CAMPANULACEAE (B. Moeliono, Amsterdam & P. Tuyn, Leyden)

Annuals, perennials, more rarely shrubs, small trees, or vines, mostly laticiferous, sometimes with subterranean tubers. *Leaves* exstipular, simple, entire or toothed to incised (rarely pinnatifid), spirally arranged or alternate, rarely opposite. *Flowers* often blue, violet, red, or white, frequently protrandrous (rarely dioecious), axillary or terminal, solitary or in mostly bracteate, racemose inflorescences (rarely cymes), bisexual (rarely unisexual or dioecious), isomerous, mostly 5-merous, regular or symmetric. Pedicels mostly with 2 bracteoles. *Calyx* segments mostly free, often persistent, valvate. *Petals* connate to various degree, sometimes almost free (exceptionally free), valvate in bud; in strongly zygomorphous flowers the corolla bilabiate dorsally slit and the lobes often very unequal, the lower lip often with 2 convexities near the base. *Stamens* adnate to the corolla or free from it, mutually mostly partly connate (either the filaments or part of them and the anthers or only the latter); filaments often widened at the base; anthers introrse, in zygomorphic flowers often unequal, often 2 or more with apical setae, further glabrous or haired. *Disk* epigynous, mostly free. *Ovary* inferior or partly so (rarely superior), 2–5-celled. Style 1, often with hairs below the 2–5 stigmatic lobes. *Ovules* ∞, mostly on axile placentas (exceptionally parietal in incompletely celled ovaries). *Fruit* capsular or a berry, or berry-like, mostly dehiscing at the apex with valves, or circumsciss. *Seeds* ∞; embryo straight; albuminous.

Distribution. Rather large family, with a worldwide distribution, with approximately 60–70 genera and roughly between 1000 and 1500 *spp.*, the largest ones, *Lobelia* and *Campanula*, counting several hundreds of species. In Malaysia the family is sparsely represented although with one endemic genus, *Phyllocharis*, in New Guinea, and a subendemic one, *Pentaphragma*.

Two genera show a remarkable trans-Pacific distribution, *viz Laurentia sect. Isotoma* with the majority of species Australian and one species in tropical America, and the *Pratia* affinity of *Lobelia* which is a distinctly South Pacific-Subantarctic group.

Codonopsis on the other hand is typically East Asian, mainly Chinese, and *Peracarpa* is Sino-Japanese. *Wahlenbergia* is worldwide distributed. *Sphenoclea* is a monotypic Old World swamp plant.

Ecology. The family is but little represented in the tropical lowland of Malaysia; most species occur in the hills or in the montane zone. The highest localities are reached by *Wahlenbergia confusa* MERR. & PERRY in New Guinea between 3500 and 4000 m, while some other *Lobelia* species are well up in the subalpine zone.

As to the climate almost all representatives belong to the undergrowth of the rain-forest. Exceptions are *Sphenoclea* which grows on damp soils and is indifferent to climate, *Lobelia alsinoides* which is bound to a seasonal lowland climate, and *Lobelia nicotianaefolia*, *Wahlenbergia marginata*, and *W. hookeri* which are obviously bound to a seasonal montane climate.

No Malaysian *Campanulacea* occupies a very special ecological niche and none occurs gregarious to an extent worthy of note.

Flower biology. Nothing is known about this subject for Malaysian representatives. It is certain that protrandry prevails in the family; the pollen is often shed in bud and the growing style, which is mostly provided with hairs, pushes the pollen up above the anthers. It has been said that apids collect it and would effect cross-pollination. In *Wahlenbergia* the stamens shrivel very soon. The stigma opens at a much later stage. Autogamy is, however, not entirely excluded in this way. DOCTERS VAN LEEUWEN (1933) emphasized that in *Wahlenbergia marginata* autogamy is the rule.

The long-tubed *Lobelias* are said to be adapted to be visited by birds and *L. nicotianaefolia* might fall under this category, but no data are available on this species. It is remarkable that also *L. montana* has scentless flowers; neither DOCTERS VAN LEEUWEN (1933) nor I myself have ever observed insects visiting the showy flowers. As fruit production is abundant, DOCTERS VAN LEEUWEN concluded to successful autogamy.

Seed dispersal. Part of the genera have capsular fruits, part of them possess berries; in *Peracarpa* the fruit is indehiscent. In all cases the seeds are numerous and small. As all but one are of delicate or creeping habit and live mostly in shaded habitats the chance that wind may have an appreciable effect can be neglected, save for the few subalpine *Lobelias* and *Wahlenbergia* which are exposed to mountain winds.

Also for the species with berries the way of dispersal is rather obscure. I have often found the very

large showy berries of *Codonopsis javanica* and *Lobelia montana* entirely untouched and shrivelling on the plant. There is, therefore, no indication that seed dispersal is likely to cover large distances.

Only for *Lobelia angulata* RIDLEY (Disp. 1930, p. 508) recorded that its small berries are, according to the ornithologist H. C. ROBINSON, a favourite food of the tree partridge, *Arborophila campbellii*. The distribution of this mountain bird coincides indeed remarkably well with the localities of the plant: from the Himalaya to Formosa and the Sunda Islands. And Dr JUNGE tells me that there are allied *Phasianinae* in East Malaysia and Australia; in South America this group is replaced by the *subfam. Odontophorinae* which may take over dispersal. However, we have no proof that the seeds pass the intestinal duct undamaged and that the eating of the berries is indeed effective for the intensive and wide dispersal of the seeds.

Lobelia chinensis is often seen along stream banks and this would point either to dispersal of seeds by water, or to aquatic transport of rhizomes.

Laurentia longiflora which is introduced and very common on ruderal places is also often found in damp places near streams and ditches; its seeds may be locally transported by water, as they are said to be water-repellent. It is sometimes also found on old walls which would point to dispersal by ants, but as far as I know the seeds of *Campanulaceae* have no aril or elaiosome.

Anatomy. METCALFE & CHALK (Anat. Dic. 2, 1950, 821) confirmed the close relationship between the *Lobeliaceae* and *Campanulaceae* which they find reflected in many similarities between the two families. Within the *Campanulaceae* they admitted that *Sphenoclea* and *Pentaphragma*, which are both not laticiferous, show some deviating anatomical characters. They expect that laticiferous canals probably occur in all genera of the *Campanulaceae*. The question arises why the *non*-laticiferous *Goodeniaceae* are kept separate from this complex; by the development of the indusium below the style they obviously represent a specialized branch of the same stock.

Chromosomes. The number of the chromosomes of the *Campanulaceae* and *Lobeliaceae*, as found in DARLINGTON & WYLIE's 'Chromosome Atlas' (1955) provide a rather confusing picture, in contrast with for example the allied *Goodeniaceae* which show in 7 publications on 4 genera constantly n = 8.

In *Campanulaceae* the basic numbers vary considerably, sometimes even in taxonomically coherent genera, *e.g. Phyteuma* in which is found n = (6), 12, 13, 14, and in *Jasione* n = 6 and 7. In *Campanula* the situation is even n = 8, 10, 12, 13, 14, and 17. Also within the species the numbers may vary, although not as aneuploids, but as polyploids, with some irregularities. Polyploidy seems to be very common indeed.

Phytochemistry. This family has not been studied intensively by phytochemists. The facts known point on the one hand to many metabolic similarities between the two great subfamilies, *Campanuloideae* and *Lobelioideae*, and on the other hand to marked differences. *Campanulaceae sensu lato* are characterized by local accumulation of silicic acid and/or carbonate of lime in epidermal cells of the leaves, especially in the hairs and neighbouring cells. Furthermore all *Campanulaceae* accumulate inulin and/or inulin-like oligo- and polyfructosans in their vegetative organs. The tendency to accumulate fructosans is even more accentuated in this family than in *Compositae*. In *Campanulaceae* fructosans are synthesized not only by perennial species but also by the annual ones as COLLIN and CHOLLLET have demonstrated. In the seeds fatty oils are stored. Flavonols and leucoanthocyanins are usually absent from the leaves of *Campanulaceae* but ferulic and/or sinapis acid are of common occurrence. All *Campanulaceae* contain articulated, ramified latex vessels in the phloem. The constituents of latices seem to be different in the two subfamilies:

Campanuloideae: The chemistry of latices of this taxon is practically unknown. Phytosterols and a phenolic glycoside, called campanulin, have been demonstrated to occur in the latex. Alkaloids or other toxic principles are not known to be present.

A saponin, platycodin, was isolated from the roots of *Platycodon grandiflorum* DC. but saponins are by no means widely distributed in the subfamily. Caffeic acid on the other hand seems to be a phenolic constituent frequently present in the leaves.

Lobelioideae: Many species of this subfamily are known to be toxic. The toxic principles are alkaloids accumulated in the latex. Many different alkaloids were demonstrated to be present in *Lobelia* and *Isotoma* species. The medicinally used North American *Lobelia inflata* L. has been thoroughly investigated for alkaloids. This plant produces about 30 alkaloids which seem all to be related structurally to lobeline, an α, α^1-disubstituted-N-methylpiperidine base. The alkaloids of all other species of *Lobelioideae* are very imperfectly known. There is, however, no doubt that other types of alkaloids occur in the subfamily. *Lobelioideae* are also characterized by the occurrence of chelidonic acid in the majority of species. On the other hand caffeic acid seems to be absent from this subfamily. Ellagic acid was found in *Centropogon lucyanus* SCHÖNL. which also contains a little leucocanthocyanin in the leaves.

Some species of *Lobelioideae* are reported to accumulate a fair amount of rubber in their latices.

Finally it may be stated that by the accumulation of inulin-like fructosans the family is related to *Goodeniaceae*, *Stylidiaceae*, and *Compositae*, and by the articulated latex bearing vessels to the *Cichorieae* subfamily of *Compositae*. These indices of relationship are, however, rather weak. A thorough chemotaxonomical discussion of *Campanulaceae s.l.* must be postponed until the chemistry of the family has been more thoroughly explored.—R. HEGNAUER.

Taxonomy. AIRY SHAW has recently suggested to 'purify' the *Campanulaceae* by raising the genera

Pentaphragma and *Sphenoclea* to the status of family, suggesting that the latter genus would only be remotely allied to *Campanulaceae* but more to *Phytolaccaceae*. Though it should be admitted that both genera deserve a special status in the family I agree with WIMMER and HUTCHINSON (Fam. Fl. Pl. ed. 2, 1, 1959, 477), who keep them together in the *Campanulaceae*.

There seems little in favour of separating *Campanulaceae* and *Lobeliaceae* as they remain side by side. And in the latter family there are many genera and species which can hardly be termed zygomorphous; also there is degree in the connation of the stamens.

The Malaysian genera can be arranged as follows:

1. *Tribus* **Campanuleae** BTH.: *Peracarpa, Wahlenbergia, Codonopsis.*
2. *Tribus* **Sphenocleae** SCHÖNL.: *Sphenoclea.*
3. *Tribus* **Pentaphragmeae** SCHÖNL.: *Pentaphragma.*
4. *Tribus* **Lobelieae** BTH.: *Lobelia, Phyllocharis, Laurentia.*

The affinity of the Campanulaceae seems distinctly fixed with the *Stylidiaceae, Goodeniaceae,* and *Compositae,* on morphological, phytochemical, cytogenetical, and anatomical grounds.

The classification of the major groups within the family seems also rather well established.

Generic distinction has been liable, however, to difference of opinion and in this revision has amply been discussed under *Codonopsis, Wahlenbergia, Laurentia,* and *Lobelia.* A century ago, when few species were known, genera could often be more or less easily defined, but as more species were found these accepted generic distinctions have often broken down in a number of species ('links'), necessitating a revision of generic limits. This revision of the hierarchy within the family can logically not be performed without either merging genera or segregating others to bring the mutual relations into balance, *i.e.* bringing taxa of the same rank on a ± common footing. In either case we have to face name changes. The latter procedure (segregation) has several manifest disadvantages against the former (large genera, subdivided into sections and subsections), *viz* that the number of generic names becomes confusingly large, and what is more regrettable, generic names become not any longer bound to some clear structural plan, but to small details, which seem rather technical than structural. Segregation will also necessitate the breaking up of genera which nobody wants to break up, because if we split up *Wahlenbergia sens. lat.* into 10–20 genera, it would be absurd to leave *Campanula* intact, as this would greatly upset the standard of the generic level within the family. A further disadvantage will be the increase of monotypic genera, as for those in favour of a larger number of genera, the only means to 'remove' links is to bring them to the generic level in their own right. But most undesirable consequences hover over the splitting procedure, because this is not the end: many novelties wait for exploration and description, and it is almost certain that among them there will be still more 'links' threatening the limits of the so-called small, uniform genera. Finally I find a great disadvantage with the small genera because in a family where the characters are so 'variable', detailed technical characters are no guarantee for common ancestry and are likely to be at least in part artificial. This will namely always be the case where species are reticulately allied. In reticulate affinities, which are obviously mostly a consequence of proportionally recent speciation[1], one will always find 'links' in attempts to subdivide such an affinity. The cytogenetical data emphasize that such a situation is found in the family.

The merging of genera is often objected with the practical argument that genera become too large and so-called 'unwieldy'. We have, however, to accept that there are large genera on which all agree that they should not be segregated, for example *Carex, Ficus, Acacia, Rhododendron, Fimbristylis, Astragalus, Bulbophyllum, Dendrobium, Malaxis, Calamus, Eugenia, Eucalyptus, etc.*

The classical, proper way to deal with these genera is to subdivide them into a hierarchy of infrageneric levels as good as we can. Segregation in such genera will never be useful, the more we learn about them.

Most recent specialists on the *Campanulaceae* agree with this view (WIMMER, MCVAUGH, NANNFELDT, and others), but some are reluctant because of name changes; as said before this cannot be remedied by segregation which will result into even more name changes. I fully agree with Dr MEIKLE, who wrote me: —"I am not happy about generic distinctions in *Campanulaceae*, and wonder if a resurvey of the family could not now be considered". As far as was compatible with the scope of the present revision we have found fit to make a small contribution towards improving generic delimitation; the necessity of name changes should, in our opinion, never be an impediment towards a real improvement of a taxonomic system.

In this revision, for which my two keen collaborators have examined much more extra-Malaysian material and have studied more literature than strictly necessary, it has been shown impossible to keep *Campanumoea* separate from *Codonopsis*, further to keep *Cephalostigma* and *Lightfootia* apart from *Wahlenbergia* which itself is very close to *Campanula.* A more serious deviation from current usage is the merging of *Pratia* with *Lobelia*, as the first was, by its berried fruit, mostly arranged widely apart from the capsular genera of *Lobelioideae.* The same discrepancy is, however, found in *Codonopsis* where berried and capsular fruits are found in one distinctly natural genus. It would appear that a subdivision of *Lobelieae* based only on the structure of the fruit (capsular or berried) is artificial.

[1] The remarkable development of a large number of species of *Lobelia cq.* genera with arboreous habit on the high African volcanoes and the Hawaiian Islands point in the same direction.

Specific variability. As is usual some species have proved more variable than others and after due examination of much extra-Malaysian material some have been accepted in a wider sense than mostly employed, notably *Wahlenbergia marginata*, *Lobelia angulata*, *L. nicotianaefolia*, *Codonopsis javanica*, and *C. lancifolia*, all of which show a wide area of distribution. Variable species are not unknown in the family, as even STEARN, who is certainly not particularly in favour of extreme lumping, felt baffled with the astonishing variability of *Campanula rotundifolia*. Part of this variation is according to the cytogenetical data due to the occurrence of chromosome races, part of it can be ascribed to raciation whether or not effected by isolation on islands. In most cases we have refrained from giving names to these races, as a proper naming should only be achieved after much more detailed field study combined with cytological and experimental-taxonomical research.

Also random paramorphs are common; as has already been remarked by SCHÖNLAND (in E. & P. Pfl. Fam. 4, 5, 1894, 43) there is a great variability in the numbers of the floral parts; see also under *Wahlenbergia marginata*.

Uses. HEYNE *l.c.* has enumerated the few, minor uses recorded in Malaysia. Some exotic species are cultivated as ornamentals; they have been enumerated at the end of the family and under *Lobelia* a key has been given to five cultivated species of that genus. It must be emphasized, though, that most *Campanulaceae* can in the tropics only successfully be grown in the montane zone.

Notes. Mr MOELIONO is responsible for revising *Lobelia*, *Codonopsis*, and *Peracarpa*, Mr TUYN for *Laurentia*, *Phyllocharis*, and *Wahlenbergia*. The drawing of the family description, the introductory notes, and key to the genera has been my privilege.—VAN STEENIS.

KEY TO THE GENERA

1. Anthers during anthesis free. Flowers regular.
 2. Flowers in dense spikes.
  3. Leaves very large and wide, asymmetrical, alternate. Spikes one-sided (scorpioid), axillary. Petals or corolla segments valvate. Fruit an indehiscent berry. See vol. 4, p. 517. **5. Pentaphragma**
  3. Leaves symmetrical, lanceolate, spirally arranged. Spikes regular, not scorpioid, terminal. Corolla lobes imbricate. Capsule circumsciss-dehiscent, opening with a lid. See vol. 4, p. 27. **4. Sphenoclea**
 2. Flowers solitary or in cymes, racemes or panicles.
  4. Leaves at least partly (lower ones) decussate. Base of the corolla tube adnate to the ovary. Fruit (in Mal. *spp.*) a berry . . . . . **3. Codonopsis**
  4. Leaves spirally arranged or distichous. Corolla not adnate to the ovary. Fruit capsular.
   5. Erect or slightly ascending herbs. Flowers blue or white, terminal. Capsule loculicid, with 2–3 apical valves . . . . . **2. Wahlenbergia**
   5. Prostrate, creeping, delicate herb, rooting at the nodes. Flowers solitary, axillary, white. Capsule indehiscent . . . . . **1. Peracarpa**
1. Anthers and mostly part of the filaments connate during anthesis. Corolla dorsally often slit to near the base, often zygomorphic.
 6. Corolla white, tube 7½–11 cm long, narrow-cylindric, not dorsally slit, almost actinomorphic. Stamens inserted high in the tube (in Mal. *sp.*) . . . . . **8. Laurentia**
 6. Corolla much smaller, at most *c.* 3 cm long, generally distinctly zygomorphic, tube dorsally mostly deeply slit. Filaments free at the base or inserted on the base of the corolla tube.
  7. Flowers solitary, through connation with the leaf epiphyllous . . . . **7. Phyllocharis**
  7. Flowers arranged in various ways, not epiphyllous . . . . . **6. Lobelia**

1. PERACARPA

HOOK. *f.* & TH. J. Linn. Soc. Bot. 2 (1858) 26; FEER, Bot. Jahrb. 12 (1890) 620, t. VII B.

Prostrate, creeping herb; stem terete, rooting at the nodes. Leaves spiral. *Flowers* 5-merous, actinomorphous, solitary, axillary, sometimes terminal. *Sepals* free, erect. *Corolla* campanulate, 5-lobed. Disk fleshy, semiglobose, 3-sulcate. Stamens 5, free from the corolla. Ovary 3-locular; ovules ∞; style simple; stigma 3(–4)fid. *Capsule* pyriform, pendulous, with a thin pellucid wall, lengthwise nerved, not dehiscent, pericarp swollen above the oblong seeds.

Distr. Monotypic, from the Himalaya to Kweichow, Japan, and Formosa, in *Malaysia:* Philippines (N. Luzon), only in the mountains.

1. Peracarpa carnosa (WALL. in Roxb.) HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 26; CLARKE, Fl. Br. Ind. 3 (1881) 437; FEER, Bot. Jahrb. 12 (1890) 620, t. 7B; CRAIB, Fl. Siam. En. 2 (1936) 308; YAMAMOTO, Obs. Fl. Form. 13 (1936) 149; HARA, J. Jap. Bot. 21 (1947) 20;

MAKINO, Ill. Fl. Japan (1954) 82, *incl. var. circaeoides.*—*Campanula carnosa* WALL. in Roxb. Fl. Ind. 2 (1824) 102; Cat. (1828) *n.* 1282; DC. Prod. 7 (1839) 474.—*Campanula circaeoides* FR. SCHMIDT *ex* MIQ. Ann. Mus. Lugd. Bat. 3 (1867) 195, 204; FORB. & HEMSL. J. Linn. Soc. Bot. 26 (1889) 9.—*P. circaeoides* FEER, Bot. Jahrb. 12 (1890) 621; FEDOROV. Fl. U.R.S.S. 24 (1957) 380.—*P. luzonica* ROLFE, Kew Bull. (1906) 201; MERR. & MERRITT, Philip. J. Sc. 5 (1910) Bot. 392; MERR. En. Philip. 3 (1923) 586.

A weak, branching succulent herb up to 16 cm long. *Leaves* broad ovate to ovate, 4–30 by 4–20 mm, cordate or truncate, entire or crenate, acute or obtuse, both sides puberulous, the underside sometimes glabrous; petiole as long as to a little shorter than the leaves, 4–25 mm, glabrous. *Flowers* 5–12 mm. Pedicels 6–30 mm. *Sepals* 5, free, subulate, sometimes triangular, ½—1(—1½) by ½ mm, entire, glabrous. *Corolla* 3–12 mm, campanulate, varying from blue to white; lobes 5, for up to ⅓ connate, nearly equal, elongate to elliptic 2¾–10 by 1–2 mm, entire, acute or obtuse, glabrous. *Stamens*: anthers *c.* 1 mm, glabrous; filaments linear, broadened to the base, 2–4 mm, finely haired, sometimes glabrous. *Ovary* obconical to campanulate, 1½–3 by 1–2 mm, glabrous; style simple, glabrous, rarely hairy, with narrow stigmas. *Fruit* ovoid to obovoid, 3–5 by 3–5 mm, with a very thin wall, pendent on the pedicels. *Seeds* fusiform-ellipsoid, 1–1½ mm, brown and smooth.

Distr. SE. Asia: N. India (Himalaya), Siam, S. China (Yunnan, Kweichow), Japan, and Formosa; in *Malaysia*: Philippines: Luzon (Benguet and Lepanto: Mt Osdung; Mt Pulog) and Panay.

Ecol. In moist mountain (oak) forest, at the base of trees, 1450–3000 m. *Fl. fr.* Febr.–June.

2. WAHLENBERGIA

SCHRAD. [Pl. Sem. Hort. Ac. Gott. 1814, p. 3, *nom. nud.*] *ex* ROTH, Nov. Pl. Sp. (1821) 399, *nom. gen. cons., cf.* STEEN. Taxon 9 (1960) 125; ?D. DON, Prod. Fl. Nep. (1825) 156; SCHRAD. Blumenbachia, *etc.* (1827) 123; RCHB. Ic. Pl. Rar. cent. 5[8] (1827) 47, t. 480; SCHRAD. Comm. Gott. 6 (1828) 123; DC. Mon. Camp. (1830) 129; BREHMER, Bot. Jahrb. 53 (1915) 9; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 201.—*Lightfootia* l'HÉRIT. Sert. Angl. (1789) 4, t. 4, *non* SW. 1788 (*Flac.*), *nec* SCHREB. 1789 (*Rub.*); R. S. ADAMSON, J. S. Afr. Bot. 21 (1955) 155.—*Campanula sect. Campanopsis* R. BR. Prod. (1810) 560.—*Cervicina* DELILE, Fl. d'Egypte (1813) 7, Atlas t. 5, f. 2, *nom. gen. rejic.*—*Cephalostigma* DC. Mon. Camp. (1830) 117.—*Campanulopsis* ZOLL. & MOR. Nat. & Geneesk. Arch. Nêerl. Ind. 1 (1844) 484, *nomen; cf.* STEEN. Bull. Jard. Bot. Btzg III, 17 (1948) 463.—*Campanopsis* O.K. Rev. Gen. Pl. 2 (1891) 378, *nom. illeg.*

Annual or perennial, erect or ascending herbs, sometimes woody at the base. Stems simple or branched, glabrous or hairy. *Leaves* (in Mal.) mostly sessile, spirally arranged, hairy or glabrous, elliptic to linear, seldom obovate or spathulate, margins mostly thickened, shallowly dentate or almost entire. Inflorescence (or flowers) terminal or axillary, usually sparsely flowered. Bracts narrow, small. Pedicels glabrous or hairy. *Flowers* distinctly protrandrous, regular, mostly blue or white. *Calyx* inferior to (in Mal.) superior, lobes 3–6 (in Mal. 3–5), acute, blunt or slightly acuminate, triangular to linear, persistent. *Corolla* 5- or 4-partite, or a 3–6- (in Mal. 3–5-) lobed tube, sometimes inside bearing slender hairs. *Stamens* 5, alternate with corolla lobes, free; anthers narrow; filaments membranous, broad or broadened at the base, ciliate, the apical part often recurved. Style about as long as corolla tube, or longer, lengthening during anthesis, the basal part sometimes bearing long, slender hairs, the upper portion sometimes with short bristle-like hairs, sometimes bearing warts at or near the base of the stigmatic lobes; stigmas 2–3 (in extra-Mal. *ssp.* up to 5), spreading late in anthesis. *Ovary* inferior (in Mal.) to superior, 2–3-celled (in extra-Mal. *spp.* up to 5-celled). *Capsule* loculicid, opening by as many apical valves as there are cells in the ovary. *Seeds* ∞, ellipsoid or triangular, shining, up to 1 mm.

Distr. Large genus, possibly comprising more than 150 *spp.*, almost cosmopolitan, with the bulk of the species on the southern hemisphere, specially in Africa. In continental Asia and Malaysia only a few species. Roughly it forms a geographical and taxonomical complement to *Campanula*, which is mainly a northern hemisphere genus.

Ecol. Extremely variable, preferring open localities in steppe, savannahs, and at high altitudes, the four Malaysian species only on the mountains.

Flower biology. The flowers are distinctly protrandrous. The sticky pollen is shed already in bud, and covers in great masses the upper portion of the style and the stigmatic lobes, concealing their shape and structure. The anthers are withering in early anthesis and are often not found in fully opened flowers. The margins and/or lobes of the filaments are incurved. Their filiform apex is mostly recurved and closely appressed to the widened central portion of the filaments. The stretching of older filaments, which are so frequent in the herbarium, is a very delicate work. All other floral parts are growing during flowering, which makes it very difficult to extract exact measurements from herbarium material. The stigmatic lobes are spreading in a later stage. The hairs that are sometimes found on the inside of the corolla and on the style seem to fall off later.

Taxon. After ample consideration we have in this revision combined the genera *Lightfootia* and *Cephalostigma* with *Wahlenbergia* and feel compelled to give our reasons for this conclusion. A century ago, when few species were known, it was rather easy to separate and define these three genera, though all of them are only separated from *Campanula* by the apical dehiscence of the fruit. *Lightfootia* would be characterized against *Wahlenbergia* by the deeper incised corolla, the narrower corolla lobes, and the style, which would be proportionally longer if compared with the corolla. *Cephalostigma* would be closest to *Lightfootia* in having a narrow-lobed, very deeply incised corolla and a simple knob-like stigma. The latter observation of DE CANDOLLE was erroneous: there are three short lobes which form in outline a more or less globular whole.

In proportion to the tremendous increase in described species the already not particularly strong differences have gradually become vague and VON BREHMER (1915, *l.c.*) in a thorough study of the African species of *Wahlenbergia* came to the conclusion that a sharp separation of the genera *Wahlenbergia* and *Lightfootia* cannot be upheld because in both genera so many different combinations are represented (by different species), that the differential characters imperceptibly merge into one another. His scheme of style and stigma structure in the various groups of species (*l.c.* p. 12) showed that no demarcation can be drawn. He maintained both names because of his 'personal aversion' to use the nomenclaturally older name *Lightfootia* l'HÉRIT. 1789 for the *Wahlenbergias* which he assumed to be older in the phylogeny, excusing this curious conclusion by stating that in the *Campanulaceae* genera are often distinguished by "sekundäre" characters. Dr R. S. ADAMSON, *l.c.*, could not find more convincing arguments and merely referred to VON BREHMER. In a recent letter he kindly elucidated his standpoint, admitting that there is not any key character that would separate the two genera; for the South African species the corolla and style characters work fairly well, but "these features break down for some of the *Lightfootia* species in tropical Africa which I feel do not really belong to the genus". He continues: "I do not feel in favour of placing the whole lot in one comprehensive genus. This would possibly be the most logical but would be very unwieldy, would entail a lot of name changes, and would tend to obscure some geographical lines of development. My own feeling is rather to increasing the number of genera. The two in question could with advantage both be split up. The smaller units would admit of key diagnosis. I am not sufficiently familiar with the extra-S. African species to attempt even an outline".

Mr CANNON of the British Museum (Nat. Hist.), Botany Department, though making the provision that he has no specialized knowledge of the group, kindly commented to us that in his opinion "it does not seem that the grounds for keeping the genera separate are anything more than mere convenience. Presumably merging the genera would bring about a large number of new combinations, but this can scarcely be regarded as a valid reason for not adopting what appears to be the scientifically correct course of action".

Finally, Dr R. D. MEIKLE, Kew, granted us the privilege of his opinion: "Quite frankly, I think that all the supposed distinctions are untenable, and I would certainly unite the two genera. I suspect the nomenclatural consequences have alone dissuaded others from doing so. I can see no good reason for conservation of either, and even if the change calls for a lot of new combinations, that simply cannot be helped".

To a serious matter like this, where we deal in this Flora with only few species of a large, worldwide distributed aggregate, we think ample consideration should be given to the opinion of specialists.

What should be strived at, specially in generic distinction, is a balanced system of recognizable units at about one level throughout the family which are structurally more or less comparable, though these units may differ considerably in the number of species. We can expect that with increase in the number of species described through intensified exploration, generic limits which were once clear may entirely disappear. From the scientific standpoint we should not leave such cases unattended, but should try to improve our insight in the family by applying a sound generic distinction.

In this case there is unanimity about the evaluation of the facts, but there is difference of opinion about the course we should take in future. Scientifically we cannot share the aversion of VON BREHMER,

neither to required name changes nor to his argument of phylogeny, as for the latter the nomenclature is entirely irrelevant.

Dr ADAMSON's perspective we feel we cannot share either, because we see no advantage in segregation in this case. Firstly it is not certain that it would really be possible, but if we discard this doubt for a moment, secondly it would lead to a large number of small genera ranking taxonomically below the generic level proper and disturb the hierarchy within the family. Naturally, subgenera are generally more "natural" than genera and sections more natural (coherent) than subgenera, and so forth descending in the ranks. But the advantage to have a large genus *Wahlenbergia* is that of generic balance in the family whilst Dr ADAMSON's desire for coherent units can well be fulfilled by distinguishing *within* the genus the natural subgeneric taxa in various ranks. A similar procedure has been followed within other natural, but very large genera, as in *Astragalus, Bulbophyllum, Carex, Dendrobium, Ficus, Eucalyptus, Acacia, etc.* I assume this infrageneric distinction will be similarly satisfactory in *Wahlenbergia sens. lat.* and will meet the needs for distinction of natural units felt by Dr ADAMSON.

As to the third genus, *Cephalostigma*, DE CANDOLLE erroneously stated (1830, *l.c.* 56) that it would deviate from *Lightfootia* by a "stigma en tête" (*capitatum, simplex, l.c.* 117); he assumed it to be intermediate between *Wahlenbergia* and *Lightfootia*. Really, the stigma has afterwards always been described as consisting of 3 lobes, as in the other genera. Consequently *Cephalostigma* cannot be upheld, as its stigmatic form is also found in *Wahlenbergia*.

Nomencl. Though *Lightfootia* l'HÉRIT. is the oldest name, it is a later homonym of *Lightfootia* SW. (see for publication dates Fl. Mal. I, 4, 1954, cxcvii, ccxiv). Fortunately more species have been described under *Wahlenbergia* than under *Lightfootia*, so that the smallest possible amount of transfers will be necessary.

KEY TO THE SPECIES

1. Petals narrow, almost free. Capsules with as many lengthwise nerves as there are calyx lobes.
2. Ovary hispid. Seeds ellipsoid, compressed. Filaments 3-lobed . . . . . **1. W. erecta**
2. Ovary glabrous. Seeds trigonous. Filaments narrow triangular . . . . . **2. W. hookeri**
1. Corolla with a distinct tube, much longer than the calyx lobes. Capsules with twice as many nerves as calyx lobes.
3. Filaments very narrow triangular. Fruit wider than long, 3-celled. Calyx lobes longer than the ovary. Corolla tube about twice as long as the calyx lobes (sometimes longer). Corolla (stretched) 12–18 mm. **3. W. confusa**
3. Filaments abruptly narrowed about halfway, the basal part about pentagonal, deltoid, or pseudo-2-lobed. Fruit longer than wide, 2–3-celled. Calyx lobes shorter or longer than the ovary. Corolla tube shorter or longer than the calyx lobes (never more than twice as long). Corolla (stretched) 2½–12 mm (in *var. grandiflora* 15–25 mm) . . . . . **4. W. marginata**

1. Wahlenbergia erecta (ROTH *ex* R. & S.) TUYN, *nov.comb.*—*Dentella erecta* ROTH *ex* R. & S. Syst. Veg. 5 (1819) 25, *ex descr.*; Nov. Pl. Sp. (1821) 140; CHAM. & SCHLECHTEND. Linnaea 4 (1829) 151; DC. Prod. 4 (1830) 419.—*Dentella perotifolia* WILLD. *ex* R. & S. Syst. Veg. 5 (1819) 25, *descr. in syn., nom. illeg.*; DC. Prod. 4 (1830) 419.—*W. perotifolia* W. & A. Prod. (1834) 405, *nom. illeg.*; DC. Prod. 7 (1839) 434; WIGHT, Ic. Pl. Ind. 3 (1844–45) 4, t. 842.—*Cephalostigma schimperi* HOCHST. *ex* RICH. Tent. Fl. Abyss. 2 (1851) 2; CLARKE, Fl. Br. Ind. 3 (1881) 428; TRIM. Fl. Ceyl. 3 (1895) 58.—*Cephalostigma erectum* (ROTH) VATKE, Linnaea 38 (1874) 699, *quoad specim. pro parte.*—**Fig. 1h-i.**

Annual, erect herb. Stems 5–10 (–35) cm, flexuose, branched, blunt-angular, the angles pale elevated lines, patently ± hispid-hairy. *Leaves* 5–20 by 1½–6 mm, spirally arranged (sometimes almost distichous), sessile, oblong, sometimes elliptic, acute, mostly obtuse at the base, sparsely hairy (hairs especially along the midrib) or almost glabrous, margin thickened, undulate shallowly and remotely dentate. *Flowers* axillary and terminal. Pedicels 5–10 mm, filiform, hairy. *Calyx* lobes 5, 1½–3 mm, linear to narrow-triangular, acute, outside sparsely patently hairy. *Corolla* 5-parted, segments linear acute about as long as the calyx lobes. *Stamens* 5, anthers 0.5 by 0.2 mm; filaments 0.8 mm, membranous, broad at the base, 3-lobed, the side lobes small, the middle lobe bearing the anther. *Ovary* 2–2½ mm, bell-shaped to obconical, patently hispid-hairy (hairs up to ½ mm), top conical, apparently lengthening during anthesis to about 1½ mm; style 1½ mm, narrow-cylindric, thickened below the apex, with 3 short stigmatic lobes. *Fruit* 2–3 mm, obconic to bell-shaped, 5-nerved, valves 3, before opening forming a glabrous cone 1–1.7 mm high. *Seeds* ∞, compressed-ellipsoid, shining, brown, ½ mm.

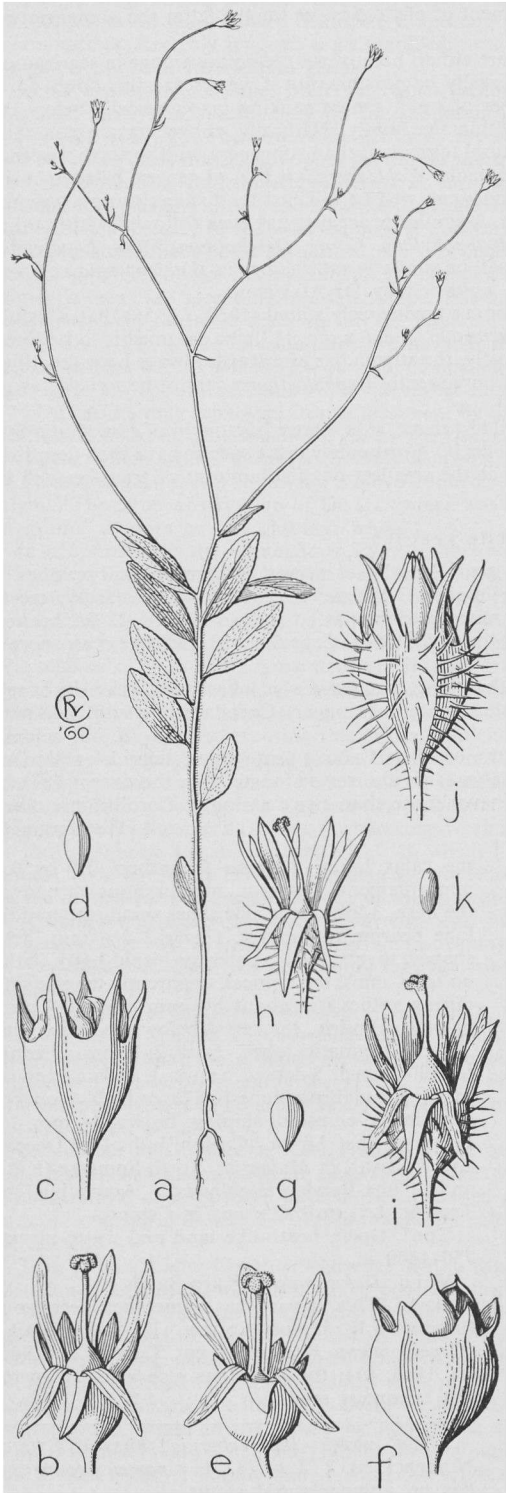
Distr. East Africa, ?Ceylon, India (the Deccan and Khasya), in *Malaysia*: North Sumatra (Karo and Toba-Batak Highlands). According to TRIMEN, *l.c.*, probably not in Ceylon.

Ecol. Open, heath-like land and waste places, 750–1400 m.

Vern. *Dukut tawar*, Karo-Batak.

Note. This species has sometimes been confused with *W. hirsuta* (EDGEW.) TUYN, *nov.comb.*[1] (*Cephalostigma hirsuta* EDGEW. Trans. Linn. Soc. 20, 1846, 81); the latter has also a hispid ovary but trigonous seeds.

[1] The name *Wahlenbergia hirsuta* STEUD. Nomencl. ed. 2, 2, p. 782, is a *nomen nudum* and has no nomenclatural status.



2. Wahlenbergia hookeri (CLARKE) TUYN, *nov.comb.* —*Cephalostigma hookeri* CLARKE, Fl. Br. Ind. 3 (1881) 429; DANGUY, Fl. Gén. I.-C. 3 (1930) 690; CRAIB, Fl. Siam. En. 2 (1936) 307.—*Cephalostigma paniculatum* (*non* DC.) HOSSEUS, Beih. Bot. Centr. Bl. 28, ii (1911) 446.—**Fig. 1a-g.**

Slender annual herb, erect. Stems 10–20 cm, hairy. *Leaves* 10–30 by 4–9 mm, (sub) petiolate, oblong, elliptic, obtuse or acute, hairy, margin thickened, crenate, shallowly dentate. *Inflorescence* slenderly branched, glabrous or nearly so, bracts 4 by 1 mm, or (mostly) smaller, pedicels 4–30 mm, filiform. *Calyx* lobes 5, 1–1.2 mm, elongate-triangular, acute, sometimes with a few hairs at the apex, further glabrous. *Corolla* 5-parted, 2 by 0.4 mm, about twice the length of the calyx lobes. Stamens 5; anthers 0.4 by 0.1 mm; filaments 1 mm, narrow triangular, sometimes almost filiform. *Ovary* 1—1½ mm, bell-shaped to obconic, glabrous; top conic, up to 1 mm high; style 1.3–1.6 mm, narrow-cylindric, 3 short narrow stigmatic lobes. Fruit (only one seen, in poor condition) 2 by 2 mm, semispherical, 2-valved. Seeds numerous, triangular, brown, shining, 0.6 mm.

Distr. India (Behar, Khasya), N. Siam (Doi Sutep), in *Malaysia*: East Java (Mt Idjen: L. VAN DER PIJL 144, BO, L, K), only once collected, June 1929.

Ecol. In reed stands (?*Themeda*), probably *c.* 1000—1200 m alt.

Note. Differs from *Wahlenbergia candollei* TUYN, *nom.nov.* [*Cephalostigma paniculatum* DC. Mon. Camp. (1830) 117, *non Wahlenbergia paniculata* (THUNB.) DC. *l.c.* p. 153] in its smaller flowers and the bell-shaped, not obconic ovary.

The shape of the seed in the Indian and the Javanese material is elliptic, in the only specimen from Siam (HOSSEUS 225) the seeds are more obovate.

3. Wahlenbergia confusa MERR. & PERRY, J. Arn. Arb. 22 (1941) 383.—**Fig. 2.**

Probably perennial, usually glabrous, sometimes stem and leaves (midrib, margin) with sparse bristle-like hairs. Stems ascending, 10–25 cm long, sulcate. *Leaves* ± uniform in shape, thickish, 2–11 by ½–3 mm. *Flowers* solitary. Pedicels 2–7 cm. *Calyx* lobes 5, ± spreading, linear-lanceolate, acute to acuminate, usually entire, always longer than the ovary, 2½–4 mm long. *Corolla* tube about twice as long as the calyx lobes, sometimes longer, 6½–8 mm; lobes 5, ovate, acute, 5–10 mm. Filaments linear-triangular, 2½–3½ mm. *Ovary* obconical, 3-celled, 1.2–3 mm; style slightly

Fig. 1. *Wahlenbergia hookeri* (CLARKE) TUYN. *a.* Habit, × ⅔, *b.* flower, stamens removed, × 7, *c.* fruit, × 7, *d.* seed, × 13, *e.* flower, stamens removed, × 7, *f.* fruit, × 7, *g.* seed, × 13.— *Wahlenbergia erecta* (ROTH *ex* R. & S.) TUYN. *h–i.* Flowers, stamens removed, × 7, *j.* fruit, × 7, *k.* seed, × 13 (*a–d* VAN DER PIJL 144 (E. Java), *e–g.* HOSSEUS 224 (Siam), *h–k* LÖRZING 7190 (N.Sumatra).

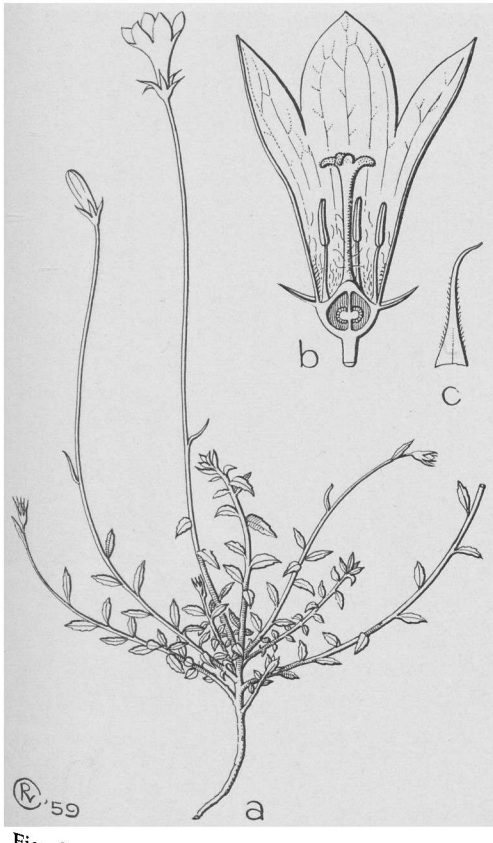


Fig. 2. *Wahlenbergia confusa* MERR. & PERRY. *a.* Habit, × ⅔, *b.* longitudinal section of flower, × 2, *c.* filament, × 6 (BRASS 9399).

shorter than the corolla tube, 5½–7 mm; stigma 3-lobed, (1–)1½–3 mm long. *Fruit* slightly wider than long, 3-valved, 2–3 mm diam., crowned by the recurved calyx lobes.

Distr. *Malaysia*: West New Guinea (vicinity of Mt Wilhelmina).

Ecol. Wet, grassy, open places along streams, once noted on sandstone, 3400–4000 m.

Note. MERRILL compared his new species with *W. eurycarpa* DOMIN (Bibl. Bot. Heft 89, 1929, 1038) but already remarked that the fruit in the latter would appear too long. DOMIN himself compared his species with *W. sieberi* and gave the differences with *W. multicaulis* which species I have reduced to *W. marginata*. As DOMIN neither mentions the shape of the filaments nor the relative length of the corolla tube, and as his material is not available to me, I refrain from giving a definite opinion.

4. Wahlenbergia marginata (THUNB.) DC. Mon. Camp. (1830) 143; Prod. 7 (1839) 433; SIEB. Fl. Jap. 2 (1845) 179; KOORD. Exk. Fl. Java 3 (1912) 300; NANNFELDT, Act. Hort. Gothob. 5 (1929) 32; ALSTON, Fl. Ceyl. Suppl. 6 (1931) 176; DOCTERS VAN LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. 2, 31 (1933) 267; HOCHR. Candollea 5 (1934) 290, *cum var.*; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 179; CRAIB, Fl. Siam. En. 2 (1936) 307; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 212, *cum var.*; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 183, p. 5; HATCH, Trans. Proc. R. Soc. New Zeal. 79 (1952) 368, *cum var.*; YUNCKER, Bull. Bern. P. Bish. Mus. 220 (1959) 261.—*Campanula marginata* THUNB. Fl. Jap. (1784) 89.—*Campanula gracilis* FORST. Prod. (1786) 84; R.BR. Prod. (1810) 561, *incl. var.*—*Campanula quadrifida* R.BR. Prod. (1810) 561.—*Campanula dehiscens* ROXB. [Hort. Beng. (1814) 85] *ex* WALL. As. Res. 12 (1816) 571, *cum ic.*; Fl. Ind. 2 (1824) 96.—*Campanula agrestis* WALL. in Roxb. Fl. Ind. 2 (1824) 97; Cat. (1829) 1292.—*Campanula lavandulaefolia* REINW. *ex* BL. Bijdr. (1825) 726.—*W. gracilis* [SCHRAD. Blumenbachia (1827) 38, *in obs.*] DC. Mon. Camp. (1830) 142, *incl. var.*; Prod. 7 (1839) 433; JUNGH. Nat. Geneesk. Arch. Neêrl. Ind. 2 (1845) 48, *cum var. hirsuta* JUNGH.; HOOK. *f.* Fl. Tasm. 1 (1860) 239; BTH. Fl. Austr. 4 (1869) 137; CLARKE, Fl. Br. Ind. 3 (1882) 429; WARB. Bot. Jahrb. 18 (1893) 212; HEMSL. J. Linn. Soc. 30 (1894) 183; BAILEY, Queensl. Fl. 3 (1900) 922; CHEESEMAN, New Zeal. Fl. (1906) 402; DEN BERGER, Trop. Natuur 6 (1917) 104 f. 4; STEARN, Dict. Gard. R.H.S. 4 (1951) 2257.—*W. quadrifida* (R. BR.) DC. Mon. Camp. (1830) 144; Prod. 7 (1839) 433; N. E. BROWN, Gard. Chron. 54 (1913) 316; DOMIN, Bibl. Bot. Heft 89 (1929) 1192; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 210.—*W. dehiscens* (ROXB.) DC. Mon. Camp. (1830) 145; Prod. 7 (1839) 434; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 216.—*W. agrestis* DC. Mon. Camp. (1830) 145; Prod. 7 (1839) 434; WIGHT, Ic. Pl. Ind. Or. 4 (1850) 1175; HOOK. *f.* & TH. Proc. Linn. Soc. Lond. 2 (1858) 21; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 215.—*W. lavandulaefolia* DC. Mon. Camp. (1830) 144; Prod. 7 (1839) 433; ZOLL. Nat. Geneesk. Arch. Neêrl. Ind. 2 (1845) 567.—*W. indica* DC. Mon. Camp. (1830) 146; Prod. 7 (1839) 434; WIGHT, Ic. Pl. Ind. Or. 4 (1850) 1176; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 209.—*W. sieberi* DC. Mon. Camp. (1830) 144; Prod. 7 (1939) 433; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 219.—*W. multicaulis* BTH. in Hügel, En. Pl. Nov. Holl. (1837) 75; DC. Prod. 7 (1839) 433; N. E. BROWN, Gard. Chron. 54 (1913) 337; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 229; STEARN, Dict. Gard. R.H.S. 4 (1951) 2258.—*Campanula sieberi* DIETR. Syn. Pl. 1 (1839) 752.—*Campanula indica* DIETR. *l.c.* 753.—*Campanula littoralis* LABILL. Pl. Nov. Holl. 1 (1844) 49, t. 70.—*Campanulopsis cyanea* ZOLL. & MOR. Nat. Geneesk. Arch. Neêrl. Ind. 1 (1844) 484, *nomen.*—*W. simplicicaulis* DE VRIESE in Lehm. Pl. Preiss. 2 (1846) 241; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 209.—*Lobelia dubia* DE VRIESE in Lehm. Pl. Preiss. 2 (1846) 242.—*Lightfootia gracilis* MIQ. Fl. Ind. Bat. 2 (1856) 567, *cum var. lavan-*

Fig. 3. *Wahlenbergia marginata* (THUNB.) DC. Grassy place near lava rocks, Mt Lawu, East Java (ARENS).

dulaefolia MIQ.—*Campanopsis marginata* O.K. Rev. Gen. Pl. 2 (1891) 378, *cum var. rigida, nom. illeg.*—*Cervicina gracilis* BRITT. Ill. Bot. Cook 2 (1901) 56, t. 182.—*W. bivalvis* MERR. Philip. J. Sc. 1 (1906) Suppl. 242.—*W. gracilenta* LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 217.—**Fig. 3-5.**

Perennial. Stem 3–60 cm, glabrous or hairy, or only pilose in the lower part. *Leaves* linear to elliptic, the lower ones usually tending to be broadest, decreasing in size upwards, 1/5–5½ cm by ½–5 mm. *Inflorescence* 1- to few-flowered. Pedicels 1–15 cm. *Calyx* lobes 3–5, linear-lanceolate, acute or ± obtuse (China), usually entire, sometimes sparsely dentate, usually about as long as the corolla tube, sometimes shorter or up to twice as long, 0.8–4 mm. *Corolla* tube 1–5 mm, lobes 3–5, ovate or elliptic, acute or acuminate, 1.2–7(?) mm. Anthers narrow, ½–2½ mm long; basal part of the filaments about pentagonal or obtrapezoid, abruptly narrowed, the upper portion filiform, 0.8–2 mm. *Ovary* obconical bell-shaped, 2–3-celled; 1–5 mm; style 1.6–5 mm; stigma 2–3-lobed. *Fruit* obconical to bell-shaped, 2–3-valved, 1½–10 by 1–5 mm.

Distr. Widely distributed from China and Japan through tropical SE. continental Asia and Malaysia to New Caledonia, Tonga, Australia, the Kermadecs, and New Zealand; in *Malaysia*: Java (from Mt Patuha eastwards), Lesser Sunda Is (Bali, Lombok, Sumbawa, Flores, Alor, Timor), S. Moluccas (Aru Is), SW. Celebes (Mt Bonthain), Philippines (Luzon), and New Guinea.

MIQUEL (Sum. 1860, 234) recorded it from Sumatra, but this seems erroneous.

CLARKE & HEMSLEY recorded *W. gracilis* even from S. Africa, but I have seen no records from Africa; this is probably in confusion with *W.*

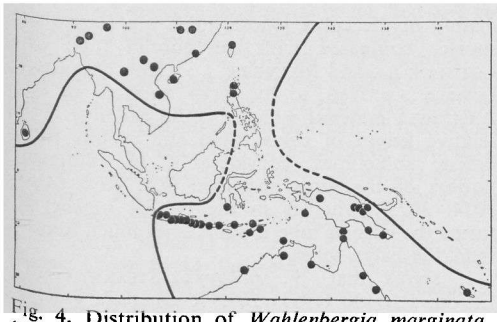


Fig. 4. Distribution of *Wahlenbergia marginata* (THUNB.) DC. with localities dotted in the area covered by the map.

gracilis E. MEY., a *nomen nudum* and a later homonym.

Ecol. In Malaysia only in the mountains (100, 800–900–) 1000–3500 m, in light *Eucalyptus* and *Casuarina* forest, along forest edges, among rocks, on lava-streams, in grassfields, and along trails as an apophyte. In India curiously recorded from sea-level upwards (CLARKE, *l.c.*), in Malaysia only found at low altitude in the Aru Is. *Fl. fr.* Jan.–Dec., specially May–July.

It seems that this plant prefers regions with a feeble to strong dry season which may explain its absence in the wet rain-forest core of West Malaysia (Sumatra, Malaya, Borneo). According to DOCTERS VAN LEEUWEN self-pollination is the rule in Java.

Vern. *Angkĕb*, *kĕrĕkan lanang*, *patikan*, *tĕlugi*, J (local), *djukut riut*, S; Papua: *ik*, Dunantina, *iki*, Asaro, Kefamo, *goiekul*, Chimbu, Masul, *kulkal*, Hagen, Togoba.

Uses. According to BACKER used against skin diseases on Mt Diëng.

Notes. In the past many authors have already pointed to the high degree of variability of this species, *e.g.* DE CANDOLLE (1830), JUNGHUHN (1845), HOOKER *f.* (1860), BENTHAM (1869), BAILEY (1900), CHEESEMAN (1906), and STEARN (1951).

This variability concerns both habit and morphological characters. The distinction between annual and perennial species, as advanced by N. E. BROWN (1913) and followed by LOTHIAN (1947) is not reliable and is impracticable. Specimens flowering in their first year are very thin and meagre with very small flowers; they have often been found together in exactly the same spot with vigorous old plants (BRASS 32353, v. STEENIS 18425, 18426). Annual dwarfs with tiny stems and small flowers are often found as krem-nophytes on steep talus. Another source of such dwarfs may be that seeds have germinated in the wrong season and were forced into flower in a juvenile stage, before having attained a good, full-grown vegetative state.

Further the woody shoots of old obviously perennial plants may produce such thin shoots (cf. BTH. Fl. Austr. 4, p. 137; CLARKE, Fl. Br. Ind. 3, p. 430; and BAILEY, Queensl. Fl. 3, p. 922). Such shoots may appear frequently in burnt savannahs and grasslands.

Besides this ontogenous variability there is also an astonishing individual variability, for instance in the degree of the hairiness of stem, leaves, and floral parts, which has sometimes been used as the only characteristic to separate species (LOTHIAN, 1947; STEARN, 1951). The development of the indument is not reliable, as it may show large variation in flowers of a single plant. Hairiness of stems and leaves seems to be very much dependent on the habitat.

There is further much variation to be observed in both the absolute and relative dimensions of nearly all the floral parts, without an appreciable geographical correlation (raciation). This variation has been drawn for the shape of the filaments in fig. 5. It must be taken into consideration that the filaments and their margins are bent inwards already in a very early stage (*cf.* DECAISNE, Rev. Hort. 3, 1849, 41 fig.); in herbarium material it is very difficult to flatten them out because of their delicacy and entangled fringe-like marginal hairs.

The length of the calyx lobes may vary as much as 1½ mm in different flowers of a single plant during anthesis (HLB 958–307–469).

From the Philippines MERRILL has described *W. bivalvis* MERR. which would be characterized by capsules with 2 apical valves. In the syntypes of MERRILL 4361 (BO, L, NY) which I could examine I have only found capsules with 3 valves. In a number of other specimens ranging through Celebes, the Lesser Sunda Is, and S. Moluccas to New Guinea and Thursday Island I have found indeed 2-valved capsules and all these specimens have very slenderly branched inflorescences (except ELBERT 1083 from Lombok): Celebes: BÜNNEMEIJER 11528, partly; Lombok: ELBERT 1332; Aru Is: BUWALDA 5354; SE. New Guinea: FORBES 847; Thursday Island: JAHERI *s.n.*; Warrior Island: LE GUILLOU Warrior 16.

But there are other less delicate-branched specimens which have in a single plant 2- and 3-

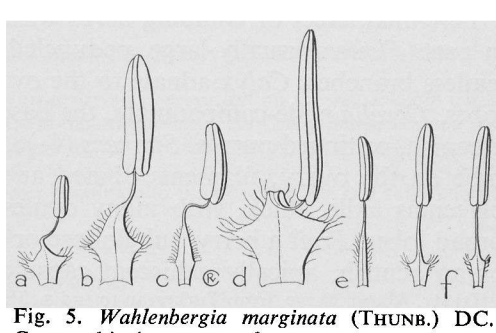


Fig. 5. *Wahlenbergia marginata* (THUNB.) DC. Geographical survey of stamen types (boiled material). *a.* From Hunan (China), *b.* Hongkong, *c.* Hongkong, *d.* Central Java (Mt Sumbing), *e.* Lombok, *f.* Timor, all × 10 (*a* FAN & LI 57, *b* LAMONT 405, *c* WRIGHT *s.n.*, *d* LÖRZING 3, *e* ELBERT 1332, *f* FORBES 4048).

valved capsules: Lombok: ELBERT 1557; China: Herb. Bog. *sine coll.* 133584; Celebes: *sine coll.* 136. Further there are also slenderly branched specimens with 3-valved capsules: Celebes: BÜNNEMEIJER 11528, partly, VAN STEENIS 10400.

For these reasons *W. bivalvis* MERR. cannot be maintained.

Chromosomes. According to the Chromosome Atlas by DARLINGTON & WYLIE (1955) *W. gracilenta*, *W. consimilis*, *W. quadrifida*, and *W. gracilis* would have 2 n = 18, 36, 54, and 64 chromosomes respectively, with the basic numbers 9 and (?) 8 which might point to the occurrence of chromosome races.

var. **grandiflora** TUYN, *nov.var.*—*W. consimilis* LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 223; MELVILLE, Bot. Mag. 172 (1959) t. 343.—*W. gloriosa* LOTHIAN, *l.c.* 224.

Corolla longior, c. 1½–2½ *cm longa.*

Similar to the species, but the corolla (in Mal.) 1¾–2 cm long, the tube *c.* 6–10 mm, usually *c.* 1½–2 times as long as the calyx lobes (3–5 mm). Calyx lobes always longer than the ovary (2–2½ mm). Fruit broad-obconical to bell-shaped, 4½–6 by 4–5 mm.

Distr. Australia (S. New South Wales to S. Australia and Tasmania), in *Malaysia*: New Guinea.

Notes. Also in this variety the hairiness is variable.

Var. grandiflora seemed to differ from the descriptions of *W. consimilis* and *W. trichogyna* mainly in the calyx lobes, which are somewhat shorter compared with the corolla tube (*cf.* LOTHIAN, *l.c.* and MELVILLE, *l.c.*). This character, however, proved to be very variable in the Australian material which I could examine. The relative length of calyx lobes and corolla tube differs sometimes considerably in different flowers of the same specimen (*e.g.* HOOGLAND 3074, 3075), whereas in the typical *trichogyna* forms the corolla tube is sometimes much longer than the calyx lobes.

It seems that *W. trichogyna* STEARN, Gard. Chron. III, 130 (1951) 169.—*Campanula gracilis* (*non* FORST.) SIMS, Bot. Mag. 18 (1803) t. 691.—*Campanula vincaeflora* VENT. Jard. Malm. (1803) t. 12, *nom. illeg.*—*W. gracilis var. vincaeflora* DC. Mon. Camp. (1830) 142; Prod. 7 (1839) 433.—*W. vincaeflora* (VENT.) DECNE, Rev. Hort. 3 (1849) 4, *cum ic. col.*; LOTHIAN, Proc. Linn. Soc. N.S.W. 71 (1947) 220, differs only in having a hairy ovary and is better subordinated as *subvar. trichogyna* (STEARN) TUYN, *nov. subvar.* It is native in East Australia and has not yet been found in New Guinea.

CRUTTWELL 776 and BRASS 22258 have the calyx lobes clearly dentate and the broadened part of the filaments seems longer than usual.

As there are found sometimes specimens with a few teeth at the margin of the calyx lobes (*e.g.* CLEMENS 4873, 5870) and the filaments are very variable throughout the species, there seems no reason to create a new variety.

3. CODONOPSIS

WALL. in Roxb. Fl. Ind. 2 (1824) 103; KOMAROV, Act. Hort. Petrop. 29 (1908) 98; CHIPP, J. Linn. Soc. Bot. 38 (1908) 374; ANTHONY, Not. R. Bot. Gard. Edinb. 15 (1926) 173; NANNFELDT, *ibid.* 16 (1931) 149; Bot. Tidsskr. 34 (1940) 381.—*Glosocomia* D. DON, Prod. Fl. Nepal. (1825) 158.—*Campanumoea* BL. Bijdr. (1826) 726.—*Cyclocodon* GRIFF. Not. Pl. As. 4 (1854) 279; KURZ, J. As. Soc. Beng. 46, ii (1877) 209.—**Fig. 6-7.**

Perennial, erect or climbing herbs with tuberous roots. *Leaves* opposite, at least in part. *Flowers* usually large, peduncled, solitary, axillary, or in cymes on short, leafless branches. *Calyx* adnate to the ovary (or below it), persistent, 4–6 spreading lobes. *Corolla* wide-campanulate, the base adherent to the ovary, 4–6 lobes, white, greenish, or tinged purple. *Stamens* (4–)6, free, inserted near the base of the corolla tube on the ovary; filaments dilated at the base; anthers free. *Ovary* 4–6-celled; placentas axile, thick, with many ovules; style cylindric; stigmas 4–6 short and broad lobes. *Fruit* a berry, subglobose or cylindrical, with truncate top, indehiscent or an acutish, apically dehiscent capsule. *Seeds* many, small, ellipsoid.

Distr. About 30 *spp.* from Turkestan to India, SE. & NE. Asia, Hainan, Formosa, and Japan; 2 *spp.* in *Malaysia.*

Taxon. To establish the proper name and circumscription for this genus I was faced with two aspects, *viz* the view taken by several early authors who combined *Codonopsis* and *Campanumoea* and those who kept them separate; among the latter are CHIPP, *l.c.*, and KOMAROV, *l.c.*, among the former for instance HOOKER *f.* (Ill. Him. Pl. 1855, 116). A third view was taken by GRIFFITH, followed by KURZ, who also distinguished two genera but of other circumscription.

The only distinction between *Codonopsis* and *Campanumoea* is the structure of the fruit, opening

by 5 small, apical valves (slits) in the first and indehiscent in the latter. When capsular, the valves are formed in the conically protruding apical part of the fruit which is crowned by the style.

In order to find out whether this is a really 'natural' character I have gone through practically all species of both genera. If it was really a natural character the species of each genus should by necessity be more closely allied *inter se* than with any species of the other genus. This appeared not to be the case, as the distinction on the fruit characters cuts through another character, *viz* whether the plants are really twiners (as in *C. javanica*) or semi-erect or sprawling (as in *C. celebica*). It thus happens that *Campanumoea lancifolia* shows in foliage and habit more resemblance with for instance *Codonopsis purpurea* WALL. in ROXB. than with other *Campanumoeas*; reversely *Campanumoea javanica* shows a close resemblance to *Codonopsis viridis*.

A second point in favour of merging the genera is the fact that within *Codonopsis* in the restricted sense, CHIPP could illustrate not less than 4 very distinct floral types, which, each separately, could serve for the same aim as a generic one-character difference. Fig. 6. This would be useless, considering the unmistakably close relationship of all the species together and their distinction against other campanulaceous genera.

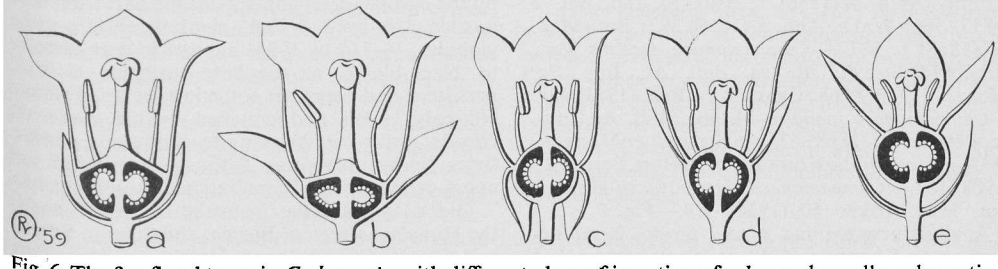


Fig. 6. The five floral types in *Codonopsis*, with different place of insertion of calyx and corolla, schematic, largely after CHIPP. *a–d.* Types used for subdivision in CHIPP's key, *l.c.* 375, *e.* structure in *C. parviflora*, after GRIFFITH, Ic. t. 481 (*Cyclocodon distans* GRIFF.).

The third point is the fact, as I have found in the relationship between *Pratia* and *Lobelia*, that apparently the character of the 'berry' *versus* the 'capsule' does not carry much important generic weight in certain groups of this family.

In merging the two genera I feel strengthened by a succinct note by DIELS, who remarked under *Campanumoea* "von folgender Gattung (= *Codonopsis*) wohl nicht zu trennen". (Bot. Jahrb. 29, 1901, 606).

A similar conclusion was reached by NANNFELDT, who made much study of *Codonopsis*. He wrote:— "In my opinion the most logical treatment should be to unite these genera (*i.e. Codonopsis* and *Campanumoea*), 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".

As far as I can see all combinations under *Codonopsis* have been made save one, so that the nomenclatural consequences are very slight indeed; the taxonomical gain is, however, considerable.

CHIPP, ANTHONY, and NANNFELDT have subdivided the genus into sections and series. I have refrained from fitting in this scheme the Malaysian *Campanumoeas*. I do not believe that they can be maintained under one subgenus or section, as they differ greatly in habit, one being sprawling and with small, white flowers ('*Cyclocodon*'), the other having the typical twining habit and large, greenish flowers of the '*pilosula*' group of NANNFELDT.

In such genera in which the species show reticulate affinity, it appears difficult to make natural subdivisions reflecting common ancestry ('Sippen').

Morph. The species of this genus gave occasion to make an observation on the remarkable nature of the inferior ovary, often called 'calyx tube' by Anglo-Saxon botanists. As CHIPP has illustrated four floral types can be distinguished in *Codonopsis*, depending on the insertion of the calyx and corolla, *viz* (1) both calyx and corolla adnate to the ovary halfway, (2) *ditto* so up to the ovarial apex, (3) corolla adnate to the apex, but calyx only half-way so, (4) corolla adnate to the ovarial apex, but calyx inferior and properly free. Fig. 6.

In no instance a free calyx 'tube' is formed.

KEY TO THE SPECIES

1. Twining. Leaves with cordate base. Flowers 1.5–3.8 mm, wide-campanulate, greenish. **1. C. javanica**

1. Sprawling or erect. Leaves decurrent at the base. Flowers ¾–1½ cm, white. **2. C. lancifolia**

1. **Codonopsis javanica** (BL.) HOOK. *f.* Ill. Him. Pl. (1855) 116, t. 16B; MIQ. Fl. Ind. Bat. 2 (1857) 566; MERR. Lingn. Sc. J. 6 (1930) 289.—*Campanumoea javanica* BL. Bijdr. (1826) 727; DC. Prod. 7 (1839) 423; HASSK. Cat. Hort. Bog. (1844) 106; VAN HOUTTE, Fl. Serres 12 (1857)

157, t. 1264; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 18; KURZ, J. As. Soc. Beng. 46, ii (1877) 209; CLARKE, Fl. Br. Ind. 3 (1881) 435; FORB. & HEMSL. J. Linn. Soc. Bot. 26 (1889) 8; DIELS, Bot. Jahrb. 29 (1901) 606; MAKINO, Bot. Mag. Tokyo 22 (1908) 155, *incl. var. japonica*; KOORD. Exk. Fl. Java 3 (1912) 300; Fl. Tjib. 3 (1923) 54; HEYNE, Nutt. Pl. 2 (1927) 1427; DANGUY, Fl. Gén. I.–C. 3 (1930) 694 & f. 78,10; HOCHR. Candollea 5 (1932) 290; MERR. Lingn. Sc. J. 11 (1932) 60; CRAIB, Fl. Siam. En. 2 (1936) 307; MASAMUNE, Fl. Kain. (1943) 330; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 183, p. 3; MAKINO, Ill. Fl. Japan (1954) 81, *cum var.*—*C. cordata* HASSK. Nat. Tijd. N.I. 10 (1856) 9; Ned. Kruidk. Arch. 4 (1856) 1; MIQ. Fl. Ind. Bat. 2 (1857) 566; WALP. Ann. 5 (1858) 393; Bot. Mag. 89 (1863) t. 5372.—*Campanumoea cordata* MIQ. Sum. (1862) 599; MAXIM. Bull. Ac. Imp. Sc. Pétersb. 12 (1868) 68; CRAIB, Kew Bull. (1911) 404. —*Campanumoea japonica* MAXIM. Bull. Ac. Imp. Sc. Pétersb. 12 (1868) 67, *non* SIEBOLD *et* MORREN, 1863.—*C. cordifolia* KOMAROV, Act. Hort. Petrop. 29 (1908) 108.—*Campanumoea maximowiczii* HONDA, Bot. Mag. Tokyo 50 (1936) 389.—**Fig. 7.**

A sinistrorse-twining plant, up to 2 m (according to KOORDERS 6–14 m long); stem 1½–4 mm diam., glabrous. *Leaves* opposite, higher up often spirally arranged, ovate to oblong-ovate, 2.6–8 by 2–5 cm, base cordate, apex obtuse, acute, sometimes acuminate, serrulate to serrate, sometimes crenate, on both sides puberulous to hairy, sometimes glabrous, underside often pruinose; petiole 1½–6½ cm. *Flowers* axillary, 1½–3.8 mm. Pedicels 1–5½ cm. *Calyx* lobes oblong to lanceolate, 11–23 by 3–4 mm, entire or denticulate to serrate, glabrous or puberulous to hairy. *Corolla* 12–35 mm, more than half-way lobed, greenish-white or yellowish-white, outside sometimes hairy, tube inside with purplish streaks or veins, lobes ovate, acuminate. *Anthers c.* 2–4 mm; filaments 3–8 mm, linear, broadened towards the base, glabrous. *Style* 5–10 mm, glabrous or hairy with 3–6 ovate-acute to elliptic lobes. *Ovary* (3–)4–5(–6)-celled, the outside partly concealed by the corolla, campanulate, visible part from the outside 3–4 by 3–4 mm, glabrous. *Fruits* subglobular, ½–1½ by 1–2½ cm, red to dark-purple to black-bluish, at the base sustained by the persistent and patent or sometimes reflexed wine-red calyx lobes and crowned by the withered corolla; walls membranous to coriaceous, sometimes fleshy; placentas fleshy. *Seeds* ovoid to ovoid-cylindrical, *c.* 1 mm, reticulate, light brown.

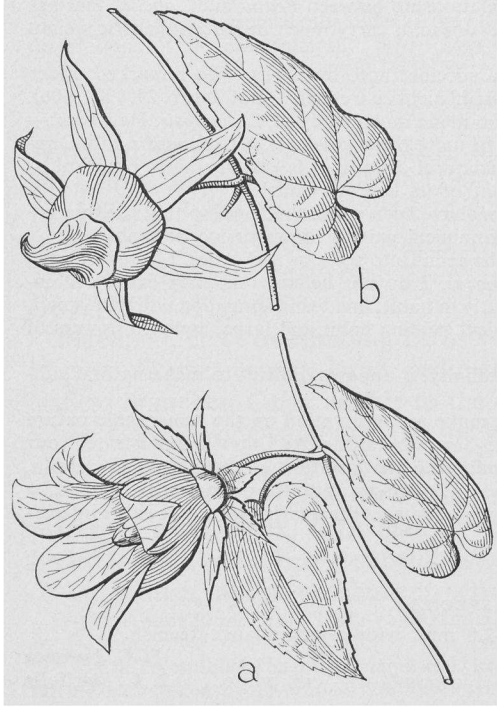


Fig. 7. *Codonopsis javanica* (BL.) HOOK. *f. a.* Flower, *b.* fruit sustained by the star-shaped calyx and topped by the marcescent corolla, all × ⅔.

Distr. In SE. Asia (from the Deccan through the Himalayan region, Burma, and Siam to South and Central China), Japan, Hainan; in *Malaysia:* Central to South Sumatra (Mts Kerintji and Dempo), Java (from Mt Pangrango eastwards).

Ecol. In open forest, mostly on forest edges, in secondary forest and thickets, sometimes in grassy fields, 900–2200 m. *Fl. fr.* Jan.–Dec.

Vern. *Kitjĕpot, srintil-srintil, susu munding,* S, *gutji, indil-indil, sigerpolo, urĕk-urĕk polo,* J.

Uses. The fruits are eaten and the tuberous roots are used for drugs.

2. Codonopsis lancifolia (ROXB.) MOELIONO, *nov. comb.*—*Campanula lancifolia* ROXB. Fl. Ind. 2 (1824) 96; DC. Prod. 7 (1839) 485.—*Campanumoea celebica* BL. Bijdr. (1826) 727; DC. Prod. 7 (1839) 423; CLARKE, Fl. Br. Ind. 3 (1881) 436; BOERL. Handl. 2 (1891) 259; STAPF, Trans. Linn. Soc. II, 4 (1894) 188; GAMBLE, J. As. Soc. Beng. 74, ii (1905) 53; ROBINSON, Philip. J. Sc. 3 (1908) Bot. 216; CRAIB, Kew Bull. (1911) 404; DIELS, Bot. Jahrb. 55 (1917) 121; MERR. En. Born. (1921) 585; RIDL. Fl. Mal. Pen. 2 (1923) 202; MERR. En. Philip. 3 (1923) 587; DANGUY, Fl. Gén. I.–C. 3 (1930) 693; CRAIB, Fl. Siam. En. 2 (1936) 307; MASAMUNE, En. Pl. Born. (1942) 123; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 183, p. 4.—*C. truncata* WALL. [Cat. (1829) *n.* 1301, *nomen*] *ex* DC. Mon. Camp. (1830) 122; Prod. 7 (1839) 423; MIQ. Fl. Ind. Bat. 2 (1857) 566.—*C. albiflora* GRIFF. Not. Pl. As. 4 (1854) 279.—*Cyclocodon adnatus* GRIFF. *l.c.* 278.—*C. celebica* MIQ. Fl. Ind. Bat. 2 (1857) 566.—*C. leucocarpa* MIQ. *l.c.* 565.—*Cyclocodon truncatum* HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 18.—*Cyclocodon lancifolium* KURZ, Flora 55 (1872) 303; J. As. Soc. Beng. 46, ii (1877) 210.—*Campanumoea axillaris* OLIV. in Hook. Ic. III, 8 (1888) t. 1775; HEMSL. J. Linn. Soc. Bot. 26 (1889) 7.—*Campanumoea truncata* DIELS, Bot.

Jahrb. 29 (1901) 606; MAKINO, Bot. Mag. Tokyo 8 (1904) 21; MERR. Philip. J. Sc. 7 (1912) 104.—*Campanumoea lancifolia* MERR. En. Philip. 3 (1923) 587; Lingn. Sc. J. 5 (1927) 181; Pap. Mich. Ac. Sc. 20 (1935) 111; YAMAMOTO, Obs. Fl. Form. 13 (1936) 147; MASAMUNE, Fl. Kain. (1943) 33; HARA, En. Sperm. Jap. 2 (1952) 96.

Sprawling or erect herb, with a hollow stem, *c.* 3 m high, nearly glabrous or hairy, mostly branched. *Leaves* opposite, petioled, lower ones ovate to ovate-elliptic, higher ones elliptic, often bract-like, 3–14 by 1–4 cm; acute to acuminate, bluntly edged at the base, coarsely serrate to serrulate, upperside glabrous, underside glabrous or puberulous to hairy; petiole 3–15 mm, glabrous. *Flowers* 7–15 mm, axillary, solitary or in cymes of 3, through reduction of the higher leaves resembling a terminal panicle. Pedicels or peduncles (1–)3–6 cm, glabrous, with two bracteoles, ½–2 cm long, linear to elliptic, glabrous or hairy. Buds winged, ovate. *Calyx* lobes 4–7, lanceolate, 4–10 by 1 mm, entire to dentate-serrate to pinnatifid, carnosulate, glabrous to puberulous. *Corolla* white, pale pink, lilac, outside glabrous, corolla tube as long as the lobes, lobes ovate to triangulate, acute, entire. *Stamens* 4–6 mm. *Anthers* as long as the filaments. Filaments linear to broadened at the base in various degree (deltoid to ovate), the broad forms inside with long hairs at the base. *Style* glabrous or scabrid. *Ovary* cupular to campanulate, 2–4 mm diam., glabrous to puberulous. *Berry* ± globular with a flattened apex, the persistent calyx adnate about half-way, greenish, turning to white, *c.* ½–1 cm diam. *Seeds* many, testa fine-reticulate.

Distr. SE. Asia (India: Himalaya and Sikkim; Burma) to S. China, Formosa, and Hainan; in *Malaysia*: Malay Peninsula (Selangor: Taiping Hills; Perak: Semangkok Pass, *ex* RIDLEY, not seen), Sumatra, E. Java (Pantjur Idjen, once found), N. Borneo (Kinabalu), Celebes, Philippines (N. Luzon; Panay; Mindanao), Moluccas (Buru and Ambon), and New Guinea.

Ecol. In open terrain or along forest-borders and trails, on tali and near streamlets, rarely in forest regrowth and young secondary forest, often in wet places, 280–1500 m. *Fl. fr.* Jan.–Dec.

Vern. *Gordang-gordang*, M (Toba), *ĕmlapagar*, Palu (W. Cel.); Philippines: *lakoronbolan*, Buk.

Note. There are two subspecies which largely replace one another geographically.

ssp. **lancifolia.**—All synonyms except *C. celebica* and *C. leucocarpa.*

Leaves generally large, 8½–16½ by 3–7½ cm, towards the apex of the stems not very much reduced, never glaucous beneath, entirely glabrous. Calyx lobes coarsely dentate to subpectinate. Filaments distinctly widened downwards, either triangular or roundish, long-hairy inside.

Distr. Continental Asia, in *Malaysia*: N. Sumatra (Atjeh, Toba), Philippines, and Moluccas (Buru, Ambon).

ssp. **celebica** (BL.) MOELIONO, *comb. nov.*—*Campanumoea celebica* BL. *l.c.*—*C. celebica* (BL.) MIQ.—*C. leucocarpa* MIQ.

Leaves averagely smaller, 5½–8(–11½) by 1½–2¾(–3¾) cm, towards the apex distinctly shorter giving the apical part of the stem the appearance of a panicle, glaucous and hairy beneath or glabrous. Calyx lobes entire to toothed. Filaments linear to triangular-broadened towards the base, glabrous (once found short hairy inside, OUWEHAND 215).

Distr. Siam (KERR 1217), in *Malaysia*: Central and South Sumatra, SE. Java, Borneo, Celebes, Philippines, Moluccas, and New Guinea.

6. LOBELIA

LINNÉ, Gen. Pl. (1754) 401; Sp. Pl. 2 (1753) 929, *non sensu* ADANS. Fam. Pl. 2 (1763) 157 *et* MILLER, Gard. Dict. ed. 8 (1768), *cf. nom. gen. cons. n.* 8716; DC. Prod. 7 (1839) 357; WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 317; Pfl. R. Heft 107 (1953) 408.—*Pratia* GAUDICH. Ann. Sc. Nat. 5 (1825) 103; PRESL, Prod. Mon. Lob. (1836) 46; WIMMER, Pfl. R. Heft 106 (1943) 104.—*Dortmanna* ADANS. Fam. Pl. 2 (1763) 134; STEUD. Nomencl. (1840) 526; O. K. Rev. Gen. 2 (1891) 379 (*Dortmannia*).—*Rapuntium* MILLER, Gard. Dict. ed. 8 (1768); PRESL, Prod. Mon. Lob. (1836) 11.—*Piddingtonia* DC. Prod. 7 (1839) 341; MIQ. Fl. Ind. Bat. 2 (1857) 572.—*Isolobus* DC. Prod. 7 (1839) 352.—*Speirema* HOOK *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 27.

Herbaceous, annual or perennial, sometimes woody below, rarely arborescent (Africa, Hawaii), often laticiferous. *Leaves* spirally arranged, alternate (distichous), or in rosettes. *Flowers* axillary or in racemes or panicles, with or without bracts, 5-merous, epigynous, ☿, rarely unisexual (some Australian *spp.* dioecious), protrandrous. *Calyx* lobes well-developed. *Corolla* gamopetalous, zygomorphic, with a dorsal slit mostly to or near the base; limb with 2 dorsal lobes, mostly diverging from

the 3 others which form a trifid whole consisting of a ventral lobe and 2 laterals; lobes valvate in bud, connate to various degree. *Stamens* 5, alternate with the corolla lobes, free or adnate to the corolla tube; filaments linear, sometimes broadened at the base; anthers basifixed, introrse, 2-celled, cells opening lengthwise. Disk absent. *Ovary* 2-celled; style 1, at the apex below the 2 stigmas provided with 'collecting hairs', during anthesis lengthening with appressed stigmatic lobes through the anther tube. *Ovules* ∞, axile, anatropous. *Fruit* fleshy to dry in various degree, *i.e.* a berry or an apically 2-valved capsule, crowned by the persistent calyx lobes. *Seeds* ∞, provided with endosperm.

Distr. Probably more than 200 *spp.*, mostly in the tropics and subtropics, especially in America.

Ecol. The Malaysian species are mostly hill and mountain plants in everwet country, except *L. alsinoides*, which is typical for lowland seasonal climatic conditions, and *L. zeylanica*, which grows from the lowland up into the montane zone.

The flowers are resupinate, even before they are open. There are 'collecting hairs' under or at the base of the stigmas of the bifid style. By the lengthening of the style, the unopened stigmas enter into the anther tube, pushing the pollen out of the tube. This occurs before the stigmas are receptive, for receptiveness is acquired long after the pollen is shed.

Nomencl. Unfortunately former typification of some common species has been unsatisfactory which has necessitated to accept several name changes. Besides, the taxonomic changes proposed here, by merging *Pratia* with *Lobelia*, and severe reduction of the number of species of *Pratia*, have resulted in a rather complicated synonymy.

Taxon. Hitherto the genus *Pratia* has almost unanimously been distinguished from *Lobelia* by the fruit, it being baccate and non-dehiscent against being capsular and apically 2-valved in *Lobelia*.

By the subdivision of the *Lobelioideae* into berried and capsular genera, advanced first by DE CANDOLLE (1839) and followed almost unanimously up to the monograph by WIMMER (1943, 1953) *Lobelia* and *Pratia* have become distant allies. The lively coloured berries of the *Pratias* which are native in the Pacific area of the southern hemisphere represent a showy character, but it should be added that flowering specimens cannot be distinguished from certain *Lobelias* which are also prostrate and rooting, humble plants in the same area.

In my opinion it seems unquestionable that they are very closely allied. This opinion is sustained by the curious fact that in the abundant material of *Pratia angulata*, which I could study, the Asiatic and West Malaysian specimens have definitely berry-like, indehiscent fruits, but those of Celebes and New Guinea show in otherwise 'inseparable' specimens various transitions in the mature state (as shown by ripe seed inside). In East Malaysia the fleshy pericarp becomes 'drier' and thinner, almost membranous, and the lengthwise nerves become more pronounced; the apex of the fruit which is in typical *Pratia* berries flat, becomes convex and tends to become tardily 2-valved. In one case of profuse material (EYMA 1161) fleshy berries and true capsules could be found in one collection. In this area also the variability of other characters of the species (hairiness, size of the flowers, leaves, pedicels, *etc.*) is wider than in West Malaysia and continental Asia, which have, obviously, a more homogeneous 'marginal' population. The tendency to possess a conical ovary is continued towards the South Pacific.

These observations have induced me to merge *Pratia* with *Lobelia*. It would be of profound interest if additional field observations could be made to verify my conclusions.

In specific delimitation I have allowed far more variation than WIMMER, SKOTTSBERG, and some other authors.

KEY TO THE SPECIES

1. Stems developed.
 2. Stems erect or rarely ascending, not rooting at the nodes.
  3. Stems terete or ribbed, not 2–3-angled. Rather coarse plants.
   4. Leaves mainly in a dense, persistent rosette, ± sparsely long-white-pilose along the margin and on the upper surface. Stems angular, unbranched. Cauline leaves oblanceolate, upwards gradually smaller, 2–5 by ½–1 cm. Perennial plant, with a strong rhizome. **2. L. sumatrana**
   4. Flowering stems without such a rosette. Leaves glabrous or hairy but not long-white-pilose, elliptic-lanceolate, mostly much larger.
    5. Flowers solitary axillary, 2–4½ cm long. Berry globose, 7–12 mm diam., on a reflexed pedicel, violet, finally black-purple . . . . . **9. L. montana**
    5. Flowers in terminal panicles or terminal or leaf-opposed racemes.
     6. Racemes terminal, later leaf-opposed. Fruit a berry . . . . . **10. L. borneensis**
     6. Racemes or panicles terminal. Fruit capsular . . . . . **1. L. nicotianaefolia**

3. Stems 2–3-angled, sometimes winged along the edges. Rather delicate, annual herbs.
7. All anthers bearded at their apex. Seeds trigonous.
8. Free basal part of the 2 anterior filaments twice as broad as that of the others and densely haired. Stem sharply triangular-winged. Stem, leaves, pedicels, and calyx glabrous or sparsely hairy. Leaves ovate-oblong or even narrower, sessile, narrowed or contracted towards the base. **3. L. alsinoides**
8. Free basal part of all filaments of equal width. Stem terete, under each leaf with 2 narrow ridges. Stem, leaves, pedicels, and calyx crisped-patent-hairy. Leaves ovate to roundish with very blunt to subcordate base set off against a distinct petiole (1–)3–20 mm long **4. L. zeylanica**
7. Only the two anterior anthers bearded at their apex. Seeds ellipsoid . . **5. L. heyniana**
2. Stems creeping or ascending, rooting at the nodes.
9. Leaves spirally arranged. All anthers bearded at their apex . . . . . **4. L. zeylanica**
9. Leaves distichous. Only 2 anthers bearded at their apex.
10. Leaves sessile, densely set (almost equitant), semi-amplexicaulous, fleshy. Plant glabrous. Filaments glabrous . . . . . **12. L. conferta**
10. Leaf-base not semi-amplexicaulous.
11. Leaves glabrous, sessile, with acute base, subentire, oblong to elliptic, rather narrow. Testa smooth . . . . . **6. L. chinensis**
11. Leaves exceptionally glabrous, at least the lower almost always petioled, mostly ovate to rounded, with a rounded (very rarely acutish) base.
12. Corolla hardly twice as long as the calyx lobes, campanulate, with ovate-deltoid lobes. Hairs more-celled. Testa smooth . . . . . **8. L. brachyantha**
12. Corolla at least *c.* 3 times as long as the calyx lobes, not campanulate, with narrow-lanceolate or ovate-lanceolate lobes. Hairs 1-celled. Testa finely reticulate . . . **11. L. angulata**
1. Stemless. Flowers solitary axillary, *c.* ½ cm long. Leaves very thin, roundish, petioled. **7. L. archboldiana**

1. Lobelia nicotianaefolia ROTH *ex* R. & S. Syst. Veg. 5 (1819/?20) 47; ROTH, Nov. Pl. Sp. (1821) 143; WALL. in Roxb. Fl. Ind. 2 (1824) 110; Pl. As. Rar. 2 (1831) 43; G. DON, Gard. Dict. 3 (1834) 709; DC. Prod. 7 (1839) 381; WIGHT, Illustr. 2 (1850) 111, t. 135 f. 1–10; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 29; HOOK. *f.* Bot. Mag. 92 (1866) t. 5587; CLARKE, Fl. Br. Ind. 3 (1881) 427, *incl. var. trichandra*; TRIM. Handb. Fl. Ceyl. 3 (1895) 57; PEARSON, J. Linn. Soc. Bot. 34 (1898) 348; MERR. & MERRITT, Philip. J. Sc. 5 (1910) Bot. 392; MERR. En. Philip. 3 (1923) 588; SKOTTSB. Medd. Göteb. Bot. Trädg. 4 (1928) 9–13. f. 1. 8–11. 12b. *incl. var. macrostemon. l.c.* 13, f. 13–14; ALSTON, Fl. Ceyl. Suppl. (1931) 175; ELMER, Leafl. 9 (1934) 3180, *incl. var. mollis*; KAUSIK, J. Ind. Bot. Soc. 17 (1938) 161–168; WIMMER, Pfl. R. Heft 107 (1953) 643, *incl. var. nicotianaefolia, bibarbata, & trichandra*; SANTAPAU, Rec. Bot. Surv. Ind. 16 (1953) 157.—*L. pyramidalis* WALL. As. Res. 13 (1820) 376; D. DON, Bot. Mag. 50 (1823) t. 2387; WALL. in Roxb. Fl. Ind. 2 (1824) 113; D. DON, Prod. Fl. Nepal. (1825) 57; WALL. Pl. As. Rar. 2 (1831) 42; G. DON, Gard. Dict. 3 (1834) 709; DC. Prod. 7 (1839) 381, *incl. var. β*; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 29; CLARKE, Fl. Br. Ind. 3 (1881) 426; FORBES & HEMSLEY, J. Linn. Soc. Bot. 26 (1889) 3; SKOTTSB. Medd. Göteb. Bot. Trädg. 4 (1928) 17, 21, f. 12e, 25–31; DANGUY, Fl. Gén. I.-C. 3 (1930) 676, f. 76 1–4; CRAIB, Fl. Siam. En. 2 (1936) 304; WIMMER, Pfl. R. Heft 107 (1953) 646.—*L. rosea* WALL. in Roxb. Fl. Ind. 2 (1824) 115; Pl. As. Rar. 2 (1831) 42, t. 152; G. DON, Gard. Dict. 3 (1858) 29; DRURY, Handb. Ind. Fl. 2 (1866) 108, *excl. syn.*; KURZ, J. As. Soc. Beng. 46, ii (1877) 212; CLARKE, Fl. Br. Ind. 3 (1881) 427; J. Linn. Soc. Bot. 25 (1890) 41; DANGUY, Fl. Gén. I.-C. 3 (1930) 675; WIMMER, Pfl. R. Heft 107 (1953) 653.—*L. excelsa* LESCH. *ex* ROXB. Fl. Ind. 2 (1824) 114, *non* BONPL. (1813); WALL. Pl. As. Rar. 2 (1832) 42; G. DON, Gard. Dict. 3 (1834) 709; DC. Prod. 7 (1839) 381; WIGHT, Ic. 4 (1850) t. 1173–4; THWAITES, En. Pl. Zeyl. (1860) 170; CLARKE, Fl. Br. Ind. 3 (1881) 427.—*L. stimulans* HAM. *ex* D. DON, Prod. Fl. Nepal. (1825) 157.—*L. purpurescens* WALL. Cat. (1828) 1307, *non* R.BR. (1810), *nomen nudum ab auctore ipso ibidem relictum* p. 157.—*L. colorata* WALL. Pl. As. Rar. 2 (1831) 42; DC. Prod. 7 (1839) 380; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 28; DRURY, Handb. Ind. Fl. 2 (1866) 108; CLARKE, Fl. Br. Ind. 3 (1881) 426; WIMMER, Pfl. R. Heft 107 (1953) 655, *incl. var.*—*Rapuntium pyramidale* PRESL, Prod. Mon. Lob. (1836) 23.—*Rapuntium nicotianaefolium* PRESL, *l.c.* 24.—*Rapuntium coloratum* PRESL, *l.c.* 24.—*Rapuntium wallichianum* PRESL, *l.c.* 24.—*Rapuntium roseum* PRESL, *l.c.* 24.—*Rapuntium leschenaultianum* PRESL, *l.c.* 24.—*L. wallichii* STEUD. Nomencl. 2 (1841) 62, *nomen superfl. ad L. purpurescens* WALL.—*L. robusta* WALL. *ex* VOIGT, Hort. Suburb. Calc. (1845) 367, *non* GRAHAM (1831).—*L. eurostos* VOIGT, *l.c.* 367.—*L. aromatica* MOON [Cat. Pl. Ceyl. (1824) 14, *nomen*] *ex* WIGHT, Ic. 4 (1850) 2, t. 1172; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 29; ALSTON, Fl. Ceyl. Suppl. (1931) 175.—*L. trichandra* WIGHT, Ic. Pl. Ind. Or. 4 (1853) t. 1171; SKOTTSB. Medd. Göteb. Bot. Trädg. 4 (1928) 16, f. 12d, 18.—*L. wallichiana* HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 29; KURZ, J. As. Soc. Beng. 46, ii (1877) 211.—*L. erecta* HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 28, *non* DE VRIESE (1845); CLARKE, Fl. Br. Ind. 3 (1881) 426.—*Dortmannia leschenaultiana* O. K. Rev.

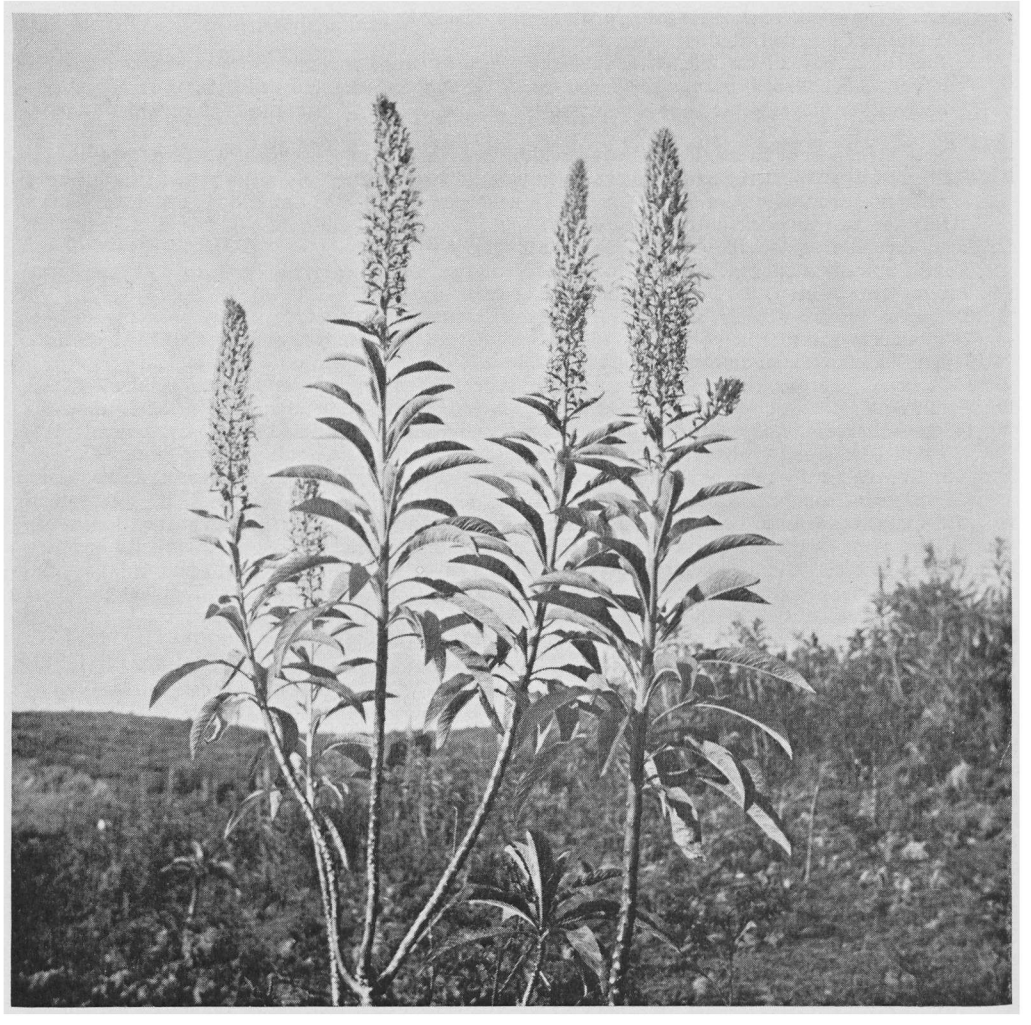


Fig. 8. *Lobelia nicotianaefolia* ROTH *ex* R. & S. Bandarawele, Ceylon, *c.* 2–2½ m tall, 1956.

Gen. 1 (1891) 972.—*Dortmannia erecta* O. K. *l.c.* 972.—*Dortmannia nicotianaefolia* O. K. *l.c.* 973.—*Dortmannia rosea* O. K. *l.c.* 973.—*Dortmannia colorata* O. K. *l.c.* 973.—*Dortmannia pyramidalis* O. K. *l.c.* 380.—*L. seguinii* LÉVEILLÉ & VAN, in Fedde, Rep. 12 (1913) 186; WIMMER, Pfl. R. Heft 107 (1953) 648, *incl. var.*—*L. fossarum* WIMMER, Akad. Anz. Wien *n.* 14 (1924) 3.—*L. eryliae* FISCHER, Kew Bull. (1928) 141; WIMMER, Pfl. R. Heft 107 (1953) 652.—*L. leschenaultiana* SKOTTSB. Medd. Göteb. Bot. Trädg. 4 (1928) 4, f. 3–7; WIMMER, Pfl. R. Heft 107 (1953) 659.—*L. doniana* SKOTTSB. Medd. Göteb. Bot. Trädg. 4 (1928) 19, f. 12, 19–24, *nomen illegit.*—*L. philippinensis* SKOTTSB. *l.c.* 13, f. 12c, 15–17; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 178; STEUP, Trop. Natuur 27 (1938) 142, f. 60; TOXOPEUS, *l.c.* 109, f. 21.—*L. epilobioides* WIMMER, in Fedde, Rep. 38 (1935) 79; Ann. Naturh. Mus. Wien 56 (1948) 367, *incl. var. sarasinorum*; Pfl. R. Heft 107 (1953) 652.—*L. leucanthera* KERR, Kew Bull. (1936) 34; CRAIB, Fl. Siam. En. 2 (1936) 304; WIMMER, Pfl. R. Heft 107 (1953) 641.—*L. palustris* KERR, Kew Bull. (1936) 35; CRAIB, Fl. Siam. En. 2 (1936) 304.—*L. camptodon* WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 366; Pfl. R. Heft 107 (1953) 637.—*L. beddomeana* WIMMER, Pfl. R. Heft 107 (1953) 645.—**Fig. 8-9.**

A coarse herb, up to 2(–4½) m. Stem terete at the base, angular towards the apex, hollow, simple or apically branched. *Leaves* spirally arranged, densely set in juvenile plants, oblong to narrow-lanceolate, the lower ones sometimes obovate-oblong, gradually decurrent towards the petiole-like base, 50–10 by 8–4 cm to 9–3 by 3–¾ cm; acuminate towards the apex (tip acute or blunt),

Fig. 9. *Lobelia nicotianaefolia* ROTH *ex* R. & S. SW. Celebes, 1937.

serrate-toothed along the margin, hairy on both sides, especially on the nerves, rarely glabrous, decreasing in size towards the apex. *Racemes* up to 45 cm long, together often forming a large, leafy panicle; rachis angular, hairy. Bracts under the lower flowers exceeding the pedicels and connate with them at the base, the higher ones shorter and higher connate, finally linear-subulate. Pedicels 1–2½ cm, obliquely patent, ascending, terete, hairy; bracteoles 2, minute, 3–12 mm long (in Indian material often caducous or absent). *Flowers* 1¼–3¾ cm long, variable in colour, pale, whitish, blue, dark purple, or rose. *Sepals* linear to lanceolate, 4–12 by 1 mm, entire to distinctly toothed, acute, glabrous or hairy. *Corolla* ¾–3 cm, outside glabrous or hairy, inside hairy to densely hairy, often with two gibbosities; dorsal lobes half as high connate with the lateral ones as compared with their junction with the ventral lobe, three times as long as the other lobes or even longer, linear; ventral and lateral lobes about equal in length, the lateral ones slightly falcate, all three ovate-acute, with a slightly crenate margin. (In immature corollas the lobes are cohering.) *Filaments* free and hairy at the base, upwards puberulous or hairy, 8–10 mm; anthers glabrous or hairy on the connectives, the two anterior ones with a hair tuft on top, from dorsal to ventral 3–4 to 2–3 mm. *Ovary* roundish cupular or narrower, 7–12-nerved, glabrous to densely hairy, 4–10 by 2–4 mm; style glabrous. *Capsule* cylindric-cupular, ¾–1 cm by 4–6 mm, glabrous or hairy. *Seeds* flattened ellipsoid, ½–5/8 mm, brown and smooth.

Distr. SE. Asia (from the Deccan to S. China), Formosa, in *Malaysia*: Philippines (Luzon and Biliran), Celebes (Central part and SW. peninsula as far as Mt Bonthain). Fig. 10.

Ecol. Open places on ridges in mossy forest, often on grassy mountain slopes and hill sides, 600–2300 m. *Fl. fr.* Dec.–Aug.

Vern. Philippines: *Adlabong*, *katlabung*, *kanyuong*, Ig., *balinyungyung*, *balyongyong*, *luñgogluñgog*, *subasob*, Bon.

Uses. The milky juice is said to be poisonous (EYMA *in sched.*).

Notes. After having studied many specimens both from Malaysia and continental Asia I have come to the conclusion that this complex represents one widely distributed and very polymorphous species, both in Asia and in Malaysia. Characters used by former authors to distinguish microspecies often do not hold in one single specimen: bracteoles may be present or absent, may be inserted at the base or in the middle of the pedicels; sepals may be toothed or not, plants may be branched or unbranched, hairy or glabrous. The differentiating characters of 'species' in this complex have gone into hair-splitting detail.

In general there are in SE. Asia two groups according to the size of the flowers, but they do not show a geographical replacement. There are many local forms but in my opinion they should not be named.

KAUSIK (J. Ind. Bot. Soc. 17, 1938, 161–167), who has studied the gametogenesis and embryology of this species, stated that the chromosome

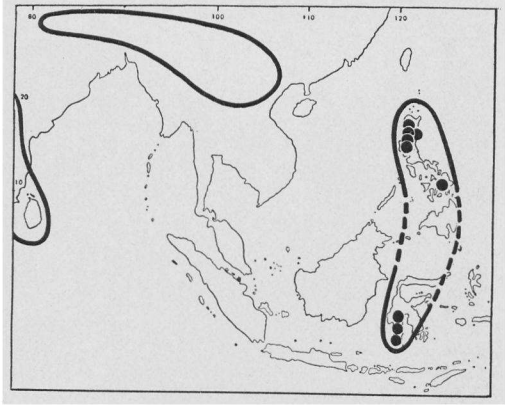


Fig. 10. Distribution of *Lobelia nicotianaefolia* ROTH *ex* R. & S., localities in Malaysia indicated by dots.

number of a plant collected at Koppa (Mysore) is n = 14.

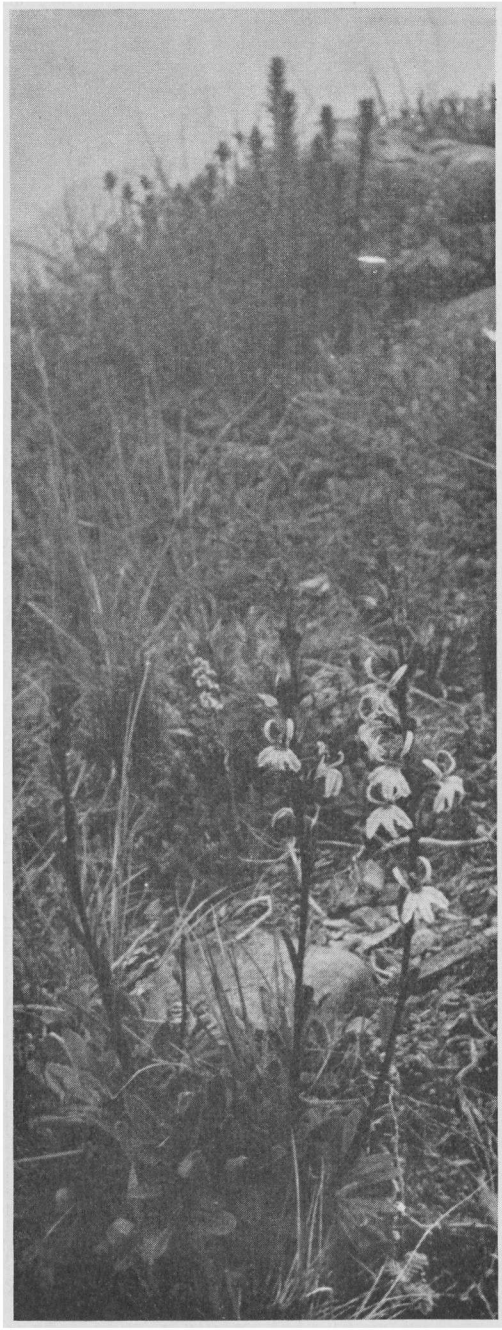


Fig. 11. *Lobelia sumatrana* MERR. Mt Losir, Gajo Lands (N.Sumatra), 1937.

2. Lobelia sumatrana MERR. Not. Nat. Ac. Sc. Philad. 47 (1940) 9; WIMMER, Pfl. R. Heft 107 (1953) 654.—*L. sp.* STEEN. Tijd. Kon. Ned. Aardr. Gen. 55 (1938) 800. — **Fig. 11.**

Erect, perennial herb, 15–40 cm, with a firm rootstock. Stem angular, glabrous to sparsely pilose. Rosette *leaves* narrowly spathulate to obovate-lanceolate, tapering towards the base, shallowly crenate-dentate, blunt, 2–5 by ½–1 cm; cauline ones erect, narrower, more distinctly sessile and smaller, all pilose. *Raceme* unbranched, up to *c.* 10-flowered, rachis 5–10 cm, glabrous. Bracts herbaceous, ovate to elliptic-oblong, resembling the leaves but smaller, 5–15 mm long. Pedicels terete, pilose, 5–8 mm, with two small, linear, hairy bracteoles. *Flowers* 1½–2½ cm long. *Calyx* lobes oblong, *c.* 5 by 1½–2 mm, blunt to broadly triangular at the apex, shallowly crenate, glabrous or pilose. *Corolla* ¾–2 cm, slit to the base, lilac or pale purple, purple-veined, inside and on the nerves and margins outside hairy, dorsal lobes connate with the lateral ones for 4–5 mm, lateral lobes connate with the ventral one for 7–9 mm; dorsal lobes narrowly lanceolate, boat-shaped, 9–11 by 2 mm, acute, lateral and ventral lobes about equal, oblong-lanceolate, 6–8 by 1½–2 mm. *Filaments* 6–8 mm, up to 1/3 free and hairy, anthers from dorsal to ventral 4–2 mm, dorsally hairy, the ventral ones with an apical hair tuft. *Ovary* 2–4½ by 2–4 mm, trumpet-shaped to campanulate, distinctly ribbed, glabrous to densely hairy; style glabrous. *Capsule c.* 5 by 4 mm, cupular, campanulate to ovoid, hirsute to pilose. *Seeds* ½ by ½ mm, flattened ellipsoid, light brown and smooth.

Distr. *Malaysia*: N. Sumatra (Gajo Lands: Mts Losir, Kemiri, Goh Lembuh).

Ecol. Mountain heaths and meadows (blangs), common, 2400–3300 m. *Fl. fr.* Febr.–May.

Note. Obviously related to certain SE. Asiatic forms of *L. nicotianaefolia* described as *L. colorata* WALL. (specially CLARKE 42477), differing by the angular stem, large rhizome, smaller narrow spathulate leaves, and a persistent rosette of leaves.

3. Lobelia alsinoides LAMK, Dict. Bot. 3 (1791) 588; R. & S. Syst. Veg. 5 (1819) 60; DC. Prod. 7 (1839) 378; SOND. Fl. Cap. 3 (1865) 539, *excl. syn. L. trialata*; WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 360; Pfl. R. Heft 107 (1953) 571, f. 93g = *icon. specim.* LAMARCK.; SANTAPAU, Rec. Bot. Surv. Ind. 16 (1953) 158.—*L. filiformis* (*non* LAMK) CAV. Ic. 6 (1801) 7, t. 511, f. 1.—*L. filiformis var. luzoniensis* PERS. Syn. 2 (1807) 214; R. & S. Syst. Veg. 5 (1819) 61; G. DON, Gard. Dict. 3 (1834) 713; DC. Prod. 7 (1839) 368; MIQ. Fl. Ind. Bat. 2 (1856) 577; F.-VILL. Nov. App. 4 (1880) 121.—*L. trigona* ROXB. [Hort. Beng. (1814) 85, *nomen*] Fl. Ind. 2 (1824) 111; Fl. Ind. ed. Carey (1832) 506; G. DON, Gard. Dict. 3 (1834) 709; DC. Prod. 7 (1839) 359; HOOK. *f.* Ic. Pl. 4 (1841) t. 358, *excl. syn. L. trialata et L. heyneana*; WIGHT, Ic. 4 (1848) t. 1170; MIQ. Fl. Ind. Bat. 2 (1857) 574; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 27, *p.p.*;

MIQ. Sum. (1861) 234; KURZ, J. As. Soc. Beng. 46, ii (1877) 211; CLARKE, Fl. Br. Ind. 3 (1881) 423; TRIM. Fl. Ceyl. 3 (1895) 56; KOORD. Exk. Fl. Java 3 (1912) 302; YAMAMOTO, Obs. Fl. Formosa 13 (1936) 148, *excl. syn. L. trialata et L. heyneana.*—*L. triangulata* ROXB. Hort. Beng. (1814) 16, *nomen nudum.*—*L. stipularis* ROTH, in R. & S. Syst. Veg. 5 (1819) 67; Nov. Pl. Sp. (1821) 144; WALL. Pl. As. Rar. 2 (1831) 43.—*Rapuntium alsinoides* PRESL, Prod. Mon. Lob. (1836) 22.— *L. sp.* GRIFF. Not. Pl. As. 4 (1854) 281.—*L. griffithii* HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 28; KURZ, J. As. Soc. Beng. 46, ii (1877) 211, *incl. var. genuina et var. dopatrioides*; CLARKE, Fl. Br. Ind.3 (1881) 424; RIDL. J. Str. Br. R. As. Soc. *n.* 33 (1911) 124; CRAIB, Kew Bull. (1911) 404; RIDL. Fl. Mal. Pen. 2 (1923) 201; DANGUY, Fl. Gén. I.–C. 3 (1930) 682, f. 75, 7-9; CRAIB, Fl. Siam. En. 2 (1936) 303; WIMMER, Pfl. R. Heft 107 (1953) 569.—*L. dopatrioides* KURZ, J. As. Soc. Beng. 39, ii (1870) 77; Flora 55 (1872) 302; CRAIB, Fl. Siam. En. 2 (1936) 303.—*L. microcarpa* CLARKE, Fl. Br. Ind. 3 (1881) 424; KOORD. Exk. Fl. Java 3 (1912) 302; DANGUY, Fl. Gén. I.–C. 3 (1930) 681; MERR. & PERRY, J. Arn. Arb. 22 (1941) 385; WIMMER, Pfl. R. Heft 107 (1953) 574.—*L. terminalis* CLARKE, Fl. Br. Ind. 3 (1881) 424; CRAIB, Kew Bull. (1904) 404; DANGUY, Fl. Gén. I.–C. 3 (1930) 680; CRAIB, Fl. Siam. En. 2 (1936) 306; WIMMER, Pfl. R. Heft 107 (1953) 573.—*Dortmannia griffithii* O.K. Rev. Gen. Pl. 2 (1891) 380.—*Dortmannia trigona* O.K. *l.c., incl. var. microcarpa et terminalis.*—*Dortmannia alsinoides* O.K. *l.c.* 972.—*L. luzoniensis* (PERS.) MERR. En. Philip. 3 (1923) 588; WIMMER, Pfl. R. Heft 107 (1953) 543.—*L. chevalieri* DANGUY, Bull. Mus. Paris (1929) 263; Fl. Gén. I.–C. 3 (1930) 683, f. 76, 9; WIMMER, Pfl. R. Heft 107 (1953) 569.—*L. thorelii* WIMMER, in Fedde, Rep. 26 (1929) 3, t. 71 f. 3.—*L. hosseusii* WIMMER, *l.c.* 2, t. 71 f. 5; DANGUY, Fl. Gén. I.–C. 3 (1930) 681; CRAIB, Fl. Siam. En. 2 (1936) 304, *incl. var.*; WIMMER, Pfl. R. Heft 107 (1953) 574.—*L. hainanensis* WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 348; Pfl. R. Heft 107 (1953) 506.—*L. chinensis* (*non* LOUR.) HANCE, J. Linn. Soc. Bot. 13 (1873) 110; FORBES & HEMSLEY, J. Linn. Soc. Bot. 26 (1889) 3; DANGUY, Fl. Gén. I.–C. 3 (1930) 680, f. 75, 10–12.—*L. radicans* (*non* THUNB.) HOSSEUS, Beih. Bot. Centralbl. 28, ii (1911) 446.—**Fig. 16c.**

Erect to ascending, unbranched to strongly branched herb, 3–35(–40) cm; stem 3-angled and winged. *Leaves* ½–1½ by ½–2 cm, sessile or short-petioled, contracted or narrowed to the base, acute or blunt, entire or toothed, glabrous to sparsely hairy; basal leaves ovate-oblong, cordate or elliptic, upwards sometimes sublanceolate, up to 1 by 0.3 cm. *Flowers* 8–12 mm, axillary, often in the higher axils, and then forming a lax terminal raceme. Pedicels 1–3½ cm, 3-angled, glabrous or slightly patent-hairy. Bracteoles basal, minute to 2 mm long and linear, often caducous. *Calyx* lobes triangular, subulate, 2¼–3¼ by ½–1 mm, entire, sometimes ciliate, glabrous or sparsely hairy. *Corolla* 4–12 mm, varying from bright blue to violet (sometimes, in Celebes, white), inside hairy (except for the specimens described as *L. hosseusii* which are glabrous, its *var. villosa* excluded), with 2 (white) gibbosities, dorsally split to the base, dorsal lobes connate with the lateral ones for 3–4½ mm, lateral lobes connate with the ventral one for 3½–6 mm; dorsal lobes 1–3 mm, falcate-oblong or falcate-ovate, acute or acuminate, margin entire or subentire, lateral and ventral lobes oblong or ovate, 1–2½ mm, acute or acuminate, entire or subentire. *Filaments* 3–5 mm, free to half-way up or higher, connate, the two anterior ones ± twice as broad as the anthers, the outside patent hairy; dorsal anthers 1¼, ventral ones 1 mm, each anther at the apex with a hair tuft, otherwise glabrous or hairy. *Ovary* 2–2½ by 1½–2½ mm, oblong, trumpet-shaped to cupular, glabrous or sparsely hairy; style glabrous. *Capsule* ± hemispherical, 2–3 by 1½–3 mm. *Seeds* ½ by 1/3 mm, trigonous, brown.

Distr. SE. Asia (Ceylon and the Deccan to S. China: Kwangtung), Hainan, and Formosa, in *Malaysia*: Malaya (Perlis: Chupeng; Singapore, WIMMER, *l.c.*), W. Java (Indramaju), Celebes (SW. & SE. peninsula), Philippines (Mindanao, Davao), S. New Guinea (N of Merauke, Wuroi, Oriomo R., Lake Daviumbu, Borovia). Fig. 12.

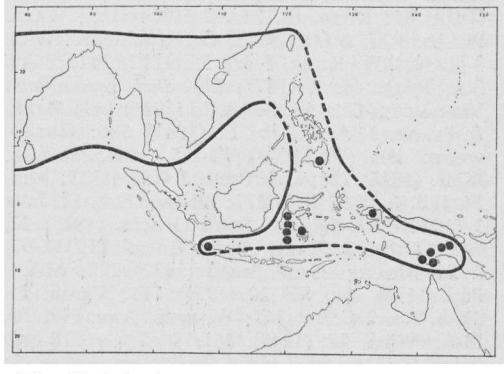


Fig. 12. Distribution of *Lobelia alsinoides* LAMK with localities in Malaysia dotted.

Ecol. In West Java and in SW. Celebes during the wet season in marshy grassland often dominated by 'siil' (*Sorghum nitidum*) and/or *Cyperaceae*; in S. Celebes also along margins of dry rice-fields. In New Guinea this species is found on swampy grounds, together with *Eriocaulon*, *Utricularia*, and several *Cyperaceae*; on wet places in savannahs with *Melaleuca*, *Acacia*, *Eucalyptus* stands and scattered *Antidesma ghaesembilla* trees. From sea-level up to 1000 m, restricted to regions subject to a dry monsoon. *Fl. fr.* Nov.–Aug.

Note. A polymorphic species with intergrading forms, so we can find a range of subsequent 'species', beginning from the typical *L. griffithii*, with its scale-like leaves to the normal broad-

ovate leaves of *L. dopatrioides* and the petiolate leaves of *L. terminalis*. I cannot trace any geographical or ecological replacement of these forms. The shape and size of the bracteoles have also lead to superfluous names: the Indian specimens have relatively long bracteoles, which induced ROTH to name this form *L. stipularis*.

L. luzoniensis (PERS.) MERR. was based upon a specimen in herb. NÉE from Luzon near Santa Cruz de la Laguña. MERRILL mentioned two recent collections from Luzon (Laguña) and Mindanao (Davao), citing COPELAND 368 and WEBER 1472 respectively. WIMMER quoted the last mentioned number under *L. alsinoides*, Pfl. R. Heft 107 (1953) 573. I have seen COPELAND 368, which was distributed as a *Wahlenbergia* (NY); it has all anthers bearded and trigonous seeds and undoubtedly represents *L. alsinoides*. This confirms my opinion, made from the plate and description, that *L. luzoniensis* is conspecific with *L. alsinoides*. CAVANILLES's figure of the plant is twice enlarged; he mentions the short seta on top of the corolla lobes and hairy anthers.

4. Lobelia zeylanica LINNÉ, Sp. Pl. 2 (1753) 932; OSBECK, Dagbok Ostindisk Resa (1757) 241; BURM. *f.* Fl. Ind. (1768) 186; R. & S. Syst. Veg. 5 (1819) 64; ROXB. Fl. Ind. 2 (1824) 113; WALL. Pl. As. Rar. 2 (1831) 43; G. DON, Gard. Dict. 3 (1834) 709; KURZ, Flora 55 (1872) 302; J. As. Soc. Beng. 46, ii (1877) 211, *incl. var. affinis*; YAMAMOTO, Obs. Fl. Form. 13 (1936) 149; MERR. & PERRY, J. Arn. Arb. 22 (1941) 386; GREENWOOD, *ibid.* 30 (1949) 78.—*L. succulenta* BL. Bijdr. (1826) 728; DC. Prod. 7 (1839) 373; MIQ. Fl. Ind. Bat. 2 (1856) 577; KOORD. Exk. Fl. Java 3 (1912) 303; OCHSE, Trop. Groent. (1925) 22, fig.; OCHSE & BAKH. Ind. Groent. (1931) 92, f. 54; HOCHR. Candollea 5 (1932) 292; MERR. Pap. Mich. Ac. Sc. 20 (1935) 111; CRAIB, Fl. Siam. En. 2 (1936) 305; WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 361, *incl. var.*; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 184, p. 3; WIMMER, Pfl. R. Heft 107 (1953) 576, *incl. var. lobbiana et f. glabra.*—*L. affinis* WALL. [Cat. (1828) 35 *et* 158 *no* 1131] *ex* G. DON, Gard. Dict. 3 (1834) 709; *non* MIRBACH, 1805; DC. Prod. 7 (1839) 360; MIQ. Fl. Ind. Bat. 2 (1856) 574; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 27; DRURY, Handb. Ind. Fl. 2 (1866) 108; CLARKE, Fl. Br. Ind. 3 (1881) 424, *incl. var. lobbiana*; TRIM. Fl. Ceyl. 3 (1895) 57; GAMBLE, J. As. Soc. Beng. 74, ii (1905) 52; CRAIB, Kew Bull. (1911) 404; KOORD. Exk. Fl. Java 3 (1912) 121; S. MOORE, Trans. Linn. Soc. Bot. II, 9 (1916) 88; DIELS, Bot. Jahrb. 55 (1917) 121; RIDL. Fl. Mal. Pen. 2 (1923) 200, f. 89; DANGUY, Fl. Gén. I.-C. 3 (1930) 679; MERR. Lingn. Sc. J. 6 (1930) 332.—*Rapuntium affine* PRESL, Prod. Mon. Lob. (1836) 13.—*Rapuntium succulentum* PRESL, *l.c.* 13.—*Rapuntium zeylanicum* PRESL. *l.c.* 13.—*L. subcuneata* MIQ. Fl. Ind. Bat. 2 (1857) 574.—*L. lobbiana* HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 28; DRURY, Handb. Ind. Fl. 2 (1866) 110.—*Dortmannia succulenta* O.K. Rev. Gen. Pl. 1 (1891) 973.—*Dortmannia zeylanica* O.K. *l.c.* 380, *pro nomen, excl. sched.*—*Dortmannia subcuneata* O.K. *l.c.* 973.—*Dortmannia trigona* O.K., *pro var. affinis* O.K. *l.c.* 380.—*L. barbata* WARB. Bot. Jahrb. 13 (1891) 444; K. SCH. & LAUT. Fl. Schutzgeb. (1900) 593.—*Pratia torricellensis* K. SCH. & LAUT. Nachtr. (1905) 402.—*Pratia ovata* ELMER, Leafl. Philip. Bot. 2 (1909) 593; MERR. Philip. J. Sc. 11 (1916) Bot. 317; En. Philip. 3 (1923) 589.—*Pratia begonifolia* (*non* LINDL.) HOSSEUS, Beih. Bot. Centralbl. 28, ii (1911) 477.

Creeping to ascending herb, 20–90 cm, stems often rooting at the lower nodes, terete, higher up sometimes angular, glabrous to sparsely hairy. *Leaves* spirally arranged, ovate to broad ovate, (¾–)1–6 by (½–)1–3½ cm; base cordate to truncate or sometimes decurrent, apex acute, sometimes blunt, margin subentire to subdentate to repand-dentate; upper surface puberulous or glabrous, underneath puberulous, especially the nerves, or glabrous; petiole terete, 1–20 mm, sometimes puberulous to appressed-hairy. *Flowers* axillary, 7–12 mm. Pedicels terete, 1–2 cm, ebracteolate. *Calyx* lobes lanceolate to oblong triangular, acute, patent-hairy, sometimes glabrous, 3–5 by ½ mm, entire to subdentate, with curved hairs to dentate-ciliate. *Corolla* 5–9 mm, purplish to pale or creamy, inside glabrous to subglabrous with two gibbosities, dorsally slit to the base; dorsal lobes connate with the lateral ones for 2–3½ mm, lateral lobes connate with the ventral one for 4–7 mm; dorsal lobes oblong or elliptic, 2½–3 by 1–1½ mm, falcate, entire to wavy, acute, outside on the nerves with long hairs, lateral and ventral lobes spathulate to ovate, 1–2 by 1–2 mm, entire, at the centre of the ventral lobe a white spot surrounding a purple stripe. *Filaments* 3–5 mm, for more than ¾ free; free parts narrowed towards the base, all of equal width, haired; anthers from dorsal to ventral 1–1½ mm to ¾–1 mm, hairy; all anthers at the apex with a hair tuft. *Ovary* cupular to obconical, 1¼–3 by 1 mm, scattered hairy to hairy (glabrous in specimens from Hainan); style glabrous. *Capsule* obconical to oblong ovate, 3–7 by 2–4 mm, with distinct nerves and a membranous pericarp. *Seeds* trigonous, 0.4 by 0.3 mm, light-brown; after withering the nerves and remains of the placenta persistent.

Distr. SE. Asia (from Ceylon and the Deccan through the Himalaya to SE. China: Kwangtung, Kwangsi, Chekiang), Hainan, and Formosa, almost throughout *Malaysia*, but not yet found in the Lesser Sunda Islands and the Moluccas; also in the Fiji Is.

Ecol. On shaded grassy grounds and moist places, under everwet climatic conditions. In coffee, tea, and rubber plantations, in open places in primary forest along streams, in shaded ravines, *etc.*, from the lowland up to 1500, rarely 1650–2000 m. *Fl. fr.* Jan.–Dec.

Vern. *Bělimbing tanah*, M, *rantji djadjar*, J, *djukut bulu mata kĕrbo, ramo kujah*, S.

Use. According to OCHSE the young leaves are

eaten as 'lalab' (steamed vegetable) with rice.

Notes. There is in literature no unanimous opinion about the typification of this Linnean species and this even induced CRAIB to suggest to reject it as a *nomen confusum* (Fl. Siam. En. 2, 1936, 305–306). DE CANDOLLE accepted it as conspecific with *L. affinis* WALL. which is in turn conspecific with *L. succulenta* BL.; he excluded from it LINNAEUS's reference to SEBA which he found fit to describe as *L. sebae* DC., now accepted as a synonym of *Monopsis simplex* (L.) WIMMER. In this interpretation he was followed later by several others, for instance KURZ, and recently MERRILL & PERRY.

The other interpretation started with CLARKE, who, for his revision of the Indian *Lobelias*, examined the material of *L. zeylanica* in the Linnean Herbarium, and stated (Fl. Br. Ind. 3, 1881, 425):—"that LINNAEUS's excellent specimen of the species is named *L. zeylanica* in his own hand, but the name has been altered (erroneously) by Sir J. E. SMITH to *L. anceps*, an Australian species."

CRAIB, *l.c.*, re-examined the Linnean specimens, two sheets: —"on one sheet marked *L. zeylanica* are 2 specimens but different plants, *viz* one what we call now "*L. succulenta*" BL. and a second non-campanulaceous plant." . . ."Pinned to this "*L. zeylanica*" sheet is another, on which is written, in LINNAEUS's hand. "18". *i.e.* the number of *L. zeylanica* in Sp. Pl. The plant on this sheet belongs to *L. zeylanica* as usually understood to-day."

This latter is obviously the specimen which CLARKE designated as the lectotype. It is referred to by SAVAGE (Cat. Linn. Herb. 1945, 165) under 1015 as *no* 42. According to SAVAGE it is not indicated on any of the Linnean sheets which came from China and was collected by OSBECK.

MERRILL & PERRY rightly considered that, though LINNAEUS derived his specific name from *Campanula ceylanica, senecionis folio, flore purpureo* SEBA, Thes. I: 37, t. 22, f. 12. 1734, yet, at the same time, he added a question mark to this reference; his description was based wholly on a plant collected by OSBECK, near Canton, in China, which represents a species totally different from the form SEBA illustrated (J. Arn. Arb. 22, 1941, 386). They concluded that the OSBECK specimen(s) are unquestionably the type of *L. zeylanica*.

In the rather detailed description OSBECK gave the following characters:—"*Perianthium . . . subtus villosum . . . filamenta . . . duo basi villosa . . . Caulis teres . . . Folia cordata . . . petiolata.*" This definition leaves no doubt that OSBECK's plant must agree with *L. succulenta* BL.

This is corroborated by an OSBECK collection in the Bergius Herbarium, which we could examine through the courtesy of Prof. FLORIN, Stockholm. On the back is written:—"*ceylanica. Lobelia foliis ovatis obtusis petiolatis crenatis caule diffuse: In China agris aquosii oryzae legi* 1751 OSBECK." The specimen doubtless represents *L. succulenta* BL.

Through the diligence of Dr NORLINDH, Lund, two other OSBECK specimens were located in the Riksmuseet Stockholm, both marked "*zeilanica*" and "*18 zeylanica*" respectively. The latter specimen has possibly actually been in the hands of LINNAEUS.

5. Lobelia heyniana R. & S. Syst. Veg. 5 (1819) 50; *non* SPRENG. 1825; BL. Bijdr. (1826) 728; G. DON, Gard. Dict. 3 (1834) 709 (*heyneana*); WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 344; Pfl. R. Heft 107 (1953) 474, *incl. var. div.*; SANTAPAU, Rec. Bot. Surv. Ind. 16 (1953) 158.—*L. decurrens* ROTH, Nov. Sp. (1821) 145; *non* CAV. 1801.—*L. micrantha* HOOK. Exot. Fl. 1 (1823) t. 44; *non* H.B.K. 1818.—*L. trialata* HAM. *ex* D. DON, Prod. Fl. Nep. (1825) 157; G. DON, Gard. Dict. 3 (1834) 709; DC. Prod. 7 (1839) 360; CLARKE, Fl. Br. Ind. 3 (1881) 425, *incl. var. lamiifolia*; CRAIB, Kew Bull. (1911) 404; KOORD. Exk. Fl. Java 3 (1912) 302; BOLD. Zakfl. (1916) 41; GAMBLE, Fl. Pres. Madras 4 (1921) 736; CRAIB, Fl. Siam. En. 2 (1936) 306.—*L. subincisa* WALL. [Cat. (1828) *n.* 1320, *nomen*] *ex* DC. Prod. 7 (1839) 367; MIQ. Fl. Ind. Bat. 2 (1856) 575.—*Rapuntium reinwardtianum* PRESL, Prod. Mon. Lob. (1836) 14.—*Rapuntium trialatum* PRESL, *l.c.* 13.—*Rapuntium arenarioides* PRESL, *l.c.* 17.—*L. arenarioides* DC. Prod. 7 (1839) 367.—*L. reinwardtiana* DC. *l.c.* 367; MIQ. Fl. Ind. Bat. 2 (1856) 565; KOORD. Exk. Fl. Java 3 (1912) 303.—*L. inconspicua* RICH. Tent. Fl. Abyss. 2 (1851) 8.—*L. zeylanica* (*non* L.) MOON, Cat. (1824) 14, *nomen*; CLARKE, Fl. Br. Ind. 3 (1881) 425, *incl. var. walkeri*; TRIM. Fl. Ceyl. 3 (1895) 56; KOORD. Exk. Fl. Java 3 (1912) 302; BOLD. Zakfl. (1916) 41; HAINES, Bot. Bihar & Orissa 4 (1922) 501, *incl. var. aligera*; BACK. & SLOOT. Theeonkr. (1924) 213, fig.; DANGUY, Fl. Gén. I.-C. 3 (1930) 678, *incl. var. parviflora*; HOCHR. Candollea 5 (1932) 292; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 184, p. 2.—*L. subracemosa* MIQ. Fl. Ind. Bat. 2 (1857) 576, *incl. var. rigidior.*—*L. dichotoma* MIQ. *l.c.* 576; WIMMER, in Fedde, Rep. 38 (1935) 78; Ann. Naturh. Mus. Wien 56 (1948) 345, *incl. var. aligera et var. pilosella*; Pfl. R. Heft 107 (1953) 476, *incl. var.*—*L. trigona* (*non* ROXB.) HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 27, *p.p.*; THWAITES, En. Pl. Zeyl. (1860) 169, *p.p.*; BENTH. Fl. Hongk. (1860) 197, *p.p.*; HOSSEUS, Beih. Bot. Centralbl. 28, ii (1911) 466, *p.p.*—*Dortmannia zeylanica* O.K. Rev. Gen. Pl. 2 (1891) 380.—*Dortmannia trialata* O.K. *l.c.* 973.—*Dortmannia inconspicua* O.K. *l.c.* 972.—*Dortmannia reinwardtiana* O.K. *l.c.* 973.—*L. aligera* HAINES, J. As. Soc. Beng. n.s. 15 (1920) 316.—*L. bialata* MERR. Philip. J. Sc. 7 (1912) Bot. 105, *ex descr.*; WIMMER, Pfl. R. Heft 107 (1953) 474.—**Fig. 16d.**

An ascending or erect herb, 5–50(–60) cm; stem 3-angled and winged. *Leaves* spirally arranged, the lower ones rhomboid to broad-ovate, upwards elliptic to linear-lanceolate, decurrent at the base, acute at the apex, ½–4 by ¼–3 cm, serrate to serrate-dentate, glabrous or sparsely hairy, especially the higher ones; petiole up to 3 mm.

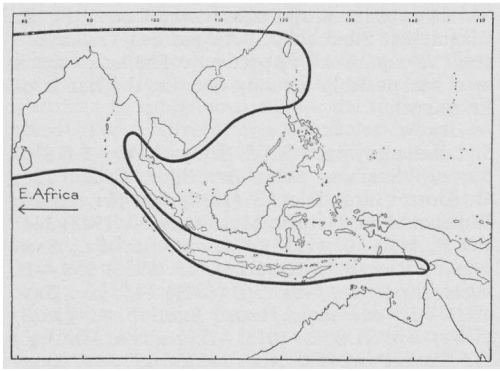


Fig. 13. Distribution of *Lobelia heyniana* R. & S.

Flowers 4½–12 mm, axillary, often forming a terminal raceme. Pedicels ½–2 cm, 3-angled, patent, glabrous or hairy with 2(–1), small, linear to minutely reduced bracteoles. *Calyx* lobes lanceolate-elliptic, 2–4 by ¼–1 mm, acute, entire to subdentate, glabrous to sparsely hairy. *Corolla* 3½–10 mm, pale-purple, lilac, sometimes white, inside with 2 gibbosities and a dark spot, nearly glabrous to hairy, slit to the base; dorsal lobes connate with the lateral ones for 1½–5 mm, lateral lobes connate with the ventral one for 2–7 mm; dorsal lobes linear to lanceolate, 1–4 by ¼–1 mm, often reflexed, sometimes longitudinally folded, small compared with the others, lateral and ventral lobes spathulate to ovate, 1–7 by ½–2½ mm, acute or blunt, entire to subcrenate. *Filaments* 3–7 mm, up to half-way free, of equal width, glabrous or hairy. Anthers from dorsal to ventral 1–1½ to ½–¾ mm, glabrous or hairy, only the 2 anterior ones with an apical hair tuft. *Ovary* trumpet- to cup-shaped, 1½–4 by 1–2½ mm, glabrous, sometimes hairy; style glabrous. *Capsule* obconical to obconical-campanulate, 3–8 by 2–2½ mm. *Seeds* semi-ellipsoid, ½ by ¼ mm, smooth, brown.

Distr. E. Africa (Erytrea, Abyssinia, Kenya to Tanganyika), SE. Asia (Ceylon and the Deccan Peninsula to S. China), *Malaysia*: North to Central Sumatra, Java (from Mt Patuha eastward), Lesser Sunda Islands (Bali: G. Agung; Lombok: G. Pusuk, G. Sembalung; Sumbawa: Batu Sulang; Timor: Noiltoko, G. Mutis), Philippines (Luzon: Bontoc, VANOVERBERGH 902, type of *L. bialata* MERR., *non vidi*), and W. New Guinea (Merauke). Fig. 13.

Ecol. In moist and swampy places, in marshes, on steep slopes and in light forest, 500–2700 m. *Fl. fr.* Jan.–Dec.

Vern. *Djukut mata kĕbo, kitombè*, S, *krĕmo, krinjingan, kukunnang*, J.

Note. Small specimens possess often lax racemes and leaves as in some specimens of *L. alsinoides*.

6. Lobelia chinensis LOUR. Fl. Coch. (1790) 514, ed. Willd. (1793) 628; R. & S. Syst. Veg. 5 (1819) 41; G. DON, Gard. Dict. 3 (1834) 709; DC. Prod. 7 (1839) 360; FORBES & HEMSLEY, J. Linn. Soc. Bot. 26 (1889) 2; DIELS, Bot. Jahrb. 21 (1901) 607; MERR. Lingn. Sc. J. 5 (1927) 181; CRAIB, Fl. Siam. En. 2 (1936) 302; YAMAMOTO, Obs. Fl. Form. 13 (1936) 148; WIMMER, Pfl. R. Heft 107 (1953) 609.—*L. erinus* (*non* L.) THUNB. Fl. Jap. (1784) 325.—*L. erinoides* (*non* L.) THUNB. *l.c.* 325.—*L. radicans* THUNB. Trans. Linn. Soc. 2 (1794) 330; R. & S. Syst. Veg. 5 (1819) 60; ROXB. Fl. Ind. 2 (1824) 110; CLARKE, Fl. Br. Ind. 3 (1881) 425; FORBES & HEMSLEY, J. Linn. Soc. Bot. 26 (1889) 3; KOORD. Exk. Fl. Java 3 (1912) 302; BOLD. Zakfl. (1916) 41; KOORD. Fl. Tjib. 3 (1918) 55; BACK. & SLOOT. Theeonkr. (1924) 212, fig.; ALSTON, Fl. Ceyl. Suppl. (1931) 175; MERR. Lingn. Sc. J. 7 (1931) 325; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 184, p. 2; T. MAKINO, Ill. Fl. Japan (1954) 80.—*L. campanuloides* THUNB. Trans. Linn. Soc. 2 (1794) 331; KER, Bot. Reg. 9 (1823) t. 733; G. DON, Gard. Dict. 3 (1834) 709.—*L. caespitosa* BL. Bijdr. (1826) 729; DC. Prod. 7 (1839) 366; MIQ. Fl. Ind. Bat. 2 (1856) 575.—*Rapuntium caespitosum* PRESL, Prod. Mon. Lob. (1836) 13.—*Rapuntium campanuloides* PRESL, *l.c.* 13.—*Rapuntium chinense* PRESL, *l.c.* 13.—*Rapuntium radicans* PRESL, *l.c.* 14.—*Isolobus radicans* DC. Prod. 7 (1839) 353.—*Isolobus kerii* DC. *l.c.* 353.—*Isolobus roxburghianus* DC. *l.c.* 353; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 27.—*Isolobus campanuloides* DC. Prod. 7 (1839) 353.—*Isolobus caespitosus* HASSK.

Fig. 14. *Lobelia chinensis* LOUR. Bogor (West Java), in dense sods in the Tji Liwung valley (1928).

Bonpl. 7 (1859) 180.—*Pratia radicans* G. DON, Gard. Dict. 3 (1834) 700.—*Pratia thunbergii* G. DON, *l.c.* 700.—*Dortmannia chinensis* O.K. Rev. Gen. Pl. 2 (1891) 380.—*Dortmannia campanuloides* O.K. *l.c.* 380.—*Dortmannia radicans* O.K. *l.c.*—**Fig. 14.**

A glabrous, branched, caespitose or prostrate rooting herb; stem 5–15 cm, terete, with two longitudinal ridges. *Leaves* alternate (distichous) with decurrent sessile or subsessile base, elliptic-ovate or lanceolate (especially apically), 13–33 by 2–6 mm; acute or blunt, subentire to shallowly toothed towards the apex. *Flowers* axillary, 7–15 mm, on one stem mostly 1–2, only one opened at a time. Pedicels terete, 6–37 mm, erect, ebracteolate. *Calyx* lobes narrow-triangular, 1½–3 by ½–¾ mm, dentate at the base. *Corolla* 5–12 mm, white to pale-purple (red in China), outside glabrous, inside hairy, sometimes with 2 green gibbosities, slit to the base; dorsal lobes connate with the lateral ones for 4–4½ mm, lateral lobes connate with the ventral one for 4½–6 mm; dorsal lobes 4½–8 mm, linear, sometimes, reflexed, blunt, lateral and ventral lobes 3–6 mm, equal, linear to lanceolate, acute. *Filaments* 5–6 mm, for more than half-way free, all of equal width, the 2 anterior ones patent hairy, with a seta or hair tuft at the top; anthers from dorsal to ventral 2–1 mm, glabrous or hairy. *Ovary* 2–5 by 1 mm, trumpet-shaped, glabrous; style hairy at the base. *Capsule* on a recurved pedicel, 4–6 mm, obconical, glabrous. *Seeds* 3/8–½ mm, ellipsoid, somewhat compressed, dark-brown, smooth.

Distr. SE. to E. Asia (from the Deccan to China and Japan), in *Malaysia*: Malay Peninsula (Singapore) and Java (eastwards to Mt Diëng), according to BACKER & VAN SLOOTEN since long introduced from continental Asia.

Ecol. On moist, grassy places, along water-courses and on cultivated land, on rice-fields and in tea and cinchona plantations, 500–1600 m, occasionally at lower altitudes. According to BACKER & VAN SLOOTEN no capsules with ripe seeds are found in Java. VAN STEENIS has found a plant at Bogor (*n.* 2151) with ripe capsules and seeds. I also saw a sheet in the Leyden Herb. (SCHIFFNER 2728, from Tjibodas) with ripe capsules and seeds. It remains questionable whether these seeds are viable.

Propagation is normally vegetative. According to BACKER & VAN SLOOTEN it descends along water-courses to lower altitudes, even to the lowlands, by stolons or stems dispersed by water. However, such lowland habitats are only temporary.

Vern. *Djukut mata keujeup, ki tombè*, S.

7. Lobelia archboldiana (MERR. & PERRY) MOELIONO, *nov. comb.*—*Pratia archboldiana* MERR. & PERRY, J. Arn. Arb. 30 (1949) 59; WIMMER, Pfl. R. Heft 107 (1953) 765.—**Fig. 15.**

Stemless, delicate plant, sometimes with stolons, 2–4 cm. *Leaves* in rosette, ovate to roundish, ½–1½ cm diam., subcordate or truncate at the base, wavy to denticulate along the margin,

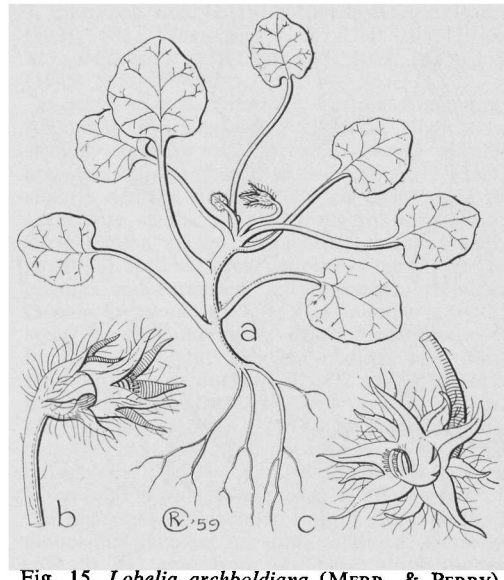


Fig. 15. *Lobelia archboldiana* (MERR. & PERRY) MOELIONO. *a.* Habit, × 2½, *b.* young flower, × 3, *c.* open flower, × 3 (CLEMENS 12442).

obtuse at the apex, very thin, glabrous or sparsely hairy above, glabrous underneath; petiole 3–7(–23) mm, glabrous or sparsely pilose. *Flowers* 5–6½ mm, axillary or terminal. Pedicels 2–12 mm, glabrous or hairy. *Calyx* lobes linear-lanceolate, with 1–2 pairs of teeth, hairy, 2–3 mm. *Corolla* red to dark wine-red, the tube 2–3 mm long, outside glabrous to sparsely hairy, inside glabrous, dorsally split to 1 mm from the base; dorsal lobes half-way connate with the lateral ones, their free part lanceolate, 2–3 mm, reflexed, lateral and ventral lobes also half-way connate, their free part lanceolate, 3–3.2 mm, acute. *Stamens c.* 2 mm, filaments for ¾ of their length free, glabrous; anthers from dorsal to ventral 1¾–¾ mm; 2 anterior ones with a short bristle and some hairs. *Ovary* campanulate to trumpet-shaped, 1–2½ by 1–2 mm, sparsely hairy; style glabrous. *Capsule* roundish to ovoid, 3 by 3 mm, sparsely hairy, with a thin wall. *Seeds* roundish to ovoid, *c.* ½ by ½ mm, smooth, dark-brown to black.

Distr. *Malaysia*: E. New Guinea (Murray Pass, Wharton Range; Rawlinson Range, Morobe Prov.), rare, twice collected.

Ecol. Under a rock wall on grassy bank of a creek and in deep holes above deep water-courses, 2840–3600 m. *Fl. fr.* July–Aug.

8. Lobelia brachyantha MERR. & PERRY, J. Arn. Arb. 22 (1941) 385; WIMMER, Pfl. R. Heft 107 (1953) 487.—**Fig. 16a-b.**

Tiny, creeping, branched herb; stem terete, rooting, sparsely pilose. *Leaves* alternate, orbicular-reniform, 2½–5 by 2½–6 mm, base cordate to truncate, margin subundulate to dentate, upper surface sparsely pilose, beneath glabrous; petiole

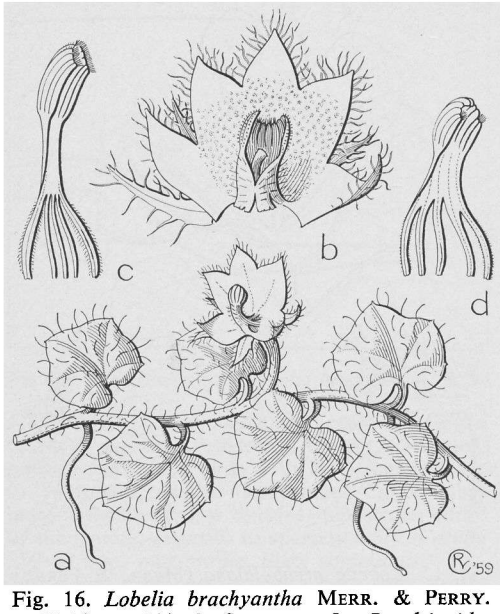


Fig. 16. *Lobelia brachyantha* MERR. & PERRY. *a.* Habit, × 2½, *b.* flower, × 5.—*L. alsinoides* LAMK. *c.* Stamens, × 5.—*L. heyniana* R. & S. *d.* Stamens, × 5 (*a–b* BRASS 11570, *c* VAN STEENIS 6705, *d* DE VOOGD 2615).

1–3 mm. *Flowers c.* 5 mm, axillary. Pedicels terete, 4–5 mm, hairy, ebracteolate. *Calyx* lobes oblong-triangular, 2–2½ by ½–¾ mm, with a distinct tooth at the base, sparsely pilose. *Corolla* subcampanulate, 4 mm long, dark purplish-red, outside pilose, inside the 3 anterior lobes papillose, dorsally not entirely split to the base; dorsal lobes connate with the lateral ones for 1 mm, lateral lobes connate with the ventral one for 2 mm; all lobes ovate-deltoid, 1½ mm, acute to blunt. *Filaments* 1½ mm, up to 1/3 free, equal, glabrous or hairy. Anthers from dorsal to ventral 1–¾ mm, glandular hairy; the 2 anteriors at the apex finely hairy (according to MERRILL & PERRY 'setigeris'). *Ovary* cupular, 1 by 1½ mm, long-hairy; style glabrous. *Capsule* cupular-ovoid, 3 by 2 mm. *Seeds* ellipsoid to roundish, 0.6–0.8 mm, smooth, light-brown.

Distr. *Malaysia*: New Guinea (Bele River, near Habbema Lake), once found.

Ecol. Creeping on bare rock on a sparsely vegetated limestone precipice, 2350 m.

Note. The pilose indument of this plant is very typical, because the hairs are more-celled. The structure of the corolla is also very unlike that of the other Malaysian species by its very short tube which gives the corolla a campanulate shape.

9. Lobelia montana REINWARDT *ex* BL. Bijdr. (1826) 728; DC. Prod. 7 (1839) 386.—*Pratia montana* HASSK. Flora 25, 2 (1842) Beibl. 1, p. 23; Cat. Hort. Bog. (1844) 106; CLARKE, Fl. Br. Ind. 3 (1881) 423; KOORD. Exk. Fl. Java 3 (1912) 304; Fl. Tjib. 3, 2 (1918) 56; DANGUY, Fl. Gén. I.-C. 3 (1930) 677, f. 75, 1–5; HOCHR. Candollea 5 (1932) 293, *incl. f. variegata*; HEND. Gard. Bull. S.S. 7 (1933) 109; DOCTERS VAN LEEUWEN, Verh. Kon. Ak. Wet. A'dam sect. 2, 31 (1933) 240; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 179; MERR. Contr. Arn. Arb. 8 (1934) 165; WIMMER, Pfl. R. Heft 106 (1943) 116, *incl. f. variegata et var. cyanocarpa*; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 184, p. 5.—*Piddingtonia montana* MIQ. Fl. Ind. Bat. 2 (1857) 573; BUIJSMAN, Flora 106 (1913) 127, *excl. syn.*—*Piddingtonia patens* MIQ. Fl. Ind. Bat. 2 (1857) 573.—*Speirema montanum* HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 27; CLARKE, J. Linn. Soc. Bot. 15 (1876) 147.—*Piddingtonia cyanocarpa* HASSK. Bonpl. 7 (1859) 179.—**Fig. 17.**

Erect, mostly branched, medium-sized to coarse, nearly glabrous herb, *c.* 1–2 m; stem terete. *Leaves* spirally arranged, ovate-oblong to lanceolate, 3½–12 by 1½–4¼ cm, decurrent at the base, dentate to subdentate, acute to acuminate; petiole *c.* ½ cm, glabrous to appressed-hairy. *Flowers* axillary, solitary, secund, scentless. Pedicel 2–4½ cm, during anthesis erect. *Calyx* lobes lanceolate, 5–11 by 1–1½ mm, obliquely patent, entire, acute. *Corolla* 1½–3 cm, purplish to lilac-blue with

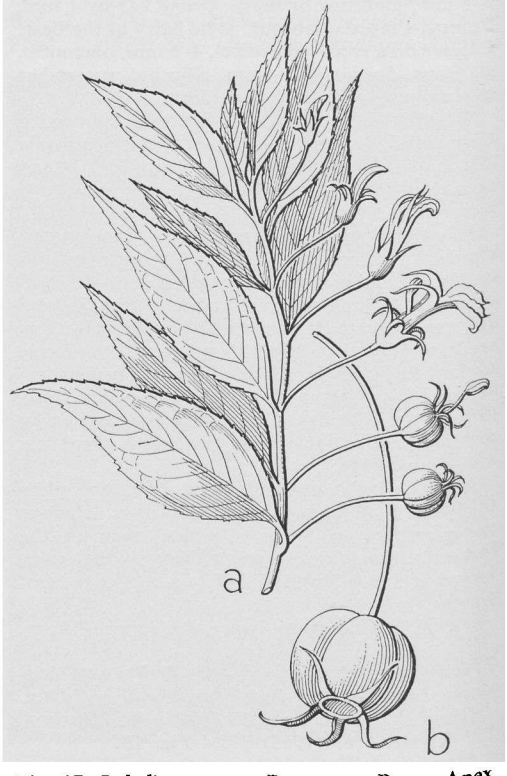


Fig. 17. *Lobelia montana* REINW. *ex* BL. *a.* Apex of flowering stem, × ⅔, *b.* ripe fruit, natural poise, × ⅔.

white-shaded margins, outside glabrous, inside hairy and with two pilose gibbosities, dorsally slit to 1–2 mm from the base; dorsal lobes connate for 1–3 mm, connate with the lateral lobes for 7–10 mm, lateral lobes connate with the ventral one for 9–12 mm; dorsal lobes linear-lanceolate, 9–10 mm, flat or crisped, margins glabrous, lateral and ventral lobes oblong-lanceolate, the ventral one broadest, 7–12 mm, crisped and ciliate, acuminate. *Filaments* 4–7 mm, for 1/3 of their length free, glabrous; anthers from dorsal to ventral 5–3 mm long, hairy; the two anteriors besides at their apex with a hair tuft. *Ovary* campanulate to hemispherical, 3–5 by 3–6½ mm, glabrous; style glabrous. *Berry* globose, ¾–1½ cm diam. (living *c.* 2–2½ cm), on long (over 6 cm), patent, afterwards recurved pedicels, violet, later dark purple. *Seeds* broad-ellipsoid to ovoid, *c.* ½ mm long, brown, smooth.

Distr. India (from the Deccan to the Himalaya) to Indo-China (Tonkin), S. China (Yunnan), and *Malaysia*: Malay Peninsula (Cameroon Highlands), Sumatra, and Java (eastwards to Mt Diëng.) Fig. 18.

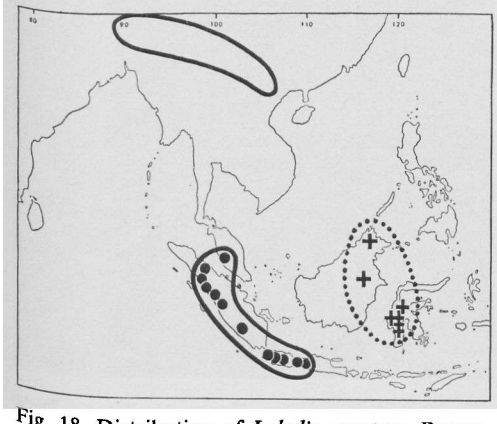


Fig. 18. Distribution of *Lobelia montana* REINW. *ex* BL. (continuous line, localities in Malaysia dotted), and *Lobelia borneensis* (HEMSL.) MOELIONO (dotted line, localities in Malaysia indicated by crosses).

Ecol. Open or half-shaded places in mountain forest, light spots in mossy forests, 1400–2600 m. According to DOCTERS VAN LEEUWEN (1933) the species is autogamous in Java.

Vern. *Ki bèwo, ki leuntja, tětěra*, S, *kěmalon, tjělengan*, J.

Note. KURZ recorded to have found this species on the summit of Mt Menumbing in Banka I. (Nat. Tijd. Ned. Ind. 27, 1864, 206); though I have not seen his collection this record must rest on an error.

10. Lobelia borneensis (HEMSL.) MOELIONO, *nov. comb.*—*Pratia borneensis* HEMSL. in Hook. Ic. Pl. 19 (1886) t. 1532; STAPF, Trans. Linn. Soc. Bot. II, 4 (1894) 188, *incl. var. grandiflora*; GIBBS, J. Linn. Soc. Bot. 42 (1914) 100; MERR. En. Born. (1921) 585; WIMMER, Pfl. R. Heft 106 (1943) 117; *ibid.* Heft 107 (1953) 765; LAM, Blumea 5 (1945) 568.

Coarse, erect half-shrub, *c.* 1–1½ m, branching, sometimes reclining; stem glabrous, slightly to strongly angular and furrowed. *Leaves* spirally arranged, elliptic-lanceolate, 9–11 by 2¾–3½ cm, slightly dentate, decurrent at the base, acute to acuminate at the top, glabrous to puberulous, darker green at the upper side, paler beneath, glossy on both surfaces; petiole 3–7 mm. *Peduncle* angular and furrowed, inflorescence a terminal raceme or pseudo-axillary by sympodial growth, erect, faintly puberulous. Bracts lanceolate, 6–7 by 1–2 mm, slightly dentate. Pedicels 5–10 mm, thin, whether or not with 1 or 2 tiny lanceolate bracteoles in the basal half. *Flowers c.* 2½ cm. *Calyx* lobes lanceolate, 6½–7 by 1½ mm, longitudinally nerved, subentire, obtuse to acute, faintly puberulous. *Corolla* 1¾–2¼ cm, blue purple or white with purple at the base of the margin of the segments or lavender tinged, inside with 2 gibbosities whether or not papillose; dorsally split to 0–2 mm from the base; dorsal lobes connate with the lateral ones for 2–4 mm, lateral ones connate with the ventral one for 7–11 mm; dorsal lobes oblong-lanceolate, 6–10 mm, longitudinally folded, recurved, the margins crisp to flat, obtuse to subacute, glabrous or slightly ciliate, lateral lobes oblong-lanceolate, 6–10 by 2 mm, recurved, ventral lobe oblong-lanceolate, 8–12 by 2–2½ mm whether or not incurved. *Filaments* up to half their length free at the base, *c.* 5 mm, glabrous; anthers from dorsal to ventral 4–2 mm, at the apex a tuft of hairs. *Ovary* 5 by 5 mm, campanulate to hemispherical, faintly puberulous; style glabrous. *Berry* 3–5 mm (mature?), globose, green. *Seeds* ¾–1 mm, globose to broad ellipsoid, slightly angular, reticulate.

Distr. *Malaysia*: Borneo (N. Borneo: Mt Kinabalu; E. Kutei), Celebes (Central part and SW. peninsula). Fig. 18.

Ecol. In secondary jungle, on forest edges, along forest paths, and in open grassfields, (500–)900–1800 m. *Fl. fr.* Jan.–Dec.

Vern. *Akar maga pawang*, N. Borneo.

Note. The nearest allies of this and the foregoing species are obviously found in remote places, China, New Zealand, and Guatemala!

11. Lobelia angulata FORST. Fl. Ins. Austr. Prod. (1786) 58, *n.* 309; R. & S. Syst. Veg. 5 (1819) 65; A. RICH. Fl. Nouv.-Zél. (1832) 227; G. DON, Gard. Dict. 3 (1834) 713; DC. Prod. 7 (1839) 366.—*L. nummularia* LAMK, Dict. Bot. 3 (1789) 589; R. & S. Syst. Veg. 5 (1819) 64; BL. Bijdr. (1826) 727; G. DON, Gard. Dict. 3 (1834) 709.—*L. begonifolia* WALL. Asiat. Res. 13 (1820) 377; in Roxb. Fl. Ind. 2 (1824) 115; D. DON, Prod. Fl. Nep. (1825) 158; WALL. Pl. As. Rar. 2 (1831) 43.—*L. javanica* THUNB. Fl. Jav. (1825) 9, *cf.* Blumea 6 (1950) 360.—*L. obliqua* HAM. *ex* D. DON, Prod. Fl. Nep. (1825) 158.—*L. pratiana* GAUDICH. Ann. Sc. Nat. Bot. 5 (1825) 103.—

Pratia repens GAUDICH. *l.c.* 103; in Freyc. Voy. Bot. (1826) 456, t. 79; G. DON, Gard. Dict. 3 (1834) 340, *incl. var.*; HOOK. *f.* Fl. Antarct. 1 (1844) 42; REICHE, Fl. Chil. 5 (1910) 63.—*L. rugulosa* GRAHAM, Edinb. N. Phil. J. (1829) 186.—*Pratia begonifolia* LINDL. Bot. Reg. (1830) t. 1373; G. DON, Gard. Dict. 3 (1834) 699 (*begoniaefolia*); PRESL, Prod. Mon. Lob. (1836) 46; CLARKE, Fl. Br. Ind. 3 (1881) 442; RIDL. J. Str. Br. R. As. Soc. *n.* 33 (1900) 102; MERR. Philip. J. Sc. 1 (1906) Suppl. 241; BURKILL & HOLTTUM, Gard. Bull. S. S. 3 (1923) 56 (*begoniifolia*); RIDL. Fl. Mal. Pen. 2 (1923) 201; DANGUY, Fl. Gén. I.-C. 3 (1930) 674; CRAIB, Fl. Siam. En. 3 (1936) 302.—*L. reniformis* CHAM. Linnaea 8 (1833) 210; DC. Prod. 7 (1839) 365.—*L. hederacea* CHAM. Linnaea 8 (1833) 212.—*Pratia hederacea* G. DON, Gard. Dict. 3 (1834) 699; HOOK. *f.* & ARN. J. Bot. 1 (1834) 277; PRESL, Prod. Mon. Lob. (1836) 46; DC. Prod. 7 (1839) 340, *incl. var. elliptica*; HOOK. *f.* Fl. Antarct. 1 (1884) 43; KANITZ, in Mart. Fl. Bras. 6, 4 (1878) 135, t. 40 f. 1; WIMMER, Rev. Sudamer. Bot. 2 (1935) 96; Pfl. R. Heft 106 (1943) 114.—*Pratia serpyllacea* PRESL, Prod. Mon. Lob. (1836) 46.—*Rapuntium angulatum* PRESL, *l.c.* 30.—*Rapuntium reniforme* PRESL, *l.c.* 15.—*Rapuntium nummularium* PRESL, *l.c.* 30.—*Piddingtonia nummularia* DC. Prod. 7 (1839) 341; MIQ. Fl. Ind. Bat. 2 (1857) 572; HOOK. *f.* & TH. J. Proc. Linn. Soc. Bot. 2 (1858) 26; HASSK. Bonpl. 7 (1859) 180; BENTH. Fl. Hong. (1861) 196.—*L. littoralis* R. CUNN. *ex* A. CUNN. Ann. Nat. Hist. I, 2 (1839) 50; REGEL, Gartenfl. 38 (1888) 662, f. 148.—*Pratia zeylanica* HASSK. Flora 25, 2 (1842) Beibl. 1, p. 23; Cat. Hort. Bog. (1844) 106.—*Pratia arenaria* HOOK. *f.* Fl. Antarct. 1 (1844) 106, t. 29 *in icon. errore Pratia arenosa*; Fl. Nov. Zel. 1 (1853) 157.—*Pratia angulata* HOOK. *f.* Fl. Antarct. 1 (1844) 43; Fl. Nov. Zel. 1 (1853) 157, *incl. var. arenaria*; Handb. Fl. New Zeal. (1867) 172; CHEESEMAN, Man. New Zeal. Fl. (1906) 397; Ill. New Zeal. Fl. (1908) t. 16; WIMMER, Pfl. R. Heft 106 (1943) 110, *incl. var.*—*Piddingtonia palliardii* LEHM. Hamb. Gartenz. 8 (1851) 337; Linnaea 25 (1852) 310; WALP. Ann. 5 (1858) 391.—*L. rotundifolia* BANKS & SOL. *ex* HOOK. *f.* Fl. Nov. Zel. 1 (1853) 158.—*L. horsfieldiana* MIQ. Fl. Ind. Bat. 2 (1857) 577.—*Pratia nummularia* A. BR. & ASCHERS. Index Sem. Hort. Berol. (1861) Append. 6; KURZ, J. As. Soc. Beng. 46, ii (1877) 210; KOORD. Exk. Fl. Java 3 (1912) 303; BOLD. Zakfl. (1916) 41; KOORD. Fl. Tjib. 3, 2 (1918) 55; HEYNE, Nutt. Pl. 2 (1927) 1428; MERR. Lingn. Sc. J. 1 (1927) 181; YAMAMOTO, Obs. Fl. Form. 13 (1936) 150; WIMMER, Pfl. R. Heft 106 (1943) 112; LAM, Blumea 5 (1945) 569; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 184, p. 3; Blumea 6 (1950) 360.—*Pratia linnaeoides* HOOK. *f.* Handb. New Zeal. Fl. (1867) 172.—*Pratia reniformis* KANITZ, in Mart. Fl. Bras. 6, 4 (1878) 136, t. 40 f. 2; WIMMER, Rev. Sudamer. Bot. 2 (1935) 96; Pfl. R. Heft 106 (1943) 115.—*L. linnaeoides* PETRIE, Trans. New Zeal. Inst. 23 (1890) 405; CHEESEMAN, Man. Fl. New Zeal. (1906) 400; PETRIE, Gard. Chron. III, 47 (1910) 99, f. 50; WIMMER, Pfl. R. Heft 107 (1953) 483, *incl. var. brevipilis.*—*Pratia papuana* S. MOORE, Trans. Linn. Soc. II, 9 (1916) 88; DIELS, Bot. Jahrb. 55 (1917) 125; *ibid.* 62 (1929) 493; WIMMER, Pfl. R. Heft 106 (1943) 114.—*Pratia wollastonii* S. MOORE, Trans. Linn. Soc. II, 9 (1916) 89; WIMMER, Pfl. R. Heft 106 (1943) 111.—?*Pratia podenzanae* S. MOORE, J. Bot. 55 (1917) 306; WIMMER, Pfl. R. Heft 106 (1943) 111.—*L. arfakensis* GIBBS, Arfak (1917) 183; KANEHIRA & HATUSIMA, Bot. Mag. Tokyo 57 (1943) 128; WIMMER, Pfl. R. Heft 107 (1953) 483.—*L. paradoxa* WIMMER, in Fedde, Rep. 26 (1929) 2; Pfl. R. Heft 107 (1953) 483.—**Fig. 19-20.**

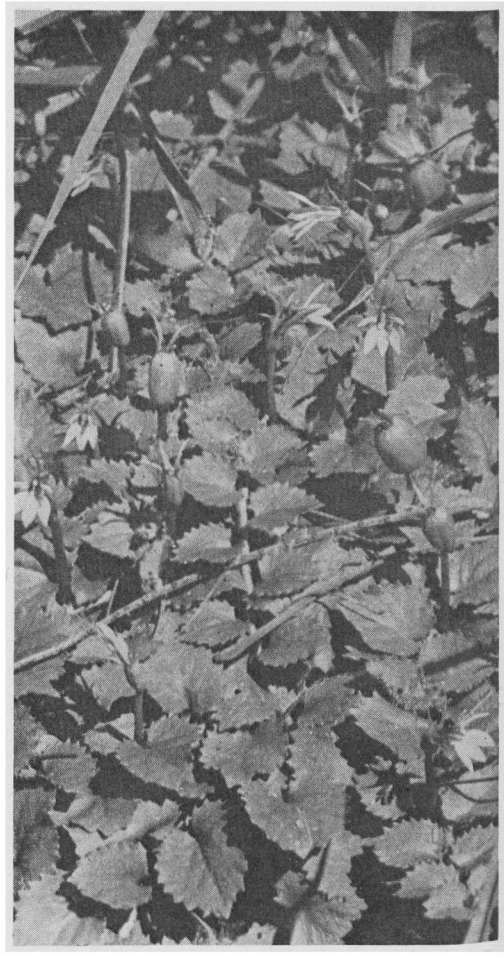


Fig. 19. *Lobelia angulata* FORST. Mt Patuha, West Java (DE VOOGD).

Polymorphous, creeping and branching herb; stem terete, up to ½ m long, rooting at the nodes, glabrous or hairy. *Leaves* alternate, round to ovate, broad-ovate or reniform, 2–25 by 2–35 mm, cordate, truncate, or even decurrent at the base, crenate, dentate or subdentate to subentire

at the margin, acute or rounded at the top, glabrous to hairy; petiole 0–25 mm, glabrous or densely hairy. *Flowers* 6–18, axillary, solitary. Pedicels ½–5(–7) cm, ebracteolate, glabrous or hairy. *Calyx* lobes linear-lanceolate to triangular, 1–11 mm, entire to distinctly dentate with up to 3 teeth at either side, acute or blunt, glabrous to puberulous. *Corolla* 4½–15 mm, outside and inside glabrous or hairy, sometimes with two gibbosities inside, dorsally split to the base or nearly so; dorsal lobes connate with the lateral ones for 1½–5 mm, laterals connate with the ventral one for 2–12 mm; dorsal lobes lanceolate, 2–14 mm long, falcate and reflexed, lateral and ventral lobes spathulate, obovate, or lanceolate, 2–12 mm, the ventral one generally broadest. *Filaments* 3–11 mm, very variable. free for ¾ of their length, equal in width, sometimes narrowed to the base, or the two anteriors broader, sometimes the two anteriors adnate to the corolla, glabrous or hairy or only the two anterior ones hairy; anthers from dorsal to ventral 1–2 to 1–½ mm, glabrous or hairy, only those of the two anteriors with a hair tuft or with a seta and some hairs. *Ovary* trumpet-shaped to obconical or ovoid or campanulate, 1–4 by 1–3 mm; glabrous to densely hairy; style glabrous or sparsely pilose. *Fruit* an indehiscent or dehiscent capsule or a subcarnose to baccate purple fruit, (1–)6½–16 by (1–)5–13 mm, glabrous to hairy, ellipsoid to globose, sometimes flattened at the apex. *Seeds* flattened-ellipsoid to ellipsoid, nearly 1 mm, brown, reticulate to fine-reticulate.

Distr. Very widely distributed, through SE. Asia (Nepal, Sikkim, Khasia, Burma, Siam, Indo-China) to China (Yunnan, Kwangsi, Hainan, Formosa), throughout *Malaysia*, Borneo and the Moluccas excepted, Australia, Tasmania, New Zealand, and adjacent islands, to S. America.

Ecol. Moist open or shaded places, in mountain forest, mossy forest, along river-banks and forest trails, 600–3300 m.

Vern. *Aäntingan, ki tombè, kitomè, kuweung, ramo keujeup, djukut mata keujeup gunung, tangkal sutji*, S, *kětrus alus, manikan, sĕrintil, urĕk urĕk polo*, J; Philippines: *gubagubai, kanapa, pisa*, Ig., *tutugi*, Bon.; *tikiritoka*, Kopanko, New Guinea.

Notes. An extremely polymorphous species. As reported in the note to the description of the genus, it is in this species that the fruits are varying not only in shape, but even in structure in the New Guinean and some Celebes specimens, which also vary in floral characters. In the abundant material I have studied, I cannot make any distinct demarcation and I am convinced that it will be wise to consider the specimens as belonging to one species. It may be possible that more numerous, detailed field data will enable to segregate infraspecific taxa.

The polymorphism had already been indicated by DIELS, who, in his revision of the Papuan species, remarked:—"Diese drei Arten (*Pratia papuana*, *P. nummularia*, und *P. angulata*) sowie die *P. wollastonii* von der Nassaukette, und mehrere andere bei *Pratia* diagnostisierte Spezies, sind übrigens so geringfügig, dass nach genauem Studium der Formenkreis, wahrscheinlich umfassender Arten angenommen werden müssen." (Bot. Jahrb. 55, 1917, 125; *ibid.* 62, 1929, 493).

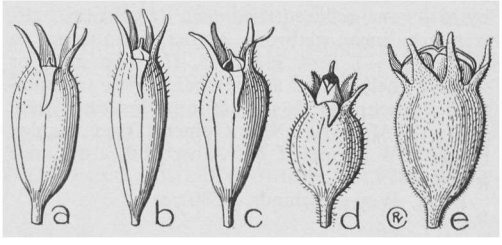


Fig. 20. Various fruits of *Lobelia angulata* FORST. *a–c.* Fleshy berry to capsule, from Celebes, *d–e.* capsular New Guinea specimens, all × 2½ (*a–c* EYMA 1161, *d* BRASS 10622, *e* NGF 4789).

Also WIMMER himself, in identifying a Philippine specimen which was astonishingly resembling *Pratia nummularia* but possessed fruits with valves on top, came obviously reluctantly to the conclusion that this character settled it as a *Lobelia*; he named it *L. paradoxa*!

BEUZENBERG & HAIR recently found the following chromosome numbers: for *L. linnaeoides* (HOOK. *f.*) PETRIE n = 7 and for *Pratia angulata* (FORST.) HOOK. *f.* n = 35 (N. Zeal. J. Sc. 2, 1959, 532, 537).

12. Lobelia conferta MERR. & PERRY, J. Arn. Arb. 59 (1949) 59.—*Pratia conferta* WIMMER, Pfl. R. Heft 107 (1953) 764.—**Fig. 21.**

Tiny, prostrate, fleshy, glabrous herb, with short stems. *Leaves* distichous, conferted, semi-amplexicaulous, sessile, oblong-lanceolate, entire, 4–5 mm by 1–2 mm, blunt to obtuse, smooth and shining. *Flowers* 5 mm long, in the upper leaf axils. Pedicels 2–5 mm, ebracteolate. *Calyx* lobes linear to lanceolate, 1½–2½ mm by 1 mm, entire, blunt to slightly acute. *Corolla* 4–4½ mm, glabrous, very light purple, inside with two gibbosities, dorsally split to the base; dorsal lobes

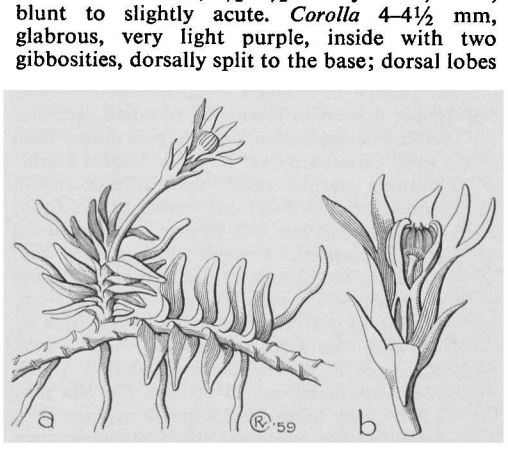


Fig. 21. *Lobelia conferta* MERR. & PERRY. *a.* Habit, × 2½, *b.* flower, × 5, anther tube opened in front (BRASS 4417).

connate with the lateral ones for 1½–2 mm; lateral lobes connate with the ventral one for 2–2½ mm; dorsal lobes lanceolate, ½–2½ mm, reflexed, sometimes of unequal length; lateral and ventral lobes equal, lanceolate to ovate, 1½–2½(–3) mm by ¾–1 mm, reflexed. *Filaments* 1½–3 mm, halfway free, linear, glabrous; anthers from dorsal to ventral 1½–1 mm, glabrous, the two anterior anthers finely haired at the apex. *Ovary* trumpet-shaped to cupular, ½–¾mm long. *Fruit* not seen.

Distr. *Malaysia*: New Guinea (Owen Stanley Range, SW. slope of Mt Albert Edward), once found.

Ecol. Wet grasslands, 3680 m.

KEY TO SOME CULTIVATED SPECIES

(in all *spp.* both anterior anthers with bearded tip)

1. Corolla tube less than 7 mm long. Pedicels glabrous. Leaves petiole-like decurrent.
2. Corolla tube 5–7 mm long. Flowers axillary. Pedicels 1½–5 cm. Calyx tube 2–4 mm, lobes 3½–11 mm. Corolla blue or violet, rarely white. Stem triangular. Leaves 1½–5 by 1/3–1 cm, oblong lanceolate, entire to serrate. Annual, native in S. Africa. **L. erinus** L.
2. Corolla tube 3–3½ mm, inside hairy. Pedicels less than 1½ cm. Calyx tube 2–3 by 2 mm, lobes 2–2½ by ½ mm, acute, entire. Corolla blue or blue-violet. Stem quadrangular, fistulose. Leaves broad-ovate, rather coarsely sinuate-dentate, 1½–3½ by 1–2 cm. Native of Central America, early introduced as an ornamental . . . . **L. cliffortiana** L.
1. Corolla tube longer than 10 mm. Pedicels hairy. Leaves sessile, the upper ones longer than 5 cm. Perennials.
3. Flowers all axillary. Pedicels 2½–8 cm, shorter than the sustaining leaf. Sepals erect, 2½–3½ mm. Corolla tube bright red, 18–21 mm; lobes yellow to orange, 12–14 mm, lower lip short-3-lobed, posterior lobes linear. Leaves ovate-lanceolate, very shallowly dentate, 6–12 by 1¾–3 cm. Erect shrub 1½–2½ m. Native in Mexico. **L. laxiflora** H.B.K.
3. Upper flowers in bracteate, terminal racemes. Pedicels shorter than 3 cm. Sepals longer than 5 mm. Lower lip over halfway 3-split. Herbs.
4. Flowers purple, rarely white. Pedicels 6–8 mm. Racemes 5–20 cm, lower bracts foliaceous. Sepals erect, 8–10 mm, with recurved ciliate margins. Corolla tube 12–15 mm, lower lip 10–12 mm, at the base with 2 white convexities. Leaves oblong, 6–15 by 2–5 cm. Native in N. America . **L. syphilitica** L.
4. Flowers dark-red. Pedicels 8–28 mm. Racemes 8–30 cm. Bracts narrow. Sepals recurved, glabrous, 10–15 mm. Corolla tube 15–20 mm, lobes 20–35 mm long, posterior ones much narrower than the anteriors. Leaves linear-lanceolate, glabrous, 8–20 by 1–2½ cm. Native in America, mostly cited as *L. fulgens* WILLD. **L. cordigera** CAV.

Excluded

Lobelia anceps THUNB. Prod. (1794) 40, *non* LINN. *f.* 1781; MIQ. Fl. Ind. Bat. 2 (1856) 578 = *Lobelia alata* LABILL. Nov. Holl. Pl. 1 (1804) 51, t. 72; WIMMER, Pfl. R. Heft 107 (1953) 469.

MIQUEL, *l.c.*, quoted this species as possibly occurring in the Sunda Islands. According to WIMMER it is an extra-Malaysian species with a distribution in S. Africa, Australia, and Chili.

Lobelia pumila BURM. *f.* Fl. Ind. (1768) 186, t. 60, f. 3 (type in G) = *Mazus pumilus* (BURM. *f.*) STEEN. Nova Guinea n.s. 9 (1958) 31 (*Scrophulariaceae*).

Lobelia tetragona BL. Bijdr. (1826) 729; HASSK. Cat. Hort. Bog. (1844) 105 = *Lobelia cliffortiana* LINNÉ, Sp. Pl. 2 (1753) 931; MIQ. Fl. Ind. Bat. 2 (1857) 577; WIMMER, Pfl. R. Heft 107 (1953) 526.

BLUME described this species as an endemic from Mt Gedeh, in West Java, but his specimens have doubtless been erroneously localized and were derived from specimens cultivated in the Botanic Gardens at Bogor or possibly naturalized in their vicinity. It is a native of Central America and has been introduced as an ornamental plant into several other countries at an early date and seems to have frequently naturalized.

Rapuntium longifolium PRESL, Prod. Mon. Lob. (1836) 26.—*L. longifolia* DC. Prod. 7 (1839) 382; MIQ. Fl. Ind. Bat. 2 (1856) 578; F.-VILL. Nov. App. 4 (1880) 121; MERR. En. Philip. 3 (1923) 588 = *Lobelia graminea* LAMK, Dict. Bot. 3 (1791) 583; WIMMER, Pfl. R. Heft 107 (1953) 413.

PRESL based this species on a specimen from the Malaspina Expedition collected by HAENKE. According to MERRILL it was erroneously localized in Luzon and came really from Central America. WIMMER has examined the type specimen (in Mus. Prague) and has referred it to *L. graminea* LAMK, which is a native of Panama and Mexico.

Rapuntium haenkeanum PRESL, Prod. Mon. Lob. (1836) 26.—*L. haenkeana* DC. Prod. 7 (1839) 382; MIQ. Fl. Ind. Bat. 2 (1856) 578; F.-VILL. Nov. App. 4 (1880) 121; MERR. En. Philip. 3 (1923) 588; WIMMER, Pfl. R. Heft 107 (1953) 685.—*Dortmannia haenkeana* O.K. Rev. Gen. Pl. 2 (1891) 972 = *Lobelia nelsonii* FERNALD, Proc. Am. Ac. Arts Sc. 36 (1901) 503 = *Lobelia laxiflora var. nelsonii* MCVAUGH, North Am. Fl. 32A (1943) 97.

According to PRESL this species was based upon a specimen from Luzon. MERRILL, *l.c.*, already suspected that this record was based on a Malaspina Expedition plant from tropical America erroneously localized as Philippine. WIMMER, *l.c.*, saw HAENKE's type specimen (Mus. Prague) and stated that it is conspecific with "*Lobelia laxiflora var. nelsonii* MCVAUGH" from Guatemala, corroborating MERRILL's statement about its native country.

7. PHYLLOCHARIS

DIELS, Bot. Jahrb. 55 (1917) 122; WIMMER, Pfl. R. Heft 107 (1953) 724.—**Fig. 22.**

Delicate, erect or ascending annual herbs; stems producing roots in the basal part. *Leaves* spirally arranged, petioled, often unequal at the base. *Flowers* solitary, inserted on the midrib of the leaves. *Calyx* obliquely cup-shaped, 5-lobed. *Corolla* 5-lobed, dorsally split to the base, bilabiate, the 2 posterior lobes much prolonged, narrow, almost free. Stamens 5, connate; anthers curved, unequal; filaments free at the base. *Ovary* inferior, 2-celled; style filiform; stigma 2-lobed. *Capsule* obliquely obovoid, opening with valves at the top, thin-walled with prominent nerves. *Seeds* ∾, ellipsoid, verruculose or smooth.

Distr. In *Malaysia*: 4 *spp.*, all endemic in New Guinea.

Ecol. Damp, shady, humous or rocky places in the undergrowth of rain-forests, 300–1650 m, apparently rare.

Notes. The genus is only distinct from *Lobelia* in the epiphyllous flowers, with 2 much prolonged upper lobes. A third differential character mentioned by DIELS, *viz* esetose anther tips, does not hold for *P. subcordata*. DIELS assumed that the fruit is finally also loculicidally dehiscent at the base, but I have seen no trace of such dehiscence.

I have seen only material of *P. subcordata* and *P. saxicola*. Of all species only one or very few numbers have been collected and though the differential characters appear satisfactory it remains to be seen whether they will prove to be constant.

Sincere thanks are due to Dr VAN ROYEN for putting his MS revision of the genus at my disposal, granting permission to publish the new species which he had fully described.

KEY TO THE SPECIES

1. Leaf-base cuneate.
2. Leaves oblong-elliptic, entire, with callose-fimbriate protruding veins. Flowers inserted at about the middle of the midrib. Calyx glabrous, warty. Posterior corolla lobes at least twice as long as the anterior ones. Seeds verruculose . . . . . **1. P. oblongifolia**
2. Leaves ovate to ovate-elliptic, dentate. Flowers inserted in the basal quarter of the midrib. Calyx hairy. Posterior corolla lobes less than twice the anterior ones. Seeds smooth . **2. P. schlechteri**
1. Leaf-base rounded, truncate or subcordate. Seeds verruculose.
3. Leaves narrow-ovate to ovate, almost entirely glabrous, the base tending to be cordate; margin crenate-serrate. Calyx glabrous . . . . . **3. P. subcordata**
3. Leaves ovate to elliptic, on both surfaces crispy-hairy, the base rounded to truncate; margin with very small protruding callose vein-tips, almost entire to faintly dentate or shallowly crenate. Calyx hairy . . . . . **4. P. saxicola**

1. **Phyllocharis oblongifolia** DIELS, Bot. Jahrb. 55 (1917) 124, fig. 1 L–N; WIMMER, Pfl. R. Heft 107 (1953) 724, fig. 108 c.—**Fig. 22g.**

Almost glabrous herb, stems 15–30 cm. *Leaves* 6–11 by 2¼–3 cm, oblong-elliptic, ± acuminate, base cuneate, entire but the veins protruding as small callose-fimbriate teeth; nerves *c.* 8 pairs, arching; petioles 1–3½ cm. *Flowers* inserted at about the middle of the midrib. Pedicels *c.* 5 mm. *Calyx* tube 1½–2 by 2 mm, lobes lanceolate, acute, 2–3 mm, both warty. *Corolla* tube ½–1 mm; posterior lobes 9 by ½ mm, at least twice as long as the anterior ones, narrow-spathulate, broadened at the base, acute; anterior lobes 3½–4 by 2–2½ mm, ovate, acute, connate up to the middle, at the inside near the posterior lobes somewhat pilose, further glabrous. Androecium 2½–3½ mm long; anthers 1–1½ mm, posterior ones dorsally ± hairy. *Seeds* verruculose.

Distr. *Malaysia*: NE. New Guinea (Udu: SCHLECHTER 17445).

Ecol. Rain-forest, 300 m. *Fl. fr.* March.

2. **Phyllocharis schlechteri** DIELS, Bot. Jahrb. 55 (1917) 124, fig. 1 A–K; WIMMER, Pfl. R. Heft 107 (1953) 725.—**Fig. 22h.**

Stems 10–20 cm, glabrous below, the upper part slightly puberulous. *Leaves* 2–5 by 1½–2½ cm, ovate to ovate-elliptic, acute, base cuneate, very sparsely hairy above, puberulous on the nerves beneath, margin dentate, ends of the veins callously protruding at the margin; nerves *c.* 6–7 pairs; petioles glabrous, ½–1½ cm. *Flowers* inserted in the basal quarter of the midrib. Pedicels 5–6 mm, glabrous. *Calyx* tube *c.* 1½ mm long, hairy, 10-ribbed; lobes 4 by ½ mm, linear, acute, with scattered hairs along the margin. *Corolla* tube 1 mm; posterior lobes 7–8 by ½ mm, ⅓ to ¼ longer than the anterior ones, linear, acute, glabrous; anterior lobes 5–6 by 1½–2½ mm, oblong-ovate, acute, connate for about ⅔ of their length, inside papillose. Androecium 3 mm long; anthers 1 mm, posterior ones dorsally hairy. *Capsule* 6–7 by 3 mm. Seeds smooth.

Distr. *Malaysia*: NE. New Guinea (Bismarck Mts: SCHLECHTER 18620).

Ecol. In humous rain-forest, 1200 m. *Fl. fr.* Nov.

Fig. 23. *Laurentia longiflora* (L.) PETERMANN. Java (ROEPKE).

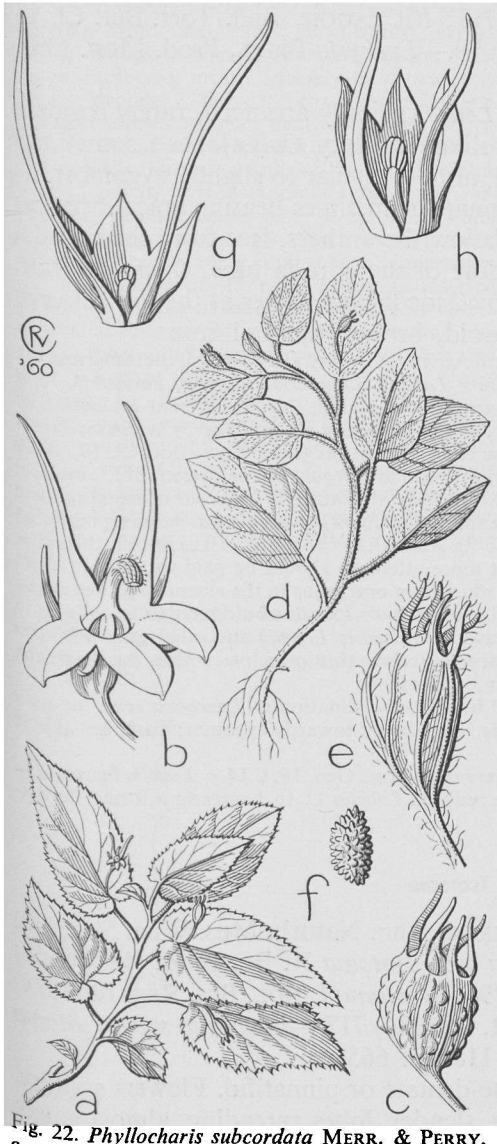


Fig. 22. *Phyllocharis subcordata* MERR. & PERRY. *a.* Habit, × ⅔, *b.* flower, × 4, *c.* fruit, × 4.—*Phyllocharis saxicola* VAN ROYEN. *d.* Habit, × ⅔, *e.* fruit, × 4, *f.* seed × 13.—*Phyllocharis oblongifolia* DIELS. *g.* Flower, × 4.—*Phyllocharis schlechteri* DIELS. *h.* Flower, × 4 (*a–c* CLEMENS 4404, *d–f* CARR 14083, *g–h* after DIELS).

3. Phyllocharis subcordata MERR. & PERRY, J. Arn. Arb. 22 (1941) 387; WIMMER, Pfl. R. Heft 107 (1953) 725, fig. 108b.—*P. lamiifolia* WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 372; Pfl. R. Heft 106 (1943) 11, fig. 8e.—**Fig. 22a-c.**

Plant almost glabrous, 5–20 cm. *Leaves* 1–3½ by 1–2 cm, ovate to ovate-oblong, acute, truncate to cordate at the base, glabrous or with some scattered hairs along the nerves beneath, margin dentate; nerves *c.* 4 pairs; petioles *c.* 1–1½ cm. *Flowers* inserted near the base of the midrib, yellow (*ex coll.*). Pedicels 4–6 mm, glabrous. *Calyx* tube 1–2 mm, glabrous, lobes 2–4 mm, linear, somewhat obtuse. *Corolla* tube 0.5–1 mm, posterior lobes 6–8 mm, linear, 1–1½ mm wide at the base, twice as long as the anterior ones, acute, glabrous, anterior lobes 3 by 1½ mm, ovate, acute, connate at least up to the middle, inside papillose. Androecium 2–3 mm; anthers 1–1½ mm, posterior ones dorsally pilose, anterior ones with a few setae on top. *Capsule* 4–4½ by 2–3 mm. Seeds about ½ mm, verruculose, showing on the surface of the ripe fruit.

Distr. *Malaysia*: NE. New Guinea (Morobe district: Yoangen: CLEMENS 3426, type; Mt Ako, Malolo Mission: CLEMENS 4404A).

Ecol. Along a wet stream bank in mountain forest, 750–1200 m. *Fl. fr.* June, Nov.–Dec.

4. Phyllocharis saxicola VAN ROYEN, *nov. sp.*—**Fig. 22d-f.**

Caules, folia et calyx pilis crispis albis pubescentes. Folia ovata ad elliptica, obtusiuscula, integra vel propter venulas ultra marginem in callositate breviter producta denticulata, basi rotundata ad truncata. Flores in costae parte quarta inferiore inserti. Semina verruculosa. Typus: CARR 14083, L.

Stems 5–12 cm, short crisped-hairy. *Leaves* sparsely hairy on both sides, 1–2½ by ½–2 cm, ovate to elliptic, rounded, truncate to subcordate at the base, margin subentire to very shallowly sinuate-dentate with ± remote vein-teeth; nerves 3–6 pairs; petioles $^1/_5$–1 cm, hairy. *Flowers* known to me in bud only, inserted near the base of the midrib. Pedicels 5–7 mm, whitish hairy. *Calyx* tube 1 mm long, whitish hairy, lobes 2–2½ mm, linear, ± acute, sparsely whitish hairy. Posterior *corolla* lobes green with a crimson median line, anterior lobes crimson, whitish pilose near the apex. Androecium *c.* 2 mm long; posterior anthers with a few white hairs. *Capsule* 4–6 by 2–3 mm, very obliquely oblong-obovoid, 10-nerved, pilose. Seeds verruculose, ½ mm.

Distr. *Malaysia*: Papua (Lala River).

Ecol. On rocks in forest, 1650 m. *Fl. fr.* Dec.

8. LAURENTIA

MICH. *ex* ADANS. Fam. 2 (1763) 134, 568; ENDL. Gen. Pl. 1 (1838) 511; DC. Prod. 7 (1839) 409; MCVAUGH, Bull. Torr. Bot. Cl. 67 (1940) 778; WIMMER, Pfl. R. Heft 107 (1953) 386.—*Isotoma* LINDL. Bot. Reg. 10 (1824) t. 964; PRESL, Prod. Mon. Lob. (1836) 42; DC. Prod. 7 (1839) 412; BENTH. Fl. Austr. 4 (1869) 134.—*Hip-*

pobroma G. DON, Gard. Dict. 3 (1834) 717; MCVAUGH, Bull. Torr. Bot. Cl. 67 (1940) 782; N. Amer. Fl. 32 A, pt 1 (1943) 99.—*Enchysia* PRESL, Prod. Mon. Lob. (1836) 40.—**Fig. 23.**

Annual or perennial, laticiferous herbs. *Leaves* spirally arranged, rarely rosulate and radical. *Flowers* in terminal racemes or solitary, axillary. *Calyx* lobes 5, sometimes unequal. *Corolla* tube entire, limb 5-parted, almost regular to slightly zygomorphic with unequal lobes. *Stamens* 5; anthers connate, sometimes bearing apical bristles; filaments free at the base, and sometimes below the anthers, free from the corolla, or 2 adnate, or all inserted above the middle of the corolla tube. *Ovary* inferior, 2-celled; stigma 2-lobed. *Capsule* opening by 2 loculicidal valves at the top between the persistent calyx lobes. *Seeds* ∞, ellipsoid, brown, up to 1 mm.

Distr. About 25 *spp.*, in the Mediterranean (3), South Africa (18), Australia (10), and the Americas (4).

Notes. It is not unexpected that also in the affinity *Lobelia*, *Laurentia*, *Isotoma*, *Palmerella*, and *Solenopsis* there is no unanimity of opinion about generic distinction, due to different evaluation of characters. *Lobelia* is properly only distinguished from the *Laurentia* assemblage by a distinctly zygomorphous corolla entirely or partially split on one side. MCVAUGH (Bull. Torr. Bot. Cl. 67, 1940, 780) even suggested that this would not hold on the argument that it would not be present in *L. sinaloae*; but this seems to be an error, *cf.* WIMMER, *l.c.* fig. 91 f. Whereas MCVAUGH is in favour of merging these genera into *Lobelia*, it is curious that he maintained the single American species of *Isotoma* as representing a monotypic genus, although it is manifestly allied to its Australian congeners. GLEASON on the other hand (Bull. Torr. Bot. Cl. 52, 1925, 93) believed that more attention should be paid to the characters of corolla and anther appendages; this would lead to more than one genus in the assemblage, but would also have the consequence that *Lobelia*, where a similar diversity is found, would have to be split up in smaller segregates. At the present these characters have been used in *Lobelia* and other genera for the distinction of infra-generic taxa. It seems satisfactory to follow this principle within the *Laurentia* complex, as has been done by ENDLICHER, WIMMER, and others.

It should be admitted that another solution could be the subordination of *Laurentia sens. lat.* as a subgenus under *Lobelia*, as there is, also in *Laurentia*, a tendency towards zygomorphism, but this is characteristic for the entire tribe *Lobeliae*.

ADANSON based his genus on the pre-Linnean *Laurentia* MICH. Gen. 18, t. 14 = *Lobelia laurentia* L. 1753 = *Laurentia gasparrinii* (TINEO) STROBL.. As he reduced *Lobelia* L. to *Laurentia* a formal conservation of *Laurentia* would seem necessary.

1. Section Isotoma

(R. BR.) ENDL. Gen. Pl. 1 (1838) 512; WIMMER, Ann. Naturh. Mus. Wien 56 (1948) 335; Pfl. R. Heft 107 (1953) 398.—*Lobelia sect. Isotoma* R. BR. Prod. (1810) 564; MCVAUGH, Bull. Torr. Bot. Cl. 67 (1940) 794.—*Isotoma* LINDL. Bot. Reg. 10 (1824) t. 964.—*Hippobroma* G. DON, Gard. Dict. 3 (1834) 717.—*Laurentia subg. Isotoma* PETERMANN, Pflanzenreich (1845) 444, t. 118 fig. 665.

Leaves spirally arranged, coarsely sinuate-dentate or pinnatifid. Flowers solitary, axillary, almost regular. Corolla tube long, slender, lobes spreading, almost equal. Stamens inserted on the corolla tube above the middle.

Distr. Ten *spp.* endemic in Australia, one native in the West Indies, widely spread by cultivation and naturalized in the tropics.

1. Laurentia longiflora (L.) PETERMANN, Pflanzenreich (1845) 444, t. 118 fig. 665; ed. 2 (1847) *id.*; WIMMER, in McBride Fl. Peru 6[2] (1937) 474; Ann. Naturh. Mus. Wien 56 (1948) 337, *cum var. runcinata* (HASSK.) WIMMER; Pfl. R. Heft 107 (1953) 405.—*Lobelia longiflora* LINNÉ, Sp. Pl. (1753) 930; LINDL. Bot. Reg. 14 (1828) t. 1200. —*Rapuntium longiflorum* MILL. Dict. ed. 8 (1768) n. 7.—*Hippobroma longiflora* G. DON, Gard. Dict. 3 (1834) 717; MCVAUGH, Bull. Torr. Bot. Cl. 67 (1940) 783; N. Am. Fl. 32A, pt 1 (1943) 99.—*Isotoma longiflora* PRESL, Prod. Mon. Lob. (1836) 42; DC. Prod. 7 (1839) 413; HEYNE, Nutt. Pl. (1927) 1428; BACK. Trop. Natuur 9 (1920) 129, fig. 1-3; FAWC. & RENDLE, Fl. Jam. 7[5] (1936) 138; BACK. Bekn. Fl. Java (em. ed.) 8 (1949) fam. 184, p. 5; STEEN. Fl. Sch. Indon. (1949) 376; QUIS. Med. Pl. Philip. (1951) 955.—*Isotoma runcinata* HASSK. Bonplandia 7 (1859) 189, *ex descr.*—**Fig. 23.**

Perennial (always?), erect or ascending, 10–30 cm; stems up to 5 mm diam., hairy to nearly

glabrous, woody at the base, with ribs or wings running from the leaves downwards. *Leaves* sessile, elongate-obovate, attenuated at the base, acute or obtuse, mostly sparsely hairy, coarsely sinuate-dentate, 3–16 by 1–3 cm. *Flowers* solitary, axillary, almost regular. Pedicels densely short-hirsute, 3–15 mm. Bracteoles 2, at the base of the pedicels, narrow, acute, up to 5 mm. *Calyx* lobes inequal, narrow-lanceolate or linear, irregularly dentate, acute, hairy, 8–20 mm. *Corolla* white, hairy, persistent, tube funnel-shaped, 5–9 cm, lobes spreading, almost equal, lanceolate, acute or obtuse, 10–25 mm. *Filaments* inserted above the middle of the corolla tube, more or less united, as long as or somewhat exceeding the corolla tube, anthers curved forward, with a bearded top, 4–6 mm, the 2 in front 2–3 mm. *Ovary* obconic to bell-shaped, (mostly 10-)ribbed, densely hairy, especially along the ribs, 3–7 mm; style equalling the anther tops or somewhat longer; stigma broad, flat, ± 2-lobed, bearing long slender hairs beneath. *Capsule* nodding, ellipsoid. Seeds ∞, ellipsoid, foveolate-reticulate.

Distr. Native in the West Indies (the type from Jamaica), in the lowlands from Florida and Sonora to Brazil and Peru; introduced into Pennsylvania (U.S.A.), Hawaii, the Marianas, and the Old World tropics, almost throughout *Malaysia*.

Ecol. In damp places, along ditches and streams, against walls, from sea-level up to 300 (–1200) m. *Fl.* Jan.-Dec.

This is the sole species which does not possess a trigger-hair on the two lower anthers, as described in *Isotoma* by HILDEBRAND (Bot. Zeit. 27, 1869, 476, f. 8–12) and MELVILLE (Kew Bull. 14, 1960, 277–279, f. 1). In several American *Laurentias* the two lower anthers have each 2 setae.

Vern. *Daun tolod*, S, *daun kĕndali*, J, *tambakis*, N. Born., Philip.: *estrélla*, Sp., Tag., *lagrimao de San Diego*, *revienta caballos*, Sp.

Note. The milky juice is said to be very poisonous, in particular for horses. According to BOORSMA (HEYNE, QUIS., *ll. cc.*) its alcaloids have a paralysing effect. The frequent occurrence along streams seems to point to seed dispersal by water; that against walls to seed dispersal by ants, but there is no elaiosome.

Cultivated species

Besides the already mentioned species of *Lobelia*, BACKER mentioned in his Flora of Java (em. ed.) 8 (1949) fam. 183 the following species to be cultivated in the mountains of Java: *Campanula medium* L., *C. rapunculoides* L., *Legousia speculum-veneris* (L.) FISCH., and *Platycodon grandiflorum* (JACQ.) DC.