

## A REVISION OF THE GENUS *RHYNCHOCORYS*

R. B. BURBIDGE & I. B. K. RICHARDSON\*

**ABSTRACT.** The genus *Rhynchocorys* (Scrophulariaceae) is revised. One new species, *R. odontophylla*, and two new subspecies of *R. elephas* are described.

### INTRODUCTION

Except for restricted accounts in national or regional floras, the genus *Rhynchocorys* has been neglected since Bentham's monograph of the Scrophulariaceae in De Candolle's *Prodromus* 10: 558-559 (1846). This is surprising as all the species are 'showy' in the field with conspicuous golden flowers, and one species, *R. maxima*, is spectacular. Neither can this neglect be attributed to great taxonomic difficulty because while the specific differences are seldom immediately obvious, the genus falls into fairly clearly defined species and subspecies.

The account by Bentham, mentioned above, though admirable in the light of the limited available material, leads to much confusion if applied to the more extensive collections of the latter half of the nineteenth and of the present century.

Boissier's *Flora Orientalis* (Vol. 4) covers the extra-European distribution of *Rhynchocorys*, and recognises two species, relegating a third to varietal rank.

No accounts suggest generic subdivision and though *R. orientalis* differs considerably in floral structure from the other species, the small size of the genus renders the recognition of any taxon between species and genus unnecessary for practical purposes.

### GEOGRAPHICAL DISTRIBUTION

The greatest concentration of species is in the Caucasus, east and north Turkey, northern Iraq and north-west Iran (see fig. 3). A single species is present in Europe, extending west to Sicily and occurring in Italy, Greece and Bulgaria. *Rhynchocorys* typically occurs in upland meadows from about 800 m to the limit of the permanent snowline but sometimes occurs down to sea-level, particularly along the southern coast of the Caspian sea. Where data is available the majority of records come from wet alpine meadows.

### ASSESSMENT OF MORPHOLOGICAL CHARACTERS

1. **LIFE FORM.** All the species are herbaceous annuals or perennials. Annuals can usually be recognised in herbarium material by the presence of a complete root system. This method of identification is not infallible as perennials in their first year may behave similarly, but generally the presence of a loose mat of fibrous root correlates with the annual habit.

Though no field data is available, it seems very likely that *Rhynchocorys* is obligately semi-parasitic, as is the related genus *Rhinanthus* L.

\* Flora Europaea Secretariat, Reading University.

2. ROOT. The value of this character in specific delimitation is negligible, except in distinguishing between annual and perennial species as described above. In the perennial species, the root is surmounted by a short rhizome bearing a series of membranous or fleshy scales. Some of these were removed, cleared by warming in 5% potassium hydroxide followed by immersion in concentrated chloral hydrate. Microscopic examination revealed that these scales were reduced leaves. These were also found in *Pedicularis olympica* Boiss. from Turkey, and are presumed to be similar to the scale-leaves found throughout the Orobanchaceae.

3. STEM. In *R. kurdica* and *R. odontophylla* the stout stem is up to 1 m and may be much branched. The other species are much smaller, between 15 and 40 cm in height, and are more sporadically branched. *R. stricta* C. Koch, an annual and the smallest species, usually aptly fits its name, having a single, erect, unbranched stem.

4. LEAVES. (See fig. 1.) The leaves are all cauline and opposite in *Rhynchocorys*, except in *R. kurdica* which has the lower stem leaves scattered or alternate. Radical leaves are either absent or represented by scales as discussed above. Petioles are very short or almost absent. The leaves grade into the bracts, to which they are similar, in the lower part of the inflorescence.

Presence or absence of leaf indumentum and its density, rather than type, are important in specific delimitation, and are described under the species concerned.

5. INFLORESCENCE. Flowers may be subsessile or pedicellate, and the length of the pedicel and calyx can be a useful character at specific level. The flowers arise in opposite decussate pairs subtended by leafy bracts and are grouped into rather lax terminal racemes which become more congested towards the top of the stem. The racemes are frequently grouped into panicles.

6. FLOWER. (See fig. 2.) The floral structure of *Rhynchocorys* is complex and has the greatest affinities with *Pedicularis*, particularly *P. groenlandica* Retz. The calyx is laterally compressed, with a retuse upper lip and a longer bilabiate lower lip. Calyx dimensions are variable but have not provided reliable specific characters. The corolla basically consists of a tube with two distal lips, the upper of which is compressed into a galea (or hood) enclosing the anthers and style. This galea is prolonged into a beak which is straight and equals or slightly exceeds the length of the tube in all species except *R. orientalis*. In this species the galea is prolonged into a downcurving beak 3-4 times the length of the tube, and ends in a small lip. The lower corolla lip is spreading and divided into 3 more or less equal lobes, except in *R. orientalis* where the central one is much reduced. In one species, *R. maxima* C. Richter, the lower corolla lobe is extremely large, exceeding 2 cm in width.

Nothing is known about the pollination of *Rhynchocorys* species but it can be inferred from the similarity in floral structure to *Pedicularis groenlandica* that pollen-foraging bumblebees (*Bombus* spp.) may be involved (see Macior, L. W., 1968. Pollination adaption in *Pedicularis groenlandica*. Amer. J. Bot. 55, 8: 927-932).

The stamens and ovary are typical of the related genera *Rhinanthus*, *Pedicularis* and *Melampyrum* and have provided no specific characters except for the glabrous ovary in *R. elephas* subsp. *boissieri*.

7. SEEDS. When present in herbarium material, an examination of the number of seeds in the capsule and their sculpturing can provide useful data to support identification.

#### RELATED GENERA

*Rhynchocorys* belongs to the tribe Rhinanthae of the subfamily Rhinanthoideae of the Scrophulariaceae. It differs from the genera *Cymbaria* L. and *Bungea* C. A. Meyer in lacking the two bracteoles which subtend the calyx. It is distinguished by the possession of a bilabiate calyx from *Rhinanthus* and *Pedicularis* which have 4-dentate and 2-5-dentate calyces respectively. The beaked galea of *Rhynchocorys* and the compressed unwinged seeds also distinguish it from *Rhinanthus* which has an obtuse galea and winged seeds.

*Rhynchocorys* is probably most closely related to *Pedicularis*, a large and variable genus, but the possibility of convergence due to similar pollinators should not be overlooked.

#### SYSTEMATIC ENUMERATION

In the following account only a selection of the specimens seen are cited in the text under some species. Those marked on the maps are not necessarily the same specimens, as in this case the intention was to show the extent of the distribution of the species concerned. The grid system used in the citation of Turkish specimens is that used in P. H. Davis's *Flora of Turkey* (see the introduction in vol. 1 of this work). All specimens cited or mapped have been seen.

#### RHYNCHOCORYS Griseb.

Spic. Fl. Rumel. et Bith. 2: 12 (1844) (nomen conservandum).

Syn.: *Rhinanthus* L., Sp. Pl. 603 (1753) pro min. parte

*Elephas* Adans., Fam. 2: 211 (1763).

*Elephantina* Bertol., Fl. Ital. 6: 279 (1844).

Annual or perennial glandular-pubescent to glabrous semiparasitic herbs. *Roots* fibrous, often surmounted by short rhizomes bearing scale leaves. *Stems* erect or ascending. *Leaves* all cauline, opposite, rarely alternate lower on stem, lanceolate, ovate, obovate or elliptical, entire to crenate or serrate. *Inflorescence* a lax panicle of racemose pedicellate or subsessile flowers, each subtended by a foliaceous bract. *Calyx* bilabiate, laterally compressed; upper lip retuse; lower lip bifid, exceeding the upper. *Flowers* yellow with 2 brown or red spots on lower lip. *Corolla tube* cylindrical, inflated distally, 2-lipped; upper lip laterally compressed forming a galea enclosing the anthers and style and prolonged into a straight or down-curved beak; lower lip pendulous, trilobed, patent. *Filaments* 4, attached

near base of tube, glabrous. *Anthers* transverse or oblique, equal. *Ovary* bilocular, orbicular, often pubescent. *Style* reaching to apex of beak, obscurely capitate. *Capsule* suborbicular, loculicidal. *Seeds* compressed, 5-70 per capsule; testa thick, irregularly striate or rugose.

## KEY TO THE SPECIES OF RHYNCOCORYS

- 1a. Beak of galea strongly curved downwards; apex expanded into a small lip . . . . . 1. *orientalis*
- 1b. Beak of galea straight or ascending; apex truncate-emarginate, not expanded . . . . . 2
- 2a. Leaves on lower part of stem alternate; leaves and bracts lanceolate to oblong; leaf margins entire or subserrate; style pilose . . . . . 3
- 2b. Leaves all opposite; leaves and bracts oblong to ovate to obovate; leaf margin crenate; style glabrous . . . . . 4
- 3a. Leaf margin entire; leaves and bracts lanceolate; lower lip of corolla exceeding 1 cm in width . . . . . 2. *kurdica*
- 3b. Leaf margin serrate; leaves and bracts oblong; lower lip of corolla less than 1 cm in width . . . . . 3. *odontophylla*
- 4a. Plant annual . . . . . 4. *stricta*
- 4b. Plant perennial . . . . . 5
- 5a. Lower lip of corolla more than 2 cm in width; pedicels mostly more than 1 cm long . . . . . 5. *maxima*
- 5b. Lower lip of corolla less than 2 cm in width; pedicels less than 1 cm long . . . . . 6. *elephas*

1. *R. orientalis* (L.) Benth in DC., Prodr. 10: 559 (1846). Fig. 1a, 2a, 3. Syn.: *Rhinanthus orientalis* L., Sp. Pl. 603 (1753).

*Elephas incurva* G. Don, Syst. 4: 619 (1838).

*Elephantina orientalis* Bertol., Fl. Ital. 6: 281 (1844).

Ic.: Reichenbach, Ic. Pl. Crit. 8: tab. 730 (1830).

Ascending pilose annual. *Stem* 20-40 cm high, usually branched. *Leaves* 3-5 cm long, ovate to narrowly ovate, bluntly serrate, sparsely pilose. *Inflorescence* a sparsely branched raceme with 4-6 pairs of flowers; bracts narrowly ovate. *Pedicels* 0.8-1.5(-2.0) cm long. *Calyx* 0.5-0.9 cm long. *Corolla tube* 5-8 mm long with two, 4 mm broad, pendulous lobes. *Beak of galea* 1.0-1.8 cm long, sharply curved downwards, apex expanded into a rotund lip 2 mm in diameter. *Lower lip* 1.2-1.8 cm, lateral lobes broader than median lobe which possesses a small central tooth into which the main nerve runs. *Seeds* 2 mm long, about 10 per capsule, longitudinally striate. *Fl.* 5-8. *Damp subalpine pastures*, 1200-2000 m.

TYPE. Described from the Orient.

TURKEY. Ag Kars: W shore of Lake Çildir, 1980 m, *J. M. Watson* 352. CAUCASIA. Prov. Kuban, vallis flum. Teberda, 1280 m, *E. Busch* 296. Ossetia, near Alagir, *Markowicz* 27 vi 1898 & 27 vi 1901. Ardon gorge, 1520 m, *Giuseppi* 48. Azerbaijan: Prov. Baku, Kuba, *Doluchanov & Tzaturon*, 5 vi 1903.

Among the sheets examined were two collected by Szovits from 'Persia', according to the labels. As there is considerable doubt about the locations of Szovits' collections, these records are excluded from this account.

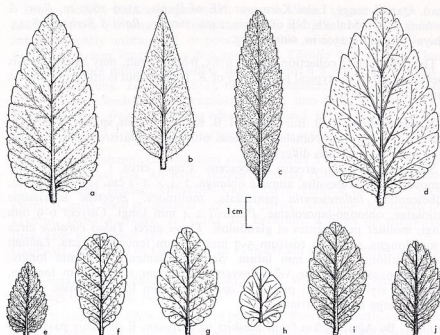


FIG. 1. Typical median-stem leaves of: a, *R. orientalis*; b, *R. kurdica*; c, *R. odontophylla*; d, *R. maxima*; e, *R. stricta*; f-j, *R. elephas*; f, subsp. *elephas*; g, subsp. *glabrescens*; h, subsp. *carduchorum*; i, subsp. *hirtula*; j, subsp. *boissieri*.

2. *R. kurdica* Nábělek in Publ. Fac. Sci. Univ. Masaryk Brno 70: 36 (1926).  
Fig. 1b, 3.

Ic.: Nábělek, loc. cit. tab. 1, fig. 4.

Erect suffruticose pubescent perennial. *Stem* rigid, woody, 50-100 cm high, frequently much branched. *Leaves* alternate or scattered on lower part of stem, opposite above, 3-6 cm long, lanceolate, entire. *Inflorescence* a panicle of many-flowered racemes; bracts lanceolate. *Pedicels* 5-8 mm long. *Calyx* 0.8-1.2 cm long, glandular-pubescent. *Corolla tube* 8-11 mm long with 2 minute, tooth-like, pendulous lobes. *Beak of galea* 5-8 mm long, straight. *Lower lip* 12-20 mm in diameter; lobes approximately equal in size. *Style* pilose. *Seeds* 0.8 mm long, 50-70 per capsule, striate, rugose. *Fl.* 6-8. *Alpine pastures and rocky slopes, 2100-3400 m.*

TYPE. Iraq "Crescit in Kurdistaniae Turcicae distr. Ramoran, in Monte Halakar-Dar ad septentr. ad oppido Geziret-ibn-Omar, in humosis lapidosis c. 2300 m, 26 vii 1910 Nábělek 1459". BRA. (photo E!)

TURKEY. B9 Van: dist. Gevaş, Artos Da., 2740 m, Davis & Polunin, D. 22723 & 22755; Artos Da., 2800-3300 m, Tong 300; Van, distr. Çatak, Kavuşşahap Da., 2300 m, Davis & Polunin, D. 23029. C9 Hakkari: Elkiyayla Da. near pass between Marunis and Beytüşşebap (CENTO road), 2300-2400 m,

*Davis* 45337; Cilo Da., below Cilo y., 2700 m, *Davis & Polunin*, *D.* 23971. C10 Hakkari: Sat Da., (above Yüksekova) valley N of lake, 2600 m, *Duncan & Tait* 131.

IRAQ. Qandil range, Lake Kermasur NE of Rania, 2100–2600 m, *Rawi & Serhang* 18293. Malakh, NE of Rania, 2400–2600 m, *Rawi & Serhang* 18244. Chiya-i Mandali, 2300 m, *Guest* 2853.

The depauperate collection, *Gillett* 9785, from N Iraq, may belong to this species as it has the typical pilose style of *R. kurdica*, but is otherwise almost completely glabrous.

3. *R. odontophylla* R. B. Burbidge & I. B. K. Richardson, *sp. nov.* Fig. 1c, 3.

Affinis *R. kurdicae* Nábelek sed foliis oblongis dentatis et labio corollae 8–10 mm lato inter alia differt.

*Suffrutex* perennis, erectus, pubescens. *Caulis* circa 1 m altus, parce ramosus. *Folia* subsessilia, anguste oblonga, 2–4 × 1–2 cm, serrato-dentata, pubescentia. *Inflorescentia* paniculata, multiflora. *Bracteeae* brevissime petiolatae, oblongo-lanceolatae. *Pedicelli* 2–4 mm longi. *Calyces* 6–9 mm longi, molliter pubescentes et glandulosi. *Flores* aurei. *Tubus corollae* circa 5 mm longus. *Galea* in rostrum 5–7 mm longum tenue producta. *Labium* patens, trilobum, 8–10 mm latum. *Stamina* filamentis 3–4 mm longis; antherae ovatae obliquae vel transversae. *Ovarium* 1·8–2·0 mm longum, hirsutum; stylus sparsim pilosus. *Capsula* 6–8 mm longa. *Semina* 20–40, 0·8 mm longa lataque, striata.

TURKEY. B9 Ağrı: 15 km from Eleşkirt to Horasan, E of Tahir pass, 2200 m, *Salix* scrub, 24 vii 1966, *Davis* 47131—holo E.

This species is known only from the type collection which is sufficiently distinct from *R. kurdica* to warrant full specific rank. The indumentum of these two species differs in a way difficult to describe, both being more or less glandular-pubescent, but the hairs of *R. odontophylla* are denser, giving an almost tomentose to velutinous appearance and glaucous colour to the plant.

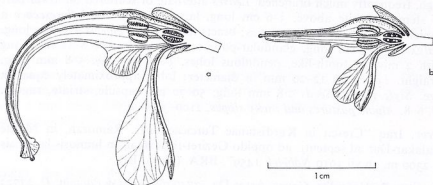


FIG. 2. Half flower drawings of a, *R. orientalis* and b, *R. stricta* to show variation in floral structure. The flowers of all other species of *Rhynchospora* are basically similar to *R. stricta*.



4. *R. stricta* C. Koch in Linnaea 22: 684 (1849). Fig. 1e, 2b, 3.

Syn.: *R. elephas* (L.) Griseb. var. *stricta* (C. Koch) Boiss., Fl. Or. 4: 478 (1879).

Erect, poorly branched pubescent annual. *Stem* 15–30(–50) cm high. *Leaves* 1.5–3.0 cm long, sub-petiolate, ovate, sparsely pubescent. *Inflorescence* frequently unbranched, or poorly so, often with less than 10 flowers. *Pedicels* 1–4 mm long. *Calyx* 6–9 mm long. *Corolla tube* 4–6 mm long; pendulous lobes minute, tooth-like. *Beak of galea* 6–8 mm long, straight or slightly ascending. *Lower lip* 8–15 mm in diameter, lobes approximately equal in size. *Seeds* 4–8 per capsule, 1.0–1.2 mm long, striate. *Fl.* 6–9. *Damp meadows, frequently on the edge of woodland, 1450–2700 m.*

TYPE. Turkey. A8 Rize: Djimil (Cimil), 1800–2750 m, C. Koch—LE, n.v.

TURKEY. A8 Trabzon: Of—Bayburt road, 45 miles S of Of, 2130 m, *Apold, Cox & Hutchison* 169. A8 Rize: İkizdere, Başköy (Cimil), *Davis & Dodds*, D. 20918; distr. Hemsin, Ortaköy—Çat, 2000 m, *Davis & Dodds*, D. 21256; Djimil (Cimil), 2000 m, *Balansa* 1506. A9 Çoruh: Ardanuç—Kordevan Da., 1450 m, *Davis & Hedge*, D. 32284. B8 Erzurum: 4 miles up valley from Ilica, 2100 m, *Watson* 248.

CAUCASIA. Recorded by Grossheim in Fl. Kavkaza ed. 2, 7; map 620, (1967).

5. *R. maxima* C. Richter in Denkschr. Akad. Wiss. Wien Math.-Nat. Kl. 50: 25 (1885). Fig. 1d, 3.

Erect, sparsely branched pubescent perennial. *Roots* frequently surmounted by scale-leaves. *Stem* 30–60(–100) cm high. *Leaves* shortly petiolate, (2–)3–5(–7) cm long, elliptical to ovate, crenate to dentate. *Inflorescence* an unbranched or poorly branched raceme with 6–10(–20) flowers. *Pedicels* 1–2 cm long. *Corolla tube* 6–8 mm long; pendulous lobes tooth-like, 3–4 mm long. *Beak of galea* 9–13 mm long, slightly ascending. *Lower lip* 2.0–3.5 cm in diameter, lobes subequal. *Seeds* 20–30 per capsule, 1.2–1.8 mm long, rugose. *Fl.* 3(near sea level)–7. *In moist ground, often in woodland or thickets, s.l.–2700 m.*

TYPE. Iran. Gilan: in locis paludosis ad Per-i-bazar (near Rasht) ann. 1882, T. H. Pichler—iso K!

CAUCASIA. Talisch: *Hohenacker* (1838); between Swant and Lenkoran, *Hohenacker* (1836). Lenkoran: Kashba military road, B. *Lewandowsky* 887. IRAN. Gilan: Ardabil—Astara, 5 miles E of Ardabil, 1520 m, *Furse* 2462; near Astara, sea level, *Bowles Scholarship expedition* 561. Tehran: near Passgala, *Kotschy* 122; Tuchal near Shahrestanak, 2200 m, *Bornmüller* 7823. Mazandaran: Ramsar, 20 m, *Merton* 2423; Chalus pass, 2700 m, *Furse & Syngé* 392; 20 miles S of Shahi, 100 m, *Furse* 5039; Haraz valley, Karehsang, 100 m, *Wendelbo* 181. Qazvin: above Allamul, between Chalus and Karaj, 1980 m, *Archibald* 2397; Gach Sar, NE of Karaj, 2130 m, *Furse* 612. Gorgan: Bandar-i-Gaz, *Sintenis* 1901: 1449.

The *R. elephas* var. *cordata* of Bentham in DC., Prodr. 10: 559 (1846), is probably synonymous with this species but examination of the relevant microfiche of the De Candolle herbarium does not enable this to be said with certainty.

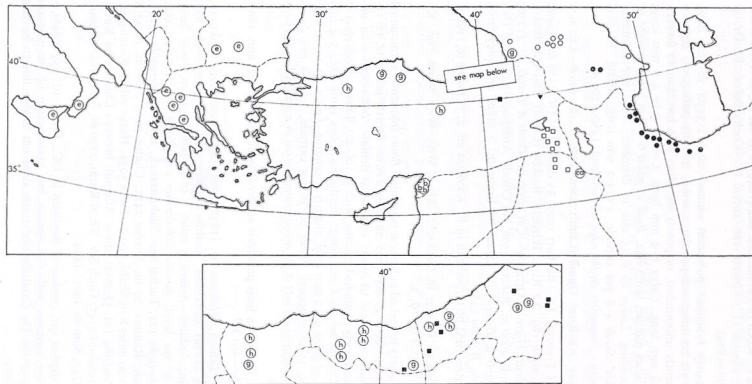


FIG. 3. Distribution map of all the species of *Rhynchocorys*: ○ *R. orientalis*; □ *R. kurdica*; ▼ *R. odontophylla*; ● *R. maxima*; ■ *R. stricta*; (e) *R. elephas* subsp. *elephas*; (g) subsp. *glabrescens*; (ca) subsp. *carduchorum*; (h) subsp. *hirtula*; (b) subsp. *boissieri*. The Turkish record of *R. orientalis* has not been mapped.



6. *R. elephas* (L.) Griseb., Spicil. Fl. Rum. et Bith. 2: 12 (1844). Fig. 1f-j, 3.  
Syn.: *Rhinanthus elephas* L., Sp. Pl. 603 (1753).

*Elephas erecta* G. Don, Syst. 4: 619 (1838).

*E. columnae* Guss., Fl. Sic. Synops. 2: 155 (1844).

*Elephantina proboscidea* Bertol., Fl. Ital. 6: 280 (1844).

A branched, ascending, glandular-pubescent to glabrous perennial. *Stem* 20-40(-60) cm high, usually branched. Leaves 3-5 cm long, ovate, obovate or oblong-elliptical, serrate to broadly crenate. *Inflorescence* varying from a simple raceme to a panicle of racemes, few to many-flowered; bracts variable, similar to leaves but smaller. *Pedicels* 4-8 mm long. *Calyx* 5-11 mm long. *Corolla tube* 4-7 mm long; pendulous lobes tooth-like 1 mm long. *Beak of galea* 6-10 mm long, straight or ascending. *Lower lip* 10-20 mm in diameter, lobes subequal. *Seeds* 20-30 per capsule, c. 1 mm in diameter, striate. *Fl.* 4-8. *Meadows from s.l. to the snowline.*

TYPE. Described from Italy (Linn. Herb. 758/1).

DISTRIBUTION. S Italy and Sicily, Greece, Bulgaria, Turkey, Caucasia and N Iraq.

A variable species in which five subspecies are recognised.

- |   |                              |
|---|------------------------------|
| 1a. Plant rarely branched, glabrous or sparsely pilose  | 2                            |
| 1b. Plant much branched, glandular-hairy  | 4                            |
| 2a. Leaves obovate to broadly elliptical with truncate to rounded teeth   | a. subsp. <i>elephas</i>     |
| 2b. Leaves ovate with acute teeth   | 3                            |
| 3a. Leaves and lower bracts with short petioles; leaf bases truncate to subcordate with 14-20 crenations per leaf | b. subsp. <i>glabrescens</i> |
| 3b. Leaves and lower bracts sessile; leaf bases distinctly cordate with 10-14 crenations per leaf                 | c. subsp. <i>carduchorum</i> |
| 4a. Capsule and ovary pubescent (N Turkey and Caucasia)   | d. subsp. <i>hirtula</i>     |
| 4b. Capsule and ovary glabrous (Amanus Mountains)   | e. subsp. <i>boissieri</i>   |

a). subsp. *elephas*.

Syn.: *R. elephas* var. *communis* Benth in DC., Prodr. 10: 559 (1856) pro parte.

!c.: Fiori & Paoletti, Ic. Fl. Ital. 356 (1899-1904).

ITALY. Calabria: Aspromonte, Torrat Telesi, *Fluter* 472. Sicily: Prov. di Messina, Sori al Martello, 1300 m, *G. Zodda* 1124.

GREECE. Phthiodites, Mt. Katavothra, 1370-1820 m, 14 vii 1879, *Heldreich*. Epiros, Mt. Smolika, 2000 m, *Balls & Gourlay*, B. 3487. Agrapha, Neuropolis reg. infer. Pindi, 1067 m, 29 vi 1885, *Heldreich*. Grammos Mts., Mt. Scrutsch, 1980 m, *Balls & Gourlay*, B. 3997.

BULGARIA. Mt. Estropole, *Stojanoff & Steffanov* 895. C Balkans (locality illegible), *Stojanoff* 12 vii 1928.

b). subsp. *glabrescens* (Benth) R. B. Burbidge & I. B. K. Richardson, stat. nov.

Syn.: *R. elephas* var. *glabrescens* Benth in DC., Prodr. 10: 559 (1846).

SYNTYPES. Turkey, in alpinis Lazistan inter Trebizond (Trabzon) et Bayburt, *Montbret!*, *Aucher* 1971. Zerdahan, *Aucher* in Herb. DC. (photo!), loc. ign. TURKEY. A4 Kastamonu: Küre-Nahas, *Sinten* 1892: 5747. A5 Sinop: Çangal Da. above Ayancik, 900 m, *Davis*, *Coode* & *Yaltirik*, *D.* 38199. (specimen with oblong leaves). A7 Giresun: Balabandağları above Tamdere, 2300 m, *Davis*, *Dodds* & *Çetik*, *D.* 20519. A8 Rize: Djimil (Cimil), 2000 m, 19 viii 1866, *Balansa*. A8 Trabzon: N slope of Soğanlı Da. above Çaykara, 2000–2200 m, *Davis* & *Hedge*, *D.* 32164. A9 Çoruh: Otingöl, 1800 m, *Stainton* & *Henderson* 5964; mountains above Artvin, 1700 m, *Davis* & *Hedge*, *D.* 29765.

CAUCASIA. Kachetia, Chaczal dagh, 16 vi 1898, *A. Fomin*. Kuban valley of Teberda, *Z. Atmanskich* 295.

c). subsp. *carduchorum* R. B. Burbidge & I. B. K. Richardson, *subsp. nov.*

A subsp. *glabrescente* foliis et bracteis inferis sessilibus basi cordatis crenis 10–14 et a subsp. *elephante* foliis ovatis differt.

TYPUS. Iraq, Rowanduz: Arl Gird Dag, 2300–2700 m, *Guest* & *Ludlow-Hewitt* 2941—holo K.

d). subsp. *hirtula* R. B. Burbidge & I. B. K. Richardson, *subsp. nov.*

A subspeciesbus praecedentibus caulibus ramosioribus, planta glanduloso-hirta et a subsp. *boissieri* capsula ovarioque pubescentibus differt.

TYPUS. Turkey, A6 Sivas: Yildis Da., Sariyer, 1700 m, near mountain stream in bushes, 15 viii 1967, *Tobey* 2358—holo E.

TURKEY. A3 Bolu: woods above Abant Gölü, *B. V. D. Post* 15 vii 1940 & 7 ix 1940. A7 Giresun: below Tamdere, 1600 m, *Davis*, *Dodds* & *Çetik*, *D.* 20694; near Giresun, 3000 m, *Davis*, *Dodds* & *Cetik*, *D.* 20734. A7 Trabzon: Sumila, *Sinten* 1889: 1734; Zigana pass above Hamsikoy, 1500 m, *Guichard* T/73/60; Zigana pass, 1520 m, *Balls* 1659. A8 Trabzon: Zephanos, 540 m, *Balls* 305. A8 Rize: above Kalanoras, 500 m, *Balansa* 1505; above Rize, 450 m, *Furse* & *Synge* 146.

The last listed specimen is atypical of this subspecies, having the facies of a diminutive *R. maxima*. It is notable that *R. maxima* specimens from Caucasia are also smaller than is usual for that species, but insufficient Caucasian material has been examined to form any positive ideas on the status of the two species in that region.

A peculiar, apparently annual collection from Kars (Turkey), (*Davis* & *Hedge*, *D.* 29687) is included here. It is less branched than is usual in subsp. *hirtula*, and at present its status is uncertain.

e). subsp. *boissieri* (Post) R. B. Burbidge & I. B. K. Richardson, *stat. nov.*

Syn.: *R. boissieri* Post in Bull. Herb. Boiss. 1: 28 (1893).

TYPE. Turkey: Hatay, Amanus mts., viii 1891, *G. E. Post* (iso K!)

TURKEY. All specimens seen were from C6 Hatay: Amanus mts.: *Haradjian* 78; 2452 & 4683; viii 1903, *G. E. Post*.

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