



Revision of the Malesian species of *Lobelia* section *Rhynchopetalum* (Campanulaceae: Lobelioideae)

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Key words

Campanulaceae
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Lobelioideae
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Sumatera

Abstract Detailed morphological study of specimens of *Lobelia* sect. *Rhynchopetalum* from Malesia revealed that this material could be divided into five species, all endemic to the region: *L. philippinensis* (three subspecies) and *L. proctorii*, endemic to the Philippines; *L. sulawesensis*, sp. nov., endemic to Sulawesi; *L. sumatrana*, endemic to Sumatera; and *L. eryliae*, with one subspecies in the Philippines and the other in Sulawesi. A key is provided for distinguishing these taxa and each is described fully.

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INTRODUCTION

Lobelia L. sect. *Rhynchopetalum* (Fresen.) Benth. comprises over 60 species found from south-eastern Brazil across the Paleotropics to Malesia. These plants are robust tetraploids ($2n = 28$), often woody or pachycaul and up to 9 m tall, with sessile often apically rosulate leaves, terminal racemes or panicles of large unilabiate or sub-bilabiate flowers, and capsules producing numerous lenticular and commonly winged seeds with a striate-reticulate testa (Lammers 2011). Monophyly of the section is supported by several molecular phylogenies (Knox et al. 1993, 2006, Knox & Palmer 1998, Antonelli 2008). Although the African species have been the subject of numerous taxonomic studies (e.g., Bruce 1934, Hauman 1934, Hedberg 1957, Maberley 1974, 1975a, b, Knox 1993, Knox & Kowal 1993), those from the remainder of the range have been accorded far less attention. In particular, the identification of the plants in Malesia has varied dramatically among the few authors who have addressed the question.

When the first Malesian representatives of *L.* sect. *Rhynchopetalum* were discovered in the Philippines, they were identified (Merrill & Merritt 1910, Merrill 1923, Elmer 1934) as *L. nicotianifolia* Roth ex Schult., a species originally described from peninsular India. Skottsberg (1928), however, restricted that name to certain populations in India and Sri Lanka, and segregated the Philippine populations as *L. philippinensis*. This approach was accepted by Wimmer (1953, 1968), who recognized in Malesia five additional taxa referable to this section as currently circumscribed: *L. sumatrana* on Sumatera; *L. eryliae*, *L. epilobioides* var. *epilobioides*, and *L. epilobioides* var. *sarasinorum* on Sulawesi; and *L. epilobioides* var. *luzonica* in the Philippines.

All these names except *L. sumatrana*, as well as many others based on specimens from the Asian mainland (e.g., *L. colorata* Wall., *L. pyramidalis* Wall., *L. rosea* Wall.), were treated as synonyms of *L. nicotianifolia* in the influential Flora Malesiana. In that treatment, Moeliono (1960: 123–125) considered these synonyms to apply to “microspecies” and “local forms” of a

“widely distributed and very polymorphous species,” which did not merit formal recognition. Subsequent authors (e.g., Cramer 1983, Lian 1983, Haridasan & Mukherjee 1988, Hong & Zhang 1992, Lammers 1998, 2007a) have disagreed with Moeliono’s expansive circumscription of *L. nicotianifolia*, and most of the names based on mainland materials have been reinstated. However, the status of the Malesian plants has not been re-examined and their identity remains problematic, a fact highlighted by Argent et al. (2007) in their discussion of possible relatives of the recently discovered Philippine species, *L. proctorii*.

MATERIALS AND METHODS

The objective of the present study is to re-examine the Malesian material of *L.* sect. *Rhynchopetalum* and to determine its best classification. As in my previous studies of insular taxa (e.g., Lammers 1991, 2005, 2007b, 2009), I placed special emphasis on discerning geographically correlated patterns of morphological variation. Plants referable to *L.* sect. *Rhynchopetalum* have been collected on six islands in Malesia: Luzon, Negros, Biliran, and Sibuyan in the Philippines; and Sulawesi and Sumatera in Indonesia. The initial hypothesis was that each island would harbour a single morphologically defined taxon unique to it. If this hypothesis were correct, it would be possible to predict the provenance of a given specimen from its morphology, or its taxonomic identity from its provenance.

To test the hypothesis, I gathered morphological data from a representative sample of over 90 specimens drawn from nearly a dozen herbaria (see Acknowledgements). From these data, I then attempted to answer two questions. First, were all specimens from a given island relatively homogeneous, with most characters evincing a continuous pattern of variation? If so, the hypothesis would be supported; if instead, several characters consistently showed correlated gaps in their patterns of variation within an island, the hypothesis would be refuted. Second, were the plants with a given suite of morphological features restricted to a single island? If so, the hypothesis would be supported; if not, it would be refuted.

Once taxa were discerned in this fashion, they were compared to nomenclatural type specimens to determine the correct name

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of each. Decisions on rank for the taxa were made in light of the definitions of species and subspecies I have employed previously (Lammers 1991, 2005, 2007a, 2009).

RESULTS AND DISCUSSION

The material studied fell into eight taxa on the basis of comparative morphology. Negros, Biliran, Sibuyan, and Sumatera each have a unique taxon. Two taxa were discerned on Luzon, but they are allopatric, with one growing at elevations of 1600 m or less, while the other occurs only at 2100 m. Sulawesi likewise harbours two taxa. They are largely allopatric, with one restricted to South Sulawesi, and the other found primarily in Central Sulawesi; their sole area of apparent sympatry is the vicinity of Rantelemo in the Latimojong Mountains of South Sulawesi. These results support the hypothesis in large part, though not completely. The provenance of a given specimen can be predicted with confidence from its morphology, while the taxonomic identity of a specimen can be predicted from its provenance more often than not. None of the eight taxa matched material of *L. nicotianifolia* from India or Sri Lanka, nor did they match any other members of *L. sect. Rhynchoptelium* from the Asian mainland. Details of this broader comparative study will appear in a forthcoming monograph.

Two of the taxa are accorded specific rank on the basis of their highly distinctive habits. The Sumatera taxon, recognized universally as *L. sumatrana* (Wimmer 1953, Moeliono 1960, Lammers 2007a), is a rhizomatous slender-stemmed herb just 20–40 cm tall, with nearly all of the leaves confined to a basal rosette. The Sibuyan taxon (recently described as *L. proctorii*) is an apically rosulate treelet 40–60 cm tall.

The six remaining taxa all are robust suffruticose herbs or shrubs, 1.3–4 m tall, with thick unbranched erect stems that are leafy throughout; these were the plants called *L. nicotianifolia* in Flora Malesiana. The South Sulawesi and high-elevation Luzon taxa differ from the remaining four by their distinctly smaller flowers, with the corolla only 12–19 (vs 22–39) mm long, the filament tube 5.5–10 (vs 12–18) mm long, and the dorsal anthers 2.5–4.5 (vs 4–6) mm long. Moeliono (1960: 125) had in fact noted that the specimens of his *L. nicotianifolia* fell into two broad groups based on floral size, but did not ascribe any importance to this difference because the two “do not show a geographical replacement”. However, differences in size of corolla and staminal column typically are correlated with pollinator differences in the *Lobelioideae*, and thus may serve as a mechanism for reproductive isolation (Wood 1961, Young 1982, Lammers & Freeman 1986, Lammers 1991, 2000, 2009, Thompson & Lammers 1997). For this reason, the South Sulawesi and high-elevation Luzon taxa are judged to be specifically distinct from the remaining four.

The South Sulawesi and high-elevation Luzon taxa can be distinguished from each other on the basis of morphology, but these differences are less substantive, involving quantitative variation (often contiguous or partly overlapping) in features that are not likely to contribute to reproductive isolation. Hence, they are considered to constitute a pair of allopatric conspecific subspecies. The sole name referable to the Philippine subspecies is *L. epilobioides* var. *luzonica*, while *L. eryliae*, *L. epilobioides*, and *L. epilobioides* var. *sarasinorum* refer to the Indonesian subspecies. The small-flowered species thus becomes *L. eryliae*, as that name has priority; its Indonesian subspecies takes the autonym, while a new combination at subspecific rank is effected here for the Philippine subspecies.

Among the four larger-flowered taxa, there is some difference in floral size between the Central Sulawesi taxon and those in the Philippines: the corolla of the former is 22–25 (vs 26–39)

mm long and the filament tube 12–13 (vs 13–18) mm long. In addition, the calyx lobes of the former are 4–6 mm long, equaling to only half again as long as hypanthium, while those of the latter are 7–14 mm long and typically two to three times longer. Although the gap between the two sets of taxa is less pronounced than that separating them from *L. eryliae*, it is nonetheless considered commensurate with recognition at species rank. No name is available for the Central Sulawesi species, so it is described here as new. The only names referable to the Philippine species are *L. philippinensis* and *L. nicotianifolia* var. *mollis*, so it takes the former.

As was the case in *L. eryliae*, the taxa comprising *L. philippinensis* can be distinguished only by less substantive sorts of characters. Consequently, the islands of Luzon, Biliran, and Negros are each considered to harbour an endemic subspecies of *L. philippinensis*. The types of both *L. philippinensis* and *L. nicotianifolia* var. *mollis* represent the Luzon subspecies and so it takes the autonym. No names are available for the Biliran and Negros subspecies and they are described here as new.

TAXONOMIC TREATMENT

Lobelia sect. *Rhynchoptelium* (Fresen.) Benth.

Lobelia sect. *Rhynchoptelium* (Fresen.) Benth. in Bentham & Hooker (1876) 552. — *Rhynchoptelium* Fresen. (1838) 603. — *Tupa* sect. *Rhynchoptelium* (Fresen.) A.Rich. (1850) 9. — Type [sub Art. 37.3]: *Rhynchoptelium montanum* Fresen. [= *Lobelia rhynchoptelium* Hemsl.]. Complete heterotypic synonymy will be found in Lammers (2011).

Plants perennial or pliestesial, sometimes rhizomatous. *Stems* typically robust or even pachycaul, 0.2–9 m tall, herbaceous, suffruticose, or woody, simple or branched, prostrate, decumbent, ascending, or erect. *Leaves* sessile (rarely petiolate), cauline or rosulate. *Flowers* resupinate, epigynous, zygomorphic, pedicellate, in a terminal bracteate anauxotelic raceme or panicle; pedicels bibracteolate or ebracteolate. *Corolla* sympetalous, typically for half or more of its length, bilaterally symmetric, unilabiate with 5 ventral lobes or sub-bilabiate with 2 dorsal and 3 ventral lobes, various shades of blue, purple, red, yellow, green, or white, 12–50 mm long; tube curved or arcuate; lobes spreading or deflexed, as long as the tube or longer. *Stamens* connate distally, forming an exerted and dorsally deflected staminal column free from the corolla tube; anthers bearded with tufts of filiform hairs at apex of ventral pair or all anthers nude at apex. *Ovary* completely or partially inferior; placentae axile; ovules numerous. *Fruit* a capsule, loculicidally dehiscent by an apical pair of triangular valves. *Seeds* small, numerous, ovoid, lenticular, commonly winged; testa striate-reticulate. *Chromosome number* $2n = 28$ (Lammers 1993, Knox & Kowal 1993, Ruas et al. 2001).

Distribution — Twelve species in south-eastern Brazil (one extending into adjacent Argentina and Paraguay); 25 species in tropical Africa, from the Gulf of Guinea to Angola, Transvaal, and Ethiopia; and 25 species in southern and eastern Asia, from Sri Lanka and India to eastern China, the Bonin Islands, Taiwan, and Malesia (one extending north to eastern Siberia, the Russian Far East, the Kuriles, Korea, and Japan).

Key to the Malesian species

- Plants from thick horizontal rhizomes; stems 0.2–0.4 m tall, 1–2.5 mm diam, herbaceous, solid; leaves basally rosulate with only 4–8 cauline; inflorescence 4–10-flowered; pedicels bibracteolate toward the base; calyx lobes lanceolate or oblong. — Sumatera 5. *L. sumatrana*
- Plants lacking rhizomes; stems 0.4–4 m tall, 5–15 mm diam, suffruticose or woody, fistulose; leaves cauline or apically

- rosulate; inflorescence 20–100-flowered; pedicels bibracteolate at or above middle; calyx lobes linear, linear-triangular, or subulate. — Philippines, Sulawesi 2
2. Stems 0.4–0.6 m tall; leaves apically rosulate, linear, 3–6 mm wide; bracts 4.2–5.5 times longer than its pedicel; hypanthium, calyx lobes, and corolla scurfy-scaly; corolla subbilabiate, green suffused with dark purple, the ventral lobes distinct, 0.8–1 mm wide; filament tube c. 4 times longer than the dorsal anthers. — Sibuyan 4. *L. proctorii*
2. Stems 1.3–4 m tall; leaves cauline, lanceolate, oblanceolate, narrowly elliptic, or narrowly oblong, 5–48 mm wide; bracts equalling to 3 times longer than its pedicel; hypanthium, calyx lobes, and corolla glabrous or pubescent but not scurfy-scaly; corolla unilabiate, white or various pale shades of pink and violet, the ventral lobes connate for at least 1/4 their length, 1–3 mm wide; filament tube 1.5–3.3 times longer than the dorsal anthers 3
3. Corolla 12–19 mm long; filament tube 5.5–10 mm long; dorsal anthers 2.5–4.5 mm long 4
3. Corolla 22–39 mm long; filament tube 12–18 mm long; dorsal anthers 4–6 mm long 5
4. Bracteoles 1.5–3 mm long; calyx lobes 4–10 mm long; filament tube glabrous or pubescent toward base in lines; trichomes at apex of ventral anthers 1–2.2 mm long. — Sulawesi 3a. *L. eryliae* subsp. *eryliae*
4. Bracteoles 0.3–1.5 mm long; calyx lobes 8–13 mm long; filament tube pubescent toward apex; trichomes at apex of ventral anthers 0.6–1 mm long. — Luzon 3b. *L. eryliae* subsp. *luzonica*
5. Calyx lobes 4–6 mm long, equalling to half again as long as hypanthium; corolla 22–25 mm long, sub-bilabiate; filament tube 12–13 mm long. — Sulawesi 2. *L. sulawesiensis*
5. Calyx lobes 7–14 mm long, 1.5–3.2 times longer than hypanthium; corolla 26–39 mm long, unilabiate; filament tube 13–18 mm long. — Philippines 6
6. Bracts 0.5–0.8 cm wide; corolla tube straight; surface of anther tube pubescent; trichomes at apex of ventral anthers 2.5–4 mm long. — Luzon 1a. *L. philippinensis* subsp. *philippinensis*
6. Bracts 0.8–2 cm wide; corolla tube decurved; surface of anther tube glabrous; trichomes at apex of ventral anthers 1.5–2.5 mm long 7

7. Hypanthium 4–5 by 3.2–3.5 mm, glabrous; calyx lobes 7–9 mm long; corolla 28–32 mm long, 6–8 times longer than hypanthium, white or lavender, the tube 10–13 mm long, the dorsal lobes 18–22 mm long; dorsal anthers 4.7–5.5 mm long. — Negros 1b. *L. philippinensis* subsp. *negrosensis*
7. Hypanthium 6–7 by 4–4.5 mm, short-pubescent; calyx lobes 11–14 mm long; corolla 26–28 mm long, 4–5 times longer than hypanthium, pale pink, the tube 13–15 mm long, the dorsal lobes c. 13 mm long; dorsal anthers 4–4.3 mm long. — Biliran 1c. *L. philippinensis* subsp. *biliranensis*

1. *Lobelia philippinensis* Skottsbo. — Fig. 1

Plants lacking rhizomes. *Stems* woody or suffruticose, 1.5–4 m tall, 5–15 mm diam, simple, erect, fistulose, glabrous or short-pubescent. *Leaves* sessile, cauline; lamina oblanceolate, narrowly elliptic, or narrowly oblong, 6–35 by 1–4.8 cm, chartaceous, short-pubescent or glabrous; apex acuminate or sometimes acute; base attenuate; margin callose-serrulate or callose-denticulate. *Inflorescence* not clearly demarcated, 20–100-flowered, simple or usually branched toward base; rachis short-pubescent; bracts linear to narrowly elliptic, 9–26 by 0.5–2 cm, 1.2–3 times longer than their pedicels, glabrous or pubescent, acuminate at apex, the margin entire; pedicels spreading or ascending, 6–18 mm long, bibracteolate at or above middle, densely pubescent; bracteoles linear or subulate, 0.5–2 mm long. *Hypanthium* campanulate, oblong, ellipsoid, or broadly ellipsoid, 4–7 by 3–5 mm, glabrous or short-pubescent; base truncate, rounded, obtuse or sometimes acute. *Calyx lobes* linear, subulate, or linear-triangular, 7–14 by 0.7–1.7 mm, 1.5–3.2 times longer than hypanthium, erect or ascending, glabrous or very sparsely short-pubescent; apex acuminate; margin entire and often ciliate. *Corolla* lavender, pale pink, or white, unilabiate, 26–39 mm long, 4–8 times longer than hypanthium, glabrous or sparsely short-pubescent on tube externally; tube straight or decurved, 10–15 by 1.7–4 mm, 4–7.5 times longer than broad, tapering from base to mouth; dorsal lobes linear or linear-triangular, 10–25 by 0.5–1.5 mm; ventral lobes narrowly triangular, 8–20 by 1–3 mm, connate for half or more of their length, forming a lip 2.5–7.5 mm wide. *Staminal column* exerted, emerging from corolla via its dorsal slit; filament tube 13–18 mm, 2.5–3 times longer than the dorsal anthers, short-pubescent toward base or in lines; anther tube

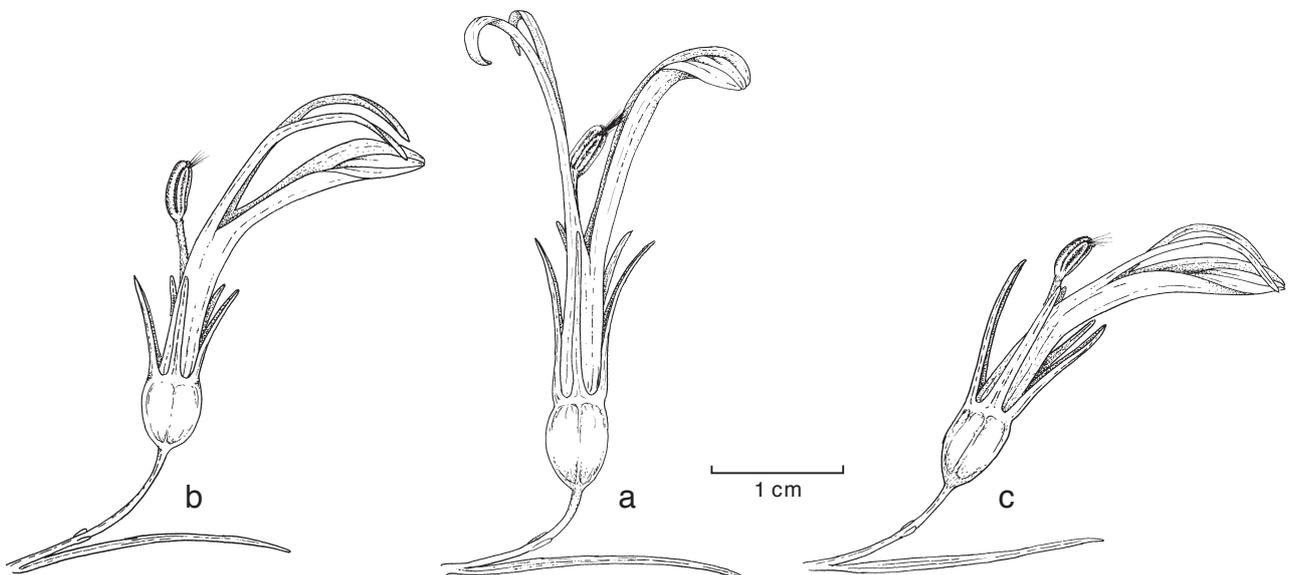


Fig. 1 Flowers of *Lobelia philippinensis* Skottsbo. a. subsp. *philippinensis*; b. subsp. *negrosensis* Lammers; c. subsp. *biliranensis* Lammers (a: Elmer 6066, NY; b: Philippine Plant Inventory 6380, BRIT; c: Sulit 5578, L).

grey, 1.4–2 mm diam, its surface glabrous or pubescent; dorsal anthers 4–6 mm long; ventral anthers 3–4 mm long, bearded at apex with white trichomes 1.5–2.5 mm long. *Capsule* broadly ellipsoid, ellipsoid, or oblong, 5–14 by 4–8 mm, the beak 2–4 mm; seeds amber-coloured, 0.4–0.6 by 0.3–0.4 mm, broadly ellipsoid, compressed, often with a single marginal rib, the testa finely striate.

Distribution — Endemic to the Philippines, with three allopatric subspecies endemic to Luzon, Negros, and Biliran.

a. subsp. *philippinensis* — Fig. 1a

Lobelia philippinensis Skotts. (1928) 13. — Type: *Vanoverbergh 38* (lecto S, here designated; isolecto B[2], FI, GB, L[2], MO), Philippines, Luzon, Bontoc Subprov., 14 Feb. 1914.

Lobelia nicotianifolia var. *mollis* Elmer (1934) 3180. — Type: *Elmer 22181* (holo PNH†; iso MO), Philippines, Luzon, Pampanga Prov., Camp Stotenburg, Mt Pinatubo, May 1927.

Stems sparsely to densely short-pubescent. *Leaves* sparsely to densely short-pubescent on both surfaces. *Bracts* linear, 9–24 by 0.5–0.8 mm; bracteoles 1–2 mm long. *Hypanthium* campanulate or broadly ellipsoid, 4–7 by 3–5 mm, sparsely short-pubescent. *Calyx lobes* 8–13 by 1–1.5 mm. *Corolla* lavender, 28–39 mm long, 4–8 times longer than hypanthium, sparsely short-pubescent; tube straight, 10–14 mm long; dorsal lobes 10–25 by 0.8–1.5 mm; ventral lobes, 8–20 by 1–3 mm, connate for 1/2 to 2/3 their length. *Filament tube* sparsely short-pubescent toward base; anther tube 1.7–2 mm diam, its surface sparsely to densely long-pubescent toward apex, sparsely short-pubescent toward base; dorsal anthers 4.8–6 mm long; ventral anthers 4–4.5 mm long, bearded at apex with white trichomes 2.5–4 mm long.

Distribution — Endemic to northern Luzon in the Philippines, from Ilocos Norte to Aurora and Zambales.

Habitat & Ecology — Forest openings, 500–1600 m. Flowering and fruiting: October through April.

Additional icones. Skottsberg (1928) f. 12c, 15–17, Murata (1995) f. 64–65 [seeds].

Notes — In the protologue, one dozen specimens representing nine gatherings were cited but none was called ‘type’. All were examined in this study. Two (*Clemens 9170*, B; *Bureau of Science 31657*, B) are *L. eryliae* subsp. *luzonica*. The one here selected as lectotype was the only sheet that Skottsberg had labelled as ‘Typus’ (cf. Rec. 9A.3).

The holotype of *L. nicotianifolia* var. *mollis* is presumed to have been lost when PNH was destroyed during World War II.

b. subsp. *negrosensis* Lammers, *subsp. nov.* — Fig. 1b

Plantae insulae Nigorum a plantis conspecificis in insula Luzonis bracteis latioribus 0.8–2 mm latis, calycis lobis angustioribus 0.7–0.9 mm latis, corollae tubo decurvato et lobis ventralibus connatis per 2/3 vel plurem longitudinis, superficie antherarum glabro, et barba antherarum ventralium brevioribus 1.5–2.5 mm longa distinguenda. — Holotypus: *Philippine Plant Inventory 6380* (BRIT), Philippines, Negros, Negros Occidental, Mt Dumalabdab, Talisay mun., 10°40'N, 123°16'E, hill forest, rocky clay, 1160 m, 25 Mar. 1992.

Stems glabrous. *Leaves* glabrous. *Bracts* 14–26 by 0.8–2 mm; bracteoles 0.5–0.8 mm long. *Hypanthium* campanulate or ellipsoid, 4–5 by 3.2–3.5 mm, glabrous. *Calyx lobes* 7–9 by 0.7–0.9 mm. *Corolla* white or lavender, 28–32 mm long, 6–8 times longer than hypanthium, glabrous; tube decurved, 10–13 mm long; dorsal lobes 18–22 by 0.8–1.2 mm; ventral lobes 16–17 by 1.8–2.2 mm, connate for 2/3 or more their length. *Filament tube* densely short-pubescent; anther tube 1.4–1.6 mm diam, glabrous; dorsal anthers 4.7–5.5 mm; ventral anthers 3.3–4 mm, bearded at apex with white trichomes 1.5–2.5 mm long.

Distribution — Endemic to Negros in the Philippines.

Habitat & Ecology — Evergreen rainforest and grassland, 1160–1200 m. Flowering and fruiting: March through June.

Additional specimens. PHILIPPINES, Negros, Negros Oriental, Sibulan, Kabalinan, L. Balinsasayao, *Philippine Plant Inventory 929* (BRIT); Negros Occidental, Murcia, Brgy. Sta., Sta. Cruz, Mt Sirab, So Managaksak, *Philippine Plant Inventory 14376* (BRIT).

c. subsp. *biliranensis* Lammers, *subsp. nov.* — Fig. 1c

Plantae insulae Biliranae a plantis conspecificis in insula Luzonis bracteis latioribus 1.8–2 mm latis, hypanthio oblongo vel elliptico longitudine 1/4–1/5 corollae, corolla pallente rosea brevioribus 26–28 mm longa cum tubo decurvato, corollae lobis ventralibus connatis per 2/3 vel plurem longitudinis, superficie antherarum glabro, antheris dorsalibus brevioribus 4–4.3 mm longis, et barba antherarum ventralium brevioribus c. 2 mm longa distinguenda. — Holotypus: *Sulit 5578* (L), Philippines, Biliran, Mt Suuro, northern slope, open ridge, 1230 m, 13 May 1954.

Stems glabrous or sparsely short-pubescent. *Leaves* glabrous adaxially, sparsely short-pubescent (primarily on midvein) abaxially. *Bracts* linear or narrowly elliptic, 21–24 by 1.8–2 mm; bracteoles 0.5–1 mm long. *Hypanthium* oblong or ellipsoid, 6–7 by 4–4.5 mm, moderately short-pubescent. *Calyx lobes* 11–14 by 1.2–1.7 mm. *Corolla* pale pink, 26–28 mm long, 4–5 times longer than hypanthium, sparsely short-pubescent; tube decurved, 13–15 mm long; dorsal lobes c. 13 by 0.5 mm; ventral lobes c. 13 by 1.5–1.8 mm, connate for almost their entire length. *Filament tube* sparsely short-pubescent in lines; anther tube c. 1.5 mm diam, its surface glabrous; dorsal anthers 4–4.3 mm long; ventral anthers c. 3 mm long, bearded at apex with white trichomes c. 2 mm long.

Distribution — Endemic to Biliran in the Philippines and known only from the type.

2. *Lobelia sulawesiensis* Lammers, *sp. nov.* — Fig. 2

Species celebensis affinis *Lobeliae philippinensi* sed ab hac specie calycis lobis brevioribus 4–6 mm longis hypanthium aequantibus vel sesquialongioribus, corolla subbilabiata brevioribus 22–25 mm longa, et filamentorum tubo brevioribus 13–18 mm longo distinguenda. — Holotypus: *Sands 590* (K), Indonesia, Sulawesi, Enrekang Distr., Latimojong Mts, on steep slope southeast of Rantelele in valley 3 km southwest of Bunte Tjejeng, 1620 m, below contour-culvert on south-facing slope, partial shade in litter over clay soil, very young secondary forest growth, 26 Nov. 1969.

Plants lacking rhizomes. *Stems* suffruticose, 3–4 m tall, 7–14 mm diam, simple or branched above, erect, fistulose, glabrous to hispid. *Leaves* sessile, cauline; lamina lanceolate or narrowly elliptic, 9.5–18 by 1.5–3 cm, subcoriaceous, adaxial surface glabrous or sparsely hispid along veins, abaxial surface sparsely to moderately hispid along veins; apex acuminate; base cuneate; margin callose-serrulate or callose-denticulate. *Inflorescence* well demarcated but sessile, 50–100-flowered, branched at base; rachis sparsely hispid; bracts linear, 10–12 by 0.9–1.2 mm, only slightly longer than their pedicels, hispid, acuminate at apex, the margin entire; pedicels spreading, 8–11 mm long, bibracteolate at middle, hispid; bracteoles linear, 1 mm long. *Hypanthium* campanulate or obconic, 4–4.5 by 2.5–3.5 mm, hispid; base acute. *Calyx lobes* linear-triangular, 4–6 by 0.8–1 mm, equalling to half again as long as hypanthium, erect, sparsely hispid; apex acuminate; margin entire. *Corolla* pale violet or mauve-pink, sub-bilabiate, 22–25 mm long, 6 times longer than hypanthium, externally glabrous or short-pubescent toward base, densely pubescent inside tube; tube straight, 7–11 by c. 2 mm, 2.8–5.5 times longer than broad, tapering slightly from base to mouth; dorsal lobes linear, 12–16 by 0.8 mm; ventral lobes elliptic, 12–16 by 2–3 mm, connate for half or a little more their length, forming a lip 2.5–6.5 mm wide. *Staminal column* exerted, emerging from corolla via its dorsal slit; filament tube 12–13 mm, 3–3.3 times longer than the dorsal anthers, sparsely short-pubescent in lines toward

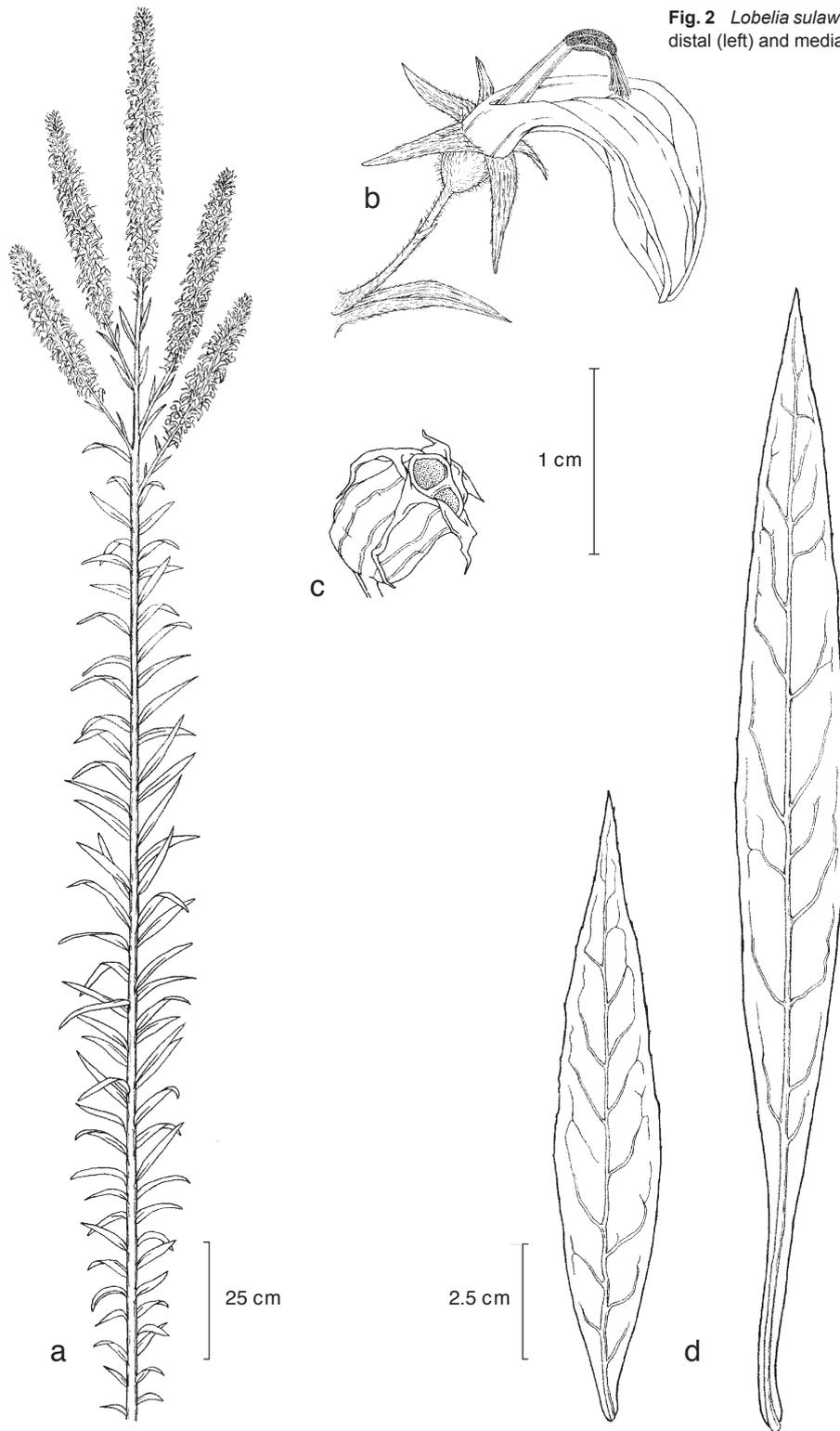


Fig. 2 *Lobelia sulawesiensis* Lammers. a. Habit; b. flower; c. fruit; d. leaves, distal (left) and medial (right) (all: Sands 590, K).

base; anther tube grey, c. 1.5 mm diam, its surface glabrous; dorsal anthers c. 4 mm long; ventral anthers 2.9–3 mm long, bearded at apex with white trichomes 2–2.5 mm long. *Capsule* oblong or ellipsoid, 9–10 by 5–6 mm, the beak c. 1 mm; seeds amber-coloured, c. 0.5 by 0.3–0.4 mm, broadly ellipsoid, compressed, the testa finely striate.

Distribution — Endemic to Central and South Sulawesi in Indonesia.

Habitat & Ecology — Evergreen forest and meadows at 800–1620 m. Flowering and fruiting: April through November.

Additional specimens. INDONESIA, Sulawesi, Central Sulawesi, Kantewoe Torr, *Kaudern 289* (S); Northern Peninsula, between Palu and Parigi, 35 km from Palu, 0°53'S, 120°E, *Meijer 9408* (L); South Sulawesi, Rante Lemo, *Kjellberg 1523* (S).

3. *Lobelia eryliae* C.E.C.Fisch.

Plants lacking rhizomes. *Stems* suffruticose, 1.3–2.5 m tall, 6–14 mm diam, simple or branched above, erect, fistulose, glabrous to densely hispid. *Leaves* sessile, cauline; lamina narrowly elliptic or narrowly oblong, 3.5–18 by 0.5–2.5 cm, chartaceous or subcoriaceous, glabrous or hispid along the midrib on the abaxial or both surfaces; apex acuminate; base cuneate or attenuate; margin callose-serrulate or callose-denticulate. *Inflorescence* not clearly demarcated, 20–85-flowered, sometimes branched at base; rachis sparsely hispid or scabrous; bracts linear or linear-elliptic, 10–30 by 0.5–2 mm, 1.2–2.5 times longer than their pedicel, glabrous or hispid along the midrib on the abaxial or both surfaces, acuminate at apex, the margin

entire (rarely very sparsely serrulate); pedicels spreading or ascending, 6–16 mm long, bibracteolate at or above middle, glabrous to densely hispid; bracteoles linear, 0.3–3 mm long. *Hypanthium* campanulate or obconic, 2.5–6 by 2–4.5 mm, glabrous or sparsely hispid toward base; base obtuse or acute. *Calyx lobes* subulate, linear, or linear-triangular, 5–13 by 0.5–1 mm, 1.2–4 times longer than hypanthium, erect or ascending, glabrous; apex acuminate; margin entire. *Corolla* violet, pale blue, mauve, or pink, rarely white, sub-bilabiate, 12–19 mm long, 3–6 times longer than hypanthium, externally glabrous or short-pubescent toward base, densely pubescent inside tube; tube straight, 4–7 by 1.5–3 mm, 1.5–3.5 times longer than broad, tapering slightly from base to mouth; dorsal lobes linear, 5–13 by 0.5–1.1 mm; ventral lobes linear-triangular, narrowly elliptic, or elliptic, 5–14 by 1–3 mm, connate for 1/4 to 1/2 or more their length, forming a lip 2.5–6.5 mm wide. *Staminal column* exerted, emerging from corolla via its dorsal slit; filament tube 5.5–10 mm, 1.5–3 times longer than the dorsal anthers, glabrous or sparsely short-pubescent toward apex; anther tube grey, 1.3–1.6 mm diam, glabrous or sparsely short-pubescent at base or dorsally toward apex; dorsal anthers 2.5–4.5 mm long; ventral anthers 2–3 mm long, bearded at apex with white trichomes 0.6–2.2 mm long. *Capsule* oblong, ellipsoid, broadly ellipsoid or ovate, 5–10 by 4–6 mm, the beak 1–2 mm; seeds amber-coloured, 0.4–0.7 by 0.2–0.5 mm, broadly ellipsoid, compressed, the testa finely striate.

Distribution — Two subspecies, one on Luzon in the Philippines, the other on Sulawesi in Indonesia.

a. subsp. *eryliae*

Lobelia eryliae C.E.C.Fisch. (1928) 141. — Type: *Smith 0012* (holo K), Indonesia, Sulawesi, peak of Bonteyne, evergreen jungle, 10 Feb. 1925.

Lobelia epilobioides E.Wimm. (1935) 79. — Type: *Rachmat 426* (holo L), Indonesia, Sulawesi, G. Batoe, Aug. 1913.

Lobelia epilobioides var. *sarasinorum* E.Wimm. (1948) 367. — Type: *Sarasin & Sarasin 1289* (lecto B, here designated), Sulawesi, Loka, 13 Oct. 1895.

Bracteoles 1.5–3 mm long. *Hypanthium* 3–6 by 2–4.5 mm. *Calyx lobes* linear-triangular, 4–10 mm long, 1.2–3.2 times longer than hypanthium. *Corolla* violet, mauve, pink, or white, 13–19 mm long; tube 2–3.5 times longer than broad; dorsal lobes 8–13 by 0.6–1.1 mm; ventral lobes elliptic or narrowly elliptic, 8–12 by 1.5–3 mm. *Filament tube* 6–10 mm, glabrous or short-pubescent toward base in lines; dorsal anthers 2.5–4.5 mm long; ventral anthers bearded at apex with white trichomes 1–2.2 mm long.

Distribution — Endemic to South Sulawesi in Indonesia.

Habitat & Ecology — Evergreen forest and meadows at 600–2300 m. Flowering: January through June; fruiting: April through October.

Icones. Wimmer (1953) f. 99c, Moeliono (1960) f. 9.

Note — Two specimens were cited in the protologue of *L. epilobioides* var. *sarasinorum*. The one designated here as lecto-type was annotated by Wimmer with this name and ‘sp. orig.’, and conforms to the protologue (cf. Rec. 9A.3). The other synonym (*Kaudern 289*, S) was annotated with a name that was never effectively published. It does not match the protologue due to its larger flowers and is assigned above to *L. sulawesensis*.

b. subsp. *luzonica* (E.Wimm.) Lammers, *comb. & stat. nov.*

Lobelia epilobioides var. *luzonica* E.Wimm., Pflanzenr. IV.276c (1968) 882. — Type: *Clemens 9170* (holo L; iso B), Philippines, Luzon, Benquet Subprov., ‘Pauay’ [Paoay], Jan. 1915.

Bracteoles 0.3–1.5 mm long. *Hypanthium* 2.5–4.5 by 2–3 mm. *Calyx lobes* linear or subulate, 8–13 mm long, 2.2–4

times longer than hypanthium. *Corolla* pale blue or pink, 12–18 mm long; tube 5–7 by 1.5–3 mm, 1.5–2.5 times longer than broad; dorsal lobes 5–11.5 by 0.5–0.8 mm; ventral lobes linear-triangular, 5–14 by 1–2 mm. *Filament tube* 5.5–7 mm, glabrous or sparsely short-pubescent toward apex; dorsal anthers 3–4 mm long; ventral anthers bearded at apex with white trichomes 0.6–1 mm long.

Distribution — Endemic to Mt Paoay and Mt Santo Tomas in Benguet Province on Luzon in the Philippines.

Habitat & Ecology — Mossy forest among shrubs at 2100 m. Flowering: January through July.

Note — Wimmer annotated *Bureau of Science 4327* (L) as “sp. orig. pro varietate!” and the sheet here recognized as the holotype as “sp. isotypicum!” However, it was the latter that he called “Typus” in the protologue (cf. Art. 9.1 Note 1).

4. *Lobelia proctorii* Argent & P.Wilkie

Lobelia proctorii Argent & P.Wilkie in Argent et al. (2007) 158. — Type: *Argent & Reynoso 8998* (holo PNH, not seen; iso E, K, L), Philippines, Sibuyan Island, Romblon Province, Mt Guiting Guiting, Camp 3 above Magdiwang village, on ridge leading to Mayos Peak, c. 1400 m, 24 Aug. 1989.

Plants lacking rhizomes. *Stems* woody, 0.4–0.6 m tall, 10–12 mm diam, simple, erect, glabrous. *Leaves* sessile, apically rosulate; lamina linear, 6–15 by 0.3–0.6 cm, chartaceous, glabrous; apex acuminate; base attenuate; margin callose-serrate, the teeth incurved. *Inflorescence* pedunculate, 35–50-flowered, simple; peduncle 11–12 cm long, moderately short-pubescent; bracts linear, 22–35 by 1.5–4 mm, 4.2–5.5 times longer than their pedicels, glabrous, acuminate at apex, the margin entire or sparsely denticulate; pedicels ascending to spreading, 4–8 mm long, bibracteolate at middle, densely short-pubescent; bracteoles linear, 2–2.5 mm long. *Hypanthium* campanulate, 4–4.5 by 4–4.5 mm, moderately short-pubescent and scurfy-scaly; base rounded. *Calyx lobes* linear-triangular or subulate, 5–7 by 1–1.8 mm, 1.2–1.5 times longer than hypanthium, erect, scurfy-scaly toward base; apex acute; margin entire or with 1 pair of low teeth. *Corolla* green suffused heavily with dark purple, sub-bilabiate, 22–23 mm long, 5–6 times longer than hypanthium, externally sparsely short-pubescent and scurfy-scaly; tube straight, 9–10 by 2–4 mm, 3.5–5 times longer than broad, tapering from base to mouth; dorsal lobes linear, 12–14 by 0.8–1 mm; ventral lobes linear, 11–12 by 0.8–1 mm, distinct. *Staminal column* exerted, emerging from corolla via its dorsal slit; filament tube 15–16 mm, c. 4 times longer than the dorsal anthers, sparsely short-pubescent in lines; anther tube grey, c. 2.5 mm diam, its surface glabrous; dorsal anthers c. 4 mm long; ventral anthers c. 3 mm long, bearded at apex with white trichomes 1–1.5 mm long. *Capsule* and *seeds* not seen.

Distribution — Endemic to Sibuyan Island in the Philippines.

Habitat & Ecology — Open grassland and elfin forest on ultramafic soils atop a ridge crest on Mt Guiting Guiting at c. 1400 m. Flowering: May through August.

Icon. Argent et al. (2007) f. 2.

5. *Lobelia sumatrana* Merr.

Lobelia sumatrana Merr. (1940) 9. — Type: *Ripley & Ulmer 62* (holo PH), Indonesia, Sumatera, [Aceh], Mt Löser, Bivouac 5, in open ‘blang’ (meadow), 7900 ft, 25 Apr. 1939.

Plants with thick horizontal rhizomes. *Stems* herbaceous, 0.2–0.4 m tall, 1–2.5 mm diam, simple, erect, glabrous or sparsely hispid. *Leaves* sessile, basally rosulate with only 4–8 cauline; lamina of basal leaves oblanceolate or spatulate, 1.8–5 by 0.5–1.4 cm, coriaceous, sparsely hispid on margin and often midvein, apex obtuse, base attenuate, margin callose-crenulate and revolute; lamina of cauline leaves oblanceolate basipetally,

becoming elliptic acropetally, 1.4–5 by 0.3–0.7 cm, otherwise similar to basal leaves. *Inflorescence* not clearly differentiated, 4–10-flowered, simple; bracts lanceolate or elliptic, 4–18 by 1.2–6.5 mm, twice as long as their pedicels basipetally, decreasing to only half as long acropetally, sparsely hispid on margin and often midvein, acute or acuminate at apex, the margin callose-crenulate; pedicels ascending, 6–8 mm, bibracteolate toward the base, hispid; bracteoles linear, 1.5–2.5 mm. *Hypanthium* campanulate or obconic, 3–4 by 2–3 mm, glabrous or hispid; base acute or obtuse. *Calyx lobes* lanceolate or oblong, 5–8 by 1.1–1.5 mm, 1.5–2.5 times longer than hypanthium, erect, hispid on margin and sometimes midrib; apex acuminate; margin entire, revolute. *Corolla* lilac-blue to pink and dark-veined, bilabiate, 16–21 mm, 4.5–7 times longer than hypanthium, glabrous or pubescent externally; tube straight but its axis depressed ventrally, 6–9 by 2–3.5 mm, 2.8–4 times longer than broad; dorsal lobes narrowly spatulate, 10–14 by 1–1.5 mm; ventral lobes oblong or elliptic, 10–15 by 2.5–4.5 mm, connate for about 1/4 their length. *Staminal column* exerted from corolla via its dorsal slit; filament tube 7–11 mm, 1.7–3 times longer than the dorsal anthers, glabrous or sparsely short pubescent; anther tube 1.5–1.6 mm diam, its surface sparsely to densely pubescent toward apex; dorsal anthers 3.5–4.5 mm long; ventral anthers 2.5–3 mm long, bearded at apex with white trichomes c. 1.5 mm long. *Capsule* ellipsoid, 7–8 by 3.5–4.5 mm, the beak 2.5–3 mm. *Seeds* not seen.

Distribution — Endemic to Aceh Province in northern Sumatra.

Habitat & Ecology — Meadows, heath, and bogs at 2400–3460 m. Flowering: February through August.

Icon. Moeliono (1960) f. 11.

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REFERENCES

- Antonelli A. 2008. Higher level phylogeny and evolutionary trends in Campanulaceae subfam. Lobelioideae: molecular signal overshadows morphology. *Molecular Phylogenetics and Evolution* 46: 1–18.
- Argent G, Wilkie P, Madulid D. 2007. *Lobelia proctorii* sp. nov. (Lobelioideae, Campanulaceae/Lobeliaceae) from the Philippines. *Plant Ecology* 192: 157–160.
- Bentham G, Hooker JD. 1876. *Genera plantarum*, vol. 2. Reeve, London.
- Bruce EA. 1934. The giant lobelias of East Africa. *Bulletin of Miscellaneous Information* 1934: 61–88, 274.
- Cramer LH. 1983. Campanulaceae, Lobeliaceae. In: *A revised handbook to the Flora of Ceylon* 4: 160–177. Amerind, New Delhi.
- Elmer ADE. 1934. New plants from Mount Pinatubo. *Leaflets of Philippine Botany* 9: 3179–3226.
- Fischer CEC. 1928. Plants new to Assam: XIII. *Bulletin of Miscellaneous Information* 1928: 297–300.
- Fresenius G. 1838. Diagnoses generum speciarumque novarum in Abyssinia a cl. Rueppell detectarum. *Flora* 21, 2: 601–616.
- Haridasan VK, Mukherjee PK. 1988. *Lobelia*. In: Hajra PK, Sanjappa M (eds), *Fascicles of Flora of India* 19: 41–59. Botanical Survey of India, Calcutta.
- Hauman L. 1934. Les *Lobelia* géants montagnes du Congo Belge. *Mémoires de l'Institut Royal Colonial Belge, Section des Sciences Naturelles et Médicales* (in octavo) 2: 1–52, pl. 1–7.
- Hedberg O. 1957. Afroalpine vascular plants, a taxonomic revision. *Symbolae Botanicae Upsalienses* 15: 1–411.
- Hong DY, Zhang TJ. 1992. A revision of *Lobelia* subgen. *Tupa* (Campanulaceae) in China. *Acta Phytotaxonomica Sinica* 30: 146–162.
- Knox EB. 1993. The species of giant *Senecio* (Compositae) and giant *Lobelia* (Lobeliaceae) in eastern Africa. *Contributions from the University of Michigan Herbarium* 19: 241–257.
- Knox EB, Downie SR, Palmer JD. 1993. Chloroplast genome rearrangements and the evolution of giant lobelias from herbaceous ancestors. *Molecular Biology and Evolution* 10: 414–430.
- Knox EB, Kowal RR. 1993. Chromosome numbers of the East African giant *Senecios* and giant lobelias and their evolutionary significance. *American Journal of Botany* 80: 847–853.
- Knox EB, Muasya AM, Phillipson PB. 2006. The Lobeliaceae originated in southern Africa. In: Ghazanfar SA, Beentje HJ (eds), *Taxonomy and ecology of African plants, their conservation and sustainable use*: 215–227. Royal Botanic Gardens, Kew.
- Knox EB, Palmer JD. 1998. Chloroplast DNA evidence on the origin and radiation of the giant lobelias in eastern Africa. *Systematic Botany* 23: 109–149.
- Lammers TG. 1991. Systematics of *Clermontia* (Campanulaceae: Lobelioideae). *Systematic Botany Monographs* 32: 1–97.
- Lammers TG. 1993. Chromosome numbers of Campanulaceae. III. Review and integration of data for subfamily Lobelioideae. *American Journal of Botany* 80: 660–675.
- Lammers TG. 1998. *Lobelia*. In: Huang TC (ed), *Flora of Taiwan* (ed. 2) 4: 787–796. Editorial Committee of the Flora of Taiwan, Taipei.
- Lammers TG. 2000. Revision of *Lobelia* sect. *Tupa* (Campanulaceae: Lobelioideae). *Sida* 19: 87–110.
- Lammers TG. 2005. Revision of *Delissea* (Campanulaceae: Lobelioideae). *Systematic Botany Monographs* 73: 1–75.
- Lammers TG. 2007a. World checklist and bibliography of Campanulaceae. Royal Botanic Gardens, Kew.
- Lammers TG. 2007b. Revision of *Lobelia* sect. *Galeatella* (Campanulaceae: Lobelioideae). *Journal of the Botanical Research Institute of Texas* 1: 789–810.
- Lammers TG. 2009. Revision of the endemic Hawaiian genus *Trematolobelia* (Campanulaceae: Lobelioideae). *Brittonia* 61: 126–143.
- Lammers TG. 2011. Revision of the infrageneric classification of *Lobelia* L. (Campanulaceae: Lobelioideae). *Annals of the Missouri Botanical Garden* 98: 37–62.
- Lammers TG, Freeman CE. 1986. Ornithophily among the Hawaiian Lobelioideae (Campanulaceae): evidence from floral nectar sugar compositions. *American Journal of Botany* 73: 1613–1619.
- Lian YS. 1983. Lobelioideae Schonland. In: *Flora Reipublicae Popularis Sinicae* 73, 2: 144–173. Science Press, Beijing.
- Mabberley DJ. 1974. The pachycaul lobelias of Africa and St. Helena. *Kew Bulletin* 29: 535–584.
- Mabberley DJ. 1975a. The giant lobelias: toxicity, inflorescence and tree-building in the Campanulaceae. *New Phytologist* 75: 289–295.
- Mabberley DJ. 1975b. The giant lobelias: pachycauly, biogeography, ornithophily and continental drift. *New Phytologist* 74: 365–374.
- Merrill ED. 1923. Campanulaceae. In: *An enumeration of Philippine flowering plants* 3: 586–589. Bureau of Science, Manila.
- Merrill ED. 1940. Botanical results of the George Vanderbilt Sumatran Expedition, 1939. *Plants from Mt Löser. Notulae Naturae* 47: 1–9.
- Merrill ED, Merritt ML. 1910. The Flora of Mt Pulog. *Philippine Journal of Science* 5 (Botany): 287–404.
- Moeliono B. 1960. *Lobelia*. *Flora Malesiana*, Ser. I, 6, 1: 121–136.
- Murata J. 1995. A revision of the infrageneric classification of *Lobelia* (Campanulaceae: Lobelioideae) with special reference to seed coat morphology. *Journal of the Faculty of Science, University of Tokyo, Section 3, Botany* 15: 349–371.
- Richard A. 1850. *Tentamen florum abyssinicae*, vol. 2. Bertrand, Paris.
- Ruas PM, Vanzela ALL, Vieira AO, Bernini C, Ruas CF. 2001. Karyotype studies in Brazilian species of *Lobelia* L., subgenus *Tupa* (Campanulaceae). *Revista Brasileira de Botânica* 24: 249–254.
- Skottsberg C. 1928. On some arborescent species of *Lobelia* from tropical Asia. *Acta Horti Gothoburgensis* 4: 1–26.
- Thompson SW, Lammers TG. 1997. Phenetic analysis of morphological variation in the *Lobelia cardinalis* complex (Campanulaceae: Lobelioideae). *Systematic Botany* 22: 315–331.
- Wimmer FE. 1935. Lobelioideae Novae. II. *Repertorium Specierum Novarum Regni Vegetabilis* 38: 75–87.
- Wimmer FE. 1948. *Vorarbeiten zur Monographie der Campanulaceae-Lobelioideae*. II. Trib. Lobelieae. *Annalen des Naturhistorischen Museums in Wien* 56: 317–374.
- Wimmer FE. 1953. Campanulaceae-Lobelioideae, II. Teil. In: Engler A, Diels L, *Das Pflanzenreich IV.276b: i–viii*, 261–813. Akademie-Verlag, Berlin.
- Wimmer FE. 1968. Campanulaceae-Lobelioideae supplementum et Campanulaceae-Cyphioideae. In: Engler A, Diels L, *Das Pflanzenreich IV.276c: i–x*, 815–1024. Akademie-Verlag, Berlin.
- Wood Jr CE. 1961. A study of hybridization in *Downingia* (Campanulaceae). *Journal of the Arnold Arboretum* 42: 219–262.
- Young TP. 1982. Bird visitation, seed set, and germination rates in two species of *Lobelia* on Mount Kenya. *Ecology* 63: 1983–1986.