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A REVISION OF PHILIPPINE *GARDENIA* (RUBIACEAE)

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A description of the defining characteristics of *Gardenia* (Rubiaceae) and a revision of the Philippine species distinguished mainly by calyx morphology are presented. A key to five species of *Gardenia* recognised for the Philippines, full descriptions and illustrations, and a list of names which should be excluded from *Gardenia* are given. Relevant Philippine names for which holotypes were not indicated or have been destroyed are lectotypified. Two new endemic species, *Gardenia ornata* K.M.Wong and *G. vulcanica* K.M.Wong, are described. *Gardenia elata* Ridl. and *G. mutabilis* Reinw. ex Blume are newly applied to Philippine species previously enumerated under other names. *Gardenia pseudopsidium* (Blanco) Fern.-Vill. is considered a doubtful name, to which some authors have referred the endemic *G. barnesii* Merr.

Keywords. Conservation, *Gardenia*, Gardenieae, Philippines, Rubiaceae, taxonomy.

Introduction

Gardenia J.Ellis (Rubiaceae) is a genus of shrubs and trees found in tropical and warm temperate regions from Africa, through East and Southeast Asia, to the western Pacific and Hawaiian islands. Currently, there are some 140 species names applied in this genus (Govaerts *et al.*, 2010), although the number of accepted species sanctioned by modern revisions is likely to decrease. Revisions in the last 50 years have included those for the Fijian region (Smith, 1974), South and Southeast Asia (Tirvengadum, 1978, 1983; Wong, 1982; Low & Wong, 2007, 2009) and Australia (Puttock, 1988, 1997).

The Gardenieae (*Gardenia* and traditional allies), in subfamily Ixoroideae, appear from molecular analyses to be paraphyletic or polyphyletic (Persson, 2000; Bremer, 2009). The analysis by Persson (2000) showed no support for a monophyletic tetrad-pollen grouping, or a palaeotropical grouping with monad pollen ('*Aidia*' group) earlier suggested from morphological and anatomical considerations (Robbrecht & Puff, 1986; Persson, 1996).

As represented by an alliance of species closely related to the type *Gardenia jasminoides* J.Ellis (Low & Wong, 2007, 2009), *Gardenia* is reliably distinguished by a number of characters, including usually having conspicuous, cream-turning-yellow,

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fragrant flowers with a hypocrateriform corolla, frequently more than 5 (6–8 or more) corolla lobes, a 1-loculate ovary with 2–9 parietal placentas, a glabrous style and exserted, knob-like and variously lobed stigma. The flowers are typically solitary and terminal, usually developing at the end of leafy branches, sometimes between a pair of axillary branches developing from the ultimate node of the flowering branch. The pollen grains are issued as tetrads, never singly. The fruits are of conspicuous size, often several centimetres across and (in many Southeast Asian species, but apparently not the African species) split irregularly when ripe, exposing seeds in a bright orange-red placental pulp that is attractive to birds. The stipules develop into tubular structures that are rather tightly ensheathing at the nodes; their colleters (modified glandular hairs scattered on the inner surfaces of the stipule and calyx) produce the exudate that often forms a resinous covering of both vegetative and floral buds. Numerous seeds are produced, usually at least several millimetres across, typically lens-shaped to angular and compressed, with a conspicuously areolate testa. The tertiary veins of the leaf typically form a scalariform (ladder-like) pattern, linking as cross-veins between the secondary veins, rather than being reticulate (net-like).

As also demonstrated elsewhere (Keay, 1958; Tirvengadum, 1978, 1983; Wong, 1982), *Gardenia* in the Philippines was previously morphologically heterogeneous and many species placed in *Gardenia* in the past are better accommodated in other genera. As a result of segregating taxa aberrant from the type alliance of *Gardenia*, only five *Gardenia* species occur in the Philippines, two of which are described as new. This is a much smaller number of species compared with the last botanical enumeration of the genus for the Philippines (Merrill, 1923). Species removed from *Gardenia* are listed at the end of this contribution under 'Excluded and Unplaced Names' with accompanying notes.

Materials and Methods

This study was based on herbarium specimens held at A, BO, K, KEP, KLU, L, NY, SAN, SING and US (herbarium acronyms follow Holmgren *et al.*, 1990). Throughout, we have used measurements based only on dried specimens. It is difficult to generalise the degree of shrinkage associated with the drying of different parts, such as corollas and younger (less woody) fruits, without specific knowledge, and a consistent use of measurements for comparing or defining entities is required. As such, it needs to be borne in mind that the present distinctions are for clarifying the taxonomy and that dimensions of parts seen in fresh or living material (such as in the sometimes cultivated *Gardenia mutabilis* Reinw. ex Blume) may vary slightly from those given here.

As many species in the Southeast Asian and Pacific regions (St. John & Kuykendall, 1949; Smith, 1974; Tirvengadum, 1983; Low & Wong, 2007, 2009) have been described with rather unique calyx morphology, a sorting of the Philippine material based primarily on calyx differences was carried out. Taxa were eventually

defined by suites of characters, including flower and other (including fruit and vegetative) characters. The calyx is firm and leathery, smooth and obconic-cupular with a subtruncate margin in *Gardenia elata* Ridl., or with an irregularly lobed margin in *G. vulcanica* K.M.Wong. Likewise, the calyx is also smooth with a subtruncate margin in *Gardenia mutabilis*, but forms a cup that tightly ensheaths the corolla tube. Narrow keels occur on the surface of an obconic-cupular calyx in *Gardenia ornata* K.M.Wong. In *Gardenia barnesii* Merr., which has a sheathing calyx with an oblique mouth, the keels develop into conspicuous slender apical spurs.

Abbreviations used in specimen citations include BS (Bureau of Science, Manila), FB (Forestry Bureau, Manila), PNH (Philippine National Herbarium) and PPI (Philippine Plant Inventory); the material included with the specimens is indicated by fb (flower buds), fl (open flowers), fr (fruits), or st (without reproductive parts present). Conservation status was assigned for the species based on documented distribution as set out in IUCN (2001).

Key to species and varieties of Philippine Gardenia

1a. Calyx tube smooth, without any keels _____ 2
1b. Calyx tube otherwise, provided with distinct keels _____ 5

2a. Calyx margin with irregular lobes or invagination and slightly recurved, including 1–2 narrow lobes 4–10 mm long (Sorsogon Province in south Luzon) _____ **5. G. vulcanica**
2b. Calyx margin subtruncate, without distinct lobes or appendages _____ 3

3a. Calyx cupular-obconical, tightly sheathing the corolla, not flared upwards in the open flower, 2.5–3 mm wide; corolla tube slender, 2–2.5 mm wide at the middle; mature fruit 2–2.5 cm in diameter; leaves 2–5 cm wide, with 8–12 pairs of secondary veins, drying dark brown to black (Bohol and Samar) _ **3. G. mutabilis**
3b. Calyx cupular-obconical, slightly flared upwards in the open flower, typically over 8 mm wide; corolla tube 2.5–4.5 mm wide at the middle; mature fruit 3.5–5 cm or more in diameter; leaves (2–)4.5–10.8 cm wide, with 8–22 pairs of secondary veins, drying pale to medium brown _____ 4

4a. Pedicels of open flowers $\leq$ 5 mm long (Luzon and elsewhere) _____ **2a. G. elata** var. **elata**
4b. Pedicels of open flowers $\geq$ 7 mm long (restricted to the Cagayan, Isabela and Rizal Provinces in Luzon) _____ **2b. G. elata** var. **longipedicellata**

5a. Calyx with 5 narrow keels (1–1.5 mm wide) along the tube continuing (and departing from the calyx surface 0.4–1 cm below the mouth) as conspicuous linear, bilaterally flattened spurs to more than 1 cm long (widespread from Luzon to Palawan and Mindanao) _____ **1. G. barnesii**
5b. Calyx with 8–9 narrow keels (1.5–2.5 mm wide) gradually broadening towards the mouth (known only on Samar) _____ **4. G. ornata**

Enumeration of Taxa

1. Gardenia barnesii Merr., Philipp. Gov. Lab. Bur. Bull. 17: 47 (1904); Merr., Philipp. J. Sci. 1: Suppl. 131 (1906); Elmer, Leafl. Philipp. Bot. 1: 5 (1906). – Type: Philippines, Luzon, Bataan Province, Lamao River, i 1904, *Barnes* FB 163 (lecto NY (fl, fb), designated here; isolecto K (st), SING (fb), US (fl)). **Fig. 1.**

Gardenia segmenta Elmer, Leafl. Philipp. Bot. 4: 1331 (1912). – Type: Philippines, Palawan, Puerto Princesa, Mt Pulgar, 500 ft [167 m], v 1911 (fl), *Elmer* 13153 (lecto NY, designated here; isolecto A, BO, K, L, US).

Gardenia megalocarpa Merr., Philipp. J. Sci. 20: 463 (1922). – Type: Philippines, Mindoro, Paluan, iv 1921 (fr), *Ramos* BS 39819 (lecto A, designated here; isolecto K, US). Type number wrongly listed as 38919 in Merrill (1922).

Tree, to 9 m high, trunk to 15 cm diameter. *Bark* smooth to slightly scaly to lightly fissured, pale yellowish grey-brown. *Stipules* connate into a cylindrical tube, often

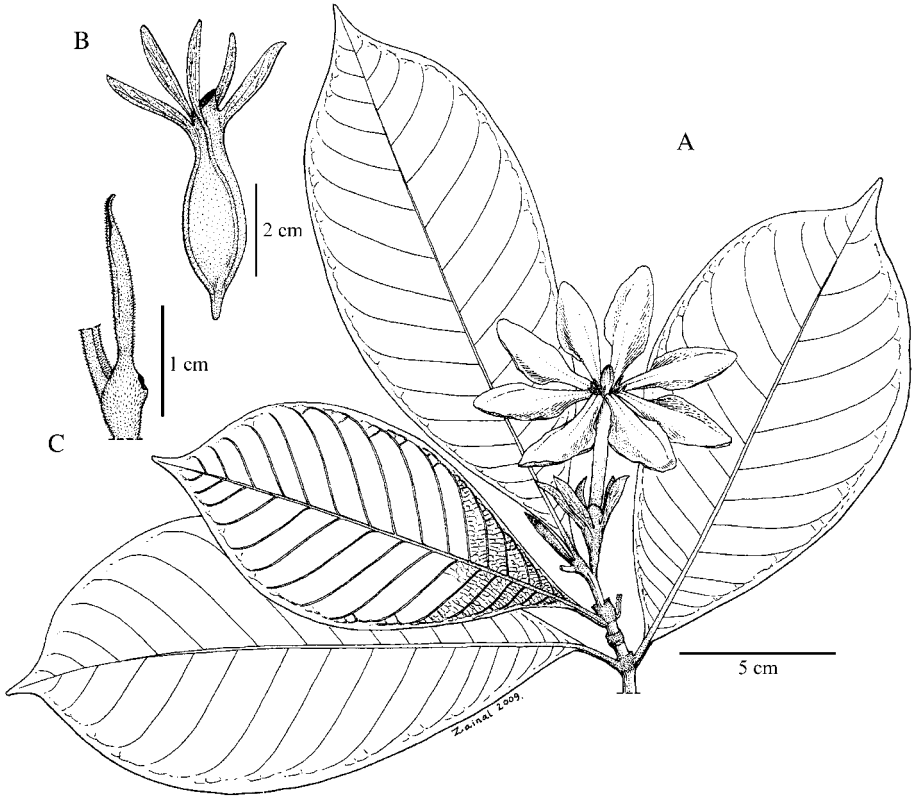

Fig. 1. *Gardenia barnesii* Merr. A, flowering leafy branch; B, immature fruit showing intact calyx tube (with oblique margin) and protruding spurs; C, puberulent sheathing stipule at shoot tip. A from *McGregor* BS 32445 (K); B from *Williams* 2942 (K); C from *Celestino & Ramos* PNH 23092 (K).

1–2 cm long, apex weakly 2-lobed to subtruncate or (rarely) slightly cleft on one side, outside scantily puberulent and sometimes coated with resin. *Petiole* 3–12 mm long, 1–1.5 mm thick. *Leaf* lamina obovate to elliptic, 5.5–22 × 2.5–8.3 cm; base cuneate; apex acute to obtuse, tip pointed to short-cuspidate; subcoriaceous; midrib flat to sunken and glabrous on upper side, prominent and puberulent on lower side; secondary veins 11–22 pairs, flat and glabrous on upper side, prominent and puberulent on lower side, vein axils on the lower side pubescent; tertiary venation scalariform. *Flowers* solitary. *Pedicels* 3–14 mm long and 1–1.5 mm thick in open flowers, reaching 8–18 mm long and 2–3 mm thick at fruit maturity. *Calyx* subfusiform to tubular, tightly sheathing the corolla tube, the margin oblique, apex acute or torn into two acute portions by corolla emergence; 8–15 mm long, 2.5–4 mm wide at the base, 5–7 mm wide at the apex; outside puberulent to subglabrous; inside puberulent to long-hairy; with 5 ridges or very narrow keels 1–1.5 mm wide along the tube, these continuing (and departing from the calyx surface 0.4–1 cm below the mouth) as linear, bilaterally flattened spurs 10–16 × 1.5–2 mm, these often slightly curved upwards. *Corolla* hypocrateriform, cream turning light yellow, then deeper yellow; tube 2.6–6 cm long, 1.5–3.5 mm wide at the mid-portion, 3.5–8 mm wide at the throat, outside puberulent to subglabrous; lobes 6–9, oblanceolate to obovate, (1.2–)3.7–4.6 × 0.7–2.1 cm, contorted to the left in bud, glabrous on both sides. *Stamens* 6–9, inserted between corolla lobes just below the throat, dorsifixed; filaments very short to inconspicuous; anthers 4.5–13 mm long, around half or more of its length exserted. *Style* glabrous; stigma club-like with 3–5 lobes, these initially coherent, 1.5–5 mm long, 1–2.5 mm wide, wholly exserted. *Fruits* mostly broad-ellipsoid, occasionally obovoid to subglobose, 3.5–6 × 3–4.7 cm, when mature often developing 5 conspicuous longitudinal ridges or low keels on the external surface especially in the upper half of the fruit; portions of the calyx often persistent at fruit apex; green ripening orange-red. *Seeds* many, embedded in a pulp-like placenta, irregularly angular-rounded to elliptic, flattened, 3–4.5 × 2.5–3.5 mm, testa surface fine-areolate.

Distribution. Endemic to the Philippines: Balabac, Busuanga, Catanduanes, Luzon, Masbate, Mindanao, Mindoro, Negros, Palawan, Panay and Ticao (Fig. 2).

Habitat and ecology. Primary and logged-over (regenerating) lowland forests.

Proposed IUCN conservation status. Least Concern (LC). This species has been collected at many sites, including logged-over forests, in the Philippines. However, with the forest conversion rates increasing steadily in the region, the status needs periodic reassessment.

Additional specimens examined. BALABAC. **Palawan Province**: Danglis [7°59′N, 117°2′E], 90–150 m, 30 vi 1994 (fr), *Soejarto et al.* 8632 (L). BUSUANGA. **Palawan Province**: 1901 (fl), *Ahern* s.n. (US). CATANDUANES. **Catanduanes Province**: Mt Nagpakdit, 14 ix 1928 (fr), *Ramos & Edano* BS 75389 (NY, SING). LUZON. No date (fb, fl), *Lobb* s.n. (K). **Abra Province**: Sallapadan, Poblacion Gangal [17°28′N, 120°49.6′E], 250 m, 18 xi 1996 (fr), *Fuentes & de la*

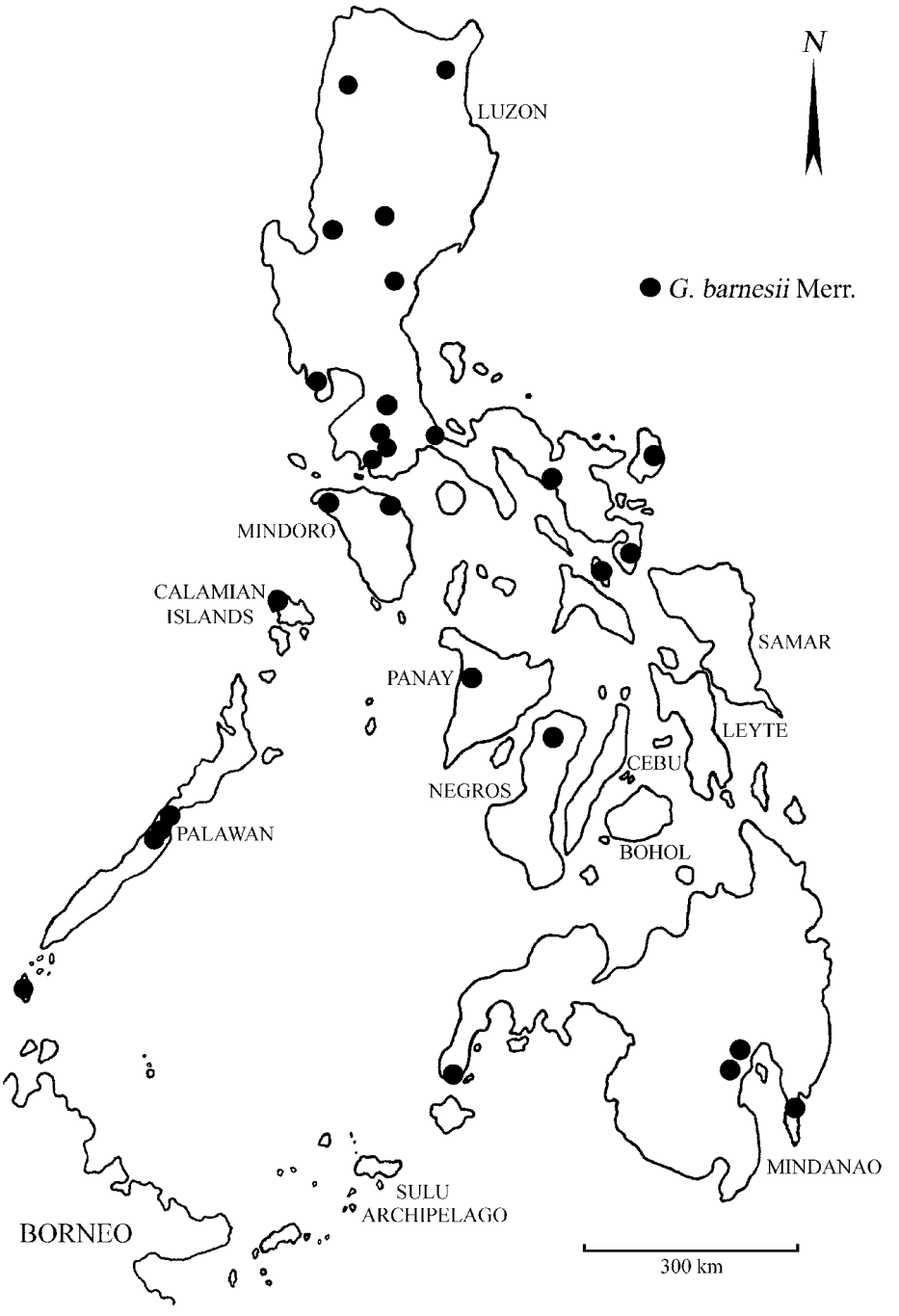

FIG. 2. Distribution of *Gardenia barnesii* in the Philippines.

Rosa PPI 38651 (K, PNH). **Bataan Province**: Lamoa River, Mt Mariveles, v 1905, *Whitford* 1235 (K, st; US, fr); Lamas Forest Reserve, x 1906 (fr), *Foxworthy* BS 1587 (NY); Mt Mariveles, xi 1904 (fr), *Elmer* 6714 (NY); Mt Mariveles, Lamao River, iii 1905, *Borden* FB 2916 (K, st; NY, fr), ii 1905, *Meyer* FB 2788 (K, st; NY, fr), 18 i 1904 (fr), *Williams* 487 (A, NY). **Batangas Province**: vii–viii 1914 (fr), *Ramos* BS 22406 (A, K, L). **Benguet Province**: Sablang, xi–xii 1910 (fr), *Fenix* BS 12722 (US); Twin Peaks, v 1904, *Elmer* 6354 (NY, fb, fl; K, US, fl). **Cagayan Province**: vi–ix 1914 (fl), *Barros* FB 23253 (A), vii–viii 1915 (fl), *Bernardo* FB 24265 (US); vicinity of Penablanca, 5 v 1917 (fr), *Adduru* 32 (A, US). **Camarines Sur Province**: Pasacao, v 1904 (fr), *van Wickle* FB 699 (US). **Laguna Province**: Mt Maquiling, xi 1914 (fr), *Foxworthy* s.n. (US), no date (fl), *Sulit* PNH 7086 (A), xi 1932 (fl), *Sulit* PNH 7254 (A), 10 xii 1949 (fl), *Sulit* PNH 12186 (A); Mt Maquiling, Los Banos, vi–vii 1917, *Elmer* 18320 (A, K, NY, fl; L, fb); San Antonio, vi 1912 (fb), *Ramos* BS 14990 (L). **Nueva Vizcaya Province**: Vicinity of Dupax, iii–iv 1912 (fr), *McGregor* BS 11422 (US). **Quezon Province**: Quezon National Park, 29 xi 1991 (fr), *Reynoso et al.* PPI 3886 (L); Quezon National Park, Atimonan [14°4′N, 121°55.2′E], 17 iii 1996 (fb), *Castro, Barbon & Garcia* PPI 22254 (K); Tayabas, iii 1908 (st), *Curran* FB 10278 (NY); Tayabas, Guinayangan, i 1884, *Vidal* 833 (K, fb; L, fl), iii–iv 1913 (fr), *Escritor* BS 20838 (US). **Rizal Province**: viii 1911 (fr), *Ramos* 1088 (US); Antipolo, x 1883 (fl), *Vidal* 383 (L), xii 1914 (st), *Merrill* Sp. Blancoanae 655 (A, K, L, NY); Bosoboso, vi 1903, *Merrill* 2631 (NY, fb; US, fl), vii 1903 (fl), *Merrill* 2817 (NY, US); Montalban, 11 viii 1935 (fr), *Bartlett* 14441 (A), 1906 (fl), *Loher* 6386 (K), vi 1909 (fl), *Loher* 12466 (A); Morong, xi 1884 (fr), *Vidal* 1452 (K). **Sorsogon Province**: Irosin, Mt Bulusan, ix 1916 (fr), *Elmer* 17189 (A, L, NY). **Zambales Province**: Mt Marayep, xii 1924 (fr), *Ramos & Edano* BS 44809 (NY). Masbate. **Masbate Province**: v–vi 1904 (fr), *Clark* FB 1702 (US), vi 1903, *Merrill* 2771 (K, fb; NY, US, fl), ix–x 1915 (fr), *Valencia* FB 24635 (US). Mindanao. Davao Province, iii 1917, *Ceballos* FB 26598 (K, fb; US, fl); Zamboanga Province, 1901 (fl), *Ahern* s.n. (US). **Davao City**: Tibunco, viii 1933 (st), *Kanehira* 2599 (NY); Todaya, Mt Apo, 457 m, vi 1909 (fr), *Elmer* 10964 (A, K, L, NY, US). **Davao del Sur Province**: Santa Cruz, 10 vi 1905, *Williams* 2942 (A, NY, fl, fr; K, US, fr). **Davao Oriental Province**: Mati, iii–iv 1927, *Ramos & Edano* BS 49150 (BO, L, st; NY, SING, fr). **Zamboanga City**: Tetuan, no date (fl), *Quadras* 287 (NY, US). Mindoro. i 1907 (fr), *Merritt* FB 6141 (NY). **Oriental Mindoro Province**: Pola, v 1903, *Merrill* 2217 (NY, fb; US, fl). Negros. **Negros Occidental Province**: Murcia, Mambucal Resort Area, 350 m, 23 iii 1992 (fr), *Stone et al.* PPI 6332 (KEP, PNH). Palawan. **Palawan Province**: v 1906, *Curran* FB 4147 (BO, L, fb, fl; US, fb), v 1906, *Foxworthy* BS 838 (NY, fl; US, fb), 'Paragua', iii 1886 (st), *Vidal* 2995 (K); Puerto Princesa, ii 1923 (fl), *Cenabre* FB 29122 (US); Puerto Princesa, Irawan R. Valley, east side, 24 iii 1984, *Ridsdale* SMHI 202 (L, 2 sheets, fb, fr); Puerto Princesa City, Irawan, Impapay, 23 ix 1993 (fl), *Madulid & Majaducon* 8053 (A), 17 ix 1993 (fr), *Madulid & Majaducon* 8008 (A); Sagpangan, Aborlan, 28 v 1955 (fb, fl, fr), *Celestino & Ramos* PNH 23092 (K, L). Panay. **Antique Province**: v–viii 1918, *McGregor* BS 32445 (K, L, fb, fl; A, NY, fl). Ticao. **Masbate Province**: v–vi 1904 (fl), *Clark* FB 1023 (K, NY, US).

Gardenia barnesii (Philippines) and *G. jasminoides* (S China) may be a vicariant pair occupying different geographical or ecological areas. Both develop protruding spurs on their calyces, but differ in their plant height, very different leaf sizes, number of leaf veins, corolla tube thickness and fruit size. *Gardenia barnesii* is a tree to 9 m tall, with leaves reaching 22 cm long with 11–22 pairs of secondary veins and globose fruits often more than 3–4 cm across. In contrast, *Gardenia jasminoides* is a shrub barely several metres high, with small leaves (generally less than 6 cm long) with fewer than 8 pairs of secondary veins and ellipsoid fruits around 3 cm long.

2. Gardenia elata Ridl., J. Straits Branch Roy. Asiat. Soc. 79: 81 (1918); Low & Wong, Gard. Bull. Singapore 61: 107 (2009). – *Gardenia tubifera* var. *tubifera* forma *elata* (Ridl.) K.M.Wong, Gard. Bull. Singapore 35: 22 (1982); K.M.Wong, Tree Fl. Malaya 4: 349 (1989); Coode et al., Checkl. Fl. Pl. Gymnosperms Brunei Darussalam 270 (1996), pro parte. – Type: Singapore, Bukit Timah, 1898 (fl), *Ridley* 11332 (lecto K, designated by Low & Wong (2009); isolecto SING).

Randia speciosa Hook., Icon. Pl. 5: t. 824 (1852), nom. illeg., non DC. (1830). – *Gardenia speciosa* Hook.f., Fl. Brit. Ind. 3: 117 (1880); King & Gamble, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 72, 2(4): 220 (1903), non Salisb. (1796) nec Roxb. ex Wight & Arn. (1834). – *Gardenia lobbii* Craib, Fl. Siam. 2: 120 (1932). – Type: Hook., Icon. Pl. 5: t. 824 (1852).

Gardenia longiflora S.Vidal, Revis. Pl. Vasc. Filip. 153 (1886); Merrill, Enum. Philipp. Fl. Pl. 530 (1923), nom. illeg., non Ruiz & Pav. (1799), nec (Salisb.) Dryander ex Aiton (1810). – Type: Philippines, Luzon, i 1884 (fl, fr), *Vidal* 832 (lecto K, designated here).

Gardenia longituba Ridl., J. Bot. 72: 274 (1934). – Type: British North Borneo, Kudat, vii 1885 (fb), *Fraser* 164 (holo K).

Gardenia glutinosa auct. non Teijsm. & Binn.: Elmer, Leafl. Philipp. Bot. 4: 1331 (1912), pro parte.

Gardenia tubifera auct. non Wall. ex Roxb.: Corner, Gard. Bull. Straits Settlem. 10: 46 (1939), pro parte; Corner, Wayside Trees of Malaya 1: 541 (1952), pro parte; Anderson, Checkl. Trees Sarawak 297 (1980); Kessler et al., Secondary Forest Trees of Kalimantan, Indonesia 135 (2000).

Tree, to 12–20 m high or more, trunk diameter 50 cm or more. *Bark* smooth to flaky, pale yellowish grey-brown. *Stipules* connate into a cylindrical tube, often to 1–2 cm long, apex weakly 2-lobed to subtruncate or (rarely) slightly cleft on one side, outside scantily puberulent and sometimes coated with resin. *Petiole* (3–)11–20 mm long, 1–2.5 mm thick. *Leaf* lamina obovate to elliptic, (5.2–)10.5–22 × (2–)4.5–10.8 cm; base cuneate; apex obtuse, tip pointed to short-cuspidate; subcoriaceous; midrib flat to grooved or sunken and minutely puberulent to subglabrous on upper side, prominent and puberulent on lower side; secondary veins 8–22 pairs, flat and sparsely puberulent to glabrous on upper side, prominent and puberulent on lower side, vein axils on the lower side pubescent; tertiary venation scalariform. *Flowers* solitary. *Pedicels* up to 10 mm long and 1.5–3 mm thick in open flowers, reaching 1–2 cm long and 3.5–9 mm thick at fruit maturity. *Calyx* cupular-tubular to slightly flared upwards, the margin subtruncate; 8–20 mm long, 4–6.5 mm wide at the base, 8–11 mm wide at the apex; outside minutely puberulent at the base and sparsely puberulent to subglabrous at the upper part; without marginal lobes, ribs or keels. *Corolla* hypocrateriform, cream turning light yellow, then orange-yellow; tube 5.7–11.6 cm long, 2.5–4.5 mm wide at the mid-portion, 5.5–10 mm wide at the throat, outside sparsely puberulent to glabrous; lobes 8–10, oblanceolate to obovate, (1.9–)3.2–4.1 × 1.1–1.9 cm, contorted to the left in bud, glabrous on both sides. *Stamens*

8–10, inserted between corolla lobes just below the throat, dorsifixed; filaments very short to inconspicuous; anthers 8–11 mm long, around a third to half of its length exserted. *Style* glabrous; stigma club-like with 5–7 lobes, these initially coherent, 5–8 mm long, (2.5–)4.5–5.5 mm wide, wholly exserted. *Fruits* mostly subglobose, occasionally obovoid, (3.5–)4.3–5 cm or more across, surface smooth; portions of the calyx often persistent at fruit apex; when ripe splitting irregularly to expose dirty white seeds embedded in a bright yellow to orange-red pulp. *Seeds* many, irregularly angular-elliptic, flattened, 5–9 × 3–5 mm wide, testa surface fine-areolate.

Distribution. Widespread from the Nicobars, Sumatra, Malay Peninsula, Borneo, to the Philippines: Busuanga, Culion, Luzon, Mindanao, Palawan, Panay, Sibuyan and Tawi-Tawi. A map showing the species range is given in Low & Wong (2009).

Habitat and ecology. Primary and logged-over lowland forests, including on ultramafic soils.

2a. Gardenia elata var. **elata. Fig. 3.**

The typical variety has flower pedicels only (1–)3–5 mm long, compared with *Gardenia elata* var. *longipedicellata* K.M.Wong, in which they are longer (7–10 mm long).

Distribution. As for the species.

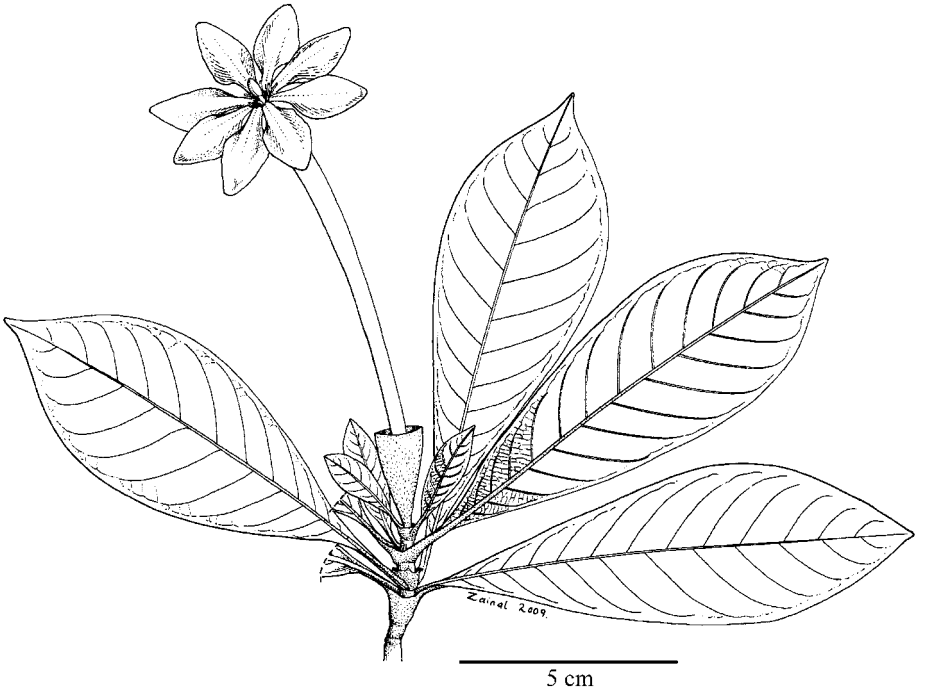

FIG. 3. Leafy branch terminated by a solitary flower of *Gardenia elata* var. *elata*, from *Ridsdale* SMHI 291 (K).

Proposed IUCN conservation status. Gardenia elata var. *elata* is a widespread taxon, and so the status Least Concern (LC) is appropriate. However, as regional forest conversion rates steadily increase, the status needs periodic reassessment.

Additional specimens examined. BUSUANGA. **Palawan Province**: ix 1922 (fr), *Ramos* BS 41218 (K, L); NE of Coron, 2 km north of San Nicolas, along Wayan Creek, 29 xi 1984 (fr), *Bourell* 2439 (A). CULION. **Palawan Province**: 29 iv 1931, *Herre* 1085 (A, fl; NY, fb, fl), iv 1931, *Herre* 1088 (A, st; NY, fr). LUZON. **Camarines Norte Province**: Paracale, xi–xii 1918 (fr), *Ramos* BS 33747 (A, NY, SING). **Laguna Province**: Dahican River, ix 1912 (fr), *Ramos* 1325 (A, L, NY, SING); San Antonio, ii 1913 (fr), *Ramos* BS 20508 (US). **Tayabas Province**: v–vi 1916 (fr), *Cailipan* FB 25640 (K, US), v–vi 1916 (fr), *Cailipan* FB 25658 (A, NY); Lucban, v 1907 (fr), *Elmer* 7732 (A). MINDANAO. Zamboanga, ii 1908 (fl), *Whitford & Hutchinson* FB 9492 (K, NY, US). PALAWAN. **Palawan Province**: ii–iii 1920 (fr), *Cenabre, Baldemor & Aduviso* FB 27899 (A), ii 1920 (st), *Cenabre, Paras & Gellidon* FB 27923 (A), viii 1913 (fr), *Escritor* BS 21566 (US), v 1913 (fb, fr), *Merrill* 1360 (A, NY, SING); St. Paul's Bay Cabayngan village, 7 v 1984 (st), *Ridsdale* SMHI 1615A (L). **Bataraza municipality**: Sumbiling, Sitio Gamayon, Bulanjao Range [8°33′N, 117°24′E], 50 m, 21 iii 1995 (fr), *Soejarto & Madulid* 9030 (A, PNH). **Puerto Princesa municipality**: Irawan, Impapai hills above BFD Field Station [9°51′N, 118°37′E], 300 m, 26 vi 1992 (fb, fl), *Soejarto & Fernando* 7750 (K, NY); Irawan River valley head, 150 m, 19 iii 1984 (fb), *Ridsdale* SMHI 145 (A, BO, K, KEP, L); Irawan River valley head, lower slopes of Mt Beaufort, 150 m, 30 iii 1984 (fb, fl), *Ridsdale* SMHI 291 (A, BO, K, L, SAN); Irawan River Valley, Tatanarom, road to Benguet mine, Mt Beaufort [9°50′N, 118°40′E], 150 m, 16 vii 1988 (fr), *Soejarto & Madulid* 6066 (NY, SING, US); Mt Bonton, 6 ix 1994 (st), *Majaducon* 8499 (L); Mt Pulgar, iv 1911, *Elmer* 13064 (K, fb, fr; A, L, fl, fr; NY, US, fl). **Sofronio Espanola municipality**: Pulot, Massin River, 12 km N. Brooks Point, lowland forest on ultrabasic, *Gymnostoma*-dominated, 23 x 1985 (fr), *Ridsdale* 998 (A, L). **Taytay municipality**: v 1913 (fl), *Merrill* 1279 (A, NY, SING); Bambanan, Mt Capoas, 90 m, 14 vi 1993 (fr), *Reynoso, Alvarez & Fuentes* PPI 11269 (L); Lake Manguao (Danao), valley of stream leading into NNW bay of lake, 60–80 m, 7 iv 1984 (fr), *Ridsdale* SMHI 357 (A, BO, KEP, L, SAN), 7 iv 1984 (fb, fr), *Podzorski* SMHI 767 (A, L, SAN); island on Lake Manguao, c.10 km SE of Taytay town [10°50′N, 119°33′E], 20–100 m, 30 i 1991 (fr), *Soejarto & Fernando* 7419 (A, PNH). PANAY. **Capiz Province**: x–xi 1925 (fr), *Edano* BS 46123 (A, BO, NY, SING). SIBUYAN. **Romblon Province**: Magallanes, Mt Giting-Giting, iii 1910, *Elmer* 12103 (K, fb; A, fb, fl; BO, NY, US, fl). TAWI-TAWI. **Tawi-Tawi Province**: vii–viii 1924 (fr), *Ramos & Edano* BS 44127 (A, NY, SING, US).

Flowering material from Palawan and south Mindanao appears to have corollas with shorter lobes (1.9–2.6 cm long) and also a tendency towards shorter tubes (5.7–8.5 cm long); elsewhere in the Philippines, the flowering material available has longer corolla lobes (3.2–4.1 cm) and longer corolla tubes (6.8–11.6 cm). The significance of this cannot be ascertained without further specimens, preferably in conjunction with field studies.

Elmer (1912) has used the name '*G. glutinosa*' which is problematic. *Gardenia glutinosa* Teijsm. & Binn., Cat. Hort. Bot. Bogor 119 (1866), is an invalid name as it was listed without a description, diagnosis or illustration (*nomen nudum*) (see Article 32.1 of the Vienna Code: McNeill *et al.*, 2006). It does not seem to refer to *Gardenia elata*. In the original publication, this name was simply listed as '*G. glutinosa T. et B.* —— *5* —— *Bima*'. 'Bima' almost certainly stands for Burma. Although there is a locality on

Sumbawa island named Bima, Teysmann did not go to Sumbawa until 1873 (van Steenis-Kruseman, 1950) and in his catalogue he used names of islands and countries to indicate origin, not smaller localities. The following specimens that Teysmann had attributed to *G. glutinosa* are instead identifiable as *G. tubifera* Wall. ex Roxb.: *Maingay* 838, Malaya (A, L), *Teysmann* s.n., Birma, 'Herb. Miquel' (K), *Teysmann*, 1868, Java (NY), *sine coll*., 'Herbarium of the late East India Company No. 2816' (A, L), *sine coll*., 'Herb. Hort. Bot. Calcuttensis, HK. 1747' (K), *sine coll*., 'H. Zollinger inter javanicum secundum, No. 3647.1. ex Bima' (K), *sine coll*., 'Zollinger Iter javanicum secundum II No. 3647' (A).

2b. Gardenia elata var. **longipedicellata** K.M.Wong, Gard. Bull. Singapore 61: 115 (2009). – Type: Philippines, Luzon, Cagayan Province, v 1921 (fl), *Ponce* FB 28435 (holo A, 2 sheets; iso US). **Fig. 4.**

Gardenia elata var. *longipedicellata* is recorded as a tree about 15 m high. It shares much similarity with the typical variety, differing only by its longer (7–10 mm) flower pedicel compared with those of *Gardenia elata* var. *elata* (only (1–)3–5 mm).

Distribution. Endemic to the Philippines, known only from Luzon.

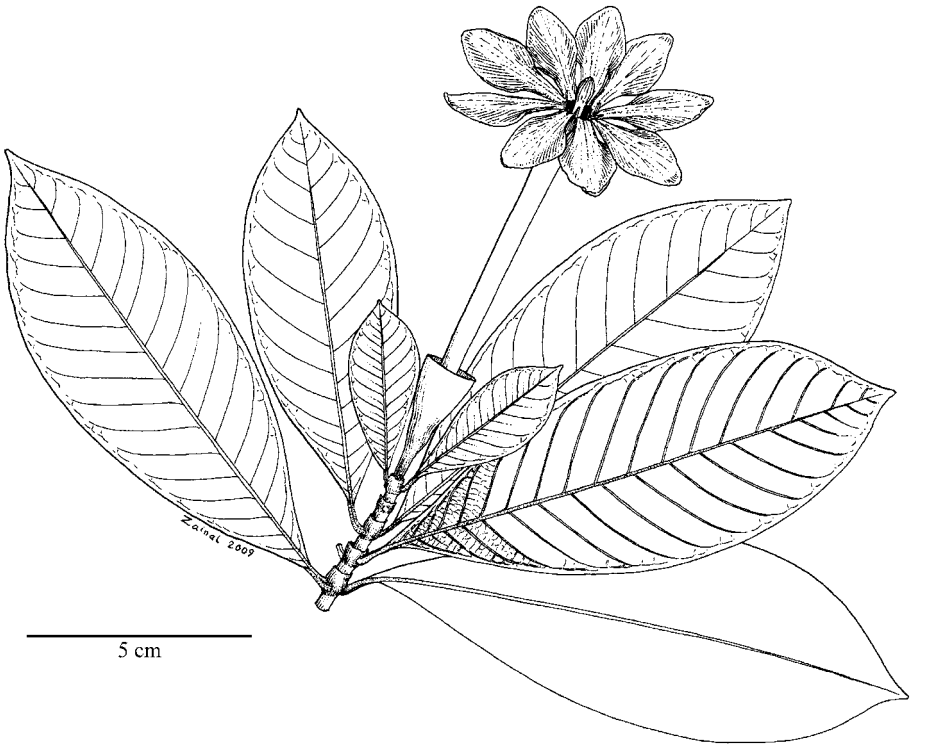

FIG. 4. Flowering leafy branch of *Gardenia elata* var. *longipedicellata* K.M.Wong, from *Bernardo* FB 15478 (L).

Habitat and ecology. Primary lowland forests, including on ultramafic soils.

Proposed IUCN conservation status. Vulnerable due to very few documented, small or restricted populations (VU D2).

Additional specimens examined. LUZON. **Cagayan Province**: i–v 1915 (fl, fr), *Velasco* FB 24116 (US). **Isabela Province**: iii 1910 (fl), *Bernardo* FB 15478 (L); Kapuntian, San Jose, San Mariano [16°59.7′N, 122°2.3′E], 400 m, 12 vii 1994 (fr), *Barbon, Romero & Fuentes* PPI 13137 (L); Palanan, Digallorin, Divinisa camp site, forest on ultrabasic [16°30′N, 122°26′E], 50 m, 10 iv 1992 (fb), *Ridsdale, Baquiran et al.* ISU 479 (A, BO, K, L). **Rizal Province**: ii 1905 (fr), *Ahern's Collector* FB 2673 (NY, SING, US); v 1907 (fl), *Ramos* BS 2689 (US).

3. Gardenia mutabilis Reinw. ex Blume, Bijdr. Fl. Ned. Ind. 16: 1016 (1827); Koorders, Versl. Minahasa 494 (1898); Koorders-Schumacher, Syst. Verz. III Abteilung 120 (1914); Koorders, Suppl. Fl. Celebes 3: 59, pl. 124 (1922). – Type: Celebes, *Reinwardt* 1567 (holo L). **Fig. 5.**

Gardenia ramosii Merr., Philipp. J. Sci. 29: 489 (1926). – Type: Philippines, Bohol, Kalingohan, viii–x 1923, *Ramos* BS 43323 (lecto A, designated here, fl; isolecto US, fb, fr).

Tree, to 5 m high. *Bark* smooth to scaly, very pale yellowish brown. *Stipules* connate into a cylindrical tube, often to 1–1.5 cm long, apex weakly 2-lobed to subtruncate or (rarely) slightly cleft on one side, outside puberulent and often coated with resin. *Petiole* 7–15 mm long, 1–1.5 mm thick. *Leaf* lamina obovate to elliptic, (5–)9–15 × (2–)2.5–5 cm; base cuneate; apex acute to obtuse, tip pointed to short-cuspidate; subcoriaceous; midrib flat and minutely puberulent on upper side, prominent and puberulent on lower side; secondary veins 8–12 pairs, flat and sparsely minutely puberulent on upper side, prominent and sparsely puberulent on lower side, vein axils on the lower side pubescent; tertiary venation scalariform. *Flowers* solitary. *Pedicels* 1.5–2 mm long and c.1 mm thick in open flowers, 1.5–2 mm long and c.2.5 mm thick at fruit maturity. *Calyx* obconic-cupular to tubular, tightly sheathing the corolla tube, the margin subtruncate, 10–17 mm long, 1.5–2 mm wide at the base, 2.5–3 mm wide at the apex; outside puberulent; without marginal lobes or ribs or keels. *Corolla* hypocrateriform; tube to 6.5–7.5 cm long, 2–2.5 mm wide at the mid-portion, 3.5–4.5 mm wide at the throat, outside minutely puberulent; lobes 7–8, oblanceolate to obovate, (2.5–)2.9–3.2 × 0.7–1 cm, contorted to the left in bud, glabrous on both sides. *Stamens* 7–8, inserted between corolla lobes just below the throat, dorsifixed; filaments very short to inconspicuous; anthers 7–10 mm long, only 1–2 mm exserted. *Style* glabrous; stigma club-like, 3.5–4 mm long, c.3 mm wide, wholly exserted. *Fruits* subglobose, 2.3–2.7 × 2–2.5 cm, when mature with a rugose surface and the epidermis flaking off as a thin, pale grey-brown layer. *Seeds* many, embedded in a pulp-like placenta, irregularly angular-rounded, flattened, 2–2.5 mm across, testa surface fine-areolate.

Distribution. South Philippines to Sulawesi. In the Philippines, so far recorded only from Bohol and Samar (Fig. 6).

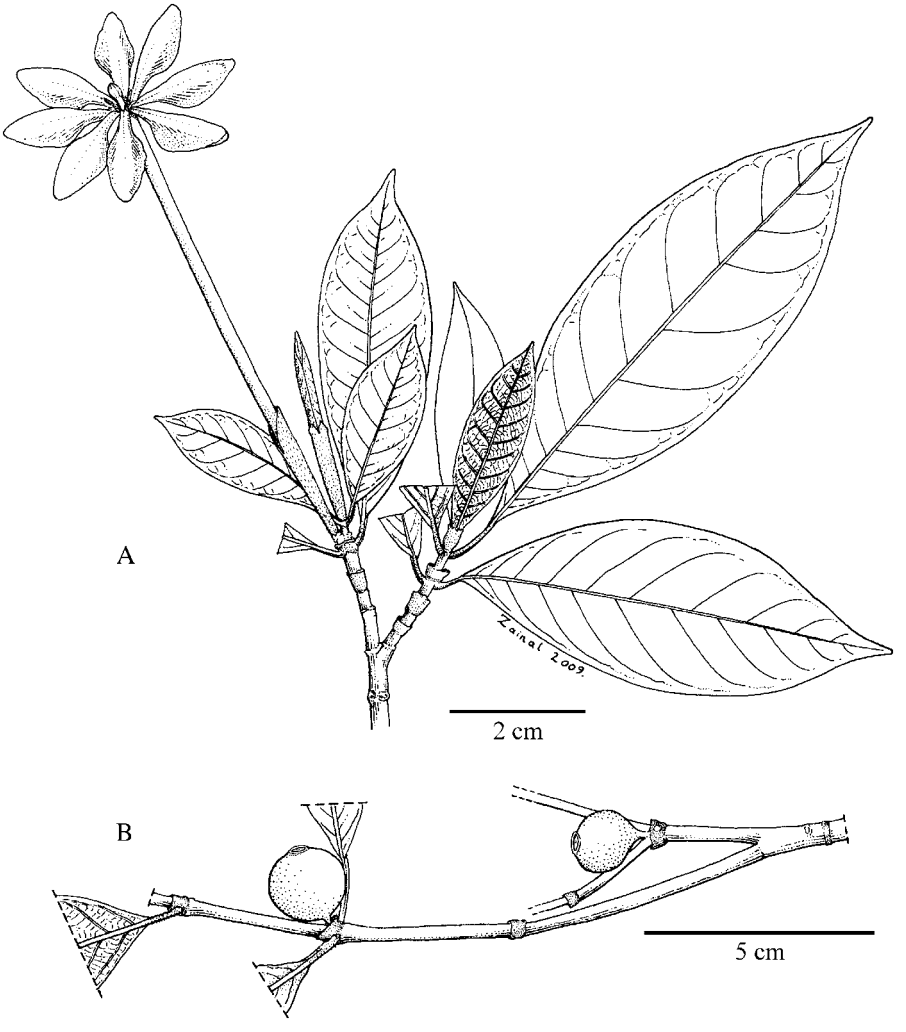

FIG. 5. *Gardenia mutabilis* Reinw. ex Blume. A, leafy branch terminated by a solitary flower, and a side shoot with sheathing stipule enveloping emerging leaves; B, fruits terminating two orders of leafy branches. A from *Madulid et al.* PPI 7705 (KEP); B from *Barbon et al.* PPI 5922 (K).

Habitat and ecology. Primary lowland forests and vegetation on limestone.

Proposed IUCN conservation status. Vulnerable due to very few known, small or restricted populations (VU D2).

Additional specimens examined. BOHOL. **Bohol Province**: viii 1923 (fr), *Ramos* BS 43283 (A, US); Logarita, Bilar, limestone [9°42.5′N, 124°6.4′E], 22 v 1993, *Madulid, Reynoso et al.* PPI 7705 (BO, fl, fr; K, PNH, fb, fr; KEP, fl). SAMAR. **Samar Province**: Wispal, Basey, 5 ii 1992 (fr), *Barbon, Garcia & Sagcal* PPI 5922 (K).

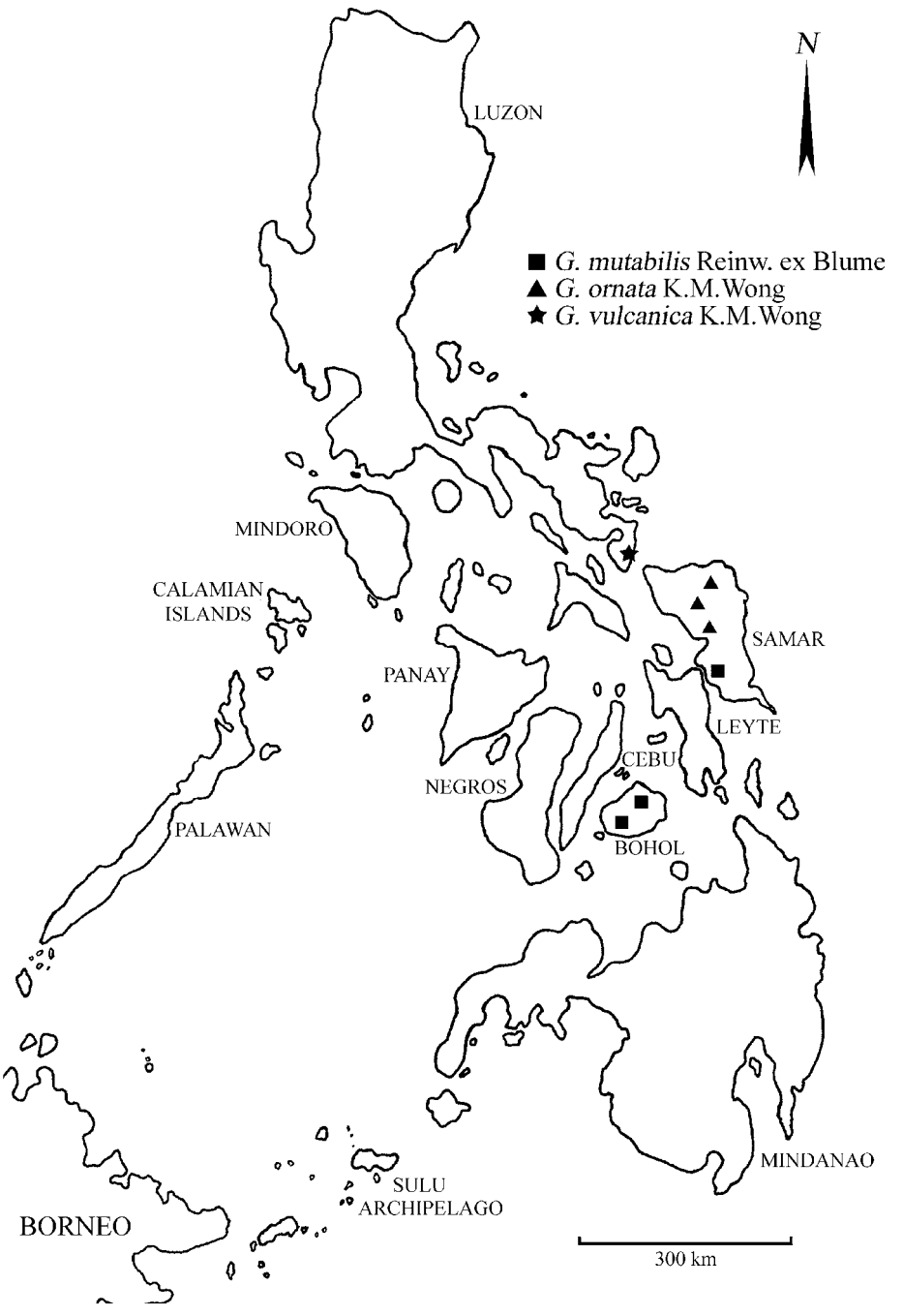

FIG. 6. Distribution of *Gardenia mutabilis*, *G. ornata* and *G. vulcanica* in the Philippines.

The leaves characteristically dry a dark colour with its fine secondary and higher-order veins submersed in the blade tissue, features that are rare in other species. A pencil tracing of a specimen (kept at A) made from a cultivated plant (V.D.60 acc. 11 xi 1912) in the Hortus Bogoriensis (Bogor Botanical Garden), obtained by Merrill from the Berlin Herbarium and correctly identified as *Gardenia mutabilis*, shows a corolla tube 12.8 cm long. This is longer than in Philippine material known so far, but such tube lengths are known in cultivated specimens in Southeast Asia, for example *Low* s.n., 13 vi 2005, Peninsular Malaysia, cult. Rimba Ilmu Botanic Garden (KLU). In the Philippine and Sulawesi material, as well as cultivated material, the open flowers have styles protruding conspicuously from the corolla mouth, by as much as 1 cm, so that the stigma is more noticeably exserted than in other west Malesian or Philippine species.

4. Gardenia ornata K.M.Wong, **sp. nov. Fig. 7.**

Gardeniae subcarinatae (Corner) Y.W.Low similis sed tubis calycis supra 10–12 mm in diam. et marginibus recurvatis nervisque secundariis foliorum paribus 14–21 differt. – Type: Philippines, Samar, Central Samar, Paranas, Campo Uno, rolling mountain/limestone, primary forest [11°58.2′N, 124°43′E], 400 m, 1 v 1996 (fr), *Reynoso & Majaducon* PPI 24052 (holo A; iso K, PNH).

Tree, to 10 m high or more, trunk diameter to 35 cm or more. *Bark* smooth, yellowish grey to pale brown. *Stipules* connate into a cylindrical tube, often 1–1.5 cm long, apex weakly 2-lobed to subtruncate or (rarely) slightly cleft on one side, outside puberulent and sometimes coated with resin. *Petiole* 3.5–9 mm long, 1–1.5 mm thick. *Leaf* lamina elliptic to slightly obovate, 6.3–12 × 2.1–5 cm; base cuneate; apex acute to obtuse, tip pointed to short-cuspidate; subcoriaceous; midrib flat to sunken and glabrous on upper side, prominent and puberulent on lower side; secondary veins 14–21 pairs, flat and glabrous on upper side, prominent and puberulent on lower side, vein axils on the lower side pubescent; tertiary venation scalariform. *Flowers* solitary. *Pedicels* c.1.5 mm long and 1.5–2 mm thick in very young fruits, c.2 mm long and 3.5 mm thick in the older woody fruit. *Calyx* obconical, much flared upwards; 11–12 mm long, 3–3.5 mm wide at the base, 10–12 mm wide at the apex; outside minutely puberulent at the base, upper part glabrous; margin subtruncate with 8–9 lobes, triangular to rounded, 1–1.5 mm high, slightly folded and recurved; with 8–9 narrow keels 1.5–2.5 mm wide, broadening upwards from base to apex. *Corolla* not known. *Fruit* subglobose, to c.3.5 cm across, surface smooth.

Distribution. Endemic to the Philippines: known only from Samar (Fig. 6).

Habitat and ecology. Primary lowland forests, in areas with limestone.

Proposed IUCN conservation status. Vulnerable due to very few known, small or restricted populations (VU D2).

Additional specimens examined. SAMAR. **Northern Samar Province**: Catubig River, ii–iii 1916 (fr), *Ramos* BS 24401 (US); Mt Capotoan, Catubig River, 89 m, 20 ii 1916 (fr), *Sablaya* 109 (A).

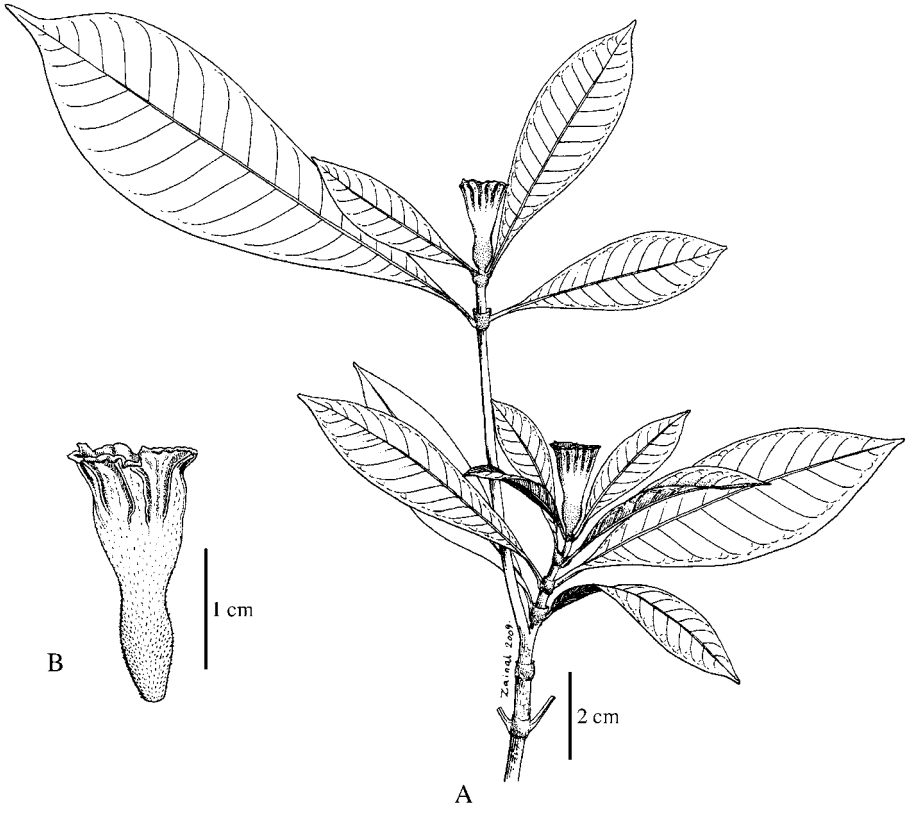

FIG. 7. *Gardenia ornata* K.M.Wong. A, leafy branches terminated by immature fruits; B, close-up of immature fruit crowned by its flared, keeled calyx tube with recurved margin. Both from *Reynoso & Majaducon* PPI 24052 (K).

This new species most closely resembles *Gardenia subcarinata* (Corner) Y.W.Low (Sumatra and Malay Peninsula) in its short, slightly flared calyx tubes with low keels. *Gardenia ornata* differs from the above species by its wider calyx tube (10–12 mm wide at the mouth), which has a recurved margin, and leaves with 14–21 pairs of secondary veins. *Gardenia subcarinata* has calyx tubes just 4–8 mm wide without a recurved margin and leaves with 7–12 pairs of secondary veins.

5. Gardenia vulcanica K.M.Wong, **sp. nov. Fig. 8.**

Gardeniae tubiferae Wall. similis, foliis infra nervis puberulis, calycis tubo margine parum recurvato lobis 1 vel 2 angustis 4–10 mm longis differt. – Type: Philippines, Luzon, Sorsogon, near Irosin, south side of Mt Bulasan, near lake [12°45′N, 124°5′E], 400 m, 9 iv 1987, *Burley* 120 (holo A, 2 sheets, fb, fl, fr; iso K, fl, fr; iso NY, fr).

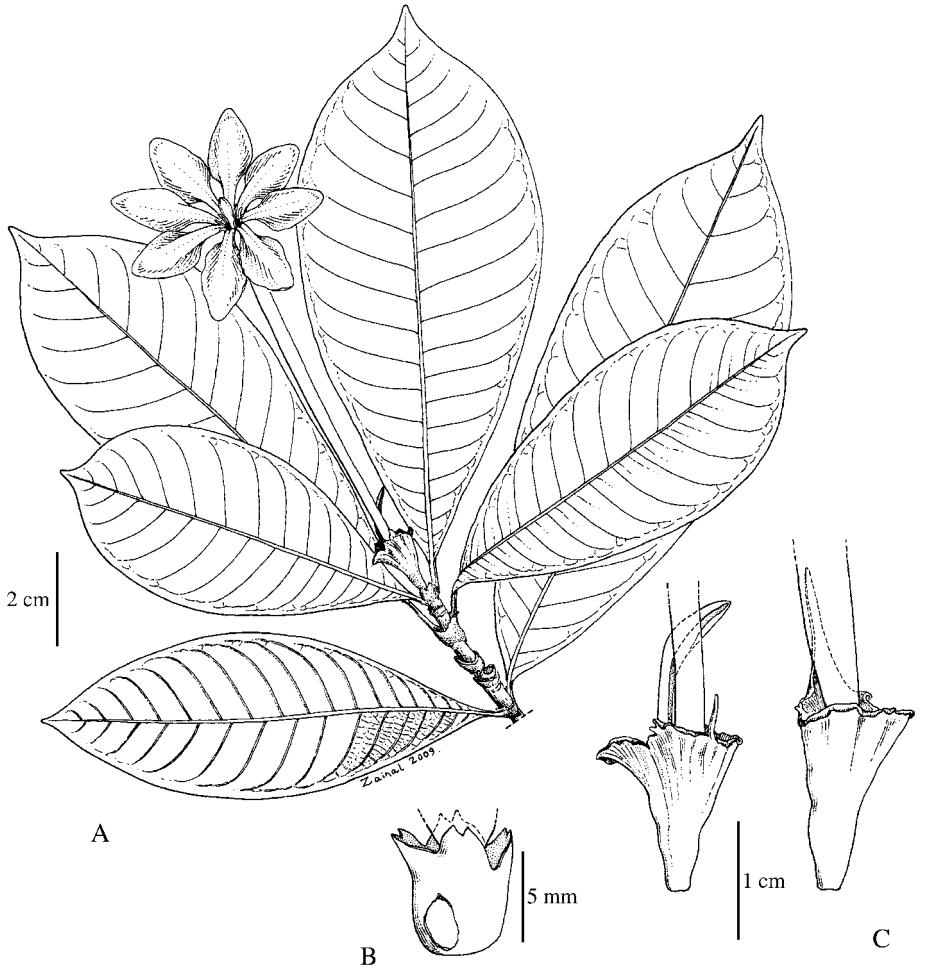

FIG. 8. *Gardenia vulcanica* K.M.Wong. A, flowering leafy branch; B, close-up of cupuliform stipule from a leafy node (petiolar scar shown at bottom left); C, close-up of two cupular-obconical calyces (note irregularly recurved tube margin and 1–2 narrowly prolonged lobes). A & B from *Burley* 120 (K); C from *Burley* 120 (K) (left) and *Stone et al.* 15900 (KEP).

Tree, to 5–6 m high or more. *Bark* smooth to slightly scaly, pale grey-brown. *Stipules* connate into a cylindrical tube, often to c.1 cm long, apex weakly 4-lobed to subtruncate or (rarely) slightly cleft on one side, outside puberulent and often coated with resin. *Petiole* 2–4 mm long, 1–1.5 mm thick. *Leaf* lamina obovate to elliptic, (5.5–)9–17.5 × (2.6–)3–5.4 cm; base cuneate; apex acute to obtuse, tip pointed to short-cuspidate; subcoriaceous; midrib slightly raised but grooved and glabrous on upper side, prominent and puberulent on lower side; secondary veins 11–23 pairs, flat and glabrous on upper side, prominent and puberulent on lower side, vein axils

on the lower side pubescent; tertiary venation scalariform. *Flowers* solitary. *Pedicels* 2–3 mm long and 1.5–2 mm thick in open flowers, reaching 3–5 mm long and 3–3.5 mm thick at fruit maturity. *Calyx* obconical, 8–9 mm long, 2–2.5 mm wide at the base, 8–9 mm wide at the apex; outside minutely puberulent; margin with irregular lobes or invagination and slightly recurved, including 1–2 narrowly prolonged lobes 4–10 mm long, without ribs or keels. *Corolla* hypocrateriform, cream turning light yellow-orange; tube 10–11 cm long, c.2.5 mm wide at the mid-portion, 7–8 mm wide at the throat, outside slightly puberulent to glabrous; lobes 8–9, oblanceolate to obovate, 2.4–2.6 × 1.2–1.4 cm, contorted to the left in bud, glabrous on both sides. *Stamens* 8–9, inserted between corolla lobes just below the throat, dorsifixed; filaments very short to inconspicuous; anthers 5–6 mm long, around half of its length exserted. *Style* glabrous; stigma club-like with 7–9 lobes, these initially coherent, c.3.5 mm long, 2.5–3.5 mm wide, wholly exserted. *Fruits* subglobose, to 3.8 cm across, surface smooth; portions of the calyx often persistent at fruit apex. *Seeds* many, embedded in a pulp-like placenta, irregularly angular-elliptic, flattened, 5–8 × 4.5–5.5 mm, testa surface fine-areolate.

Distribution. Endemic to the Philippines: known only from Luzon, in forest around the base of the volcanic Mt Bulusan (Fig. 6).

Habitat and ecology. Primary lowland forests.

Proposed IUCN conservation status. Vulnerable due to very few known, small or restricted populations (VU D2).

Additional specimens examined. LUZON. **Sorsogon Province**: Bulusan Volcano, ix 1915 (fr), *Ramos* BS 23682 (A, L, US); Mt Bulusan, Lake Bulusan, 400 m, 9 iv 1987 (fl), *Stone et al.* 15900 (KEP).

This species resembles *Gardenia tubifera* (Thailand, Malay Peninsula, Sumatra, Borneo) (Low & Wong, 2009) in its smooth calyx tube, but differs in its puberulent veins on the lower leaf surface and the slightly recurved calyx tube margin, which has one or two narrow, 4–10 mm long lobes. In contrast, *Gardenia tubifera* has glabrous lower leaf surfaces and the calyx margin is plane and entire.

DOUBTFUL NAME

Gardenia pseudopsidium (Blanco) Fern.-Vill., Novis. App. 109 (1880); Merrill, Bull. Bur. Forest. Philipp. Islands 1: 54 (1903); Elmer, Leafl. Philipp. Bot. 1: 5 (1906); Merrill, Sp. Blancoanae 363 (1918); Merrill, Enum. Philipp. Fl. Pl. 531 (1923). – *Sulipa pseudopsidium* Blanco, Fl. Filip. 497 (1837).

Blanco (1837) did not cite specimens in his description. Blanco's original (Spanish) description did not provide measurements of parts or an illustration and is very general, stating only:

Cor. cuatro veces mas larga que el caliz, bilabiada: el tubo delgado, la gargantua abierta, y el limbo grande con cinco lacinias; las dos mayores á un lado, y las tres menores al' otro.

[Corolla four times longer than the calyx, two-lipped: the tube slender, the throat widened, and the limb expanded with five lobes; these (with) two larger to one side, the other three smaller than the others.]

Merrill (1918) stated that 'There is no doubt as to the correctness of referring *Sulipa pseudopsidium* Blanco to *Gardenia* in spite of a few discrepancies in Blanco's description which were apparently due to faulty observations' and favoured associating this name with *G. barnesii*. These discrepancies are not minor and would include 'two-lipped' (which could be interpreted as the pressed open corolla appearing somewhat asymmetric) and the corolla 'limb with five lobes' (in contrast, *Gardenia barnesii* has 6–9 corolla lobes). Merrill could have been led to associate the Tagalog name given by Blanco (*Malabayabas*) with *Gardenia* but he did not explain how else he identified Blanco's taxon. *Malabayabas* is also applied to *Tristaniopsis* (Myrtaceae) (e.g. Eala, 1975) and Merrill (1903) himself documented this name being applied to *Dysoxylum* (Meliaceae), *Eugenia* (Myrtaceae) and two different genera in the Rubiaceae.

As the Blanco description of *Sulipa pseudopsidium* does not fully correspond to the corolla structure of *Gardenia barnesii*, and no other specific evidence links it with certainty to that species, it should be considered a *nomen dubium*. The specimens selected by Merrill (Species Blancoanae No. 655: A, NY, US: all leafy twigs with neither flower nor fruit material) to represent what he thought Blanco's name referred to cannot be considered evidence in view of his interpretation being suspect.

Excluded and Unplaced Names

Gardenia acutifolia Elmer, Leafl. Philipp. Bot. 1: 6 (1906), is *Villaria acutifolia* (Elmer) Merr., Philipp. J. Sci. C. 5: 248 (1910); Merrill, Enum. Philipp. Fl. Pl. 532 (1923).

Gardenia curranii Merr., Sp. Blancoanae 363 (1918); Merrill, Enum. Philipp. Fl. Pl. 530 (1923), is *Ceriscoides curranii* (Merr.) Tirveng., Nordic J. Bot. 3: 456 (1983).

Gardenia elliptica Elmer, Leafl. Philipp. Bot. 1: 6 (1906), is *Villaria philippinensis* Rolfe, J. Linn. Soc., Bot. 21: 311 (1884). According to Alejandro *et al.* (2008), *Villaria philippinensis* is the correct name for both *V. littoralis* Vidal and *V. odorata* (Blanco) Merr.

Gardenia lagunensis Merr., Philipp. J. Sci. C. 10: 110 (1915); Merrill, Enum. Philipp. Fl. Pl. 530 (1923), is a member of the *Rothmannia* complex, requiring further elucidation (Pereira, pers. comm.).

Gardenia merrillii Elmer, Leafl. Philipp. Bot. 1: 5 (1906); Merrill, Enum. Philipp. Fl. Pl. 530 (1923), is a member of the *Rothmannia* complex, requiring further elucidation (Pereira, pers. comm.).

Gardenia morindifolia Elmer, Leafl. Philipp. Bot. 1: 67 (1906); Merrill, Enum. Philipp. Fl. Pl. 530 (1923), is *Vidalasia morindifolia* (Elmer) Tirveng., Biogeographica (The Hague) 74: 166 (1998).

Gardenia negrosensis Merr., Philipp. J. Sci. C. 10: 111 (1915); Merrill, Enum. Philipp. Fl. Pl. 530 (1923), is a member of the *Rothmannia* complex, requiring further elucidation (Pereira, pers. comm.).

Gardenia obscura (Blanco) S.Vidal, Phan. Cuming. Philipp. 18, 119 (1885), based on *Remijia obscura* Blanco, Fl. Filip., ed. 2: 116 (1845), ed. 3, 1: 207 (1877), is *Villaria glomerata* (Bartl. ex DC.) Mulyan. & Ridsdale, Reinwardtia 12: 195 (2004).

Gardenia obscurinervia Merr., Philipp. J. Sci. C. 11: 32 (1916); Merrill, Enum. Philipp. Fl. Pl. 531 (1923), is *Sulitia obscurinervia* (Merr.) Ridsdale, Blumea 25: 301 (1979). Wong (2004) has explained why *Sulitia* should not be congeneric with *Atractocarpus* Schltr. & K.Krause, resulting in *Atractocarpus obscurinervius* (Merr.) Puttock, Austral. Syst. Bot. 12: 304 (1999) also being a synonym.

Gardenia pinnata (Blanco) Merr., Philipp. Gov. Lab. Bur. Bull. 27: 53 (1905), based on *Serissa pinnata* Blanco, Fl. Filip. 163 (1837), is *Villaria glomerata* (Bartl. ex DC.) Mulyan. & Ridsdale, Reinwardtia 12: 195 (2004).

Gardenia pubifolia Merr., Philipp. J. Sci. C. 10: 112 (1915); Merrill, Enum. Philipp. Fl. Pl. 531 (1923), described as having 'cymes in the uppermost axils among the crowded leaves' and 'corolla tube 6 mm long' cannot refer to a *Gardenia*, which would have terminal and typically solitary flowers much larger than this. The type, *Wester* BS 19343, Mindanao, Davao, Mati, 10 viii 1912, is at US and has only leafy twigs; the ovate stipules that are connate to less than halfway and non-resinous buds are clearly not of *Gardenia*.

Gardenia whitfordii Elmer, Leafl. Philipp. Bot. 1: 4 (1906) and *Randia whitfordii* (Elmer) Merr., Philipp. J. Sci. 1: Suppl. 130 (1906); Merrill, Philipp. J. Sci. C. 3: 437 (1908); Elmer, Leafl. Philipp. Bot. 3: 1004 (1911), 5: 1895 (1913); Merrill, Enum. Philipp. Fl. Pl. 529 (1923), are *Discospermum whitfordii* (Elmer) S.J.Ali & Robbrecht, Blumea 35: 301 (1991).

Gardenia carinata sensu Fern.-Vill., Novis. App. 109 (1880), non Wall. ex Roxb., Fl. Ind. ed. Carey & Wall. 2: 560 (1824), has not been traced to any specimen, although the locality was stated as 'in oppido Talisay, provinc. Batangas (Luzon)'. This could well refer to *Gardenia barnesii*, which is the only Philippine species with well-developed calyx keels.

Gardenia thunbergia sensu Fern.-Vill., Novis. App. 109 (1880), non L.f. (1781), is probably *Voacanga globosa* (Blanco) Merr., Sp. Blancoanae 384 (1918).

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