

MATERIALS FOR A FLORA OF TURKEY XXXVI:
Rubiaceae II

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ABSTRACT. New taxa of Rubiaceae from Turkey are described in the following genera: *Crucianella*, one new species; *Asperula*, one new species and six new subspecies; *Galium*, twenty new species and two new subspecies. New subspecific combinations are made in *Crucianella* and *Asperula*.

INTRODUCTION

The following treatment is devoted to taxonomic and nomenclatural studies of various taxa of Rubiaceae subfamily Rubieae, as a result of continued research on species of *Crucianella*, *Asperula* and *Galium* in Turkey. A field trip during the summer of 1978 has made possible some important new observations and collections. All specimens cited with a herbarium abbreviation have been seen; more extensive citation of specimens will be given in *Flora of Turkey* vol 7. The previous 'Materials—Rubiaceae', by F. Ehrendorfer, appeared in *Notes R.B.G. Edinb.* 22:323–401 (1958).

Crucianella

Crucianella sorgerae Ehrend., sp. nov. Fig. 2.

C. imbricatae Boiss. proxima sed differt imprimis corollae tubo lobisque papillois, corollis majoribus, foliis minoribus et angustioribus. A *C. latifolia* L. bracteis basi non inflatis folisque multo minoribus diversa.

Herba annua, 20–30 cm alta. *Caulis* basi ramosus, $\pm$ scabridus, internodiis mediis 6–8 cm longis. *Folia* verticillata 6, inferiora late oblanceolata, 5–10 $\times$ 1.5–2.5 mm, superiora linearia, 8–10 $\times$ 0.5–0.8 mm, margine revoluta scabrida usque puberula. *Spicae* terminales, interdum una longe et patule pedunculata lateralis (caulis ideo apice subdichotomus), 3.5–6 cm longae, subdensae. *Bractae* late lanceolato-acuminatae, 5.5–7.5 $\times$ 1.5–2 mm, sese ultra dimidium obtegentes, florem unicum fulcrantes, marginibus membranaceis basi latis, apicem versus sensim angustatis, planis, minute ciliolatis, apice mucronatis, mucrone brevi ($\pm$ 0.2 mm); *bracteolae* similes sed breviores et angustiores. *Flores* tetrameri, 5–6 mm, purpurascenti-lutei, bracteas paulo superantes, corollae tubo nodoso et dense puberulo usque papilloso lobisque papillois. *Calyx* collum hyalinum sublobatum formans, c. 0.4 mm. *Merica*rpi minute granulata.

Type. Turkey C4 İçel: 28 km W of Ovacik, 300 m, 4 vi 1966, F. Sorger 66–15–6 (holo. hb. Sorger; iso. WU).

Distr.: Locally endemic to the Cilician coast.

C. sorgerae, *C. imbricata* and *C. latifolia* are closely related in having dorsally rounded, not carinate bracts and ovate-lanceolate lower stem leaves. *C. imbricata*, ranging from the Aegean Islands and Cyprus through NW, W and C Anatolia to Syria (Lebanon?) has smaller flowers (3–5 mm)

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with $\pm$ smooth corolla tubes and larger leaves ($10-25 \times 1-4$ mm). The widespread *C. latifolia* (S Europe, N Africa and SW Asia) differs mainly in its basally inflated and $\pm$ connate bracts, corollas $5-7.5$ mm and leaves up to 40×8 mm. On the other hand, *C. sorgerae* also shares some features with the 5-merous, large-flowered ($6-8$ mm) *C. macrostachya* which occurs from Cyprus through S Anatolia to W Syria.

As *C. gilanica* Trin. proved to be conspecific with *C. glauca* [A. Rich. ex] DC. (cf. Schönb.-Tem. & Ehrend. in *Plant Syst. Evol.* 127:300, 1977) the following new combinations are required for Turkish taxa:

C. gilanica* Trin. subsp. *remota* (Ehrend.) Ehrend., **comb. nov.*

Syn.: *C. glauca* [A. Rich. ex] DC., Prodr. 4:586 (1830).

C. glauca A. Rich. var. *genuina* Boiss., Fl. Or. 3:24 (1875).

C. glauca A. Rich. subsp. *remota* Ehrend. in Ann. Nat. Mus. Wien. 56:216-217 (1948).

C. glauca A. Rich. subsp. *glauca* Ehrend. in Notes R.B.G. Edinb. 22:327 (1958).

C. gilanica Trin. subsp. *glauca* (A. Rich.) Ehrend. in Schönb.-Tem. & Ehrend. in *Plant Syst. Evol.* 127:300 (1977).

The combination *C. gilanica* Trin. subsp. *glauca* (A. Rich.) Ehrend. is incorrect, as the validly published older name *C. glauca* A. Rich. subsp. *remota* Ehrend. is cited as a synonym.

C. gilanica* Trin. subsp. *pontica* (Ehrend.) Ehrend., **comb. nov.*

Syn.: *C. glauca* [A. Rich. ex] DC. subsp. *pontica* Ehrend. in Ann. Naturhist. Mus. Wien 56:215 (1948).

C. colchica Mandenova in Zam. Sist. Geogr. Rast. 17:64 (1953).

C. gilanica* Trin. subsp. *transcaucasica* (Ehrend.) Ehrend., **comb. nov.*

Syn.: *C. glauca* A. Rich. subsp. *transcaucasica* Ehrend. in Ann. Naturhist. Mus. Wien 56:218 (1948).

Asperula

Sect. *Cynanchicae* (DC.) Boiss.

A number of new subspecies and new combinations must be recognised within 3 extremely polymorphic Turkish representatives of the section, *A. nitida* Sm., *A. lilaciflora* Boiss. and *A. stricta* Boiss.

***A. nitida* Sm. subsp. *mytilinica* Ehrend., subsp. nov. Fig. 1.**

Syn.: *A. nitida* Sm. var. *hirtella* sensu Rech. f., Fl. Aegaea 567 (1943).

Folia breviter hispidula, $\pm$ recta. *Bractaeae* lanceolato-subulatae, aristis usque ad 1.2 mm longis. *Corolla* ($5-6-7$ mm) longa, scabridula. *Planta* in sicco $\pm$ nigrescens.

Type. Islands: Mytilini (Lesvos), mt. Olympos by Ayiaassos, c. 940 m, 19 v 1934, K. H. Rechinger fil. 5563 (holo. Hb. Rech. fil.).

Distr.: Endemic to Lesvos.

This westernmost subspecies of *A. nitida* is at present known from the type gathering only. Its main features are relatively large corollas which are scabrid outside, lanceolate-subulate bracts and hispidulous, rather straight leaves, $\pm$ nigrescent on drying. Subsp. *nitida*, which is restricted to Ulu Da.,

may be distinguished from it by its $\pm$ glabrous, distinctly inward curved, shining leaves, glabrous corollas and lanceolate-ovate bracts.

A. nitida Sm. subsp. **subcapitellata** Ehrend., subsp. nov. Fig. 1.

Folia parce pilosa, recta usque leviter incurva. *Bractae* lanceolatae, aristatae. *Corolla* 3-4.5 mm longa, scabridula, lobis tubum aequantibus usque eo c. 2½-plo brevioribus. *Planta* in sicco raro nigrescens.

Type. Turkey A4 Kastamonu: Ilgaz Da., *Pinus* woods & final ridge before summit, 2000 m, 19 vii 1969, *Darrah* 22 (holo. E).

Distr.: N and adjacent C Anatolia.

This taxon approaches *A. capitellata* [Hausskn. & Bornm. ex] Bornm. in its smaller corollas, it is distinguishable, however, by its shorter corolla lobes, rounded, non-conical papillae of the ovary and less caespitose habit.

A. nitida Sm. subsp. **hirtella** (Boiss.) Ehrend., stat. nov.

Syn.: *A. nitida* Sm. var. *hirtella* Boiss., Fl. Or. 3:39 (1875).

A densely hispidulous, $\pm$ small-flowered plant, confined to alpine habitats of W and WC Anatolia, differing from the foregoing in its dense indumentum, broader, sometimes acute bracts and shorter corolla tube (1.5-2 $\times$ as long as lobes).

A. lilaciflora Boiss. subsp. **mutensis** Schönbn.-Tem., subsp. nov. Fig. 1.

Planta $\pm$ dense tomentosa. *Caules* simplices usque jam e basi ramosi. *Corolla* 4-4.5 mm longa. *Ovarium* hispidum.

Type. Turkey C4 İçel: Mut to Silifke, 8 km S of Mut, 400 m, 15 v 1965, *Coode & Jones* 1025 (holo. E).

Distr.: S Anatolia (Endemic to Isauria).

A rather distinct subspecies, confined to lower altitudes of Isauria. Differs from all other subspecies of *A. lilaciflora* in its dense tomentose indumentum and hispid ovaries.

A. lilaciflora Boiss. subsp. **coa** (Rech. fil.) Ehrend., stat. nov. Fig. 1.

Syn.: *A. coa* Rech. fil. in Denkschr. Akad. Wiss. Wien, Math.-Nat. Kl. 105(1):566 (1943).

This small-flowered (3-4 mm) taxon with more flexuous, $\pm$ glabrescent stems from the island of Kos merits only subspecific status, as it cannot be clearly separated from subsp. *phrygia*.

A. lilaciflora Boiss. subsp. **phrygia** (Bornm.) Schönbn.-Tem., comb. et stat. nov.

Syn.: *A. stricta* Boiss. var. *scabrida* Boiss., Diagn. ser. 1(3):33 (1843).

A. stricta Boiss. var. *phrygia* Bornm. in Beih. Bot. Centr. 24(2):467 (1909).

A. phrygia (Bornm.) Ehrend. in Notes R.B.G. Edinb. 22:339 (1958).

Large-flowered (4-5-8 mm plants, with almost unbranched inflorescence and $\pm$ lax and flexuous stems from W and WC Anatolia are better treated at subspecific level, because plants intermediate between the

less widespread subsp. *lilaciflora*, endemic to W Anatolia (Izmir, Uşak), with larger corolla lobes and stems branched from the lower third are frequent.

A. stricta Boiss. subsp. **monticola** Ehrend., subsp. nov. Fig. 1.

Planta humilis, 6–20(–25) cm alta, laxe caespitosa, caulibus saepe flexuosis. *Folia* linearia, 5–12(–15) × 0·6–1 mm, scabrida usque breviter hispida. *Inflorescentia* pauciflora. *Corolla* rosea, 4–7 mm, ± infundibularis, lobis ± patulis.

Type. Turkey C3 Isparta: Dedegöl Da. above Oruz Gazi Y., 2 viii 1949, Davis 16048 (holo. K; iso. W).

Distr.: Endemic to SW Anatolia.

This endemic, growing in mountain steppes and on scree at higher altitudes, differs from the second alpine subspecies of the Cilician Taurus (subsp. *grandiflora*) in its shorter corollas with lobes ± curved outward and shorter and scabrid to shortly hispid leaves. There are specimens showing affinities to subsp. *latibracteata* (Boiss.) Ehrend. which is widespread mainly in C & E Anatolia, on the one hand and to *A. lilaciflora* on the other. Two further subspecies of *A. stricta*, preferring lower altitudes: subsp. *stricta* and subsp. *elmaliensis* are clearly distinct by their more robust and ± stiff stems, up to 60 cm, and ± branched, many-flowered inflorescences.

A. stricta Boiss. subsp. **grandiflora** Schönb.-Tem., subsp. nov. Fig. 1.

Planta humilis, c. 15–25 cm alta, ± caespitosa, caulibus iis praecedentis ± strictioribus. *Folia* filiformia, 8–18 × 0·4–0·7(–1) mm, glabra usque scabridula. *Inflorescentia* pauci- usque multiflora. *Corolla* 7–9 mm longa, distincte hypocrateriformis, lobis erectis.

Type. Turkey C5 İçel: Bulghar Magara, 1895, *Siehe* 535 (holo. WU; iso. E).

Distr.: Endemic to S Anatolia (Taurus and Anti-Taurus).

A large-flowered and narrow-leaved plant of rock crevices and scree, occurring from 2500–2600 m.

A. stricta Boiss. subsp. **elmaliensis** Schönb.-Tem., subsp. nov. Fig. 1.

Suffrutex subrigidus, ± tomentosus, usque ad 35 cm altus, in sicco haud nigrescens. *Inflorescentia* ramosa, ± multiflora. *Bracteae* (1·5–)2–3-plo longiores quam latae, lanceolato-acuminatae, edenticulatae, basi connatae. *Corolla* lutea.

Type. Turkey C3 Antalya: Korkuteli to Elmali, limestone scree, 16 km from Korkuteli, 1200–1250 m, 24 vi 1948, *Huber-Morath* 8635 (holo. hb. Hub.-Mor.; iso. WU).

Distr.: Endemic to SW Anatolia.

This rather tall, stiff and subtomentose subspecies, preferring dry habitats from 1150–1600 m, approaches subsp. *latibracteata*, which differs mainly in its rather short, broad and ± denticulate bracts.

It is not quite certain whether the colour of the flowers is always yellow in this subspecies (or pink in subsp. *monticola*), as these records are taken from sporadic herbarium notes and *A. stricta* is known to be rather variable as to flower colour.

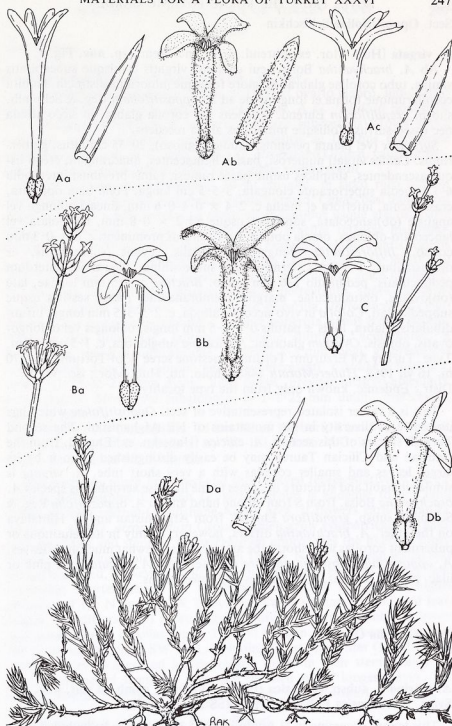


FIG. 1. *Asperula*. A, *A. stricta*: a, subsp. *grandiflora*; b, subsp. *elmaliensis*; c, subsp. *monticola* (flowers $\times 5$, leaves $\times 8$). B, *A. lilaciflora*: a, subsp. *coa*; b, subsp. *mutensis*. C, *A. virgata*. D, *A. nitida*: a, subsp. *mytilinica*, leaf $\times 8$, habit $\times 1$; b, subsp. *subcapitellata*. B, C & D: partial inflorescences $\times 2$, flowers $\times 6.5$.

Sect. *Oppositifoliae* Schischkin

A. virgata [Hub.-Mor. ex] Ehrend. & Schönb.-Tem., sp. nov. Fig. 1.

Ab *A. brachyantha* Boiss., cui caulibus virgatis cymisque subcapitatis similis, tubo corollae glabrae longiore foliisque minoribus distincta. Habitu corollarumque forma et longitudine ad *A. oppositifoliam* Reg. & Schmalh. subsp. *grandifloram* Ehrend. accedens sed corolla glabra, in sicco albidā nec roseo-suffusa foliisque minoribus ab ea recedens.

Suffrutex (vel planta perennis, caudice lignoso), 20–35 cm altus, glaberrimus. *Caules* virgati numerosi, basi ± lignescentes, quadranguli, erecti usque ascendentes, simplices usque parce ramosi, ramis brevibus; internodia 6–12, media superioraque elongata, 3–5.5 cm longa. *Folia* bina opposita, crassiuscula, inferiora et media c. $2-4 \times 0.4-0.6$ mm, lineari-oblonga vel anguste (ob)lanceolata, superiora usque ad 2×0.8 mm, lanceolata vel lanceolato-oblonga, omnia obtusa, nervo subtus prominenti c. 0.1–0.3 mm crasso. *Inflorescentia* elongato-pyramidalis, cymis subcapitatis, ± dichasialibus, 1–5-floris, terminalibus subsessilibus, lateralibus interdum pedunculatis, pedunculo 1–6 mm longo. *Bractee* c. 1.5 mm longae, late (ob)ovatae, obtusiusculae, margine membranaceae. *Flores* sessiles usque subpedicellati. *Corolla* in vivo siccoque albidā, c. 2.5–3.5 mm longa, infundibularis, glabra, lobis ± patulis 0.8–1.5 mm longis, oblongis vel oblongo-ovatis, obtusis. *Ovarium* glabrum. *Mericarpi* subglobosa, c. 1.5 mm diam. Type. Turkey A8 Erzurum: Tortum, limestone scree W of Tortum G., 1070 m, 16 vii 1958, *Huber-Morath* 14885 (holo. hb. Hub.-Mor.; iso. WU). Distr.: Endemic, known only from the type locality.

This is a rather isolated representative of sect. *Oppositifoliae* which has its centre of diversity in the mountains of NE Afghanistan. The second Turkish species of this section, *A. cilicica* [Hausskn. ex] Ehrend. from the Isaurian and Cilician Taurus may be easily distinguished from it by its larger leaves and smaller corollas with a very short tube. *A. virgata* is similar in habit and structure of cymes to the likewise xerophilous species *A. brachyantha* Boiss. from S Iran on one hand and to *A. oppositifolia* Reg. & Schmalh. subsp. *grandiflora* Ehrend. from Afghanistan and W Himalaya on the other. *A. brachyantha* differs, however, mainly in its velutinous or puberulent corollas with short tube and larger, somewhat mucronate leaves. *A. oppositifolia* subsp. *grandiflora* deviates from *A. virgata* in its pink or lilac, hirsute corollas, larger leaves and lower stems.

Sect. *Glabella* Griseb.

A. taurina L. subsp. *caucasica* (Pobed.) Ehrend., comb. et stat. nov.
Syn.: *A. caucasica* Pobed. in Fl. URSS 23:692 (1958).

This taxon, occurring in N Anatolia, E of 38°E, has to be included in *A. taurina* (N Anatolia, W of 36°E) from which it cannot be clearly separated. A number of differential characters, cited by Pobedimova (*l.c.*) could not be substantiated.

Galium

Sect. *Galium**G. margaceum* Ehrend. & Schönb.-Tem., sp. nov.

G. kutzingii Boiss. & Buhse affine, sed differt ovario glabro, indumento omnino sparsiore et foliis saepe $\pm$ longioribus. A *G. fistuloso* Somm. & Lev. caulibus saltem partim subteretibus (nec subcostatis), foliis supra scabridis, subtus puberulis, pedicellis subglabris ac floribus plerumque minoribus diversum. A *G. vero* L. et a *G. atropatano* Grossh. caulibus per-ramosis, basi $\pm$ prostratis et foliis brevioribus valde recedit.

Planta suffrutescens perramosa, 30–40 cm alta, in sicco raro tantum nigrescens, radice lignosa perlonga et caudice crasso. *Caules* basi lignescenti saepe prostrati, a basi perramosi ramis ascendentibus usque erectis, parte inferiore subteretes, sursum $\pm$ quadranguli, breviter retrorse hispidulo-pubescentes, internodiis inferioribus iisque ramorum $\pm$ abbreviatis, ceteris c. 2–3 cm longis. *Folia* verticillata 6–8, patula usque reflexa, (5–)6–10(–12) $\times$ 0.5–1.4 mm, linearia vel lineari-oblonga, mucronata, apice hyalino c. 0.1–0.3 mm longo, leviter incurvo, margine perrevoluta, supra antrorso-scabrida, saepius subopaca, subtus dense puberula. *Inflorescentia* cylindracea usque elongato-pyramidalis, $\pm$ dense puberula, ramis erecto-patulis. *Bractae* cito diminutae, lanceolatae usque ellipticae, acuminatae, $\pm$ naviculares, margine subscabridae. *Pedicelli* 1–3 mm longi, glabrescentes usque glabri, divaricati, apicem versus subincrassati. *Corolla* ochroleuca, rotata, (1.75–)2–2.5 mm diam., lobis ovatis, breviter incurvo-apiculatis, extus glabris. *Mericarpia* subglobosa, c. 1–1.25 mm diam., nigricantia, laevia et glabra.

Type. Turkey A8 Gümüşhane: 14 km SE of Bayburt, 6 km W of Maden, 1670 m, on marl, *Ehrendorfer et al.* 787–141–1 (holo. WU; iso. W, E, etc.). Distr.: Endemic to NE Anatolia.

This creeping, much branched and short-leaved representative of the extremely polymorphic Eurasian *G. verum* group is endemic to dry talus slopes of the Erzurum-Gümüşhane-Artvin area. It flowers earlier than *G. verum* L. and *G. atropatanum* Grossh. which grow sympatrically in adjacent meadows and steppes. *G. margaceum* approaches the likewise short-leaved *G. kutzingii* Boiss. & Buhse from Talysh, N and NW Iran which may be distinguished, however, by its dense indumentum even on ovaries, and somewhat shorter leaves. *G. fistulosum* Somm. & Lev., from higher altitudes of the N parts of W Transcaucasia, is similar in habit and leaf-length, but differs in its more angular, subcostate stems, glabrous leaves and usually larger corollas (up to 3.5 mm in diam.). All other members of the *G. verum* group in SW Asia, including *G. atropatanum* Grossh., with densely hairy ovaries and leaves, clearly differ in their stems which are scarcely branched from the base and by their much longer leaves. The specific epithet '*margaceum*' is derived from 'marga' = marl.

Sect. *Leigalium* Ledeb. Ser. *Erecta* Pobed.*G. fissurense* Ehrend. & Schönb.-Tem., sp. nov.

G. lucido All. proximum, sed differt caudice crasso, foliis tenuibus brevioribus ac floribus numquam plus 3.75 mm diam. *G. corrudifolio* Vill.

et *G. protopycnotricho* Ehrend. & Krendl caudice crasso simile, sed a primo foliis latioribus tenuioribus, a secundo glabritie foliisque angustioribus recedit. A *G. albo* Mill. rhizomatoso caulibus gracilioribus, foliis tenuibus minoribus et angustioribus diversum.

Planta perennis, caudice crasso multicipiti, raro surculis brevibus stoloniformibus. *Caulis* numerosi (10-)25-55 cm alti, ascendentes usque erecti, $\pm$ quadranguli, laeves et glabri, raro basi purpurascentes, saepe jam e parte inferiore perramosi, rarius subsimplices, internodiis folia pluries superantibus, aestate extrema ramis vegetativis nonnullis elongatis. *Folia* tenuia verticillata 6-8, (6-)8-20(-22) $\times$ 1-2.75(-3) mm, sublinearia vel lineari-oblancoolata usque oblanceolato-oblonga, subulato-acuminata, apice hyalino 0.17-0.25 mm longo, margine $\pm$ revoluta $\pm$ sparse antrorse denticulato-scabridula usque sublaevia, nervo subtus tenui, lucida, subtus paulo pallidiora, utrinque glaberrima. *Inflorescentia* multiflora elongato-ovoidea usque pyramidalis, ramis $\pm$ patulis, glaberrima. *Pedicelli* 1.5-3 mm longi, erecto-patuli usque $\pm$ divaricati. *Antherae* fuscae. *Corolla* $\pm$ flavida, rotata, 2-3.75 mm diam., lobis oblongis, incurvo-apiculatis. *Mericarpi* late reniformia, 1.25-1.5 mm longa, fusca, rugulosa, glabra. $2n = 22$. Type. Turkey A8 Rize: 2 km SE of Ikizdere, c. 500-600 m, granite rocks, Ehrendorfer et al. 787-153-3 (holo. WU; iso. W, E, etc.).

One of the basic narrow-leaved diploids within the *G. mollugo* group and confined to rock crevices of the Euxine mountain region of N Anatolia. It is very likely that *G. fissurense*-like diploid ancestors have contributed to the very similar tetraploid *G. lucidum* Bieb. which is widespread in open and rocky (sub)mediterranean-montane habitats of S & SC Europe. The latter differs mainly in having usually elongate, stolon-like rhizomes, longer and more leathery leaves and somewhat larger flowers. Two further diploids of the *G. mollugo* group have an even more compact growth form without any stolon-like shoots: the eu-mediterranean *G. corrudifolium* Vill. (from the E Iberian Peninsula to the W coast of Greece) differs in its smaller and narrower, needle-like leaves and denser inflorescences, whereas *G. protopycnotrichum* Ehrend. & Krendl in C and E parts of the Balkan peninsula and adjacent NW Anatolia can be distinguished by often hairy stems, broader leaves and usually larger flowers. Delimitation from the tetraploid *G. album* Mill. (distributed almost throughout Europe and northern SW Asia) is difficult, but possible, as this plant has more robust and sometimes hairy stems, larger, broader and $\pm$ leathery leaves, and usually larger flowers.

Sect. **Leiogalium** Ledeb. Ser. **Octonaria** (Klokov) Pobed.

Within this series the very polymorphic *G. glaucum* group is represented in Anatolia by the following two vicarious taxa which should be treated as species:

G. campanelliferum Ehrend. & Schönb.-Tem., sp. nov.

G. glauco L. proximum sed foliis verticillatis 6-7(-8) brevioribus angustioribus et scabridioribus ac corollis minoribus ab eo recedit. A *G. biebersteinii* Ehrend. imprimis inflorescentia ampliore, cymis minus glomerulatis et foliis plerumque longioribus differt. A *G. octonario* (Klokov) Pobed. rhizomate elongato tenui, foliis brevioribus, $\pm$ minus scabridis ac corollis late campanulatis, $\pm$ majoribus diversum.

Planta perennis glauca, (20-)30-75 cm alta, rhizomate tenui ramoso, $\pm$ horizontali, interdum stoloniformi in sicco praesertim parte superiore saepe nigrescens. *Caules* pauci $\pm$ tenues, 0.75-1.6(-3.9) mm diam., ascendentes, subteretes, quadristriati, glabri, raro breviter hispiduli, $\pm$ ramosi, internodiis inferioribus valde abbreviatis, foliis brevioribus usque iis aequilongis, sursum cito (usque ad 9 cm) elongatis, sub anthesi ramis vegetativis paucis brevibus. *Folia* verticillata 6-7(-8), 15-30 $\times$ 0.5-1 mm, acicularia usque anguste oblanceolato-lineararia, acuta usque cuspidata, apice hyalino 0.2-0.5 mm longo, margine ad nervum medianum usque revoluta plurifariam antrorso-scabrida, nervo subtus basi dilatato, plus dimidio latitudinis folii aequanti, apicem versus attenuato. *Inflorescentia* $\pm$ multiflora, saepius laxa, (late) ovoidea, glaberrima, ramis erecto-patulis, $\pm$ aequilongis aut inferioribus interdum $\pm$ elongatis, cymis corymbiformibus. *Bractea* elliptico-acuminatae, margine antrorso-scabridulae usque laeves. *Pedicelli* 0.75-1.5 mm longi, suberecti usque erecto-patuli, $\pm$ pruinosi. *Corolla* albida, (2-)2.5-3.75 mm diam., late campanulata, tubo lobis tertia parte usque dimidio brevior et lobis late triangulari-ovatis, $\pm$ breviter apiculatis, demum patulis. *Ovarium* pruinose. *Mericarpi* late obovoidea, c. 1.5-1.75 mm longa, nigricantia, minute reticulato-rugulosa, glabra.

Type. Turkey C2 Denizli: c. 20 km SE of Denizli towards Kazik Beli pass, c. 700 m, open *Quercus coccifera* scrub, palaeozoic schists, 25 v 1962, *Ehrendorfer* 62-1/30-3 (holo. WU; iso. E).

Distr.: Endemic to W and SW Anatolia.

This endemic grows in open oak scrub and pine woods of W and SW Anatolia. The closely related *G. glaucum* L., widespread in C and S Europe, differs generally in its larger leaves in whorls of 8-10 and larger flowers (4-6 mm in diam.). *G. biebersteinii* Ehrend. from the Crimea usually has shorter leaves which are more condensed towards the base of the stems and narrower inflorescences with almost glomerulate cymes. *G. octonarium* (Klokov) Pobed. from SE Europe to E Kazakhstan can be distinguished by its strong rootstock (without stolon-like shoots), longer and more scabrid leaves, and infundibular corollas. Finally *G. volhynicum* Pobed. from SE Europe and *G. moldavicum* (Dobrescu) Franco from NE Romania differ in their pyramidal partial inflorescences and partly hairy stems.

***G. radulifolium* Ehrend. & Schön.-Tem., sp. nov.**

G. campanellifero Ehrend. & Schön.-Tem. proximum, sed differt imprimis caulibus validioribus ac foliis longioribus. A *G. glauco* L. verticillis 6-7-foliis scabridioribus ac floribus minoribus diversum. A *G. octonario* (Klokov) Pobed. foliis latioribus, vix ad nervum usque revolutis ac floribus late campanulatis recedit.

Planta perennis, glauco-viridis, valida, 30-100 cm alta, in sicco haud nigrescens, rhizomate crasso obliquo. *Caules* crassiusculi (1.1-)1.75-5.5 mm diam., leviter ascendentes usque suberecti, subteretes, quadristriati, basi $\pm$ lignescentes, glaberrimi, jam e parte inferiore ramosi, internodiis infimis tantum $\pm$ abbreviatis, foliis vix brevioribus, ceteris usque ad 10 cm elongatis; sub anthesi ramis vegetativis paucis, brevibus. *Folia* verticillata 6-7, (15-)20-50 $\times$ 0.8-1.75 mm, lineari-oblanceolata, acuta usque cuspidata, apice hyalino usque ad 0.5 mm longo, margine praesertim

dimidio anteriore haud ad nervum medianum usque revoluta ac ibidem inferiora superioribus scabriora, nervo subtus dimidio inferiore dilatato, plus dimidio latitudinis folii aequanti, apicem versus attenuato, supra viridiora. *Inflorescentia* multiflora ampla, laxa, obovoidea, glaberrima, ramis erecto-patulis, inferioribus elongatis, cymia corymbiformibus, saepius densis. *Bractee* (late) ellipticae, acuminatae, margine scabridulae usque laeves. *Pedicelli* 0.6–1.6 mm longi, erecto-patuli, pruinosi. *Corolla* alba late campanulata, 2–3.75 mm diam., tubo lobis aequilongo vel iis paulo breviora, lobis late ovatis, $\pm$ breviter apiculatis, demum patulis. *Ovarium* pruinsum. *Mericalpia* late obovoidea, c. 1–2 mm longa, nigricantia, laevia, glaberrima, nitida.

Type. Turkey B8 Erzurum: Ilica to Tercan, 1900 m, rocky igneous slope, 10 vii 1957, Davis 30844 (holo. E; iso. W).

Distr.: Endemic to C and EC Anatolia.

The easternmost representative of the *G. glaucum* group in Anatolia. It can be distinguished from the foregoing by its more robust stems and its longer and somewhat broader leaves which are more greenish above. It is similar in habit to *G. glaucum* L. which has its leaves in whorls of 8–10, however, and differs in its larger corollas. *G. octonarium* is distinguished by its narrower leaves and infundibular corollas. A specimen from A4 Ankara: Çubuk baraj, Krause 5127, approaches *G. campanelliferum* in habit and leaf shape.

Sect. *Orientigalum* Ehrend.

Within this extremely polymorphic section in the western Irano-Turanian area a number of new species have to be recognised:

G. scopulorum Schönbn.-Tem., sp. nov.

G. kurdico Boiss. & Hohen. proximum sed indumento, tubo corollae mericalpiisque longioribus diversum. A *G. tubifloro* Ehrend. cui habitu simillimum, imprimis corollis subrotatis nec hypocrateriformibus distinctum.

Planta perennis, lanata, prostrata, in sicco haud nigrescens, rhizomate elongato, ramoso. *Caules* c. 5–10 cm longi, tenues, flexuosi, internodiis inferioribus $\pm$ congestis, superioribus ad 2.5 cm usque elongatis. *Folia* verticillata 4–5, (5–)8–10 $\times$ (3–)4–7(–8.5) mm, late ovata vel late elliptica usque suborbicularia, cuspidata, margine leviter revoluta, subpetiolata, uninervia. *Inflorescentia* corymbiformis pauciflora, *pedicellis* 1–3 mm longis, $\pm$ patulis, glabris usque parce pilosis. *Corolla* in sicco albida, subrotata, c. 1.3–2.3 mm diam., tubo 0.2 mm longo, lobis ovato-oblongis, obtusiusculis, c. 0.8–1.5 mm longis. *Mericalpia* usque ad 2.5 mm longa, cylindraceo-obconica, superne truncata, lanata.

Type. Turkey B6 Malatya: Gürün to Malatya, c. 40 km from Malatya, c. 1400 m, 7 viii 1956, McNeill 457 (holo. K; iso. E, W).

Distr.: Endemic to E Anatolia.

This taxon belongs to a group of species with prostrate stems, rather dense lanate to villous indumentum and $\pm$ broadly ovate, cuspidate to acuminate leaves, all preferring shady rocks. It is closely allied to *G. kurdicum* from E Anatolia to N Iraq, which may be distinguished, however, by

its shorter indumentum, longer corolla tube and broader mericarps. *G. tubiflorum*, endemic to Boz Da. in SW Anatolia, is clearly distinguished by its hypocrateriform corolla.

***G. papilliferum* Ehrend. & Schönb.-Tem., sp. nov.**

G. sieheano Ehrend. affine, sed foliis latioribus, papillois, inflorescentiisque paucifloris diversum.

Planta perennis, humilis, caespitosa; rhizomate filiformi, $\pm$ ramoso, $\pm$ horizontali. *Caules* 7–12 cm, ascendentes, subsimplices, basi tantum ramis aliquot brevibus, dense foliatis, in partibus foliatis papillois, sursum glabri, internodiis paucis, inferioribus congestis, superioribus usque ad 5 cm elongatis. *Folia* verticillata 4–6, 4–7 $\times$ 2–2.5 mm, inferiora oblanceolata-spathulata, obtusa, superiora spathulata usque obovata, acutiuscula, omnia opaca, minute papillosa. *Inflorescentia* $\pm$ corymbiformis, pauciflora, cymis subcapitatis, *pedunculis* 4–20 mm longis, *pedicellis* brevissimis, (1–1.5 mm), $\pm$ papillois. *Corolla* alba, 3–3.5 mm diam., subcylathiformis, tubo c. 0.5 mm longo, lobis ovato-oblongis, 1.75–2 mm longis, obtusis, apice incurvatis. *Antherae* elongato-ellipsoideae, 0.5–0.6 mm, nigrescentes. *Stylus* tertia parte superiore bifidus, ramis inaequalibus. *Ovarium* granulatum, glabrum.

Type. Turkey B7 Erzincan: Keşiş Da. above Cimin, 2700–2900 m, 27 vii 1957, Davis 31628 (holo. E).

Distr.: Endemic to Keşiş Da.

Member of a group of low, caespitose species with small, obtuse to acute leaves in whorls of 4–6 only. More closely allied to *G. sieheanum*, a local endemic of the Ala Da., which may be distinguished by its narrower, glabrous to pubescent but never papillose leaves and many-flowered inflorescences.

***G. huber-morathii* Ehrend. & Schönb.-Tem., sp. nov.**

G. tmoleo Boiss. affine, sed caulibus basi lignescens, inflorescentia ovoidea ovarisque basi pilosis ab eo recedens. A *G. miti* Boiss. & Hohen., cui foliorum forma, corollae magnitudine et inflorescentia simile, caulibus tenuioribus basique minus lignosis, thyrsis angustioribus ovarisque pilosis diversum.

Planta perennis, rhizomate lignoso. *Caules* numerosi, (10–)25–30 cm alti, basi leviter lignescens, tenues, fragiles, erecti usque ascendentes, glabri vel basi minute puberuli, $\pm$ nitidi, internodiis, $\pm$ aequalibus, 2–4.5 cm longis. *Folia* verticillata (4–)6, 15–20 $\times$ (1.1–)1.5–2 mm, anguste elliptica, acuminata usque mucronata, mucrone hyalino, margine plana et laevia, basi subpetiolata, glabra, $\pm$ nitida. *Inflorescentia* ovoidea, glabra, ramis ultimis cymarum $\pm$ monochasialibus; *pedunculi* 5–18 mm, *pedicelli* filiformes, 1.5–4 mm longi; *bractae* infimae foliaceae, superiores reductae usque nullae. *Corolla* in sicco infuscata (alba ?), c. 3.5 mm diam., subrotata, tubo 0.2–0.4 mm longo, lobis ovatis, apiculatis, 1–1.5 mm longis. *Antherae* 0.4–0.5 mm, cylindratae, lutescentes. *Ovarium* basi vix dense appresse pilosum. *Mericarpi* late ellipsoidea, c. 1.5–2 mm longa, laevia, glabra.

Type. Turkey C4 Konya: Konya to Bozkir, gorge of river Çarşamba, 74 km from Konya, limestone rocks, 1060 m, 14 vi 1948, *Huber-Morath* 9336 (holo. Hb. Hub.-Mor.; iso. WU).

Distr.: Endemic; known from the type gathering only.

Close to *G. tmoleum* from SW Anatolia which may be distinguished from by its filiform stem bases, corymbiform thyrses and glabrous ovaries. *G. huber-morathii* is similar in habit and leaf-shape to the much more widespread *G. mite* (occurring from C and E Anatolia to N Iraq and Iran) which differs, however, in its strongly woody stem bases, broad many-flowered inflorescences and glabrous ovaries.

***G. baytopianum* Ehrend. & Schönb.-Tem., sp. nov.**

Ex affinitate *G. dieckii* Bornm., cui forma foliorum ac glabritie simile, sed differt caulibus elatioribus, foliis majoribus et thyrsis laxis corymbiformibus.

Planta perennis, glaberrima, in sicco pernigrescens, rhizomate elongato tenui. *Caules* pauci c. 25–30 cm alti, ascendentes, $\pm$ flexuosi, parce ramosi, quadranguli usque subteretes, nitidi, internodiis paucis elongatis, 3–10 cm longis. *Folia* verticillata 4–6, patula, 7–8 $\times$ 3–5 mm, obovata, apiculato-cuspidata, subcoriacea, nervo subtus tenui, prominenti. *Inflorescentia* perlaxa pauciflora, corymbiformis, ramis elongatis, erecto-patulis, cymis 8–10-floris. *Bractee* ovato-acuminatae, vix ultra 1 mm longae. *Pedicelli* (0.5–)3–6 mm longi, erecto-patuli. *Corolla* colore ignoto, subcampanulata, c. 3 mm diam., tubo brevi, c. 0.3–0.4 mm longo et lobis oblongis, apice subapiculatis, incurvis. *Antherae* 0.3–0.5 mm, ellipsoideae, flavescentes. *Ovarium* glabrum. *Mericarpia* obovoidea, c. 1.5–2 mm longa, rugulosa, glabra.

Type. Turkey B7 Sivas: Divriği, 31 v 1968, *T. Baytop* 12928 (holo. ISTE).
Distr.: Endemic to the Upper Euphrates valley.

An isolated local endemic, reminiscent of the serpentinicolous *G. dieckii* Bornm. from the NE Taurus in its leaf shape and lack of indumentum.

***G. setuliferum* Ehrend. & Schönb.-Tem., sp. nov.**

Syn.: *G. tolosianum* sensu Ehrend. in Notes R.B.G. Edinb. 22:362 (1958) pro parte, non Boiss. & Kotschy (1875).

G. tolosiano Boiss. & Kotschy affine sed foliis setuloso-ciliatis, inflorescentia multiflora et corollibus minoribus diversum.

Planta perennis, humilis, caespitosa, in sicco nigrescens, caudice lignoso ramoso. *Caules* usque ad 20(–25) cm alti, prostrati vel ascendentes, tota longitudine herbacei vel basi $\pm$ lignescentes, $\pm$ ramosi, glabri, internodiis inferioribus abbreviatis, superioribus usque ad 5.5 cm elongatis. *Folia* verticillata (5–)6, 5–9(–10) $\times$ 2–3.5 mm, oblanceolato-spathulata, breviter cuspidata usque acuta, margine leviter revoluta, antrorso-setulosa, supra nitida, subtus opaca, nervo $\pm$ prominenti. *Inflorescentia* multiflora, corymbiformis usque brevipyramidalis, glabra, ramis suberectis, saepe monochasialibus, confertis; *bractee* superiores reductae. *Pedicelli* 0–3 mm longi, erecti. *Corolla* alba, 2.5–3 mm diam., tubo 0.3–0.4 mm longo, lobis triangulari-ovatis, obtusis, 1.25–1.3 mm longis. *Antherae* late ellipsoideae,

0.5–0.6 mm longae, flavidae. *Mericarpia* subglobosa, 1.4–1.8 mm diam., rugulosa, glabra.

Type. Turkey C6 Adana: Amanus, mt. Döldül, 1500–2000 m, *Haradjian* 3906 (holo. W).

Distr.: Endemic to Amanus mts.

This species belongs to a group of low caespitose, short- and rather broad-leaved perennials, restricted to the east parts of C and S Anatolia. Closely related to *G. tolosianum* Boiss. & Kotschy from the south parts of Amanus, which differs mainly in its smooth leaf-margins and larger corollas (3.5–4.5 mm diam.). *G. dieckii* Bornm. from the Cilician Gates may be distinguished by its broader leaves [to 6(–7) mm], with smooth margins and greenish-yellow corollas, tinged with smoky brown.

***G. hypoxylon* Ehrend. & Schönb.-Tem., sp. nov.**

Ad *G. mitem* Boiss. & Hohen, accedens sed praesertim foliis brevioribus, ciliolatis thyrsisque angustioribus ab eo recedens.

Suffrutex humilis, caudice insigniter lignoso. *Caules* 15–30 cm alti, erecti usque ascendentes, tertia vel dimidia parte superiore ramosi, nodis puberulis exceptis glabri; internodia inferiora 1–2.5 cm, superiora usque ad 6.5 cm elongata. *Folia* verticillata 6, (3–)5–15 × 0.6–1.4 mm, lineari-oblongeolata, inferiora obtusiuscula, superiora acuminata usque apiculata, apice hyalino, secus tertiam partem anteriorem marginis plani nervumque obsoletum saepe ciliolata. *Inflorescentia* pyramidalis, multiflora, ad nodos parce puberula, ramis brevibus, postremo suberectis. *Bractae* infimae frondosae, superiores minutae, omnes sparse ciliolatae. *Pedicelli* 1–3.5 mm longi, erecti usque leviter patuli, glabri. *Corolla* alba, subrotata, 2.5–3.5 mm diam., tubo usque ad 0.3 mm longo lobisque ovato-oblongis, apiculatis usque mucronatis, 1.5–1.8 mm longis. *Antherae* sublenticulares usque ellipsoideae, 0.4–0.5 mm longae, lutescentes. *Mericarpia* usque ad 1.5 mm longa, ovoidea, minute rugulosa, glabra.

Type. Turkey B7 Erzincan: Keşiş Da. above Cimin, 2700 m, 27 vii 1957, *Davis* 31640 (holo. W; iso. E).

Distr.: Endemic to Keşiş Da.

This local endemic is apparently closely related to the more widespread *G. mite* which is a taller plant, up to 60 cm, with longer and usually entirely glabrous leaves and broadly pyramidal inflorescences.

***G. zabense* Ehrend., sp. nov.**

G. psilophyllo Ehrend. & Schönb.-Tem. proximum, sed differt indumento denso, foliis obtusiusculis floribusque minoribus.

Planta perennis, suffrutescens, dense pubescens. *Caules* c. 25–35 cm alti, basi ± lignescentes, erecti usque ascendentes, ramosi; internodia inferiora abbreviata, superiora usque ad 5 cm elongata, interdum omnia ± aequilongae, c. 2–2.5 cm. *Folia* verticillata 6, 15–20 × 2–3 mm, oblanceolato-oblonga, obtusiuscula, subpetiolata, margine plano, nervo subtus conspicuo, ± patula usque reflexa. *Inflorescentia* late pyramidalis, multiflora, laxa, ramis patulis; bractae inferiores frondosae, superiores cito reductae. *Pedicelli* 0.5–3.5 mm longi, erecti usque subpatuli. *Corolla* alba, extus

pilosa 2.5–3 mm diam., tubo c. 0.4 mm longo lobisque ovato-oblongis, breviter apiculatis, usque ad c. 1.5 mm longis. *Ovarium* hirsutum. *Fructus* ignotus.

Type. Turkey C10 Hakkari: Zab gorge, 9 km from Hakkari to Van, 1200 m, 14 vi 1966, Davis 44933 (holo. E).

Distr.: Endemic; known only from the type gathering.

Very similar in habit to *G. psilophyllum* which occurs in the subalpine to alpine region from E Anatolia to W Iran. This species differs from *G. zabense* in its glabrous to sparingly puberulent stems and leaves, usually acuminate leaf-apex and larger corollas (3–5 mm diam.).

***G. basalticum* Ehrend. & Schönbr.-Tem., sp. nov.**

G. achurensi Grossh. simile, sed caule glabro, foliis latioribus et corollis ochroleucis (nec lacteis) perspicue apiculatis diversum. A *G. czerepanovii* Pobed. differt glabritie caulis saepe elatioris ac foliorum plerumque majorum aut latiorum quidem.

Planta perennis usque suffrutescens, siccando cumariniodora, radice lignosa ac caudice crasso multicipiti. *Caules* nonnulli (10–)15–30(–40) cm alti, erecti usque leviter ascendentes aut partim e basi procumbenti ramos erectos emittentes, basi ± lignescentes, quadranguli usque quadricostati, nodis ± puberulis exceptis glaberrimi, sub anthesi ramis vegetativis nonnullis, internodiis ± aequilongis [c. 1–5(–7) cm]. *Folia* verticillata patula usque subreflexa (3–)4–6, (4–)8–25(–35) × 2.5–5 mm, oblanceolato-spathulata vel -oblonga usque obovata, apice rotundata ac saepe brevissime apiculata usque obtusa aut cuspidata usque acuta, sine apice hyalino perspicuo, margine ± plano minutissime papillosa, glabra, nervo tenui subtus quidem distinguibili. *Inflorescentia* ± laxa ovoidea usque pyramidalis, ramis subdivaricatis gracilibus, ultimis monochasialibus. *Bractae* eximie diminutae. *Pedicelli* c. 1–4.5 mm longi, erecto-patuli usque patuli. *Corolla* ochroleuca rotata, c. 2–3 mm diam., lobis oblongis vix usque longe apiculatis, apice usque ad dimidium lobi aequanti. *Antherae* in sicco plerumque pallidae vel fusciscentes. *Mericarpia* reniformia disjuncta, saepe solitaria, c. 1.1–1.6 mm longa, nigricantia, obsolete rugulosa, glabra.

Type. Turkey A8 Erzurum: 39 km N of Tortum on road to Artvin, 6 km S of Tortum gölü, narrow gorge W of road, 1150–1200 m, volcanic talus and rock, Ehrendorfer et al. 787–122–1 (holo. WU; iso. E).

Distr.: Endemic to NE Anatolia.

The new taxon is apparently limited to volcanic talus and rock in the Ağrı-Erzurum-Artvin area. With its rotate slightly yellowish flowers it appears to connect sections *Orientigalium* and *Leiogalium*. *G. basalticum* seems to be closely related to the vicarious *G. achurense* Grossh. from S Transcaucasia (Nakhichevan) which can be distinguished by its hairy stems, shorter, linear-oblong, reflexed leaves and milk-white corollas with scarcely apiculate lobes. Another close relative is *G. czerepanovii* Pobed. from S Transcaucasia and NW Iran, which seems restricted to limestone cliffs, and is a rather low perennial, with smaller, ± coriaceous and often narrower ciliate to somewhat hairy leaves, hispidulous stems and whitish flowers.

Within the extremely polymorphic *G. incanum* group, one of the caespitose narrow-leaved (sub)alpine representatives of Sect. *Orientalium*, the following new species has to be recognised:

***G. sorgerae* Ehrend. & Schönb.-Tem., sp. nov.** Fig. 2.

Syn.: *G. incanum* Sm. subsp. *centrale* Ehrend. in Öst. Bot. Zeitschr. 98:445 (1951), pro parte.

Planta leviter suffrutescens nana, caudice multicipiti. *Caules* c. 3–4 cm alti, prostrato-ascendentes, brachyblastis basalibus inconspicuis, dense hirsuti. *Folia* verticillata 6, lineari-oblancoolata vel anguste elliptica, 4–6 × 0.7–1 mm, pilis crispulis c. 0.1–0.12 mm longis hirsuta, apice hyalino 0–0.15 mm longo, margine revoluta, nervo subtus angusto, 0.07–0.12 mm lato. *Inflorescentia* perreducta, pauciflora. *Pedicelli* c. 2–3 mm, hirsuti. *Corolla* in sicco albida, infundibularis 2–2.5 mm diam., lobis triangulari-oblongis, subcucullatis. *Ovarium* et mericarpia hirsuta.

Type. Turkey C3 Isparta: Dedegöl Da., 2200 m, 1 vii 1965, *Sorger* 65–42–70 (holo. hb. Sorger; iso. WU).

Distr.: Endemic to the Isaurian Taurus.

This is one of the species with rather obsolete basal short vegetative shoots. It is apparently closely related to the likewise dwarf *G. incanum* Sm. subsp. *pseudo-cornigerum* Ehrend. from the eastern parts of C and adjacent E Anatolia, which differs, however, in its less dense indumentum, longer hyaline leaf-apex, broader nerve on the underside of the leaf and larger corollas, (2.75–)3.5–5 mm diam. Some specimens of the taller and often glaucous subsp. *centrale* Ehrend., with its centre of diversity in SW Anatolia, occur sympatrically with *G. sorgerae* and seem to approach the latter in their dense and rather long indumentum.

Sect. *Jubogalium* Ehrend.

***G. parvulum* [Hub.-Mor. ex] Ehrend. & Schönb.-Tem., sp. nov.**

G. jungermannioidi Boiss. proximum, sed caulibus basi puberulis, supra nodos saepe hirtellis, foliis haud imbricatis, distincte mucronulatis, margine leviter revolutis, corollis flavo-virentibus ovariisque breviter appresse pilosis ab eo recedit. Etiam *G. cappadocico* Boiss. affine, sed foliis angustioribus hirtellis, thyrsis perlaxis, floribus longius pedicellatis et pilis ovarii curvatis (nec strictis) diversum.

Planta perennis nana, gracillima, dense caespitosa. *Caules* filiformes, 2–4(–5) cm alti, subalato-quadranguli, parte inferiore procumbentes, puberuli, ramis erectis usque ascendentibus, sparse puberulis, supra nodos tantum saepe hirtellis. *Folia* verticillata 5–6, 3–5.5(–6.25) × 0.2–0.5(–0.9) mm, inferiora internodia paulo superantia, oblanceolata usque oblanceolato-elliptica, superiora internodiis quarta usque tertia parte breviora, linearia usque anguste oblanceolato-linearia, acicularia, nitida, apice leviter incurvo cuspidata usque mucronulata, apice hyalino 0.5–1.5 mm longo, margine leviter revoluta, supra praecipue basin versus hirtella, subtus glabra, nervo crasso prominenti. *Inflorescentia* pauciflora perlaxa subcorymbiformis, cymis 2(–3)-floris, *pedunculis* tenuissimis 2–6 mm, *pedicellis* filiformibus c. 3–7.5 mm longis, divaricatis, glabris. *Corolla*

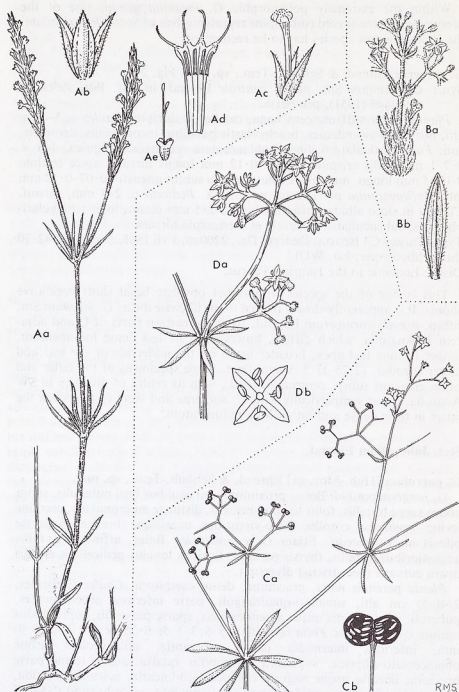


FIG. 2. A, *Crucianella sorgerae*: a, habit $\times \frac{3}{4}$; b, bracts $\times 3$; c, flower & bracts $\times 3$; d, corolla, dissected $\times 4$; e, gynoecium & calyx $\times 4$. B, C, D, *Galium*: B, *G. sorgerae*: a, inflorescence & upper part of stem $\times 2$; b, cauline leaf $\times 6$. C, *G. isauricum*: a, partial inflorescence $\times 1$; b, mericarp $\times 6$. D, *G. brevifolium* subsp. *insulare*: a, partial inflorescence $\times 2$; b, corolla $\times 4$.

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flavo-virens, c. 1.5–2(–2.5) mm diam., subcylathiformis, lobis ovatis vel oblongo-ovatis, apice breviter incurvo-apiculatis. *Ovarium* striis dorsalisibus appresse pilosis. *Mericalpia* late ellipsoidea, c. 0.75–1 mm longa, flavida, colliculata, dorso pilis 0.07–0.1 mm longis sursum curvatis uncinatis hirtella.

Type. Turkey C6 Adana: mountains N of Haruniye, 410 m, 13 vi 1953, Huber-Morath 12685 (holo. hb. Hub.-Mor.; iso. WU).

Distr.: Endemic to N parts of Amanus mts.

This local endemic is a geographical and morphological link between *G. jungermannioides* and *G. cappadocicum* and forms with them a disjunct relict group of dwarf perennial chasmophytes. It is closely allied to *G. jungermannioides* Boiss. from the Lebanon on account of its densely caespitose habit and leaf size; the latter, however, can be distinguished by its glabrous stems, subimbricate leaves with usually flat margins, and dark-purplish flowers. *G. cappadocicum* Boiss. from the mountains of E Anatolia differs in its more compact inflorescences, somewhat broader leaves [up to 1.5(–2) mm] and usually villous mericarps (hairs more often straight, up to 0.35 mm).

Sect. *Kolgyda* Dumort.

G. isauricum Ehrend. & Schönb.-Tem., sp. nov. Fig. 2.

G. peplidifolio Boiss. affine, sed foliis verticilli (4–)6–8, (nec 4–5) angustioribus, $\pm$ apiculatis (nec obtusis) et lobis corollae longioribus ab eo dignoscendum. A *G. brevifolio* Sm., cui forma foliorum simile, floribus minoribus, lobis corollae haud aristatis pedicellisque tenuioribus diversum.

Herba annua gracilis, c. 15–25 cm alta. *Caulis* ascendenti-erectus, quadrangulus, $\pm$ dimidio superiore ramosus, laevis et glaber. *Folia* verticillata (4–)6–8, infima c. 3–4 $\times$ 1–1.5 mm, suborbiculari usque oblanceolato-spathulata, apiculata usque acuta, petiolata, petiolo lamina triplo brevior usque eam subaequant; superiora 5–9 $\times$ 0.4–0.8 mm, lineari-oblanceolata, acuta usque apiculata, subpetiolata, secus marginem nervumque sparsim antrorso-scabrida usque sublaevia, glabra. *Inflorescentia* late corymbiformis, glabra, ramis patulis usque divaricatis; *pedicelli* 2–5 mm longi, capillares, divaricati, glabri. *Bractae* cito diminutae, nodi ultimi inflorescentiae iis destituti. *Corolla* in sicco albida, subrotata, 1.5–2.25 mm diam., lobis tubo c. triplo longioribus, ovato-oblongis usque lanceolatis, obtusiusculis. *Mericalpia* subglobosa, c. 1–1.5 mm diam., laevia, albide striata, glabra.

Type. Turkey C3 Antalya: 9 km S of Akseki, 1050 m, 29 v 1962, Ehrendorfer 62-1/57-4 (holo. WU).

Distr.: Endemic to Isauria.

Apparently close to *G. peplidifolium*, distributed from the E Aegean Islands to the E parts of S Anatolia, which may be distinguished from it by its less numerous, broader and obtuse leaves and shorter corolla lobes. *G. brevifolium* from W and SW Anatolia, which is similar in leaf-shape, differs in its large flowers on thickish pedicels and caudate-aristate corolla-lobes.

G. brevifolium Sm., widely distributed through W and SW Anatolia, can be divided into two subspecies:

***G. brevifolium* Sm. subsp. *brevifolium*.**

Syn.: *G. caudatum* Boiss., Diagn. ser. 1, 3:48 (1843).

Inflorescentia cymis $\pm$ corymbiformibus composita. *Lobi corollae* aristati.

Type. Turkey C3/4?: ad littora Caramaniae, *Sibthorp* (OXF).

Distr.: W & SW Anatolia. The type locality is not known with precision.

***G. brevifolium* Sm. subsp. *insulare* Ehrend. & Schönb.-Tem., subsp. nov.**
Fig. 2.

Syn.: *G. caudatum* Boiss. var. *chium* Boiss. & Orph. in Boiss., Diagn. ser. 2, 6:91 (1859).

Inflorescentia cymis subumbellatis composita. *Lobi corollae* apiculati tantum.

Type. Islands: In insula Chio (Khios) supra Vrontado, 900 m, *Orphanides* (holo. ATHU, n.v.).

Distr.: Endemic to the Islands and to the W and SW coastal regions of Anatolia.

This subspecies seems to be related to *G. penduliflorum* Boiss., an endemic of W and WC Anatolia, which differs, however, in its obtuse leaves, thinner, somewhat nodding pedicels and smaller flowers. *G. nigricans* Boiss. from SE Anatolia is similar to some extent as to the thickened pedicels, but deviates distinctly by its smaller purplish flowers and narrower leaves.

***G. stepparum* Ehrend. & Schönb.-Tem., sp. nov.** Fig. 3.

G. brevifolio Sm. affine sed differt floribus minoribus, lobis corollae haud aristatis fructibusque subnutantibus.

Planta annua gracilis, 5–8 cm alta. *Caulis* saepe e basi ramosus, ascendens usque erectus, quadrangulus, basin versus $\pm$ retrorse scaber, sursum tantum aut tota longitudine laevis. *Folia* verticillata (6–)8–12, inferiora c. $2.5 \times 1.1\text{--}1.5$ mm, obovato-spathulata usque oblanceolata, secus marginem $\pm$ revolutum et supra hirsuta; superiora $3\text{--}6 \times 0.3\text{--}0.5$ mm, lineari-oblanceolata, cuspidata, apice hyalino usque ad 0.2 mm longo, secus marginem perrevolutum antrorse scabrida, supra $\pm$ hirsuto-scabrida. *Inflorescentia* terminalis $\pm$ trichotoma, cymis jam e parte inferiore caulis orientibus. *Pedunculi* subpatuli usque divaricati, glabri. *Pedicelli* 0.75–2.5 mm longi, sparse antrorso-scabridi, fructiferi subincrassati, $\pm$ recurvi. *Bractaeae* anguste oblanceolatae, sursum cito diminutae, ad nodos ultimos absunt. *Corolla* in sicco albida, rotata, c. 2–2.5 mm diam., lobis ovatis, obtusis usque breviter apiculatis. *Ovarium* hirsutum, pilis patulis leviter incurvis. *Mericarpia* subglobosa, c. 1 mm diam., hirsuta, pilis tenuibus basi vix dilatatis.

Type. Turkey B3 Kütahya: 50 km N of Afyon, 1000 m, 1 vi 1963, *Sorger* 63–46–60 (holo. hb. Sorger; iso. WU).

Distr.: Endemic to WC Anatolia.

This slender annual reminds one of the foregoing *G. brevifolium* because of its slightly thickened pedicels. The latter may be distinguished by its large corollas with caudate-aristate lobes and strongly incrassate, erect pedicels.



FIG. 3. *Galium*. A, *G. stepparum*: a, partial inflorescence $\times 2$; b, corolla $\times 4$. B, *G. floribundum* subsp. *airoides*: a, partial inflorescence $\times 2$; b, stem indumentum, much enlarged. C, *G. pseudocapitatum*: a, habit, slightly more than natural size; b, corolla, dissected $\times 4$; c, flower $\times 4$. D, *G. exurgens*, partial inflorescence (from immature material) $\times 2$. E, *G. runcinatum*, undersurface of leaf, much enlarged.

Two subspecies are recognised within *G. floribundum* Sm., a rather widespread annual throughout W and S Anatolia and the adjacent Islands, well characterised by purplish minute flowers on likewise purplish pedicels and hairy ovaries:

***G. floribundum* Sm. subsp. *floribundum*.**

Syn.: *G. nebulosum* Boiss., Diagn. ser. 1, 3:49 (1843).

G. pseudointricatum Cand. in Bull. Soc. Bot. Fr. 44:149 (1897).

Folia saepius mucronata, apice hyalino usque ad 0·3(–0·4) mm longo. *Pedicelli* 1·5–3(–6) mm longi. *Corolla* usque ad 2·3 mm diam.

Type: In insula Cypro, *Sibthorp* (OXF).

Distr.: Mainly W and S (more sporadically N) Anatolia, Islands.

***G. floribundum* Sm. subsp. *airoides* [Hub.-Mor. ex] Ehrend. & Schönb.-Tem., subsp. nov. Fig. 3.**

Folia subulato-aristata, apice hyalino 0·4–0·5 mm longo. *Pedicelli* 4–11 mm longi. *Corolla* 1·1–1·6 mm diam.

Type: Turkey C3 Antalya: bay of Tekirova at E foot of Tahtali Da., on serpentine, 0–50 m, 25 v 1950, *Huber-Morath* 10079 (holo. hb. Hub.-Mor.; iso. WU).

Distr.: Endemic to Tahtali Da.

This subspecies, with strongly elongate pedicels and aristate leaf-tips, seems restricted to serpentine.

***G. pseudocapitatum* [Hub.-Mor. ex] Ehrend. & Schönb.-Tem., sp. nov. Fig. 3.**

Syn.: *G. capitatum* sensu Barbey, Lydie, Lycie, Carie 61 (1890), non Bory & Chaub. (1832).

G. capitato Bory & Chaub., *G. incrassato* Halácsy et *G. globulifero* Hub.-Mor. & Reese affine, sed omnibus ovario subpyriformi distinctissimum.

Planta annua, intricato-ramosa, 20–35 cm alta. *Caules* basi prostrato-geniculati, ramis ± erectis, quadrangulis, angulis subprominentibus scabridis usque sublaevibus, ceterum glabris aut hirsutis. *Folia* verticillata 6–8, 7–13(–15) × 1·2–5 mm, inferiora oblanceolato-spathulata, petiolata, petiolo dimidium laminae ± aequanti, superiora lineari-oblanceolata, apiculata, apice hyalino, c. 0·1–0·2 mm longo, secus marginem revolutum antrorso-scabrida, glabra aut hirsuta. *Inflorescentia* elongato-pyramidalis usque cylindracea, cymis subcapitatis, c. 10–20-floris in dichasia dispositis, pedunculo glabro aut hirsuto. *Bractee* cymas fulcrantes 1–2, cymis paulo breviores usque eas leviter superantes, lanceolatae usque anguste ellipticae, acuminato-cuspidatae, apice hyalino. *Pedicelli* 0·3–1·25 mm longi, glabri aut hirsuti. *Corolla* in sicco albidula, 1·5–2 mm diam., crateriformis, tubo distincte contracto, lobis late ovatis, mucronatis (mucrone 0·1–0·2 mm longo). *Ovarium* obconico-pyriforme, supra manifeste dilatatum, papillosum, glabrum aut hirsutum.

Type: Turkey C3 Antalya: auf salzhaltigen steinigen Orten bei Vinika (Finike), 26 vi 1883, *Pichler* (holo. & iso. WU).

Distr.: Endemic to the Lycian Taurus.

This plant belongs to a group of annual *Galia* with flowers arranged in subcapitate cymes. *G. capitatum* from C and S Greece and *G. incrassatum* from Crete, both with reddish flowers, and *G. globuliferum*, a local endemic from the coast near Muğla, are distinct, however, by the shape of the ovary which is never pyriform but ovoid to ellipsoid.

***G. exsurgens* Ehrend. & Schönb.-Tem., sp. nov. Fig. 3.**

Syn.: *G. hierosolymitanum* sensu Boiss., Fl. Or. 3:76 (1875) pro parte excl. typ.

G. pseudocapitato [Hub.-Mor. ex] Ehrend. & Schönb.-Tem. affine sed corollis minoribus, rotatis (nec crateriformibus) et mericarpiis reniformibus ab eo distinctum. Habitu et indumento *G. hierosolymitano* L. simile, sed differt foliis latioribus, cuspidatis (nec acuminato-aristatis) lobisque corollae breviter mucronatis (nec aristatis).

Planta annua ramosissima, 7–40 cm alta, in sicco ± nigrescens. *Caules* saepe numerosi, prostrato-ascendentes usque suberecti, ramis erecto-patentibus, quadranguli, praesertim angulis prominentibus plerumque distincte retrorso-scabridi et hirsuti aut sublaeves et glabri. *Folia* verticillata (4–)6–10, 4–15 × 1–2.5 mm, inferiora in verticillis approximatis 4–6 tantum, obovato-spathulata usque oblanceolata, apiculata, secus marginem leviter revolutum et nervum subtus antrorso-scabrida, ceterum glabra, superiora oblanceolato-oblonga usque-linearia vel (anguste) elliptica, cuspidata, apice hyalino 0.2–0.3 mm longo, secus marginem ± revolutum antrorso-scabrida et saepius hirsuta, interdum glabra. *Inflorescentia* (elongato-)pyramidalis usque corymbiformis, cymis laxae subcapitatis, 4–12-floris, dichasii duplici modo dispositis. *Pedunculi* erecto-patentes, hirsuti aut subglabri. *Pedicelli* 0.5–1.5 mm longi, ± dense hirsuti, fructiferi ± reflexi et inconspicue incrassati. *Bractee* cymas fulcrantes 1–2, eas ± aequantes usque iis paulo longiores, ellipticae. *Corolla* in sicco albida, subrotata, 1–1.25 mm diam., lobis ovatis mucronatis (mucrone 0.1–0.2 mm longo), plerumque extus hirsuta. *Ovarium* glabrum aut hirsutum, pilis patulis, interdum leviter uncinatis. *Mericalpia* immatura late reniformia, c. 0.5–0.6 mm longa, papillosa, glabra aut hirsuta.

Type. Turkey C4 İçel: 40 km W of Anamur, 400 m, *Sorger* 66–13–15 (holo. hb. *Sorger*; iso. WU).

Distr.: Endemic to the Isaurian Taurus.

Approaches in habit and indumentum *G. hierosolymitanum*, which is distributed from the E parts of S and E Anatolia to Syria and Lebanon and may be distinguished by its narrower, ± acuminate-aristate leaves and aristate corolla lobes. Possibly related to *G. pseudocapitatum* too, which differs, however, mainly in its subpyriform ovaries. Intermediates occur between this species and the partly sympatric *G. floribundum*, characterised by scarcely capitate, rather loose cymes and long aristate corolla lobes.

***G. runcinatum* Ehrend. & Schönb.-Tem., sp. nov. Fig. 3.**

Syn.: *G. longeapiculatum* Hausskn., nom. in sched.

G. nigricanti Boiss. affine, sed corollis majoribus flavoviridibus folisque saepe planis et retrorso-aculeolatis discedens. A *G. haussknechtii* Ehrend., cui foliis retrorso-aculeolatis simile, praesertim florum colore et pedicellis fructiferis haud recurvis diversum.

Planta diffuse ramosa, 5–25 cm alta, in sicco haud nigrescens. *Caules* plerumque validi, e basi vel parte superiore tantum ramosi, quadranguli, angulis $\pm$ sparse retrorso-scabridi, glabri. *Folia* verticillata 8–12, 5–15(–17) $\times$ 0.5–2.5 mm, infima spathulata, media oblanceolata, superiora lineari-lanceolata, apice acuminata usque subulata, apice hyalino inconspicuo, secus marginem planum, saepe leviter incrassatum aut basin versus leviter revolutum et nervum subtus prominentem retrorso-aculeolata, interdum dimidio anteriore antrorso-scabrida, basin versus patule usque retrorse aculeolata. *Thyrsi* corymbiformes ampli, ramis divaricatis. *Pedicelli* divaricati, 1–4 mm longi, capillares, glabri, fructiferi inconspicue incrassati. *Bracteae* 1–3 mm longae, lineari-subulatae, glabrae aut hirsutae. *Corolla* pallide flavo-viridis, c. 2–2.5 mm diam., rotata, lobis triangulari-ovatis, aristatis, arista lobum saepe superanti. *Mericalp* subglobosa, c. 1 mm diam., $\pm$ papillosa, glabra.

Type. Turkey B7 Elazığ: N side of Hazar Gölü, 1250 m, 5 vi 1957, *Davis & Hedge*, D. 28987 (holo. E; iso. W).

Distr.: Endemic to E Anatolia.

Apparently allied to *G. nigricans* Boiss., an annual with purplish flowers of similar shape but distinctly incrassate pedicels and antrorsely scabrid leaves, which is widespread from Egypt to more southern parts of E Anatolia and Iran. The often retrorsely scabrid leaf-margins are reminiscent of the sympatric *G. haussknechtii* Ehrend. from which it differs by its smaller size, non-trailing stems, yellowish (not white) flowers and erect (not recurved) pedicels in fruit.

***G. tortumense* Ehrend. & Schönbr.-Tem., sp. nov.**

G. ghilanico Stapf habitu simile sed caulibus thyrsisque glaberrimis et lobis corollae paulo majoris aristatis bene distinctum.

Planta annua gracilis, (8–)15–20 cm alta. *Caulis* jam e basi ramosus aut basi procumbens, ramis erectis usque ascendentibus, quadrangulus, glaberrimus. *Folia* verticillata 4–6, (5–)10–15 $\times$ 1–2 mm, oblanceolato-spathulata, inferiora cuspidata, apice $\pm$ hyalino, margine revoluta supra sparsissime antrorse, subtus retrorso-scabridula, petiolata, superiora plana, acuta usque cuspidata, apice hyalino obsoleto, subsessilia. *Thyrsi* elongato-pyramidales, glabri, ramis inferioribus $\pm$ elongatis, cymis axillaribus (1–)5–9-floris; *pedunculi* bracteis paulo usque subduplo longiores, divaricati; *pedicelli* c. 1–2 mm, divaricati, fructiferi leviter recurvi. *Corolla* in sicco albida, c. 1.3–1.5 mm diam., subcyathiformis, lobis ovato-oblongis, aristatis, arista lobum aequanti. *Mericalp* c. 1.3–2.3 mm longa, late reniformia, subpapillosa, glabra.

Type. Turkey A8 Erzurum: 39 km N of Tortum towards Artvin, 6 km SW of Tortum Gölü, narrow gorge W of road, 1150–1200 m, *Ehrendorfer et al.* 787–122–2 (holo. WU; iso. E).

Endemic to NE Anatolia.

This well separated new species seems to approach *G. ghilanicum* Stapf, a taxon of the *G. parisiense* L. group, which is widespread from the Caucasus to Syria and to C Asia (Nepal). *G. ghilanicum* differs mainly in its retrorsely scabrid stems and inflorescence branches, smaller flowers with acute to shortly apiculate corolla lobes, and smaller fruits (0.8–1.3 mm).