. Bergmeier (C), A. Boratynski et al. (KOR), J. Bouharmont (priv. herb.), K. I. Christensen (C), W. Greuter & H. Merxmüller (B, M), T. Landström (LD), W. Lippert (M), B. Oxelman & Tollsten (GB), G. Sfikas (priv. herb.), W. Strasser (priv. herb.), Strid et al. (C, etc.), Kit Tan & Vold (C, etc.) and several collectors from UPA (A. Anagnostopoulos, K. Athanasiou, D. Christodoulakis, Th. Georgiadis, G. Iatrou, D. Phitos, A. Tiniakou and D. Tzanoudakis). However, in view of its size and floristic merit, Parnonas is still rather underexplored. In the "Flora Hellenica" database held at the "Flora Hellenica" Secretariat at Copenhagen, there are 2002 records representing 747 species from the Parnonas area as compared with 3460 records representing 933 species from neighbouring Mt Taigetos. The total number of species is certainly over 1100 on Parnonas and there will also probably be an increase of 10–20% more on Taigetos. Of taxa treated in the "Mountain Flora of Greece" (Strid 1986, Strid & Tan Kit 1991), i.e. with reference to species and subspecies occurring at upper montane and alpine levels, there are 224 taxa on Parnonas as compared to 318 on Taigetos and 289 and 357 on Killini and Chelmos respectively in the northern Peloponnese.

## Phytogeography

Based on data from the "Mountain Flora of Greece", Strid (1996) classified the floras of 28 Greek mountains with respect to phytogeographical elements. The percentage figures for Parnonas are as follows: widespread 11.7, Central European 13.9, Balkan and Anatolian 12.6, widespread Mediterranean 20.2, Balkan and Italian 4.5, Balkan endemic 10.4, Greek endemic 12.6, single-area endemic 6.7, single-mountain endemic 1.8 and insufficiently known 5.6. These figures are similar to those for Mts Taigetos, Killini and Chelmos, all in the Peloponnese. The frequency of narrow endemism is lower than in the mountains of

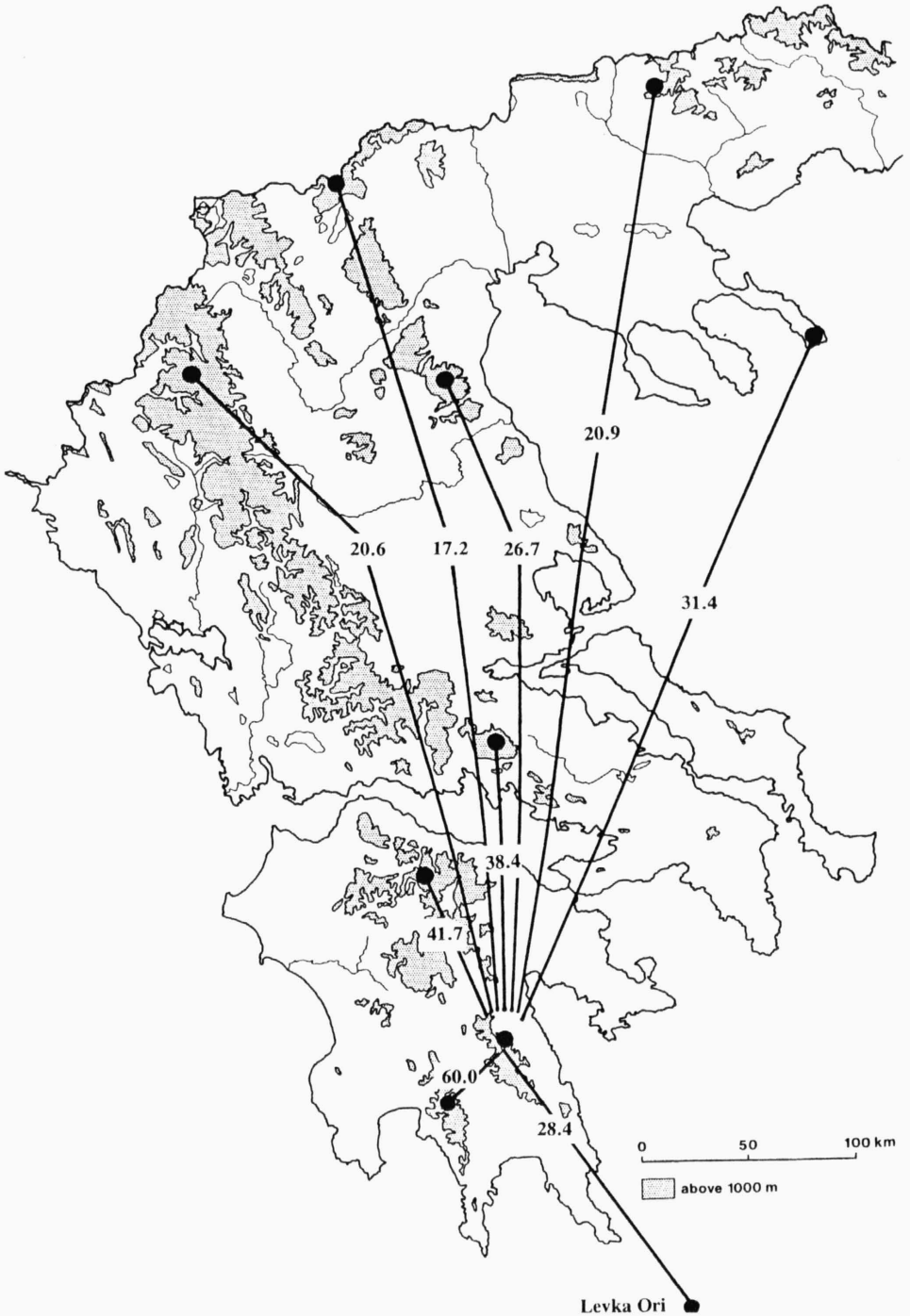


Fig. 1. – Percentage of species shared by Parnonas and nine other Greek mountains. Clockwise from lower left: Taigetos, Chelmos, Smolikas, Voras, Parnassos, Olimbos, Vrontous, Athos and Levka Ori (on Kriti).

Kriti (Levka Ori, Psiloritis and Dikti) where the combined percentages of Greek endemics, single-area endemics and single-mountain endemics is between 40.1 and 44.3, but higher than the corresponding figures for the more northerly Greek mountains. If lowland and lower montane taxa were to be included, there would certainly be a higher percentage of widespread Mediterranean ones at the expense of Central European taxa and the endemic categories.

Floristic connections between Parnonas and nine other Greek mountains are shown in Fig. 1. The figure is based on data from the “Mountain Flora of Greece” although discussion in two earlier paragraphs refers to more complete data which has arisen from the current study of the Parnonas area and is held in the Flora Hellenica database. The nine mountains (clockwise from lower left) are Taigetos, Chelmos, Smolikas, Voras, Parnassos, Olimbos, Vrontous, Athos and Levka Ori (on Kriti). The numerals indicate the percentage of species occurring on Parnonas as well as on the mountain with which it is compared. For example, 210 species have been recorded from alpine and upper montane levels on Mt Athos; of these, 66 or 31.4 % also occur on Parnonas.

The percentage figures in Fig. 1 reflect not only geographical distance but similarities or differences arising from substrate and other ecological features. As expected, the highest similarity (60.0 %) is found between Parnonas and adjacent Taigetos which is also limestone in nature. In the north, similarities to Olimbos and Athos (both limestone mountains) are higher than to Smolikas, which is approximately the same distance from Parnonas but largely composed of serpentinite. Low similarity values (17.2 % and 20.9 %, respectively) are found when Parnonas is compared to Voras and Vrontous in northern Greece which are geologically different, the former consisting of micaceous schist and the latter of granite.

At least 72 Greek endemics are known to occur on Parnonas (see the list below). Of these more than half (38, marked by asterisks) are endemic to the Peloponnese and 13 (marked by double asterisks) are exclusive to Parnonas: *Abies cephalonica* J.W. Loudon, \**Achillea taygetea* Boiss. et Heldr., *Achillea umbellata* Sm., *Alkanna graeca* Boiss. et Spruner subsp. *graeca*, \**Anthemis laconica* Franzén, *Arenaria guicciardii* Boiss., \**Asperula boryana* (Walp.) Ehrend., \*\**Asperula elonea* Iatrou et Georgiadis, \*\**Asperula malevonensis* Ehrend. et Schönbr.-Tem., \**Asperula mungieri* Boiss. et Heldr., \**Asperula taygetea* Boiss. et Heldr., \*\**Astragalus agraniotii* Boiss., \**Astragalus drupaceus* Orph. ex Boiss., \**Bolanthus laconicus* (Boiss.) Barkoudah, *Bufonia stricta* (Sm.) Gürke, \**Campanula andrewsii* A. DC. subsp. *hirsutula* Phitos, \**Campanula asperuloides* (Boiss. et Orph.) Engler, \**Centaurea affinis* Friv. subsp. *laconiae* Prodan, *Centaurea raphanina* Sm. subsp. *mixta* (DC.) Runem., \*\**Centaurea rupestris* L. subsp. *parnonia* (Halácsy) Routsis et Georgiadis, *Cerastium candidissimum* Correns, *Cerastium illyricum* Ard. subsp. *brachiatum* (Lonsing) Jalas, \**Cerastium pedunculare* Bory et Chaub. \**Crepis heldreichiana* (O. Kuntze) Greuter, \**Crocus biflorus* Miller subsp. *melanantherus* B. Mathew, \**Cyclamen repandum* Sm. subsp. *peloponnesiacum* Grey-Wilson, *Dianthus biflorus* Sm., *Dianthus diffusus* Sm., \**Dianthus serratifolius* Sm. subsp. *abbreviatus* (Halácsy) Strid, *Dianthus tymphresteus* (Boiss. et Spruner) Boiss., *Erodium chrysanthum* L'Hér., \**Erysimum pectinatum* Bory et Chaub., \**Erysimum pusillum* Bory et Chaub., *Fritillaria graeca* Boiss. et Spruner, \**Galium taygeteum* Krendl, *Galium thymifolium* Boiss. et Heldr., *Geocaryum parnassicum* (Boiss. et Heldr.) Engstrand, *Gypsophila nana* Bory et Chaub., \**Hypericum taygeteum* Quézel et Contandr., *Lamium garganicum* L.

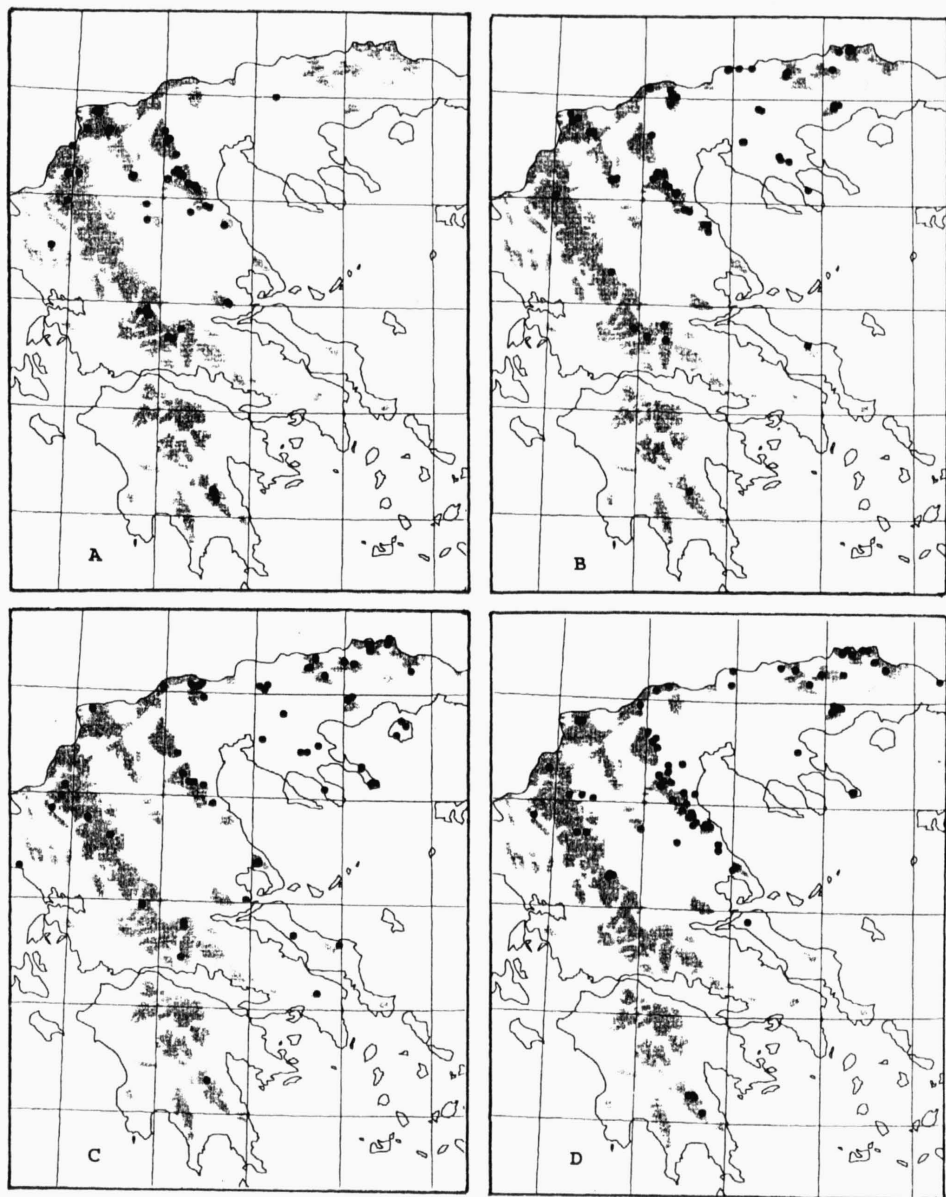


Fig. 2. – Central European or Balkan species with their southernmost localities on Parnonas. A: *Dianthus stenopetalus*; B: *Epilobium angustifolium*; C: *Populus tremula*; D: *Silene viridiflora*.

subsp. *pictum* (Boiss. et Heldr.) P. W. Ball, \*\**Matricaria rosella* (Boiss. et Orph.) Nyman, \*\**Minuartia favargerii* Iatrou, \*\**Minuartia wettsteinii* Mattf. subsp. *parnonia* Kamari, \*\**Nepeta orphanidea* Boiss., *Onosma erectum* Sm. subsp. *erectum*, *Origanum scabrum* Boiss. et Heldr., *Paronychia albanica* Chaudhri subsp. *graeca* Chaudhri, *Petrorhagia glumacea* (Bory et Chaub.) P. W. Ball et Heywood, \*\**Petrorhagia grandiflora* Iatrou, *Petrorhagia illyrica* (L.) P. W. Ball et Heywood subsp. *taygetea* (Boiss.) P. W. Ball et Heywood, *Plantago atrata* Hoppe subsp. *graeca* (Halácsy) Holub, \*\**Potentilla arcadiensis* Iatrou, *Pterocephalus perennis* Coulter subsp. *perennis*, *Rindera graeca* (A. DC.) Boiss. et Heldr., *Satureja parnassica* Boiss. subsp. *parnassica*, \**Scabiosa crenata* Cyr. subsp. *breviscapa* (Boiss. et Heldr.) Hayek, *Scutellaria rupestris* Boiss. et Heldr. subsp. *parnassica* (Boiss.) Greuter et Burdet, \**Sideritis clandestina* (Bory et Chaub.) Hayek subsp. *clandestina*, *Silene congesta* Sm., *Silene corinthiaca* Boiss. et Heldr., *Silene gigantea* L. subsp. *hellenica* Greuter, \**Silene goulimyii* Turrill, \**Silene integripetala* Bory et Chaub. subsp. *integripetala*, *Silene italica* (L.) Pers. subsp. *peloponnesiaca* Greuter, \*\**Silene laconica* Boiss. et Orph., \**Stachys chrysantha* Boiss. et Heldr., *Trinia frigida* (Boiss. et Heldr.) Drude, \*\**Trisetum laconicum* Boiss. et Orph., \**Verbascum daenzeri* (Fauché et Chaub.) O. Kuntze, *Veronica chamaedrys* L. subsp. *chamaedryoides* (Bory et Chaub.) M. A. Fischer, *Veronica glauca* Sm. subsp. *peloponnesiaca* (Boiss. et Orph.) Maire et Petitm., \*\**Viola parnonia* Kit Tan, Sfikas et Vold.

Parnonas is also remarkable for the occurrence of some widely disjunct species. The most striking example is possibly *Juniperus drupacea* Labill. which has its only European occurrences in southern Greece. This species is fairly widespread on Parnonas where it was first discovered by Bayer and also by Orphanides, and most surprisingly, recently found on Taigetos (see Tan Kit et al. 1999). Its main distribution area is in south central Turkey, western Syria and Lebanon; the linear distance between Parnonas and the nearest localities in Anatolia is c. 800 km.

The central European *Chamaespartium sagittale* (L.) P. Gibbs extends on the Balkan Peninsula southwards to the border area of Bulgaria and Greece. On the Greek side it is fairly common in the Rodopi and has also been found on Mt Belles (Kerkini), being a species of rocky and gravelly places in grassy meadows or open woodland on non-calcareous substrate at c. 1200–1800 m. Literature records from elsewhere in northern Greece require confirmation, but the species reappears unexpectedly in the coniferous forest zone on the northern part of Parnonas, a disjunction of c. 450 km.

Several other species belonging to the Central European or Balkan elements have their southernmost Greek localities on Parnonas. They are usually plants of open woodland or meadows at montane levels and include at least the following: *Acer monspessulanum* L., *Agrimonia eupatoria* L., *Arrhenatherum elatius* (L.) J. et C. Presl, *Calamintha grandiflora* (L.) Moench, *Dianthus stenopetalus* Griseb. (Fig. 2A), *Epilobium angustifolium* L. (Fig. 2B), *Euphorbia seguieriana* Necker, *Ferulago sylvatica* (Besser) Reichenb., *Inula conyzae* (Griseb.) Meikle, *Lapsana communis* L., *Laserpitium siler* L., *Lathyrus niger* (L.) Bernh., *Lathyrus pratensis* L., *Melica uniflora* Retz., *Populus tremula* L. (Fig. 2C), *Sanicula europaea* L., *Senecio macedonicus* Griseb., *Silene viridiflora* L. (Fig. 2D) and *Taxus baccata* L.

## Conclusions

In conclusion, we may state that Parnonas, a mountain of great phytogeographical interest, is still insufficiently explored. The total number of species, including those from the lower slopes is probably 50 % higher than that currently known. Parnonas has a high degree of local and regional endemism both at alpine levels and at the lower and middle southern slopes, particularly in rocky habitats. It also harbours some widely disjunct species with their main distribution areas in southern Turkey or the central Balkan Peninsula. Several Central European or Balkan species have their southernmost localities on Parnonas and these are usually plants of mesic woodland habitats.

## Shrnutí

Práce přináší fytogeografické poznámky k pohoří Parnonas v jižním Řecku. Zabývá se výčtem fytogeografických elementů a vysokým zastoupením endemitů a taxonů s výrazně disjunktním areálem (jež mají hlavní oblast svého rozšíření v jižním Turecku nebo ve střední části Balkánského poloostrova). V pohoří Parnonas má jižní hranici areálu řada středoevropských a balkánských druhů (většinou vázaných na mezické lesy). Práce dále přináší stručný nástin historie floristického výzkumu území a srovnává Parnonas s devíti jinými řeckými pohořími. Dochází k závěru, že navzdory značnému fytogeografickému významu je pohoří Parnonas dosud nedostatečně prozkoumáno. Celkový počet skutečně zde rostoucích druhů je pravděpodobně zhruba o polovinu vyšší, než kolik se jich zatím udává.

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