Some Notes on the Genus Codonopsis Wall.

BY

J. A. NANNFELDT.

With Plates CCXXVII–CCXXX and One Figure in the Text.

During my work on the Campanulaceae, collected in China by Dr. H. Smith in the years 1921 and 1922, I felt it necessary to study *Codonopsis ovata* and its allies more thoroughly. Through the kindness of the Regius Keeper, Prof. W. W. Smith, the material of the species concerned in the herbarium of the Edinburgh Royal Botanic Garden was placed at my disposal. The value of this material was increased by its having served as a basis for J. Anthony's key to the genus (Not. Roy. Bot. Gard. Edinb. Vol. xv., 1926). In so far as my results had some bearing upon species collected by Dr. H. Smith during his first journey to China, they are already published (Meddel. Göteb. Bot. Trädg. Vol. v., 1930). Later I have also had the privilege of studying the material of these species preserved at the herbarium of Kew Gardens through the kindness of the Director, Dr. A. W. Hill, which material was used by T. F. Chipp in preparing his monograph of the genus in 1908 (Journ. Linn. Soc. Bot. Vol. xxxviii.).

Meanwhile Dr. H. Handel-Mazzetti has entrusted me with the determination of the Campanulaceae collected during his journeys in China in 1914–18, and also the material of the " Naturhistorisches Museum " of Vienna was received for examination.

My continued work on the genus made it clear to me that the present arrangement of species into major groups is not a satisfactory one, and I have tried to arrive to a more natural concept of the relationships within the genus. Thus my notes resolve themselves into two parts. In the first I shall discuss the natural groups which in my opinion can be distinguished. In the second part two new species of the *ovata*-group, discovered by G. Forrest, will be described and some notes on the known species will be given. For convenience sake the names are arranged in alphabetical order and to every species its known distribution is added.

Upsala, July, 1930.

[Notes, R.B.G. Edin., No. LXXVIII, February 1931.]

The genus *Codonopsis* is known of old to comprise plants of very different habit and of very diverse floral structure. As Anthony has pointed out, the division by Chipp (l.c., p. 378), according to which the species were separated into four groups founded on floral characters only, viz., "Calyx inferus," "Calyx semisuperus, corolla supera," "Calyx semisuperus, corolla semisupera," and "Calyx superus," is inferior to that of Komarov (Acta Hort. Bot. Petrop. Tomus xxix. p. 102), who used both floral and vegetative characters. The genus was divided by the latter into two subgenera, the first of which, *Pseudocodonopsis*, was characterized in the following way: "Corolla rotata ad basin usque 5 partita, ovarium fere inferum, capsula obconica." In this subgenus Anthony placed *C. convolvulacea*, *Forrestii*, *vinciflora*, and *efilamentosa*. Accidentally, he overlooked that *C. rosulata*, too, is most naturally placed here. They have all many vegetative characters in common. The root of *C. vinciflora* is still unknown, but those of the other species are relatively small and subspherical. The stem is leafy only in the lower part and terminates with a long petiolate, blue flower, and is more or less twining, especially in the upper part.

The staminal filaments of *C. convolvulacea* were described correctly by Oliver in 1895 (Hook., Ic. pl., Pl. 2385) as "brevia, basi late et subito dilatata carnosula intus pilosula," but in 1908 Chipp (l.c., p. 389) described them as "ad basin dilatata et *intus** appendice ciliata instructa, caetera glabra, . . .," and in the same year Prain (Bot. Mag., Tab. 8178) as "glabra, radiatim refracta, *extra** prope basin appendicibus ovatis margine ciliatis induta." The plate in the Botanical Magazine is correct, however, and gives a very good idea of both the shape and the position of the stamens. The filaments are more or less adpressed to the disc. The stamens of the three other species agree in all essential points, though the filaments of *C. efilamentosa* and *rosulata* are less conspicuous.

As far as I am aware, nothing is known about the mode of pollination in these species, but it is surely not too audacious to guess that the broad, pilose and appressed filaments serve as a shelter for the honey, which is secreted from the disc and which would otherwise be exposed directly to the open in these rotate flowers.

The species of this subgenus are natives of Burma, S.E. Tibet, Yunnan, and Sze-ch'uan.

There is another species, viz. *C. dicentrifolia*, that occupies a very isolated position in the genus, but has many points in common with the first subgenus. I have seen too scanty material to form a definite opinion, but certainly it should either be placed with *Pseudocodonopsis* or rather constitute a subgenus of its own. The capsule is inferior and obconical, the corolla turbinate and parted only to about $\frac{1}{3}$, the filaments of the anthers are glabrous, about 5 mm. long, gradually attenuated from a dilated base. Its habitat is Sikkim.

* Italicized by the present author.

The second subgenus, *Eucodonopsis*, was characterized in the following words: "Corolla late vel tubuloso-campanulata parum incisa, ovarium semisuperum, capsula lata basi subhemisphaerica supra conoidea," and subdivided into two series, Volubiles and Erectae. The first of these was not further characterized but the second was described in the following words: "Caule erecto scaposo vel foliato vel subscandente (non volubili)." In general, these two series are relatively natural, though the distinguishing character is only biological and the limit is often difficult to draw between them. As far as I see *C. rotundifolia*, *tubulosa* and *macrocalyx* are by no means more scandent than is *C. subglobosa*, but the three first are placed with the Volubiles and the last mentioned with the Erectae. In my opinion a much more distinct and natural limitation is obtained if the first series is restricted to those (twining) species whose stems do not end with a flower and thus have unlimited growth. All flowers are axillary. The species placed with this series by Anthony belong all here with the exception of *C. Farreri* and of the above-mentioned *C. rotundifolia*, *tubulosa* and *macrocalyx*. The series Volubiles was further divided into three subseries, "A. Folia alterna vel opposita bina, corolla campanulata," comprising the main part of the species, "B. Folia alterna opposita vel pseudoverticillata terna quaterna, corolla campanulata," comprising *C. Henryi*, *lanceolata*, *ussuriensis*, and *minima*, and "C. Folia alterna vel bina, corolla tubulosa," comprising *C. tubulosa* and *macrocalyx*.

As mentioned above subseries C. is to be excluded totally from this series. Of subseries B. *C. lanceolata*, *ussuriensis* and *minima* form a very natural group, the "*lanceolata*-group," distinguished by the "subverticillate leaves." On closer examination it is found, however, that the leaves of the primary stem are alternate and very inconspicuous. In their axils branches of some centimetres' length are borne, leafless below and near the top furnished with three or four broadly lanceolate, subverticillate leaves, the whole branch suggesting a digitate leaf. Often the branch ends with a flower and not seldom another flowering branch emerges from an axil of the first. *C. Henryi*, with its large cauline leaves and closely leaved branches, has only an apparent resemblance. The species of the *lanceolata*-group are closely allied and show slight differences both in vegetative and floral characters. They occupy a very natural area, Amur, Manchuria, Corea, Japan, and western and northern China.*

The remaining species of this series are *C. Tangshen*, *viridis*, *affinis*, *micrantha*, *pilosula* (=*silvestris*), *Henryi*, and *modesta*. The affinity of these species is not so close but they will preliminarily be designated as the "*pilosula*-group." All of them have large leaves (often with

* Marquand's report of *C. lanceolata* (Linn. Soc. Journ. Bot. Vol. xlviii. p. 195) from Tibet is incorrect, being based upon Ward no. 6030, which on examination has proved to be *C. tubulosa*.

more or less cordate base) on the primary stem ; in the axils of these are borne either pedunculate flowers, or leafy branches with terminal or axillary flowers ; in most species both corolla and calyx are semi-superior. However the calyx of *C. Tangshen* is almost inferior, but in other respects that species looks almost identical with *C. pilosula* and they can scarcely be kept apart on vegetative characters only. To be sure, an evolutionary and morphological study of these flowers should be most interesting. Here it should also be remembered that some species of the *pilosula*-group (particularly *C. Tangshen*) are very near to some species of *Campanumoea* (particularly *C. javanica* Blume). In my opinion the most logical treatment should be to unite these two genera, but in order to avoid disagreeable nomenclatural changes it is perhaps more practical to maintain *Campanumoea* as a distinct genus on account of its baccate fruits.

In consequence the scope of the series Erectae is to be somewhat extended and characterized by the primary stems bearing terminal flowers. Anthony divided this series into species with " stem leafy or subscapose " and those with " stem bearing many leafy branches, no radical leaves present," and this division seems to be a most natural one. To the first group should be added the above-mentioned *C. rotundifolia, tubulosa,* and *macrocalyx* while *C. rosulata,* which I have placed above with the *Pseudocodonopsis,* should be excluded. The group will be referred to here as the " *tubulosa*-group." According to the description *C. Draco* also belongs here. The species of this group are marked by poorly or not branched stems, bearing large leaves of very variable shape, often more or less deeply incised. The calyx is semisuperior, its lobes variable, often serrate, in some species (*C. Benthami, rotundifolia, tubulosa,* and *macrocalyx*) large and foliaceous. In *C. Benthami, tubulosa,* and *macrocalyx* the stamens are hairy.

The second group, the "*ovata*-group," to which I have given most of my attention comprises the following species, viz. : *C. foetens, subglobosa, Bulleyana, thalictrifolia, mollis, ovata, viridiflora, clematidea, cardiophylla, Kawakamii, tsinlingensis, nervosa, obtusa, bicolor,* and the two species, *alpina* and *macrantha,* described below. It seems very probable that *C. Farreri* also should be included in this group, though it differs in being much larger than the other species, while the branches bear secondary branches. The above species are characterized by having a more or less erect stem (only in *C. subglobosa* definitely twining) terminating in a pendulous flower. No radical leaves are present. The cauline leaves are few and small, in size and shape congruent with those of the branches. Near the base of the stem are several sterile branches, with approximate, alternate or subopposite leaves. The upper part of the stem is either subscapose, unbranched and one-flowered with only one or two small leaves, or furnished with a few flowering branches. By the last-mentioned

difference Komarov (Acta Horti Petrop. Vol. xxix. p. 115) tried to distinguish *C. ovata* from *C. clematidea*, and Anthony (l.c.) used it as a main basis for differentiation in his key. However, it does not hold true in many species, among them *C. ovata*! Poor specimens are often one-flowered, and vigorous ones, many-flowered. Useful characters are found in the size and hairiness of the leaves and in the shape of the calyx and the corolla. As it is difficult to know the latter characters from descriptions only, some figures of the flowers are published here (Fig. 1). As will be seen below the shape and sometimes

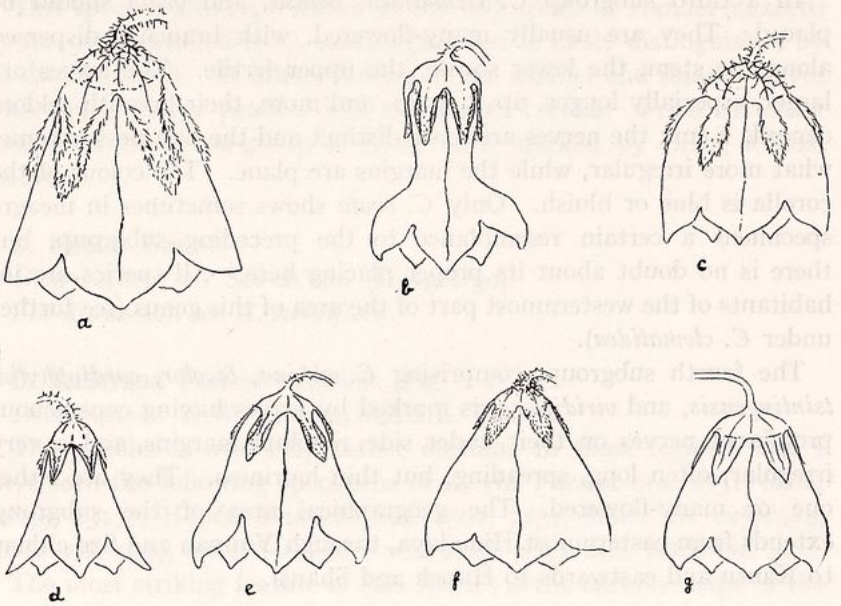

Fig. 1.—Flowers of: *a* C. macrantha (Forrest 18949. Typus !). *b* Bulleyana (Forrest 2731. Typus !). *c* subglobosa (Forrest 6684. Typus !) *d* ovata (Stewart in Herb. Edinb.). *e* foetens (Smith & Cave 1693). *f* nervosa (H. Smith 4198. Typus !). *g* alpina (Forrest 14659. Typus !). All × ¾.

also the hairiness of the calyx is variable within wide limits in some of the species, but with experience they are rather easily recognised.

In the *ovata*-group several subgroups of closely allied species with continuous geographical distribution can be distinguished. In the first place *C. thalictrifolia* and *mollis* may be mentioned. They differ from all others in their subcylindrical corolla and anthers with setose carina. They are natives of Nepal, Sikkim and adjoining parts of Tibet. As to vegetative characters they agree closely with the second subgroup, in which *C. Bulleyana, foetens, macrantha, nervosa*, and *subglobosa*, and according to the description probably also *C. Kawakamii*, may be united. From the preceding subgroup these are marked by the glabrate stamens and the broader, more or less

campanulate corolla. The species of both subgroups are characterized by the rather crowded branches near the base of the stem. As the branches have very short internodes and the leaves often are subopposite, they suggest a compound leaf. The leaves are more or less cordate, about as broad as they are long, with the nerves not or very slightly marked, both surfaces are even, looking almost velvety from appressed parallel hairs, the margins are plane, entire or subrepand. Their geographical area is eastern Himalaya, western Yunnan, western Sze-ch'uan and the adjacent parts of Tibet. *C. Kawakamii*, a native of Formosa, occupies an isolated area.

In a third subgroup *C. clematidea*, *obtusa*, and *ovata* should be placed. They are usually many-flowered, with branches dispersed along the stem, the lower sterile, the upper fertile. The leaves are larger, especially longer, up to 4 cm. and more, their breadth seldom exceeds 2 cm., the nerves are more distinct and the hairiness is somewhat more irregular, while the margins are plane. The colour of the corolla is blue or bluish. Only *C. ovata* shows sometimes in meagre specimens a certain resemblance to the preceding subgroup, but there is no doubt about its proper placing here. All species are inhabitants of the westernmost part of the area of this genus (see further under *C. clematidea*).

The fourth subgroup, comprising *C. alpina*, *bicolor*, *cardiophylla*, *tsinlingensis*, and *viridiflora*, is marked by leaves having conspicuous prominent nerves on their under side, revolute margins, and a very irregular, often long, spreading, but thin hairiness. They are either one or many-flowered. The geographical area of the subgroup extends from easternmost Himalaya, through Yunnan and Sze-ch'uan to Kansu and eastwards to Hupeh and Shansi.

C. alpina Nannf. n. sp. (Fig. 1 *g*, Pl. CCXXVII.).

Radix valida, napiformis, ad 1 cm. crassa, caulibus pluribus praedita.

Caulis uniflorus, ascendenti-erectus, 15–25 cm. altus, paucifoliosus, sparsissime longe albo-setosus, basi ramulis sparse albosetosis foliiferis sterilibus obsitus.

Folia petiolata, petiolis 4–6 mm. longis, glabris vel pilis paucis praeditis, caulina alternantia, ramulina subopposita vel rarius alterna, ovato-cordata, ad 1.8 × 1.5 cm., obtusa, leviter repando-crenata, margine crasso revoluto, supra viridia glabra vel subglabra, subtus pallidiora glaucescentia, breviter et sparsissime albo-setulosa.

Calyx semisuperus, receptaculo applanato-conico, glabro, pruinoso, nervis 10 distinctissimis instructo, tubo paullo ultra ovarium producto. Lobi sinu valde aperto truncato sejuncti, triangulari-oblongi, 8–10 × 5–6 mm., utrinque glabri, extus pruinosi, distincte 3-nervosi, integri vel leviter et sparse denticulati, margine paullo revoluto.

Corolla supera, late campanulata, 2.5–3 cm. longa, sicca 2.5 cm.

lata, ad $\frac{1}{5}$–$\frac{1}{4}$ incisa " purpureo-viridis, nervis purpureis," glabra, lobis triangulari-rotundatis.

Staminum filamenta basi dilatata, c. 7–8 mm. longa, glabra; antherae c. 4 mm. longae, glabrae.

Stylus glaber; stigma late trilobum.

Typus: G. Forrest no. 14659 in Herb. Edinb.

Tibet austr.-orient. Sarong, " on Doker-la, Mekong-Salween divide. Lat. 28° 20′ N.—Slightly scandent plant of 6–15 inches. Flowers purplish green, veined purple. Open pasture on rocky slopes." Aug. 1917. G. Forrest no. 14659. (Herb. Edinb., Kew.).

This species, also represented in the collections of Handel-Mazzetti by no. 9638, is allied to *C. cardiophylla* but is easily distinguished by its dwarf growth. It differs further by the smaller and thinner leaves with much longer petioles and by shorter corolla. From all other species of the *ovata*-group it is at once marked by being almost glabrous.

C. bicolor Nannf.

Distribution: N. Sze-ch'uan (Dongrergo).

For discussion see *C. viridiflora*.

C. Bulleyana Forrest ex Diels (Fig. 1 *b*).

Distribution: N.W. Yunnan and S.E. Tibet.

This species is evidently rather common in these regions, and I have seen the following specimens of it, viz. Forrest nos. 2731, 6608, 14839, 23177, Handel-Mazzetti nos. 4302, 7231, Maire no. 125/1924, Rock nos. 4939, 9884, Schneider nos. 2128, 3859, and Ward no. 1095.

The most striking feature of this species is the curious shape of the corolla. The calyx-lobes are mostly somewhat revolute.

C. cardiophylla Diels. (Pl. CCXXVIII.).

Distribution: Hupeh and southern Shansi.

Under this name several specimens are cited by Anthony (l.c.), which in my opinion do not belong here. Forrest no. 14659 is *C. alpina* Nannf., Forrest no. 18949 and Ward no. 1100 are *C. macrantha* Nannf., Ward nos. 77, 762 and 1074 as well as Forrest no. 14394 are very near to *C. viridiflora* but represent perhaps one or more distinct species, as far as can be judged from the unsatisfactory material.

Besides the type collection I have seen *C. cardiophylla* but once, viz. " Shansi austr.: Yüan-ch'ü distr., Shui-wang-p'ing, in prato alpino, c. 2000 m.s.m., 24.7.1924, H. Smith n. 6762." This collection differs from the type only in being constantly one-flowered.

It agrees with *C. alpina* in being almost glabrous, but differs from this as well as from all allied species by the very thick and firm leaves with short petioles and very distinct revolute margins.

Very characteristic is also the maroon-dotting of the inner surface

of the corolla, with the dots spread all over the inferior part of it and forming an almost confluent ring just below the base of the corolla-lobes.

This is the only species of this group known to grow east of the high mountains of Western China. The thick and firm leaves which give the plant an almost xerophytic habit may be regarded as an adaptation to the drier conditions.

C. clematidea C. B. Clarke.

Distribution: Punjab, Chamba, Kashmir, Afghanistan, Buchara (teste Komarov), Turkestan.

I have seen most specimens cited by Chipp as *C. ovata* v. *cuspidata*, viz. Aitchinson no. 748, Karelin and Kiriloff no. 1702, Fetissow, Kyschochewicz and Fetissow, Krassnow, Regel (Herb. Nat. Mus. Wien), Littledale, and Thomson. All these are in my opinion *C. clematidea*. I have not seen the Chinese specimen cited (Soulié no. 593) but this is certainly something else, as *C. clematidea* has been seen only from Turkestan and adjacent regions. To the above-mentioned specimens can be added Jaeschke no. 50 (cited by Chipp as *C. ovata*) and the following not cited by him:

Turkestan: Sairam, VII. 1877, A. Regel (Herb. Nat. Mus. Wien). Talki, VII. 1877, A. Regel (Herb. Nat. Mus. Wien).

Pamir and Thian Shan Journey, 1906, Appleton no. 271 (Herb. Kew).

Kashmir: Baltistan, Paskyum, 9300′, 8. VI. 1928, B.B. Osmaston no. 130 (Herb. Kew.).

Tibet occ.: Kibar, Thomson no. 2127 (Herb. Kew.).

W. Himalaya: Duthie no. 21947 b. (Herb. Nat. Mus. Wien).

Pangi (Chamba) Buri, 14000′, 11. VII. 1899, Duthie (Herb. Kew.).

Punjab: above Kyelang, Kulu-Lahaul, 6. VII, 1888, Drummond no. 22508 (Herb. Kew.).

Kandang, 9. VII. 1888. Drummond no. 25266 (Herb. Kew.).

Kailang, 24. VI. 1888. Drummond 25267 (Herb. Kew.).

Kolong-Kailang, 2. VII. 1888, Drummond no. 25268 (Herb. Kew.).

C. clematidea has thus a very wide distribution in western Central Asia, in most parts being the only representative of the genus. In the westernmost part of its area, however, *C. obtusa* also is distributed, and, as is shown by the mixture of both species in many collections, they grow together in the same localities. In south-west Kashmir and Chamba the related *C. ovata* is distributed, apparently in part replacing *C. clematidea*.

From *C. obtusa* it is recognised by the very large calyx-lobes whose margins meet. According to the diagnosis by Komarov (l.c., p. 115) it should be very easily known also from *C. ovata*. In most cases this is

true, and I am convinced that they are distinct. However, in some few cases the differences given by him fail. *C. ovata* is often tall and many-flowered with large leaves. If then the margins of the calyx-lobes are revolute, as they typically are and as is shown by fig. 1 *d*, the specimens are still easily placed. But sometimes the calyx-lobes are plane, and then the specimens may be mistaken for *C. clematidea*. Yet, the calyx-lobes of *C. ovata* have always ciliated margins, and those of *C. clematidea* are almost glabrous, somewhat hairy only towards the tip.

C. Farreri Anth.

Distribution: N.E. Burma.

To judge from the description there is little doubt about this species being a member of the *ovata*-group. It differs from the other members, however, in being much larger and in its branches bearing secondary ones.

C. foetens Hook f. et Thoms. (Fig. 1 *e*).

Distribution: Sikkim and adjacent parts of Tibet.

The Chinese specimens cited by Chipp and Anthony belong all to other species, viz. Soulié no. 540 and Ward no. 959 to *C. nervosa*, Pratt no. 531 and Soulié no. 125 to *C. subglobosa*.

The characters distinguishing the present species from *C. nervosa* are given in my earlier paper (l.c., p. 29).

C. Kawakamii Hayata.

Distribution: Formosa.

C. macrantha Nannf. n. sp. (Fig. 1 *a*, Pl. CCXXIX.).

Radix crassa, pluriceps.

Caulis uni- vel pauciflorus, erectus, 50–60 cm. altus, paucifoliosus, apicem versus 2 bracteolis ovato-triangularibus instructus, sat dense et longe albo-setosus, basi ramulis foliiferis sterilibus obsitus.

Folia petiolata, petiolis 2–3 mm. longis, albo-setosis, caulina alternantia, ramulina subopposita vel rarius alterna, triangulari-ovata vel ovato-cordata, ad 1.8 cm. longa et lata, basi subcordata vel attenuata, obtusa, levissime repando-crenata, vel subintegra, supra dense albo-setulosa, subtus sparsius praesertim in nervis et apicem versus albo-setosa.

Calyx semisuperus, receptaculo hemisphaerico, nervis 10 radiatis distinctis instructo, glabro vel praesertim in nervis longe albosetosa, tubo paullo ultra ovarium productus. Lobi sinu obtuso aperto sejuncti, 12–20 × 5–7 mm., ± rhomboidei, in latissima parte valde revoluta, intus basin versus glabri, apicem versus sensim dense albo-setulosi, extus basin versus glabri vel praesertim in nervis longe et pauce albo-setosi, apicem versus dense albo-setulosi.

Corolla supera, campanulata, 3–4 cm. longa, sicca 3.5–4.5 cm. lata, ad ¼ incisa, pallide coerulea, lobis rotundatis, extus loborum apicibus et in nervis setis albis paucis praedita.

Staminum filamenta basi dilatata, c. 8 mm. longa, glabra ; antherae c. 6 mm. longae, glabrae.

Stylus glaber ; stigma late trilobum.

Typus : G. Forrest no. 18949 in Herb. Edinb.

Tibet austr.-orient. : " Salween-kiu-chiang divide. Lat. 28° 40′ N. Long. 98° 15′ E. Weakly scandent plant of 1½–2 ft. Flowers milky-blue, netted a slightly deeper shade. Amongst heavy grass in side valleys." Aug. 1919. G. Forrest (no. 18949). (Herb. Edinb., Kew.).

" Rocks amongst shrubs on open ground. Doker-la. Fls. lavender-blue. 13–14,000 ft." 1913. F. Kingdon Ward (no. 1100). (Herb. Edinb.).

C. macrantha is closely related to *C. Bulleyana*, *foetens*, and *nervosa*, but is distinguished from them in being larger especially as to the flowers, which often reach a length of 4 cm. Unlike them it is also often many-flowered. The calyx lobes are often 2 cm. long with highly revolute margins, as fig. 1 *a* shows. In badly developed specimens the calyx-lobes and the corollas are smaller ; and if they then are only in bud, they may be mistaken for *C. nervosa*. I was not aware of the full scope of its variability, until I received the material collected by Dr. Handel-Mazzetti, where I found it to be represented by nos. 5825, 8071, and 9703. My earlier determination (l.c., p. 27) of the last mentioned specimen as *C. nervosa* proved to be wrong.

The calyx-lobes of *C. nervosa* are always shorter and especially narrower, mostly plane and never so distinctly revolute, and the sinuses broader. The leaves of *C. macrantha* are distinctly larger, and somewhat less hairy. *C. foetens* is at once distinguished by its slenderness, and *C. Bulleyana* by its very characteristic shape of the corolla.

C. mollis Chipp.

Distribution : Southern Tibet.

From the Edinburgh specimen it is evident that this species is many-flowered when fully developed. It is at once distinguished from *C. thalictrifolia* by being much more robust and in all parts larger.

C. nervosa (Chipp) Nannf. (Fig. 1 *f*).

Distribution : Western Sze-ch'uan and N. W. Yunnan.

I can add to the specimens cited earlier by Chipp (l.c., p. 385) and by myself (l.c., p. 27) the following from Herb. Kew., viz. Soulié no. 540 (cited by Chipp, l.c., p. 384 as *C. foetens* and surmised by W. W. Smith, N. Roy. Bot. G. Edinb. vol. viii. p. 108, to belong to *C. subglobosa*) and Wilson no. 2289 (Western Sze-ch'uan, 8. 1909).

As I have pointed out above, the specimen Handel-Mazzetti no. 9703 cited by me (l. c.) has proved to be *C. macrantha*.

C. obtusa (Chipp) Nannf.

Distribution: Afghanistan, Turkestan, Kashmir (Gilgit).

This species is distinguished from the allied and very similar *C. clematidea* and *ovata* by its small, free calyx-lobes emerging directly from the receptacle and leaving between their bases an open space as broad as the lobes or even broader.

C. ovata Bth. (Fig. 1 *d*).

Distribution: Kashmir and Chamba.

I have seen all specimens cited by Chipp and agree with him in the determination of them except for Jaeschke no. 50, which is in my opinion *C. clematidea*.

For discussion of the differences between this species and *C. clematidea* see the latter.*

C. subglobosa W. W. Smith (Fig. 1 *c*).

Distribution: N.W. Yunnan and S.W. Sze-ch'uan.

I have seen the three specimens: Pratt no. 531, Soulié nos. 125 and 540, which were placed by Chipp (l.c., p. 384) with *C. foetens* and which W. W. Smith (l. c.) believed to be his species. For the two first it holds true, but the last mentioned is *C. nervosa*.

The following specimens have been examined, viz., Forrest nos. 83, 6684, Handel-Mazzetti nos. 5456, 10058, Pratt no. 531, Rock no. 6289, Schneider no. 2114, Soulié no. 125, and Ward no. 930.

C. thalictrifolia Wall.

Distribution: Nepal, Sikkim and adjacent parts of Tibet.

This species is at once distinguished by its extraordinary slenderness with almost filiform branches, the tubulate corolla, and the setose anthers. The size of all parts sometimes exceeds by far the measurements given by Chipp (l.c., p. 381) as shown by Kingdon Ward no. 5995. *C. mollis* is nevertheless very distinct.

C. tsinlingensis Pax et K. Hoffm. (Pl. CCXXX.).

Distribution: Shensi (Tsin-ling-shan).

This species was described from Ta-pai-shan in the mountain range of Tsin-ling-shan. As it was not seen by Anthony, it was excluded from his key. I have seen several sheets from the type locality (Giraldi no. 2432 in Herb. Berlin-Dahlem and Purdom in Herb.

* After my manuscript was finished, a plate and a description of this species has been published by O. Stapf (Bot. Mag., Tab. 9208). His opinion as to the limits between this species and *C. clematidea* is in accordance in the main with mine.

Kew). It is near to *C. viridiflora* and *C. bicolor*, but is distinguished from both *inter alia* by the corolla being long-haired and purple-dotted all over the interior. The receptacle and the calyx-lobes are mostly glabrous but in some otherwise typical specimens they are hairy.

C. viridiflora Maxim.

Distribution: Kansu and N.W. Sze-ch'uan.

This species is nearly allied to *C. bicolor* and to the doubtful specimens cited in the discussion of *C. cardiophylla*. A specimen, Mount Everest Exp. 1922 no. 296, is in the same category, but a definite opinion cannot be formed until much richer material of these forms from westernmost China and eastern Tibet is available. For the present I am inclined to restrict the name *C. viridiflora* to specimens with relatively small flowers, the main colour of the corolla yellowish green, purple-dotted only at the very base, and with calyx lobes more or less ovate and very irregularily incised. The flowers of *C. bicolor* are larger, the lower half of the corolla purple, and the calyx-lobes narrower and almost entire.

R. M. Adam, photo.]

Codonopsis alpina, Nannf.

Codonopsis cardiophylla, Diels.

R. M. Adam, photo.]

Codonopsis macrantha, Nannf.

Codonopsis tsinlingensis, Pax et K. Hoffm.