



Peucedanum isauricum (Apiaceae), a striking new species from S Anatolia, with notes on the related *P. graminifolium* and *P. spreitzenhoferi*

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Peucedanum isauricum* (Apiaceae), a striking new species from S Anatolia, with notes on the related *P. graminifolium* and *P. spreitzenhoferi

Abstract

Parolly, G. & Nordt, B.: *Peucedanum isauricum* (Apiaceae), a striking new species from S Anatolia, with notes on the related *P. graminifolium* and *P. spreitzenhoferi*. – Willdenowia 34: 135-144. – ISSN 0511-9618; © 2004 BGBM Berlin-Dahlem.

Peucedanum isauricum is described as a species new to science and illustrated. Its taxonomic position in *P.* sect. *Palimbioidea* close to *P. graminifolium* of N Turkey and the more distantly related *P. spreitzenhoferi* of the Levant is discussed. *P. isauricum* stands out in combining a junciform-polygonoid habit with heteromorphic, in their majority grass-like leaves. Light-microscopic photographs of transverse sections and SEM photographs of mericarps of *P. isauricum* and *P. spreitzenhoferi* are presented. *P. isauricum* is considered a neo-endemic and only recorded from a very localised range in the western Central Taurus near Demirtaş, Antalya province, Turkey.

Through the courtesy and continuous commitment of Robert Ulrich, pharmacist in Tübingen, Germany, the authors had the opportunity to study a collection of a highly unusual *Apiaceae* from the S Anatolian Taurus Mts gathered and observed by him over four subsequent years. From the very beginning, he was well aware of its novelty, but the incomplete material rendered any generic assignment impossible. In the following years Ulrich made a small, but fine collection of that late-flowering, heterophyllous umbel with grass-like leaf segments and a junciform synflorescence. Before a set of specimens was forwarded to us in 2003, other sets had been deposited in the herbaria of MSB and STU with Ulrich's preliminary identifications as unnamed *Apiaceae* or under various peucedanoid genera such as *Johrenia* DC., *Johreniopsis* Pimenov or *Rhabdosciadium* Boiss., all including taxa with a junciform habit. The ripe fruits now available allowed a carpological study and the assessment of its relationship. We describe it here as a species new to science within the genus *Peucedanum* L.

Chromosome numbers were obtained from somatic mitoses of root-tips of plants raised from fruits of *Ulrich 3/28d* (see below) by cytological standard techniques following the protocol by Vogt & Oberprieler (1993).

To obtain sections of the lower leaf surface for stomata examination, leaf fragments of herbarium specimens were watered for some 24 h before cutting; the water was subsequently substituted by glycerine.

***Peucedanum isauricum* Parolly & Nordt, sp. nova**

Holotype: Türkei [Turkey], C4 Antalya, NE Demirtaş (Richtung Pass) [towards pass], 840 m, lichter Waldhang, Waldsaum [open forest slope, forest fringe], Exp. W, 7.9.2001, R. Ulrich 1/12 (STU; isotype: B). – Fig. 1-2b, d-f, h.

Affinis *Peucedano graminifolio*, a quo caule tenui, 2-2.5 mm (nec 5 mm) diam., synflorescentia junciformi paniculata (nec umbellis regulariter compositis), umbellis (2-)3-radiatis (nec 5-10 radiatis), radiis glabris (nec spinoso-asperis) et umbellulis 5-8-floris (nec 18-26 floris) differt.

Slender, erect, completely glabrous, one-stemmed perennial, (23-)40-80(-104) cm tall. *Rootstock* relatively weak, 0.5-1 cm in diam., with a short, but dense fibrous collar. *Stems* slender, (1.5-) 2-2.5 mm diam. at base, solid, very finely striolate, greyish green, with inflorescence-bearing branches in upper 2/3, usually somewhat flexuous. *Leaves* mostly basal (in the lower 1/5), distinctly heteromorphic, with the different leaf types gradually merging into one another, all with acute apices. *Radical leaves* rather few (4-5), soon withering and only present in not yet flowering plants, flat, outermost with lamina deltoid to broadly oblong-deltoid in outline, 1.2-3 × 1.2-3.5 cm, triternate, segments (narrowly) obovate, c. 0.7-3 × 0.5-1.7 cm, deeply incised to subpinnatifid, cuneate at base, terminal segment slightly larger than the laterals; petioles pale greyish green, very variable in length, 1.5-14 cm long, canaliculate with involute margins, basal sheath 1-1.5 cm; *subsequent 2 or 3 leaves* with lamina broadly ovate to oblong in outline, 2.5-7 × 2-8 cm, 2-pinnate, primary segments only 2(-3) and remote, broadly lanceolate, 0.7-5.5 × 0.6-2 cm, cuneate at base, ultimate segments lanceolate to linear, apex acute; petioles 2-4.5 cm long, deeply canaliculate with involute margins, basal sheaths 1-5 cm long; *basal and lower cauline leaves* (i.e. those of the first 1-2 nodes) 3-6, withered at fruiting time, lamina ovate to broadly rounded, triangular in outline, 11-17 × 8-18 cm, commonly 1-pinnate with only 2(-3) pairs of grass-like pinnules, very rarely 2-pinnate, ultimate segments 2-5 cm distant, linear to very narrowly lanceolate, c. 4-14 × 0.1-0.3 cm, subsessile with a very narrow cuneate base, ± flat, margin entire, sometimes with 1 or 2 teeth-like subdivisions on either side, all segments on the lower face with a prominent, paler mid-vein and distinct marginal veins, causing a moderate thickening and weak enrolling of the margin, apex long extended to subulate, terminal segment larger than the lateral ones; leaf margins and veins with distinct epidermal denticulation; petioles 7-18 cm long, deeply canaliculate with involute margins, basal sheath 3-8 cm long; *upper cauline leaves* few, upwards increasingly smaller, simpler, more reduced, uppermost usually simple, 0.5-4 cm long, linear or subulate and (sub)sessile, supporting inflorescence branches. *Synflorescence* a junciform panicle bearing compound umbels. *Umbels* commonly obsoletely 3-rayed, towards the ends of branches only 2-rayed, subsessile or on 2-15 mm long, thin, angled peduncles; rays distinctly unequal, one subsessile, longest to 15 mm. *Bracts* 0-1, 4-5 × 1.5-2 mm, pale brown, narrowly lanceolate to subulate, occasionally tapering into a long acumen, somewhat amplexicaule, with broad membranaceous margins. *Flowers* small, rather inconspicuous, c. 2.5 mm in diam., all perfect, pedicellate, (3-)5-6(-8) in each umbellule. *Bracteoles* normally 5, very rarely only 4 or, up to 7 of umbellule with more than 5 flowers, persistent, spreading-erect, pale brown, lanceolate, with a conspicuous membranaceous margin, 1/3 as long as or (sub)equalling the 2-3 mm long, filiform pedicels. *Sepals* obsolete. *Petals* white, obovate with an extended, strongly inflexed, entire, truncate-retuse tip, c. 1.2-0.6 mm, with a yellowish, conspicuous oil-duct. *Stamens* spreading; filaments white, 1.5-1.8 mm long; anthers yellowish, subglobose, 0.6-0.7 × 0.5-0.6 mm, dorsally inserted. *Stylopodium* broadly conical, greenish or pinkish, with large, bulging papillae. *Styles* c. 1 mm long, slender, deflexed. *Fruit* straw-coloured, ovoid, dorsally compressed, flattened. *Mericarps* 4.5-5.5 × 3-3.5 mm, ovoid, with wings only c. 0.5 mm wide, inconspicuously 5 ribbed, oil-ducts prominent, 2 of them commissural, 4 vallicular and 5 in the ribs (the 3 dorsal ones associated with vascular bundles). *Embryo* dicotylar. *Hypocotyl* stout, fleshy. *Cotyledons* of seedlings glabrous, with a lamina c. 10 × 3 mm, linear-oblong or ligulate to narrowly spatulate, apex obtuse, tapering into a c. 7 mm long petiole, which is dilated and sheathing at the base, channelled above.

Chromosome number. – $2n = 22$ (Fig. 3).

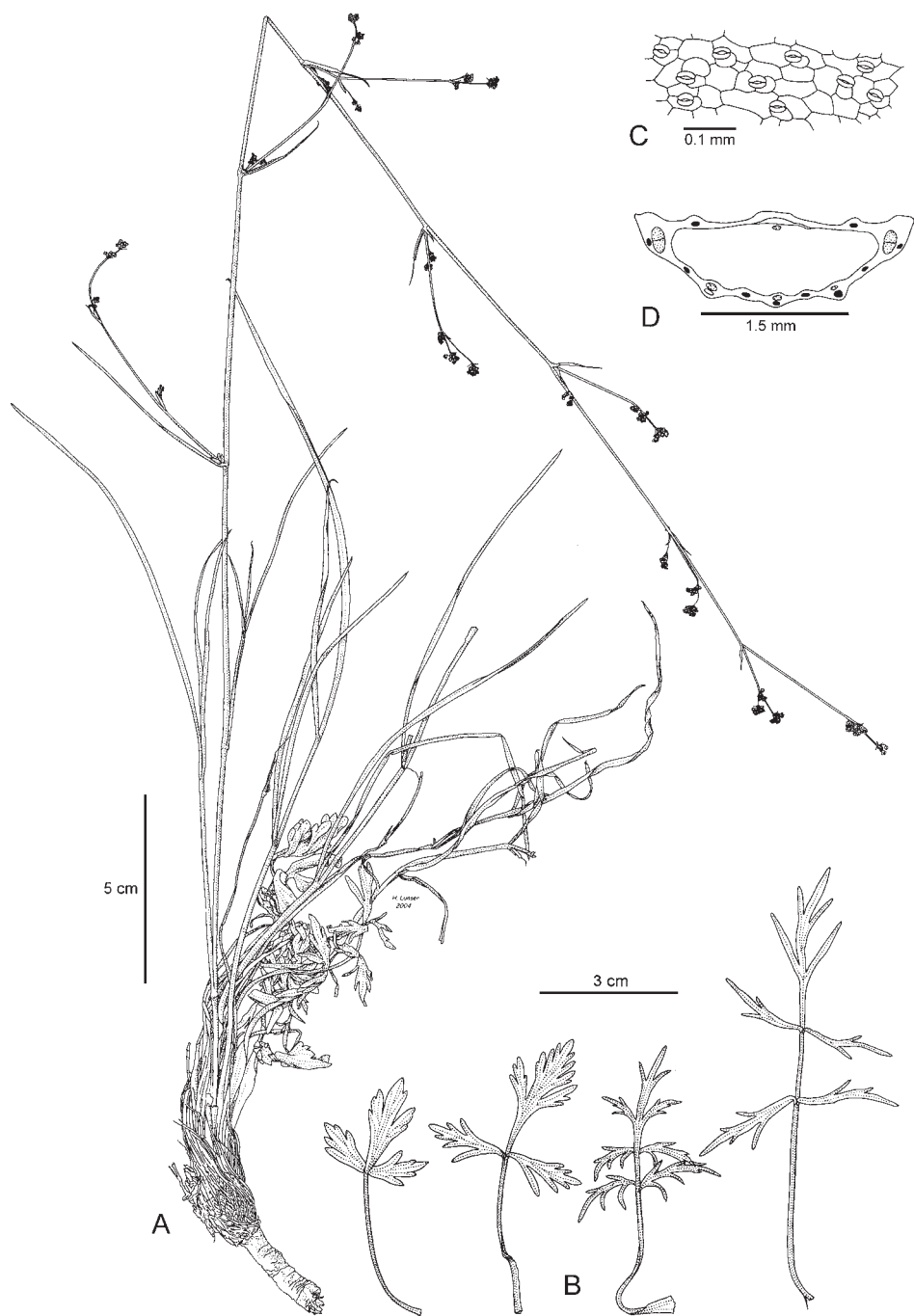


Fig. 1. *Peucedanum isauricum* – A: habit (after the holotype); B: sequence of basal leaves from outer radical to inner basal leaf (after R. Ulrich 3/27, herb. Parolly); C: epidermis with stomata from lower surface of stem-leaf (after R. Ulrich 1/16, STU); D: transverse section of mericarp; dotted: vascular bundles, black: oil ducts (after R. Ulrich 3/27, herb. Parolly).

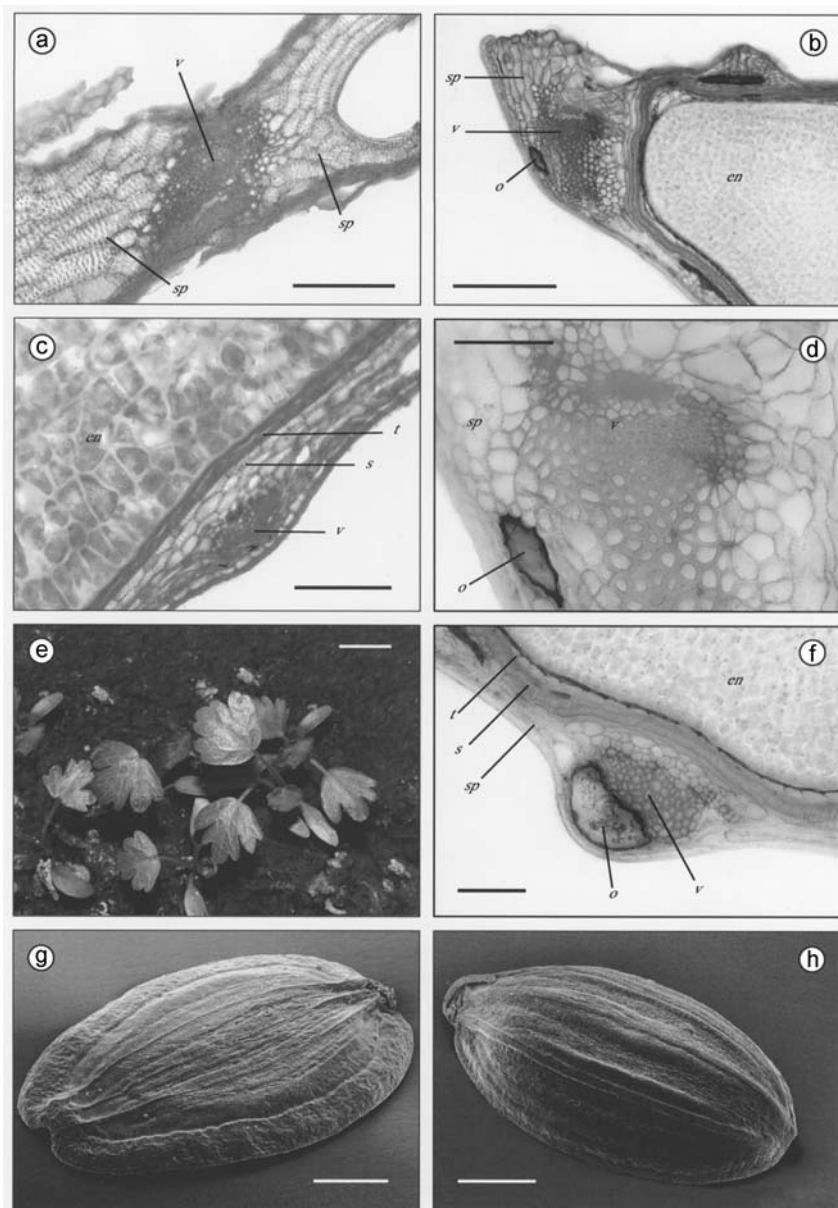


Fig. 2. Comparative morphology and anatomy of *Peucedanum isauricum* (b, d-f, h) and *P. spreitzenhoferi* (a, c, g); a-d, f: transverse sections of mericarps; g-h: SEM photographs – a: base of the wing with prominent vascular bundle (without an attached oil duct) and well developed spongiose tissue both in wing and pericarp; b: overview of the lateral part (narrow wing, distinct oil duct, spongiose tissue in distal portion of the wing); c: dorsal rib with vascular bundle without oil duct, sclerenchyma 2-layered, rudimentarily developed; d: vascular bundle with oil duct (magnified part from b); e: seedlings with cotyledons and primary leaves, c. 5 weeks after germination; f: dorsal rib with vascular bundle and oil duct, sclerenchyma 2-layered, well developed; g + h: mericarp, dorsal view (note the deflexed style). – Abbreviations: en = endosperm, o = oil duct, s = sclerenchyma, sp = spongiose tissue, t = testa, v = vascular bundle; scale bars = 0.1 mm (a, c-d, f), 0.5 mm (b), 1 mm (g-h), 5 mm (e); b, d-f, h after R. Ulrich 3/28d (herb. Parolly); a, c, g after Grizi 452 (B).

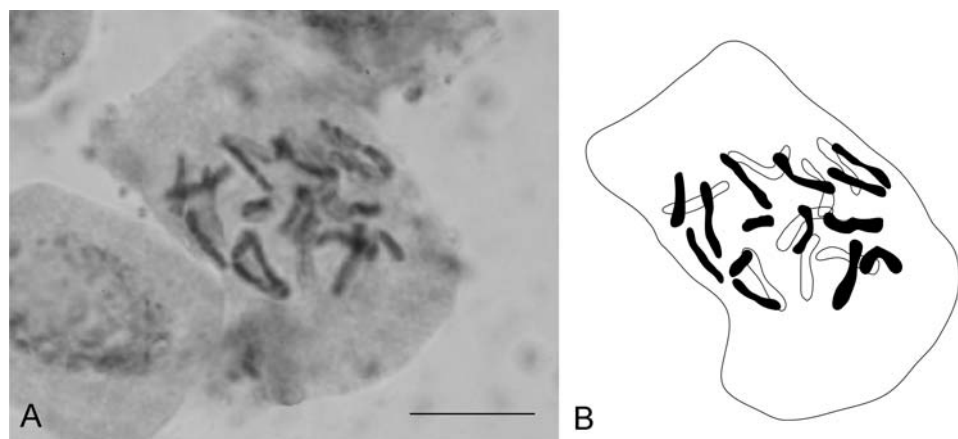


Fig. 3. *Peucedanum isauricum*, metaphases of root-tip mitoses, $2n = 22$ (from Ulrich 3/28d). – Scale bar = 10 μ m.

Etymology. – The epithet refers to Isauria, one of the classical provinces of old Anatolia, encompassing in botanical terms a vast range in the W Central Taurus between the Manavgat Çayı and the Göksu Nehri (Davis 1958, Parolly 1995, 2004).

Phenology. – *Peucedanum isauricum* flowers from about mid-August to late October with a clear peak in September. The first ripe fruits date from early November. In all likelihood, there is no obligatory winter dormancy; mericarps collected in autumn 2003 and sown out at the end of November germinated in the greenhouse within four to eight weeks. Until June, the young plants attained heights of about 15–20 cm.

Distribution. – To our knowledge, *Peucedanum isauricum* is localised in a wide forest range NE Demirtaş in the eastern edge of Antalya vilayet, where it occurs between 450 and 1200 m.

Additional specimens seen. – C4 ANTALYA: NE Demirtaş (Richtung Pass), 950 m, Hanganriss und Waldsaum, Exp. W, 9.10.2000, *R. Ulrich 0/56* (STU); *ibid.*, Waldsaum, Exp. W, 7.9.2001, *R. Ulrich 1/13* (STU); *ibid.*, lichter, bewaldeter Hang, *R. Ulrich 1/14, 1/16* (STU); *ibid.*, *R. Ulrich 1/145* (MSB); *ibid.*, lichter Kiefern-Wald, Exp. NW, 3.7.2003, *R. Ulrich 3/28a* (herb. Parolly), *3/28b* (B); *ibid.*, Exp. N, 12.11.2003, *R. Ulrich 3/28d* (herb. Parolly [mericarps only]); *ibid.*, 840 m, Waldsaum, Exp. W, 24.10.2001, *R. Ulrich 1/62* (STU); *ibid.*, *R. Ulrich 1/143* (MSB); 850 m, Waldsaum, Exp. W, 23.10.2002, *R. Ulrich 2/69* (herb. Parolly); *ibid.*, *R. Ulrich 2/69a* (B); *ibid.*, *R. Ulrich 2/69b* (B, herb. Parolly [mericarps only]); etwa 20 km NE Demirtaş, 520 m, lichte Stellen im Pinuswald, Exp. NW, 27.10.2001, *R. Ulrich 1/129* (STU); *ibid.*, *R. Ulrich 1/144* (MSB); NE Demirtaş (Richtung Başköy), 450 m, Feuerschneise, Exp. E, 23.10.2002, *R. Ulrich 2/70* (herb. Parolly); *ibid.*, 460 m, Waldrand (*Pinus brutia*), Exp. N, 29.6.2003, *R. Ulrich 3/27a-c* (B, herb. Parolly).

Site conditions. – Confined to the *Pinus brutia* Ten. ecosystem on rocky limestone slopes, *Peucedanum isauricum* was recorded along its altitudinal range in various exposures (E, N, W) and with changing associates. At its lowest sites (450–520 m) it grows along forest margins and in fire breaks, gaps and clearings, but also among the dense young-growth forest together with the locally often lacking *Bupleurum subuniflorum* Boiss. & Heldr., *Carlina involucrata* subsp. *libanotica* (Boiss.) Meusel & Kästner, *Centaurea babylonica* (L.) L., *Eryngium creticum* Lam., *E. falcatum* Delar., *E. glomeratum* Lam., *Helichrysum pamphylicum* P. H. Davis & Kupicha and *Sideritis congesta* P. H. Davis & Hub.-Mor.

Higher up, at 840–860 m, it grows both outside and under a more or less closed canopy, associated with *Bupleurum subuniflorum*, *Cephalaria isaurica* Matthews, *Digitalis davisiana* Heywood, *Ferulago isaurica* Peşmen and *Origanum saccatum* P. H. Davis. It reaches its optimum in

a dense old-growth pine forest with a thick needle litter at c. 950 m. In spite of hundreds of individuals covering the forest floor as the prevailing species, one needs a trained eye to discover them due to the grass-like appearance. Besides the latter four, the following rare species have been noted: *Eryngium falcatum*, *Hypericum montbretii* Spach, *Phlomis leucophracta* P. H. Davis & Hub.-Mor. and *Syrax officinalis* L. Above 1000 m, *Peucedanum isauricum* becomes less frequent; scattered plants compose together with *Phlomis samia* L. a monotonous understorey in the forest up to elevations of about 1170 m.

Recommended IUCN threat category. – At an elevation of some 850 m, R. Ulrich stopped counting after the first 1000 individuals at one very place. His observations over the years reveal a flourishing population with copious fruit setting. However, its narrow distribution range constitutes an enhanced risk of threat, suggesting the classification of *Peucedanum isauricum* as “Vulnerable (VU)” according to criterion D of the IUCN Red List Categories (2001).

Relationship. – Judging from our fruit anatomical studies, the striking similarities in leaf shape with the yellow-flowered *Leutea* Pimenov (also partly similar in junciform habit and inflorescence structure; Pimenov 1987c) and in junciform-polygonoid habit with some *Johrenia*, *Johreniopsis* and *Rhabdosciadium* (see Hedge & Lamond 1987) are superficial. Its characters place *P. isauricum*, in agreement with, e.g., Frey (1989) and Thellung (1926), in *Peucedanum* sect. *Palimbioidea* Boiss.

The taxonomy of *Peucedanum* sensu amplissimo is still in full motion and in dispute. Today, *Peucedanum* s.l. is widely considered as a conglomerate of fairly distantly related elements. In spite of the exclusion of the North American taxa now placed in *Lomatium* Raf. and allied genera, *Peucedanum* s.l. still includes some 100-120 species (Pimenov & Leonov 1993). Recent studies suggest on the one hand that similarity between taxa is frequently the result of homoplasy and support the splitting into smaller, more natural units (Downie & al. 2000, Frey 1989, Hadaček 1989, Pimenov 1987a-c, Pimenov & Leonov 1993, Pimenov & al. 2003, Reduron & al. 1997, Shneyer & al. 2003, Spalik & al. 2004). *Holandrea* Reduron & al., the most recent segregate, narrowing down *P. sect. Palimbioidea*, e.g., is only distantly related to the peucedanoid clade with members of *Peucedanum* and segregates such as *Cervaria* N. M. Wolf, *Imperatoria* L., *Oreoselinum* Hill, *Pteroselinum* (Rchb.) Rchb., *Thysselinum* Hill, *Tommasinia* Bertol. and *Xanthoselinum* Schur. On the other hand, there is also ample evidence that the “true *Peucedanum* species”, i.e. those 8-10 species that should belong to *P. sect. Peucedanum* (Pimenov & Leonov 1993) are in fact not really that distant from other *Peucedanum* species (Downie & al. 2000, Shneyer & al. 2003).

We large follow here, also in carpological respects, Pimenov (1987a-c) and Pimenov & Leonov (1993). Discussion of the relationships of *P. isauricum* must in this situation be preliminary. Two species from NW Turkey and the Levant, respectively, viz. *P. graminifolium* Boiss. and *P. spreitzenhoferi* Dingler, appear even in a greatly widened geographical frame the best candidates for comparison and putative relationships.

Peucedanum isauricum has a somatic chromosome number of $2n = 22$ (Fig. 3). In *Peucedanum*, chromosome numbers of $2n = 66$ seem largely confined to the core group of *P. sect. Peucedanum* (Frey 1989, Pimenov & al. 2003). Chromosome numbers, however, can add nothing to our understanding of the systematics of *Peucedanum*; all segregated genera have $2n = 22$ as also some of the true *Peucedanum* species (Pimenov & al. 2003).

In the “Flora of Turkey” (Chamberlain 1972) *Peucedanum isauricum* clearly keys out in the first lead to the NW Anatolian *P. graminifolium* Boiss. (for iconography and map see Frey 1989 and Vural & Adıgüzel 1996). We follow Frey (1989) in the sectional classification of *P. graminifolium* (Chamberlain, in contrast, places it in the tradition of Boissier (1872) in *P. sect. Peucedanum*). The resemblance between the two species is chiefly due to the similarly glaucous, grass-like leaves (heterophylly is not yet reported in *P. graminifolium*) with a papillose-denticulate epidermis along the margins and on the veins, the flower morphology (e.g., sepals obsolete), and the very unequal rays. However, both are remarkably distinct especially in synflorescence morphology and some carpological characters (see below).

Chamberlain (1972) has apparently not seen the second of the two records of *P. graminifolium* then known, viz. *Bornmüller 2210* (B), which deviates considerably in several features. Considering both specimens, as well as the excellent descriptions by Frey (1989) and Vural & Adıgüzel (1996), *P. graminifolium* can readily be told apart by its striate and much thicker stems (5 mm) and its synflorescence composed of typically arranged compound umbels with a higher number (5-10) of adaxially spiny-pubescent (versus glabrous) rays and up to (5-)7-10 scarious-margined, lanceolate, in young flower extremely long (8-14(-20) mm) bracteoles, later deflexed. *P. graminifolium* has 18-26 flowers per umbel, and, as in *Bornmüller 2210*, one broadly scarious-margined bract of 50×3 mm and partly 2-pinnate leaves with narrowly lanceolate segments up to 11.5 mm long.

Peucedanum isauricum may have its only other ally in *P. spreitzenhoferi* from Palestine, Syria, Transjordan and Lebanon, which may also occur in the Hatay province in Turkey, from where Chamberlain (1972) cites a record of questionable identity under the synonymous illegitimate name *P. junceum* (Boiss.) Mout. (a later homonym of *P. junceum* Schult., see Zohary 1972). *P. isauricum* and *P. spreitzenhoferi* share, unique in the Near Eastern *Peucedanum* species, the junciform habit, furthermore the morphology of the stem, the bracteoles, the occasionally occurring single bract and the shape of the fruit. These characters (and the spongiose-margined mericarps) led Boissier (1872) to classify the latter, albeit with reservations, originally as *Johrenia juncea*. On the other side, there are many characters distinguishing *P. isauricum* from *P. spreitzenhoferi*, relegating both taxa into rather isolated positions. *P. spreitzenhoferi* (for iconography see Mouterde 1970 and Zohary 1972) differs by its taller size (1-2(-3) m) and stouter stems, the shape and division of the leaves, which are 20-30 long, ovate-oblong in outline, 2-3-pinnatisect into long-petiolate, oblong-lanceolate divisions, with ultimate segments pinnatifid or pinnatisect into oblong, mucronate, serrate or incised lobes, and umbels often with more (3-8) and longer (1.5-5 cm) peduncled rays (vigorous plants may produce some more regularly compound umbels). In addition, the mericarps have relatively broader (c. 0.6 mm), in fully ripe state spongiose wings, again reminiscent of *Johrenia*. The fruit anatomy of the two species deviates considerably, since in *P. isauricum* the mericarps bear additional resin canals in the ribs above the vascular bundles (Fig. 1, 2). This character state (and a varying number of vallecular resin canals) is unevenly distributed in *Peucedanum* s.l., and found, e.g., in *Holandrea schottii* (DC.) Reduron & al., *Oreoselinum nigrum* Delarbre (resin canal below vascular bundles), *Pteroselinum austriacum* (Jacq.) Rechb. and *Xanthoselinum alsaticum* (L.) Schur (Arenas & García 1993, Hadaček 1989, Thellung 1926), being thus without taxonomic value for generic or subgeneric classification.

Comparative fruit morphology and anatomy. – The comparison concentrates on *Peucedanum isauricum* and *P. spreitzenhoferi*, since no ripe fruits of *P. graminifolium* were available (see also Chamberlain 1972, Frey 1989). However, some carpological data (brief description of cross morphology, including transverse section) of this species are provided by Vural & Adıgüzel (1996). For carpological gross anatomy of *P. isauricum* see the description above, for transverse section Fig. 1D. The testa is \pm completely obliterating except for the tissue surrounding the funicular bundle. Sometimes an outer one-celled layer of parenchyma can be observed. The embryo is embedded in a well developed endosperm containing protein bodies as reserve material. The pericarp consists of a thin inner (1-)2-layered sclerenchyma (short, densely pitted, tangentially arranged fibres or tracheid-like cells), followed by a moderately to conspicuously parenchymatic tissue of spongy consistence, in which the vascular bundles and oil ducts are situated. The spongiose cells are well developed, especially in the wings (Fig. 2). Already Thellung (1926: 1365) mentioned the tangentially arranged sclerenchyma fibres as “dickwandige, getüpfelte Querfaserzellen” among the carpological features of *Peucedanum* s.l. We found such structures neither in *Leutea* nor in *Johreniopsis*. The mericarps of *P. spreitzenhoferi* bear more prominent, relatively broader (ratio width of mericarp / width of wing), c. 0.6 mm wide and distinctly spongiose wings (Fig. 2). The oil ducts are restricted to the four dorsal valleculae. The wall thickenings of the one-celled fibre sheath are very weakly developed.

The mericarps of *Peucedanum graminifolium* are with 5-6.5 × 3.5-4.5 mm in average somewhat larger than those of *P. isauricum* and more prominently and wider winged (c. 1 mm). They are described as “valleculae 1-vittate, dorsal vittae 4, commissural vittae 2” (Vural & Adıgüzel 1996). As in *P. spreitzenhoferi*, these oil ducts are not associated to the vascular bundles.

Phytodermal characters. – In our search for potential allies of *Peucedanum isauricum* and for clarifying its sectional classification, a study of phytodermal characters such as the epidermal structure of the leaf cells (Frey 1989) and stomatal features (Guyot 1984) was included. We experienced, however, that they are, with minor exceptions, useful at the species level but less helpful to irrelevant at higher taxonomic levels. *P. isauricum* belongs with *P. graminifolium* to a group of species with densely arranged, clearly projecting papillae on the epidermis of the leaf margin and the veins. Already under the low magnification of a hand-lens this appears as a strong denticulation, at the margins in double rows in our species and ± 125 µm high. Even more prominently this denticulation is found in the species around the former *P. schottii* and *P. carvifolia*, now making up the core of the genus *Holandrea*, but also, e.g., in *Imperatoria ostruthium* L. In contrast, *P. spreitzenhoferi* exhibits a moderate denticulation, such as in *Pteroselinum austriacum* and *Xanthoselinum alsaticum*. The latter two species may occasionally be very weakly denticulate; moreover, transitions in the degree of denticulation occur. For other examples see Frey (1989) and Guyot (1984). Not surprisingly, in *P. isauricum* the anomocytic and anisocytic types of stomatal arrangement predominate (Fig. 1C), since these are common types in *Peucedanum* s.l. (Guyot 1984, Metcalfe & Chalk 1979). As far as observed in our limited material, diacytic types, are, if ever present, exceptionally rare. This is shared by, e.g., *Holandrea* spp., *Pteroselinum austriacum* and *Cervaria rivini* Gaertn. (Guyot 1984).

Peucedanum s.l. in Turkey. – Frey (1989), in his morphological monograph of *Peucedanum* sect. *Peucedanum* and *P.* sect. *Palimbiodea*, gives E Mediterranean territories, namely N Greece, as diversity centre, and this apparently holds to a certain extent also for *Peucedanum* s.l. and Turkey. In order to assess its diversity and composition in Turkey, we compiled a taxonomically and nomenclaturally up-dated inventory of the taxa referred to as *Peucedanum* by Chamberlain (1972). For eight of the 14 Turkish species given (*P. arenarium* Waldst. & Kit. comprises two subspecies)

Table 1. Alternative generic placements and recent combinations of some *Peucedanum* taxa in the Turkish flora. – References: 1: after Pimenov (1987b), Pimenov & al. (2003), Shneyer & al. (2003); 2: after Reduron & al. (1997); 3: after Spalik & al. (2004); 4, 5: after Pimenov & Leonov (2004), 6: after Pimenov (1987c); 7: Pimenov (1992); 8: Frey (1989).

| No. | Accepted name | “Flora of Turkey” name (Chamberlain 1972) |
|-----|--|---|
| 1 | <i>Cervaria aegopodioides</i> (Boiss.) Pimenov | ≡ <i>Peucedanum aegopodioides</i> (Boiss.) Vandas |
| 2 | <i>Holandrea carvifolia</i> (Villars) Reduron & al. | ≡ <i>Peucedanum carvifolium</i> Villars ¹ |
| 3 | <i>Holandrea caucasica</i> (M. Bieb.) Spalik & al. | ≡ <i>Peucedanum causicum</i> (M. Bieb.) C. Koch |
| 4 | <i>Johreniopsis carvifolia</i> (Boiss.) Pimenov | = <i>Peucedanum palimbioides</i> Boiss. ² |
| 5 | <i>Johreniopsis chrysea</i> (Boiss.) | ≡ <i>Peucedanum chryseum</i> (Boiss.) D. F. Chamb. |
| 6 | <i>Johreniopsis seseloides</i> (C. A. Mey.) Pimenov ³ | = <i>Peucedanum meyeri</i> (Boiss.) Boiss. ³ |
| 7 | <i>Ormosolenia alpina</i> (Schult.) Pimenov | ≡ <i>Peucedanum alpinum</i> (Schult.) B. L. Burtt & P. H. Davis |
| 8 | <i>Peucedanum officinale</i> subsp. <i>longifolium</i> (Waldst. & Kit.) R. Frey | ≡ <i>Peucedanum longifolium</i> Waldst. & Kit. |

¹ Pimenov & Leonov (2004) removed *Peucedanum alpigenum* Boiss. from the synonymy of *P. carvifolium* and treated it as Anatolian endemic. However, M. Pimenov and J.-P. Reduron, who checked the type in G, found it so imperfect that they could not assign it to *Holandrea*; clarifying additional gatherings are needed (Pimenov, pers. comm.). – ² If placed in *Peucedanum*, *P. fallax* Freyn & Sint. has priority. – ³ Controversially, Frey (1989) merges both under *P. paucifolium* Ledeb., see also Šiškin (1951).

alternative generic placements with recent support are provided and listed along with some nomenclatural changes in Table 1.

For recent sectional classifications of some other “true” Anatolian *Peucedanum* species see Frey (1989); *P. sect. Peucedanum: P. officinale* subsp. *longifolium* (Waldst. & Kit.) R. Frey), *P. ruthenicum* (M. Bieb.) Rochel; *P. sect. Palimbioidea: P. graminifolium*) and Downie & al. (2000; *P. sect. Pseudoselinum* C. Koch: *P. zedelmeyerianum* Manden).

Five of the 16 Anatolian taxa of *Peucedanum* sensu amplissimo are endemics, including *Johre-niopsis chrysea*, *J. carvifolia*, *P. alpigenum*, *P. arenarium* subsp. *urbanii* (Frey & Sint. ex Wolff) D. F. Chamb. and *P. graminifolium* (Chamberlain 1972, Pimenov & Leonov 2004; Table 1). Adding *P. isauricum*, confirms the importance of Anatolia as speciation centre for *Peucedanum* s.l. Compared to *P. sect. Peucedanum*, *P. sect. Palimbioidea* shows a lower phenotypic variability and narrower ecological preferences, which may perhaps indicate a younger age of this section (Frey 1989). Despite its isolated position, *P. isauricum* may thus be a neo-endemic.

Specimens of related Peucedanum species seen. – *P. graminifolium*: TURKEY: A5 SAMSUN: Ak Dağ near Ladik, 1890, Bornmüller 2210 (B).

P. spreitzenhoferi: ISRAEL: Jerusalem, 800 m, waste places, 1.6.1911, F. S. Meyers & J. E. Dinsmore 6289 (B); *ibid.*, in agris, 16.9.1909, J. E. Dinsmore 4289 (B); *ibid.*, neglected places, terra-rossa, 12.10.1951, A. Grizi (B).

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References

- Arenas, J. A. & F. M. García 1993: Atlas carpológico y corológico de la subfamilia *Apioideae* Drude (*Umbelliferae*) en España peninsular y Baleares. – *Ruizia* **12**: 1-245.
- Boissier, E. 1972: *Flora orientalis* **2**. – Genevae & Basileae.
- Chamberlain, D. F. 1972: *Peucedanum* L. – Pp. 473-481 in: Davis, P. H. (ed.), *Flora of Turkey and the East Aegean Islands* **4**. – Edinburgh.
- Downie, S. R., Watson, M. F., Spalik, K. & Katz-Downie, D. S. 2000: Molecular systematics of Old World *Apioideae* (*Apiaceae*): relationships among some members of tribe *Peucedaneae* sensu lato, the placement of several island-endemic species, and resolution with the apoid superclade. – *Canad. J. Bot.* **78**: 506-528. [[CrossRef](#)]
- Frey, R. 1989: Taxonomische Revision der Gattung *Peucedanum*: Sektion *Peucedanum* und Sektion *Palimbioidea* (*Umbelliferae*). – *Candollea* **44**: 257-327.
- Guyot, M. 1984: Les types stomatiques dans les espèces françaises du genre *Peucedanum* (*Ombellifères*). – *Revue Biol. Cytol. Vég. Bot.* **7**: 17-30.
- Hadaček, F. 1989: Vergleichende phytochemische Untersuchungen in der Gattung *Peucedanum* (*Apiaceae* - *Apioideae*). – *Stapfia* **18**: 1-186.
- Hedge, I. C. & Lamond, J. M. 1987: *Umbelliferae*. A synoptic guide to characters and genera. – Pp. 445-450 in: Rechinger, K. H. (ed.), *Flora iranica* **162**. – Graz.
- IUCN 2001: IUCN Red List Categories: Version 3.1. Prepared by the IUCN Species Survival Commission. – Gland & Cambridge.

- Metcalf, C. R. & Chalk, L. 1979: Anatomy of the dicotyledons, ed. 2, **2**. – Oxford.
- Mouterde, P. 1970: Nouvelle flore du Liban et de la Syrie **2**. – Beyrouth.
- Parolly, G. 1995: Die Steinschuttfloren (Heldreichietea) des Westlichen und Mittleren Taurus (Türkei). Pflanzensoziologische, floristische und ökologische Untersuchungen. – Diss. Bot. **247**.
- 2004: The high mountain vegetation of Turkey – a state of the art report, including a first annotated conspectus of the major syntaxa. – Turk. J. Bot. **28**: 39-63.
- Pimenov, M. G. 1987a: *Leutea*. – Pp. 445-450 in: Rechinger, K. H. (ed.), Flora iranica **162**. – Graz.
- 1987b: *Cervaria*. – Pp. 451-454 in: Rechinger, K. H. (ed.), Flora iranica **162**. – Graz.
- 1987c: *Johreniopsis*. – Pp. 454-457 in: Rechinger, K. H. (ed.), Flora iranica **162**. – Graz.
- 1992: *Ormosolenia* restored. – Edinburgh J. Bot. **49**: 219-223.
- & Leonov, M. V. 1993: The genera of the *Umbelliferae*, a nomenclator. – Kew.
- & — 2004: The Asian *Umbelliferae* Biodiversity Database (ASIUM) with particular reference to South-West Asian taxa. – Turk. J. Bot. **28**: 139-145.
- , Vasil'eva, M. G., Leonov, M. V. & Daushevich, J. V. 2003: Karyotaxonomical analysis in the *Umbelliferae*. – Enfield.
- Rechinger, K. H. 1987: *Peucedanum* L. sensu lato. – Pp. 442-445 in: Rechinger, K. H. (ed.), Flora iranica **162**. – Graz.
- Reduron, J.-P., Charpin, A. & Pimenov, M. G. 1997: Contribution à la nomenclature générique des *Apiaceae* (Ombellifères). – J. Bot. Soc. France **1**: 91-104.
- Šiškin, B. K. 1951: *Peucedanum* L. – Pp. 168-203 in: Šiškin, B. K. & Bobrov, E. (ed.), Flora SSSR **17**. – Moskva & Leningrad.
- Shneyer, V. S., Kutavina, N. G. & Pimenov, M. G. 2003: Systematic relationships within and between *Peucedanum* and *Angelica* (*Umbelliferae*–*Peucedaneae*) inferred from immunological studies of seed proteins. – Pl. Syst. Evol. **236**: 175-194. [[CrossRef](#)]
- Spalik, K., Reduron, J.-P. & Downie, S. R. 2004: The phylogenetic position of *Peucedanum* sensu lato and allied genera and their placement in tribe *Selineae* (*Apiaceae*, subfamily *Apioideae*). – Pl. Syst. Evol. **243**: 189-210. [[CrossRef](#)]
- Thellung, A. 1926: *Umbelliferae* (Morison) B. Juss. – Pp. 926-1537 in: Hegi, G. (ed.), Flora von Mitteleuropa **5,2**. – München.
- Vogt, R. & Oberprieler, C. 1993: Chromosome numbers of North African phanerogams I. – Fl. Medit. **3**: 187-210.
- Vural, M. & Adıgüzel, N. 1996: Türkiye florasıyla ilgili notlar 1 = *Peucedanum graminifolium* ve *Olymposciadium caespitosum* (*Apiaceae/Umbelliferae*). – Ot Sist. Bot. Derg. **3**: 59-64.
- Zohary, M. 1972: Flora Palaestina **2**. – Jerusalem.

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