

Taxonomy of *Begonia longifolia* Blume (Begoniaceae) and related species

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Tebbitt, M. (Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, NY 11225-1099; email: markttebbitt@bbg.org). Taxonomy of *Begonia longifolia* Blume (Begoniaceae) and related species. *Brittonia* 55: 19–29. 2003.—The *Begonia longifolia* Blume complex is revised and seven species are recognized. *Begonia crassirostris* Irmsch., *B. inflata* C. B. Clarke, *B. tricornis* Ridl., and *B. trisulcata* (A. DC.) Warb. are synonymized with *Begonia longifolia* Blume, making this the most widely distributed *Begonia* species within Asia. *Begonia tetragona* Irmsch. is synonymized with *B. acetosella* Craib. Descriptions are provided for *Begonia longifolia*, *B. acetosella*, and four closely related and also poorly known species with baccate fruit: *B. cristata* Warb. ex L. B. Sm. & Wassh., *B. renifolia* Irmsch., *B. sarcocarpa* Ridl., and *B. turbinata* Ridl. *Begonia hayatae* Gagnep. is also recognized as a member of this complex but is not described here. Evidence for a speciation mechanism within this group is discussed. *Begonia acetosella* and *B. sarcocarpa* are lectotypified.

Key words: Asia, *Begonia*, Begoniaceae, *Sphenanthera*.

Begonia L. is a pantropical, herbaceous genus comprised of roughly 1400 species divided among 63 sections (Doorenbos et al., 1998). The current study examines the taxonomy of a group of closely related species in sect. *Sphenanthera* (Hassk.) Warb., an exclusively Asian section which has traditionally been recognized on the basis of its members having baccate fruit (Warburg, 1894; Irmscher, 1925; Doorenbos et al., 1998). The species of the *Begonia longifolia* Blume complex, on which this study focuses, are unique within the sect. *Sphenanthera* in having a combination of erect habit, deciduous stipules, leaves that are usually at least twice as long as wide, and, possibly, by lacking rhizomes. During the course of a taxonomic revision of the sect. *Sphenanthera* no morphological discontinuities could be detected in herbarium or living material of the following taxa within this complex: *Begonia crassirostris* Irmsch. (described from China), *B. inflata* C. B. Clarke (described from India and questionably from Bhutan), *B. tricornis* Ridl. (described from the Malay Peninsula), *B. trisulcata* (A. DC.)

Warb. (described from Java), and *B. longifolia* Blume (described from Java). Furthermore, examination of published descriptions (Miquel, 1856; Candolle, 1859; Clarke, 1879; Koorders, 1912; Ridley, 1917a, 1922; Irmscher, 1939) of these five taxa also failed to provide characters that distinguish them. Accordingly, they are treated here as a single, morphologically variable, and widely distributed species, which is given the earliest name *B. longifolia* Blume.

Morphological comparisons of all of the Asian *Begonia* with baccate fruit suggest that seven species, *B. acetosella* Craib, *B. cristata* Warb. ex L. B. Sm. & Wassh., *B. hayatae* Gagnep., *B. renifolia* Irmsch., *B. sarcocarpa* Ridl., *B. tetragona* Irmsch., and *B. turbinata* Ridl., are very closely related to *B. longifolia*, differing most noticeably from this species in the shapes and sizes of their leaves and fruit (Fig. 1), or in the number of perianth segments in their female flowers, or in the number of ovary locules. Three of these species, *B. sarcocarpa*, *B. renifolia*, and *B. tetragona*, are each known only from their type specimens and might

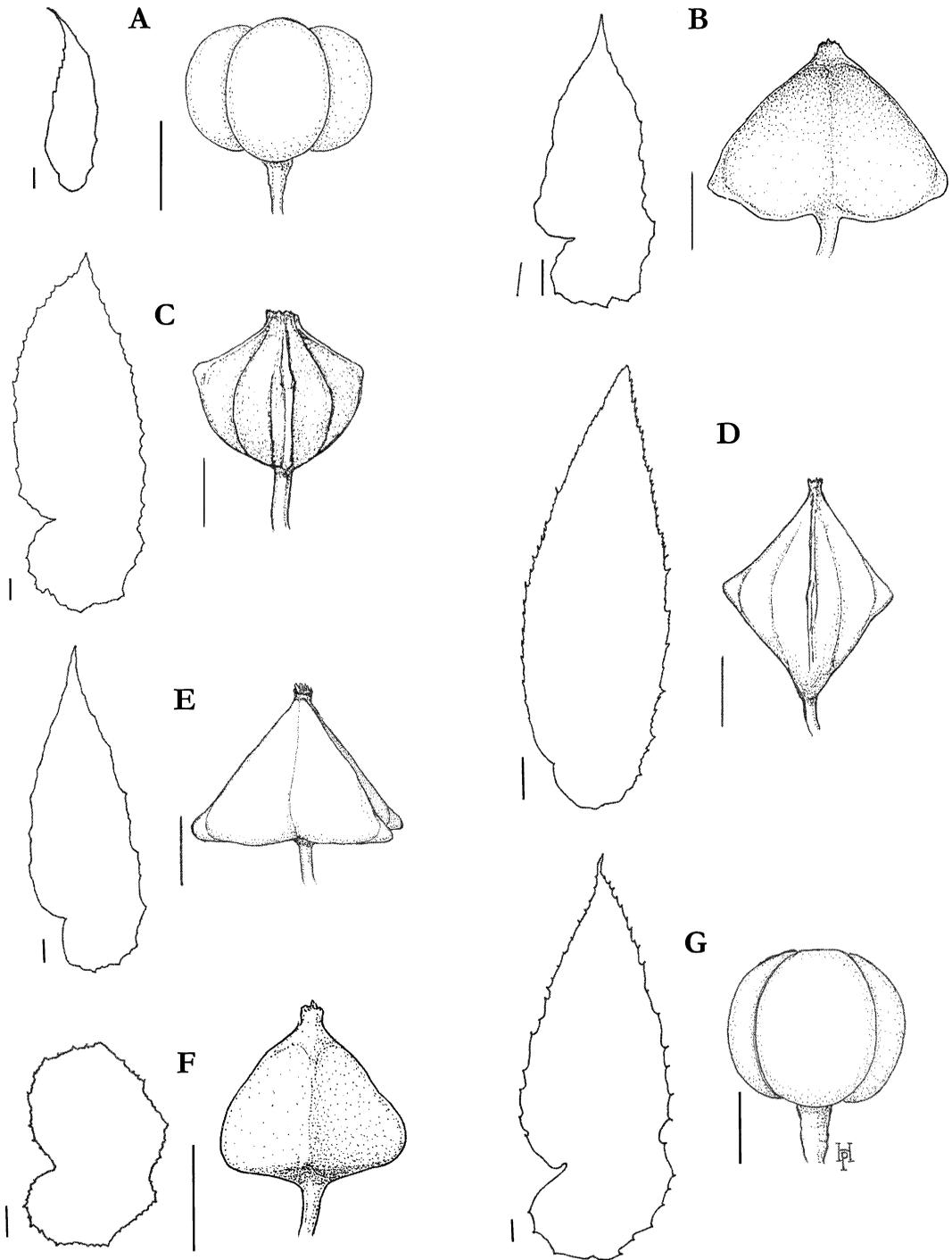


FIG. 1. Leaves and fruit of species in the *Begonia longifolia* complex. **A.** *B. sarcocarpa*. (From Robinson & Kloss s.n., BM.) **B.** *B. hayatae*. (Modified from Liu & Lai, 1977.) **C.** *B. cristata*. (From Sarason 288, K.) **D.** *B. acetosella*. (From Henry 12251A, K.) **E.** *B. turbinata*. (From Robinson & Kloss s.n., BM.) **F.** *B. renifolia*. (From Warburg 15188, B.) **G.** *B. longifolia*. (From Blume 740, B.) Scale bar: Leaves = 1 cm; fruit = 0.5 cm.

represent aberrant individuals of the sympatric species, *B. turbinata*, *B. cristata*, and *B. acetosella*, respectively. The first two species are recognized here, whereas *B. tetragona* is synonymized with *B. acetosella*. *Begonia sarcocarpa* differs from *B. turbinata* in terms of several clearly defined characters: leaf size, leaf venation pattern, fruit shape, and number of female perianth segments. This suggests that *B. sarcocarpa* represents a distinct species with a very limited distribution. *Begonia renifolia*, which differs from *B. cristata* in leaf shape and degree of pubescence, is also recognized here, in this case, because the type specimen lacks flowers and cannot be compared adequately with *B. cristata*. Additional *Begonia* collections from northern Sulawesi are needed to address this problem. *Begonia tetragona* is synonymized with *B. acetosella* because the characters which Irmscher (1939) used to separate *B. tetragona* from *B. acetosella*—deep, double toothed leaf margins and twice-branched placenta—occur individually in some specimens of *B. acetosella*. Furthermore, individual plants of *B. acetosella* might have leaf margins ranging from the kind found in the type of *B. acetosella* to the kind found in the type of *B. tetragona*. Because the previous descriptions of *B. acetosella*, *B. cristata*, *B. longifolia*, *B. renifolia*, *B. sarcocarpa*, and *B. turbinata* are incomplete, amended descriptions of these species are provided. *Begonia hayatae* is described in detail by Liu and Lai (1977) and is, therefore, not described here.

Begonia longifolia, as recognized here, has an unusually broad distribution for the genus, which includes many species with narrow endemic distributions. Like many of the other widely distributed species in this genus, *B. longifolia* probably owes its large distribution both to its wide ecological tolerance and to the greater chances of long distance dispersal afforded by its baccate, and therefore presumably animal-dispersed, fruits. Baccate fruits are atypical within this mostly wind-dispersed genus but are also found in some of the other widely distributed Asian *Begonia* species (e.g., *B. acetosella* and *B. leprosa* Hance), as well as in the African *B. oxyloba* Welw. ex Hook. f.,

which has one of the broadest natural distributions found in the genus.

Based on morphological similarity and distribution patterns, *Begonia longifolia* appears to have originated in the mountainous region between northeastern India and northern Vietnam, migrating from there along mountain corridors to Taiwan and Malesia, and giving rise to the other members of the complex when some of its dispersing populations became geographically isolated. Evidence for this hypothesis is based on the fact that the closest relatives of the *B. longifolia* complex occur in the mountains between northeastern India and northern Vietnam (Tebbutt, unpubl. data) and also that the distribution of *B. longifolia* matches a recognized montane plant migration route from China into Malesia (van Steenis, 1965). Furthermore, *B. acetosella* and *B. hayatae* and the two closely related sympatric species pairs, *B. cristata/B. renifolia* and *B. turbinata/B. sarcocarpa*, each occur in areas adjacent to the main range of *B. longifolia* (Fig. 2) and share greater morphological similarity to *B. longifolia* than they do to each other. Preliminary analyses of ITS sequence data from multiple accessions of *B. longifolia*, *B. acetosella*, *B. hayatae*, and *B. cristata* support this hypothesis (Tebbutt, unpubl.). A similar process of population isolation and speciation might presently be occurring in *B. longifolia*'s southeastern range. Some specimens of *B. longifolia* from eastern Java and Bali have shortly winged fruit and more widely branched inflorescences than typically found elsewhere in the species' range, suggesting that these peripheral populations are somewhat genetically isolated. These morphological characteristics are not consistent enough, however, to warrant the designation of separate specific or infraspecific taxa.

Key to taxa in the *Begonia longifolia* species complex

1. Ovary 4-locular *B. acetosella*
1. Ovary 3-locular.
 2. Lamina of leaves reniform *B. renifolia*
 2. Lamina of leaves lanceolate to broadly elliptic.

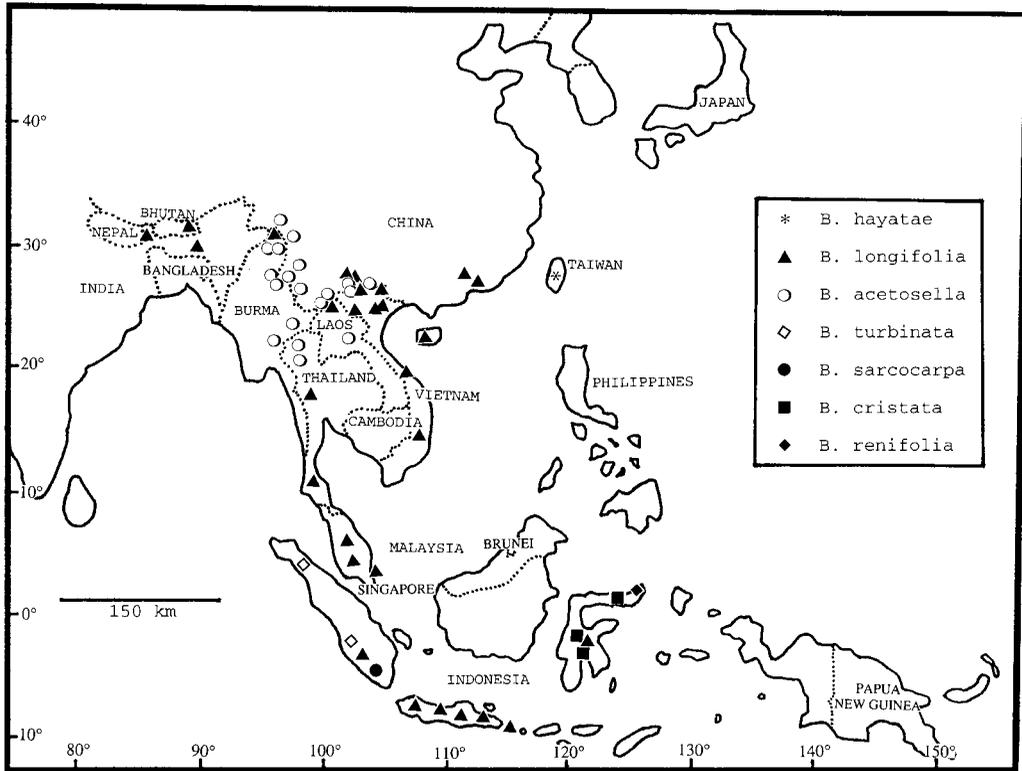


FIG. 2. Distribution of species in the *Begonia longifolia* complex. Symbols may represent more than one collection.

- 3. Female tepals 5; leaves 5–6.5 × 1.2–1.8 cm *B. sarcocarpa*
- 3. Female tepals 6; leaves 8–22 × 1.8–14 cm.
- 4. Stems slender, often tinged red; fruit turbinate *B. turbinata*
- 4. Stems robust, not usually tinged red; fruit more or less globose.
- 5. Leaves broadly elliptic, margin remotely, short and somewhat irregularly bidentate, smaller teeth serrate *B. cristata*
- 5. Leaves usually lanceolate, larger leaves occasionally broadly elliptic, margin shallowly single toothed to almost entire.
- 6. Fruit apex indented ..
..... *B. hayatae*
- 6. Fruit apex beaked
..... *B. longifolia*

Descriptions

BEGONIA ACETOSELLA Craib

Begonia acetosella Craib, Bull. Misc. Inform. 153.

1912. TYPE: THAILAND. Chiangmai, Doi Sotep, 660–900 m, *Kerr 557* (LECTOTYPE, here designated: K; ISOLECTOTYPES: K, B).

Begonia tetragona Irmsch., Mitt. Inst. Allg. Bot. Hamburg 10: 515–516. 1939. TYPE: CHINA. Yunnan Province, Mengtze, SW mts., forests, 4000 ft, *Henry 10737A* (HOLOTYPE: B; ISOTYPE: E).

Dioecious? erect branched *herb*, to 2 m tall, lacking rhizomes. *Stems* fleshy, green or reddish, swollen at base and nodes, branched, internodes to 20 cm long; branches green or often tinged red particularly at base and on nodes or occasionally red throughout, glabrous or with microscopic hairs, 4–10 mm diam., branches usually flexuous towards their apices. *Stipules* deciduous, opaque green, ovate-lanceolate to lanceolate, 8.5–29 × 1.5–8.5 mm, apex acuminate, glabrous or with sparse microscopic hairs. *Leaves*: *petioles* 1–7(–17) cm long, joining lamina at a transverse angle, glabrous or with sparse short-glandular hairs; *lamina* green above, paler green beneath with veins sometimes tinged pink, both sur-

faces glabrous to sparsely hairy, especially on veins beneath, asymmetric, usually ovate to ovate-lanceolate, larger leaves elliptic-acuminate, 10–27 × 2.5–12 cm, apex acuminate to long acuminate, basal sinus truncate to 12 mm deep, basal lobes unequal, not overlapping, inner lobe 1.7–7.3 cm long, margin shortly toothed and ciliate or occasionally bidentate, larger teeth to 1 cm deep, veins 5–7, palmate. *Inflorescences* axillary, 1–5-flowered, a once branched dichasium in which the primary peduncle branches vary from 1–3(–50) mm long so that the inflorescence appears to be either umbellate or cymose, flowers fragrant; *bracts* deciduous, ovate, 4–10 × 1–3.5 mm, apex acute to glandular setose; *bracteoles* absent. *Pedicels* glabrous or with sparse microscopic glandular hairs, those of male flowers to 1.4 cm long, those of female flowers 4–10 mm long. *Male flowers*: *perianth segments* white, sometimes flushed pink near base of inner surface, 4, outer pair usually obovate-elliptic, 10–18 × 6–15 mm, outer surface with microscopic glandular hairs, apex rounded, inner pair ovate to elliptic-obovate, 5.5–16 × 3–8.5 mm, glabrous, apex rounded; *stamens* yellow, 60–100, *filaments* free, attached to a raised receptacle, receptacle to 1.5 mm tall, filaments equal in length, 2–2.6 mm long, *anthers* rectangular to obovate, 1.5–3 mm long, dehiscing via vertical slits along sides of anther, connective projecting 0.3–1 mm, apex rounded, often wider than locules. *Female flowers*: *perianth segments* white to pale pink, 4, usually broadly elliptic, sometimes broadly ovate or almost orbicular, outer pair 6–9.5 × 6–12 mm, outer surface with minute glandular hairs, inner pair 6–7 × 3.5–6 mm, glabrous, apex usually rounded; *ovary* green, 4-angled or very rarely 3-angled on same plant, 3–15 × 4–11 mm, wings present on central part of each locule, triangular, often narrowly so, with microscopic glandular hairs, (3–)4-locular on same plant, *placentation* axile, *placentae* bifid, bearing ovules on both surfaces of placental branches; *styles* 4, caducous to eventually deciduous, slender, ca. 5 mm long, base fused for 0.5–1 mm, bifid from about halfway, branches erect, stigmatic papillae twice spirally twisted. *Infructescence* usually single fruited, but sometimes bearing up to

3 fruits; *fruiting pedicels* 10–12.5 mm long; *fruit* fleshy, glossy light green, pendulous, rhomboidal to spherical, 12–15 × ca. 17 mm, wings triangular to 5.5 mm tall, base ca. 4 mm wide, apex acute, glabrous.

Key to the varieties of *Begonia acetosella*

1. Leaves and petioles hairless or almost so *var. acetosella*
1. Leaves and petioles hairy *var. hirtifolia*

BEGONIA ACETOSELLA var. ACETOSELLA

Distribution and ecology.—Flowering January to August. Northern Thailand, northern Laos, northern Vietnam, southeastern Tibet, southwestern China (Yunnan) and northeastern Burma. Shady moist sites by streams among tall vegetation, or in mixed or evergreen, primary to degraded forest, or occasionally in bamboo forest. Mostly on mountains, 800–2750 m, but frequently down to ca. 400 m. Occasionally on limestone. A common, frequently collected species.

Non-fruiting material is easily confused with *B. longifolia* Blume, but can be separated on the basis that *B. acetosella* has a considerably shallower leaf sinus than *B. longifolia* and has a tendency to possess flexuous, rather than straight upper stems.

Several indigenous peoples of northern Vietnam use the stems to treat a variety of ailments including fevers, coughs, and stomach complaints. The Black Hmong people of Vietnam occasionally eat the leaves and stems as a vegetable. Black Hmong children eat the stem for its invigorating and thirst quenching properties. The stems and leaves have a bitter, acidic taste.

Selected specimens examined: TIBET. Medoc, Hami, 800–1000 m, 6 Aug 1974, *Qinghai-Tibet team 74-4114* (KUN).

CHINA. Yunnan: Gongshan County, Duoogjiang, 1350 m, 11 Nov 1954, *Feng Kuomei 24182* (KUN); Luchung County, Fengshuilong, 13 May 1974, *Luchun team 753* (KUN[2]); Salwin Valley, 25°10'N, 98°50'E, 1830 m, *Forrest 19373* (B, E, K, P, US); nr. Schuidien between Môngdse and Manho, 1300 m, *Handel-Mazzetti 6039* (WU); Mengze SE Mts., 1525 m, *Henry 10737* (K, NY); Yingdong County, Li Yue he, 1620 m, 19 May 1963, *Wquanan 9257* (KUN[2]); Changyuan County, Long tou shan, 800–850 m, 13 Jun 1974, *Li Yuanhui 011930* (KUN); Guizhou Xingren,

28 Aug 1960, *Chang Zhisong* 8823 (KUN); Pingbian xinli xiang, 1200 m, 18 Jul 1953, *Institute of Botany Kunming Working Station 02602* (KUN[2]); Menglian County, N of town, 18 Aug 1973, *Menglian expedition group 010237* (KUN); Xishuangbanna, Yuleshan, 21 Mar 1975, *Tao Guado 013643* (KUN); Mar-li-po, Sze-tai-po, Loa-chun-shan, 1300–1500 m, 20 Dec 1947, *Feng 13953* (KUN[2], E).

BURMA. Valley of the Taping, Lat. 24°30'N, *Forest 12155* (E); Putao Distr., 150–1830 m, general in subtropical jungle but ascends behind Konglu to 1980 m, 12 Sep 1920, *Farrer 1503* (E); Bhamo, 7 Apr 1912, *Lace 5759* (K[2], E); Mong hau, trans Salween, 640 m, 17 Mar 1911, *Robertson 273* (K[2]); Southeastern Shan States, Keng Tung territory, valley of the Meh Len, between Muang Hpyak and Pang Sop Lao, 525–690 m, 27–28 Jan 1922, *Rock 2124* (B, NY, US).

THAILAND. Doi Pu Ka, 1500–1600 m, *Kerr 4940* (BM, K); Doi Chiengdao, Me Na Lao drainage, ca. 550 m, 20 Mar 1950, *Garrett 1288* (K[2], L[3]); Chiengmai, A. F. G. *Kerr 1744* (B, E[3], K[2], L); Muang district, Chiang Mai Prov., Doi Sutep-Pui National Park, Shristian Hill, S of Doi Sutep temple, *Maxwell 90-290* (E, L, topotype); Kao Paga Paw, Chaing apum, ca. 400 m, 4 Mar 1931, *Kerr 20325* (BM); Northern Teen Tok 10 km N. of Doi Chieng Dao, 600 m, 3 Aug, *Larson et al. 3098* (E); Siam, Doi Wao, 915 m, 24 Feb 1912, *Kerr 2440, 2440A* (K).

LAOS. Tawieng Chieng kwang [Xiang Khoang], 1900 m, evergreen forest, 6 Apr 1932, *Kerr 20929* (BM, K[2]).

VIETNAM. 2 km to Sapa, 1550–1600 m, 11 Dec 1964, *Sino-Vietnam team & C. Y. Wu 379* (KUN); Prov. Sontây, Mont Bavi, 400 et 800 m, 24 Feb 1941, *Petelot 7084* (B[2]); Tam Dao, Sep 1908, *D'Alleizette s.n.* (L).

BEGONIA ACETOSELLA var. HIRTIFOLIA Irmsch.

Begonia acetosella var. *hirtifolia* Irmsch., Mitt. Inst. Allg. Bot. Hamburg 10: 515. 1939. TYPE. CHINA. Yunnan Province, Szemao, 4500 ft, *Henry 12251A* (HOLOTYPE: B; ISOTYPES: E, K[2]).

Additional specimens examined: CHINA. **Yunnan:** Cangyuan County, 1100–1200 m, 20 Jun 1975, *Liyanhui 013380* (KUN); Ruili Denga, 9000 m, 26 Apr 1961, *Zhouxun 563* (KUN[2]); Yuan Yang, panzhuhua, 1200 m, 30 May 1974, *Lu Chun 1187* (KUN[2]); Fo-Hai, 1540 m, May 1936, *C. W. Wang 74269* (KUN[2]); Tsang-Yuan, 1250 m, May 1936, *C. W. Wang 73184* (KUN[2]); Xishuangbanna, Mengyang, 1100 m, 26 Mar 1957, *Sino-Soviet Union expedition team 5692* (KUN[2]).

BURMA. Myelleyiana between Nimgama and Lamkang, 215–785 m, 1 Apr 1953, *Tha Hla & Chit Koko 3724* (K); Kachin Hills, *Toppin 4299* (K).

BEGONIA CRISTATA Warb. ex L. B. Sm. & Wassh.

Begonia cristata Warb. ex L. B. Sm. & Wassh., Phytologia. 52: 442. 1983. TYPE. INDONESIA. N

Celebes: Tomohon, Apr 1894, *Sarason 288* (LECTOTYPE, designated by Smith & Wasshausen, 1983: K).

Begonia cristata Warb. ex Koord., Natuurk. Tijdschr. Ned.-Indië. 63: 90. 1904. nom. nud.

Monoecious, erect branched herb to 2 m tall, lacking rhizomes, stems fleshy, dull red, glabrous, 0.4–1.2 cm diam. ribbed (when dry) internodes 7–18 cm long. *Stipules* caducous, ovate to narrowly lanceolate, 0.8–2 × 0.2–0.45 cm, apex setose, elsewhere glabrous. *Leaves: petioles* 2.5–16.5 cm long, 1–3 mm diam. (when dry) glabrous, joining lamina at a transverse angle; lamina green on both surfaces, beneath paler, both surfaces glabrous, or below with very sparse microscopic glandular hairs in basal portion, asymmetric, broadly elliptic, 10–22 × 4–14 cm, apex acute to acuminate, basal sinus cordate, 1–3 cm deep, basal lobes almost equal, overlapping, inner lobe 4–9.5 mm long, margin remotely short and somewhat irregularly bidentate, larger teeth angular, smaller teeth serrate, veins 6–7, palmate. *Inflorescences* axillary, a 2–3-branched dichasium, with up to 20 flowers, bearing male and female flowers synchronously on same inflorescence; *peduncles* ca. 1 cm long, glabrous; *bracts* caducous, narrowly ovate, 4–6 × 2.5 mm; *bracteoles* absent. *Pedicels*: those of male flowers with sparse microscopic glandular hairs, 6–7 mm long, those of female flowers glabrous, ca. 5 mm long. *Male flowers: perianth segments* white to pale pink, 4, outer pair broadly ovate to elliptic, concave, with very sparsely microscopic glandular hairs, 4–8 × 3–5 mm, apex rounded, inner pair broadly ovate to elliptic, glabrous, 3–8.5 × 2.8–4.2 mm, apex rounded; *stamens* 25–50, filaments 1–1.5 mm long, those in center slightly longer than the outer ones, fused at base, *anthers* wedge-shaped, 1.5–2 mm long, connective projecting ca. 0.2 mm, apex rounded, dehiscing via longitudinal slits along sides of anther. *Female flowers: perianth segments* white to pale pink, 6, broadly ovate to elliptic, subequal, 3.1–10 × 2.2–6 mm, pubescence as in male flowers; *ovary* fleshy, subglobose, 3-lobed, ca. 5 × 6.5 mm, with sparse microscopic glandular hairs, lobes with rounded riblike to obtuse-triangular wings to 1 mm long along

center of each locule, 3-locular, *placentation* axile, *placentas* bifid, bearing ovules on both surfaces of placental branches; *styles* 3, caducous, 2.4–4 mm long, free or shortly fused at base, bifid from halfway, branches erect, stigmatic papillae broad, once or twice spirally twisted. *Infructescences* 1–10-fruited; *fruiting pedicels* 0.5–1 cm long; *fruit* fleshy, green becoming red, subglobose, to ca. 1 × 1.2 cm, glabrous or with sparse microscopic hairs as on ovary, locules with persistent wartlike remnants of wings when dry.

Distribution and ecology.—Flowering year-round. Indonesia (Sulawesi). Forest, at 100–700 m.

This species is likely to be the same as Blume's (1827) *Begonia aptera*, as that taxon was described from Sulawesi and matches *B. cristata* except it has 4-locular, rather than 3-locular fruit. Blume might have made a mistake in stating that his species has 4-locular fruit, or this might represent a typographic error, as neither I nor past authors have been able to locate any material from Sulawesi with 4-locular fruit. Unfortunately, Blume (1827) does not list any specimens of his *B. aptera*. In view of this confusion and the possibility that material of Blume's species with 4-locular fruit exists, yet unlocated in a herbarium, *Begonia cristata* must become the accepted name for the 3-locular taxon.

The name *Begonia cristata* was first published by Koorders (1904) based on an earlier unpublished name of Warburg. Koorders, however, neglected to provide a description or type specimen and it was left to Smith & Wasshausen (1983) to designate a lectotype and describe the species.

Selected specimens examined. INDONESIA. **Sulawesi**: Minahassa, Bojong, 1888, *Warburg 15187* (B[2]); Goeroepaki, *Kauderns 61* (L); Tomohon, 700 m, 6 Jun 1954, *Alston 15679* (BM, L); Lokon, 16 May 1894, *Sarason 278* (K); Minahassa, N slope of Mt. Klabat, ca. 500 m, 27 Jun 1956, *Forman 248* (K[3]); Utara, 220 km, W of Manado, *Burley, Turin et al. 3717* (L); G. Masarang, Tomohon, secondary forest edge of crater lake, ca. 1200 m, 22 Jun 1956, *Forman 207* (K[2]); Pasoei-Rante Lemo, 1929, *Kjellberg 1627* (B); Todjambae, 800 m, 23 Jun, *Kjellberg 1750* (B); Sopa Valley, ca. 80 km S of Palu 0°30'–1°30'S, 119°30'–120°30'E, 1000 m, 24 May 1979, *E. Hennipman 5588* (A); Sopa Valley, ca. 80 km, SSE of Palu, ca. 1°16'S, 120°16'E, 1000 m, 2 May 1979, *de Vogel*

5174 (L[2]); Selatan, Gunung Rantemario Gowa subcamp, ca. 3°24'S, 120°00'30'E, 11 Jul 1993, 1850 m, *Kofman 210* (L[2]).

BEGONIA LONGIFOLIA Blume

Begonia longifolia Blume, *Catalogus*. 102. 1823. TYPE. INDONESIA. Salak, s.d., *Blume 740* (HOLOTYPE: B).

Diploclinium longifolium (Blume) Miq., *Fl. Ned. Ind.* 1(1): 687. 1856. TYPE. INDONESIA. Java, Salak, *Blume 740* (HOLOTYPE: B). *Diploclinium longifolium* var. *luxurians* Miq. ex Koord, in *Exkurs. Fl. Java* 2: 650. 1912 pro syn. *Begonia longifolia* Blume, 1823.

Casparya trisulcata A. DC., *Ann. Sci. Nat. Bot.* 4(2): 119. 1859. TYPE. INDONESIA. s.d., *Zollinger 2850* (HOLOTYPE: G). *Begonia trisulcata* (A. DC.) Warb., *Engler & Prantl, Nat. Pflanzenfam.* 3(6A): 142. 1894. TYPE. INDONESIA. Java, s.d., *Zollinger 2850* (HOLOTYPE: G).

Begonia crassirostris Irmsch., *Mitt. Inst. Allg. Bot. Hamburg* 10: 513. 1939. TYPE. CHINA. Yunnan Province, Szemao, s.d., *Henry 12251* (SYNTYPE: K[n.v.]; ISOSYNTYPES: B, NY); Yunnan, Shipping, s.d., *Henry 13600* (SYNTYPE: K[n.v.]); Kwangsi, 31 Aug 1928, *Ching 7281* (SYNTYPE: WU[n.v.]); Kwangtung, *Ford 1* (SYNTYPE: K); Kwangtung, 25 Dec 1928, *Tsiang Ying 1744* (SYNTYPES: E, UC[n.v.]); Hainan, 28 Apr 1922, *McClure 9325* (SYNTYPE: K; ISOSYNTYPES: MO, PNH); Hainan, 2 Aug 1927, *Tsang Wai Tak 278* (SYNTYPES: E, UC[n.v.]; ISOSYNTYPES: G, K, MO); Hainan, 27 May 1928, *Tsang Wai Tak 536* (SYNTYPE: UC[n.v.]; ISOSYNTYPES: B, K, NY).

Begonia inflata C. B. Clarke, in J. D. Hooker, *Fl. Brit. Ind.* 2: 636. 1879; C. B. Clarke, *J. Linn. Soc., Bot.* 18: 115. 1881. TYPES. INDIA. Darjeeling, Rishap, 3000 ft, 2 Aug 1870, *Clarke 12312A & C* (SYNTYPE: K); "Birma?," *Griffith Kew distribution number 2587* (SYNTYPES: B, GH, K[n.v.]).

Begonia tricornis Ridl., *J. Straits Branch Roy. Asiat. Soc.* 75: 35. 1917. TYPE. MALAYSIA. Pahang, Telom, *Ridley 14123* (HOLOTYPE: SING), Telom, Nov 1900, *Ridley s.n.* (ISOTYPE: K). *Begonia roxburghii* Ridl., *J. Fed. Malay States Mus.* 4: 20. 1909, non A. DC. 1864. TYPE. MALAYSIA. Pahang, Telom, Nov 1908, *Ridley 14123* (HOLOTYPE: SING), Telom, Nov 1900, *Ridley s.n.* (probable ISOTYPE: K).

Monoecious, branched erect leafy herb, to 2 m tall, lacking rhizomes. *Stems* green or reddish, usually glabrous, occasionally sparsely hairy. *Stipules* deciduous, narrowly lanceolate to lanceolate-subulate, 6–17 × 1.25–3 mm, apex acute, glandular setose, otherwise glabrous, margin entire. *Leaves: petioles* 0.7–14 cm long, usually glabrous, occasionally with sparse hairs, joining lamina at a transverse angle; *lamina* green

above, paler green beneath, both surfaces glabrous or veins on lower surface occasionally with sparse microscopic glandular hairs, asymmetric, lanceolate to elliptic-acuminate or broadly elliptic, 11–22 × 2.15–10.5 cm, apex gradually long acuminate, base cordate, basal lobes unequal, outer lobe 1–7.5 cm long, inner lobe very short, sinus (truncate-) 0.5–1.5(–3) cm deep, margin shallowly toothed to almost entire, often slightly wavy, ciliate, veins 5–7, palmate. *Inflorescences* axillary, twice branched dichasia usually 5–7-flowered, occasionally to 10-flowered, male and female flowers borne synchronously on the same or on separate inflorescences; *peduncles* 3–15 mm long, glabrous to sparsely hairy; *bracts* caducous, narrowly lanceolate to lanceolate-subulate, 2.25–12 × 0.75–5 mm, apex acute, setose, outer surface with sparse microscopic glandular hairs, margin usually entire, rarely ciliate; *bracteoles* absent. *Pedicels* glabrous or with microscopic glandular hairs, those of male flowers 0.5–1.3 cm long, those of female flowers to 1.4 cm long. *Male flowers*: *perianth segments* usually white, sometimes pale pink, 4, glabrous, outer pair broadly ovate or obovate to elliptic, outer surface strongly concave, 4–10 × 2.5–9 mm, apex rounded, inner pair broadly ovate to linear-obovate, 3.5–8.5 × 2–7.8 mm, apex rounded; *stamens* 30–60, *filaments* 0.7–1.6 mm long, free to scarcely fused at base, occasionally attached to a raised receptacle, receptacle to 1.5 mm tall, *anthers* narrow-oblong to linear or elliptic, inner slightly longer than outer, 1–2.6 mm long, connective projecting 0.2–0.4 mm, apex rounded, dehiscing via vertical slits along the sides of the anther. *Female flowers*: *perianth segments* usually white, sometimes pale pink, 6, subequal, becoming gradually smaller towards center of flower, glabrous, outer 3 elliptic, 5–16 × 3.6–6 mm, apex rounded, inner 3 elliptic, 4.7–13 × 2.6–4.6 mm, apex rounded; *ovary* globose, 3-lobed, 3–10 × 3–7 mm, with 3 ribs along angles, occasionally with equal wings from center of each locule, wings ca. 1 mm long, triangular, glabrous or with very sparse microscopic glandular hairs, 3-locular, *placentation* axillary, *placentas* bifid, bearing ovules on both surfaces of placental

branches; *styles* 3, deciduous, slender, 3–5 mm tall, fused at base for ca. 0.7 mm, bifid from shortly below halfway, branches erect, stigmatic papillae once to thrice spirally twisted. *Infructescences* often 4-fruited; *fruiting pedicels* ca. 1 cm long; *fruit* fleshy, green to reddish green, pendulous, globose to turbinate, 6–12 × 8–14 mm in dried state, apex rounded, with very sparse microscopic glandular hairs.

Distribution and ecology.—Flowering year round in Indonesia and the Malay Peninsula, but in more northerly latitudes flowering March–October. Northeastern India, Bhutan, southern China (Yunnan to Fujian, including Hainan), Taiwan, Burma, northern Thailand, northern & central Vietnam, Malaysian peninsula, and Indonesia (Sumatra, Java, Bali, Sulawesi). Found in a wide range of habitats from primary rainforest to degraded scrub, on acidic to basic substrate in full to half shade. Usually in moist soils, but not in seasonally waterlogged sites. At altitudes between 120–2000 m. A common species collected frequently throughout most of its range.

Clarke's syntype of *B. inflata* C. B. Clarke (*Griffith 2587* [B, GH, K]) is annotated "Birma?" but in Clarke (1879) the locality is given as "Bhotan?" The locality of this specimen, therefore, remains uncertain.

The leaves and stems of this species, which have a bitter acidic taste, are occasionally eaten as a vegetable within northern Vietnam.

Selected specimens examined: INDIA. **Assam**: Mouth of "Sireng" (Abor expedition), 215 m, 30 Dec 1911, *Burkill 37586* (CAL, K). **Meghalaya**: Shillong, Pangu-Minguing, 600–1267 m, 16 May 1958, *Rao 17711* (CAL).

BHUTAN. Shongan Dzong, 28 Aug 1915, 915 m, *Cooper 4713* (E).

CHINA. **Yunnan**: Mar-li-po, Tung-ting, 1200–1500 m, *Feng 1354* (B); Gongshan Dulong River, 1500 m, 11 Jul 1979, *Linqin & Dengxiangfu 790855* (KUN[2]); Hekou County, 350–400 m, 28 Jul 1991, *Shui Yuming B91–407* (KUN); Mengla Bubong, 700 m, Oct 1980, *Zhu Hua 1303* (KUN); Luo Ping, 780 m, 24 Nov 1984, *Sunhan 0511* (KUN); Mar-li-po, Tung-ting, 1200–1500 m, 22 Nov 1947, *Feng 13541* (KUN[2]); Pingbian, 600 m, 26 Aug 1963, *Mao Pingyi 03083* (KUN[2]); Xishuangbanna, Mengyang, 750 m, 9 Aug 1977, *Tao Guoda 16712* (KUN). **Guangxi**: Moxian County, 300 m, 11 May 1957, *Chen Zhaozhou 50518* (KUN); Longjin County, 740–880 m, 14 Jun 1957, *Chen Shaoqing 12619* (KUN). **Guangdong**: Kung Ping Shan & vic., T'aaan Faan, Fang Ch'eng Distr.,

Tsang 26832 (E, K[3], P); Lofoushan Mountains, *Tsiang Ying* 1744 (E). **Hainan:** Bak Sa, Forest, 22 Apr 1936, S. K. Lau 26391 (KUN); Hung Mo Mt., *Tsang, Tsang & Fung* 47 (NY); the top of Lin Fa Shan and vic. (Lam Ko Distr.), *Tsang* 278 (E, G, K, MO); Sha Po Shan (Taam Chau Distr.), *Tsang* 536 (B, K, NY); Ngo Ko Shan, nr. Tsat Cha Village (Ch'ang-kiang Distr.), 12 Jun 1933, S. K. Lau 1928 (BM, NY, P); Five Finger Mt., *McClure* 9325 (K, MO, NY). **Fujian:** Nanjing County, 500 m, 13 Aug 1964, *Xiameng University collecting team* 1102 (KUN); SW Fukien, Liung Chon San, S of Shanghang, 725 m, *Gressitt* 1677 (BM, MO).

BURMA. Kachin Hills, *Toppin* 4339 (K); Theronliang Tidding valley, 28°5'N, 96°17'E, *Kingdon-Ward* 7936 (K).

THAILAND. S of Ka Tha Lai in Pan Paung River Valley ca. 40 km SE of Wangka, 120–245 m, Kwai Noi River Basin expedition, C. Y. Wu 838 (A); S of Ka Tha Lai in Pan Paung River Valley, ca. 40 km SE of Wangka, 400–800 m, 13–16 Jun, *Kostermans* 838 (K); Kao ` Surat, *Kerr* 13256 (K).

VIETNAM. Phu-Cho, no collector, 065 (P); Hoa Binh Prov., 2 Apr 1982, *Nguyen Nghia Thin* 949 (HNU[2]); Vinh Yên Prov., Tam Dao, *Eberhardt* 4990 (K, P); Mt. Bavi, *Balansa* 3757 (P[2]); Dò Hoay phué, 9 Sep 1980, *Aliuoi* 164 (HN); Binh Tri Thien, A Luoi, 7 Sep 1980, *Phu* 122 (HN[2]); Chapa, Apr 1925, no collector, s.n. (B); Thua Thien-Hue Prov., Vallée du sông, s.d., *Eberhardt* 3107 (P); Lang bian, Ninh Thuan Prov., *Eberhardt* 1764 (P).

MALAYSIA. Malay Peninsula: **Pahang:** Cameron Highlands, ca. 1125 m, 30 Apr 1937, *Henderson* 32961 (BM, K). Tanah Runto, Pulau Tioman, 457 m, 8 May 1927, *Md Nur* 18883 (K, L); Menuang Gasing, *Kloss* s.n. (K[2]). **Selangor:** Genting Simpah, 6 Aug 1922, *Burkill* 9989 (B, K, SING); Genting Bidai, Mar 1917, *Kloss* s.n. (K[2]); Genting Bidai, 24 Sep 1914, *Ridley* s.n. (K[2], SING).

INDONESIA. **Sumatra:** Lintang, NW Helling, 1150 m, s.d., *Bümmemeyer* 3551 (L), 3746 (L). **Java:** Mt. Salak, 6–850 m, 27 Jan 1894, *Schiffner* 2268 (L); Tjibodas Gunang Gedah, Bogor, in forest above gardens, 3 Mar 1959, *Sinclair* 10080 (E); Pasin Walang nr. Nangeranger, 1000 m, 1913, *Backun* 8724 (B); Preanger, ca. 1000 m, Tjadas-Malang, s.d., *Bakhuizen & Brink* 2899 (L); Res. Besoeki Panjoer Idjen, *Koorders* 1912 (L). **Bali:** Bedugul forest region, Mt. Batukau complex, *Kostermans et al.* KK&SS92 (L); 08°15'S, 115°10'E, Lake Bratan, nr. Bedugul, 20 Jun 1976, *Meijer* 10551 (L[2]); Batu Kau, 1200 m, 22 Mar 1964, *Dilmy* 991 (L); Batoekaoe, 23 Jan 1935, *de Voogd* 2142 (L). **Sulawesi:** East of Tongoa, 650 m, ca. 1°10'S, ca. 120°10'E, 25 Feb 1981, *Johansson et al.* 76 (K).

CULTIVATED. CHINA. **Yunnan:** Szemao Hotel, 2000 m, *Koyama et al.* 1408 (KUN); "From Darjeeling SB 1920 where seed was rec'd in 1912 from Mr I. H. Burkill when on the Abor Expedition" (K).

BEGONIA RENIFOLIA Irmsch.

Begonia renifolia Irmsch., Bot. Jahrb. Syst. 50: 379. 1913. TYPE. INDONESIA. **Sulawesi:** Minahassa, Bojong, s.d., *Warburg* 15188 (HOLOTYPE: B).

Erect herb. Stems simple, slender, not flexuous, internodes ca. 13 cm long, sparsely hairy, hairs glandular, stalks of hair multicellular. *Stipules* caducous, ovate-lanceolate, 1.5 × 0.5 cm, apex acuminate, margin very sparsely rusty red ciliate elsewhere glabrous. *Leaves* few; *petioles* erect, 9.5–12 cm long, hairy, joining lamina at a transverse angle; *lamina* glabrous above, rusty red pilose on primary veins beneath, elsewhere glabrous, asymmetric, reniform, 8–9 × 8–10 cm, apex indistinct, base very unequally cordate, inner lobe rounded, 4.5–5.5 cm wide, margin bidentate, primary teeth present at point of primary vein contact with margin, secondary teeth small, continuous around margin, acute, ciliate, with microscopic glandular hairs, veins 7–8, splitting into three half way along their length, palmate. *Inflorescences* a twice-branched axillary dichasium, 2–3 cm long, few-flowered; *peduncles* 2–2.5 cm long, sparsely hairy; *bracts* caducous, ovate, 8 × 0.4 mm, apex acuminate, margin very sparsely irregularly ciliate; *bracteoles* absent. *Flowers* not observed; *styles* 3, bifid from halfway, branches erect, stigmatic papillae once spirally twisted. *Infructescence* 6-fruited; *fruiting pedicels* 0.5 cm long, erect; *fruit* with thin walls (when dry), subpyramidal, 3-locular, locules inflated-globose, ca. 7 × ca. 9 mm, glabrous, wings rudimentary, riblike, attached to middle portion of locules; *placentation* axillary, *placentas* bifid, bearing ovules on both surfaces of placentar branches.

Distribution.—Known only from the type specimen. Indonesia (northern Sulawesi).

BEGONIA SARCOCARPA Ridl.

Begonia sarcocarpa Ridl., J. Fed. Malay States Mus. 8(4): 38 1917. TYPE. INDONESIA. Sumatra: Korinchi Expedition, Barong Bharu, W side of Barisan Range, 1914, *Robinson & Kloss* s.n. (LECTOTYPE, here designated: BM).

Monoecious, erect herb. Stems flexuous with several short branches, internodes short (1.5–2 cm long in branches), slender, glabrous. *Stipules* caducous, lanceolate-acuminate, 4–5 × ca. 1.5 mm, glabrous. *Leaves:* *petioles* 0.7–1.2 cm long, slender, glabrous, joining lamina at a transverse angle; *lamina* glabrous on both surfaces, asymmetric, lan-

ceolate-acuminate, 5–6.5 × 1.2–1.8 cm, apex acuminate, base cordate, basal lobes unequal, inner lobe 0.5–1 cm wide, sinus 1.5–2.5 mm deep, margin shortly acute-toothed where secondary veins reach the margin, veins pinnate. *Inflorescences* terminal and in upper leaf axils, once-branched dichasiums, 3–4-flowered, male and female flowers borne synchronously on same inflorescence; *peduncles* to 6 mm long; *bracts* caducous, ovate, 1–2 × 0.6–1.4 mm, glabrous; *bracteoles* absent. *Pedicels* to 1.4 cm long, glabrous. *Male flowers: perianth segments* 4, glabrous, obovate to elliptic, subequal, outer pair slightly longer, 5–6 × 2–4.5 mm, apex obtuse; *stamens* ca. 75, *filaments* free, linear, central filaments slightly longer, to 1 mm long, *anthers* obovate-elliptic, ca. 1.3 mm long, dehiscing via longitudinal splits along sides of anther, connective projecting ca. 0.2 mm, apex rounded. *Female flowers: perianth segments* 5, subequal, elliptic, 5–6.5 × 1.6–2.8 mm, glabrous; *ovary* globose, ca. 4 × ca. 4 mm, appearing wingless, wings 3, very short, along center of locules, ca. 0.3 mm long, 3-locular, *placentation* axile, *placentae* bifid, ovules attached to both surfaces of placental branches; *styles* 3, caducous, ca. 2.5 mm long, shortly fused at base, branches bifid from 1/3 of length, branches erect, horseshoe shaped, stigmatic papillae once spirally twisted. *Infructescences* 1–2-fruited, erect; *fruiting pedicels* 8–9 mm long; *fruit* fleshy, globose, locules inflated, ca. 0.8 × ca. 0.8 cm, wingless but widest part with small protrusions, crowned by remains of style.

Distribution and ecology.—Known only from the type specimen. Flowering in June. Indonesia (Sumatra). Montane forest, 1200 m.

A Robinson & Kloss specimen which Ridley labeled as the holotype of *Begonia baccata* Ridl. is designated the lectotype of *B. sarcocarpa* Ridl. It appears that Ridley changed his mind concerning the name of this taxon before its publication; an examination of his bibliography (Henderson & Van Steenis, 1935) and references contained therein indicates that he never published the name *Begonia baccata*. This is presumably because Hooker (1866) had previously used the name *Begonia baccata* for an African species. The specimen, *Rob-*

inson & Kloss s.n., is very distinct and fits the original description of *B. sarcocarpa* Ridl. Ridley did not designate a type specimen in his description of *B. sarcocarpa* (Ridley, 1917b).

BEGONIA TURBINATA Ridl.

Begonia turbinata Ridl., J. Fed. Malay States Mus. 8(4): 37. (1917). TYPES. INDONESIA. Sumatra: Siolak Daras, at 3000 ft, 1914, *Robinson & Kloss s.n.* (LECTOTYPE, here designated: BM; ISOLECTOTYPES: BM, K), Sungei Kumbang at 1370 m, *Robinson & Kloss s.n.* (SYNTYPE: BM).

Monoecious, erect herb. *Stems* to 2.5 m tall, green, slender, simple or few branched, glabrous. *Stipules* caducous, lanceolate, 0.6–1.3 × 0.3–0.6 cm, apex acuminate, margin entire, glabrous. *Leaves: petioles* 2–7 cm long, slender, glabrous, joining lamina at a transverse angle; *lamina* green above, paler green with red veins beneath, both surfaces with sparse microscopic glandular hairs, asymmetric, lanceolate, 8–16 × 1.8–6.5 cm, apex acuminate, base shallowly cordate, basal lobes unequal, inner lobe 0.7–2.4 cm long, sinus 0–2.4 cm deep, margin serrate-toothed, teeth ciliate, veins 6, palmate. *Inflorescence* a loose axillary 1–2-branched dichasium, few-flowered, male and female flowers borne synchronously on same inflorescence; *peduncles* to 1 cm long; *bracts* caducous, ovate, ca. 6 × 2 mm, apex acuminate, with very sparse microscopic glandular hairs; *bracteoles* absent. *Pedicels* of male flowers to 1.7 cm long, of female flowers to 1 cm long. *Male flowers: perianth segments* 4, white to pink, glabrous, outer pair orbicular-elliptic, 4.6–6 × 3.2–4.4 mm, apex obtuse, inner pair ovate-elliptic, 3.8–5.4 × 2.5–4 mm, apex obtuse; *stamens* ca. 25–30, *filaments* ca. 0.6 mm long, linear, free to base, central filaments slightly longer than outermost filaments, *anthers* linear-elliptic, ca. 1.5 mm long, dehiscing via vertical slits along side of anther, connective projecting ca. 0.2 mm, apex rounded. *Female flowers: perianth segments* 6, white to pink, glabrous, ovate-elliptic, outer 3 to 8 × 6 mm, apex obtuse, inner 3 to 7 × 3 mm, apex obtuse; *ovary* fleshy, green, spinning-top-shaped, locules inflated, with 3 very short wings running along outer angle of locules, these later drying out in fruit

to become knoblike protrusions, 3-locular, *placentation* axile, *placentae* bifid, bearing ovules on both surfaces of placental branches; *styles* 3, caducous, slender, ca. 2.5 mm long, shortly fused at base, branches bifid from $\frac{1}{3}$ of length, stigmatic papillae once spirally twisted. *Infructescence* 1–4-fruited, orientated at 45° to stem; *fruiting pedicels* to 1.3 cm long; *fruit* fleshy, erect, spinning-top-shaped, locules inflated, 7–13 × 8–15 cm, wingless, but with knoblike protrusions on angles of locules, apex acute, crowned by basal part of styles.

Distribution and ecology.—Flowering in March. Indonesia (Sumatra). Forest at 850–1370 m.

Selected specimens examined: INDONESIA. **Su-matra**: Vic. of Mt. Kerinci, Sungei Kering, Kerintji, 2 Mar 1954, *Alston 14040* (BM, L); S side of pass between Sungei Penuh & Indrapura, 855 m, 8 Mar 1954, *Alston 14312* (BM); lower slopes of Dolok Si Manoeek, Asahan (NW from Taloen na Oeli, Toba); Berastagi Woods, *Ridley s.n.* (BM); Deleng Singkoet, N of Berastagi, Karo Plateau, *Bartlett 6595* (NY); Berastagi, West-Hill, 12 Feb 1921, *Ridley s.n.* (K); In ravine between Baboeli and Paekas, 1250 m, 9 Jan 1932, *W. N. & C. M. Bangham 776* (NY); trail from Medan Rd. to top of Sibajak Volcano, 1280–1981 m, 15 Feb 1932, *W. H. & C. M. Bangham 1018* (K[2], NY).

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