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GERALD PAROLLY

Notes on two neglected Turkish *Asyneuma* taxa *(Campanulaceae)*

Abstract

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Based on a recent collection of Wettstein's dubious *'Campanula juncea'* from the SW Anatolian Akdağları mountain massif, new morphological and ecological data of this largely ignored, ill-defined and under-recorded local endemic are presented, it is illustrated for the first time and its taxonomy is clarified. The species is placed in *Asyneuma* and the combination *A. junceum* is validated as a nomen novum. Remarkable populations of *A. compactum* found on the Geyik Dağları are described as var. *eriocarpum,* a variety new to science, and illustrated.

1. What is *Campanula juncea* Wettst.?

The SW Anatolian Akdağları mountain massif (situated in C2 Muğla province in terms of the Flora of Turkey-grid, Fig. 1) harbours, among many other endemics, *Campanula juncea* Wettst. It is one of the rarest Turkish plants and its taxonomic position is still unsettled. In Damboldt's *Campanulaceae* account for the "Flora of Turkey and the East Aegean Islands" (Damboldt 1978), *C. juncea* is treated as a doubtful name (indicated with "?") and placed in the synonymy of *Asyneuma compactum* (Boiss. & Heldr.) Damboldt. The "Med-Checklist" (Greuter & al. 1986) later followed this treatment.

The doubts on the identity of *Campanula juncea* are chiefly caused by the scrappy appearance of the type collection (at WU), consisting of four, partly depauperate and strongly grazed individuals, as well as by the exceptional rarity of additional collections (Damboldt 1978). The type material was collected by the Austrian Felix von Luschan on 17 July 1882 "in cacumine meridionali montis Ak Dagh" (Wettstein in Stapf 1885; for problems related to Luchan's itinerary and collecting dates see Mill 1983). Since then, only Quézel & al. (1970) were fortunate enough to find *C. juncea* at its locus classicus, the Lycian Akdağ proper, and to study it in the field. Quézel (1973) recorded it in his account of the asylvatic vegetation units of the Taurus Mts among the character species of a community typical of the exposed rocky ridges of the Akdağları and stated that it "mime certains *Asyneuma,* notamment *A. compactum*". In the protologue of *C. juncea*, Wettstein (in Stapf 1885) himself already related it to that species.

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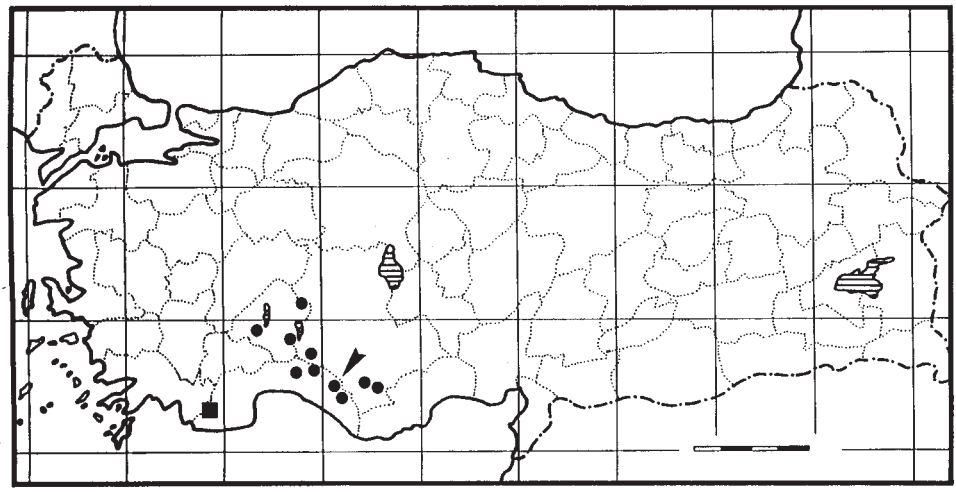


Fig. 1. Distribution of *Asyneuma junceum* (square), *A. compactum* var. *compactum* (dots; incl. subsp. *glabrescens* Contandr. & Quézel) and *A. compactum* var. *eriocarpum* (the single locality known indicated by an arrow). – Based on Ayaşliğil (1987), Damboldt (1978), Quézel (1973) and own field records; scale 200 km.

In 1999, the present author succeeded in making the third, more extensive and appropriate collection of *Campanula juncea* in the same mountain range. A study of this material and of the type collection revealed that *C. juncea* is by no means conspecific with *A. compactum.* I take the opportunity to amend the description of this largely ignored species, to clarify is taxonomy and nomenclature and to provide the relevant ecological data.

Description

Rather compact, caespitose and somewhat domed perennial, up to c. 15 cm (or more?) high, with dense leaf rosettes and mostly leafless stems, glabrous except for the leaves. *Taproot* stout, napiform, brown, the 4-8 cm long collar region of the caudex branched and densely clothed with the marcescent remains of leaf bases and petioles of the previous years. *Stems* stiff and stout, erect to ascending, at base 2.5-3 mm in diameter, c. 15 cm long (perhaps also longer; most specimens grazed to 8-12 cm), completely glabrous, simple or rarely branched, with (1)6-10 (perhaps more) long-pedicellate flowers [also in the type specimen with up to 7 flowers, not 1-4 as erroneously indicated by Wettstein 1885]. *Rosette leaves* (including petiole) 30-40(45) × 2-3(4) mm, entire, narrowly spathulate, obtuse, attenuate into a long petiole, upper surface of lamina shortly velutinous (hairs to 0.3 mm), lower surface glabrous [Wettstein erroneously reported exactly the contrary: "Folia ... supra glabra, infra breviter velutina"], lamina, at least when dry, often conduplicate, petiole at least in lower half with cilia 0.3-0.5 mm long, leaf base somewhat sheathing and distinctly swollen. *Cauline leaves* usually absent, rarely present in the lower part of the stems, then single, minute (1 mm), scale-like, lanceolate, sessile. *Bracts* subtending the flowers or 10-20 mm distant from the flowers, in size and shape similar to the cauline leaves. *Pedicels* 15-35 mm long, rather thin, spreading-erect. *Calyx* glabrous, lobes lanceolate, acute, 3-3.5 mm long, very minutely appendiculate [Wettstein stated "laciniis exappendiculatis"], erect, about as long as the obconical tube. *Corolla* 10-14 × 2 mm, c. 3-4 times as long as the calyx, glabrous, deep violet-blue, early in anthesis tubulose and divided to (2/3)3/4-4/5 into linear, acute lobes, later lobes free. *Ovary* c. 2.5 mm long, glabrous, stigma c. 9 mm, 3-partite. *Capsule* erect (ripe fruits not available), opening by subapical pores.

Ic.: For the first time illustrated here, Fig. 2-3.

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Fig. 2. *Asyneuma junceum* – Lycian Akdağlari above Gömbe, *Döring, Parolly 6198 & Tolimir* (B).

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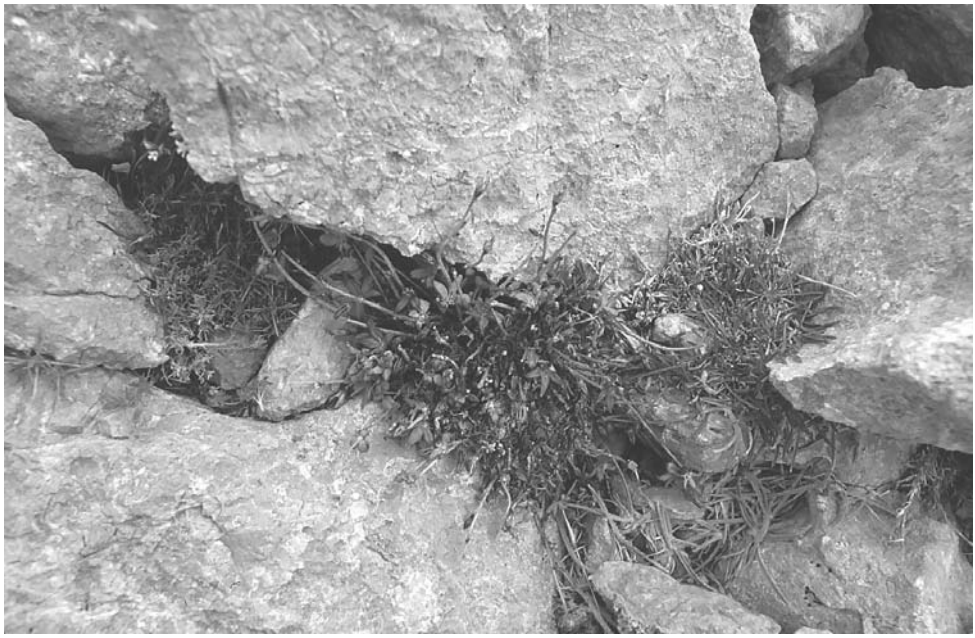


Fig. 3. *Asyneuma junceum,* with *Alopecurus lanatus* and *Minuartia juniperina* on the summit plateau of an unnamed lateral summit N of the Uyluk Tepe, Akdağ, Lycian Akdağları above Gömbe, c. 2900 m. – Photograph by G. Parolly, 27.6.1999.

Taxonomy

The systematic position of *Asyneuma* and its conflicting delimitation from the closely related genera *Campanula* and *Phyteuma* was discussed by Damboldt (1970). His generic concept, as presented first in 1968, is adopted here (Damboldt 1968, 1970, 1978). Accordingly, the major diagnostic features of *Asyneuma* are: (a) corolla more or less rotate, with petals only fused at base and the free corolla lobes narrowly linear; (b) calyx appendages lacking; (c) stigma 2-3(4)-partite; (d) capsule ovoid-oblong to subglobose, opening by median or subapical pores (for details see Damboldt 1968).

These features are clearly found in *Campanula juncea* with the only restriction that calyx appendages are not completely lacking but rudimentarily present in the form of five very minute protuberances at the edges of the ovary. However, the same minute structures are also present in some typical *Asyneuma* species, notably in *A. compactum.* The diagnostic feature (b) should therefore be amended in "calyx appendages absent or rudimentarily present".

Our species, moreover, strongly resembles a group of dwarf species, which have traditionally and unequivocally been placed in the genus *Asyneuma,* in particular *A. compactum* and *A. pulvinatum* Davis. Using the keys by Damboldt (1978) and Tan & Yıldız (1988) to identify the plants, they expectedly run down to *A. compactum*, but several features actually distinguish both species: the stiff and stout, usually 6-10-flowered and long-pedicellate stems (*A. compactum* has 1(2-3)-flowered inflorescences), the indumentum outlined in the description above, the always entire leaf margins, shorter calyx lobes (3-3.5 mm instead of 4-5 mm in *A. compactum*), distinctly smaller cauline leaves (1 mm instead of 2-3 mm in *A. compactum*), the swollen leaf base and the caudex covered with marcescent remains of the foliage of previous years. The last feature is shared with *A. pulvinatum* Davis, an extremely rare rock plant of the Tahtalı Dağ (C3 Antalya). The latter species forms dense domed cushions with forked stems, densely leafy throughout; its smaller flowers are in short, racemose inflorescences often reduced to a single, nearly sessile

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flower; its leaves are minute, acute, 7-9 × 1.5-2 mm, in rosettes, and the capsules open with median pores. Long pedicels as in our species are present in a few, all but pulvinate species such as *A. filipes* (Náb.) Damboldt, *A. lobeliodes* (Willd.) Hand.-Mazz., *A. davisianum* Yıldız & Kit Tan and *A. ekimianum* Kit Tan & Yıldız (Damboldt 1970, 1978, Tan & Yıldız 1988).

A striking feature observed in our species and in some populations of *A. compactum* is that the flowers resemble in early (male) stage those of *Campanula:* they are divided only to 2/3-4/5 instead of fully to the base as it is typical for *Asyneuma,* and only in the later (female) stage the corolla then splits completely into free lobes. In this respect both species thus bridge the gap between *Campanula* and *Asyneuma*.

Since *Campanula juncea* Wettst. is an illegitimate name, the combination in *Asyneuma* is made as a nomen novum (Art. 58.1 ICBN, Greuter & al. 2000):

Asyneuma junceum Parolly, **nom. nov.** ≡ *Campanula juncea* Wettst. in Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 50(2): 117. 1885, nom. illeg. [non *Campanula juncea* Hill, Veg. Syst. 8: 14. 1765, nec *Campanula juncea* D. Dietr., Syn. Pl. 1: 756. 1839 (= *Lightfootia juncea* Sond.)]. – Holotype: Turkey, "südlicher Gipfel des Akdagh", 17.7.1882, *Luschan* (WU!).

Distribution

Asyneuma junceum, collected only three times on Akdağ (Fig. 1), is a stenoendemic of the Lycian Akdağları, and, seen on a larger scale, of the Lycian sector of the Taurus mountains (for details see Davis 1971, Parolly 1995, 1998).

Additional specimens seen

TURKEY, C2 MUĞLA: Lycian Akdağları above Gömbe, Akdağ, area between the Şubası Yayla and Uyluk Tepe, summit plateau of an unnamed lateral summit N of the Uyluk Tepe, 36°33'42"N, 29°35'75"E, c. 2900 m, rocky slopes, wind-swept cushion community, limestone and dolomite, 27.6.1999, *Döring, Parolly 6198 & Tolimir* (B, ISTE, herb. Parolly); ibid., flattened slopes of a lateral summit N of the Uyluk Tepe, c. 2600 m, wind-swept cushion community, limestone and dolomite, 27.6.1999, *Döring, Parolly 6198a & Tolimir* (ISTE).

The material collected by Quézel & al. (1970) in 1968 on the "crêtes culminales de l'Ak dağ, 2700-2900 m" (MARS), was not available for loan owing to a re-arrangement of the herbarium (Quézel, in litt.).

Site conditions and synecology

Asyneuma junceum is a subalpine to alpine species, presently recorded from altitudes ranging between 2400 and nearly 2900 m. It preferably inhabits exposed ridges of the alpine belt (in the Western Taurus starting at c. 2500 m) in various exposures and is restricted to limestone. The low-covering vegetation (10-50 %) on these wind-swept crests and hilltops is generally composed of a mixture of chamaephytes and hemicryptophytes, among which cushion plants, especially tragacanthic thorn-cushion species, are dominant. Phytosociologically it is grouped into the Paronychion lycicae alliance, which classifies the wind-beaten cushion communities (Drabo-Androsacetalia order, Astragalo-Brometea class) of the Western Taurus (Quézel 1973; for additional vegetation surveys see Hein & al. 1998, Kürschner & al. 1998, Parolly 1995, 1998). Quézel (1973) is definitely right in assigning *Asyneuma junceum* to the character species of a particular Drabo-Androsacetalia community and in establishing the Campanulo junceae-Violetum crassifoliae association, typical of the high elevations of the Lycian Akdağ.

These cushion communities have been studied more closely by the author during a research project dealing with the high mountain vegetation of the Taurus range. In alpine altitudes, *Asyneuma junceum* is centred within the Campanulo junceae-Violetum crassifoliae [in accordance with Art. 30 CPN, Barkman & al. 1986, the name of that syntaxon must not be rejected merely because the taxon name is relegated to synonymy; however, Art. 44, ruling the correction of syntaxomic names based on homonymous taxa, could be applied, but this procedure is left for

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the presently undertaken revisive account of the Drabo-Androsacetalia (Parolly in prep.)]. Lower down, it encroaches on a still undescribed subalpine Paronychion unit, and, exceptionally rarely, it is also found in the adjoining stands of the local Tanacetion praeteriti Quézel 1973 alliance (thorn-cushion and dwarf-shrub communities of the Western Taurus; Astragalo-Brometea class). In all these moderately sloping (inclination from ± 0 to 10°) and debris- to boulder-rich places it grows together with, in particular, *Minuartia erythrosepala* (Boiss.) Hand.-Mazz., *M. juniperina* (L.) Maire & Petitm., *M. leucocephala* (Boiss.) Mattf., *Paronychia chionaea* Boiss., *Silene caryophylloides* subsp. *eglandulosa* (Chowdh.) Coode & Cullen, *Centaurea bourgaei* Boiss., *Scorzonera cana* (C. A. Mey.) Hoffm. s.l., *Alyssum condensatum* Boiss. & Hausskn., *Draba bruniifolia* var. *nana* (Stapf) Schulz, *Astragalus angustifolius* Lam., *Onobrychis cornuta* (L.) Desv., *Androsace villosa* L., *Ranunculus brevifolius* Ten., *Pedicularis cadmea* Boiss., *Veronica caespitosa* Boiss. var. *caespitosa*, *Alopecurus lanatus* Sm. and *Festuca pinifolia* (Hackel ex Boiss.) Bornm.

Asyneuma junceum is able to penetrate scree layers and to react against moderate soil movements caused by cryoturbation. By contrast, *A. compactum* scarcely has this potential.

Conclusion

Asyneuma junceum seems, like the other Lycian endemics *A. pulvinatum* and *A. lycium* (Boiss.) Bornm., and like *A. compactum* of the western sector of the Central Taurus, to be a very isolated relict species with distinct habitat preferences. Phytosociologically, *A. junceum* replaces in the Akdağları the corresponding Pisidian-Isaurian *A. compactum* as an important element of the Drabo-Androsacetalia communities (Fig. 1).

With *Asyneuma junceum* the accepted *Asyneuma* species in Turkey amount to 21, of which 14 are endemic (Tan & Yıldız 1988).

2. A new variety of *Asyneuma compactum*

Asyneuma compactum var. ***eriocarpum*** Parolly, **var. nova**

Holotype: Turkey, C4 Antalya, Geyik Dağları, Büyük Geyik D., ridge N of the main summit, 36°54'01"N, 32°09'95"E, c. 2610-2620 m, rocky slope, saddle position, wind-swept cushion community, limestone, 20.7.1999, *Döring, Parolly 6799 & Tolimir* (B; isotypes: ISTE, herb. Parolly) – Fig. 4b, 5.

Ab var. *compacto* indumento ovarii et tubi calyci tomentoso-lanato, c. 2-3 mm longo, denso, albido, nervos omnino occultante distinguitur.

The remarkable new variety of *Asyneuma compactum* (Boiss. & Heldr.) Damboldt, found in the Geyik Dağları (Fig. 1), is easily distinguished from *A. compactum* var. *compactum* by the dense, lanate-tomentose indumentum of the ovary and calyx tube, with 2-3 mm long white hairs, which completely hide the nerves and all other structures of the ovary (Fig. 4b, 5) and later, although somewhat glabrescent, of the fruit. The indumentum is somewhat less dense in *Döring, Parolly 6762a & Tolimir,* but the length of the hairs is the same. Some ecologically correlated peculiarities of the habit are discussed below.

By contrast, calyx and ovary in var. *compactum* are, if not glabrous at all, strongly glabrescent. In most cases, only five isolated tufts of short hairs (c. 0.3-0.5 mm) are found at the edges of the calyx lobes and the overall impression is that of a dark green ovary. The only, all the more notable exception among the herbarium specimens and life plants studied by the author are the isotypes of var. *compactum* at E ("B3 İsparta: in regione superiore Davros Dagh (Davras Dağı), Pisidiae, 1670-1820 m, *Heldreich*"). This material represents a puzzling, variable gathering of typically compact cushion-forming plants with a comparatively dense indumentum in all parts. It includes some individuals with a short, moderately dense, puberulous indumentum even on the ovary, but the rather stiff hairs are always shorter than 1 mm and thus hardly longer than those on the stems and leaves, and the capsules are nearly completely glabrous.

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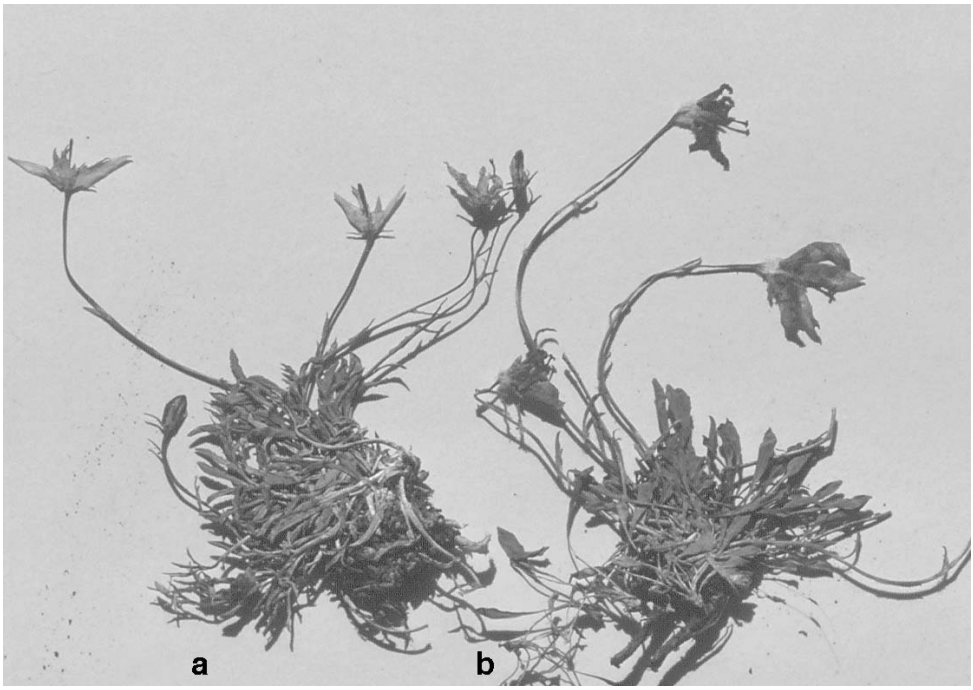


Fig. 4. *Asyneuma compactum* var. *compactum* (a, from *Döring, Parolly 6661 & Tolimir,* herb. Parolly; Dedegöl Dağları) and var. *eriocarpum* (b, from the holotype at B).



Fig. 5. *Asyneuma compactum* var. *eriocarpum* – flower in detail showing the dense lanate-tomentose indumentum of the ovary and calyx. – From the holotype at B.

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The plants of var. *eriocarpum* display a strikingly lax (less compact) habit and are in all dimensions, in particular in the length of the stems (up to 20 cm) and the size of the flowers (corolla up to 16 mm), at the upper range of the values known for the species. No doubt, this luxuriant growth is largely caused by the site conditions and no particular feature of var. *eriocarpum.* Comparable tall plants have already been recorded by Davis from the Geyik Dağ (*Davis 14563* [E!]), by the author from the Dedegöl Dağları and by Contandriopoulos & al. (1971) from the Oyuklu Dağ.

From the latter mountain Contandriopoulos & Quézel described *A. compactum* subsp. *glabrescens* (in Contandriopoulos & al. 1971: 57). However, since the distinguishing features of this subspecies fit fully into the range of variation of the stem and leaf indumentum of *A. compactum,* which is glabrescent to nearly completely glabrous, Damboldt (1978) reduced this taxon to a synonym. A discussion of the reputed synecological differentiation of subsp. *compactum* and subsp. *glabrescens* as presented by Quézel (1973) is provided by Hein & al. (1998). Nevertheless, field observations and the material kept at B, E and LI (herb. Sorger) indicate that the populations of the western part of the species' range (Davras Dağ, Dedegöl and Sultan Dağları) have often a denser indumentum than those from the Geyik Dağları and Oyuklu Dağ. By contrast, the stem indumentum of some samples of var. *eriocarpum* is unusually dense and long, but this feature is not very constant and not fully correlated with the density of the tomentose ovary indumentum.

Some flowers in the type population of var. *eriocarpum* are 6-merous, which may indicate a higher ploidy level (Contandriopoulos 1972 reports for *A. compactum* s.l. 2n = 34).

Taking in account the general variability of *A. compactum,* the variability observed also in var. *eriocarpum* and the fact that var. *eriocarpum* is geographically not separated from the other populations of *A. compactum*, the rank of a variety seems appropriate for the new taxon.

Additional specimens seen

TURKEY, C4 ANTALYA: Geyik Dağları, Akdağ, transitional ridge between the two northern cirques facing the plateau between Geyik D. and Akdağ, alt. 2450 m, wind-swept cushion community, limestone and dolomite, 19.7.1999, *Döring, Parolly 6762a & Tolimir* (herb. Parolly). – No additional material is kept at E and LI.

Site conditions

Asyneuma compactum var. *eriocarpum* dwells in a W facing, rather densely covering, alpine thorn-cushion community in a wind-sheltered position close to a recently melted, late snow-field below the main summit ridge. The enhanced water and fine soil supply is reflected by a number of character species of snow-patch communities (cf. Kürschner & al. 1998), such as *Taraxacum bithynicum* DC., *Ranunculus demissus* var. *major* Boiss., *Muscari aucheri* (Boiss.) Baker, *Ornithogalum oligophyllum* E. D. Clarke and *O. orthophyllum* Ten., which intermingle the typical set of Astragalo-Brometalia thorn-cushion plants. In the Geyik Dağları, the two *A. compactum* varieties are ecologically distinct: var. *compactum* has hitherto only been recorded from dry wind-swept cushion communities on stony ground with a very reduced proportion of fine soil.

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References

Ayaşliğil, Y. 1987: Der Köprülü Kanyon Nationalpark. Seine Vegetation und ihre Beeinflussung durch den Menschen. – Diss. (Landschaftsökologie) Univ. Weihenstephan.

Barkman, J. J., Moravec, J. & Rauschert, S. 1986: Code of phytosociological nomenclature, ed. 2. – Vegetatio **67:** 147-195.

Contandriopoulos, J. 1972: Contribution à l'étude cytotaxonomique des Campanulacées du Proche-Orient, III. – Bull. Soc. Bot. France. **119:** 75-94.

—, Quézel, P. & Pamukçuoğlu, A. 1971: Campanulacées nouvelles du pourtour méditerranéen oriental. – Ann. Univ. Provence, Sci. **46:** 53-61.

Damboldt, J. 1968: Vorarbeiten zu einer Revision der Gattung *Asyneuma (Campanulaceae)*. – Willdenowia **5:** 35-54.

— 1970: Revision der Gattung *Asyneuma*. – Boissiera **17.**

— 1978: *Asyneuma* Griseb. & Schenk. – Pp. 65-81 in: Davis, P. H. (ed.), Flora of Turkey and the East Aegean Islands **6.** – Edinburgh.

Davis, P. H. 1971: Distribution patterns in Anatolia with particular reference to endemism. – Pp. 15-27 in: Davis, P. H., Harper, P. C. & Hedge, I. C. (ed.): Plant life of South-West Asia. – Edinburgh.

Greuter, W., Burdet, H. M. & Long, G. 1986: Med-Checklist 3. Dicotyledones *(Convolvulaceae-Labiatae)*. – Genéve & Berlin.

—, McNeill, J., Barrie, F. R., Burdet, H. M., Demoulin, V., Filgueiras, T. S., Nicolson, D. H., Silva, P. C., Skog, J. E., Trehane, P., Turland, N. J., Hawksworth, D. L.: International code of botanical nomenclature (Saint Louis Code) adopted by the Sixteenth International Botanical Congress St Louis, Missouri, July-August 1999. – Regnum Veg. **138.**

Hein, P., Kürschner, H. & Parolly, G. 1998: Phytosociological studies on high mountain plant communities of the Taurus mountains (Turkey). 2. Rock communities. – Phytocoenologia **28:** 465-563.

Kürschner, H., Parolly, G. & Raab-Straube, E. von 1998: Phytosociological studies on high mountain plant communities of the Taurus Mountains (Turkey). 3. Snow-patch and meltwater communities. – Feddes Repert. **109:** 581-616.

Mill, R. R. 1983: The Anatolian itineraries of Felix von Luschan. – Notes Roy. Bot. Gard. Edinburgh **41:** 57-64.

Parolly, G. 1995: Die Steinschuttfluren (Heldreichietea) des Westlichen und Mittleren Taurus (Türkei). Pflanzensoziologische, floristische und ökologische Untersuchungen. – Diss. Bot. **247.**

— 1998: Phytosociological studies on high mountain plant communities of the South Anatolian Taurus mountains. 1. Scree plant communities (Heldreichietea): A Synopsis. – Phytocoenologia **28:** 233-284.

Quézel, P. 1973: Contribution à l'étude phytosociologique du massif du Taurus. – Phytocoenologia **1:** 131-222.

— , Contandriopoulos, J. & Pamukçuoğlu, A. 1970: Contribution à l'étude de la flore des hautes montagnes de l'Anatolie occidentale. – Candollea **25:** 341-387.

Stapf, O. 1885: Beiträge zur Flora von Lycien, Carien und Mesopotamien. Planta collectae a Dre Felix Luschan ann. 1881, 1882, 1883, 1. – Denkschr. Kaiserl. Akad. Wiss. Wien, Math.-Naturwiss. Kl. **50(2):** 72-120.

Tan, K. & Yıldız, B. 1988: New *Asyneuma (Campanulaceae)* taxa from Turkey. – Willdenowia **18:** 67-80.

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