

TWO NEW SPECIES OF *BORAGINACEAE* (TRIBE *CYNOGLOSSEAE*) FROM TURKEY

Z. AYTAÇ¹ & R. R. MILL²

Two new species of *Boraginaceae* are described from Turkey: *Paracaryum hedgei* and *Rindera dumanii*. Their affinities and phytogeography are discussed. Both species are illustrated and their distributions mapped. *Rindera* sect. *Bilegnum* is raised to subgeneric rank as *Rindera* subgen. *Bilegnum*.

Keywords. *Boraginaceae*, *Cynoglosseae*, new species, new subgenus, *Paracaryum*, phytogeography, *Rindera*, Turkey.

INTRODUCTION

This paper describes two new species of *Boraginaceae*, one in the genus *Paracaryum* (DC.) Boiss. and the other in *Rindera* Pallas. Both new taxa therefore belong to tribe *Cynoglosseae* as traditionally delimited, although there is currently some debate about whether that tribe should be merged with the closely allied tribe *Eritrichieae* (see, for example, the abstract by Böhle & Hilger, 1998, and the paper by Långström & Chase, 2002 who found that members of the two tribes were ‘interdigitated’ in a clade that also contained *Myosotis* L. and *Trigonotis* Steven). The specimens were collected by Z.A. during field trips to southern Turkey in 1997, 1998 and 1999. Both have close allies, and the *Rindera* represents a major extension of the known range of one of the constituent subgenera of that genus, as discussed under the species.

In the descriptions, terminology follows Mill (1979a). In particular, it should be noted that in descriptions of the corolla, the *tube* is limited to that part below the throat scales; the *limb* is all of that part of the corolla above the scales, whether there is a tubular portion or not; the limb is divided apically into *lobes* which may extend to near the base of the limb, in which case there will be a tubular portion between the lobes of the limb and its base at the zone of scales.

NEW SPECIES

***Paracaryum hedgei* Aytaç & R.R.Mill, sp. nov.** (*P.* subgen. *Mattiastrum* (Brand) R.R.Mill sect. *Mattiastrum*). **Fig. 1.**

P. racemoso (Schreb.) Britten ut videtur maxime affinis propter habitum perennem multicaulem et corollas in sicco intense atrocaeruleas, sed a quo fornicibus sine

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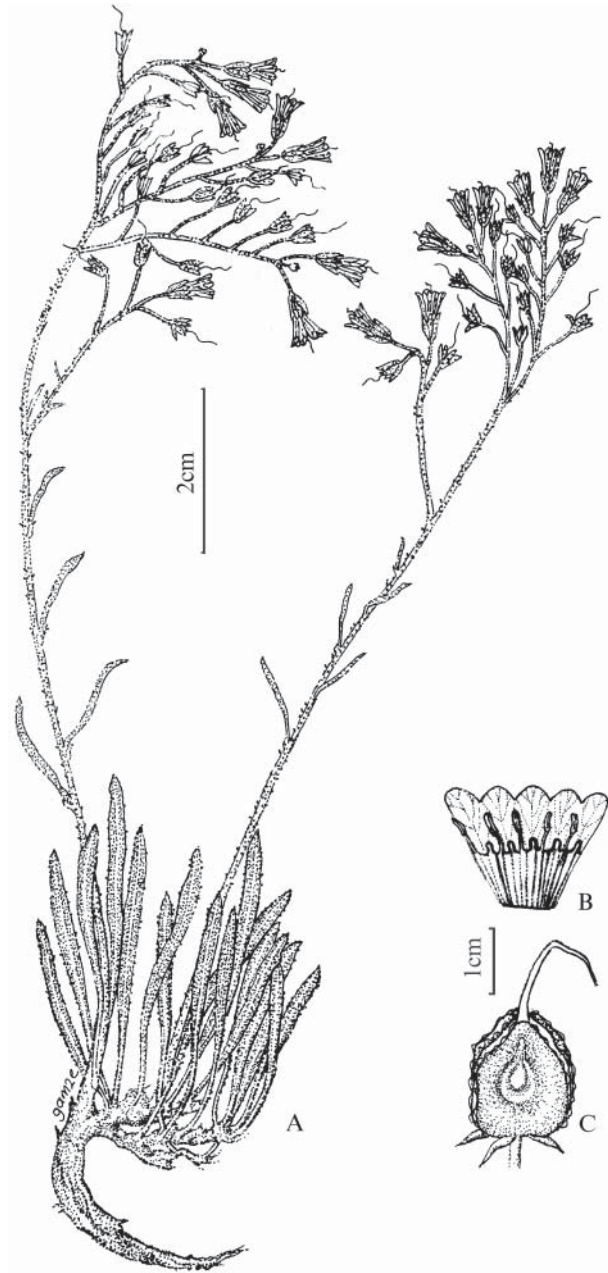


FIG. 1. *Paracaryum hedgei* Aytaç & R.R.Mill: A, habit; B, dissected corolla; C, fruit. Drawn from type material (Aytaç 7595).

appendiculis subapicalibus lateralibus gibbosis distinctis, antheris brevioribus (2–2.5mm, non 2.5–4mm) et disco nuculae sine glochidiis distinguitur. *P. calycino* Boiss. & Bal. etiam similis, a quo habitu perenni (haud bienni), caulibus e caudice

lignoso numerosis evolutis, pedicellis calycem aequantibus vel longioribus, lobis calycis brevioribus (c.5mm longis, non (6.3–)7–10mm), corollis in sicco intense caeruleis (non violascentibus), fornicibus corollae paullo apiculatis (haud obtusis vel incurvatis), antheris semper fornices excedentibus (haud eos aequantibus), nuculis 10–11mm diametro ala plerumque denticulato differt.

Type: Turkey C4 Konya: Ereğli, 3km N of İvriz, around Ayrancı Dam, 1200–1300m, protected *Abies cilicica* and *Pinus nigra* forest, 22 vi 1997, *Z. Aytaç* 7595 (holo. GAZI; iso. ANK, E) – flowering material.

Perennial. *Rootstock* stout, woody, blackish, each crown producing up to 10 fertile stems and numerous sterile leaf ‘rosettes’. *Fertile stems* 15–20(–25)cm, changing little in height between flowering and fruiting, erect, unbranched and adpressed-strigose below (hairs nearly all antrorsely adpressed, with a few erecto-patent), branched in flowering region. *Basal leaves*: early ones with petiole 10–15mm and lamina obovate to spatulate, 20–30 × 3–4mm; later ones with petiole 20–40mm and lamina oblong to oblanceolate, 30–40 × 2–4mm; indumentum adpressed-strigose, a few longer and more patent hairs from bases developing multicellular tubercles. *Cauline leaves* sessile, linear-lanceolate, 10–25mm (smaller above), acute, indumentum similar to basal. *Inflorescence* corymbose-paniculate, in fruit with first branching dichotomous and divaricate, higher pedicels arranged paniculately, sometimes a single paniculate branch immediately below main inflorescence and/or a single corymbose branch lower down. *Flowers* 5–20 per inflorescence. *Pedicels* as long as or longer than calyx, densely adpressed-pilose. *Calyx lobes* lanceolate to oblong, 4.5–5mm, obtuse, adpressed white-pilose. *Corolla* blue (drying deep ultramarine), infundibular, 10–12mm; tube c.5mm, ± equalling calyx; limb c.6mm, slightly longer than tube; lobes 2–3 × c.2.5mm, rounded. *Faucal scales* oblong, 1.5–2mm, base hastate, apex slightly apiculate, broadened just below apex but lacking distinct subapical lateral appendages. *Filaments* 2mm, inserted ± level with bases of scales; *anthers* 2–2.5mm, always longer than scales, above scale bases and all except lowest 0.5mm above the scale apices, but not exerted from corolla. *Style* 11–14mm, exerted from corolla by up to 4mm; stigma capitate. *Nutlets* orbicular, 10–12 × 10–11mm; wing 2mm, denticulate, lacking glochids, finally with narrow blue margin; disc pyriform, slightly more greenish dorsally than the wing, keeled dorsally, normally glabrous but occasionally with a few non-glochidiate processes.

Additional specimens examined (paratypes). TURKEY. C4 Konya: details as holotype, *Z. Aytaç* 7598 (ANK, E, GAZI) – fruiting. Karaman – Mut (İçel), 17km, Tarlaören köyü civarı, 1350m, korunmuş *Pinus nigra* orman açıklıkları, 7 vi 1999, *Aytaç* 7889 (GAZI, E); *ibid.*, 25 vi 1987, *K.A. Mesbitt* 1093 (GAZI). Karaman: Ayrancı, above Koraş, 1750m, steppe, 23 vi 1998, *Ekici* 2090 (GAZI).

Ecology and distribution. Steppe, clearings of *Abies cilicica* (Antoine & Kotschy) Carrière and *Pinus nigra* L. forest; 1200–1750m. Fl. and fr. June–July. Distribution: Fig. 3.

Endemic to Turkey. East Mediterranean element. Known from the type locality (from which flowering and ripe fruiting material was collected on the same day) and two other localities. The population in the type locality is not large, but is in a protected area. Hence the recommended IUCN category (IUCN, 2001) for this new species is EN.

We have great pleasure in naming this attractive new species in honour of Ian Hedge, a former staff member and now Honorary Associate of the Royal Botanic Garden Edinburgh, in recognition of his long-standing interest in the flora of the Middle East and who, in retirement, is working just as hard on the floristics of further flung lands such as Madagascar.

Paracaryum hedgei belongs to *P.* subgen. *Mattiastrum* (Brand) R.R.Mill (formerly the genus *Mattiastrum* Brand: see Mill, 1977 for discussion). Within that subgenus, it appears most closely related to *P. racemosum* (Schreb.) Britten, with which it shares not only a very distinctive ultramarine blue flower, both fresh and when dried, but also a perennial habit with woody rootstock producing many flowering stems. From *P. racemosum*, which is widespread in Central and Inner Anatolia on sunny slopes, fallow fields and steppe but rare in the southern third of Turkey, *P. hedgei* differs in:

- absence of distinct, projecting lateral appendages near the apex of the throat scales, which instead are merely slightly broadened subapically;
- shorter calyx lobes (4.5–5mm, not 5.5–10mm) and generally shorter anthers (2–2.5mm, not 2.5–4mm);
- absence of glochidiate spinules on the nutlet disc (a very few processes are found on occasional fruits but they are never glochidiate).

Paracaryum racemosum itself is a rather variable species. Specimens from the northern part of its range (Sivas, etc.) tend to have larger corollas than those from the south. One southern, small-flowered variant is *P. azureum* Boiss. (Boissier, 1849: 131), described from ‘in collibus aridis prope Ghelindost inter Karagatsch et Koniah in Lycaonia’ where it was collected in June 1845 by Heldreich (holo. G–BOIS, seen for Mill, 1979b). Coincidentally there is a small village called Karaağaç very close to Ayranci, the type locality of *P. hedgei*. However, the ‘Karagatsch’ referred to by Boissier is Şarkikaraağaç on the way to Beyşehir in İsparta, well to the west of Konya, rather than to the east where Ayranci is. We nevertheless compared the material here described as *P. hedgei* with two specimens at E which appear to be isotypes of *P. azureum*. These specimens both have nutlets with glochidiate spinules (numerous on the nutlets of one of them, fewer and less distinct on the other less mature specimen which has flowers). In *P. hedgei*, the nutlets are normally completely smooth; in the rare cases where processes do develop, glochids have not been observed at their apex. The corollas on the flowering isotype of *P. azureum* have 3-dentate throat scales with distinct lateral gibbous appendages, agreeing with the protologue of *P. azureum*. *Paracaryum hedgei* has scales that are broadened slightly at the apex but, in three corollas dissected, none of the scales had distinct lateral

appendages. We are therefore confident that our taxon is distinct both from typical *P. racemosum* and from *P. azureum*. There are also specimens of the latter from other localities in southern Turkey such as near Karaman. They deserve further study to decide whether *P. azureum* is a synonym of *P. racemosum*.

Paracaryum hedgei also superficially resembles *P. calycinum* Boiss. & Bal. and could be confused with it if too much reliance is based upon corolla scale morphology since the scales of *P. calycinum* also lack lateral appendages. However, *P. hedgei* is clearly perennial (not biennial), with a woody rootstock producing many stems and sterile rosettes, rather than one or few stems only. It also differs from *P. calycinum* in several other characters:

- pedicels as long as or longer than the calyx;
- calyx lobes shorter (5mm, not (6.3–)7–10mm);
- flower colour: in *P. calycinum* the corolla is always violet (fresh and dry), never with the sea-blue colour so characteristic of *P. racemosum* and *P. hedgei*;
- corolla scales hastate at base and slightly apiculate at apex (not obtuse or incurved);
- anthers always longer than the scales;
- nutlets 10–11mm diam., with the wing denticulate (never entire).

With the addition of *P. hedgei*, *Paracaryum* subgen. *Mattiastrum* sect. *Mattiastrum* now contains 13 species. Eleven of these occur in Turkey, all but one being endemic (Mill, 1979b). They are characteristic of the Inner Anatolian steppes, being largely replaced in the mountains of the Taurus and the ‘Anatolian Diagonal’ (as defined by Davis, 1971 and discussed by Ekim & Güner, 1986) by members of *Paracaryum* subgen. *Modestomattiastrum* (Brand) R.R.Mill (Mill, 1977) such as *P. lithospermifolium* (Lam.) Grande. Two members of subgen. *Mattiastrum* sect. *Mattiastrum* have previously been recorded from C4 Konya: *P. racemosum* var. *racemosum* and *P. longipes* Boiss. The differences from *P. racemosum* have been summarized above. *Paracaryum longipes*, which is allied to *P. calycinum* but has smaller flowers on very long pedicels, differs from *P. hedgei* in:

- biennial not perennial habit;
- much smaller corollas (6–7mm, occasionally up to 8mm, but always much smaller than the smallest corollas of *P. hedgei* whose corollas are 10–12mm) which are deep blue-violet (not deep blue);
- narrowly linear faucal scales which are retuse or bifurcate, not apiculate;
- smaller nutlets (7.5–9mm diam., not 10–12mm), with usually a coarsely crispulate-dentate (not denticulate) wing margin. The wing is sometimes subentire, but always has marginal glochids which are absent in *P. hedgei*.

Rindera dumanii Aytaç & R.R.Mill, **sp. nov.** (subgen. ***Bilegnum*** (Brand) R.R.Mill, **comb. et stat. nov.**: vide infra). **Fig. 2.**

Rinderae Pallas species nova insignis et aliis speciebus nuculas bialatas habentibus valde disjuncta. *R. albidae* (Wettst.) Kusn. magis similis, a qua fornicibus ad apices

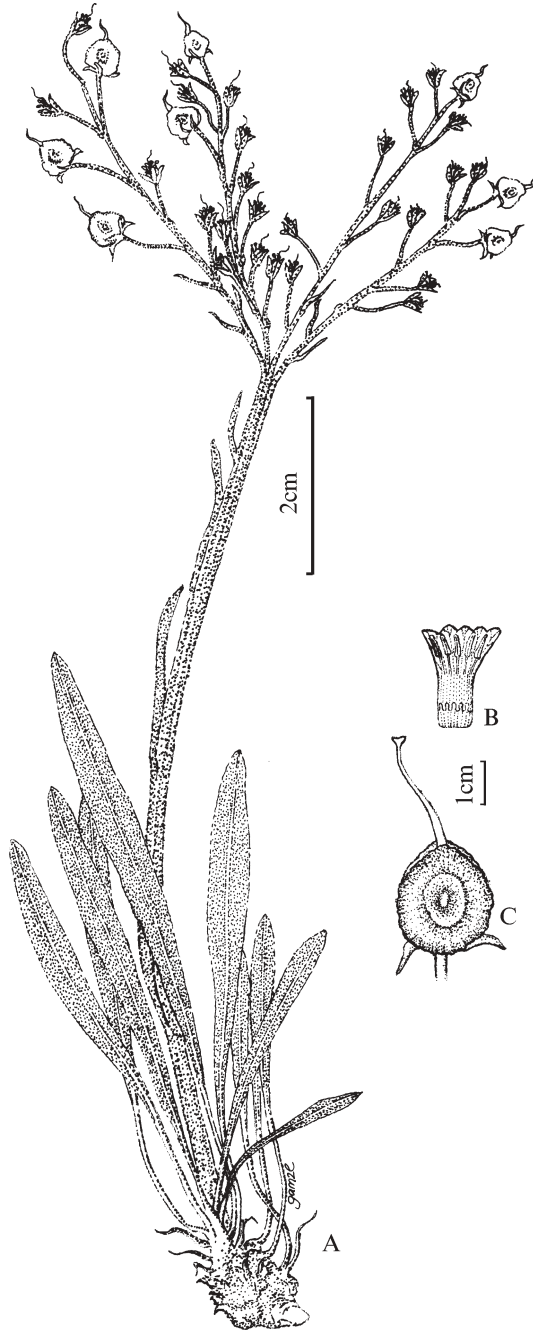


FIG. 2. *Rindera dumanii* Aytaç & R.R.Mill: A, habit; B, dissected corolla; C, fruit. Drawn from type material (Aytaç 7868).

retusis (haud acutis), filamentis e corolla non clare exsertis, lobis corollae brevioribus, ala interiore nuculae processibus longis sparsis provisa differt. A *R. lanata* (Lam.) Bunge lobis corollae multo brevioribus haud anguste ellipticis, antheris multo minoribus ovoideis ad summum corollae positis (haud longis linearibusque et lobos corollae brevioribus), nuculae ala duplici (haud simplici) facile distinguitur.

Type: Turkey C3 Antalya: Akseki-Beyşehir: Çamlık kasabası, Kızıldağ doğu yamaçları, 1600–1700m, *Pinus nigra* orman açıklığı, 30 vi 1998, Z. Aytaç 7868 & H. Duman (holo. GAZI; iso. ANK, E).

Perennial. *Stems* erect, solitary, simple, 25–40cm, leafy, densely adpressed-lanate with short, greyish-white hairs. *Basal leaves* numerous, suberect to erect: petiole 40–70mm (petiole + lamina slightly shorter than total height of flowering stem), retrorsely greyish-white adpressed-lanate; lamina narrowly elliptic, 80–150 × 8–15mm, base gradually attenuate into petiole, apex acute. *Cauline leaves* much reduced, sessile, lanceolate to linear-lanceolate, 10–40 × 2–5mm, acuminate; all leaves with distinct midrib abaxially, densely and evenly adpressed-lanate on both surfaces with very fine short hairs lying ± parallel to midrib; tubercle-based hairs entirely absent. *Inflorescence* corymbose, composed of scorpioid cymes; cymes up to 4 per inflorescence, up to 12-flowered, straight but divaricately spreading in fruit. *Pedicels* 5–10mm at anthesis, to 15mm in fruit, lanate with spreading short whitish-grey hairs. *Calyx lobes* ovate-lanceolate, 5–7mm, obtuse, densely white-tomentose. *Corolla* reddish-purple, drying brownish, cylindrical, 6–7mm; tube c.2.5mm; limb c.5mm, lobed to c.2.5mm, the lobes c.2/7 of total corolla length, rounded at apex and contracted at base with a wide rounded sinus between each lobe; gibbosities in tube/unlobed limb absent. *Faucal appendages* inserted at mid point of the tube and unlobed part of limb, oblong to oblong-lanceolate, 1 × 1mm, retuse at apex and hastate at base. *Stamens* slightly exserted from corolla tube but not from corolla; filaments inserted well above faucal scales, c.2mm; anthers nearly medifixed, shortly ellipsoid, c.0.8–1.2mm, obtuse at both base and apex. *Style* clearly exserted from corolla, slightly broadened just below capitate stigma. Nutlets suborbicular, 14–16 × 15mm, with double wing; outer wing 2–4mm broad, margin entire to slightly undulate, glabrous and otherwise smooth; inner wing incurved, 4–5mm broad, margin lacerate, without glochids but with some long processes; disc broadly elliptic, 8–9 × 6.5–8mm.

Additional specimen examined. TURKEY. C3 Antalya: Akseki-Beyşehir: Çamlık kasabası, Kızıldağ, doğu yamaçları, 1600–1700m, *Pinus nigra* orman açıklığı, 15 vi 1997, Aksoy 1164 (GAZI).

Ecology and distribution. Clearings of *Pinus nigra* forest, on serpentine. Fl. and fr. May–June. Distribution: Fig. 3.

Endemic to Turkey. East Mediterranean element. Known only from the type locality. Probably most closely related to *R. albida* (Wettst.) Kusn., from which it differs in its corolla tube being longer than the limb, faucal appendages slightly retuse (not acute), and inner wing of fruit margins lacerate and with sparse long processes.

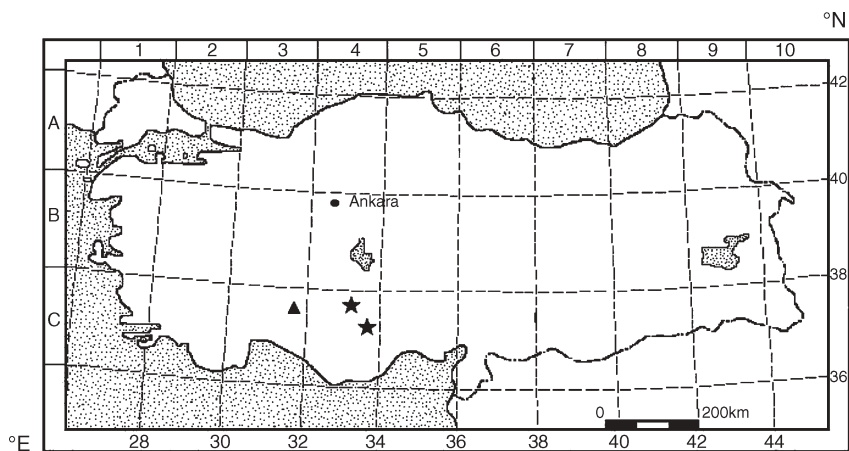


FIG. 3. Map of Turkey showing distribution of *Paracaryum hedgei* Aytaç & R.R.Mill (★) and *Rindera dumanii* Aytaç & R.R.Mill (▲).

We dedicate this new species to our friend and colleague Dr Hayri Duman of Gazi University, Ankara, Turkey, who has done so much to contribute to our knowledge of Turkish endemic plants.

The discovery of this new species brings the total of Turkish species of *Rindera* to four. Of these, two (*R. albida* and *R. caespitosa* (A.DC.) Bunge) are exclusively eastern in their Turkish distributions (Mill, 1979c). The only other *Rindera* likely to be found as far west as Antalya is *R. lanata* (Lam.) Bunge, one of the most widespread species in the genus, though also near the western limit of its range in SW Anatolia. In both flower and fruit, it is very easily distinguished from *R. dumanii*. Its flowers, which are usually lilac-pink (drying blue), have very long, narrowly oblong corolla lobes (not short and obtuse as in *R. dumanii*), the anthers are long and linear, nearly basifixed (not almost medifixed) and not exerted from the corolla but partially visible between the lobes; and the nutlets have a single wing (not double).

The genus *Rindera* Pallas is mostly Central and Middle Asian and can be divided into several groups that have been recognized at sectional level (Riedl, 1967) or as subgenera (Mill, 1979a and in preparation). *Rindera dumanii* belongs to **Rindera** subgen. **Bilegnum** (Brand) R.R.Mill, **comb. et stat. nov.**¹ *Rindera* subgen. *Bilegnum* is characterized by nutlets with a double margin to the wing (hence the subgeneric name) and anthers exerted from the corolla, although this latter feature is shared with other groups within *Rindera*. *Rindera* subgen. *Bilegnum* is centred in Iran and now comprises four species, the other three being *R. albida* (Wettst.) Kusn. (E & SE Turkey, N, W & C Iran), *R. bungei* (Boiss.) Gürke (W & C Iran: the only original species of *Bilegnum* and type of the subgenus), and *R. media* (Turrill) Parsa (NW

¹ Syn.: *Bilegnum* Brand, Repert. Spec. Nov. Regni Veg. 13: 549 (1915) pro gen. (basionym); *Rindera* Pallas sect. *Bilegnum* (Brand) Riedl in Rech.f., Fl. Iranica 48: 129 (1967).

Iran). These three all occur much further east than *R. dumanii* and its occurrence in Antalya, far to the west of *R. albida*, represents a major range extension of the subgenus and is of particular phytogeographic interest. Antalya is not, however, the most westerly point in the distribution of the genus as a whole since *R. graeca* (A.DC.) Boiss. & Heldr. occurs in Greece, and *R. umbellata* (Waldst. & Kit.) Bunge reaches Romania. Outside the *Boraginaceae*, several other genera show disjunctions between Antalya or Konya and Iran and/or Afghanistan. The most recently described of these is *Pentanema alanyense* H.Duman & Anderb. (*Asteraceae*; Duman & Anderberg, 1999). These authors (op. cit., p. 338) list several other taxa showing this disjunction type, including *Arnebia purpurea* Erik & Sümbül from Antalya (Erik & Sümbül, 1986), which Duman & Anderberg (1999) link with *A. euchroma* (Royle) I.M.Johnst. from Afghanistan and Iran, but which has been shown cladistically, on morphological characters, to be more closely related to *A. pulchra* (Willd. ex Roem. & Schult.) J.R.Edm. from NE Anatolia and Caucasia (Brummitt, 1998).

The area in which this new species was collected seems to be a local centre of endemism as it harbours several endemic species in various families, some of which have been recently described (Duran & Duman, 1999; Aytaç & Aksoy, 2000a,b). *Rindera dumanii* was collected on serpentine, and this substrate may well be a contributory factor to the endemism rate. 'Serpentine endemics' are common in other parts of Turkey where serpentine is exposed, such as Sandras Dağ. The locality of *R. dumanii* is about 1° west of where the *Pentanema* and *Arnebia* mentioned above were collected, suggesting that the zone of Antalya/Iran disjunction discussed by Duman & Anderberg (1999) extends further west than previously thought. It is also within the distribution of *Omphalodes ripleyana* P.H.Davis, a local endemic allied to *O. luciliae* Boiss., but which differs from the latter in its fimbriate nutlet wing margin, among other characters. The development of long processes along the margin of the inner wing in *R. dumanii* is therefore particularly interesting since it suggests that environmental factors have caused two not very closely related genera of *Cynoglosseae* to evolve in a parallel way.

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