NOTES ON GENTIANACEAE

H. SMITH
(*Botanical Institute, Uppsala*)

1. The status of Crawfurdia and Tripterospermum

IN describing some new species in the Edinburgh herbarium I am going to use the generic names *Crawfurdia* Wall. and *Tripterospermum* Blume. Both genera have been discredited, but, as I think, on inadequate grounds. I shall give a summary of their history, and explain my reasons for maintaining them as valid genera.

Crawfurdia was established by Wallich (Tent. Fl. Napal. 63 (1826)). The genus was based on the two new species *Crawfurdia speciosa* Wall. and *C. fasciculata* Wall. Wallich found those two to be unlike all known *Gentiana* by their climbing habit and by the big, nodding flowers. No other distinctions were given.

In the same year, and possibly in the same month, Blume described a new genus and species of climbing gentian from Java: *Tripterospermum trinerve* Blume (Bijdr. 849 (1826)). In the diagnosis he relied not only on the climbing habit and the baccate fruit, he also pointed out the distinctive feature: "ovarium basi urceola brevi cinctum". This important characteristic has been overlooked by later authors.

Grisebach (in De Candolle, Prodr. 9: 121–122 (1845)) retained both genera without any discussion. His "species a *Crawfurdia* exclusae" included *C. blumei* G. Don, which is a younger synonym of *Tripterospermum trinerve* Blume. This indicates, that Grisebach felt convinced about the taxonomic validity of the genus *Tripterospermum*.

An investigation of this group of plants was carried out by C. B. Clarke (Journ. Linn. Soc. Lond., Bot. 14: 441–443 (1875)). Clarke did not accept the genus *Tripterospermum* Blume. He transferred it to *Crawfurdia* Wall., and divided this genus into the two sections *Dipterospermum* Clarke and *Tripterospermum* (Blume) Clarke. The former characterised by: "capsula papyracea . . . semina complanata, undique simpliciter alata, hinc inde sectione horizontali dipterosperma". The latter by: "capsula baccata . . . semina complanata undique alata, ala altero simplici, altero latere bifida, hinc inde sectione horizontali tripterosperma". In *Dipterospermum* he placed one of the Wallich species, *C. speciosa* and the new described *C. puberula* Clarke in *Tripterospermum* the other Wallich species, *C. fasciculata* (partim)[1] together with *C. luteo-viridis* Clarke, *C. blumei* G. Don, and *C. japonica* Sieb. et Zucc. In the Flora of British India (1883) Clarke maintained this arrangement, but made the sections into subgenera and amended partly the diagnosis of *Tripterospermum*: " . . . capsula 2-valved or subindehiscent. Seeds wedge-shaped, triquetrous almost[2] winged on the angles, one face much narrower than either of the others".

[1] The nomenclatural confusion around this epithet is beautifully illuminated by J. R. Sealy in Kew Bull. 1949, p. 311 etc.

[2] The word "almost" winged is certainly a misprint for mostly winged. Compare with the earlier statement "undique alata". Of the species Clarke had occasion to examine only certain races of *C. luteo-viridis* have wingless seeds, or nearly so. (Fig. 2, E–H).

The next revision of *Crawfurdia* was made by Gilg (Engler & Prantl, Natürl. Pflanzenfam. IV; 2: 79 (1895)). He added as subgenus No. 1 *Pterygocalyx* (Maxim.) Gilg, based on *Pterygocalyx volubilis* Maxim. This plant does not belong here. It is a biennial *Gentianella* of a type which comes close to section *Crossopetalum*, but differs from it by climbing habit and discoid, alate seeds. The subgenera *Dipterospermum* and *Tripterospermum* were retained, as arranged and diagnosed by Clarke. No further enlightenment on the group was given. The disc around the base of the gynophore, recorded by Blume as a characteristic of *Tripterospermum*, is faithfully reproduced in Fig. 37D, but not even mentioned in the text. Gilg seems, however, to have felt uneasy about the arrangement of the genus. He writes: "Trotz der ziemlich grossen Verschiedenheiten der Untergattungen dürfte es zweckmässig sein die Gattung als Ganzes zu erhalten, da sämtliche Arten habituell ausserordentlich übereinstimmen und dadurch von allen Gattungen der Familie scharf geschieden sind".

Lastly, the group was examined by Marquand (Kew Bull. 1931, p. 69 etc.). He found, that the treatment of *Crawfurdia* as a genus independent of *Gentiana* could no longer be maintained. I shall quote important parts of his argument, as I have some objections to raise. "All subsequent authors have retained the genus *Crawfurdia*, distinguishing it from *Gentiana* solely on the ground of its twining stems and drooping flowers. But *Gentiana filicaulis* Hemsley (sect. *Stenogyne*) is a species which exhibits distinct signs of climbing habit, . . . On the other hand, *Gentiana crawfurdioides* (sect. *Dipterospermum*), a new species described below, has a wide range of habit, from distinctly twining stems to erect stems, which, though spirally twisted, are not more so than is frequently the case in *Gentiana* sensu stricto. In any case, *Crawfurdia* as a whole is a rather unnatural group and cannot be maintained as at present delimited, even as a subdivision of *Gentiana*. Its two sections, *Dipterospermum* and *Tripterospermum* are, however, natural and well marked by the seed characters, so that they are here transferred as sections of *Gentiana*".

I cannot agree with Marquand's conception of the group. First, the comparison with *Gentiana filicaulis* Hemsley is unfortunate. This rare species has been, so far as I know, collected only once. Its placing in the *Gentiana* section *Stenogyne* by Kusnezow was a mistake, which has never been corrected. How this happened is easy to find out. Hemsley regarded his plant as related to *Gentiana serra* Franch., *G. pterocalyx* Franch. and *G. rhodantha* Franch., "though distinct by extremely slender stem and distinctly petiolate leaves". These species were at that time referred by Franchet himself to sect. *Pneumonanthe*, and not to his newly described sect. *Stenogyne*. In this he counted a single species, the small-flowered and somewhat *Chondrophylla*-like *G. primuliflora* Franch. The sect. *Stenogyne*, as we know it, was arranged by Kusnezow (1894). He enlarged Franchet's section to comprise the above-mentioned species and the closely allied *G. striata* Maxim. Kusnezow never saw *G. filicaulis*. When he nevertheless transferred it to *Stenogyne* in company with these other species, he simply followed Hemsley's suggestion as to its probable relationship. *Gentiana filicaulis*[1] is no *Gentiana*, it is a typical

[1] **Tripterospermum filicaule** (Hemsley) H. Sm., **comb. nova.**—Syn. *Gentiana filicaulis* Hemsley in Journ. Linn. Soc. 26: 127 (1890).

Tripterospermum, though of somewhat smaller size than the usual. It is inevitably classified so by the distinctions which characterise this genus (see below). *Tripterospermum* is not connected with sect. *Stenogyne*, neither is any non-climbing species found in it.

The statement: "though spirally twisted, not more so than is frequently the case in *Gentiana* sensu stricto" is incomprehensible to me. I have never seen a *Gentiana* with the slightest twisting of the stem.

About *Gentiana crawfurdioides* (sect. *Dipterospermum*) Marquand says: (op. c. p. 73): "This species shows a clear connection with *Stenogyne*, the stems being spirally twisted to a slight extent only". I fail to see, where the connection with *Stenogyne* comes in. The plant is somewhat dwarfed in size compared to other species. The erect, slender, terete stems are slightly less twisted than usually is the case. They are, however, not straight but somewhat undulating. Of likeness to *Stenogyne*, there is not a trace to be found in the plant. The big flowers (5·5 cm), the floral details, the halfway split calyx with asymmetrical lobes, the big glabrous leaves and the whole bearing of the plant is totally incongruous with *Stenogyne*. The specimens were collected in pastureland. The ecological conditions in such open growing ground are not the same as in the usual *Crawfurdia* habitats, and they alone may account for the very slight modification from type. *Gentiana crawfurdioides* Marq. does not prove any connection between *Dipterospermum* and *Stenogyne*.

Marquand has in the same paper (p. 75) described a non-climbing *Dipterospermum*, *Gentiana semialata*.[1] This is a species of the greatest interest. The plant is of some 3 dm in height, it has an erect, *quadrangular*, stout stem without any trace of twisting. In these respects it is unique in the group, and it could be said to fall within the limits of the genus *Gentiana*, and thus form a connecting link with them. Its relationship with the climbing species of *Dipterospermum* is, however, obvious. This circumstance shows, that the delimitations between *Gentiana* and *Dipterospermum* are less strongly marked than they are towards *Tripterospermum*.

This occurrence of an erect, non-climbing species within a genus comprising numerous climbers of fairly great distribution, can be explained in two ways. One or several species could have emigrated to open regions, where their climbing ability would be of no use, and so in due time was lost. But if this is the story, it is difficult to see how the twisted, terete stems could be transformed into a straight quadrangular shape—a shape which is so primarily characteristic in *Gentianinae*. In *Crawfurdia semialata* I prefer to see a forerunner to the climbing Crawfurdias, a survivor from times older than the development of their climbing ability.

I see no reason why the already so wide genus *Gentiana* should be encumbered with the sections *Dipterospermum* and *Tripterospermum*, both plants of alien types. It is surprising that the investigators have relied so exclusively on the twining habit and on the shape of the seeds to keep the

[1] **Crawfurdia semialata** (Marq.) H. Sm., **comb. nova.** (Plate 26).—Syn. *Gentiana semialata* Marquand in Kew. Bull. 1931, p. 75. Conspecific with this is *Gentiana curviflora* Marquand, ibidem, p. 74. The only difference I can find between them is, that *semialata* is collected in October when in full flower, *curviflora* in August, with the first, partly misshapen flowers just coming out. Of the two names I have chosen the less inept one.

three groups apart. There are other easily noted and thorough-going morphological distinctions to use for classification.

Crawfurdia Wallich emendata.

Syn.: *Crawfurdia* subgenus *Dipterospermum* Clarke.
Gentiana sect. *Dipterospermum* (Clarke) Marq. emendata.

Vascular bundles in calyx tube 10; nectariferous glands at base of gynophore naked; stamens symmetrical, straight, of equal length, free part of filament much thickened downwards (Plate 27, 5); fruit capsular; perennial, climbing plants (with exception of *C. semialata*) with terete, spirally twisted stems (Fig. 1B).

It is apparent that the mysterious and disturbing *C. semialata* is closely related to the climbing species. The floral characteristics do exactly match. It is yet so far removed from them by the robust, quadrangular, not twisted stem, that it must be placed in a section of its own:

Crawfurdia, sectio **Protocrawfurdia** H. Sm., **sect. nov.** caule quadrangulo, non torto nec volubili, distincta.

Crawfurdia sectio **Crawfurdia** caule terete torto volubili distincta.

Tripterospermum Blume emendata.

Syn.: *Crawfurdia* subgenus *Tripterospermum* (Blume) Clarke.
Gentiana sectio *Tripterospermum* (Blume) Marq. emendata.

Vascular bundles in calyx tube 5; nectariferous glands at base of gynophore covered by a collar-like disc; stamens asymmetrical, of unequal length, at top unilaterally and uniformly curved downwards, free part of filaments filiform or nearly so (Plate 27, 1–3); fruit baccate or capsular; perennial, climbing plants with terete, spirally twisted stems (Fig. 1A).

Gentiana sectio **Stenogyne** Franch. emend. Kusnezow

Vascular bundles in calyx tube 5; nectariferous glands at base of gynophore naked; stamens asymmetrical, of unequal length, at top more or less curved downwards unilaterally; free part of filaments filiform or nearly so (Plate 27, 4); fruit capsular; annual (*G. rhodantha* Franch. excepted) plants with quadrangular, not twisted stems, and never climbing.

It must be pointed out, that in herbarium specimens the curving of the stamens in *Tripterospermum* and sectio *Stenogyne* is plainly visible only if the flowers are pressed at right angle to the unilateral curving.

Some of the species of *Stenogyne* do not always keep true to the characterisation above. In the small-flowered *G. primuliflora* Franch. the curving of the stamens is hardly observable. The two big-flowered species *G. souliei* Franch. and *G. pterocalyx* Franch. can sometimes develop a more or less incomplete extra set of vascular bundles.

The section *Stenogyne* is a somewhat mysterious group among the *Gentians*. It comprises some 15, mostly well-delimited species of apparent relationship, distributed within a rather small area in S.W. and W. China. All of them have in common a certain look, which makes them unlike other Gentians. I have denied any direct connection between them and *Crawfurdia* or *Tripterospermum*. Still, there are features which do hint obscurely in both

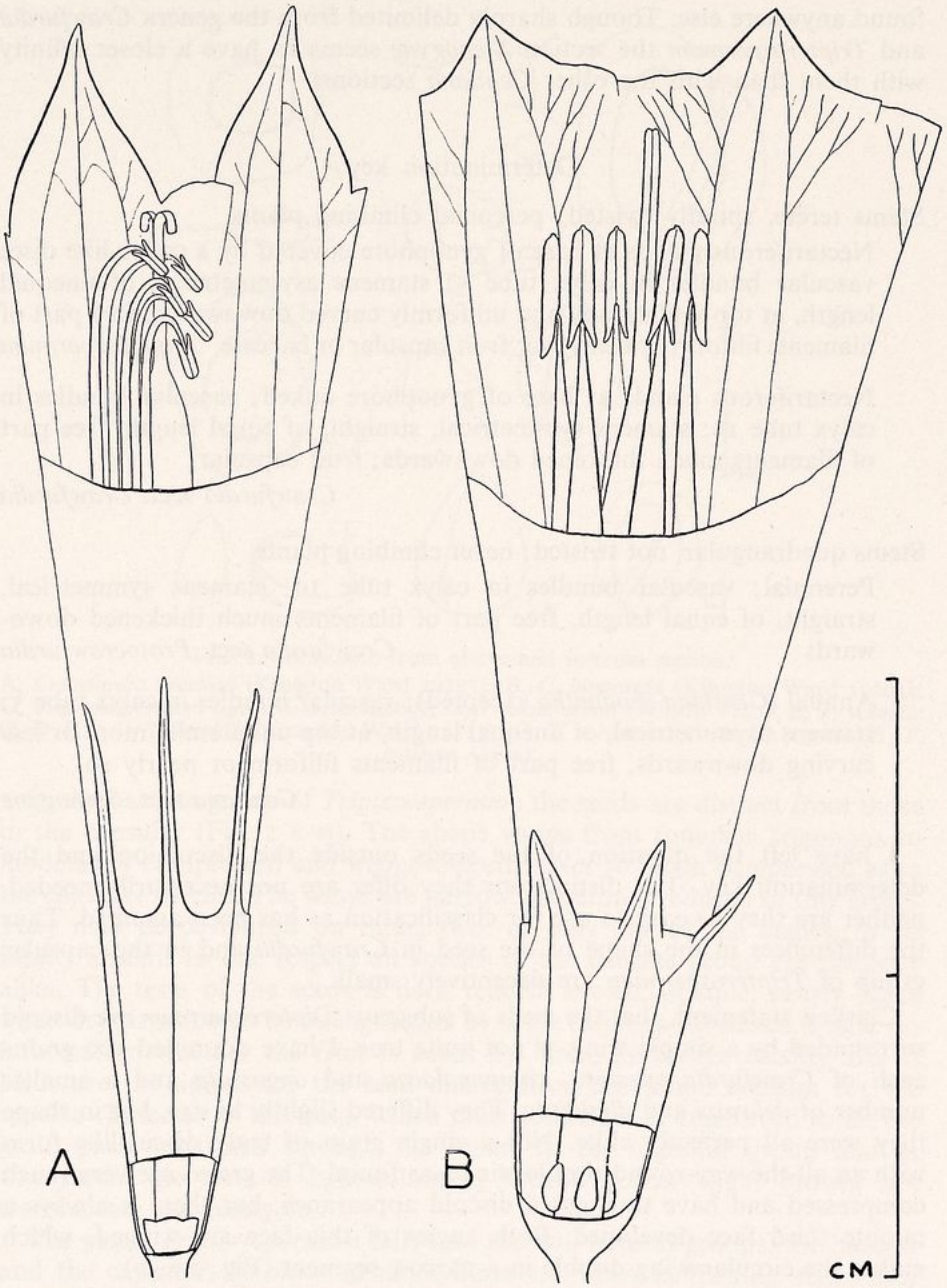


FIG. 1. Flowers partly cut open to show base of gynophore and upper part of stamens. A, *Tripterospermum* (*T. carlesii* H. Sm.); B, *Crawfurdia* (*C. speciosa* Wall.).

directions. They have the unilateral curving of the stamens in common with *Tripterospermum*, even if this here is less strongly marked than by them. But, the collar-like disc around the base of the pistil is lacking. The nectar-glands are naked, as they are in *Crawfurdia* and in *Gentiana*. A certain type of a stiff, short pilosity is often met with in *Stenogyne*. Exactly the same kind of pilosity is a characteristic of *Crawfurdia* sectio *Protocrawfurdia*, but not

found anywhere else. Though sharply delimited from the genera *Crawfurdia* and *Tripterospermum* the section *Stenogyne* seems to have a closer affinity with them than with the other *Gentiana* sections.

Determination key

Stems terete, spirally twisted; perennial climbing plants.

Nectariferous glands at base of gynophore covered by a collar-like disc; vascular bundles in calyx tube 5; stamens asymmetrical, of unequal length, at top unilaterally and uniformly curved downwards, free part of filaments filiform or nearly so; fruit capsular or baccate *Tripterospermum*

Nectariferous glands at base of gynophore naked; vascular bundles in calyx tube 10; stamens symmetrical, straight, of equal length, free part of filaments much thickened downwards; fruit capsular *Crawfurdia* sect. *Crawfurdia*

Stems quadrangular, not twisted; never climbing plants.

Perennial; vascular bundles in calyx tube 10; stamens symmetrical, straight, of equal length, free part of filaments much thickened downwards . . . . . *Crawfurdia* sect. *Protocrawfurdia*

Annual (*Gentiana rhodantha* excepted); vascular bundles in calyx tube 5; stamens asymmetrical, of unequal length, at top unilaterally more or less curving downwards, free part of filaments filiform or nearly so *Gentiana* sect. *Stenogyne*

I have left the question of the seeds outside the discussion and the determination key. The distinctions they offer are not necessarily needed, neither are they so easy to use for classification as has been assumed. Thus the differences in the shape of the seed in *Crawfurdia* and in the capsular group of *Tripterospermum* are deceptively small.

Clarke's statement, that the seeds of subgenus *Dipterospermum* are discoid surrounded by a simple wing, is not quite true. I have examined 100 grains each of *Crawfurdia speciosa*, *campanulacea* and *angustata* and a smaller number of *delavayi* and *dimidiata*. They differed slightly in size, but in shape they were all perfectly alike. Not a single grain of truly discus-like form with an all-the-way-round simple wing was found. The grains are very much compressed and have thus got a discoid appearance, but there is always a minute third face developed. Both angles of this face are winged, which makes the circular wing double in a narrow segment (Fig. 2 A, B).

The seeds in the capsular group of *Tripterospermum* are built on exactly the same pattern as in *Crawfurdia*, but the grains are slightly less compressed, and the third face thus made a little bigger (Fig. 2 C, D). Fully mature seeds can readily be identified, but in herbarium specimens, put into the plant press when the seed was still soft, the grains will be completely flattened. They are then difficult to tell, and are easily misinterpreted. Marquand himself has proved how dangerous it is to rely solely on seed characters in this case. Of the species he described or mentioned (*op. c.*), not less than 6, by him assigned to *Dipterospermum*, belong to *Tripterospermum* (see below).

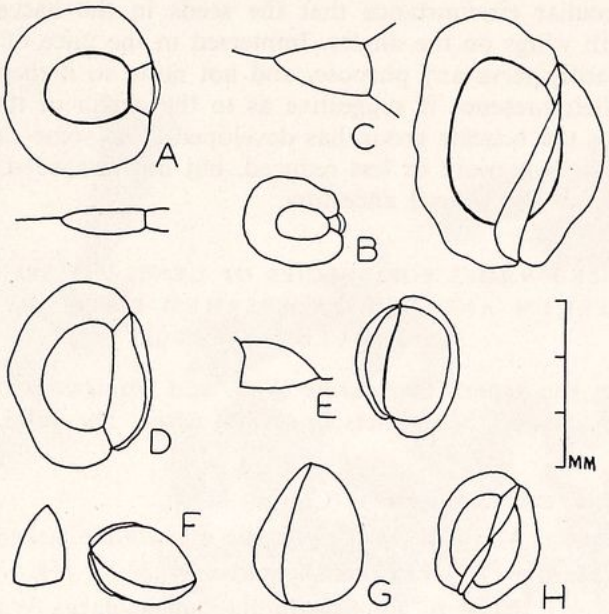


FIG. 2. Seeds seen from above and in cross section.
A, *Crawfurdia speciosa* (Kingdon Ward 20245); B, *C. angustata* (Kingdon Ward 19204); C, *Tripterospermum affine* (Clarke 14869); D, *T. discoideum* (Wilson 1742); E, *T. volubile* (J. D. H.); F, *T. volubile* (Kingdon Ward 21573); G, *T. cordatum* (H. Smith 13520); H, *T. trinerve* (Java).

In the baccate group of *Tripterospermum* the seeds are distinct from those in the capsular (Fig. 2 E–H). The shape varies from roundish trigonous to moderately compressed and wedge-shaped, never so much compressed as in the capsular species. The wings are narrow, sometimes reduced to tiny crests. They may be developed on three, two, or only one of the angles, or be totally absent. In one respect all species of the baccate group are perfectly alike. The testa of the seeds is dark reddish brown, opaque, nearly black when dry; it seems to be strengthened by some resinous substance. I have no information whether the fruit is eaten by birds, as berries usually are. If birds are the agents for the seed distribution, this could account for the specific character of the testa, which must somehow be reinforced to let the grain pass unharmed through the birds. In the capsular group and in *Crawfurdia* the testa is light-coloured, whitish yellow—light brown, not translucent, but nearly so.

The genus *Tripterospermum* falls into the two natural groups, the baccate and the capsular. However distinct these are when in fruiting state, they cannot be identified with full certainty when only flowers are at hand. I have tried in vain to find other thoroughgoing distinctions than those of the fruit. There are certain tendencies. In the baccate group the flowers are usually shorter than in the capsular—but not always. The calyx tube is usually short, with more or less obliquely spreading lobes laterally compressed and descending on the tube as wings. In the capsular group the calyx tube is usually longer, the lobes dorso-ventrally flattened and not descending on the tube. But there are exceptions in both directions. Until better known the genus *Tripterospermum* is best left undivided.

It is a peculiar circumstance that the seeds in the baccate group are equipped with wings on the angles. Immersed in the juice of the berry the wings can hardly serve any purpose, and not more so if they are eaten by birds. But their presence is suggestive as to the origin of the group. It is probable that the baccate group has developed from some capsular forms, and the wings, now more or less reduced, but not discarded, are a useless inheritance from the winged ancestors.

REVISED NAMES FOR SPECIES OF GENTIANA SECTIONS DIPTEROSPERMUM AND TRIPTEROSPERMUM LISTED BY MARQUAND (KEW BULL. 1931, 69).

Reinstating the genera *Crawfurdia* Wall. and *Tripterospermum* Blume, I am forced to change the epithets in several cases. The valid names are in bold type:

GENTIANA sectio DIPTEROSPERMUM (Clarke) Marq.

angustata (Clarke) Marq. p. 70. **Crawfurdia angustata** Clarke

bomareoides Marq. p. 73. **Crawfurdia bomareoides** (Marq.) H. Sm., **comb. nova.**

bulleyana (Forr.) Marq. p. 70. **Crawfurdia campanulacea** Wall. et Griff. = *Crawfurdia bulleyana* Forr.

crawfurdioides Marq. p. 72. **Crawfurdia crawfurdioides** (Marq.) H. Sm., **comb. nova.**

curviflora Marq. p. 74. **Crawfurdia semialata** (Marq.) H. Sm.

dimidiata Marq. p. 77. **Crawfurdia dimidiata** (Marq.) H. Sm., **comb. nova.**

fratri Marq. p. 70. **Crawfurdia delavayi** Franch.

heleni Marq. p. 69. **Crawfurdia angustata** Clarke = *Crawfurdia trailiana* Forr.

khamensis Marq. p. 70. **Crawfurdia thibetica** Franch.

iochroa Marq. p. 74. **Crawfurdia iochroa** (Marq.) H. Sm., **comb. nova.**

kingdoni Marq. p. 70. **Crawfurdia speciosa** Wall. = *Crawfurdia wardii* Marq.

nienkui Marq. p. 76. **Crawfurdia nienkui** (Marq.) H. Sm., **comb. nova.**

pricei Marq. p. 75. **Crawfurdia pricei** (Marq.) H. Sm., **comb. nova.**

semialata Marq. p. 75. **Crawfurdia semialata** (Marq.) H. Sm.

sessiliflora Marq. p. 76. **Crawfurdia sessiliflora** (Marq.) H. Sm., **comb. nova.**

sinkuensis Marq. p. 73. **Crawfurdia sinkuensis** (Marq.) H. Sm., **comb. nova.**

speciosa (Wall.) Marq. p. 70. **Crawfurdia speciosa** Wall.

caudata Marq. p. 78. **Tripterospermum caudatum** (Marq.) H. Sm., **comb. nova.**

confusa Marq. p. 70. **Tripterospermum volubile** (D. Don) H. Sm., **comb. nova.** = *Gentiana volubilis* D. Don in Prodr. Fl. Nepal. 126 (1825).

cordata Marq. p. 77. **Tripterospermum cordatum** (Marq.) H. Sm., **comb. nova.** = *Crawfurdia cordata* (Marq.) Hand.-Mazt.

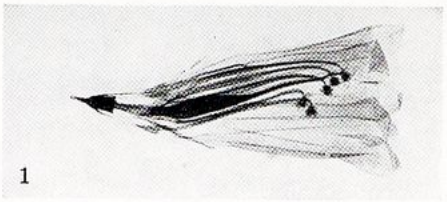
discoidea Marq. p. 72. **Tripterospermum discoideum** (Marq.) H. Sm., **comb. nova.**

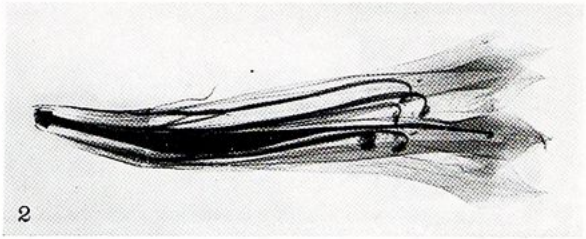
fascicularis Marq. p. 70. **Tripterospermum affine** (Wall.) H. Sm., **comb. nova.** = *Crawfurdia affinis* Wall.

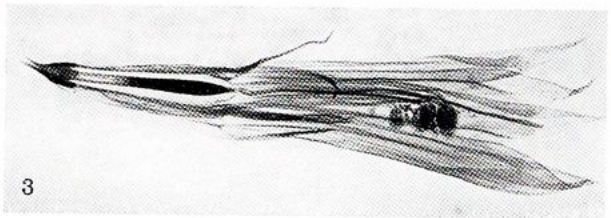
membranacea Marq. p. 75. **Tripterosperm ummembranaceum** (Marq.) H. Sm., **comb. nova.**

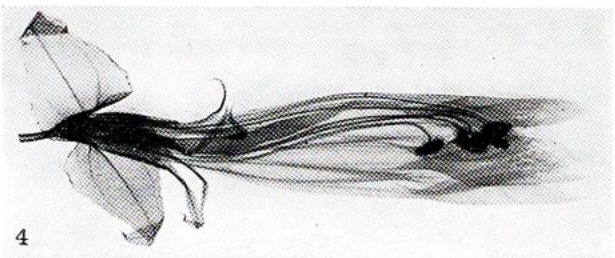
PLATE 26. Holotype of *Gentiana semialata* (Marq.) H. Sm. (Ward 4984).

facing p. 244









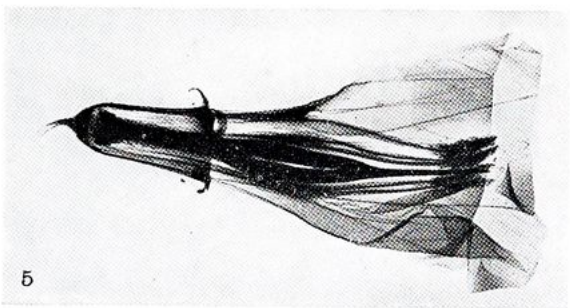


PLATE 27. Röntgen photos of flowers from herbarium specimens by Tor Nitzelius, Bot. Garden, Gothenburg. 1, *Tripterospermum volubile* (D. Don) H. Sm. (Ludlow, Sherriff & Hicks 20848). 2, *T. caudatum* (Marq.) H. Sm. (Farges 253). 3, *T. affine* (Wall.) H. Sm. (Khasia, Hooker f. & Thoms.). 4, *Gentiana rhodantha* Franch. (H. Smith 13550). 5, *Crawfurdia speciosa* Wall. (Ludlow & Sherriff 10005).

Note! 1 baccate, 2 and 3 capsular group of *Tripterospermum*, collar-like disc around base of pistil, filaments unilaterally curving at top. 4 the small naked nectar-glands in base of pistil unfortunately not visible, filaments unilaterally curving at top. 5 naked robust nectar-glands in base of pistil visible, stamens straight, thickened downwards.

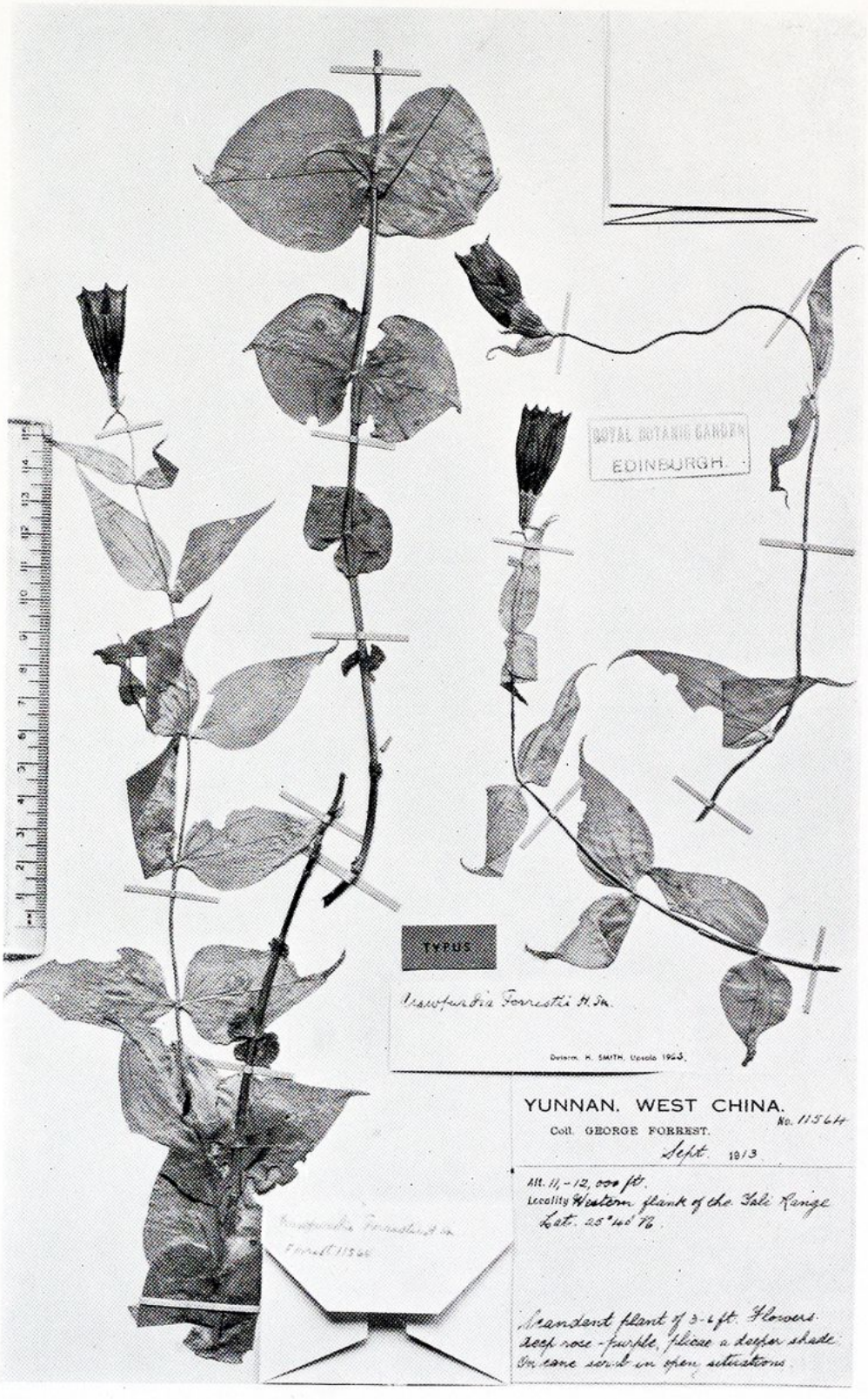


PLATE 28. Holotype of *Crawfurdia forrestii* H. Sm. (Forrest 11564).

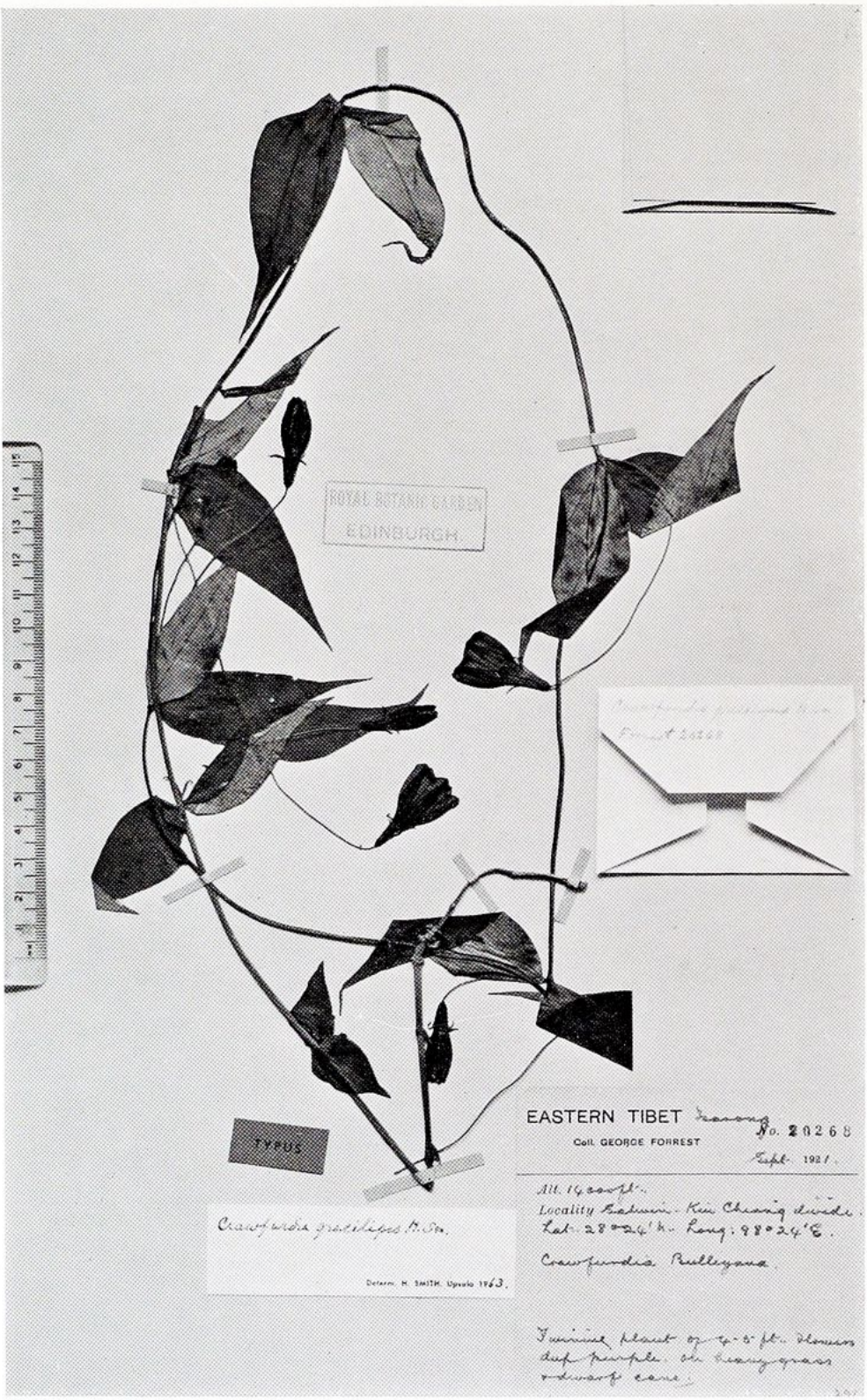


PLATE 29. Holotype of *Crawfurdia gracilipes* H. Sm. (Forrest 20268).

PLATE 30. Holotype of *Tripterospermum carlesii* H. Sm. (Carles 134).

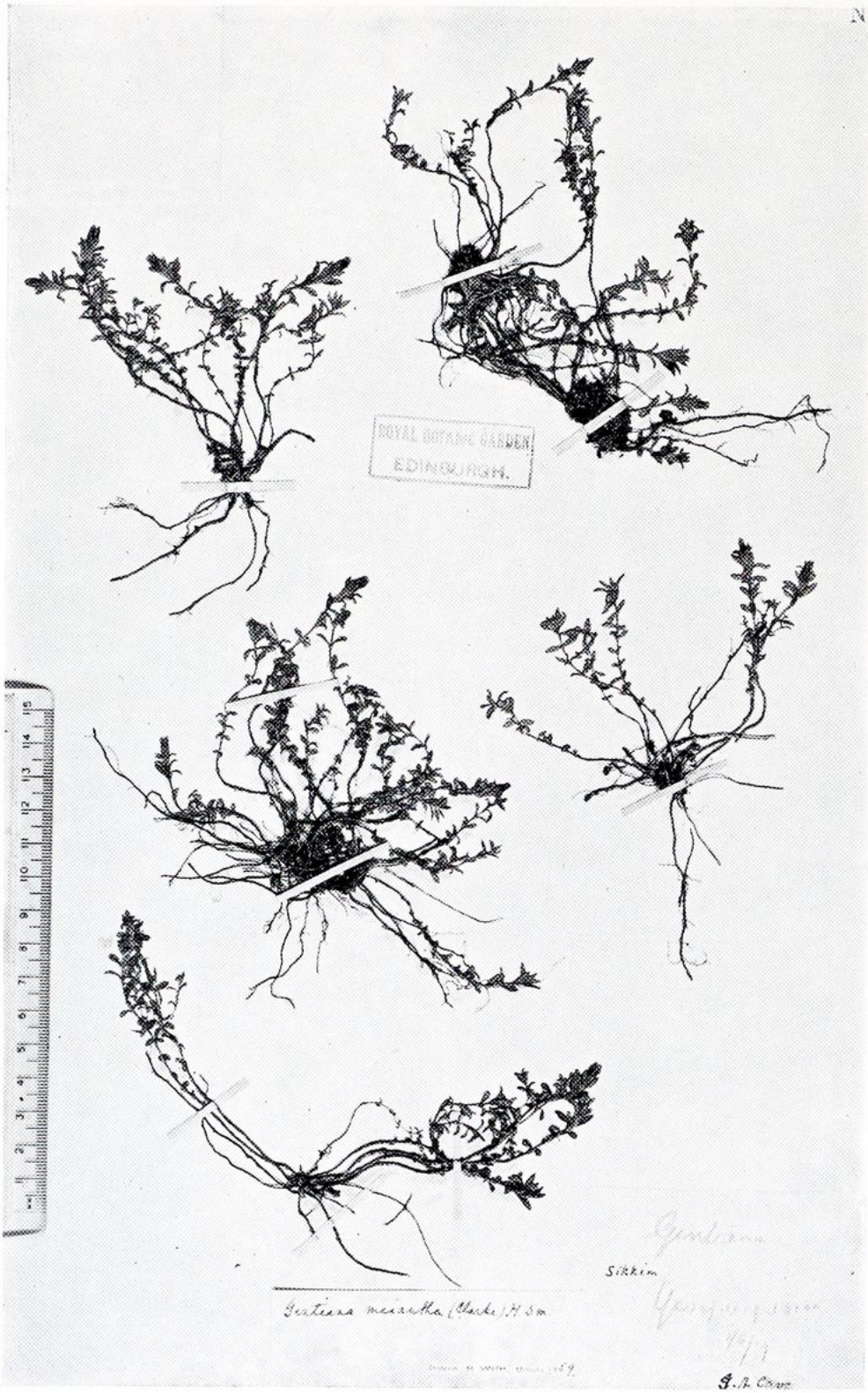


PLATE 31. Holotype of *Gentiana meiantha* (Clarke) H. Sm. (Cave s.n.).

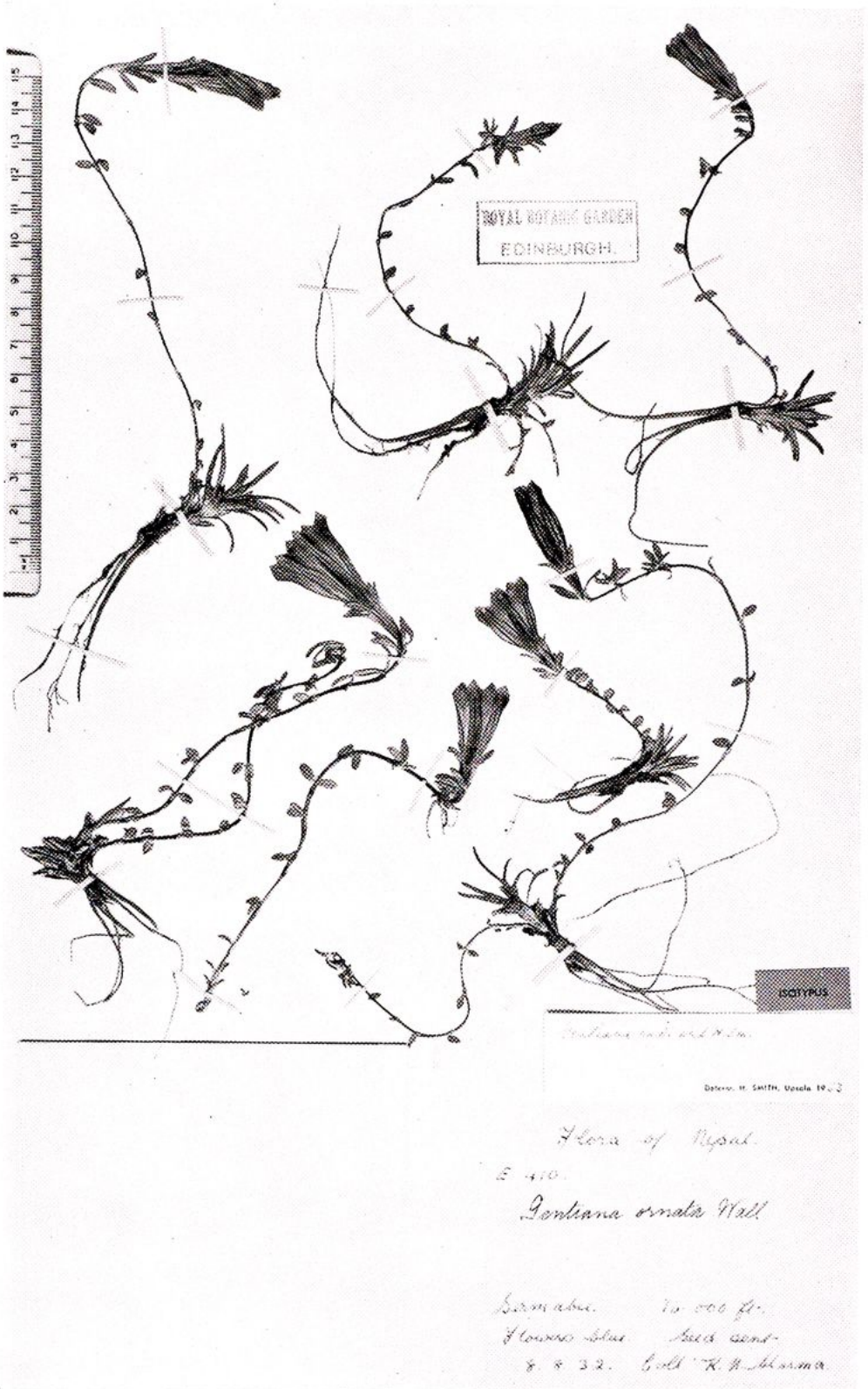


PLATE 32. Holotype of *Gentiana radicans* H. Sm. (Sharma 410).

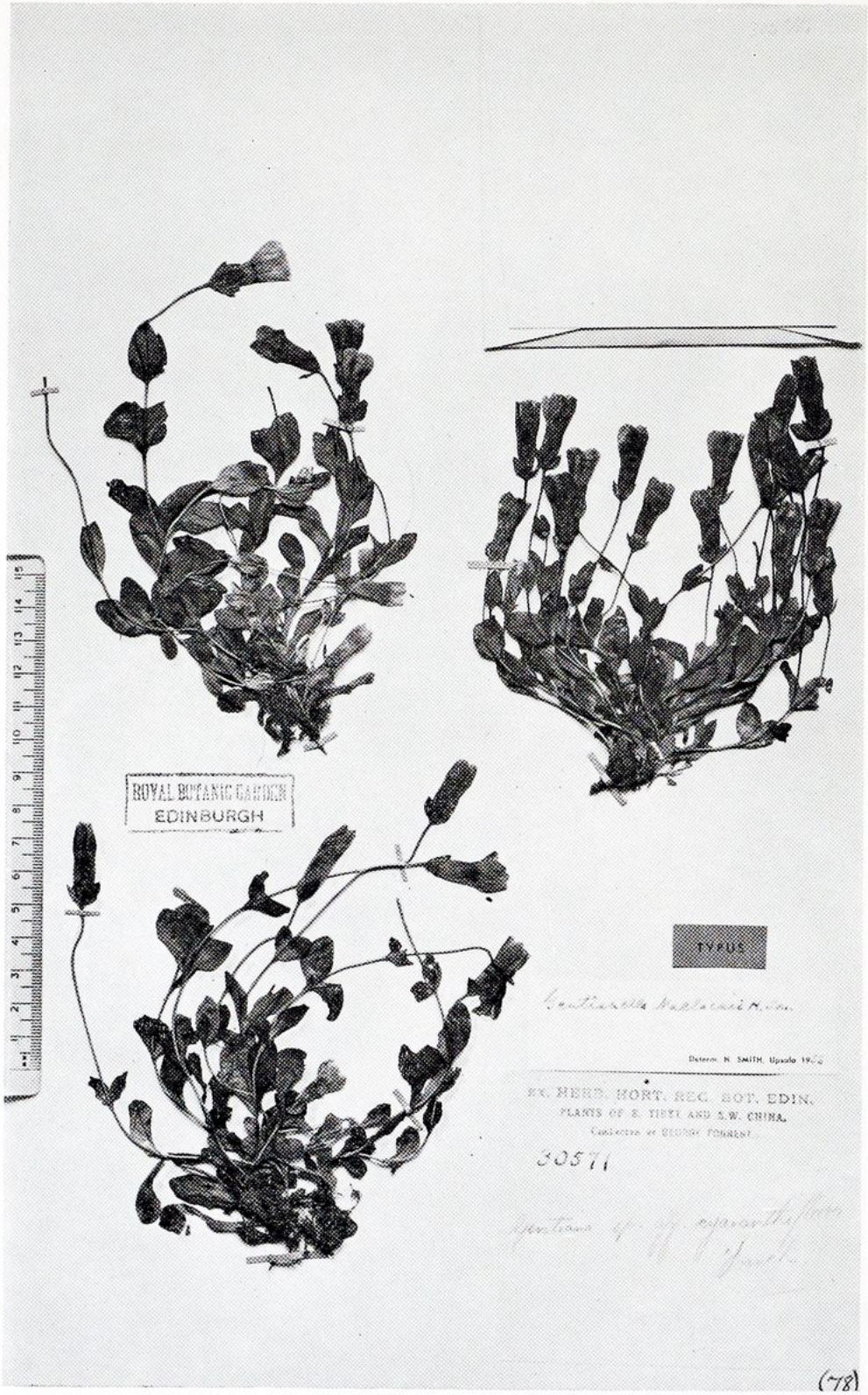


PLATE 33. Holotype of *Gentianella maclarenii* H. Sm. (Forrest 30571).

PLATE 34. Holotype of *Swertia candelabrum* H. Sm. (comm. Wigram 111).

PLATE 35. Holotype of *Swertia divaricata* H. Sm. (Forrest 18528).

facing p. 245

GENTIANA sectio TRIPTEROSPERMUM (Blume) Marq.

golowninia Marq. p. 70. **Tripterospermum japonicum** (Sieb. et Zucc.) Maxim. = *Crawfurdia japonica* Sieb. et Zucc. = *Crawfurdia trinervis* (Thunb.) Mak.

luteo-viridis (Clarke) Marq. p. 70. **Tripterospermum volubile** (D. Don) H. Sm. = *Gentiana confusa* Marq.

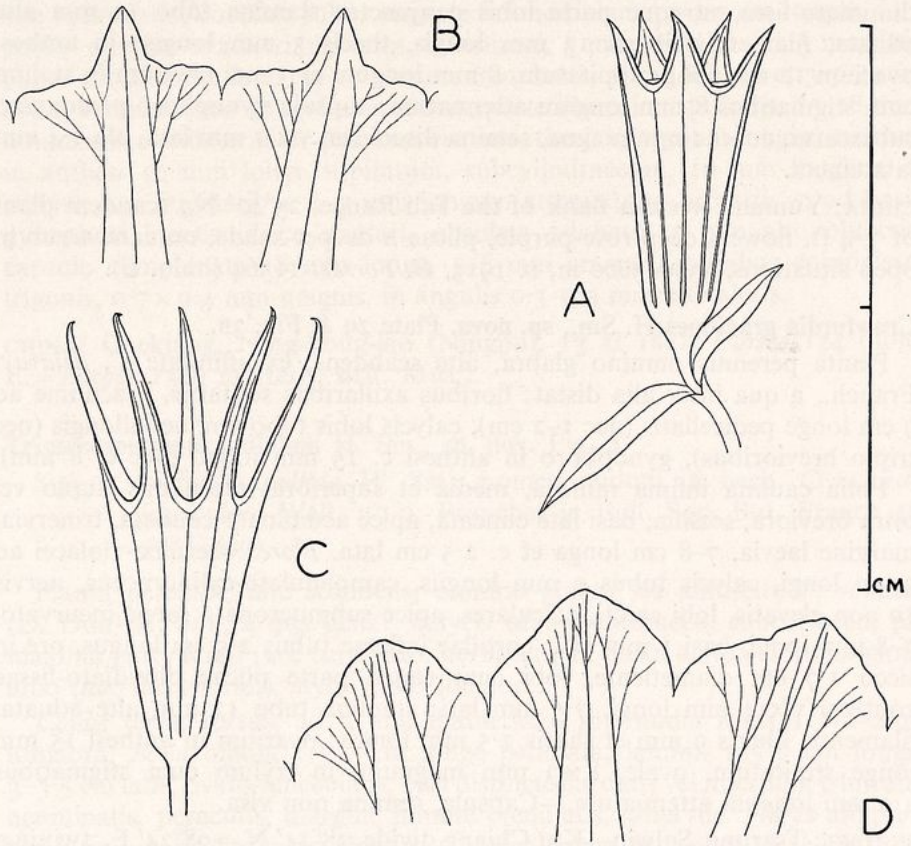


FIG. 3. *Crawfurdia forrestii* (holotype): A, calyx; B, part of corolla limb. *Crawfurdia gracilipes* (holotype): C, calyx; D, part of corolla limb.

2. New species of Gentianaceae

CRAWFURDIA WALL. SECTIO CRAWFURDIA

Crawfurdia forrestii H. Sm., **sp. nova.** Plate 28 & Fig. 3A.

Planta scandens non vel parum ramosa. In specimine 46 cm alta flos singulus apicalis subsessilis, in specimine majore flores perpauci axillares 5–15 mm longe pedicellati. Ex affinitate *C. delavayi* Franch. sed differt: floribus majoribus 3·8–4 cm longi (nec c. 3 cm), nervis 10 in tubo calycis deorsum elevatis, corollae lobis angustis (nec latis), nervis 5 in pagina inferiori foliorum acute papillosis (nec glabris).

Folia caulina internodiis subaequilonga vel breviora, infima ovato-rotundata, breviter acuminata, 5–6 cm longa et aequilata, superiora ovato-lanceolata, caudato-acuminata, 5–6 cm longa, 3–2 cm lata. *Flores* roseo-violacei, 2–15 mm longe pedicellati; calycis tubus integer vel interdum modice fissus, c. 10 mm longus, nervis 10 in inferiori dimidia parte elevato-incrassatis, lobi triangulares, subapiculati, erecti vel interdum recurvantes, 2–4 mm longi, basi 2 mm lati; corollae tubus c. 3·5 cm longus, modice inflatus, lobi c. 3·5 mm longi, anguste triangulares, acuti, plica truncata, dimidiato-fissa, utraque parte lobis conjuncta; stamina tubo 12 mm alte adnata, filamentis liberis 13 mm longis, thecis 3 mm longis; in anthesi ovarium 12 mm longe stipitatum, 8 mm longum et 3 mm crassum in stylum cum stigmatibus 8 mm longum attenuatum; capsula gynophoro prolongato subexcerta, 20 × 11 mm magna, semina discoidea, vix 1 mm lata, ala 0·4 mm lata cincta.

CHINA: Yunnan, western flank of the Tali Range, 25°40′ N., scandent plant of 3–4 ft, flowers deep rose-purple, plicae a deeper shade, on cane scrub in open situations, 3300–3600 m, ix 1913, *G. Forrest* 11564 (holo. E).

Crawfurdia gracilipes H. Sm., **sp. nova.** Plate 29 & Fig. 3B.

Planta perennis omnino glabra, alte scandens, ex affinitate *C. delavayi* Franch., a qua inter alia distat: floribus axillaribus solitariis, gracillime ad 9 cm longe pedicellatis (nec 1–2 cm), calycis lobis tubo fere aequilongis (nec triplo brevioribus), gynophoro in anthesi c. 15 mm longo (nec c. 8 mm).

Folia caulina infima minora, media et superiora internodiis duplo vel ultra breviora, sessilia, basi late cuneata, apice acuminato-caudata, trinervia, margine laevia, 7–8 cm longa et c. 2·5 cm lata. *Flores* coeruleo-violacei ad 3 cm longi, calycis tubus 9 mm longus, campanulato-cylindraceus, nervis 10 non elevatis, lobi erecti, aciculares, apice submucronato saepe incurvato, 7–8 mm longi, basi 1 mm lati; corollae inflatae tubus 2·5 cm longus, ore in sicco 1·7 cm diametiente, lobi cum eaque parte plicae dimidiato-fissae contigui vix 4 mm longi, 7·5 mm lati; stamina tubo 12 mm alte adnata, filamentis liberis 9 mm et thecis 2·5 mm longis; ovarium in anthesi 15 mm longe stipitatum, ovale, 8 × 3 mm magnum, in stylum cum stigmatibus 4·5 mm longum attenuatum.—Capsula, semina non visa.

SE TIBET: Tsarung, Salwin—Kiu Chiang divide, 28°24′ N.—98°24′ E., twining, plant of 4–5 ft, flowers deep purple, on heavy grass and dwarf cane, ix 1921. *G. Forrest* 20268 (holo. E).

CHINA: Yunnan: Shi-gi-tung, Champutung, 3000 m, flower blue, x 1935, *C. W. Wang* 67293.

TRIPTEROSPERMUM BLUME

Tripterospermum carlesii H. Sm., **sp. nova.** Plate 30 & Fig. 1A.

Planta perennis, omnino glabra, alte scandens, ex affinitate *T. affinis* (Wall.) H. Sm. et *T. coerulei* (Hand.-Mzt.) H. Sm.[1] Ab hac distat calycis tubo exalato, stylo 5–6 mm longo (nec 18–25 mm), ab illa omnibus partibus robustioribus, foliis subcoriaceis, basi truncatis vel subcordatis (nec herbaceis, basi cuneatis).

[1] **Tripterospermum coeruleum** (Hand.-Mzt.) H. Sm., **comb. nova.** Syn. *Crawfurdia coerulea* Handel-Mazzetti, Symbolae sinicae, Pt. VII, 950 (1936)

Caulis teres, dextrotortus, 1·5–1 mm diametiens. *Folia* caulina internodiis duplo vel triplo breviora, c. 5 mm longe petiolata, subcoriacea, subtus modice albescentia, ovato-lanceolata, basi truncata vel subcordata, apice caudato-acuminata, margine laevia, ad 5·5 cm longa et 1·8 cm lata. *Flores* c. 4 cm longi in axillis singuli vel 2–3 verticillati, 3 mm longe pedicellati, conspicue striatis, striis rubris et pallidioribus alternis; calycis tubus subcylindraceus, 10–12 mm longus, nervis 5 in superiori parte calycis modice elevatis, lobi filiformes, 5–10 mm longi, vix 0·5 mm lati, sinubus inter lobis late rotundatis; corollae tubus anguste infundibularis, 3–3·5 cm longus, lobi paullo oblique ovato-triangulares, acuminati, 5 mm longi et 4–4·5 mm lati, plicae rotundatae, integrae vel parum crenulatae, 1 mm longae et 3·5–4 mm latae; stamina tubo 10 mm alte adnata, parte libera inaequilonga 15–18 mm, omnia apice unilateraliter deorsum curvata, thecis c. 1·5 mm longis; ovarium in anthesi 10 mm longe stipitatum, subcylindraceum, 10 mm longum, in stylum cum stigmatibus c. 7 mm longum attenuatum, nectariis 5, ad basin gynophori locatis, disco anulari, obsolete 5-lobato, 1 mm alto obtectis; capsula complanata 18 mm longa, 5–6 mm crassa, seminibus compresso-trigonis, 0·7 × 0·4 mm magnis, in angulis 0·3–0·5 mm late alatis.

CHINA: Chekiang, Ning-kong-jao (Ningpu), 13 xi 1881, *Carles* 134 (holo. E. = *Forbes* 1389 in Herb. Brit. Mus.).

Tripterospermum pallidum H. Sm., **sp. nov.** Fig. 4.

Syn.: *Crawfurdia pallida* H. Sm., nomen nudum in herb. *Crawfurdia fasciculata* Wall. no 2, Franchet in Bull. Soc. Bot. France 46: 308 (1899).

Planta perennis, alte scandens, omnino glabra, ex affinitate *T. volubilis* (D. Don) H. Sm., a qua distat: calycis tubo cylindraceo, subcoriaceo, pro maxima parte tereti (nec turbinato, herbaceo, ad basin alato), flore longiore, albo (nec flavo-viridi), stylo triplo longiore.

Caulis teres, tortus, ad 2 mm diametiens, internodia foliis 1 1/2–2-plo longiora. *Folia* omnia 1·5–2 cm longe petiolata, laminis 4·5–6 cm longis. 3–3·5 cm latis, ovato-lanceolatis, basi distincte cordatis vel interdum truncatis, acuminatis, peracutis, margine minute crenulatis, 3-nerviis. *Flores* albi, 3–4 cm longi, in axillis vulgo singuli, 1–3 mm longe pedicellati; calycis tubus 6·5–8 mm longus, cylindraceus, subcoriaceus, suprema parte obsolete 5-carinatus, ceterum laevis, lobi 5–7(–9) mm longi, aciculares, lateraliter compressi, sinubus latis subrectis multo angustiores; corollae tubus 2·8–3·5 cm longus, vix inflatus, ore in sicco 13–15 mm diametiens, lobi c. 5 mm longi, 4–5 mm lati, ovato-lanceolati, acuminati, peracuti, plica 1·5 mm longa, 3–4 mm lata, oblique rotundato-truncata; stamina tubo 15 mm alte adnata, inaequilonga, parte libera filamentorum 12–16 mm longa, apice unilateraliter incurvata; ovarium in anthesi 4 mm longe stipitatum, basi disco anulari 1·5 mm alto, modice 5-lobato cinctum, c. 7 mm longum, in stylum 20–25 mm longum subabrupte contractum; fructus submaturus baccatus, verisimiliter globosus; semina submatura compresso-trigona, angulis anguste alatis.

CHINA: Yunnan, Tschen-fong-chan, fleurs blanches, ix 1894, *Delavay* 5117 (holotype in Herb. Paris). *Ibidem*, arbuste grimpant, fl. blanches, *Maire*. Environs de Long-ku, 18 viii 1904, *Ducloux* 2940. Tsiao-gai, 500 m, x *Maire*.

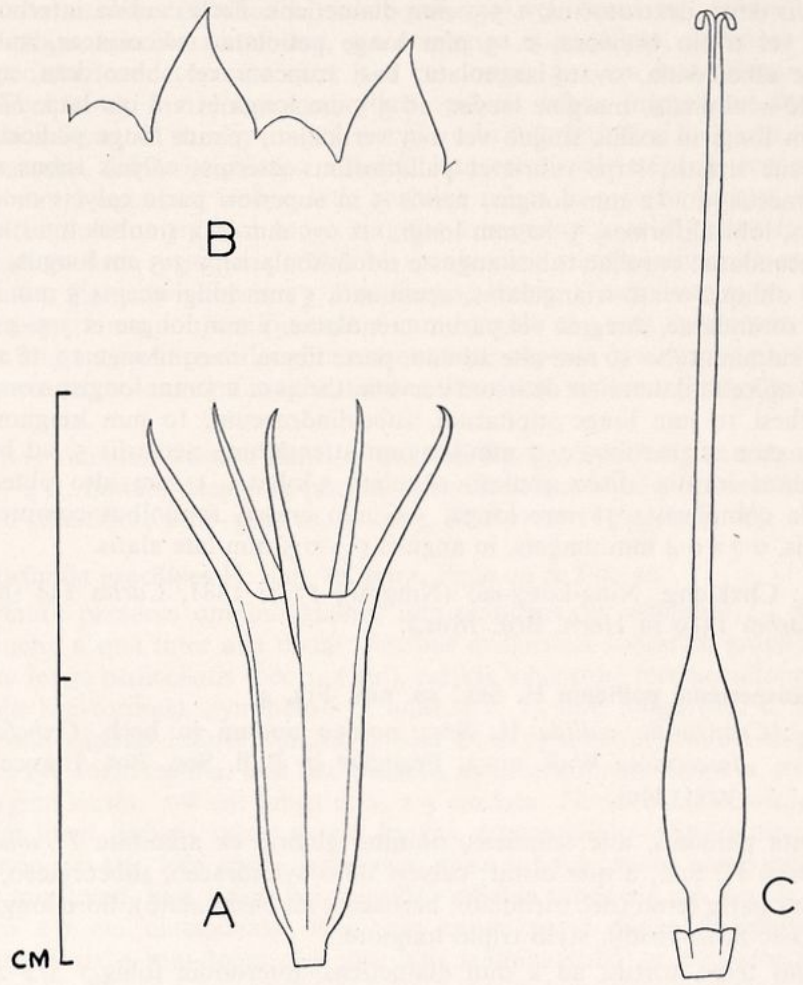


FIG. 4. *Tripterospermum pallidum* (isotype): A, calyx; B, part of corolla limb; C, pistil.

GENTIANA SECTIO FRIGIDA KUSN. SERIES ORNATAE

Gentiana meiantha (Clarke) H. Sm., **comb. nova.** Plate 31 & Fig. 5.

Syn.: *Gentiana ornata* Wall. var. *meiantha* Clarke in Fl. Brit. Ind. 4: 116 (1883).

SIKKIM: Jongri, 3900 m, 15 x 1875. *C. B. Clarke* 25797, 26125 (holotype in Herb. Kew). Yampung, 3900 m, 1 ix 1919, *G. H. Cave* s.n. (Herb. Edinb.).

NEPAL: Arun valley, north of Hatiar, Potti La, 3900 m, corolla and filaments blue, on open slopes, 22 viii 1956, *J. D. A. Stainton* 1422 (Herb. Brit. Mus.).

Clarke's variety is based on rather poor specimens collected in the late autumn. His comment about it is: "a very dubious plant". It is mentioned by Stapf in his illuminating article on *Gentiana prolata* (Bot. Mag. 1933, tab. 9311). He points out that the var. *meiantha* has the general habit of *G. prolata* but differs by the small flowers, only c. 1 cm long, and by the slender downwards barren shoots which in their upper parts show a marked tendency

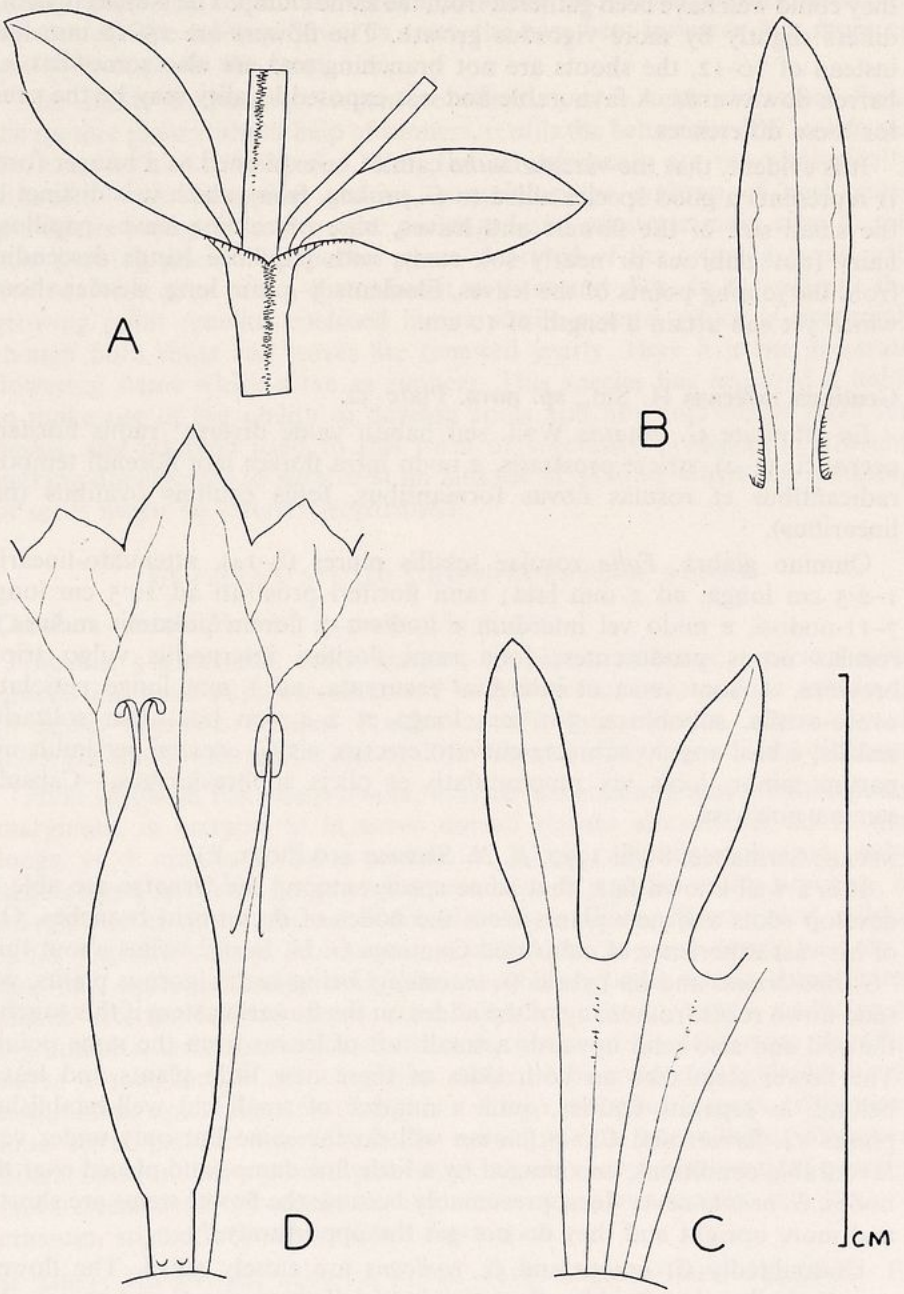


FIG. 5. *Gentiana meiantha* (Cave s.n.): A, pair of median leaves; B, uppermost cauline leaf; C, part of calyx; D, part of flower.

towards branching. He suggests the explanation that the small size of flowers and leaves could have been caused by starvation on poor soil. It should be noted, that Stapf only saw the type sheet.

The new material gives another aspect of the variety. The fine collection made by Cave shows 5 complete specimens, so similar to Clarke's plant that

they could well have been gathered from the same clump. The Nepal collection differs slightly by more vigorous growth. The flowers are 15–18 mm long instead of 10–12, the shoots are not branching and are also somewhat less barren downwards. A favourable and less exposed locality may be the cause for these differences.

It is evident, that the var. *meiantha* cannot be explained as a hunger-form. It represents a good species allied to *G. prolata*, from which it is distinct by the small size of the flowers and leaves, base of cauline leaves papillose-hairy (not glabrous or nearly so), stems with papillose bands descending from the joining points of the leaves, filaments 3–4 mm long, slender shoots which yet can attain a length of 10 cm.

Gentiana radicans H. Sm., **sp. nova.** Plate 32.

Ex affinitate *G. ornatae* Wall. sed habitu valde diversa: ramis floriferis perpaucis (1–2), stricte prostratis, e nodo infra florem iam florendi tempore radicantibus et rosulas novas formantibus, foliis caulinis ovalibus (nec linearibus).

Omnino glabra. *Folia* rosulae sessilis plures (8–14), attenuato-linearia, 1–2·5 cm longa, ad 2 mm lata; rami floriferi prostrati ad 10·5 cm longi, 7–11-nodosi, e nodo vel interdum e nodis 2–3 florem proximis radices et rosulas novas producentes; folia rami floriferi internodiis vulgo triplo breviora, sursum versa et interdum recurvata, ad 1 mm longe petiolata, ovato-ovalia, subobtusa, 3–7 mm longa et 2–4 mm lata. *Flos* solitarius sessilis, e basi angulo subrecte curvato erectus, eis *G. ornatae* persimilis nisi parum minor, lobis vix mucronulatis et plicis subbrevioribus.—Capsula, semina non visa.

NEPAL: Sermabee, 8 viii 1932, *K. N. Sharma* 410 (holo. E).

It is a well-known fact, that some species among the Ornatae are able to develop roots and new plants from the nodes of decumbent branches. Out of his vast experience of cultivated Gentians G. H. Berry[1] writes about this: "*G. sino-ornata* and its hybrid *G. macauleyi* being such vigorous plants, will send down roots from many of the nodes on the flowering stem if this touches the soil and also send upwards a small tuft of leaves from the same points. The flower stem dies on both sides of these new little plants and leaves behind, as separate entities, quite a number of small but well-established plants. *G. farreri* and *G. veichiorum* will do the same but only under very favourable conditions, encouraged by a little fine damp sand placed over the nodes. *G. ornata* never does, presumably because the flower stems are shorter and more upright and they do not get the opportunity."

Undoubtedly *G. ornata* and *G. radicans* are closely allied. The flowers are so similar that it is hardly possible to tell them apart, and so are also the rosular leaves. But the organisation of the flowering stems are altogether different. Instead of the numerous, mostly upright and rather short stems of *G. ornata*, their number is in *G. radicans* reduced to one or two, and their shape is largely altered. They are up to 10·5 cm long, strictly prostrate, already at flowering time producing roots and a new rosette from the uppermost node (or nodes). The broad and short subobtuse leaves are subequal,

[1] Gentians in the garden, London 1951, p. 41.

shortly petiolate, as a rule turned upwards and much shorter than the internodes. The solitary flower is erect, the base bent upwards at a more or less right angle to the stem.

The ability to plant its vegetative offspring at a certain distance from the mother plant without help of runners, recalls the behaviour of *G. arethusae* Burk. and *G. viatrix* H. Sm. Yet, the arrangements are morphologically diverse. There the apical gemma, containing the embryo of next years growth, is brought along by the prolonged and prostrate main stem to the new growing place. The mother plant, deprived of the growing point, will live on for a year or so, thereafter it withers and dies. In *G. radicans* the growing point remains enclosed in the sessile rosette, which is perennial, though both roots and leaves are renewed yearly. Here it is the prostrate flowering stems which serve as runners. This species has acquired a habit to make use of the ability to develop roots and new individuals from the nodes, and adopted itself to this form of vegetative propagation, thereby making doubly sure to survive at an altitude of 4880 m, where the maturing of seeds might be severely jeopardised.

GENTIANA SECTIO CHONDROPHYLLA BUNGE.

Gentiana cristata H. Sm., **sp. nova.** Fig. 6 C–E.

Biennis, 5–9 cm alta, caulis simplex vel parum ramosus, superiori parte praesertim dense papilloso-ciliatus. Flores coerulei, pauci, ad 12 mm longi in axillis supremis sessiles. Species ex affinitate obscura, nervo dorsali foliorum et loborum calycis alte hyalino-cristata, crista dense ciliata distincta.

Folia rosularia rotundato-ovalia, breviter aristulata, anguste cartilagineo-marginata, in margine ut in nervo dorsali elevato albo-ciliata, ad 10 mm longa et 7 mm lata; folia caulina c. 5-juga, rotundato-obovata, sub-aequimagna, 4–6 mm longa et 3–5 mm lata, internodiis multo breviora, in margine et in crista alta nervi dorsalis dense ciliata. *Flores* erecti, calycis tubus 3–4 mm longus, lobi anguste triangulares, 4–5 mm longi, basi vix 2 mm lati, apice aristulati, marginibus hyalinis apicem versus minutissime ciliatis ceterum levibus, nervo dorsali hyalino-cristato, crista media parte 0·5 mm alta, lacerulata at dense ciliata in tubum ad 2/3 decurrente; corollae tubus 9 mm longus ore c. 3 mm diam., lobi ovato-triangulares, acuti, minutissime apiculati, 2 mm longi et 1·8 mm lati, plica integra, triangulari lobo tertia parte breviori; stamina tubo 3·5 mm alte adnata, filamentis liberis inaequalibus 2·5 vel 4 mm longis, thecis 1 × 0·5 mm magnis; ovarium maturescens ovali-cylindraceum, circum alatum, 5 mm longum et c. 2·5 mm crassum, stigmatibus subsessilibus coronatum.

SE TIBET: Ka-gwr-pu, 4200 m, 21 vii 1913, *Kingdon-Ward* 844 (holo. E). The locality is written Ka-gur-pu in "The land of the blue Poppy" (1913) and Ka-kar-pu in "The mystery rivers of Tibet" (1923).

Gentiana exquisita H. Sm., **sp. nova.** Fig. 6A, B.

Planta 9–15 cm alta, verisimiliter stolonibus tenuibus hypogaeis perennans, *G. gratae* H. Sm. arcte affinis, sed distat: corollae lobis angustis vix 1 mm latis, sublinearibus, obtusis (nec 2·5 mm latis et late ovatis), fimbriis plicarum attenuato-acicularibus, acutissimis (nec cylindraceis, obtusis).

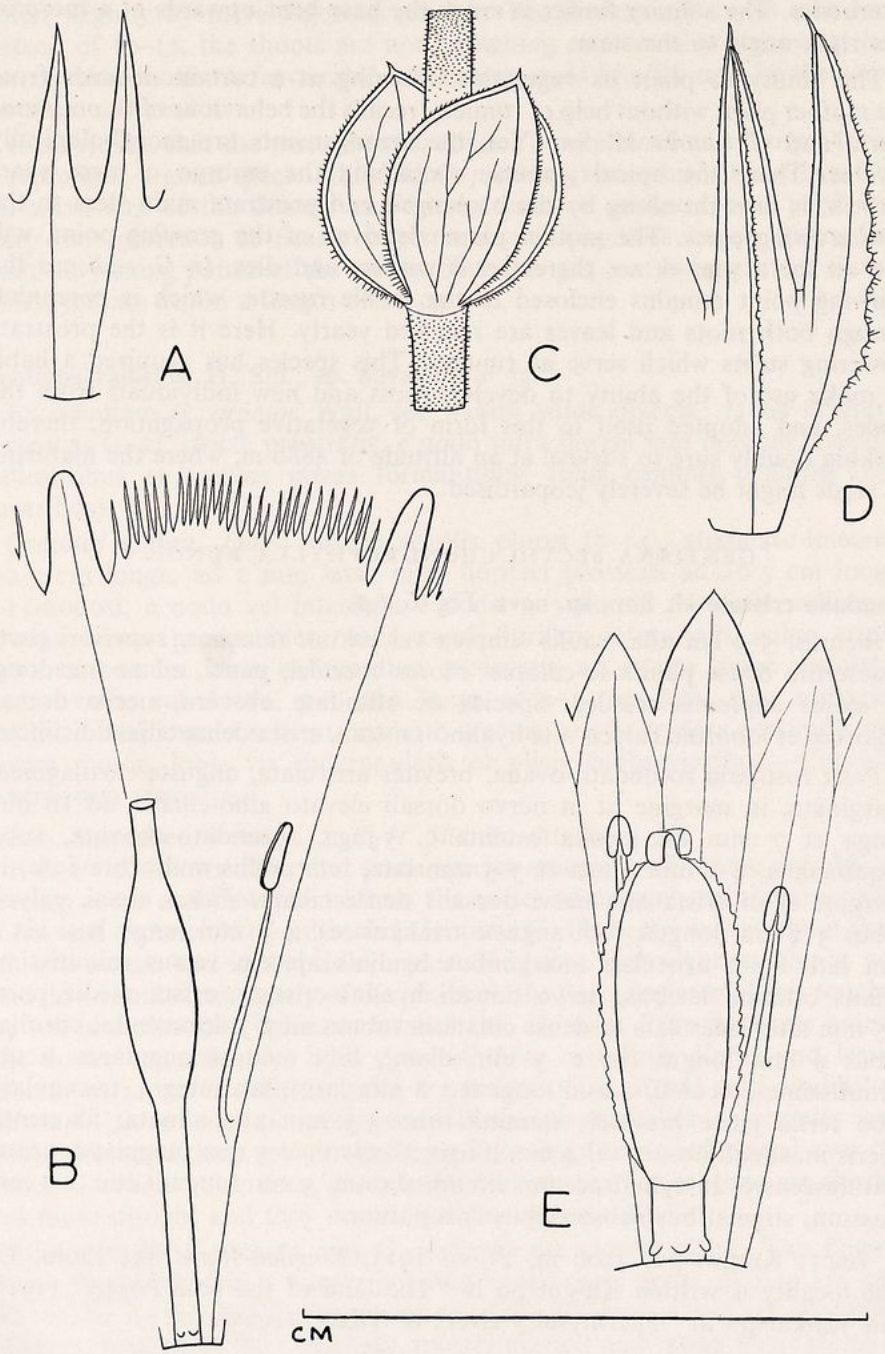


FIG. 6. *Gentiana exquisita* (holotype): A, part of calyx; B, part of flower. *Gentiana cristata* (holotype): C, median pair of leaves; D, part of calyx; E, part of flower.

Caulis glaber, simplex vel sursum parce dichotomiter ramosus, ramis unifloris. *Folia* caulina 6–7-juga, glabra, infima ovata, superiora paullo longiora ovato-lanceolata, obtusa, 3–5 mm longa et 2–3 mm lata. *Flores* pallide violacei intus coeruleo-punctati (e collectore), graciliter 17–22 mm longe pedicellati; calycis tubus 3 mm longus, lobi 3 mm longi, aciculares, acutissimi, emucronati, basi 0·7 mm lati; corollae tubus 12 mm longus, lobi sublineares, obtusi, uninervii, 1 mm lati, plicae lobis subaequilongae vel parum breviores, 3·5–4 mm latae, superiori dimidia parte in fimbriis dissoluta, fimbriis acicularibus acutissimis; stamina tubo 3 mm alte adnata, parte libera filiforme 4 mm longa, thecis 1·1 × 0·5 mm magnis; ovarium stipitatum ellipsoideum, stylo distincto 1 mm longo.—Capsula, semina non visa.

CHINA: Yunnan, Salwin—Kiukiang divide, Lungucilaka, 3300 m, 14 ix 19––, pale violet, marked with purple spots inside, alpine meadows or side of swamp, *T. T. Yu* 20254 (holo. E). Tibet Frontier, Adung valley, sources of the Irrawaddy, 28°20′ N.–97°40′ E., 4000 m, *Kingdon-Ward* 9887.

BURMA: Nam Tamai valley 1937–1939, *Kingdon-Ward* 13208b.

Gentiana xanthonannos H. Sm., **sp. nova.** Fig. 7 D–F.

Biennis, humilis, 2–2·5 cm alta, e basi copiose ramosa, ramis brevibus unifloris. Ex affinitate obscura nisi *G. capitatae* Ham. remote relata, sed floribus luteis et corollae lobis aristatis inter alia valde distincta. Habitu *G. incomptae* H. Sm. subsimilis.

Folia rosularia florendi tempore vulgo emarcida, oblanceolata, acuta, 5–7 mm longa et 3–4 lata, angustissime cartilagineo-marginata, breviter aristata; folia caulina conduplicantia, spathulata, c. 5 mm longa et 3 mm lata, breviter aristata, hyalino-marginata, margine, apice excepto, minute ciliolata. *Flos* pallide luteus (e collectore), sessilis, c. 9 mm longus; calycis tubus 4·5 mm longus, lobi triangulari-lanceolati, basi 0·9 mm lati, acutissimi, aristati, hyalino-marginati; corollae tubus 8 mm longus, lobi ovato-lanceolati, conspicue aristati, cum arista fere 2 mm longi, basi 1·1 mm lati, plica rotundata, integer, lobis duplo brevior; stamina tubo 4 mm alte adnata, parte libera tenuissima, 1·5 mm longa, thecis 0·8 × 0·2 mm magnis; ovarium maturescens obovatum, 4 × 2·5 mm magnum, circum alatum, stylo cum stigmatibus recurvatis c. 1 mm longo; semina irregulariter trigona, 1 × 0·5 mm magna, testa brunnescente, longitudinaliter obsolete striatula.

CHINA: Yunnan: Yung-peh mountains, 26°40′ N., 2100–2400 m, vi 1917, plant of 1 inch, flowers pale yellow, open dry pastures, *Forrest* 15101 (holo. E).

GENTIANELLA SECTIO COMASTOMA WETTST.

Gentianella maclarenii H. Sm., **sp. nova.** Plate 33 & Fig. 7B, C.

Perennis; caudex simplex vel multiceps rosulas et infra eas ramos floriferos edens; rami floriferi 10–20 cm longi, arcuatim adscendentes, simplices vel pauciramulosi; flores solitarii, 2–2·9 cm longi et 4–7 cm longe pedicellati. Ex affinitate *G. cyananthiflorae* (Franch.) H. Sm., a qua inter alia distat: foliis majoribus, latioribus, squama oris pro lobo corollae simplici (nec bifida), filamentis staminum infra adnationem longe et tenuiter villoso-pilosis (nec glabris).

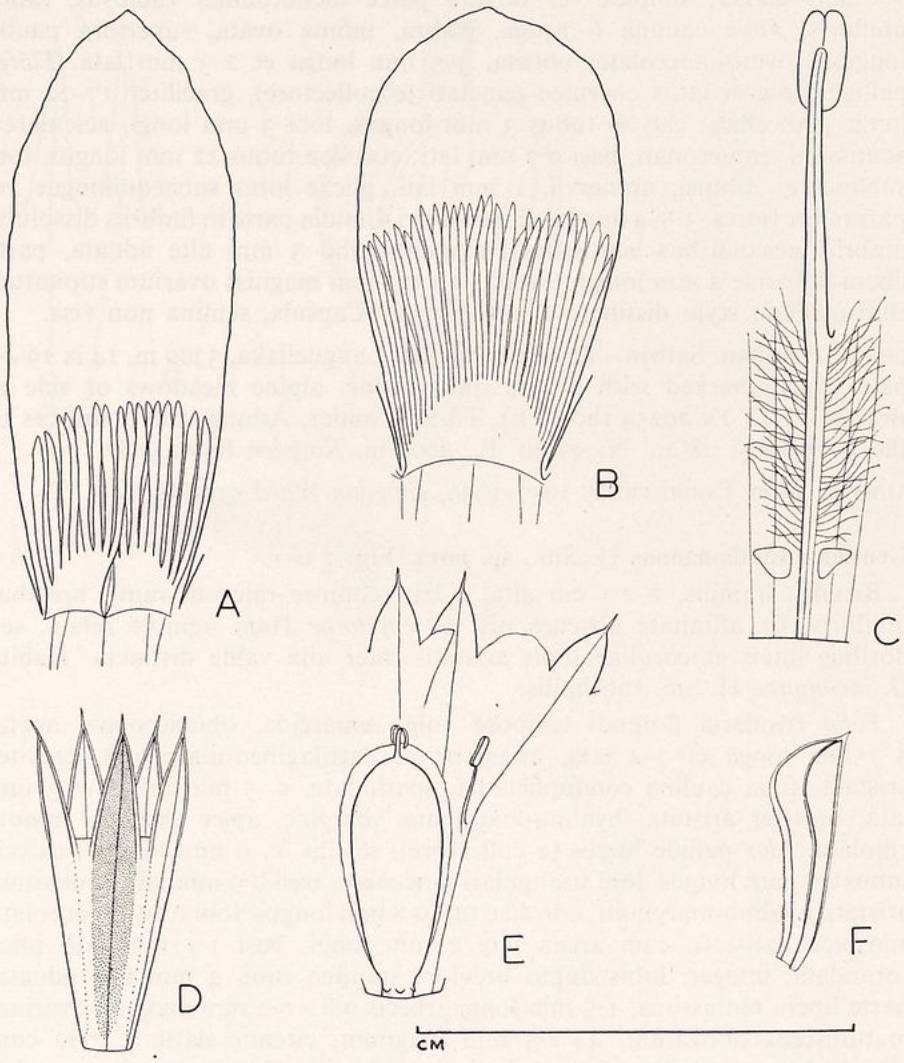


FIG. 7. *Gentiana cyananthiflora* (isotype): A, lobe of corolla. *G. maclarenii* (holotype); B, lobe of corolla; C, stamen. *G. xanthonannos* (holotype); D, calyx; E, part of flower; F, upper cauline leaf.

Folia rosularia obovato-ovalia, obtusa, lamina ad 20 mm longa et 9 mm lata in petiolum latum c. 10 mm longum sensim angustata; folia caulina 3–4-juga, ovato- vel obovato-ovalia, media majora ad 20 mm longa et 10 mm lata, sessilia, infima vulgo paullo minora et angustiora, obovata, subpetiolata, suprema minora et vulgo angustiora. *Flores* erecti, coeruleo-violacei; tubus calycis perbrevis vix 1 mm longus, lobi subaequales, lanceolati, acuti, 8–10 mm longi, 2·5–4·5 mm lati; corollae tubus c. 15 mm longus, cylindraceus, ore (in sicco) c. 7 mm diametienti, lobi late obovati, obtusi, c. 12 mm longi et 6·5 mm lati, membrana fimbriata oris pro lobo simplici, fimbriis 25–30 ad 4 mm longis, parte indivisa membranae 0·5–2 mm longa. Stamina tubo 8 mm alte adnata, filamentis liberis c. 6 mm, parte adnata pilis villosis tenuibus 1–2·5 mm longis instructa, antherae fere 2 mm longae; ovarium 1·5–2 mm

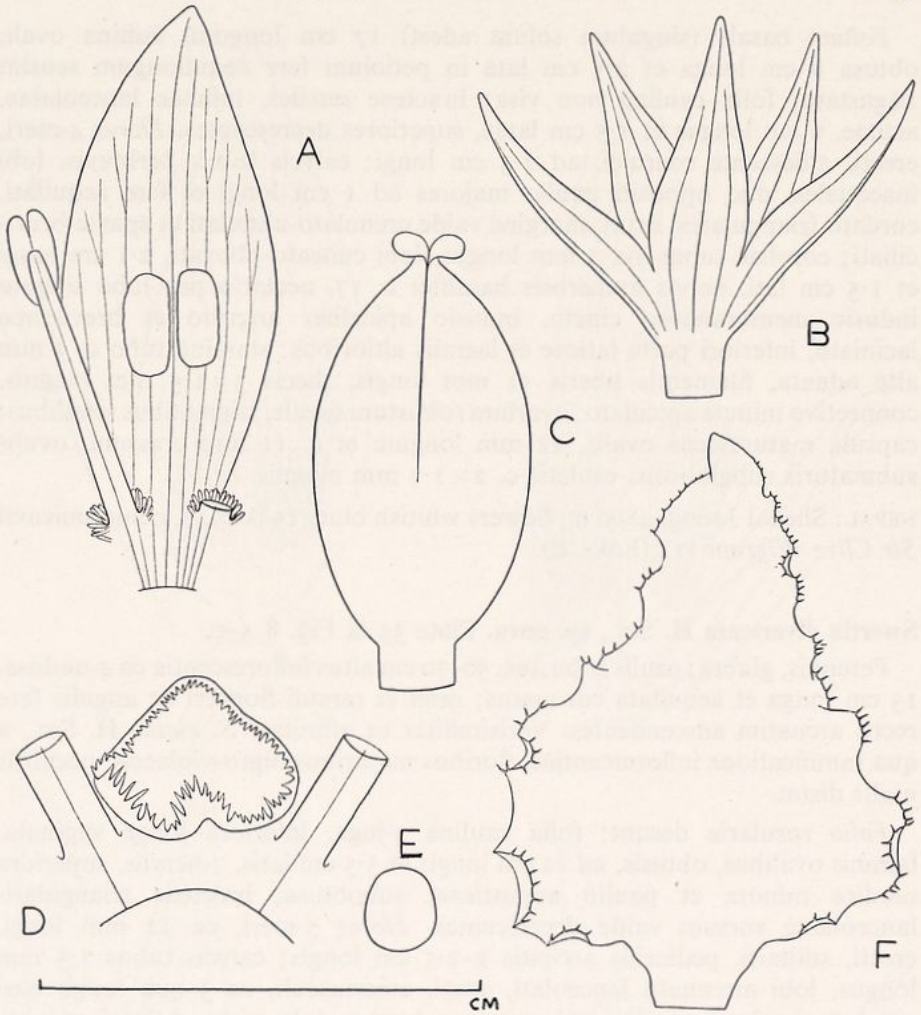


FIG. 8. *Swertia divaricata* (holotype): A, part of flower; B, calyx; C, capsule. *S. candelabrum* (holotype): D, nectary; E, seed; F, outline of calyx lobe.

longe, stipitatum, ovato-cylindraceum, 17 mm longum et 3 mm crassum in stylum 1·5 mm longum sensim attenuata. Capsula, semina non visa.

CHINA: Yunnan: *Forrest* 30571 (holo. E). Fuch'uan Mts., Oct. *McLaren* "D collection" 331.

SWERTIA SECTIO EUSWERTIA CLARKE

Swertia candelabrum H. Sm., **sp. nova.** Plate 34 & Fig. 8 D–F.

Planta plus quam 4 dm alta (specimine singulo media parte deficiente incompleto); caulis erectus, robustus; inflorescentia pyramidalis c. 20 cm alta et 16 cm lata, pauciflora (flores c. 17), nodis 3 longe distantibus, ex axillis infimis flores solitarii et rami robusti c. 10 cm longi arcuatim adscendentes e quorum nodo apicali flores erecti c. 4 robuste 2–6 cm longe pedicellati editi. Affinis *S. hookeri* Clarke a qua distat inflorescentiae forma, nectario cordato membrana laciniata cincto (nec nudo) et seminibus subglobosis, exalatis (nec discoideis, alatis).

Folium basale (singulum solum adest) 17 cm longum, lamina ovali, obtusa 8 cm longa et 2·5 cm lata in petiolum fere aequilongum sensim angustata; folia caulina non visa; bracteae sessiles, infimae lanceolatae, acutae, 6 cm longae et 1·5 cm latae, superiores decrescentes. *Flores* 4-meri, erecti, albescente coerulei, ad 2·5 cm longi; calycis tubus perbrevis, lobi inaequales, duo oppositi paullo majores ad 1 cm longi et fere aequilati, cordato triangulares, acuti, margine valde crenulato-undulati et sparse breviciliati; corollae tubus vix 3 mm longus, lobi cuneato-obovati, 2·1 cm longi et 1·5 cm lati, nervis numerosis basaliter c. 17, nectario pro lobo singulo indusio membranaceo cincto, indusio apicaliter angusto et brevissime laciniato, inferiori parte latiore et laciniis altioribus; stamina tubo c. 3 mm alte adnata, filamentis liberis 11 mm longis, thecis 3 × 1·5 mm magnis, connectivo minute apiculato; ovarium robustum sessile, stigmatibus sessilibus; capsula maturescens ovalis, 22 mm longum et c. 11 mm crassum, ovulis submaturis subglobosis, exalatis c. 2 × 1·7 mm magnis.

NEPAL: Shebal Joong, 4800 m, flowers whitish blue, 15 ix 1927, communicavit *Sir Clive Wigram* 111 (holo. E).

Swertia divaricata H. Sm., **sp. nova.** Plate 35 & Fig. 8 A–C.

Perennis, glabra; caulis robustus, 50–70 cm altus inflorescentia ca 4-nodosa, 15 cm longa et aequilata coronatus; rami et ramuli floriferi ex angulis fere rectis arcuatim adscendentes. Verisimiliter ex affinitate *S. elatae* H. Sm., a qua ramificatione inflorescentiae, floribus majoribus nigro-violaceis, nectariis nudis distat.

Folia rosularia desunt; folia caulina 4-juga, inferiora longe vaginata, laminis ovalibus, obtusis, ad 12 cm longis et 5·5 cm latis, 7-nerviis, superiora modice minora et paullo angustiora, subobtusa, bracteae triangulari-lanceolatae sursum valde decrescentes. *Flores* 5-meri, ca 12 mm longi, erecti, solitarii, pedicellis arcuatis 2–2·5 cm longis; calycis tubus 1·5 mm longus, lobi attenuato lanceolati, acuti, crassiusculi, ca 5 mm longi, basi vix 2·5 mm lati; corollae tubus 2 mm longus, lobi nigro-violacei, minute viridi-punctulati, ovato-lanceolati, subacuti, 10 mm longi et 4·5 mm lati; nectaria bina perfecte nuda, subrectangularia, approximata, medio lobi locata; stamina ore tubi adnata, filamentis liberis 6 mm longis, crassiusculis basi externe breviter fimbriato-barbatis, thecis 2 mm longis et 1 mm crassis; ovarium breviter stipitatum, late ellipsoideum, 8 mm longum et 4 mm crassum, stigmatibus suborbicularibus subsessilibus; semina oblonga vel interdum modice complanata, irregulariter angularia, angulis vulgo anguste alatis, 1·2–2 mm longa et 0·3–0·5 mm crassa, testa minute reticulata.

CHINA: Yunnan, N'Maikha—Salwin divide, 25°30′ N., 2400 m, plant of 20–28 inches, flowers deep black-purple, greenish at tips, heavy pastures on the margins of forest in side valleys, ix 1919, *G. Forrest* 18528 (holo. E).

Swertia endotricha H. Sm., **sp. nova.** Fig. 9C, D.

Ex affinitate *S. atroviolaceae* H. Sm., habitu *S. forrestii* H. Sm. persimilis. Ab hac distat lobis corollae majoris acutis, nectariis binis non confluentibus, ab illa foliis oppositis, a duabus basi corollae intus longe fimbriato-barbato.

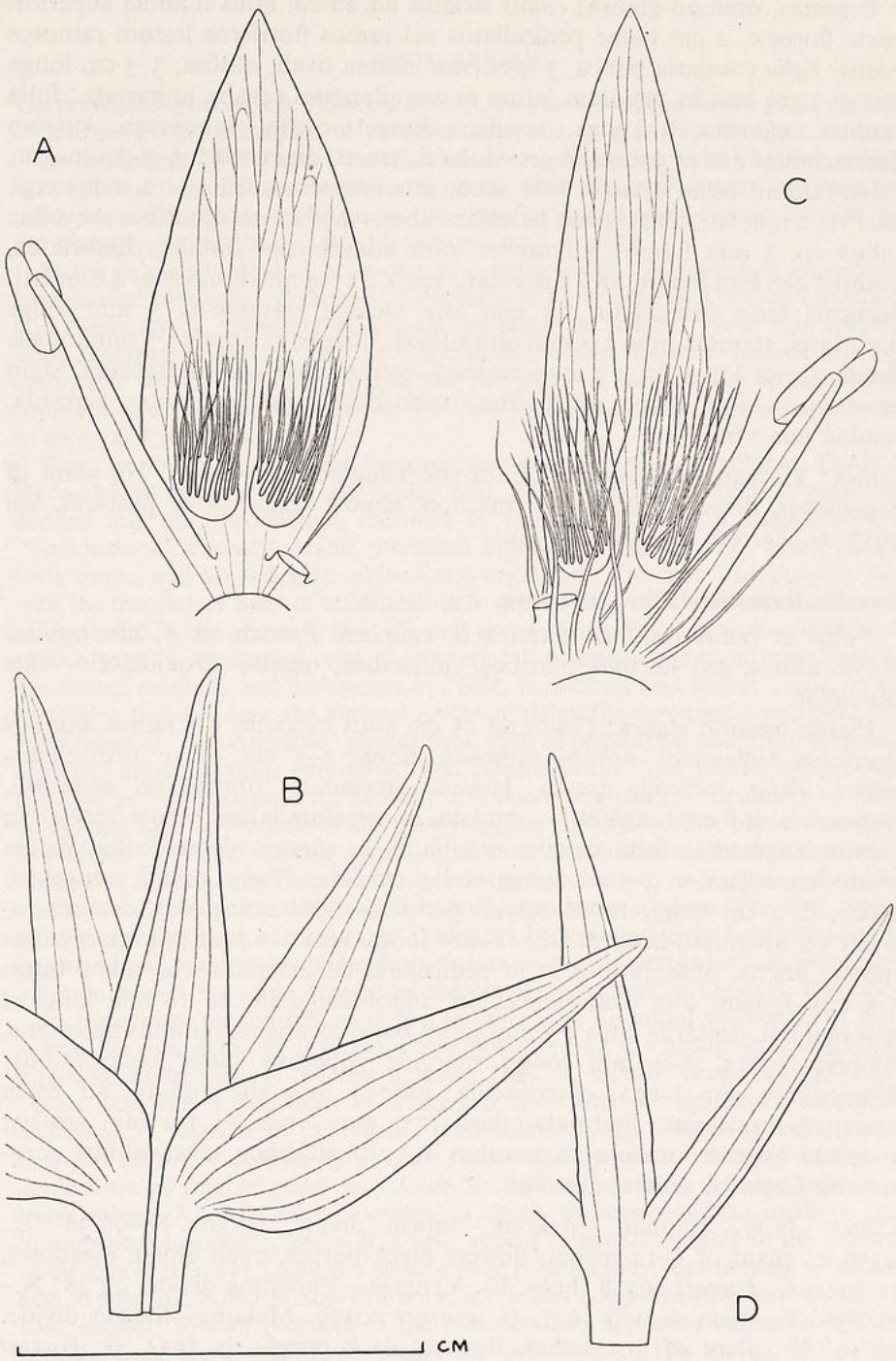


FIG. 9. *Swertia forrestii* (holotype): A, part of flower; B, calyx. *S. endotricha* (holotype): C. part of flower; D, calyx.

Perennis, omnino glabra; *caulis* strictus ad 20 cm altus dimidia superiori parte flores c. 2 cm longe pedicellatos vel ramos floriferos iterum ramosos edens. *Folia* rosularia pauca, 3–5-nervia, lamina ovali, obtusa, 3–5 cm longa et 1·7–2 cm lata in petiolum latum et aequilongum sensim angustata; folia caulina opposita, 3–4-juga, sessilia, elongato-ovata, subobtusa, sursum decrescentia. *Flores* 5-meri, nigro-violacei, erecti, diametro 2·5–3 cm magni; calyx fere ad basin divisus, lobi acuti, attenuato-lineares, ad 12 mm longi, basi vix 2 mm lati, marginibus basalibus liberis modice obtegentibus; corollae tubus vix 2 mm longus, circum et infra adnationem staminis fimbriatus, fimbriis 2–6 mm longis, lobi lanceolati, acuti, 12–14 mm longi et c. 4 mm lati, nectariis binis orbiculatis 2·5 mm alte locatis, margine c. 5 mm longe fimbriatis; stamina tubo 1·5 mm alte adnata, filamentis liberis 7·5 mm longis, thecis 3 mm longis et 1·3 mm crassis; ovarium ovato-cylindraceum, stylo crasso c. 1 mm longo stigmatibus suborbicularibus coronato. Capsula, semina non visa.

CHINA: Yunnan, Mountains N.E. of the Yangtze bend, 27°45′ N., plant of 6–9 inches, flowers deep purple maroon, almost black, stony pastures, viii 1913, *G. Forrest* 10955 (holo. E).

Swertia forrestii H. Sm., **sp. nova.** Fig. 9A, B.

Foliis et ramis floriferis alternis *S. calicinae* Franch. et *S. alternifoliae* Royle affinis, sed floribus pluribus, minoribus, intense atroviolaceis valde dissimilis.

Planta omnino glabra; *Caulis* ad 25 cm altus ex axillis 5–8 ramos alternos floriferos suberectos iterum ramosos, flores 1–3 cm longe pedicellatos edens. *Folia* radicalia pauca, lamina lanceolata, obtusa vel subacuta, 5–7-nervia, 6–8 cm longa et 1–2 cm lata, in petiolum latum triente breviorem sensim angustata; folia caulina sessilia, 5–8, sursum decrescentia, media ovato-lanceolata, c. 4·5 cm longa et 1·5 cm lata. *Flores* 5-meri, conspicui, erecti, c. 2 cm longi; tubus calycis perbrevis, lobi inaequales, acuminato-ovati vel attenuato-lineares, 14–18 mm longi, basi 2–6 mm lati, marginibus infimis liberis, obtegentibus et in pedicellum decurrentibus; corollae tubus 1·5 mm longus, lobi ovato-lanceolati, subobtusi-acuti, ad 18 mm longi et 5–6 mm lati, nectariis binis 2·5 mm supra basin locatis marginibus fimbriatis, fimbriis 10–15, 1–4 mm longis margine superiori saepe deficientibus; filamenta 9 mm longa, crassiuscula, tubo 1 mm alte adnata, ad basin externam brevissime fimbriata, thecis 2·7 mm longis et 1·2 mm crassis; ovarium anguste ovatum stigmatibus suborbicularibus subsessilibus coronatum. Capsula, semina non visa.

CHINA: N.W. Yunnan, Mekong—Salwin divide, 27°30′ N.–98°36′ E., 4350 m, plant of 6–14 inches, flowers black-purple, open alpine meadows, ix 1921, *G. Forrest* 20718 (holo. E). Yangtze—Yungning divide, 27°48′ N.–100°36′ E., 3600 m, viii 1921, *G. Forrest* 20579. Mekong—Salwin divide. 28°10′ N., plant of 2–3 inches, flowers black purple, ix 1914, *G. Forrest* 13341. Chung-Tien, Mt. La-Ch'ou-Ch'ou-K'ha, ix 1928, *J. F. Rock* 17261.