Floristic reports from the high mountains of Pindhos, Greece

Björn Aldén

Aldén, B. 1976 10 22: Floristic reports from the high mountains of Pindhos, Greece. *Bot. Notiser 129:* 297–321. Stockholm. ISSN 0006-8195.

Some 50 species and subspecies are discussed. 4 new taxa are described from C and S Pindhos, viz. *Campanula pindicola, Centaurea triamularia, Lithospermum goulandriorum* ssp. *thessalicum* and *Solenanthus pindicus*. 16 species are reported as new for Pindhos, 5 new to Greece and 1 (*Thesium brachyphyllum* Boiss.) new to the Balkan Peninsula. The new hybrid *Achillea fraasii* Schultz × *A. holosericea* Sibth. & Sm. is described. New chromosome numbers for 10 taxa are given.

Björn Aldén, Department of Plant Taxonomy, University of Lund, Ö. Vallgatan 18, S-223 61 Lund, Sweden.

This report presents new or noteworthy high-mountain plants from the S and C parts of the Pindhos mountains on the Greek mainland. The area investigated is shown in Fig. 1. Two serpentine mountains, Mt Mavrovouni and Mt Milia (the area also known as Lingos), c. 10 km N of Mt Zygos were also visited. Field-work was carried out during the summers of 1971 to 1974. More than 5,000 collections were made, most of them from above 1800 m. Circumstances prevented the author from investigating an area S and SE of Mt Karava. These parts are still unknown botanically.

Unless otherwise stated the nomenclature follows Flora Europaea 1–3 (Tutin et al. 1964–1972) and Prodromus Flora peninsulae Balcanicae 2 and 3 (Hayek 1931, 1933). The main works consulted for information on general distribution are Vergleichende Chorologie der zentraleuropäischen Flora (Meusel et al. 1965), Flora der Schweiz (Hess et al. 1967–1972), Flora of Turkey 1–5 (Davis 1965–1976) and Flora Europaea 1–3 (Tutin et al. 1964–1972).

Two mountains previously unexplored botanically will be briefly discussed below.

Mt Koziakas

Mt Koziakas is one of the mountains bordering the plains of Thessaly, 20 km W of Trikkala. It consists of hard limestone exhibiting karst formation with a series of steep-sided cliffs running N and S. In the summit area, with peaks between 1750 and 1901 m, are also some occurrences of younger and softer limestone. The timber-line, formed by *Abies borisii-regis*, is between 1700 and 1800 m according to the aspect. The boulder-rich rocky parts have an extremely rich mixed flora. Depressions in the hard limestone form rather isolated niches each with one or a few dominant species that are virtually restricted to the depression (Fig. 2). Most of the species on Mt Koziakas are non-alpine, mostly nemoral plants such as *Actaea spicata, Fraxinus excelsior, Lilium martagon, Lonicera alpigena, Malva moschata, Polygonatum officinale, Rubus idaeus, Senecio nemorensis, Solidago virgaurea* and *Thalictrum aquilegiifolium*. Species more typical to alpine regions in Greece are *Asplenium fissum, Geranium macrorrhizum, Heracleum sphondylium* ssp. *pyrenaicum, Saxifraga paniculata* and *S. sempervivum*.

Classification into montane, subalpine or

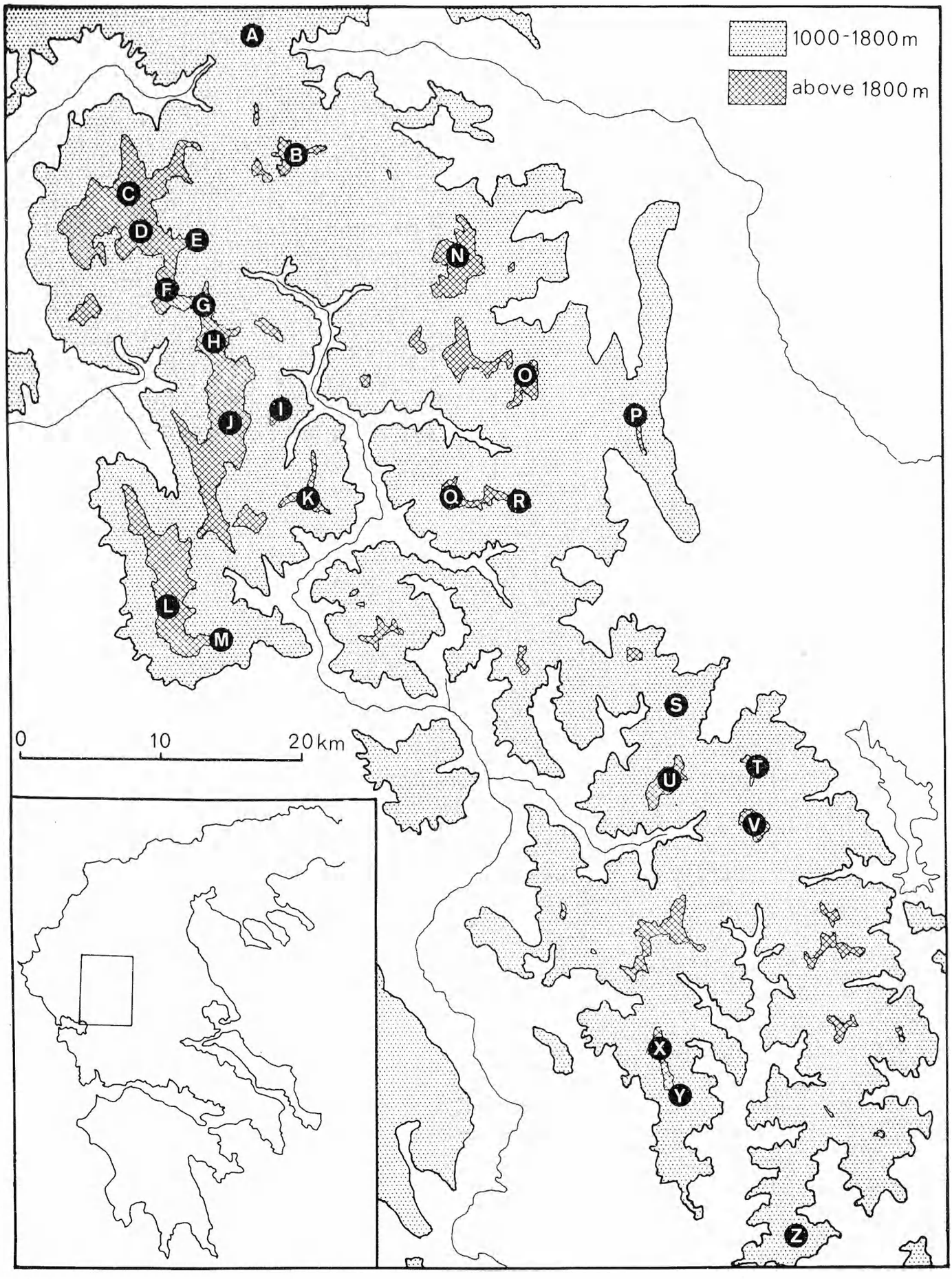
1000-1800 m
above 1800 m
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
X
Y
Z
0
10
20 km

Fig. 2. Mt Koziakas. Part of a depression in hard limestone at c. 1800 m.

alpine species is often problematic. The altitudinal phytozonation is not well defined because of climatic conditions, grazing and tree felling. Only a limited number of species can be regarded as being restricted to given altitudinal levels. There are at least three very rare species on Mt Koziakas that add to its interest, viz. *Allium heldreichii, Geranium aristatum* and *Lithospermum goulandriorum* ssp. *thessalicum* Aldén, ssp. nov. The richness of the flora and the relative accessibility of the area make Mt Koziakas well worth protecting.

Mt Pachtourion

Mt Pachtourion consists of three ridges with peaks between 1800 and 2000 m, the chief ones being Soufli and Katafili. (The most westerly parts are also known as Neraidha – not marked in Fig. 1). It lies roughly 7 km SE of the village of Ghardikion in the valley of Aspropotamos and SE of Mt Kakarditsa, the highest peak in C Pindhos. Between the peaks Soufli and Katafili, which are very steep, are a series of lower peaks. On the N slopes *Fagus*

Fig. 1. C and S Pindhos. Mountains visited:

Augo (Q)
Baros (F)
Boutai (E)
Dhokimi (B)
Kakarditsa (J)
Karava (U)
Katarrachias (H)
Kauki (Z)
Kazarma (T)
Kourouna (I)
Koziakas (P)
Liakoura (Y)
Loupata (R)
Mazur-Ailas (S)
Neraidha (O)
Pachtourion (K)
Peristeri (C)
Perivoulion (G)
Pteri (X)
Spilea (M)
Trapos (D)
Tringia (N)
Tzoumerka (L)
Voutsikaki (V)
Zygós (A)

Fig. 3. Mt Pachtourion. A NW slope with *Fagus sylvatica* reaching 1800 m.

sylvatica ascends to 1800 m (Fig. 3) and to about 1600 m on the S slopes. An interesting feature of Mt Pachtourion is the abundance of base-poor metamorphic rocks, viz. iron silicates and the mineral pyrolusite. Here *Euphorbia glabriflora*, *Achillea absinthoides* and *Senecio viscosus* were found. On the S slopes at about 1700 m in screes and other stony places, *Asyneuma canescens*, *Centaurea triamularia* Aldén, sp. nov. and *Euphorbia deflexa* occur. The aromatic species *Nepeta spruneri*, *Satureja parnassica* and *Artemisia absinthium* dominate. On some of the very steep NE slopes of the peak Katafili *Acantholimon androsaceum* covers the rocks in parts. In the boulder-rich areas of hard limestone on the peak Soufli *Sideritis perfoliata* was found, and in moist rock meadows on the N side *Alchemilla plicatula* and *Coeloglossum viride*. Many of the cliff systems and peaks in this fascinating area remain to be investigated.

Chromosome counts – material and methods

Plants have been raised from seed and bulbs collected in nature and kept in cultivation in the experimental greenhouses of the Lund Botanical Gardens. Chromosome counts were made from root tips of young plants that had been kept overnight at a temperature of c. 3° C. The root tips were then fixed in the Svalöf modification of Navashin-Karpechenko fixative and later sectioned with a microtome and stained with crystal violet.

Apiaceae

Peucedanum longifolium Waldst. & Kit.

Collections. Mt Augo, 6 km SW of Pirra, 1850–1950 m, A 2401 – Mt Boutai, 4 km SW of Chalikion, 1800–1900 m, A 3194 – Mt Pachtourion, 5.5 km SSE of Athamania, c. 1900 m, A 4706 – Mt Koziakas, 5 km NE of Pertoulion, c. 1900 m, A 1517 – Mt Trapos, 5 km SW of Chalikion, 1800–1850 m, A 4208 – Mt Tzoumerka, 4 km W of Theodhoriana, c. 2000 m, A 2740.

Previously only recorded from Mt Phalakron in NE Greece (Quézel & Contandriopoulos 1968).

The specimens collected are not in the fruiting stage. The leaf lobes are very narrow (0.5–1 mm, rarely up to 2 mm) the material thus being referable to *P. longifolium*.

P. longifolium occurs on dry rocky ground between 1800 and 2000 m, often associated with *Jurinea mollis* ssp. *glycacantha, Salvia argentea, Laserpitium siler* ssp. *garganicum* and in W Pindhos also with *Alkanna nonneiformis*.

General distribution. Balkan Peninsula.

Aspleniaceae

Asplenium fissum Kit. ex Willd.

Collections. Mt Kakarditsa, 3.5 km W of Athamania, 2050–2250 m, A 3531 – Mt Katarrachias, 6 km ENE of Kalarrites, 2100–2160 m, A 5308 – Mt Koziakas, 6 km E of Pertoulion, c. 1850 m, A 4841 – Mt Pachtourion, 6 km SSE of Athamania, c. 1800 m, A 4653 – Mt Perivoulion, 7.5 km S of Chalikion, c. 2100 m, A 3336 – Mt Spilea, 4 km SSW of Theodhoriana, 1850–1930 m, A 2899 – Mt Trapos, 5 km WSW of Chalikion, 1980–2080 m, A 3815 – Mt Tzoumerka, 4.5 km W of Theodhoriana, 2000–2050 m, A 2753.

Previously recorded from Mt Peristeri in Pindhos (Quézel & Contandriopoulos 1965).

Most plants from Pindhos have 2–3-pinnate, rather short and broad leaves. In habit they are thus closer to *A. lepidum*, but in other respects (glabrous leaf lamina, spore size and sculpture) the specimens agree with *A. fissum*.

A. fissum grows in crevices of cliffs and boulders of hard limestone from 1800 to 2200 m but is not common.

General distribution. Mountains of SC and SE Europe.

Asplenium viride Huds.

Collections. Mt Kakarditsa, 4 km W of Athamania, 2250–2350 m, A 3692 – Mt Katarrachias, 6 km ENE of Kalarrites, 2150–2250 m, A 5193 – Mt Mavrovouni, 5 km WNW of Milea, 1900–2000 m, A 5139 – Mt Milia, 5 km NW of Milea, 2050–2100 m, A 4937 – Mt Perivoulion, 7.5 km S of Chalikion, c. 2100 m, A 3186 – Mt Trapos, 6 km SW of Chalikion, c. 2200 m, A 4142 – Mt Tzoumerka, 5.5 km WSW of Theodhoriana, c. 2250 m, A 2754.

Reported from Mt Trapos (=Mt Plaka) by Quézel & Contandriopoulos (1965).

Rare in Pindhos. Occurs in moist places among rocks and on rock ledges in the W parts. On Mt Kakarditsa up to 2300 m.

General distribution. N temperate regions.

Asteraceae

Achillea absinthoides Hal.

Collections. Mt Kakarditsa, 3 km W of Athamania, c. 2000 m, A 3650 – Mt Loupata, 6 km SSW of Pertoulion, 1850–2000 m, A 1724 – Mt Pachtourion, 5.5 km SSE of Athamania, c. 1830 m, A 4681; do, c. 1800 m, A 4695 – Mt Tzoumerka, 4.5 km WSW of Theodhoriana, 1800–1900 m, A 2657; do, 1900–1950 m, A 2699.

Previously recorded only from Mt Tzoumerka (locus classicus) and Mt Smolika above the village of Samarina (Zaganiaris 1938–40). No specimens have been seen from the last locality (left out in Fig. 8 A).

A. absinthoides grows on dry rock ledges or stony slopes from 1800 to 2000 m, mainly on base-poor metamorphic rock and associated with *Senecio viscosus*.

Chromosome number 2n = 18 (A 3650). No previous counts.

General distribution. Endemic to Pindhos (Fig. 8 A).

Achillea fraasii Schultz × **A. holosericea** Sibth. & Sm.

Collection. Mt Trapos, 5 km SW of Chalikion, 1800–1850 m, A 4215.

A new hybrid with the basal and lower cauline leaves 3-pinnate, as in *A. fraasii*, but with broader segments. Indumentum of leaves on both surfaces dense with villous-sericeous hairs as in *A. holosericea*. Bracts as in *A. fraasii*, with sparse covering of long hairs. Ligules cream-coloured. Pollen stainability 12.5% (in cotton blue).

The hybrid was found on a dry rock ledge growing together with the parental species.

Centaurea phrygia L.

Collections. Mt Baros, 8 km SSW of Chalikion, 1850–1950 m, A 3069 – Mt Peristeri, 6 km W of Chalikion, c. 2150 m, A 4190 – Between Mt Peristeri and Mt Trapos, 5.5 km WSW of Chalikion, c. 2000 m, A 4239.

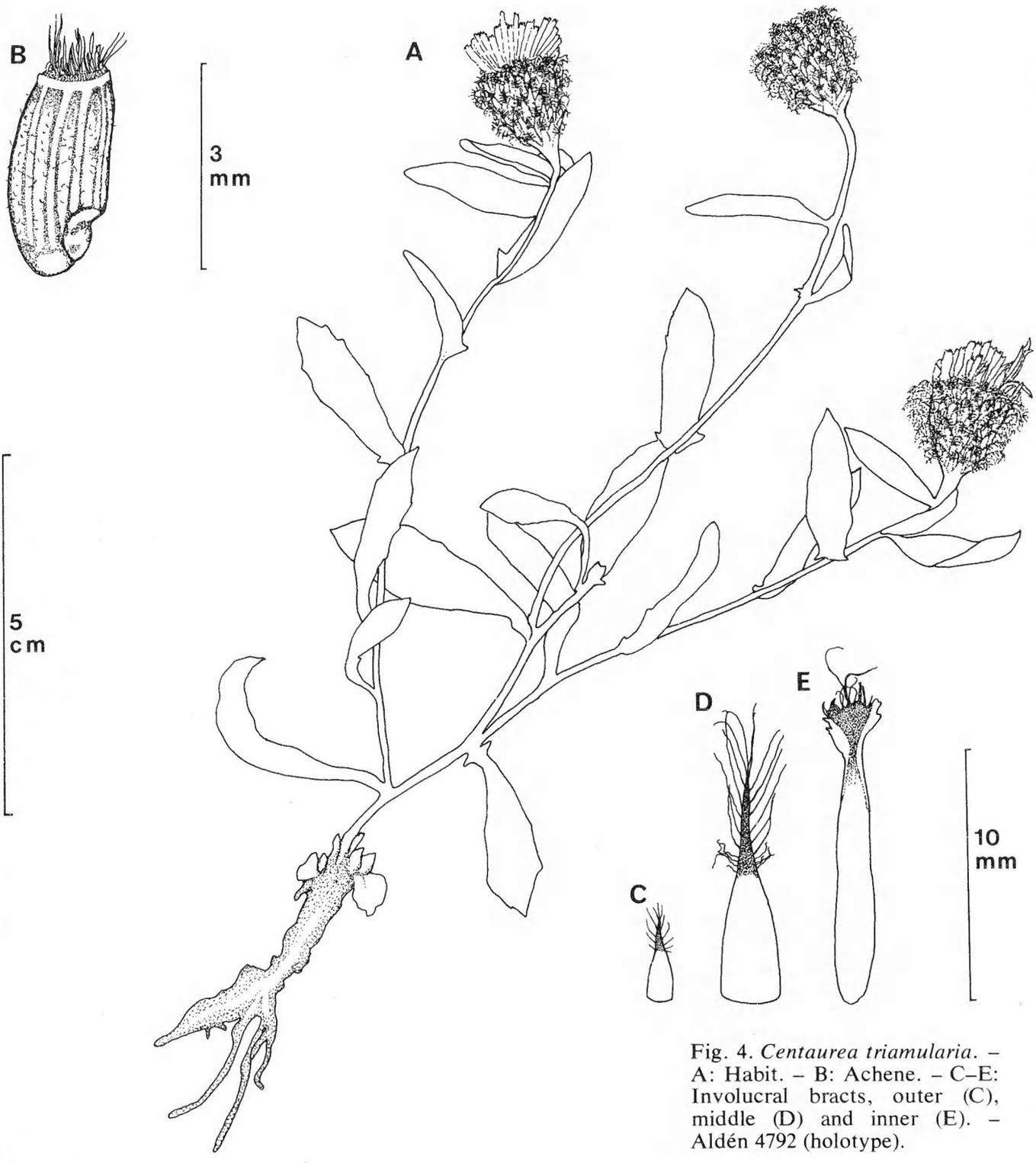

Fig. 4. *Centaurea triamularia*. – A: Habit. – B: Achene. – C–E: Involucral bracts, outer (C), middle (D) and inner (E). – Aldén 4792 (holotype).

On a few mountains in WC Pindhos some plants belonging to the *C. phrygia* group were found. The same taxon has been reported by Formanek (1897) from Mt Dhokimi under *C. nigrescens* Willd. From the Balkan Peninsula where the degree of variability of the *C. phrygia* group is high a number of local taxa have been given species rank (cf. Săvulescu 1964). Characters such as branching, indumentum, shape of leaves and capitula, shape and colour of bract appendages, some of these partly modificative, have been used for diagnosis. The nomenclature used below is according to Dostál (1975).

Of the subspecies recognized within *C.*

phrygia the plants from Pindhos approach ssp. *melanocalathia*, endemic to the Carpathian Mountains. They differ in some characters, viz. stems simple (rarely branched once or twice), 10–30 cm, leaves narrowly lanceolate to ovate-lanceolate, sparsely puberulent to greyish arachnoid-tomentose, involucre mostly with arachnoid-tomentose bracts. Characters such as indumentum and shape of leaves vary according to habitat. The same characters also distinguish them from ssp. *phrygia* which also differs slightly in shape of appendage.

Ssp. *rarauensis*, a local taxon in Romania, has simple stems and arachnoid-tomentose leaves, but differs in having broader leaves and a dark brown, not black, bract appendage. The Greek plants thus show new vegetative character combinations, but as the group is in need of revision I prefer to place them under *C. phrygia* s.l., in the vicinity of ssp. *melanocalathia*, with no other epithet.

The plants were found on dry ground that had been previously wet and in meadows up to 2150 m.

General distribution (*C. phrygia* s.l.). N, C and SE Europe to W Asia.

Centaurea triamularia Aldén, sp. nov. – Fig. 4

Typus: Graecia, Thessalia: Mons Pachtourion, supra pagum Athamania in Aspropotamos, in rupestribus, aridis, subalpinis, c. 1700 m, 31.7. 1974, Aldén 4792 (LD holotypus).

Perennis. Caulis humilis, procumbens vel ascendens, 9–20 cm altus, arcuato-recurvatus, basi et ad medium ramosus. Folia integra vel sparsim serrata, utrinque breviter hirta et ± arachnoidea, 5–13 × 20–50 mm, inferiora obovato-lanceolata, in petiolum attenuata, media et superiora obovato-lanceolata vel lanceolata, saepe subhastata. Capitula solitaria, subsessilia. Pedunculi mox incrassati. Involucrum cylindricum, 6–9(–10) × 12–15 mm, phyllis appendicibus non obtectis, sparse lanatis vel subglabris. Appendices interiores orbiculatae, ad apicem fimbriatae, obscure fuscae, mediae, 6–8 mm, lanceolatae, ad apicem filiformes, plumoso-ciliatae c. 8–12-fimbriatae, obscure fuscae, arcuato-recurvae attenuatae. Flores dilute purpurei. Achaenia c. 3 mm longa, papposa, pappo ad 1 mm longo. Numero chromosomatum 2n = 22.

Procumbent to ascending perennial. *Stems* from a rhizome, 9–20 cm, arcuate, branched at or below middle. *Leaves* entire to remotely serrate, arachnoid-puberulent, 5–13 × 20–50 mm, lowest attenuate into a petiole, obovate-lanceolate, middle and upper subhastate, obovate-lanceolate to lanceolate. *Capitulum* single on short, slightly thickened peduncles. Involucre cylindrical, 6–9 × 12–15 mm. *Bracts* sparsely lanate to subglabrous, not completely covering each other. Appendage of inner bracts orbiculate with a fimbriate apex, dark brown, middle 6–8 mm, attenuate into a subulate-filiform acumen, arcuate-recurved, pectinate-fimbriate with 8–12 fimbriae on each side, blackish-brown. *Florets* pale purple. Achenes c. 3 mm, reddish-brown, finely puberulent. Pappus up to 1 mm long.

In size of involucre and type of bract appendage *C. triamularia* resembles *C. indurata*, but differs markedly in habit, size of achenes and length of pappus. *C. triamularia* is best placed near *C. stenolepis* and perhaps also *C. phrygia* ssp. *pseudophrygia*, which it approaches in achene and pappus characters, but not in habit, shape of leaves and shape and size of involucre.

C. triamularia grows on dry and stony slopes of base-poor rock at c. 1700 m. Chromosome number 2n = 22.

Gnaphalium hoppeanum Koch

Collections. Mt Kakarditsa, 4 km W of Athamania, 2250–2350 m, A 3696 – Mt Karava, 3 km ESE of Vlasion, c. 2100 m, A 995 – Mt Katarrachias, 5.5 km ENE of Kalarrites, 2150–2250 m, A 5256 – Mt Peristeri, 6 km W of Chalikion, c. 2150 m, A 3965; do, 2200 m, A 4161; do, 2200–2290 m, A 4179 – Mt Perivoulion, 7.5 km S of Chalikion, 2100–2180 m, A 3320 – Mt Trapos, 5 km WSW of Chalikion, 1980–2080 m, A 3809 – Mt Tzoumerka, 4.5 km WSW of Theodhoriana, 1900–2000 m, A 2514.

G. hoppeanum, in some cases confused with *G. supinum*, has previously been collected on Mt Peristeri (Maire & Petitmengin 1908, as *G. supinum*, Quézel & Contandriopoulos 1965) and on Mt Tzoumerka (Baldacci in Halácsy 1902, as *G. supinum*). No *G. supinum* has been found in the material from C and S Pindhos. Specimens of *G. hoppeanum* from Pindhos have one to many capitula, when few they are rather distant, when many they are crowded at anthesis. After anthesis, however, growth continues so that the capitula become more distant.

G. hoppeanum grows in a variety of alpine habitats.

General distribution. Abruzzia in Italy and the S Balkan Peninsula.

Scorzonera hispanica L.

Collections. Mt Baros, 8 km SSW of Chalikion, 1850–1950 m, A 3080 – Mt Boutai, 4 km SW of Chalikion, 1800–1900 m, A 3200 – Mt Kakarditsa, 3 km W of Athamania, 1820–1920 m, A 3712 – Mt Kourouna, 2 km SSW of Aghio Paraskevi, 1900–1970 m, A 2015.

New to C and S Pindhos.

Plants erect, stems 20–50 cm, usually branched above the middle, leaves 10–25 × 0.2–1.0 cm. Morphologically the material is referable to var. *glastifolia* (Willd.) Wallr. (cf. Hayek 1931).

S. hispanica grows in dry meadows from 1800 to 1950 m.

General distribution. C and S Europe, S Russia, Caucasus, Turkey and Siberia.

Scorzonera mollis Bieb.

Collections. Mt Augo, 6 km SW of Pirra, 1850–2000 m, A 2346; do, 1700–1800 m, A 2359; do, 1800–1850 m, A 2375; do, 1850–1900 m, A 2402 – Mt Boutai, 4 km SW of Chalikion, 1800–1900 m, A 3210 – Mt Spilea, 3.5 km SSW of Theodhoriana, c. 1800 m, A 2854 – Mt Trapos, 5 km SW of Chalikion, 1800–1850 m, A 4207.

In Pindhos previously known only from Mt Smolika (Baldacci 1899) and Mt Grammos (Zaganiaris 1938–40).

S. mollis grows in dry stony places up to 1900 m.

Chromosome number 2n = 14 (A 3210). No previous counts.

General distribution. SE Europe, Asia to Iran.

Scorzonera purpurea L. ssp. **rosea** (Waldst. & Kit.) Nyman

Collections. Mt Baros, 8 km SSW of Chalikion, 1800–1900 m, A 2933; do, 1850–1950 m, A 3105 – Mt Pachtourion, 5 km SSE of Athamania, c. 1800 m, A 4575.

The taxon is here treated as a subspecies of *S. purpurea* (Nyman 1879).

Ssp. *rosea* is rare in Greece collected on Mt Kaimaktsalan (Rechinger 1936) and near the village of Siatista (Zaganiaris 1938–40) in Greek Macedonia and in Pindhos on Mt Said Pascha (near Mt Zygos) by Sintenis (in Halácsy 1901). Only one typical specimen was collected on Mt Baros. Intermediates between ssp. *rosea* and ssp. *peristerica* with densely fibrous stock apex but with rather short recurved leaves occur on Mt Pachtourion and Mt Baros.

Compared with ssp. *peristerica* ssp. *rosea* seems to be more sensitive to grazing and was found in richer ungrazed meadows at about 1850 m.

General distribution. EC Europe, from C Italy to C Greece.

Boraginaceae

Alkanna nonneiformis Griseb.

Collections. Mt Boutai, 4 km SW of Chalikion, 1800–1900 m, A 3221 – Mt Kakarditsa, 4 km W of Athamania, 2250–2350 m, A 3570 – Mt Loupata, 6 km SSW of Pertoulion, 1850–2000 m, A 1728 – Mt Peristeri, 5 km W of Chalikion, c. 2100 m, A 4113 – Mt Perivoulion, 7.5 km S of Chalikion, 2100–2150 m, A 3138 – Mt Trapos, 5 km SW of Chalikion, 1800–1850 m, A 4209 – Mt Tzoumerka, 4.5 km WSW of Theodhoriana, 1800–1900 m, A 2652; do, 1900–1950 m, A 2682.

New to Greece. *A. nonneiformis*, previously regarded as endemic to Yugoslavian Macedonia, was found mainly in the W parts of C Pindhos (Fig. 8 B). It is rather variable, especially in shape of leaves and in indumentum. The relation between eglandular and glandular hairs on the calyx and pedicels is not as distinct as previously described (cf. Rechinger 1964), i.e. the glandular hairs do not always dominate. In some specimens from Pindhos the corolla is almost glabrous externally and the middle cauline leaves lanceolate to ovate-lanceolate. The nutlets are 2.5–3 mm (in the Yugoslavian Macedonian specimens up to 2.5) with only a moderate downward curvature of the apices. The foeniculi are larger than in plants from Yugoslavian Macedonia.

A. nonneiformis grows on rock ledges and in dry stable screes, often below S- to E-facing cliffs, from 1800 to 2300 m.

General distribution. S Yugoslavia and Pindhos in Greece.

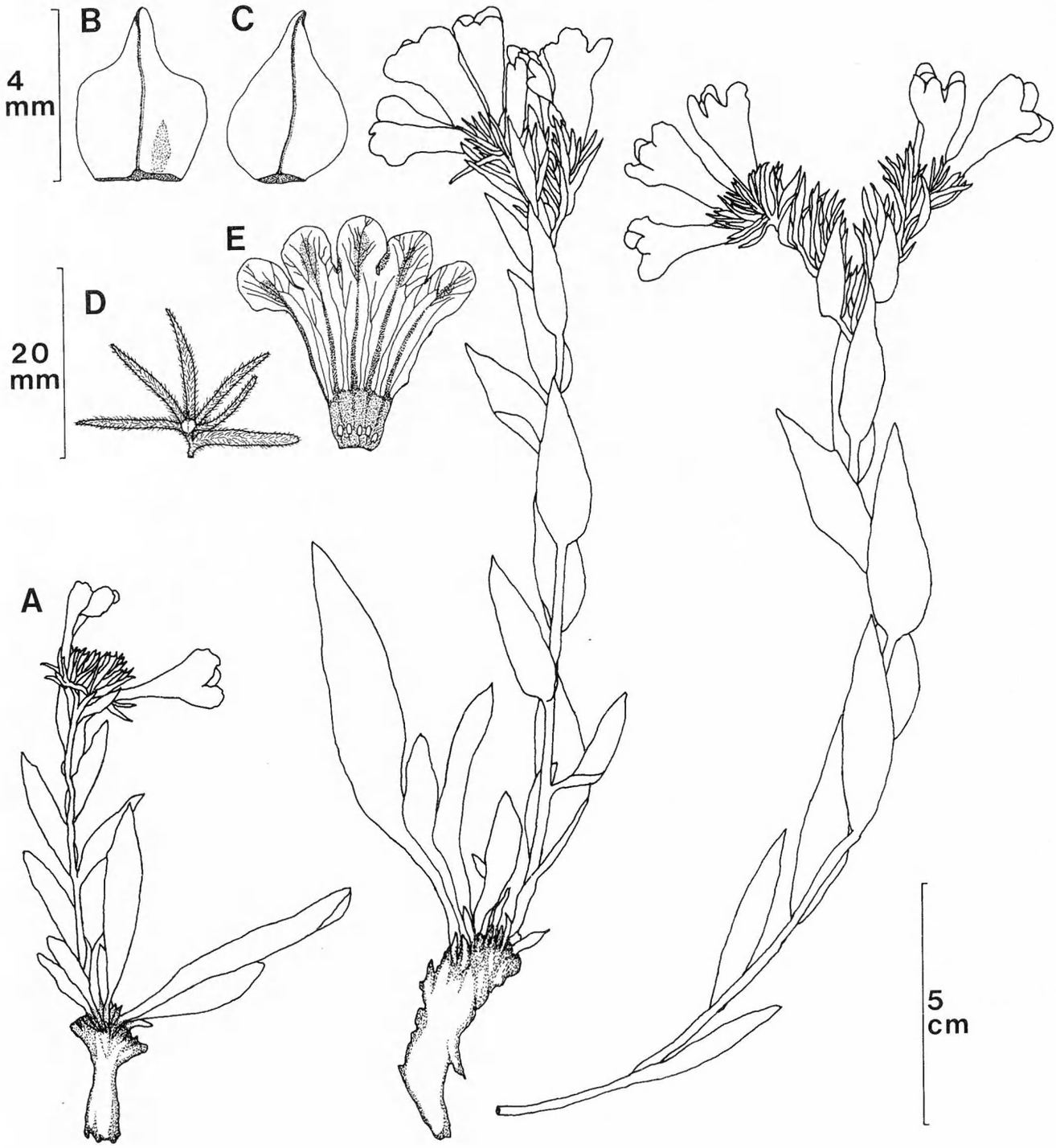

Fig. 5. *Lithospermum goulandriorum*. – A, B, D, E: ssp. *thessalicum*. – C: ssp. *goulandriorum*. – A: Habit. – B–C: Nutlets from the ventral side. – D: Calyx and bract after anthesis. – E: Corolla (opened). – A, E: Aldén 1515 (holotype). – B, D: Aldén 1202. – C: Stamatiadou 7244 (holotype).

Lithospermum goulandriorum Rech. f. ssp. **thessalicum** Aldén, ssp. nov. – Fig. 5

Collections. Graecia, Thessalia: Mons Koziakas, supra pagum Elati, in praeruptis calcareis, 1900 m. 7.7. 1972 Aldén 1515 (LD holotypus); Mt Koziakas, 11 km NW of Pili (near Elati), c. 1800 m, A 1202; 5 km NE of Pertoulion, 1750–1900 m, A 1505.

Ssp. *goulandriorum* similis, sed calyx 9–11 mm (post anthesin ad 15 mm), corolla major, (22–)25–30 mm, 12–15 mm diametro, in vivo et in sicco azurea, antherae 1.3–1.5 mm longae, fructus 4×2.8 mm, compresso-ovoideus, latere interno carinatus, apice abrupte attenuatus, basi c. 2 mm latus. Numero chromosomatum 2n = 28.

Shortly villous to strigose perennial with a stout, black, vertical rhizome. *Stems* simple, ascending to erect, (7–)10–20(–25) cm. Basal *leaves* in a rosette, attenuate into petioles, laminas lanceolate, up to 15 cm long, 5–20 mm broad, acute. Cauline leaves lanceolate to ovate-lanceolate (rarely ovate), 2–6 × 7–15(–20) mm. Indumentum of leaves and bracts strigulose to strigose. *Inflorescence* in dense cincinnate cymes or subcapitate with 10–15(–18) flowers. Pedicels 1–4 mm. *Calyx* 9–11 (after anthesis up to 15 mm), strigose, with lobes linear to linear-lanceolate. *Corolla* funnel-shaped, very slightly oblique, 12–15 × (22–)25–30 mm, with lobes 5–6 mm long, externally sparsely pilose, azure blue. *Stamens* inserted 1.5 mm above the insertion of the corolla. Anthers 1.3–1.5 mm long. *Style* short, c. 0.6 mm and erect. *Nutlets* 4 × 2.8 mm, smooth and shining, ovoid, compressed dorsi-ventrally, with a ventral carina, abruptly narrowed at apex and with a broad base (2 mm).

The genus *Lithospermum* is maintained according to Riedl (1967).

Ssp. *goulandriorum* was found by Stamatiadou on Mt Timphi in Epiros in 1969 and later described by Rechinger (1971).

Ssp. *thessalicum* is clearly separable from ssp. *goulandriorum* in having very large azure blue corollas. The inflorescence is denser and the indumentum consists of hairs at least 1 mm long, giving a greyer appearance. The nutlets are greyish-white and shining as in ssp. *goulandriorum*, but differ in having a well-marked, not subattenuate apex and a broad base.

Ssp. *thessalicum* is a chasmophyte growing on hard limestone from 1800 to 1900 m.

Chromosome number 2n = 28 (A 1202). In the section *Margarospermum* Reichenb., which comprises 6 taxa most of which are evidently old relicts, no chromosome counts are yet available of *L. gastonii* Benth., from the French Pyrenees, and *L. goulandriorum* ssp. *goulandriorum*. The more widespread *L. purpureo-coeruleum* and *L. zollingeri* A. DC., from E Asia, both have 2n = 16 (Reese 1952, Britton 1951, Matsuura & Suto 1935, Grau 1966). *L. calabrum* Ten., endemic to S Italy has 2n = 20 (Grau 1968).

Solenanthus pindicus Aldén, sp. nov. – Fig. 6

Typus. Graecia, Thessalia: Mons Kakarditsa, supra pagum Athamania in Aspropotamos, in rupestribus, aridis, superioribus, 2050–2250 m. 20.7. 1973. Aldén 3507 (LD holotypus).

Perennis. Caulis simplex, crassus, ad 60 cm longus. Folia basalia longe petiolata, ad 35 cm longa, 2–4 cm lata, inferiora et media sessilia lanceolata vel ovato-lanceolata, superiora ovato-lanceolata vel ovata. Folia et caules breviter tomentosi. Inflorescentia sat longe paniculata, ramis non vel paulo crassis, fructiferis sat laxis. Pedicelli calyce breviores vel subaequantes. Calyx (post anthesin) 4–5 mm longus, laciniis linearibus vel lineari-lanceolatis, obtusis. Corolla tubulosa, 5–6 mm longa, stamina valde exserta, 8–10 mm longa. Nucula magna, compressa, plana vel paullo convexa, interne et lateribus ± dense aculeolata vel sub-glochidiata, glochidia 1–2-unguiculata, externa non vel parce aculeolata. Aculei semiaequales. Areolae non aculeatae glabrae, nitidae.

Robust perennial up to 60 cm. *Stems* simple, rather thick, striate-sulcate. Basal *leaves* long-petiolate, up to 35 cm, with lamina lanceolate, 2–4 cm broad, lower and middle cauline leaves sessile, acute, attenuate-rotundate, lanceolate to ovate-lanceolate, upper cauline leaves ovate-lanceolate to ovate. Leaves and stem shortly tomentose. *Inflorescence* rather lax, branches not or slightly thickened, elongating until fruiting stage. Pedicels 2–4 mm, mostly shorter than calyx. *Calyx* (after anthesis) 4–5 mm, tomentose, with lobes linear to linear-lanceolate. *Corolla* tubular, 5–6 mm long, glabrous or with a few hairs externally. *Stamens* long-exserted (3–4 mm above apex of corolla), filaments 8–10 mm long. *Style* long-exserted. *Nutles* 5–6 mm long, outer surface with a few circular glochidia up to 1 mm long, hooks of glochidia (0–)1(–2), lateral and inner surfaces rather densely glochidiate-aculeolate.

S. pindicus is related to the likewise very local *S. albanicus*, known from NW Greece and S Albania. The most useful characters are the number and shape of the glochidia. *S. pindicus* has much fewer and shorter (up to 1 mm) glochidia on the outer surface of the nutlet and the glochidia or aculei are subequal mostly with one (rarely 0 or 2) apical hook (in *S. albanicus* (2–)4–6 hooks; Fig. 6 B). The upper cauline leaves are ovate-lanceolate to ovate, not ovate-rhombic as in *S. albanicus*. *S. stamineus*, a mainly SW Asiatic species, occurs on Mt Chelmos on Peloponnesos. It differs from

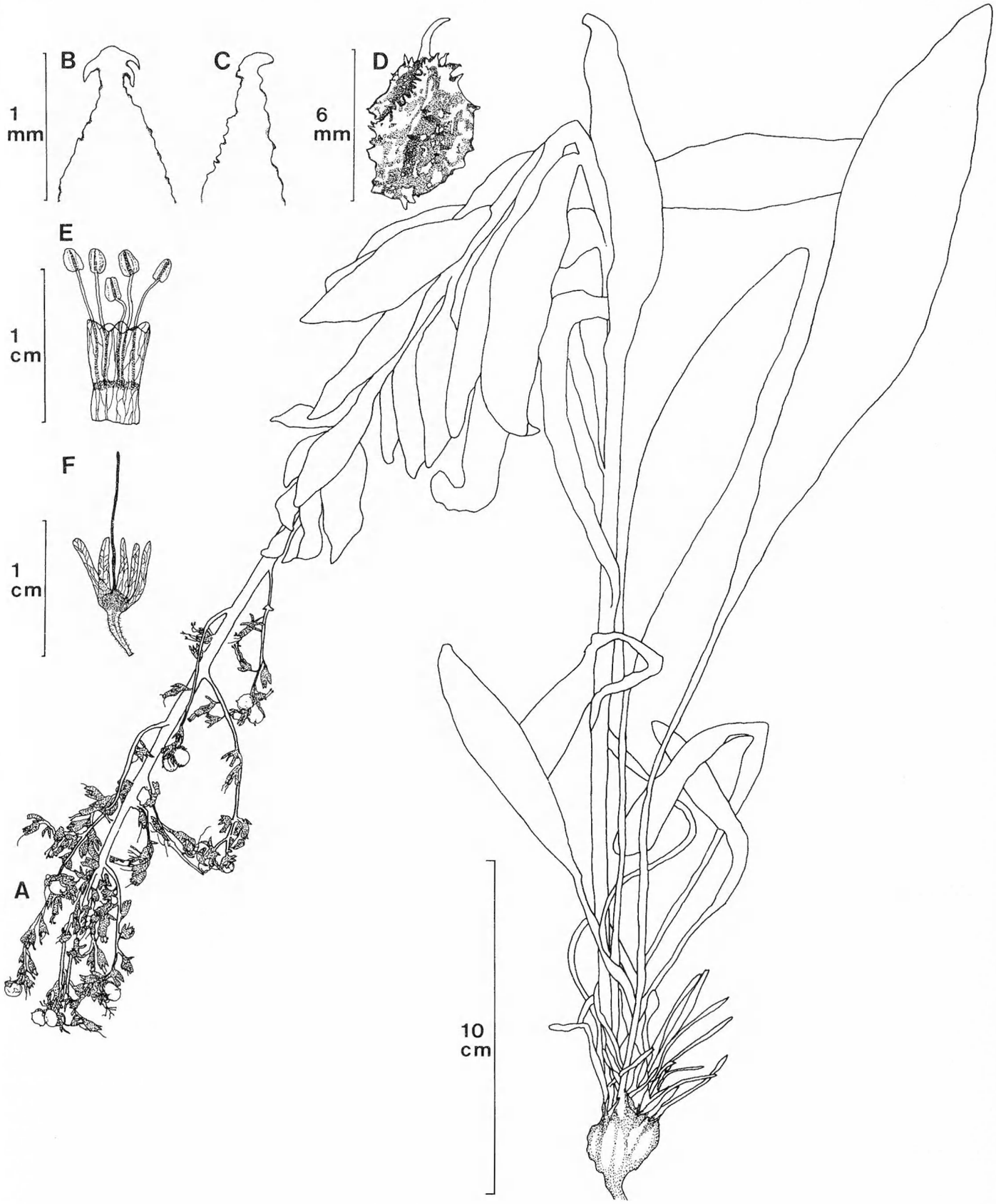

Fig. 6. A, C–F: *Solenanthus pindicus*. – B: *S. albanicus*. – A: Habit. – B–C: Glochidia from nutlets. – D: Nutlet. – E: Corolla and stamens. – F: Calyx and style. – A, C–F: Aldén 3507 (holotype). – B: Baldacci 188 (holotype).

both *S. pindicus* and *S. albanicus* in its grey indumentum of leaves and stem and the flattened glochidia. A fourth species in Greece, *S. scardicus*, was reported from Mt Kaimaktsalan by Zaganiaris (1938–40). It is best distinguished from the others on larger and winged nutlets.

S. pindicus grows on dry stony rock ledges at about 2150 m.

Campanulaceae

Asyneuma canescens (Waldst. & Kit.) Griseb. & Schenk ssp. **canescens**

Collections. Mt Karava, 3 km ESE of Vlasion, c. 2150 m, A 974 – Mt Kazarma, 4 km NE of Vlasion, c. 1800 m, A 720; 5.5 km NE of Vlasion, c. 1900 m, A 4378 – Mt Mazur–Ailas, 3 km ESE of Argidhea, 1750–1800 m, A 882 – Mt Pachtourion, 5 km SSE of Athamania, c. 1880 m, A 4576.

A. canescens ssp. *canescens* (cf. Damboldt 1970) is new to Pindhos, but known both N and S of the area. It is a rare plant in Pindhos, found mainly in the SE parts. The plants from Pindhos are usually smaller than normal, have ascending, often flexuose to erect stems, 10–20 cm, leaves 1–3 cm long, flowers mostly single in the panicle.

It grows in dry stony places from 1750 to 2100 m.

General distribution. SE Europe.

Campanula pindicola Aldén, sp. nov. – Fig. 7

Typus. Graecia, Thessalia: Mons Kakarditsa, supra pagum Athamania in Aspropotamos, in rupestribus calcareis superioribus, c. 2100 m. 21.7. 1973. Aldén no. 3669 (LD holotypus).

Perennis. Caules plures, tenues, nudi, teretes, ascendentes, 15–20 cm alti. Rhizoma tenue repens. Folia basalia ignota (per anthesin deficientia), caulina inferiora lanceolato-spathulata, integerrima vel rarius sparsim crenulata, 1–2 × 5–10 mm, media et superiora linearia vel lineari-lanceolata, stricta vel paullo reflexa, media longiora ± dense obsita, basi et apice breviora, 0.4–2.0 × 10–30(–37) mm, plerumque canaliculata, obtusa et breviter mucronata. Flores (1–)2–6, subnutantes, racemum laxum formantes. Bractea 6–10 mm longa. Pedunculi et pedicelli ± crassi, plerumque ante anthesin nutantes, 3.5–12 mm. Calyx glaber, 6–9 mm laciniis 3–6(–7) mm tenuibus triangularibus vel linearibus, apice reflexis. Corolla cyanea, breviter campanulata, apice parum expanda demum subangustata, 9–11 mm longa, interne papillosa et sparse pilosa, laciniis 3–4 mm longis, triangularibus. Stamina c. 5 mm longa. Stigma corollam subaequans. Receptaculum papillosum, 3-loculare.

Glabrous perennial. *Stems* several, terete, somewhat ribbed, slender, ascending, 15–20 cm, from a slender more or less horizontal rhizome. Basal *leaves* unknown, absent at anthesis, lower cauline leaves lanceolate-spathulate, entire or very rarely remotely crenulate, 1–2 × 5–10 mm, middle and upper cauline leaves linear to linear-lanceolate, straight or slightly recurved, 0.4–2.0 × 10–30(–37) mm, usually canaliculate, obtuse and shortly mucronate. Middle cauline leaves longest and more abundant. *Inflorescence* (1–)2–6-flowered, lax, with 1–4 undeveloped flower primordia. Peduncles and pedicels rather stout, usually recurved, 3.5–12 mm long. Bracts 6–10 mm long. *Calyx* 6–9 mm with lobes 3–6(–7) mm, narrowly triangular to linear, apex recurved. *Corolla* dark blue, shortly campanulate, scarcely expanded, 9–11 mm long, lobes (2–)3–4 mm long, triangular. Inner surface of corolla with papillae and very fine dendroid hairs. *Stamens* c. 5 mm long. *Stigma* almost equalling corolla. *Ovary* papillose, 3-locular.

C. pindicola is clearly referable to the taxonomically very difficult subsect. *Heterophylla* (Witas) Fed. The nomenclature below according to Podlech (1965). Of the four series recognized within this subsection *C. pindicola* comes close to species in *Saxicolae* Witas. The main difference is the slender rhizome which it has in common with *C. gentilis* Kovanda (Kovanda 1968) that was placed in *Saxicolae* by Kovanda (1970). *C. gentilis* differs from *C. pindicola* in shape and size of corolla, the more abundant lower cauline leaves, leaves increasing abruptly in length upwards and in being densely caespitose. An intermediate between *Saxicolae* and *Vulgares* Witas is *C. velebitica* from N Balkan. It differs from *C. pindicola* in having much larger, broadly campanulate corollas and narrower calyx teeth. *C. romanica*, a typical *Saxicolae*, differs (apart from the thickened rhizome) in having the middle cauline leaves remotely serrulate and a narrowly campanulate corolla. The only *Campanula* species with a papillose receptacle (as in all *Saxicolae*) known from Pindhos is *C. albanica* ssp. *albanica*. It is commonly 1-flowered with corollas 14–18(–22) mm long. In the shape of the corolla *C. pindicola* comes close to species in the series

Fig. 7. *Campanula pindicola*. – A: Habit. – B: Flower (opened). – Aldén 3669 (holotype).

Pusillae. As *C. caespitosa,* for example, they have, however, persistent leaf rosettes, nodding flower buds and smooth receptacles.

C. pindicola grows together with *C. albanica* ssp. *albanica* in limestone crevices at about 2100 m.

Caprifoliaceae

Viburnum lantana L.

Collections. Mt Baros, 8 km SSW of Chalikion, 1900–2000 m, A 3293 – Mt Koziakas, 6 km E of Pertoulion, 1800–1840 m, A 4826 – Mt Trapos, 5 km SW of Chalikion, c. 1900 m, A 4205 – Between Mt Trapos and Mt Peristeri, 5 km WSW of Chalikion, c. 1950 m, A 4134 – Below Mt Zygos, 2 km NE of Metsovon, c. 1250 m, A 122.

New to Pindhos. Only a few records from Greece, viz. Macedonia and W Thrace (cf. Rechinger 1939, Ganiatsas 1939), Mt Parnassos in Sterea Hellas and Peloponnesos.

V. lantana is a predominantly woodland species, but grows in limestone crevices and on rock ledges from 1800 to 1950 m in a few

places in Pindhos. Also found on serpentine rock at 1250 m near the village of Metsovon.

General distribution. S and C Europe to C Ukraine and N Africa.

Caryophyllaceae

Paronychia polygonifolia (Vill.) DC. in Lam. & DC.

Collections. Mt Karava, 4 km NNW of Vlasion, 1950–2000 m, A 4338 – Mt Voutsikaki, c. 4 km ESE of Vlasion, c. 2020 m, A 4438.

In Greece previously only known from a few mountains in Sterea Hellas, i.e. the region S of Pindhos.

It was found growing together with *Herniaria parnassica* in dry meadows at about 2000 m in SE Pindhos.

General distribution. S Europe to Turkey.

Crassulaceae

Sedum atratum L.

Collections. Mt Kakarditsa, 4 km W of Athamania, c. 2300 m, A 3605 – Mt Katarrachias, 5.5 km ENE of Kalarrites, 2150–2250 m, A 5237; 6 km ENE of Kalarrites, c. 2100 m, A 5272 – Mt Peristeri, 6 km W of Chalikion, c. 2200 m, A 4182 – Mt Perivoulion, 7.5 km S of Chalikion, 2050–2150 m, A 3324 – Mt Trapos, 5 km WSW of Chalikion, 1980–2080 m, A 3843; 6 km SW of Chalikion, c. 2220 m, A 4156.

S. atratum is new to C Pindhos and not common in Greece though localities are known from most mountain areas except from Peloponnesos.

Plants from Pindhos have stems 1.5–7 cm, unbranched or branched with erect branches, leaves green to red, petals greenish-yellow to almost pink, up to twice as long as sepals. According to Webb (1961) ssp. *carinthiacum* occurs in the Austrian alps, Slovenia, the Dolomites, N Albania and Epiros in NW Greece. It appears to be the dominant form on the Balkan Peninsula, though plants corresponding to ssp. *atratum* occur here and there in the region. The variation, even within small populations, is, however, too wide to justify the maintenance of the two subspecies recognized by Webb (1964).

Material from Austria and Switzerland shows the same morphological variation.

S. atratum grows on moist ground, on rock ledges, etc. up to 2300 m.

General distribution. Mountains of C and S Europe.

Cyperaceae

Carex diandra Schrank

Collections. Below Mt Baros, 7 km SSW of Chalikion, 1600–1650 m, A 4256; do, A 4260 – Between Mt Peristeri and Mt Trapos, 6 km WSW of Chalikion, c. 2000 m, A 4020.

New to Greece.

C. diandra shows a high degree of variability in the area, partly as the result of hybridization with *C. paniculata*. Plants from Pindhos have stems 20–40 cm, leaves 1–5 mm broad, spikes up to 1 cm long, not or very shortly stalked, lowest bracts sometimes very long. Some of the plants are also more robust than normal and correspond to var. *major* (Koch) A. & G. (cf. Hylander 1966).

On Mt Zygos, near the road between Trikkala and Ioannina, are some tussocks of the hybrid *C. diandra* × *C. paniculata*. They are predominantly sterile, have short-stalked spikes, long lower bracts and intermediate utriculi characters.

C. diandra grows in poor-fens above the timber-line in the W and more humid parts of Pindhos.

General distribution. Europe, Canary Islands, Caucasus, N Asia, N America and New Zealand.

Carex silvatica Huds.

Collections. Mt Augo, 4.5 km SW of Pirra, 1650–1750 m, A 2160 – Mt Neraidha, 4 km NW of Pertoulion, c. 1900 m, A 1607.

New to Pindhos. Previously reported from NE Greece (Hayek 1933), Mt Bela Voda E of Lake Prespa (Zaganiaris 1938–40) and Euboea (Rechinger 1936).

The Pindhos localities of a woodland species such as *C. silvatica* are interesting in that they are 100 to 200 m above the present timber-line, and may indicate previous altitudes of timber-lines in the area. On many of the mountains the woods have been destroyed and recovery is very slow and counteracted by

grazing. Other typical woodland species can also be found far above the present timber-line.

General distribution. Europe, N Africa, temperate Asia, introduced and naturalized in eastern N America.

Euphorbiaceae

Euphorbia brittingeri Opiz ex Samp.

Collections. Mt Baros, 8 km SSW of Chalikion, 1900–2000 m, A 3010 – Below Mt Zygos, 4 km NNW of Metsovon, c. 1400 m, A 125.

E. brittingeri is recorded for Greece in Smith & Tutin (1968) but I have seen no reports of localities.

It belongs to the critical *E. epithymoides* group and resembles *E. montenegrina* in having leaves serrate or serrulate to half or more than half of the leaf margin. The length of the tubercles on the fruits (often used as a key character) is not constant within *E. brittingeri* as tubercles 2–3 times as long as wide, can sometimes be found.

The morphology of the plants collected in Pindhos is as follows: Perennial with rather short stems, 20–30 cm, woody below. Sterile shoots present. Leaves 10–30 mm long, obovate to ovate-lanceolate, mostly serrulate to more than half of their length, with sparse long hairs below and on margins. Ray leaves yellowish at anthesis, rhomboid-elliptical. Raylet leaves suborbicular. Capsule densely covered with yellow, slender tubercles. Seeds yellowish-brown, smooth, c. 2 mm.

E. brittingeri was found in meadows and on moist rock ledges from 1400 to 1950 m.

General distribution. W and C Europe, N and C Italy and N and C Balkan Peninsula.

Euphorbia deflexa Sibth. & Sm.

Collections. Mt Pachtourion, 7 km SSE of Athamania, 1680–1720 m, A 4782; 5 km SSW of Athamania, c. 1700 m, A 4787.

New to Pindhos. *E. deflexa* is a plant with a wide altitudinal amplitude known from the coastal lowlands but also from several mountain areas, for example, Mt Parnassos, Mt Olympos (in Halácsy 1904) and Mt Vermion (Rechinger 1939).

Chromosome number 2n = 16 (A 4787). No previous counts known.

In the single locality on Mt Pachtourion it was growing in scree of non-calcareous rock at c. 1700 m.

General distribution. Endemic to Greece and Crete.

Euphorbia glabriflora Vis.

Collections. Mt Pachtourion, 5.5 km SSE of Athamania, c. 1830 m, A 4675; do, c. 1800 m, A 4696 – Mt Zygos, 4 km NE of Metsovon, c. 1750 m, A 1297.

A rare species in Pindhos collected on Mt Zygos (Haussknecht 1897, as *E. pindicola* sp. nov.) and above the village of Malakasi, near Mt Zygos, by Sintenis (in Halácsy 1904).

E. glabriflora grows in open woods or above the timber-line up to 1850 m in areas with non-calcareous rock, especially on serpentine.

Chromosome number 2n = 16 (A 1297). No previous counts known.

General distribution. C Balkan Peninsula.

Fabaceae

Astragalus purpureus Lam.

Collections. Mt Augo, 6 km SW of Pirra, 1800 m, A 2367; do, 1850–1900 m, A 2429.

New to Greece. Nearest localities in Albania.

The plants from Mt Augo differ somewhat from the SC European plants in being smaller in most of their parts, stems up to 10 cm, leaves up to 4 cm, peduncles shorter than or as long as leaves.

There were c. 100 individuals growing in crevices of a limestone rock at 1800 m and also a few individuals on a rock ledge somewhat higher up.

General distribution. S and W Europe from W France and E Spain to C Balkan Peninsula.

Lathyrus pallescens (Bieb.) Koch

Collections. Mt Baros, 8 km SSW of Chalikion, 1850–1950 m, A 3085 – Mt Neraidha, 3 km N of Chatsipetrion, 1950–2000 m, A 1105 – Mt Peristeri, 5.5 km W of Chalikion, 2100–2200 m, A 3936; 6 km W of Chalikion, 2050–2150 m, A 4010; 5 km W of Chalikion, c. 2100 m, A 4119 – Mt Perivoulion, 7.5 km S of Chalikion, 1950–2050 m, A 3124; do, 2100–

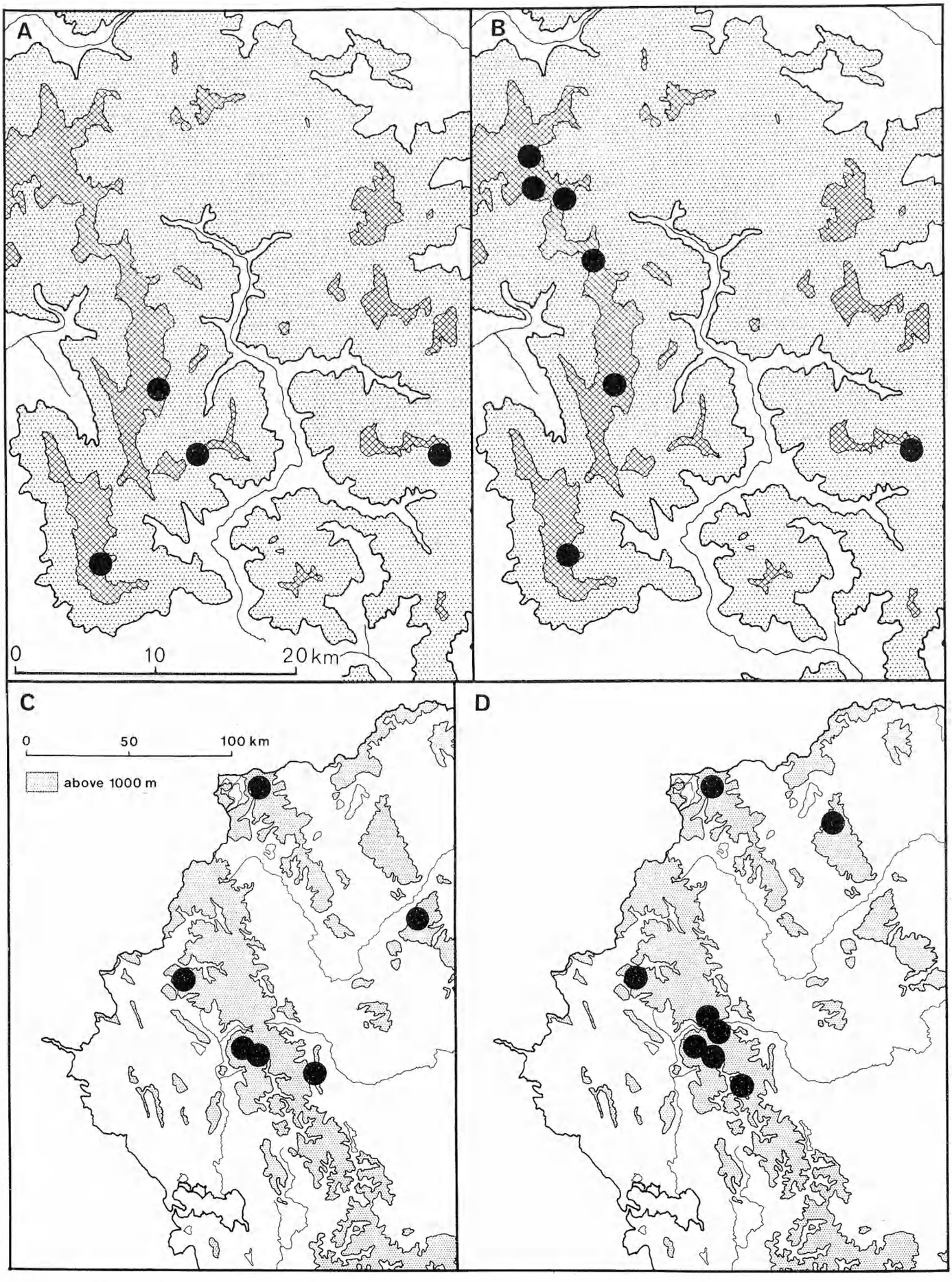

Fig. 8. Known localities in Greece for 4 species. – A: *Achillea absinthoides*. – B: *Alkanna nonneiformis*. – C: *Geranium aristatum*. – D: *Asphodelus albus*.

2180 m, A 3319 – Mt Tringia, 2.5 km N of Paleochorion, 1850–1950 m, A 339; 6 km S of Kastanea, 1800–1900 m, A 473.

New to Greece.

L. pallescens is a glabrous or sparsely hairy perennial. According to Ball (1968) *L. pallescens* is a pubescent plant with a pubescent or villous calyx. This is not so. Specimens from Pindhos and several other specimens seen from outside Greece are glabrous or sparsely hairy with a glabrous calyx, but with the margins of the calyx teeth mostly ciliate. The closely related *L. pannonicus* is distinguished from *L. pallescens* in having the style filiform, not dilated, at the apex. The colour of the corolla in plants from Pindhos is cream-sulphur, sometimes with a violet tinge.

L. pallescens grows on rather dry rocky but grass-rich slopes from 1850 to 2150 m.

General distribution. SE Europe, Transcaucasia and E Turkey.

Geraniaceae

Geranium aristatum Freyn & Sint.

Collections. Mt Baros, 8 km SSW of Chalikion, 1850–1900 m, A 3273 – Mt Boutai, 3 km SSW of Chalikion, c. 2000 m, A 3448 – Mt Koziakas, 6 km E of Pertoulion, c. 1850 m, A 4851 – Between Mt Peristeri and Mt Trapos, 5 km WSW of Chalikion, 1860–1930 m, A 4053; do, c. 1950 m, A 4127.

A rare plant in Greece (localities in Fig. 8 C) with the locus classicus on Mt Trapos (Freyn 1897). Also reported from Mt Phlambouro above the village of Katafigion (Zaganiaris 1938–40), Mt Timphi (Goulimy 1955, Quézel & Contandriopoulos 1965) and on Mt Bela Voda (Quézel & Contandriopoulos 1968). In Hayek (1927) Macedonia refers to localities in Yugoslavia just N of the Greek border and E of Lake Doiran (Bornmüller 1925).

G. aristatum grows among boulders and on ledges of hard limestone from 1800 to 2000 m.

General distribution. S Albania, S Yugoslavia and NW to NC Greece.

Geranium sylvaticum L. ssp. sylvaticum

Collections. Below Mt Baros, 7 km SSW of Chalikion, 1600–1650 m, A 4264 – Mt Katarrachias, 6 km ENE of Kalarrites, 2150–2250 m, A 5195 – Mt Trapos, 6 km WSW of Chalikion, 2150–2250 m, A 3896.

New to Pindhos. The nearest localities of *G. sylvaticum* are in NE Greece and in Albania, though some of these belong to ssp. *caeruleatum*.

Ssp. *sylvaticum* occurs in moist rock meadows up to 2200 m.

General distribution. Temperate Eurasia, introduced in N America.

Iridaceae

Iris germanica L.

Collections. Mt Trapos, 5 km SW of Chalikion, c. 1950 m, A 4229; do, 1950–2000 m, A 4232.

I. germanica is now a widely cultivated species and naturalized in most parts of S and C Europe. Previous collections in Pindhos are from Mt Timphi (Goulimy 1955: probably *I. germanica;* Phitos 1962: *Iris* sp.; Quézel & Contandriopoulos 1965: *Iris* spec., magnifique espèce sans doute nouvelle).

The plants from Pindhos differ somewhat from the description in Hayek (1933) in having stout simple stems, 30–50 cm with about 3 flowers and slightly recurved leaves, 10–40 × 1.0–3.5 cm. Plants cultivated in the greenhouses in Lund were up to 70 cm high and branched.

I. germanica is probably indigenous in Pindhos. It was found on a few rock ledges from 1950 to 2000 m.

Chromosome numbers 2n = 46 (A 4229) and 48 (A 4232). Previous reports are 2n = 24, 34, 36, 44, 48 and 60 (Fedorov 1969).

General distribution. S and C Europe, N Africa and Israel.

Lamiaceae

Salvia argentea L.

Collections. Mt Augo, 6 km SW of Pirra, 1850–1900 m, A 2406 – Mt Boutai, 4 km SW of Chalikion, 1800–1900 m, A 3195 – Mt Kazarma, 6 km NE of Vlasion, 1900–2000 m, A 4406 – Mt Kauki, c. 2 km N of Kerasochorion, 1600–1750 m, A 113 – Mt Neraidha, 2.5 km W of Pertoulion, c. 1500 m, A 1663 – Mt Peristeri, 5 km W of Chalikion, c. 2100 m, A 4115 – Mt Trapos, 5 km SW of Chalikion, 1800–1850 m, A 4217 – Mt Voutsikaki, 4 km E of Vlasion, 1600–

1700 m, A 621 – Mt Tzoumerka, 4.5 km WSW of Theodhoriana, 1900–1950 m, A 2680.

Not previously reported from the area though known from NW Pindhos (Halácsy 1902).

S. argentea is represented by two altitudinal forms, one tall, amply branched, lowland to montane form and one rather short, shortly branched form, found at higher altitudes. The latter form, which is called var. *alpina* Heldr. (cf. Halácsy 1902), is not uncommon in C and S Pindhos and occurs on dry stony E or S slopes from 1500 to 2100 m.

General distribution. S Europe.

Sideritis perfoliata L.

Collection. Mt Pachtourion, 5 km SE of Athamania, 1900–1940 m, A 4707.

Very rare in Greece, and outside Pindhos only reported from Mt Athos (by several authors) and Mt Phengari on Samothrace (Turrill 1935, as var. *lanata*, Ade & Rechinger 1938).

The plants from NE Greece differ from those in Pindhos in being densely lanate. In Pindhos it is reported from Mt Agrapha (Heldreich in Halácsy 1902), Mt Neraidha (Maire & Petitmengin 1908) and Mt Grammos (Zaganiaris 1938–40). Mt Neraidha (not the one shown in Fig. 1) is rather close to and W of the peak Soufli, Mt Pachtourion, where *S. perfoliata* was found in 1974. A glabrous form (not seen by me and perhaps wrongly determined) was reported from Mt Augo in Epiros (Regel 1942). The plants on Mt Pachtourion are 20–35 cm, sparsely hirsute and glandular and have 4–10 verticillasters. Young leaves sublanate.

As *S. perfoliata* is a mainly Anatolian species the localities in Pindhos are of great interest.

It grows in crevices of hard limestone.

General distribution. Greece, Anatolia.

Stachys recta L. s.l.

Collection. Mt Loupata, 6 km SSW of Pertoulion, c. 1850 m, A 1676.

I have seen no previous reports of *S. recta* from Pindhos except that of Baldacci (1898). A fairly distinct morphological form of *S. recta* was found on Mt Loupata. Plants collected on Mt Kakarditsa by Baldacci (as *S. recta*) though in poor condition belong to this form.

The morphology of the plants from Mt Loupata shows some new combinations of characters (habit and flower in Fig. 9): Ascending to erect, shortly hispid, almost eglandular perennial, 10–15 cm. Leaves 10–20 × ×4–10 mm, crenate-dentate, the lower ones petiolate, ovate to obovate, rounded to cuneate at base, the upper ones sessile to subsessile, oblong to lanceolate. Indumentum of leaves, stem and calyx of crispate to ± straight hairs up to 1 mm long. Flowers in 1–2 verticillasters, each with 1–6 flowers. Calyx campanulate, 7–9 mm, with a few short glandular hairs. Calyx teeth subequal, margins covered with subsessile glands, acuminate, broadly triangular, c. 1/3 as long as the tube. Corolla 12–15 mm, yellow with or without purple spots, pubescent-glandular, upper lip 4–5 mm, lower lip 7–9 mm. The number of verticillasters, flowers and habit is clearly influenced by habitat and altitude. In habitat, habit and leaf shape, but not shape of calyx teeth and degree of hairiness, it is close to *S. beckeana*. This taxon, which is restricted to SW Yugoslavia and N Albania, is nothing but an altitudinal form of *S. recta* with long hairs perhaps meriting recognition as a subspecies. Another high-mountain taxon, described from N Albania, is *S. recta* L. ssp. *dörfleri* (Hayek) Hayek. Though in habit close to the plants from Pindhos it differs in having narrowly triangular calyx teeth. As the whole group shows a reticulate variational pattern and no experimental studies have yet been carried out, no new specific or infraspecific epithet is given to this C Pindhos taxon.

It was found in mobile scree at c. 1850 m.

General distribution (*S. recta* s.l.). S Europe to W Asia.

Liliaceae

Allium guicciardii (Boiss.) Heldr.

Collections. Mt Kakarditsa, 3 km W of Athamania, 1820–1920 m, A 3725 – Mt Koziakas, 5 km NE of Pertoulion, c. 1750 m, A 1478; 6 km E of Pertoulion, c. 1600 m, A 4861 – Mt Milia, 5 km NW of Milea, 2050–2100 m, A 4966 – Mt Pachtourion, 5 km SSE of Athamania, c. 1700 m, A 4790.

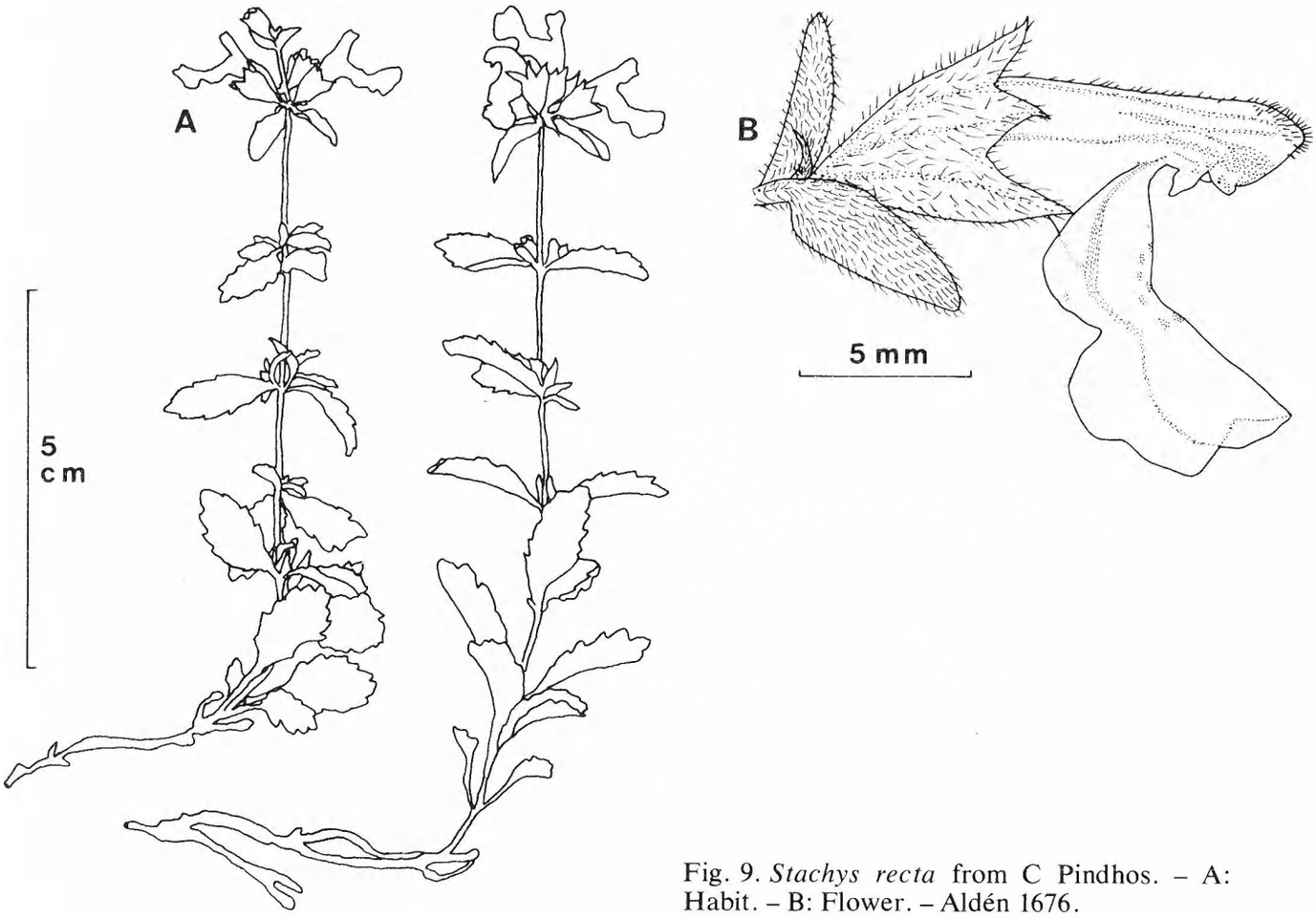

Fig. 9. *Stachys recta* from C Pindhos. – A: Habit. – B: Flower. – Aldén 1676.

In Pindhos known only from the lower slopes of Mt Peristeri (Haussknecht 1899).

It grows on dry stony slopes from 1600 to 2100 m and was also found on serpentine in the mountains N of Mt Zygos.

Chromosome numbers 2n = 16 (A 4966) and 32 (A 3725, 4790). No previous counts known. The closely related *A. flavum* has 2n = 16 (Fedorov 1969).

General distribution. C and S Balkan Peninsula.

Allium heldreichii Boiss.

Collections. Mt Koziakas, 11 km NW of Pili, c. 1800 m, A 1231; 5 km NE of Pertoulion, c. 1900 m, A 1518; 6 km E of Pertoulion, c. 1850 m, A 4849.

A. heldreichii, previously regarded as endemic to Mt Olympos, was first found outside Mt Olympos by Rechinger (1939) and Ganiatsas (1939) on Mt Vermion.

It belongs to the section *Allium* and is very closely related to *A. aucheri* Boiss., in E Anatolia, Iran and Caucasus (cf. Wendelbo 1971). The newly discovered plants on Mt Koziakas are even closer to *A. aucheri* than the previously known ones in having tepals 7–10 mm long. In fact when the characters of plants from Mt Olympos and Mt Koziakas are considered together, the difference between *A. heldreichii* and *A. aucheri* is very slight being mainly a question of plant height and shape of perigonium, and *A. heldreichii* could perhaps better be classified as a subspecies of *A. aucheri*.

A. heldreichii is thus a taxon which again shows the connection between NC Greece and more easterly elements.

It is a predominantly woodland species. It grows in rocky places on Mt Koziakas up to 1900 m.

Chromosome number 2n = 14 (A 4849). No previous counts.

General distribution. Endemic to NC and N Greece.

Allium parnassicum (Boiss.) Hal.

Collections. Mt Katarrachias, 5.5 km ENE of Kalarrites, c. 2050 m, A 5339 – Mt Koziakas, 6 km E of Pertoulion, 1750–1850 m, A 4815.

A Greek endemic species. Some localities in Sterea Hellas, one on Mt Peristeri in Pindhos (Maire & Petitmengin 1908) and one on Mt Smolika (Zaganiaris 1938–40).

Grows on dry grassy slopes from 1750 to 2050 m.

General distribution. SC, C and NW Greece.

Allium suaveolens Jacq.

Collection. Mt Kakarditsa, 3.5 km W of Athamania, 2050–2250 m, A 3506.

New to Greece. The nearest localities are in Albania.

The plants from Pindhos have smaller umbels, 20–25 mm and slightly longer stamens than specimens seen from outside Greece.

A. suaveolens was found on rock ledges on the NE side of Mt Kakarditsa.

Chromosome number 2n = 16 (A 3506) which agrees with previous reports (Fedorov 1969).

General distribution. C and S Europe.

Asphodelus albus Mill.

Collections. Mt Augo, 4.5 km SW of Pirra, c. 1650 m, A 2327 – Between Mt Trapos and Mt Peristeri, 5 km WSW of Chalikion, c. 1950 m, A 4135 – Below Mt Zygos, 4 km NNW of Metsovon, c. 1400 m, A 128.

A mainly W Mediterranean species, in Pindhos collected previously on Mt Tragopetra (near Mt Dhokimi) by Sintenis (cf. Halácsy 1902) and on Mt Timphi (Phitos 1962). Outside Pindhos reported from Mt Vermion (Rechinger 1939, Ganiatsas 1939) and Mt Bela Voda (Zaganiaris 1938–40). The known localities in Greece are shown in Fig. 8 D.

On Mt Augo, at about 1600 m, it was growing in abundance, almost covering some of the slopes. Seen but not collected on Mt Boutai.

Chromosome number 2n = 28 (A 2327). Previous counts 2n = 26 and 56 (Fedorov 1969, Lovka et al. 1972).

General distribution. S Europe, from Bretagne to C Balkan.

Ophioglossaceae

Botrychium lunaria (L.) Swartz in Schrad.

Collections. Mt Baros, 8 km SSW of Chalikion, 1800–1900 m, A 2975; do, 1900–2000 m, A 3023 – Mt Kakarditsa, 3.5 km W of Athamania, 2050–2100 m, A 3664; 4 km W of Athamania, c. 2350 m, A 3750 – Mt Karava, 3 km NNW of Vlasion, 2050–2150 m, A 4290; 3 km NW of Vlasion, c. 2150 m, A 4306 – Mt Katarrachias, 5.5 km ENE of Kalarrites, 2150–2250 m, A 5241 – Mt Mazur-Ailas, 3 km ESE of Arghidhea, c. 1800 m, A 932 – Mt Peristeri, 6 km W of Chalikion, 2200–2295 m, A 3945; do, 2200–2290 m, A 4165 – Mt Perivoulion, 7.5 km S of Chalikion, 2100–2180 m, A 3318; do, 2050–2188 m, A 3133 – Mt Trapos, 5 km WSW of Chalikion, 1980–2080 m, A 3829; 5.5 km WSW of Chalikion, c. 2100 m, A 3865 – Mt Tringia, 6 km S of Kastanea, 1950–2000 m, A 1935 – Mt Tzoumerka, 4.5 km WSW of Theodhoriana, 1750–1850 m, A 2487; do, 1900–2000 m, A 2507 – Below Mt Zygos, 4 km NNW of Metsovon, c. 1400 m, A 126.

No published localities seen from C and S Pindhos.

Somewhat variable according to habitat. Plant height varies from 1–15 cm.

B. lunaria is a common species in the area and can be found in a variety of habitats from rich and moist rock meadows to dry places of heathland character up to 2300 m.

General distribution. Between 35° and 65° in the N Hemisphere, Patagonia, S Australia and Tasmania.

Ophioglossum vulgatum L.

Collections. Mt Kakarditsa, 3 km W of Athamania, c. 1800 m, A 3773 – Mt Koziakas, 5 km NE of Pertoulion, 1740 m, A 1561.

New to Pindhos, but collected in 1965 by Rechinger (Rechinger 18641, unpublished) near Mt Zygos at 1500 m. Apart from Pindhos known from Mt Athos (n.v.), the islands of Naxos and Ikaria (Runemark et al. 1960), the islands of Andros (Snogerup & Bothmer 31699, 31962 and 32575, unpublished) and Kephallinia (Snogerup 23729, unpublished).

Grows in wet places up to 1800 m.

General distribution. Europe, Asia and N America.

Orchidaceae

Coeloglossum viride (L.) Hartm.

Collections. Mt Baros, 8 km SSW of Chalikion, 1850–1900 m, A 3274 – Mt Katarrachias, 6 km ENE of Kalarrites, 2150–2250 m, A 5206; do, c. 2100 m, A 5275 – Mt Pachtourion, 5 km SE of Athamania, 1900–1940 m, A 4737 – Mt Perivoulion, 7.5 km S of Chalikion, c. 2100 m, A 3177 – Mt Trapos, 6 km WSW of Chalikion, 2150–2250 m, A 3888.

New to Pindhos, but known from Mt Olympos. *C. viride* is the only orchid species, with the exception of *Orchis pallens,* that can be found at higher altitudes in Pindhos.

It grows in moist rock meadows from 1900 to 2250 m.

General distribution. Europe to Siberia and N America.

Poaceae

Agropyron sanctum (Janka) Hackl.

Collections. Mt Liakoura, 4 km ENE of Granitsa, 1400–1500 m, A 755 – Mt Pteri, 5 km NNE of Granitsa, c. 1700 m, A 1883.

Apart from localities in NE Greece (cf. Rechinger 1939) only known from Mt Voutsikaki (Mt Ghavellu) (Formanek 1897, Haussknecht 1899) in SE Pindhos.

A. sanctum grows on dry stony slopes just above the timber-line.

General distribution. Endemic to Greece.

Festuca paniculata (L.) Schinz & Thell.

Collections. Mt Baros, 8 km SSW of Chalikion, 1850–1950 m, A 3056; do, c. 1900 m, A 4244.

First recorded from Greece by Ganiatsas (1939) on Mt Vermion. Later reported by Quézel & Contandriopoulos from Mt Smolika (1965) and Mt Bela Voda (1968). The nearest localities outside Greece are in Albania and Yugoslavian Macedonia.

A few tufts of *F. paniculata* were found on a dry grassy slope of heathland character.

General distribution. C and S Europe, NW Africa.

Ranunculaceae

Actaea spicata L.

Collections. Mt Koziakas, 6 km E of Pertoulion, 1800–1840 m, A 4833 – Mt Pachtourion, 6 km SSE of Athamania, c. 1800 m, A 4656 – Between Mt Peristeri and Mt Trapos, 5 km WSW of Chalikion, 1860–1930 m, A 4062; do, c. 1950 m, A 4128.

Except for an early report from Peloponnesos by Sibthorp (in Halácsy 1901), recorded from Mt Cholomon (on Chalkidhiki; Zaganiaris 1938–40), Mt Vermion (Quézel & Contandriopoulos 1968), Mt Timphi (Goulimy 1955, Quézel & Contandriopoulos 1965) and Mt Peristeri (Quézel & Contandriopoulos 1965).

A. spicata is a predominantly woodland species but occurs at higher altitudes in S Europe.

In Pindhos it was found in crevices and among boulders of hard limestone from 1800 to 2000 m. It is probably spread by rock partridges (*Alectoris graeca*) which nest among the boulders and eat the berries.

General distribution. Temperate Eurasia.

Ranunculus platanifolius L.

Collection. Mt Baros, 8 km SSW of Chalikion, 1850–1900 m, A 3275.

Very rare in Greece and only known from Mt Grammos (Zaganiaris 1938–40) and two localities in C Pindhos, in and near the valley of Aspropotamos, viz. on Mt Mikrogura above the village of Chalikion (Sintenis in Halácsy 1901) and near the village of Kastanea at 1700 m (Quézel & Contandriopoulos 1965). All localities are in forest.

On Mt Baros *R. platanifolius* was found in a moist rock crevice far above the timber-line.

General distribution. C and S Europe, Belgium and W Fennoscandia.

Rosaceae

Amelanchier ovalis Med.

Collections. Mt Trapos, 5 km SW of Chalikion, c. 1900 m, A 4206 – Mt Tzoumerka, 4.5 km WNW of Theodhoriana, c. 2100 m, A 2761.

New to Pindhos. The nearest locality is on Mt Parnassos in Sterea Hellas.

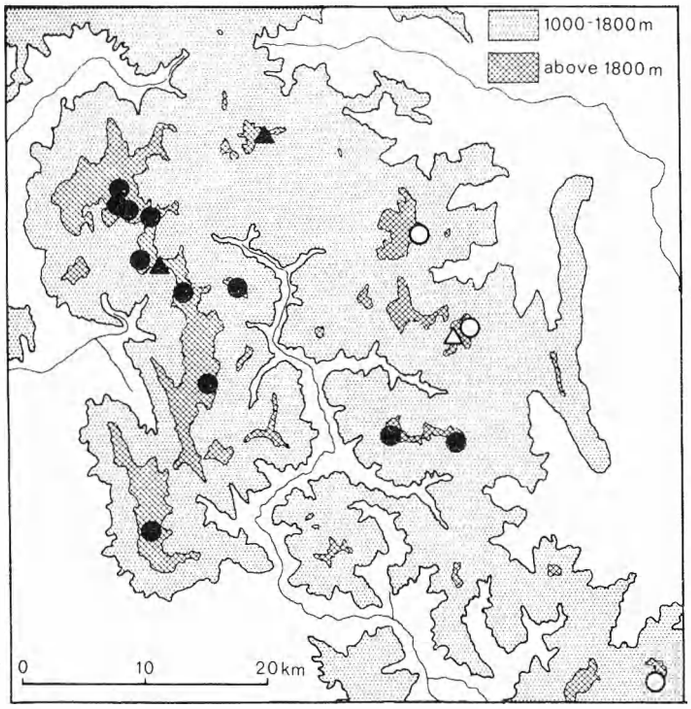

Fig. 10. Known localities of 4 *Thesium* species in C and S Pindhos. *Thesium linophyllon* ssp. *linophyllon* (dots), *T. brachyphyllum* (circles), *T. arvense* (unfilled triangle) and *T. parnassi* (filled triangles).

Differs from *A. ovalis* var. *cretica*, known from Crete, Peloponnesos and the island of Youra, N Sporades (Snogerup & Phitos 43312, unpublished), in the leaves lacking persistent indumentum.

In Pindhos *A. ovalis* grows in vertical limestone cliffs.

General distribution. C and S Europe, Caucasus, Lebanon and NW Africa.

Santalaceae

Thesium arvense Horvatovszky

Collections. Mt Neraidha, 3 km N of Chatsipetrion, 1950–2000 m, A 1108; do, 1900–1950 m, A 1114.

T. arvense was reported from Mt Peristeri and Mt Karava by Quézel & Contandriopoulos (1965), but the plants were incorrectly determined and probably belong to *T. linophyllon* ssp. *linophyllon* (Greuter, pers. comm.). Thus the locality on Mt Neraidha seems so far to be the only in Pindhos (Fig. 10).

It is an extremely variable species and when not in flower is sometimes hard to distinguish from *T. divaricatum*. The latter, collected at lower altitudes in Pindhos, Sterea Hellas and on Peloponnesos differs, however, in having less dense longitudinal venation on fruits, longer pedicels and a slenderer habit. Length of bracts and bracteoles is very variable and of less diagnostic value. *T. arvense* on Mt Neraidha is smaller than normal, has more condensed panicles and rather short bracts as long as to twice as long as the fruit.

It was found on dry grazed grassy slopes from 1950 to 2000 m.

General distribution. SE to E Europe to C Asia (Hendrych 1968).

Thesium brachyphyllum Boiss.

Collections. Mt Kazarma, 4 km NE of Vlasion, c. 1850 m, A 662 – Mt Neraidha, 4 km NW of Pertoulion, c. 1900 m, A 1590 – Mt Tringia, 3 km NNW of Paleochorion, c. 1900 m, A 219.

New to the Balkan Peninsula (localities in Fig. 10). The localities given in Boissier (1879) and later cited in Hayek (1924) refer to specimens collected by Pichler in "montis Balkan Thraciae" and by Balansa in "Tauri Cilicici supra Bulghar Maaden". The latter locality was evidently misinterpreted by Hayek as being in Bulgaria, not in SC Turkey as it is. However, both specimens are said to be stoloniferous and thus cannot be *T. brachyphyllum*.

The plants from Pindhos have the following morphology (Fig. 11): Procumbent to ascending, estoloniferous perennial up to 5 cm with a stout and woody stock. Leaves crowded, up to 13 mm long but usually much shorter. Nut c. 2.5 mm, with a few prominent longitudinal veins and lateral anastomosing veins. Bracts 2–5 times as long as nut. Inflorescence beginning below middle. The stoloniferous *T. parnassi* has nuts at least 3 mm long, usually with several prominent longitudinal veins or sometimes quite smooth with scarcely noticeable lateral veins. Leaves on stem not crowded. Bracts equalling or twice as long as nut. Inflorescence shorter, beginning at or above the middle of the stem.

T. brachyphyllum grows on dry grassy slopes.

General distribution. Greece, Crimea, Anatolia and Caucasus (Hendrych 1966).

Thesium linophyllon L. ssp. **linophyllon**

Collections. Mt Augo, 6 km SW of Pirra, 1850–1900 m, A 2427; do, 2000–2050 m, A 2237 – Mt Baros,

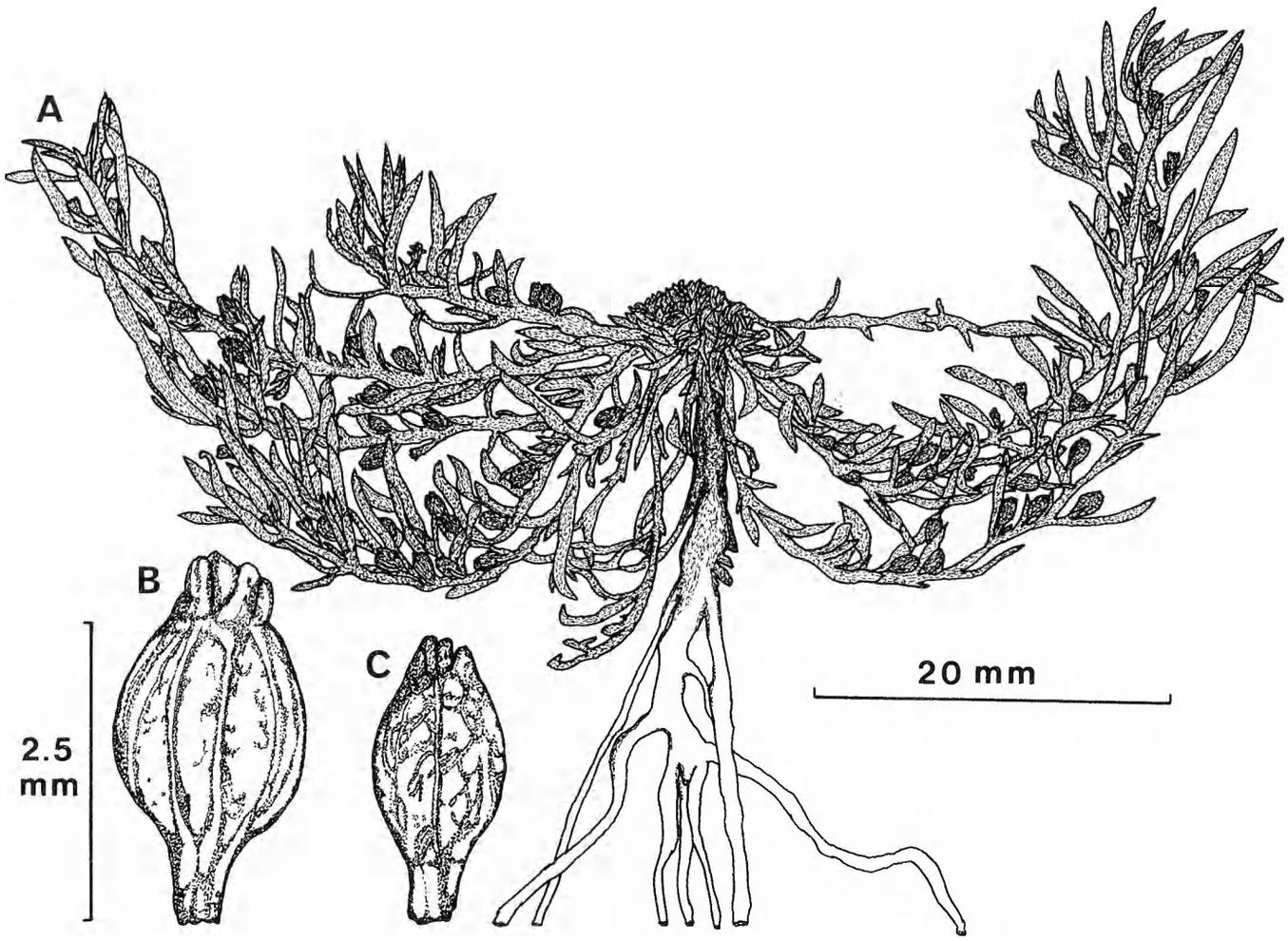

Fig. 11. A, C: *Thesium brachyphyllum*. – B: *T. parnassi*. – A: Habit. – B–C: Nuts. – A, C: Aldén 219. – B: Aldén 2942.

8 km SSW of Chalikion, 1850–1950 m, A 3092 – Mt Boutai, 4 km SW of Chalikion, 1800–1900 m, A 3196; 3 km SSW of Chalikion, 1950–2000 m, A 3436 – Mt Kakarditsa, 3 km W of Athamania, c. 2000 m, A 3472; 3.5 km W of Athamania, 2050–2100 m, A 3670 – Mt Katarrachias, 5.5 km ENE of Kalarrites, 2000–2050 m, A 5317 – Mt Kourouna, 2 km SSW of Aghio Paraskevi, 1800–1900 m, A 1977; do, 1900–1970 m, A 2023 – Mt Loupata, 6 km SSW of Pertoulion, 1850–2000 m, A 1718 – Between Mt Peristeri and Mt Trapos, 5 km WSW of Chalikion, 1860–1930 m, A 4054; do, c. 1950 m, A 4130 – Mt Trapos, 5.5 km WSW of Chalikion, c. 2200 m, A 4137; 5 km SW of Chalikion, 1800–1850 m, A 4216 – Mt Tzoumerka, 5.5 km WSW of Theodhoriana, 2100–2250 m, A 2577.

New to Pindhos. Previously reported from Mt Athos (cf. Hendrych 1969). The localities in Pindhos are given in Fig. 10.

The nomenclature is according to Hendrych (1969).

Ssp. *linophyllon* is extremely variable in vegetative characters but always stoloniferous.

It grows in dry meadows from 1850 to 2200 m on calcareous ground.

General distribution. C, SE and E Europe extending to the Ukraine (Hendrych 1969).

Thesium parnassi A. DC.

Collections. Mt Baros, 8 km SSW of Chalikion, 1800–1900 m, A 2942 – Mt Dhokimi, 9.5 km W of Kastanea, 1850–1900 m, A 4886; do, c. 1850 m, A 4916 – Mt Mavrovouni, 5 km WNW of Milea, 1900–2000 m, A 5118 – Mt Milia, 5 km NW of Milea, c. 2150 m, A 4988.

Not previously collected in S and C Pindhos. Localities in Fig. 10.

T. parnassi grows on dry or moist grassy slopes up to 2150 m on non-calcareous ground and was also found in the serpentine mountains N of Mt Zygos.

General distribution. Albania, Greece, Italy, Sicily and Yugoslavia.

Scrophulariaceae

Limosella aquatica L.

Collection. Mt Karava, 3 km NNW of Vlasion, c. 1950 m, A 4323.

Only one previous locality known in Greece, viz. Mt Timphi (Quézel & Contandriopoulos 1965).

L. aquatica is a rather polymorphic species a number of forms of which have been described. Plants with linear to linear-setaceous leaves have been called f. *borealis* Less. (cf. Neuman 1901). Dwarf plants can often be found growing together with normal-sized individuals. Plants with pedicels up to as long as leaves occur in the two known localities in Greece. These plants agree with plants I have seen in Scandinavia. Normally the flowers are 5-merous but plants with 4-merous flowers have been seen in material from Scandinavia and Greece. The collection described as *L. tenella* (Quézel & Contandriopoulos 1965) is thus a form of *L. aquatica*. The plants from Mt Karava are only 6–20 mm tall, with linear to linear-setaceous leaves. The pedicels are shorter than to almost equalling the leaves and the flowers are 4–5-merous.

It was found in a doline where snow had previously lain.

General distribution. Eurasia, Greenland and N America.

References

Ade, A. & Rechinger, K. H. 1938: Samothrake. *Repert. Spec. Nov. Regni Veg. Beih. 100:* 106–146.

Baldacci, A. 1898: Rivista della collezione botanica fatta nel 1895 in Albania. *Nuov. Giorn. Bot. Ital. N. S. 5:* 1–44.

– 1899: Rivista della collezione botanica fatta nel 1896 in Albania. *Ibid. 6:* 149–188.

Ball, P. W. 1968: Lathyrus. *In* T. G. Tutin et al. (eds.), *Flora Europaea 2:* 136–143. Cambridge.

Boissier, M. E. 1879: *Flora Orientalis 4*. Genevae et Basiliae.

Bornmüller, J. 1925: Beiträge zur Flora Mazedoniens. *Bot. Jahrb. 59:* 294–504.

Britton, D. M. 1951: Cytogenetic studies on the Boraginaceae. *Brittonia 7:* 233–266.

Damboldt, J. 1970: Revision der Gattung Asyneuma. *Boissiera 17:* 5–128.

Davis, P. H. 1965–1976: *Flora of Turkey and the East Aegean Islands 1–5*. Edinburgh.

Dostál, J. 1975: New nomenclatural combinations and taxa of the Compositae subtribe Centaureinae in Europe. *In* V. H. Heywood (ed.), Flora Europaea. Notulae Systematicae ad Floram Europaeam spectantes 18. *Bot. J. Linn. Soc. 71:* 191–210.

Fedorov, A. (ed.) 1969: *Chromosome numbers of flowering plants*. Leningrad.

Formanek, E. 1897: Dritter Beitrag zur Flora von Thessalien. *Verh. Naturf. Ver. Brünn 25*.

Freyn, J. 1897: Orientalische Pflanzenarten. *Bull. Herb. Boissier 5:* 579–626.

Ganiatsas, K. A. 1939: Botanikai ereunai epi tou orous Bermiou. *Epist. Epet. Shol. Fus. Math. Epist. Panepist. Thessalonikēs 5:* 225–264.

Goulimy, C. N. 1955: Some alpines of Greece. *Alp. Gard. Soc. Bull. 23:* 328–334.

Grau, J. 1966: Unterschiede in der Chromosomengestalt bei Moltkia und Lithospermum. *Ber. Deutsch. Bot. Ges. 79:* 182–187.

– 1968: Cytologische Untersuchungen an Boraginaceen I. *Mitt. Bot. München 7:* 277–294.

Halácsy, E. von 1901–1904: *Conspectus florae graecae 1–3*. Lipsiae.

Haussknecht, C. 1897, 1899: Symbolae ad floram graecam. Aufzählung der im Sommer 1885 in Griechenland gesammelten Pflanzen. *Mitt. Thür. Bot. Ver. 11:* 30–65, *13–14:* 18–77.

Hayek, A. 1924–1933: Prodromus florae peninsulae balcanicae 1–3. *Repert. Spec. Nov. Regni Veg. Beih. 30 (1–3)*.

Hendrych, R. 1966: Thesium hispanicum sp. nova, a new plant for Spain. *Fol. Geobot. Phytotax. 1:* 70–77.

– 1968: A treatise of Thesium arvense. *Acta Univ. Carol.-Biol. 1968:* 243–262.

– 1969: The outline of the taxonomy and chorology of Thesium linophyllon. *Acta Univ. Carol.-Biol. 1969:* 119–170.

Hess, H. E., Landolt, E. & Hirzel, R. 1967–1972: *Flora der Schweiz 1–3*. Stuttgart.

Hylander, N. 1966: *Nordisk kärlväxtflora II*. Stockholm.

Kovanda, M. 1968: New taxa and combinations in the subsection Heterophylla (Witas) Fed. of the Genus Campanula L. *Fol. Geobot. Phytotax. 3:* 407–411.

– 1970: Polyploidy and variation in the Campanula rotundifolia complex. Part II. (Taxonomic) 1. Revision of the groups Saxicolae, Lanceolatae and Alpicolae in Czechoslovakia and adjacent regions. *Fol. Geobot. Phytotax. 5:* 171–208.

Lovka, M., Sušnik, A., Löve, A. & Löve, D. 1972: IOPB chromosome number reports XXXVI. *Taxon 21:* 337–339.

Maire, R. & Petitmengin, M. 1908: Étude des plantes vasculaires récoltées en Grèce (1906). *Bull. Soc. Sc. Nancy 1908:* 149–266, 360–481.

Matsuura, H. & Suto, T. 1935: Contributions to the idiogram study in phanerogamous plants, 1. *Journ. Fac. Sci. Hokkaido Imp. Univ. S. 5, Bot. 5:* 33–75.

Meusel, H., Jäger, E. & Weinert, E. 1965: *Vergleichende Chorologie der zentraleuropäischen Flora*. Jena.

Neuman, L. M. 1901: *Svensk flora*. Lund.

Nyman, C. F. 1879: *Conspectus florae Europaeae 2*. Örebro.

Phitos, D. 1962: Beitrag zur Kenntnis der Flora von Nord-pindos. *Mitt. Bot. Staatssamml. München 4:* 285–293.

Podlech, D. 1965: Revision der europäischen und nordafrikanischen Vertreter der Subsect. Heterophylla (Wit.) Fed. der Gattung Campanula L. *Feddes Repert. 71:* 50–187.

Quézel, P. & Contandriopoulos, J. 1965: Contribution à l'étude de la flore du Pinde central et septentrional et de l'Olympe de Thessalie. *Candollea 20:* 51–90.

– 1968: Contribution à l'étude de la flore de la Macédoine grecque. *Ibid. 23:* 17–38.

Rechinger, K. H. 1936: Ergebnisse einer botanischen Sommerreise nach dem Ägäischen Archipel und Ostgriechenland. *Bot. Centralbl. Beih. 54 B:* 577–688.

– 1939: Zur Flora von Ostmazedonien und Westthrazien. *Bot. Jahrb. 69:* 419–552.

– 1964: Zur Kenntnis der europäischen Arten der Gattung Alkanna. *Ann. Naturhistor. Mus. Wien 68:* 191–220.

– 1971: Lithospermum Goulandriorum Rech. f., eine neue, bemerkenswerte Art der griechischen Flora. *Bot. Notiser 124:* 355–358.

Reese, G. 1952: Ergänzende Mitteilungen über die Chromosomenzahlen mitteleuropäischer Gefässpflanzen I. *Ber. Deutsch. Bot. Ges. 64:* 241–256.

Regel, C. de 1942: Flora graecae notulae 2. *Candollea 9:* 104–137.

Riedl, H. 1967: Boraginaceae. *In* K. H. Rechinger (ed.), *Flora Iranica 48*. Graz.

Runemark, H., Snogerup, S. & Nordenstam, B. 1960: Studies in the Aegean flora. I. Floristic notes. *Bot. Notiser 113:* 421–450.

Săvulescu, T. (ed.) 1964: *Flora R P R 9*. Bucuresti.

Smith, A. R. & Tutin, T. G. 1968: Euphorbia. *In* T. G. Tutin et al. (eds.), *Flora Europaea 2:* 213–226. Cambridge.

Turrill, W. B. 1935: On the flora of the nearer East: XVI. *Kew Bull. 1935:* 54–57.

Tutin, T. G. et al. (eds.) 1964–1972: *Flora Europaea 1–3*. Cambridge.

Webb, D. A. 1961: Crassulaceae. *In* V. H. Heywood (ed.), Flora Europaea. Notulae Systematicae ad Floram Europaeam. *Feddes Repert. 64:* 20–24.

– 1964: Crassulaceae. *In* V. H. Heywood, (ed.), Flora Europaea. Notulae Systematicae ad Floram Europaeam spectantes 3. *Feddes Repert. 69:* 62.

Wendelbo, P. 1971: Alliaceae. *In* K. H. Rechinger, (ed.), *Flora Iranica 76*. Graz.

Zaganiaris, D. 1938–40: Herbarium macedonicum. Primum, secundum, tertium et quartum mille. *Epist. Epet. Shol. Fus. Math. Epist. Panepist. Thessalonikēs 5:* 97–131, 151–185; *6:* 38–139.