

ADDITIONAL NOTES ON THE GENUS *GMELINA*. V

Harold N. Moldenke

GMELINA L.

Additional & corrected bibliography: Duthie in Strachey, Cat. Pl. Kumaon 138. 1906; Deb, Fl. Tripura 1: 16 & 18. 1981; Elias in Bentley & Elias, Biol. Nectaries 197 & 246. 1983; Mold., Phytologia 56: 102--126. 1984.

The *J. R. Drummond* 26698, distributed as *Gmelina* sp., actually is *Clerodendrum aculeatum* (L.) Schlecht.

GMELINA ARBOREA Roxb.

Additional & corrected bibliography: Duthie in Strachey, Cat. Pl. Kumaon 138. 1906; Deb, Fl. Tripura 1: 16 & 18. 1981; Mold., Phytologia 56: 102, 108, 125, & 126. 1984.

Thanks to the kindness of my good friend and colleague, Dr. George M. Hocking, I am able to record that Bhattacharjee & Das (1969) have reported the presence of alkaloids in the leaves of this species. Also, the correct spelling for two words inadvertently misspelled in a previous paper in this series is "Ayurvedic" and "anasarca". He also informs me that "I have read that the trunk diameter [of this species] increases to 0.4 m. in 5 years, thus showing twice the growth rate of southern pine."

GMELINA ASIATICA L.

Additional bibliography: Elias in Bentley & Elias, Biol. Nectaries 197 & 246. 1983; Mold., Phytologia 56: 102, 105, 108, 125, & 126. 1984.

GMELINA ELLIPTICA J. E. Sm.

Additional bibliography: Mold., Phytologia 56: 102--106. 1984.

Additional citations: GREATER SUNDA ISLANDS: Sumatra: *Lörzing* 11192 (Bz--21242).

GMELINA HAINANENSIS Oliv.

Additional bibliography: Mold., Phytologia 56: 107--109. 1984.

The "*Liang* 65341" cited by me in a previous paper in this series is an unintentional typographic error for "*Liang* 65340".

GMELINA MOLUCCANA var. *ELLIPTICA* (Mold.) Mold.

Bibliography: Anon., Biol. Abstr. 50 (12): B.A.S.I.C. S.84. 1969; Mold., Biol. Abstr. 50: 6338. 1969; Mold., Phytologia 18: 71. 1969; Anon., Biol. Abstr. 51 (17): B.A.S.I.C. S.89. 1970; Hocking, Excerpt. Bot. A.15: 422. 1970; Mold., Biol. Abstr. 51: 9630. 1970; Mold., Excerpt. Bot. A.18: 445. 1971; Mold., Fifth Summ. 1: 340 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 330 & 549. 1980; Mold., Phytologia 56: 126. 1984.

This variety differs from the typical form of the species in having its leaf-blades regularly broadly elliptic, narrowed to a dis-

tinctly acute base.

The variety is based on an unnumbered *R. Teona* collection from a primary forest on a hillside 190 feet above sealevel along the Kolokofa river, on northwestern Ysabel island, Solomon Islands, collected on April 6, 1966, and deposited in the United States National Herbarium in Washington. The collector describes the plant as a tree, 60 feet tall, with a trunk girth of 4 feet, the bole straight, buttresses present, thick and equal, to about 2 feet wide, the bark surface light-brown, fawn-color inside, flecked with light-brown outside, pink inside.

Citations: SOLOMON ISLANDS: Ysabel: *Teona* s.n. [Herb. Brit. Sol. Isls. Prot. 6371] (Ld--photo of type, W--2578238--type).

GMELINA MOLUCCANA f. *GLABRESCENS* (Mold.) Mold., *Phytologia* 19: 439. 1970.

Synonymy: *Gmelina salomonensis* f. *glabrescens* Mold., *Phytologia* 4: 178. 1953.

Bibliography: C. T. White, *Journ. Arnold Arb.* 31: 113. 1950; Mold., *Biol. Abstr.* 27: 2026. 1953; Mold., *Phytologia* 4: 178. 1953; Mold., *Résumé* 204 & 456. 1959; Mold., *Biol. Abstr.* 51: 9630. 1970; Mold., *Phytologia* 19: 439. 1970; Mold., *Excerpt. Bot. A.* 18: 445. 1971; Mold., *Fifth Summ.* 1: 340 (1971) and 2: 524 & 880. 1971; Mold., *Phytol. Mem.* 2: 330 & 549. 1980; Mold., *Phytologia* 55: 335 (1984) and 56: 124 & 125. 1984.

This form differs from the typical form of the species in having the branchlets, peduncles, inflorescence-branches, pedicels, and lower leaf-surfaces glabrous or subglabrous.

The form is based on *Kajewski* 2228 from the seashore at Buin, Karngu, Bougainville island, in the Solomon Islands, collected on October 10, 1930, deposited in the Herbarium Bogoriense at Buitenzorg, Java. It is quite possible that the *Walker & White* 169 & 257, from New Georgia and San Cristoval islands, cited by White (1950) as *G. salomonensis* may represent the present taxon since he refers to the "adult leaves being glabrous or the young and half-grown leaves having [only] a slight pubescence on the midrib and main lateral nerves on the lower surface."

Citations: SOLOMON ISLANDS: Bougainville: *Kajewski* 2228 (Bi--isotype, Bz--21336--type, Ld--photo of type, N--isotype, N--photo of type).

GMELINA MOLUCCANA f. *GLANDULOSA* (H. Hallier) Mold., *Phytologia* 56: 121. 1984.

Synonymy: *Gmelina glandulosa* H. Hallier, *Meded. Rijks Herb. Leid.* 37: 57. 1918.

It seems most doubtful to me that this taxon is distinct from the typical form of *G. moluccana* (Blume) Backer since Blume (1826), in his original description of the species, definitely speaks of "infra puberulis basique glandulosis".

GMELINA NEOCALEDONICA S. Moore, *Journ. Linn. Soc. Lond. Bot.* 45: 375--376. 1921.

Synonymy: *Gmelina neo-caledonica* S. Moore ex Mold., *Résumé Suppl.*

3: 32 in syn. 1962.

Bibliography: S. Moore, Journ. Linn. Soc. Lond. Bot. 45: 375--376. 1921; A. W. Hill, Ind. Kew. Suppl. 7: 104. 1929; Fedde & Schust./ Justs Bot. Jahresber. 53 (1): 1074. 1932; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 68 & 93 (1942) and ed. 2, 151 & 186. 1949; Mold., Résumé 205 & 456. 1959; Mold., Résumé Suppl. 3: 32. 1962; Mold., Fifth Summ. 1: 341 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 331 & 549. 1980; Mold., Phytologia 55: 333. 1984.

A large shrub, 2--3 m. tall, or small tree, to 8 m. tall; branchlets stout, the leafy tips minutely fulvous-tomentose, finally glabrescent, the bark loose, gray, longitudinally coarsely striate; leaves decussate-opposite, petiolate; leaf-blades coriaceous, ovate or rarely suborbicular, 12--17 cm. long, 8--14.5 cm. wide, apically obtuse or very obtuse, marginally slightly revolute, basally obtuse or rounded, shiny dark-green and glabrous above, pale gray-green beneath, very minutely white- or pale brownish-farinose beneath; inflorescence terminal, cymose-paniculate, oblong, 10 cm. long, densely flowered, fulvous-tomentose throughout; calyx campanulate, 6.5 mm. long, externally densely fulvous-tomentose, the rim 5-dentate; corolla white, with 2 yellow blotches on the lower lip,, externally densely fulvous-tomentose, the tube infundibular, 9 mm. long, the limb bilabiate, the posterior lobes oblong-ovate, longer than the similar suborbicular anterior lobe; stamens subincluded; style short-exserted, rather thick, subglabrous; stigma bilobed, the posterior lobe tooth-like and much shorter than the anterior one; ovary ovoid, 2 mm. long. apically setulose, 4-locular; ovules subapically pendent.

The species is based on *Compton 2858* from a riverside in a *Calitris* forest, at 200 feet altitude, on serpentine soil, at Comboui, New Caledonia.

This is the first of the two known New Caledonian species of *Gmelina* and, according to Moore (1921) "is very different from its congeners". Recent collectors have encountered it in mesophytic forests on serpentine hillsides, at 200--600 m. altitude, in flower in November.

Citations: NEW CALEDONIA: *Franc 1512* (Ca--390509, N, N), 1998 (N); *Guillaumin & Baumann-Bodenheim 13234* (N); *Hurlimann 755* (N); *McKee 3484* (Go, W--2210294).

GMELINA OBLONGIFOLIA Roxb., Hort. Beng., imp. 1, [95]. 1814; Fl. Ind., ed. 2, imp. 1, 3: 83. 1832.

Bibliography: Roxb., Hort. Beng., imp., 1, [95]. 1814; Roxb., Fl. Indica, ed. 2, imp. 1, 3: 83--84. 1832; Voigt, Hort. Suburb. Calcut. 473. 1845; Walp., Repert. Bot. Syst. 4: 98. 1845; Schau. in A. DC., Prodr. 11: 679--680. 1847; Buek, Gen. Spec. Syn. Candol. 3: 200. 1858; Roxb., Fl. Indica, ed. 2, imp. 2, 485--486. 1874; C. B. Clarke in Hook. f., Fl. Brit. India 4: 582--583. 1885; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 173. 1895; Gamble, Man. Indian Timb., ed. 2, imp. 1, 537 & 778. 1902; Brandis, Indian Trees, imp. 1 & 2, 502 & 509 (1906) ad imp. 3, 502 & 509. 1911; H. Hallier, Meded. Rijks Herb. Leid. 37: 56. 1918; Gamble, Man. Indian Timb., ed. 2, imp. 2, 537 & 778. 1922; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 54 &

93 (1942) and ed. 2, 125, 127, & 186. 1949; Mold., Résumé 159, 163, & 456. 1959; Brandis, Indian Trees, imp. 5, 502 & 509. 1971; Mold., Fifth Summ. 1: 268 & 276 (1971) and 2: 880. 1971; Roxb., Fl. Indica, ed. 2, imp. 3, 485--486. 1971; Gamble, Man. Indian Timb., ed. 2, imp. 3, 537 & 778. 1972; Mold., Phytol. Mem. 2: 263, 270, & 549. 1980; Roxb., Hort. Beng., imp. 2, [95]. 1980.

A tall, slow-growing timber tree, to 10 m. tall at 14 years; trunk straight, the bole 4--5 m. to the first branch, to about 45 cm. in circumference at breast height (at 14 years of age); bark ash-colored, somewhat cracked; branches ascending; young branchlets somewhat tetragonal; leaves decussate-opposite, petiolate, exstipulate; petioles about 5 cm. long, canaliculate above, with several glands close to the apex; leaf-blades oval or ovate to oblong, 15--31 cm. long, 7.5--21 cm. wide, apically subobtuse, marginally entire, rather rough, with a concave glandular impression on each side of the base of the midrib; inflorescence terminal, paniculate, solitary, broadly ovate in outline, its branches decussate-opposite, tetragonal, brownish-farinose; bracts small, very early caducous; flowers large, numerous, fragrant; calyx cyathiform, externally farinose and with a few glands, the rim truncate and entire; corolla rosy, irregular, its tube short, curvate, the throat obliquely campanulate, the limb 5-parted, 2-lipped, the lower lip longer, with a deep-yellow mark at the center of its base; anthers 2-locular; style equaling the stamens; stigma unequally 2-lobed; ovary superior, turbinate, externally glabrous, 4-locular, each locule 1-ovulate; ovules attached slightly below their apex to the upper part of the placenta; fruit drupaceous, oblong, the size of a large olive, somewhat tetragonal and apically obtuse, externally smooth and shiny, bright-crimson when ripe, containing a single pyrene which is clavate, tetragonal, 4-locular, perforated centrally from the base; seeds solitary, lanceolate; endosperm absent; embryo erect; cotyledons conforming to the seed in size and shape; radicle small, inferior.

Roxburgh (1832) states that "the seed ripens in August and September" and that the species is "a native of the eastern parts of Bengal [Bangladesh]; flowering in March and April." Clarke (1885) asserts that the description "indicates a remarkable tree that no one else has seen. There is at Kew an unpublished drawing of Roxburgh's of this tree, agreeing exactly with the description."

Hallier (1918) comments: "Seine *Gm. oblongifolia* hat Roxburgh nach einem Exemplar des botan. Gartens zu Calcutta beschrieben. Da sie nach Clarke ein ansehnlicher Baum ist, 'that no one else has seen', so lag die Vermuthung nahe, dass sie nicht, wie Roxburgh angiebt, von Ostbengalen stammt.. Sondern mit der Art von Ambon [*G. moluccana* (Blume Backer)] zusammenfällt. Von dieser unterscheidet sie sich jedoch durch 'leaves somewhat rough', 'flowers large, rosy' und einen 'calyx entire'. Die beiden Arten dürften also doch wohl verschieden sein."

Nothing is known to me about this taxon beyond what is stated in its bibliography.

GMELINA PALAWENSIS H. J. Lam, Verbenac. Malay. Arch. 224--225. 1919.

Synonymy: *Gmelina palawensis* H. J. Lam ex Kanehira, Fl. Micrones.

342. 1933. *Gmelina palauensis* H. J. Lam ex Mold., Fifth Summ. 1: 524 in syn. 1971. *Gmelina palawensis* H. J. Sm. ex Mold., Phytol. Mem. 2: 408 in syn. 1980.

Bibliography: H. J. Lam, Verbenac. Malay. Arch. 216, 224--225, & 366. 1919; Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 65 & 68. 1921; H. J. Lam in Diels, Engl. Bot. Jahrb. 59: 28. 1924; A. W. Hill, Ind. Kew. Suppl. 6: 92. 1926; Fedde & Schust., Justs Bot. Jahresber. 47 (2): 245. 1927; Kanehira, Fl. Micrones. 342 & 457. 1933; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 63 & 93. 1942; Hosokawa, Journ. Jap. Bot. 24: 44. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 143 & 186. 1949; Mold., Phytologia 4: 54. 1952; Saint John, Pacif. Sci. 10: 101. 1956; Mold., Résumé 184, 186, 195, 201, 427, & 456. 1959; Mold., Résumé Suppl. 1: 13 (1959), 2: 7 (1960), 3: 22 & 23 (1962), and 18: 7. 1969; Mold., Fifth Summ. 1: 317, 320, & 337 (1971) and 2: 524, 778, & 880. 1971; Fosberg, Sachet, & Oliv., Micronesica 15: 235. 1979; Mold., Phytol. Mem. 2: 311, 408, & 549. 1980; Fosberg, Otobed, Sachet, Oliv., Powell, & Canfield, Vasc. Pl. Palau 38. 1982; Mold., Phytologia 55: 335 & 493 (1984) and 56: 48 & 125. 1984.

A medium-sized tree, 6--12 m. tall; trunk to 12 cm. in diameter at breast height; branchlets cylindric, with grayish-brown bark, the lenticels numerous; leaves decussate-opposite; petioles 2.5--8 cm. long, glabrous; leaf-blades membranous or subchartaceous, dark-green above, yellow-green beneath, ovate or broadly ovate, 8--23 cm. long, 6--11 cm. wide, apically acuminate or sometimes obtuse, marginally entire, basally usually decurrent, sometimes almost rounded, glabrous on both surfaces, shiny above, basally with a few glands above and below the main veins, the secondaries 4--7 per side; inflorescence elongate, racemiform, basally foliose, 10--15 cm. long, 3--4 cm. wide; peduncles 1.5--5.5 cm. long; bracts foliaceous, 3--8 mm. long, 1--3 mm. wide, glabrous; pedicels 3--12 mm. long; flowers fragrant, snapdragon-like; calyx cupuliform, 3.5--4.5 mm. long, externally glabrous and covered with large glands, the rim entire; corolla white or white and magenta to pink or purple, 2-lipped, externally densely golden-fulvous (except for the lower part), the tube 1--1.3 cm. long, the limb 5-lobed with subequal lobes, the upper lip 5 mm. long and 2.5 mm. wide, bilobed, the lower lip 3-lobed, the lateral lobes 6.5 mm. long and 3 mm. wide, the middle lobe 8 mm. long and 3.5 mm. wide; stamens 4, included, didynamous; filaments thickened, 7--9 mm. long, basally pilose with simple hairs, apically glanduliferous; style thickened, glabrous; stigma conspicuously unequally bifid, one branch 2 mm. long, the other minute, both subulate; ovary globose, externally glabrous; fruit drupaceous, pear-shaped, lavender or magenta.

This species is based on *Ledermann 14429 & 14431* from Ngarsul, at 200--300 m. altitude, on Babelthaop island, Palau Islands, the former collected in flower on November 24, 1914, and the latter in bud on February 21, 1918, and on *Raymundus 114 & 210* from Koror island, all deposited in the Herbarium Bogoriense at Buitenzorg, Java. The native names, "blachaiösch", "blacheos", and "blaheos", are reported for the plant. The species is known also from the islands of

Amiriik, Kaiguru, Malakal, and Palau. Collectors have encountered it in open forests and valley jungles, at 5 m. altitude, in flower in February, April, and June, and in fruit in February and June. Takematsu refers to it as a "common forest tree" or "rarely found". Canfield speaks of it as an "uncommon tree at bordering forest and mangrove in volcanic clay soil along with *Calophyllum*, *Pandanus*, *Schefflera*, *Cocos*, and *Scleria*."

The corollas are said to have been "pink" on Fisher 111, "purple" on Takamatsu 1639, "lavender" on Lane 49-156, and "white and magenta" on Canfield 446.

The Lam (1924) reference in the bibliography (above) of this species is sometimes cited as "1925", but that is merely the volume titlepage date; the page here concerned was issued in 1924.

The Ahern 461 [161] & 462, distributed as typical *G. palawensis*, actually represent its var. *dinagatensis* Mold., the former collection being the type collection.

Citations: PALAU ISLANDS: Amiriik: Kanehira 1923(W--1669163). Babelthaob: Canfield 446 (W--2828477); Takamatsu 1561 (Bi), 1639 (Bi); Tuyama s.n. [28 Aug. 1937] (Bi). Kaiguru: Takamatsu 1594 (Bi, Ca--805559, W--1992675). Palau: T. R. Fisher 111 (Ft--7838, Ft--7839); Hosokawa 6969 (Bi, W--2036324); Kanehira 387(Bi, N), 1923 (N), 2280 (N), s.n. [Feb. 1929] (Ca--203935); Lane 49-156 (Ba--385391).

GMELINA PALAWENSIS var. CELEBICA Mold., Phytologia 3: 417--418. 1951.

Bibliography: Mold., Phytologia 3: 417--418. 1951; Mold., Résumé 195 & 456. 1959; Mold., Fifth Summ. 1: 325 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 315 & 549. 1980; Mold., Phytologia 55: 335. 1984.

This variety differs from the typical form of the species in having subcoriaceous or coriaceous leaf-blades which are mostly obovate in shape, to 21 cm. long and 8.7 cm. wide, and basally attenuate-cuneate.

This apparently endemic Celebesian plant is based on *G. Kjellberg 2001* from sealevel at Malili, Celebes, collected on August 2, 1929, and deposited in the Herbarium Bogoriense at Buitenzorg, Java.

Collectors describe the plant as a tree, to 30 m. tall, often 5--25 m. to the first branch and 75 cm. in diameter at 0.5 m., 60 cm. at 1 m., 41 cm. at 1.5 m., and 35--45 cm. at 1.3 m. above the base, the flowers fragrant, the corolla rose-color (*Waturandang* 42), and the fruit dark-green (in March). They have found it growing at 25--600 m. altitude, in flower in January and October, and in fruit in March and December. They record the vernacular names, "longgewoewoe", "tamboererere", "woewoe", and "woeroko".

Material of this taxon has been distributed in some herbaria as typical *G. palawensis* H. J. Lam.

Citations: GREATER SUNDA ISLANDS: Celebes: *Burki* 32 [Boschproefst. bb.23574] (Bz--21312); *Hoornscha* 8 [Boschproefst. bb.8560] (Bz--21307, N); *Kjellberg 2001* (Bz--21308--type, Bz--21309--isotype, Ld--photo of type, N--photo of type, S--isotype); *Reppie* 93 [Boschproefst. Cel.III.35] (Bz--21316, Bz--25580, Bz--25581), 214 [Boschproef-

st. Cel.IV.189] (Bz--21317), 377 [Boschproefst. Cel.III.167] (Bz--21311), 378 [Boschproefst. Cel.III.168] (Bz--21310, Bz--22582), 379 [Boschproefst. Cel.III.169] (Bz--21313); *Waturandang* 42 [Boschproefst. Cel.III.35] (Bz--21314, Bz--21322, Bz--21323, Bz--21324, N), 133 [Boschproefst. Cel.IV.128] (Bz--21318), 134 [Boschproefst. Cel.IV.129] (Bz--21319, N), 135 [Boschproefst. Cel.IV.130] (Bz--21320), 136 [Boschproefst. Cel.IV.131] (Bi, Bz--21321).

GMELINA PALAWENSIS var. *DINAGATENSIS* Mold., *Phytologia* 3: 418. 1951.

Bibliography: Mold., *Phytologia* 3: 418. 1951; Mold., *Résumé* 184 & 456. 1959; Mold., *Résumé Suppl.* 18: 7. 1969; Mold., *Fifth Summ.* 1: 317 (1971) and 2: 880. 1971; Mold., *Phytol. Mem.* 2: 308 & 549. 1980; Mold., *Phytologia* 55: 335. 1984.

This variety differs from the typical form of the species in having the leaf-blades subcoriaceous, elliptic in shape, 7--15 cm. long, 3.5--7 cm. wide, and basally attenuate.

It is based on *Ahern* 461Q from the island of Dinagat. Philippine Islands, collected in 1901 or 1902, and deposited in the Herbarium Bogoriense at Buitenzorg, Java. It appears to be endemic to Dinagat and Mindanao islands.

Material of this variety has been distributed in some herbaria as typical *G. palawensis* H. J. Lam, *Faradaya* sp., or even *Radermachera* sp.

Citations: PHILIPPINE ISLANDS: Dinagat: *Ahern* 461Q [161] (Bz--21305--type, Bz--21306--isotype, Ld--photo of type, N--isotype, N--photo of type, W--445766--isotype). Mindanao: *Ahern* 462 (W--445519).

GMELINA PALAWENSIS var. *NOVOGUINEENSIS* Mold., *Phytologia* 4: 54--55. 1952.

Bibliography: Mold., *Phytologia* 4: 54--55. 1952; Mold., *Résumé* 201 & 456. 1959; Mold., *Fifth Summ.* 1: 337 (1971) and 2: 880. 1971; Mold., *Phytol. Mem.* 2: 327 & 549. 1980; Mold., *Phytologia* 55: 335. 1984.

This variety differs from the typical form of the species in having its leaf-blades firmly coriaceous, elliptic, basally rounded, and marked at the very base with 2 very large and prominent orchidaceous glands.

The variety is based on *Womersley*, *Herb. Dept. For. N. Guin. NGF. 2922* from Morobe, Morobe District, Territory of New Guinea, deposited in the Herbarium Bogoriense at Buitenzorg, Java.

Recent collectors describe the plant as a small tree, 6 m. tall, the outer bark gray and fissured, the inner bark straw-green, the wood creamy-straw, the leaf-blades dark-green and smooth above, pale-green and rough beneath, the corollas "cream with purple", and the fruit green (in March). They have found it growing in secondary forests, on rocky slopes above the mangrove forest, and also within the mangrove zone itself, at altitudes of sealevel to 40 m. in fruit in March. They report the native vernacular name, "boa".

Citations: NEW GUINEA: Territory of New Guinea: *Kerenga & al. LAE.73871* (Mu); *Womersley*, *Herb. Dept. For. N. Guin. NGF.2922* (Bz--72674--type, Ld--photo of type, N--photo of type, Ng--6602--isotype).

GMELINA PANICULATA Fletcher, Kew Bull. Misc. Inf. 1938: 204. 1938.

Bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 204 & 422. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 60 & 93. 1942; Hill & Salisb., Ind. Kew. Suppl. 10: 100. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 137 & 186. 1949; Anon., Kew Bull. Gen. Ind. 134. 1959; Mold., Résumé 178 & 456. 1959; Mold., Fifth Summ. 1: 296 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 286 & 549. 1980; Mold., Phytologia 55: 335 & 497. 1984.

A small tree; branches terete or obtusely tetragonal, brown, spinose, at first slightly pubescent with the hairs more numerous at the nodes, eventually glabrous; lenticels few; spines axillary, 8--10 mm. long; leaves decussate-opposite; petioles 1.5--3 cm. long, brown in drying, canaliculate above, pubescent especially apically above; leaf-blades chartaceous, broadly ovate or elliptic, 7--13 cm. long, 5--8 cm. wide, apically subacuminate, marginally entire or slightly revolute, basally subcuneate, reddish-brown on both surfaces when dried, glabrous or slightly pubescent above, glabrous and with numerous, white, rounded or quadrangular glands beneath; midrib conspicuous above, prominent beneath; secondaries 4 or 5 pairs, parallel, prominent beneath; tertiaries numerous, parallel; inflorescence terminal, 2--4 cm. long, glandular-tomentose with fulvous hairs; bracts ovate or lanceolate, 2.5--10 mm. long, 1--5 mm. wide; calyx externally glandular-pubescent and marked with large black glands, the tube 3 mm. long, internally smooth, the rim 4-dentate, the teeth 1 mm. long and 1.5 mm. wide; corolla externally glandular-pubescent, the tube 2.5 cm. long, internally glabrous, the limb 2-lipped, the posterior lip 5 mm. long and 5 mm. wide, the lower lip 3-lobed, 10 mm. long and 18 mm. wide, the lobes all apically rounded; stamens 4, 2 filaments 14--15 mm. long and attached 13.5 mm. above the base of the corolla-tube, the other two 7.5 mm. long and attached 12.5 mm. above the base; anthers 2.5 mm. long; style shortly bilobed; ovary obovoid, 2.8 mm. long and wide, externally glabrous; fruit ovoid, 1.5--2 cm. long, 1 cm. wide, externally slightly pubescent.

This apparently endemic species is based on *Put 2086* from Krabin, Aranya, Prachinburi District, Thailand, and is known only from the original collection. It is known to me only from the bibliography (above).

GMELINA PHILIPPENSIS Cham., Linnaea 7: 109 [as "(asiatica ?)

philippensis"]. 1832; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040. 1893.

Synonymy: *Gmelina asiatica* Lour., Fl. Cochinch., ed. 1, 376. 1790 [not *G. asiatica* Kurz, 1902, nor L., 1753, nor Wall., 1831. *Gmelina? finlaysoniana* Wall., Numer. List 215, no. 6317 hyponym. 1832; Schau. in A. DC., Prodr. 11: 680. 1847. *Gmelina asiatica?* Blanco, Fl. Filip., ed. 1, 492--493. 1837. *Gmelina inermis* Blanco, Fl. Filip., ed. 1, 493. 1837. *Gmelina asiatica* L. var. Cham. ex D. Dietr., Syn. Pl. 3: 613 in syn. 1843. *Gmelina hystrix* Schult. ex Kurz, Journ. Roy. Asiat. Soc. Beng. 39 (2): 81. 1870. *Gmelina hystrix* Kurz ex Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1153. 1876. *Gmelina inermis*

Naves ex Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: Nov. App. 159 in syn. 1880 [not *G. inermis* Wight, 1831]. *Gmelina hystrix* Kurz ex Vidal, Phan. Cuming. Philip. 134. 1885. *Gmelina bracteata* Burck, Ann. Jard. Bot. Buitenz. 10: 98, pl. 7, fig. 5 & 6. 1891. *Gmelina finslaysoniana* Wall. ex Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *silvestris* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *silvestris* f. *viridibracteata* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *silvestris* f. *colorata* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina finslaysoniana* var. *hystrix* Kuntze, Rev. Gen. Pl. 2: 507. 1891. *Gmelina asiatica* Schau. ex H. Hallier, Meded. Rijks Herb. Leid. 37: 60 in syn. 1918. *Gmelina philippinensis* Cham. ex H. J. Lam, Verbenac. Malay. Arch. 222. 1919. *Gmelina asiatica* var. *philippinensis* (Cham.) Bakh. in Lam & Bakh., Bull. Jard. Bot. Buitenz., ser. 3, 3: 70. 1921. *Gmelina asiatica* var. *philippinensis* Bakh. ex E. D. Merr., Enum. Philip. Flow. Pl. 3: 399 in syn. 1923. *Gmelina asiatica* Lam ex Fletcher, Kew Bull. Misc. Inf. 1938: 405 in syn. 1938. *Gmelina hystrix* "Schult. ex Kurz" apud Anon., Kew Bull. Gen. Ind. 134. 1959. *Gmelina philippensis* Hall & Gooding, Fls. Islands Sun 11, 41, 47, & 133. 1966. *Gmelina philippensis* Cham. & Schlecht. ex Mold., Résumé Suppl. 18: 12 in syn. 1969. *Gmelina philippinensis* Cham. & Schlecht. ex Mold., Résumé Suppl. 18: 12 in syn. 1969. *Gmelina filippensis* Cham. ex Mold., Phytologia 23: 432 in syn. 1972. *Gmelina filippensis* Cham. ex López-Palacios, Pittieria 6: 13 & 17. 1974. *Gmelina hystrix* Schult. ex López-Palacios, Pittieria 6: 17 in syn. 1974. *Gmelina philippensis* Cham. ex López-Palacios, Revist. Fac. Farm. Univ. Andes 20: 24. 1979. *Gmelina hystrix* var. *silvestris* Kuntze ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina asiatica* var. *hystrix* H. J. Lam ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina finslaysoniana* var. *viridibracteata* Kuntze ex Mold., Phytol. Mem. 2: 408 in syn. 1980. *Gmelina philippense* Cham. ex Mold., Phytologia 54: 243 in syn. 1983. *Gmelina philippensis* f. *colorata* (Kuntze) Mold., Phytologia 55: 234. 1983. *Gmelina philippensis* f. *viridibracteata* (Kuntze) Mold., Phytologia 55: 234. 1983.

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Illustrations: Blanco, Fl. Filip., ed. 3, 2: pl. 215 (in color). 1878; Burck, Ann. Jard. Bot. Buitenz. 10: pl. 7, fig. 5 & 6. 1891; Hook. f., Curtis Bot. Mag. 120 [ser. 3, 50]: pl. 7391 (in color). 1894; Liu, Illustr. Nat. Introd. Lign. Pl. Taiwan 2: 1222, fig. 1030. 1962; Sharma & Mukhopadhyay, Journ. Genet. 58: 383, fig. 39 & 40. 1963; Hall & Gooding, Fls. Islands Sun pl. 30 (in color). 1966; Corner & Watanabe, Illust. Guide Trop. Pl. 761. 1969; Preston in Syngé, Suppl. Dict. Gard. 903. 1969; Mold. in Menninger, Flow. Vines pl. 194, dust-jacket, & advert. (in color). 1970; López-Palac-

ios, Fl. Venez. Verb. [320]. 1977.

A moderately sized to large, dense, attractive, straggling or scandent (if shaded), usually spinose shrub, stout bush, undershrub, or small shrubby tree with the habit of a *Bougainvillea*, 3--7 m. tall, sometimes sprawling or prostrate; trunk (when formed) often armed with spines to 5 cm. long; stems usually several from ground level, arching, with long shoots arising from the arch, lenticellate; lenticels scattered on older wood, pustulate; branches arching, the ultimate lateral ones rather short, divaricate, sharp-pointed, drooping or subscaudent, forming more or less flattened masses; dwarfed branchlets spinose, the spines horizontal, short, 0.25--1.5 cm. long, or absent; youngest branchlets hispid-pubescent; bark yellowish-lenticellate; wood soft, white; leaves decussate-opposite, ascending, dimorphic, mostly anisophyllous; petioles 0.5--4 cm. long; leaf-blades chartaceous and fleshy or subcoriaceous when fresh, submembranous in drying, ovate, oblong, or elliptic to rhomboid-elliptic or obovate, 1.5--10 cm. long, 1.5--6 cm. wide, apically obtuse or subacute, marginally entire and often slightly recurved or distantly coarse-toothed to slightly few-lobed, glabrous and shiny above, pale and often glaucous beneath, puberulent only on the larger venation, the intervening spaces covered by many peltate scales (the leaves in one form are mostly 10--15 cm. long, elliptic-oblong, subacute and entire; in the other form they are shorter, broader, and shallowly lobed, a variation perhaps connected with the dampness or dryness of the site, an environmental character which may also play a part in the general habit and spinescence of the plant); inflorescence terminal, cymose, strobiliform, 10--20 cm. long, dense, pendulous, many-flowered, the cymes arranged in racemiform clusters in the axils of large, persistent, foliaceous, and very conspicuous, rather petaloid, showy bracts which are membranous, broadly oval or ovate to obovate or orbicular and concave, yellow (in the typical form), permanently green or yellowish-green [in f. *viridibracteata* (Kuntze) Mold.], or maroon, purplish, reddish-purple, or purple to red or brownish-red [in f. *colorata* (Kuntze) Mold.], sometimes striped or purple-veined, brunnescent in drying, 1.5--4 cm. long, 1--3.5 cm. wide, apically obtuse to mucronate or short-apiculate, shortly ciliate-hairy only along the margins, 5-venose, the veins often red or purple; flowers pendulous, slightly fragrant, in 1-flowered cymules, sessile or subsessile, easily detached, 5--7.5 cm. long; calyx green, campanulate, short, externally strigose-hirtous, marked with 2--4 external glands, the rim 4- or 5-dentate; corolla bright-yellow or light lemon-yellow to orange-yellow, the tube irregularly narrow-campanulate, curiously curvate and inflated upwards, 4.5--5.5 cm. long, externally moderately densely pubescent or glabrous, the limb about 5 cm. wide, concave, globose, 4-parted, the "upper lip like the head of a duck" [Qureshi], 3-lobed, the lobes short, broadly ovate-rotund, reflexed, the lower lip longer, ovate, obtuse, the 2 lateral lobes much smaller; stamens inserted at the middle or near the top of the corolla-tube, didynamous, the filaments yellow, the 2 longer (anterior) stamens with equal yellow (maturing brown) anthers and their filaments often apically with

tiny gland-tipped hairs, the subreniform anthers on the much shorter (posterior) stamens smaller and differently colored, their filaments glabrous throughout; pollen grains prolate, $49 \times 37 \mu$ (range $42--53 \times 35--39 \mu$), the endocolpium faint, the ectine surface areolate, the areoles of various shapes; style equaling the stamens, yellow; stigma bilobed, one lobe much shorter than the other; ovary obtuse; fruit drupaceous, obovoid, fleshy, pendulous, about 2.5 cm. long, yellow or yellowish, externally smooth, the pericarp soft and watery when mature; pyrenes very hard, 5-celled, with one seed per cell or by abortion less; chromosome number: $2n = 38$.

This rather *Bougainvillea*-like shrub is native to the Philippine Islands; also (perhaps originally introduced) from India eastward through Thailand, Burma, and Indochina to Indonesia; rather widely cultivated for ornament in private gardens and public parks in many parts of tropical Asia, Africa, and America. It is based on a Philippine collection from Luzon, collector and number not designated, originally deposited in the Berlin herbarium, now lamentably destroyed.

Gmelina philippensis is a very quick-growing plant and usually requires severe pruning when in cultivation. It may be propagated by cuttings. The pollen is described in detail and illustrated by Nair & Rehman (1962).

In the Philippines the juice of the ripe fruit of this plant is used in treating soreness of the toes due to excessive wetness. In Malaya the leaves and fruit are pounded with lime and applied to the throat as a poultice in treating coughs. In Indonesia the juice of the roots is employed as a purgative and in the treatment of over-fatigue. In Indochina an extract of the roots (used internally) and of the leaves (used externally) is employed as an excitant, discutient, and in treating diseases of the joints and nerves.

The *Jambosa sylvestris* Rumpf, *J. sylvestris parvifolia* Rumpf, *Radix deiparae* Rumpf, and *R. deiparae spuria* Rumpf, often cited [e.g., by Naves (1880)] as synonyms of this species, actually apply to the juvenile form of *G. elliptica* J. E. Sm.

Gmelina philippensis is sometimes attacked by the fungus, *Meliola clerodendricola* var. *micromera* (Syd.) Hansf.

Vernacular names recorded as applied to *G. philippensis* include the following: alipung, alipúng, alipunga, alipúnga, bristly bush-beach, bristly bushbeach, бага-бабуи, bagaboboi, balabalayan, betebet, bosel-bosel, bulang, bulangan, bulangan duri, cây gang tu hú, ching chai, găng tu hú, gmelina de Asia, kalulut, kălûlûť, kibana-yôroku, kumbil, paniktik, pekan, Philippine shihmu [=stone-wood], purple bulang, snapdragon tree, sousou, sowsow, talunġun, tulongan, & tulôŋgau.

Chamisso's (1832) original description of this plant is: "foliis ellipticis, utrinque breviter acuminatis, apice obtusis, subcoriaceis nitidis, subtus in nervo et venis pilosis, caeterum nudus, bracteis ellipticis membranaceis pilosis calyce ter quaterque longioribus. E Lugonia retulimus specimina vix sufficientia, ramulum floriferum, aliumque fructiferum. A vulgari caldariorum nostrorum hispita notis allatis diversa, caeterum simillima. An species an varietas sit, doceant nos, quibus stirpem in vivis recognoscere erit

datum. Folia supra nitida, subtus opaca, leviter glaucescentia, in nervo et venis pilis longiusculis laxis antrorsis munita: margine reflexo, longitudine bipollicari, latitudine 14 linearum, petiolo semipollicari. Calyx callis glandulosis nigris pariter infectus major, corolla minor quam in *G. asiatica* culta; ramulus florifer pariter spinis expers. Fructus nondum maturus axi semipollice breviori."

In the opinion of E. D. Merrill, as noted in pencil on the margin of his personal copy of Blanco's 1837 work, both Blanco's *G. asiatica* and *G. inermis* represent *G. philippensis*. Blanco's description actually is quite ample: "Tronco lleño de puntos prominentes, y con espinas axilares en las ramas. Hojas á veces opuestas, y á veces amontonaditas en un punto, que se acercan á la figura eliptica, enteras lampiñas por la pagina superior, y pelosas en el peciolo y venas inferiores. Flores terminales en racimos, con una hojuela floral aovada en la base de cada florecita. Cal. persistente lampiño mui pequeño, con cuatro ó cinco dientes apenas notables, y con tres hasta cinco glandulas, colocadas en la parte de afuera, y á un lado cerca del borde. Cor. mui grande: el tubo largo de figura de ambudo con la garganta abierta, y el limbo mui grande concavo, globoso, y ligeramente hendido en cuatro partes: la de arriba arquada acia adelante: las dos laterales mas pequeñas, y la de abajo igual á ellas. Estam. fijos en medio de la corola: los dos, dos veces mas largos y gruesos que los otros dos. Ant. hechadas y todas cuatro hendidas en ls base: las de los estambres mas cortos, mas pequeñas y de otro color. Estilo del largo de los estambres. Estigma en dos partes: la una mui corta, y la otra larga y alesnada. Drupa superior grande, aovada, carnosa, con una nuez durisima, que contiene desde dos hasta cinco aposentos, y en cada uno una semilla. = Este arbol cuyal flores son amarillas del largo de una pulgada, se eleva á la altura de tres varas. El fruto es oloroso, y parece una manzanita. Son dignas de notarse las glandulas del caliz. Flor. en Jul." For his *G. inermis* he says merely: "Ramas sin espinas. Hojas anchas lanceoladas. = En lo demas como en la especie anterior [*G. asiatica*]". Fernandez-Villar regarded this as representing *G. villosa* Roxb. [now known as *G. elliptica* J. E. Sm.], but Merrill (1918) states categorically that "There is no justification for this reduction....he merely described a thornless or nearly thornless form of *G. philippensis*."

Kuntze (1891) describes his var. *silvestris* as having "folia duplo minora vix pollicaria parte superiore obtusangula"; his f. *colorata* with "bracteae brunneae. Cap St. James"; his f. *viridibracteata* as having "Bracteae virides. Cap St. James"; and his var. *hystrix* "hat 1½--3 Zoll. lange, oval lanzettliche, nicht stumpfeckig angedeutet gelappte Blätter und ist bei jetzt vorangswiese nur aus Gärten bekannt."

Gmelina philippensis is the type and only species in Briquet's Section *Bracteosae* Briq., which he characterizes as having the "Bracteen sehr gross, netzig-adrig, coloriert". All other species of the genus are placed by him in Section *Microstromatae* Briq. with the "Bracteen lanzettlich, öfters schmal, anfällig".

Hallier (1918) notes that *G. philippensis* "hat auf der Unterseite

des Blattes etwas entfernt vom Mittelnerven jederseits eine Reihe grösserer Drüsen (ausser kleinen zerstreuten Drüsenköpfchen) wie sie an gleicher Stelle auch bei Simarubaceen, Linaceen (Humirieen und *Ancistrocladus*), Malpighiaceen, Polygalaceen (*Diclidanthera* und *Xanthophyllum*), Chrysobalanaceen (Chrysobalaneen, *Trigoniasium* und *Dichapetalum*), Marcgraviaceen (auch *Tetramerista*) und Ebenaceen (*Diospyrus*- und *Maba* -arten) vorkommen."

Jafri & Ghafoor (pers. comm.) distinguish this species from the only other one known to them in Pakistan as follows:

Spinose scandent shrub; leaves rhomboid-elliptic; petioles 2--2.5 cm. long; bracts large, foliaceous, petaloid.....*G. philippensis*
 Unarmed tree; leaves broadly ovate; petioles over 5 cm. long; bracts small, neither foliaceous nor petaloid.....*G. arborea*

Hooker (1894) gives an interesting account of the early history of *Gmelina philippensis*, calling it "A very little known plant, of which the first published description is by the late S. Kurz, a first-rate Indian Botanist, and author of 'The Forest Flora of Burma', who was for some time an employé in the Herbarium of the Botanic Garden of Buitenzorg (Batavia), and latterly Curator of that of the Calcutta Gardens. Kurz's description of it is apparently made from specimens grown in the gardens of Bangkok, Siam, and preserved in the Buitenzorg Herbarium; and as to the name and authority of Schult, he says, 'I found it attached to the plant in the Library of the Botanic Garden, Buitenzorg, but I am unable, at present, to give a reference to the work in which it occurred'. The Kew Herbarium contains several specimens of it from Siam, collected by the late Sir R. Schomburgk, and the late Mr. Murton, when Superintendent of the Botanic Gardens of Bangkok, who says of it, 'apparently wild at Bangkok'. There are also specimens sent from the Natal Botanic Garden as a Siam plant. On the other hand, there are undoubtedly indigenous specimens from the Philippine Islands, from Cuming (No. 1913), and from Vidal, collected in the Province of Laguna (No. 3439), and the latter author gives, in his edition of Blanco's 'Flora de Filipinas', several localities for it in the Archipelago. I think, therefore, it may be assumed that this beautiful plant has been introduced into Siam from the Philippines; and from Siam to India and Natal.

"Plants of *Gmelina hystrix* were sent to Kew from the gardens of H. H. the Gaekwar of Baroda, by Mr. Goldring, Superintendent of his Highness's gardens and plantations, who says of it, 'that it forms a sturdy shrub, and that the bracts there are higher coloured than those represented in the plate' [Curtis Bot. Mag. pl. 7381]. At Kew the plant is grown in the Water-Lily House, trained against the glass roof, where it has the habit of a *Bougainvillea*, and flowers freely." Actually, of course, the species was described much earlier than by Kurz in the work quoted by Hooker -- in 1790 by Loureiro from Cochinchina, in 1832 by Chamisso from the Philippines, etc., albeit not under Schultes' epithet.

Merrill (1935), in speaking of Loureiro's plant from Cochinchina, says: "Loureiro referred his material to *Gmelina asiatica* Linn. with expressed doubt. His description conforms better with the charac-

ters of *Gmelina philippensis* Cham. than with *G. asiatica* Linn., and the former is well represented by Clemens 3152 from near Loureiro's classical locality. Loureiro describes the bracts as red, but in the Philippine form they are always yellow."

Corner (1952) differentiates this species from its close relatives as follows:

Tree, not thorny; leaves over 3 inches long, with a long tip.....

G. arborea.

Thorny bush or small tree; leaves 3 inches long or less.

Leaves woolly-felted beneath; bracts green.....*G. elliptica.*

Leaves not woolly-felted.

Bracts large, purplish, 1--1 3/4 inches long; leaves up to 3

inches long.....*G. philippensis.*

Not as above; leaves up to 1 1/2 inches long, often 3-lobed.....

G. asiatica.

Petélot (1953) records *G. philippensis* from central and southern Vietnam and Cambodia.

López-Palacios (1977) distinguishes the two species known in Venezuela merely as follows:

Erect tree.....*G. arborea*

Scandent shrub.....*G. philippensis*

Recent collectors report finding *G. philippensis* growing in moist mixed forests and dense mixed forests with pines, in deciduous and open grassy forests, in forests and scrub in general, in thickets and ricefields, in clay soil of open forests, and sprawling over limestone rocks, at 4--1000 m. altitude, in flower in every month of the year, and in fruit in January, March to May, July, and November. Erlanson describes it as "a large tree" (perhaps it was growing over or on a large tree?).

The chromosomes are described by Sharma & Mukhopadhyay (1963) and the pollen by Nair & Rehman (1962) on the basis of *Nat. Bot. Gard. Lucknow* 3566, slide 2695. The species is said by Preston (1969) to have been introduced into cultivation in England from the "E. Indies" in 1894. Obviously, from Hooker's comments in that year, it was cultivated long before that elsewhere (Thailand, Natal).

The corollas are almost uniformly described by collectors (on at least 15 of the collections cited below) as "yellow", but are said to have been "canary-yellow" on Biegel 5461, "golden-yellow" on Hallier C.124 & C124a, "bright-yellow" on Squires 920, and "yellow and red" on Erlanson 5333.

The large, very conspicuous, overlapping bracts in the hop-like, drooping inflorescences are apparently very variable in color, having been described by collectors as "yellow", "red", "maroon", "purple", "brownish", "green or brownish-red", "light-brown with mauve margins", "reddish-purple and green", "brown, red-striped", and "green outside, reddish inside". According to Merrill the Philippine plants have them "always yellow" and so that should probably be regarded as the typical wild form's color. Loureiro found them red in Cochinchina; Kuntze found both brown ones and green ones in South Vietnam and implies that the other colors occur only in cultivated material in Europe and elsewhere.

Jafri & Ghafoor (pers. comm.) lists *G. philippensis* as "Sometimes

cultivated in our gardens (in Pakistan) as an ornamental for its beautiful, paniculate cymes", flowering there from April to November. Kurz (1870) lists it as cultivated in Thailand. Williams (1949) reports it cultivated in Zanzibar, "introduced from East Indies", where it is "somewhat scandent" in habit.

Corner (1952) describes the flowers as 2 inches long, "partly concealed by the large speckled purplish bracts: the inflorescences [are] like soft purplish cones", recording the species from Perlis, Kedah, and Kelantan in Malaya, without indication if native or cultivated only in those areas.

Maheshwari (1963) asserts that the species is planted "in the hedgerows of public and private gardens and parks" in Delhi, India, where it flowers from April to August. He cites *Maheshwari 653* and distinguishes it from the only other species known (to him) in the area as follows:

Unarmed, small tree; bracts small.....*G. arborea*

Spiny shrubs; bracts large, colored.....*G. philippensis*

Sen & Naskar (1965) also report it as cultivated in India, where Bose (1965) describes it as very quick growing and therefore needing constant severe pruning. Gledhill (1962) reports it cultivated in Sierra Leone. Tingle (1967) found it in cultivation in Hong Kong, listing a vernacular name in Chinese characters; Sasaki (1928) and Hsiao (1980) report it cultivated in Taiwan, the latter author providing another vernacular name in Chinese characters. Bailey (1935) lists it as available to the world horticultural trade from Taihoku and Singapore suppliers.

Fernandez-Villar (1880) comments that he personally observed the species growing in Panay, presumably in the wild state. Cooke (1905) regarded the species as native in Thailand as well as in the Philippines, and, judging from the numerous collections from forested areas in that country, this seems entirely possible, in which case the natural indigenous distribution may well be from Thailand, through Indochina and Malaya, to the Philippines, as some writers have suggested (but others have disputed).

Bentham (1876) cites only unnumbered Teijsmann and Schomburgk collections from Thailand and *Cuming 1913* from the Philippines; Vidal (1885) cites only the same *Cuming 1913*. Williams (1905) cites *Murton 33*, *Schomburgk 197 & 331*, *Teijsmann 5946* and *Zimmermann 71* from cultivation in Thailand, as well as a preserved specimen of flowers and fruit in alcohol in the Kew Garden Museum No. 1. Murton claims that "I have seen this [plant] in places about Bangkok apparently wild". Brandis (1906) lists the species from Tenasserim [Burma], Thailand, and the Philippines. Brown and his associates (1917) record it from Volcano Island in the Philippines.

Hallier (1918) cites *Zimmermann 71* from Thailand, *Hallier C.124a* from Singapore (cultivated) and *C.124* from Java (cultivated, the plant said to have come originally from Banka), and *Elmer 8934*, *Hallier 4295*, and *Lillies 16* from Luzon island in the Philippines. He describes the plant as "häufig in der Buschsteppe" on Luzon.

Bakhuizen (1921) gives its range as Thailand, Tenasserim, Cochin-China, and the Philippines, citing only *Teijsmann 5946* and *Zimmer-*

mann 71 from Thailand and Barnes 362 from the Philippines. Merrill (1923) asserts that it is common and probably endemic in thickets and secondary forests at low and medium altitudes on at least Luzon and Panay, Philippine Islands. Fletcher (1938) cites from Thailand: Kerr 5724, 10704, 12293, 15067, & s.n., Marcan 847, Murton 33, Put 1319, Rabil 145, Schomburgk 197 & 331, Teijsmann 6946 [which he regards as the type collection of *G. hystrix* Schult.], Vanpruk 461 & 714, Winit 412 & 1653, and Zimmermann 71. He lists it also, without citation of confirming specimens, from Tenasserim, Indochina, and Malaya.

López-Palacios (1977) cites *Aristeguieta* 5396 & 6590 and López-Palacios 2669 from cultivation in Venezuela. Lasser and his associates (1974) also list the species as cultivated in Venezuela.

It is worth noting here that the Gillis 9799, cited below, was taken from a plant grown from seed collected in Panama [presumably from cultivated material there] by B. Maguire. Squires 920 exhibits one branch with all entire leaves and another branch with all 3-lobed leaves; Herb. Bernhardt s.n. exemplifies the very small-leaved 3-lobed form, while Kienholz 269 illustrates very well the formation of short sharp terminal spines at the tips of small branchlets or twigs.

Numerous bibliographic errors occur in the literature -- for instance, the Fernandez-Villar (1880) reference in the bibliography (above) is sometimes incorrectly cited as "1918"; Merrill (1923) mis-dates the Walpers (1845) reference as "1844"; López-Palacios (1974, 1975) mis-dates the Chamisso (1832) reference as "1839" and (1974) cites Wallich 6317 as "6313" and mis-dates the work (1832) as "1822".

Material of *G. philippensis* has been misidentified and distributed in some herbaria as "*Gmelina arborea* L.", *G. asiatica* L., *G. asiatica* var. *typica* H. J. Lam, and even as *Acanthaceae*. On the other hand, the Sulit, Philip. Nat. Herb. 11741, distributed as typical *G. philippensis*, is actually the type collection of its f. *transitoria* Mold., while Peele 1389 is *G. asiatica* L., Niyomdham & al. 241 and Pierce P.280 are *G. elliptica* J. E. Sm., and Copeland 346 and Mearns 170 are *G. elliptica* f. *lobata* (Gaertn.) Mold.

Citations: INDIA: Kerala: Erlanson 5333 (Mi, N). Tamil Nadu: Kuriakose s.n. [Veli, 24-1-33] (N). THAILAND: Kerr 4647a (Ed), 6223a (Ed); Larsen, Santisuk, & Warncke 1918 (Ac); Surapat 357 (W--2450882); Zimmermann 70 (Br), 71 (B, B, Br, Bz--21062, Mu--3943, W--595071). VIETNAM: Annam: Clemens & Clemens 3152 (Ca--340583, N, W--1427363); C. B. Robinson 1344 (N); Squires 920 (Bz--21063, Mu, N, S, W--1702762). Cochinchina: Kuntze 3928 (N, N); Thorel 60 (B). PHILIPPINE ISLANDS: Luzon: Balintay, Philip. Nat. Herb. 5629 (Mi); P. T. Barnes, Herb. Philip. Bur. For. 362 (Bz--21055, N, W--851035); H. H. Bartlett 14557 (Mi), 14697 (Mi, N), 14723 (Mi), 15296 (Mi); T. E. Borden, Herb. Philip. For. Bur. 1780 (N, W--1091554); E. B. Copeland 346 (N); Elmer 8934 (Bz--21057, N, W--854813), 18278 (Bz--21054, Ca--27077, Du--175657, N, S, Um--162, Ut--67295, W--1237692); R. B. Fox, Philip. Nat. Herb. 4886 (Mi); F. W. Foxworthy, Herb. Philip. Bur. Sci. 112 (Bz--21058, Gg--31096, W--626867), 1564 (N, W--627262); Kienholz 269 (Ur); Lete 333 (Ca--365698); Loher 4426 (W--446873); E. D. Merrill 1690 (W--436641), 2932 (W--437904), 7564

(Gg--31098, S, W--901875), *Sp. Blanc.* 122 (Bz--21056, N, W--903797); *Otanes*, *Herb. Philip. Bur. Sci.* 17708 (Bi, W--1238490); *Quezon* 8394 (Mi); *Quisumbing* 2161 (Ok--17317); *M. Ramos* 338 (Mu--4198, Ut--22252, W--1133036); *Santa Maria* 8413 (Mi); *Vanoverbergh* 4036 (Vi); *H. N. Whitford* 395 (N, W--851580); *R. S. Williams* 196 (N, W--706859). GREATER SUNDA ISLANDS: Sarawak: *Clemens & Clemens* 21089 [field no. 5414] (Bz--21048, Bz--21049, N). CULTIVATED: Florida: *Gillis* 9799 [Fairchild Gard. 69-388] (Ft--8763). Guyana: *D. Fairchild* 2969 (W--1626026). Hong Kong: *Chan* 1131 (Mi). India: *Herb. Roy. Bot. Gard. Bangalore* s.n. [April 1887] (Pd), s.n. [April 1889] (Pd); *Koelz* 8104 (Ba); *Nafday* 123 (Ba). Java: *Backer* 34140 (Bz--21053); *Collector undetermined* s.n. (Bz--25577); *Herb. Bot. Bogor. X.F.17* (Bz--21050, Bz--21052, Bz--25584), *XV.F.8* (Bz--26302, Bz--26303, Bz, Bz, N), *XV.F.8a* (Bz--26304, N), s.n. [Febr. 1910] (Bz--21051), s.n. (Bz--21059, Bz--21060). Kenya: *Moldenke & Moldenke* 26078 (Ld). Martini-que: *Duss* 4766 (N). Netherlands: *Mennega* 345 (Ba). Pakistan: *Qureshi* s.n. [8.11.1961] (Kh). Pennsylvania: *Petersen* J.2501 (Ba--373301). Saint Vincent: *Howard & Howard* 18054 (N). Singapore: *Nur* s.n. [11 June 1924] (Ba, N). Sri Lanka: *Moldenke, Moldenke, & Jaysuriya* 28140 [E.29] (Ac, Gz, Ld, Pd, W--2764415). Thailand: *Teijsmann* 5946 (Bz--21061). Tobago: *L. M. Andrews* 3-81 (N). Trinidad: *Bhorai* B.591 (N). Venezuela: *Aristeguieta* 5396 (Ld); *López-Palacios* 2669 (Ac, Mu). Zimbabwe: *Biegel* 5461 (Ba--390301). LOCALITY OF COLLECTION UNDETERMINED: *Herb. Bernhardt* s.n. [Caltern, 22. Febr.] (E--118648); *Herb. Torrey* s.n. [Turon] (C, T). MOUNTED ILLUSTRATIONS: *Corner & Watanabe*, *Illust. Guide Trop. Pl.* 761. 1969 (Ld); *Hooker*, *Curtis Bot. Mag.* 120 [ser. 3, 50]: pl. 7391. 1894 (Ld, N); *Menninger*, *Flow. Vines* pl. 194. 1970 (Ld); *Mold.*, color slide 179 (Ld); *Source undetermined*, fig. 8627 (N).

GMELINA PHILIPPENSIS f. *COLORATA* (Kuntze) Mold., *Phytologia* 55: 234. 1984.

Synonymy: *Gmelina finslaysoniana* var. *silvestris* f. *colorata* Kuntze, *Rev. Gen. Pl.* 2: 507. 1891.

Bibliography: Kuntze, *Rev. Gen. Pl.* 2: 507. 1891; Mold., *Phytologia* 55: 234. 1984.

This form is based on an unnumbered Kuntze collection from Cape St. James in Cochinchina, South Vietnam. I regard it as including the plants whose bracts, when fresh, are maroon, purplish, reddish-purple, or purple to red or brownish-red.

GMELINA PHILIPPENSIS f. *TRANSITORIA* Mold., *Phytologia* 18: 210. 1969.

Bibliography: Mold., *Biol. Abstr.* 50: 7999. 1969; Mold., *Résumé Suppl.* 18: 7. 1969; Hocking, *Excerpt. Bot. A.* 18: 444. 1971; Mold., *Fifth Summ.* 1: 317 (1971) and 2: 880. 1971; Mold., *Phytol. Mem.* 2: 308 & 549. 1980; Mold., *Phytologia* 55: 333. 1984.

This form differs from the typical form of the species in having the lower surface of the leaf-blades conspicuously brownish-pilose, the hairs straight (or almost so) and simple, not twisted nor tomentose-matted, found all over the lower surface of the lamina as well as on the venation.

The type of the form was collected by M. D. Sulit (*Philip. Nat.*

Herb. 11741) on Guimaras island, Philippine Islands, in February or March, 1950, and is deposited in the United States National Herbarium in Washington. It was originally distributed by E. D. Merrill as typical *G. philippensis* Cham., which, however, has the lower leaf-surface glabrous, subglabrous, or with hairs only on the largest veins. The present plant has definitely pubescent twigs and conspicuously spiny branches. It seems in many ways intermediate between *G. philippensis* Cham. and *G. elliptica* J. E. Sm. and may even represent a natural hybrid between them. Thus far it is known only from the original collection.

Citations: PHILIPPINE ISLANDS: Guimaras: Sulit, Philip. Nat. Herb. 11741 (Ld--isotype, W--2125718--type).

GMELINA PHILIPPENSIS f. *VIRIDIBRACTEATA* (Kuntze) Mold., Phytologia 55: 234. 1984.

Synonymy: *Gmelina finslaysoniana* var. *silvestris* f. *viridibracteata* Kuntze, Gen. Gen. Pl. 2: 507. 1891.

Bibliography: Kuntze, Rev. Gen. Pl. 2: 507. 1891; Mold., Phytologia 55: 234. 1984.

This form is based on an unnumbered Kuntze collection from Cape St. James, in Cochinchina, South Vietnam. It differs from the typical Philippine form with yellow bracts by its green or yellowish-green bracts.

GMELINA RACEMOSA (Lour.) Merr., Trans. Amer. Phil. Soc., ser. 2, 24 (2): 336. 1935.

Synonymy: *Lantana racemosa* Lour., Fl. Cochinch., ed. 1, 2: 376--377. 1790. *Gmelina racemosa* Wight ex Wall., Numer. List 87, no. 1816E hyponym. 1831. *Gmelina lecomtei* Dop, Bull. Soc. Bot. France 61: 322, 1915.

Bibliography: Lour., Fl. Cochinch., ed. 1, 2: 376--377 (1790) and ed. 2, 457. 1793; Raeusch., Nom. Bot., ed. 3, 173. 1797; Wall., Numer. List 87, no. 1816E. 1831; D. Dietr., Syn. Pl. 3: 610. 1843; Schau. in A. DC., Prodr. 11: 608. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 253. 1858; Dop, Bull. Soc. Bot. France 61: 322 & 323. 1915; Prain, Ind. Kew. Suppl. 5, imp. 1, 115. 1921; Dop, Rev. Internat. Bot. Appliq. Agric. Trop. 13: 893--897. 1933; Dop in Lecomte, Fl. Gén. Indo-chine 4: 842, 847, & 849. 1935; E. D. Merr., Trans. Amer. Phil. Soc., ser. 2, 24 (2): 11, 336, & 426. 1935; A. W. Hill, Ind. Kew. Suppl. 9: 125. 1938; Fedde & Schust., Justs Bot. Jahresber. 60 (2): 573. 1941; Mold., Alph. List Inv. Names 25. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 58, 59, & 93. 1942; E. D. Merr., Chron. Bot. 10: 263--264. 1946; H. N. & A. L. Mold., Pl. Life 2: 68. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 135, 136, & 186. 1949; Mold., Resume 176, 297, 306, & 456. 1959; Prain, Ind. Kew. Suppl. 5, imp. 2, 115. 1960; Vidal & Lemoire, Journ. Agr. Trop. Bot. Appl. 17: 27. 1970; Mold., Fifth Summ. 1: 301 (1971) and 2: 523, 542, 880, & 972. 1971; Mold., Phytol. Mem. 2: 290, 293, 408, & 549. 1980; Mold., Phytologia 55: 334, 337, & 499 (1984) and 56: 34, 35, 108, & 109. 1984.

A good-sized forest tree, 6--15 m. tall; young branchlets pubescent or grayish-yellow-tomentose, eventually glabrescent; bark red-

dish-brown, striate, very prominently lenticellate; wood white, durable, resistant to termites, useful in hand-construction; leaf-scars very prominent; leaves decussate-opposite; petioles 6--7 cm. long, 2--3 mm. wide, tomentellous, canaliculate above; leaf-blades subcoriaceous, broadly oval or ovate to rounded or obcordate, bicolored, brunnescent in drying, apically obtuse, marginally entire or obscurely sinuate, basally obtuse or short-cuneate, shiny and glabrous (except for the larger veins) above, glaucous and velutinous-tomentose beneath; secondaries 3 or 4 pairs, straight or slightly arcuate; tertiaries transverse, regular; inflorescence terminal, paniculate, about 20 cm. long, di- or trichotomous, yellow-tomentose throughout; cymes small, few-flowered; bracts linear-lanceolate, 5--6 mm. long, glandulose; flowers sessile or subsessile; calyx campanulate, about 1 cm. long, externally sparsely pilose and apically with numerous, small, vertical, black glands, its rim truncate and subentire or obsoletely 5-denticulate; corolla yellow and purple, infundibular, about 3 cm. long, externally pruinose, the tube apically ampliate, the limb 5-lobed, the lobes subequal, apically rounded; stamens 4, subexserted; style about 2.4 cm. long; stigma bifid; ovary ovoid, externally pubescent on the upper part; fruit drupaceous, 3--4 cm. wide, very fleshy, at first green, then yellow, and finally black, the base pedicellate and included by the fruiting-calyx, the endocarp woody, apically depressed; seeds 1 or 2.

This species is based on an unnumbered Loureiro collection from Cochinchina ["Habitat in sylvis Cochinchinae"], South Vietnam.

Gmelina lecomtei is based on *Lecomte & Finet* 421 from between Chapa and Muong-xen, Annam, Vietnam. Dop (1915) says of it: "Cette espèce se rapproche du *Gm. arborea* L. Elle s'en distingue par le calice tronqué; la corolle pruiteuse et non tomenteuse, et le fruit beaucoup plus gros". In his 1933 work he continues: "*G. Lecomtei*..... Je me contenterai de signaler ici que ce bel arbre de 10 à 15 m. de haut, ne peut pas être confondu avec le *G. arborea* Roxb. malgré une ressemblance très grande des feuilles dans leur forme et leur texture. Cette ressemblance est d'ailleurs telle que les deux espèces sont appelées par les annamites du même nom Loi tho. Un échantillon récolté par M. de Pr A. Chevalier dans la réserve forestière de de Hui-la, et qui appartient indubitablement à l'espèce *G. Lecomtei*, est nommé tout comme *G. arborea*, Loi tho. Les caractères floraux très important distinguent nettement ces deux espèces. Le tableau suivant les résume. *G. arborea*: Calice à 5 lobes triangulaires-aigus, longs de 0,5 mm. Pas de glandes calicinales. Ovaire glabre. *G. Lecomtei*: Calice tronqué, sans dents. Glandes calicinales très nombreuses, petites, disposées en rangées verticales sur la moitié supérieure. Ovaire pubescent dans sa partie supérieure."

He continues: "Si ces caractères éloignent nettement *G. Lecomtei* de *G. arborea*, ils le rapprochent par contre de *G. chinensis* Benthام commun en Chine, dans le Kwang tung et à Hongkong. Les deux espèces ont des feuilles identiques, mais le port et les caractères floraux les distinguent aisément. *G. Lecomtei*: Arbre de 10 à 15 m. Glandes calicinales, très nombreuses et petites. Corolle à 5 lobes. *G. chinensis*: Arbuste de 2--3 m. Glandes calicinales 1--3 très larges. Corolle à 4 lobes.

"La distribution du *G. Lecomtei* est la suivante: au Tonkin, cette essence a été récoltée par Lecomte et Finet de Chapa à Muong Xen, par Balansa, au Mont Bavi près Lang Kok, par Pételot à Chogang, par H. Bon à Tren thon, par Fleury (in herb. Chevalier) à Phu tho, réserve de Trung Giap, par A. Chevalier à Tuyen Quang, réserve de Huila; et Annam au Mont Bani par Clemens, à Lien Chien, à Tourane et à Bana par Poilane; au Laos à Phon thane par Sire.....Depuis la rédaction de cette note de nouveaux et nombreux échantillons reçus par le Muséum m'ont montré qu'il existait entre ces deux espèces tous les intermédiaires et qu'il y avait lieu de réduire la deuxième espèce au rang de variété dont la synonymie s'établira ainsi".

Merrill (1935) mistakenly reduces *G. hainanensis* Oliv. and *G. balansae* Dop to *G. racemosa*, commenting: "Loureiro's description definitely applies to *Gmelina* and to a species in the group with *G. chinensis* Benth., *G. hainanensis* Oliv., *G. balansae* Dop and *G. lecomtei* Dop. Among these it agrees best with the characters of *G. hainanensis* Oliv., from which I do not think that *G. balansae* Dop can be distinguished. *Gmelina hainanensis* Oliv. was most casually and inadequately described by Oliver in the discussion following a description of *G. chinensis* Benth.....Clemens 3980 from Mount Bana, near Tourane.....probably represents Loureiro's species."

Recent collectors have found *G. racemosa* in flower from May to July and in fruit in July. The corollas are described as having been a "beautiful soft yellow with purple" on the Clemens collection. Vernacular names recorded for the species are "cây tlai", "cay tré", "loi tho", "mak phong", "ntoo nvshaub", "shek tzi shu", and "song tsio".

Vidal & Lemoine (1970) refer to *G. racemosa* as a tree of high dense forests, citing Lemoine 177 & 1968 and Yang Ts'í 77 from Laos.

Material of *G. racemosa* has been misidentified and distributed in some herbaria as *G. balansae* Dop or *G. "chinensis* L." On the other hand, the Pételot 1941, distributed as *G. racemosa*, actually is *G. balansae* Dop, while Chun & Tso 43542, Fung 20370, Gressitt 1077, How 70453, 70801, & 71643, Lau 75 & 3664, McClure 9281, and Wang 32777 are *G. hainanensis* Oliv.

Citations: VIETNAM: Annam: Clemens & Clemens 3980 (Ca--339429, Gg--156305, Gg--156306, Ln--69972, N, Ut--99961, W--1427778, W--1427779); Lecomte & Finet 421 (Ca--53723). Tonkin: Pételot 1941 (W--1759241, W--1717113).

GMELINA SESSILIS White & Francis ex Lane-Poole, Rep. For. Resources Terr. Papua N. Guin. 136. 1925; Proc. Roy. Soc. Queensl. 38: 257--258, fig. 18. 1927.

Bibliography: Lane-Poole, Rep. For. Resources Terr. Papua N. Guin. 136. 1925; White & Francis, Proc. Roy. Soc. Queensl. 38: 257--258, fig. 18. 1927; A. W. Hill, Ind. Kew. Suppl. 7: 104 (1929) and 8: 102. 1933; Mold., Known Geogr. Distrib., Verbenac., ed. 1, 67, 69, & 93 (1942) and ed. 2, 149, 153, & 186. 1949; Mold., Résumé 201 & 456. 1959; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Mold., Phytologia 31: 390 & 398. 1975; Mold., Phytol. Mem. 2: 327, 408, & 549. 1980; Mold., Phytologia 55:

334. 1984.

Illustrations: White & Francis, Proc. Roy. Soc. Queensl. 38: 258, fig. 18. 1927.

A large tree, to 34 m. tall; bole to 21 m. long, with a girth of 2.4 m., more or less buttressed to 2.4 m.; branchlets densely ferruginous-pubescent, sulcate, 5 mm. in diameter about 10 cm. below the inflorescence; leaves decussate-opposite; petioles 2--3 cm. long, concave above, convex beneath, densely pubescent; leaf-blades coriaceous, ovate-orbicular, 12--22 cm. long and about equally wide, but the narrow ones $1\frac{1}{2}$ times as long as wide, apically obtuse or rarely obtusely acuminate, marginally broadly sinuate or entire, basally cordate or rounded, sparsely pubescent above, densely pubescent beneath and with 1--3 glands at the base on each side of the midrib; secondaries 7--9 on each side, along with the veinlets conspicuous on both surfaces, impressed above and elevated beneath; inflorescence terminal, spiciform, narrow, 10--12 cm. long, 4 cm. wide, basally foliose; cymules opposite or whorled, considerably separated in the lower portions of the inflorescence, dense in the upper portion; exterior bracts foliaceous, large, concave, ovate, axially glabrous, abaxially densely pubescent and dotted with black glabrous glands; interior bracts similar but smaller; bractlets ovate-lanceolate, about 7 mm. long, abaxially densely pubescent; calyx campanulate, externally ferruginous-pubescent and dotted with small glabrous glands, internally glabrous, obscurely bilabiate or the rim sinuate to 3- or 4-lobate, the lobes broad; corolla about 1.7 cm. long, the exterior of the tube basally glabrous, apically densely pubescent, about 1 cm. long, the limb bilabiate, the upper lip 2-lobed, the lower lip 3-lobed; filaments 7 and 9 cm. long, pubescent; anthers basally cordate, 1.5 cm. long, 1 mm. wide, dorsifixed near the apex; style 1--6 cm. long, apically recurved; ovary obovoid, externally glabrous, apically depressed around the style-base.

This species is based on *Lane-Poole 303* from Baroi, Papua, New Guinea. White (1927) comments that it is "Allied to *G. Dalrympleana* (F. v. M.) H. J. Lam and to *G. macrophylla* Wall. From the latter it differs in its narrow inflorescence, and from the former in its dense inflorescence." It has been collected in flower in March.

Fedde & Schuster (1937) mis-cite this species to volume "39" of the Proceedings of the Royal Society of Queensland, published in 1928, instead of to volume 38 (1927).

Citations: NEW GUINEA: Papua: *Lane-Poole 303* (Bz--21333--isotype, Ld--photo of isotype, N--photo of isotype). Territory of New Guinea: *Collector undetermined N.G.F.2005* (Ng--6599, Ng--16897, Ng).

GMELINA SESSILIS var. *PAPUANA* (Bakh.) Mold., Phytologia 4: 178. 1953.

Synonymy: *Gmelina papuana* Bakh., Journ. Arnold Arb. 10: 71--72, pl. 16 & 17. 1929. *Gmelina papuana* Scheff. ex Mold., Known Geogr. Distrib. Verbenac., ed. 2, 186 sphalm. 1949.

Bibliography: Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21: pl. 26. 1907; Bakh., Journ. Arnold Arb. 10: 68/69 & 71--72, pl. 16 & 17. 1929; Bakh. in C. T. White, Journ. Arnold Arb. 10: 264. 1929; A. W.

Hill, Ind. Kew. Suppl. 8: 102. 1933; Wangerin, Justs Bot. Jahresber. 57 (1): 696. 1937; Fedde & Schust., Justs Bot. Jahresber. 57 (2): 401. 1938; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 67 & 93 (1942) and ed. 2, 149 & 186. 1949; Mold., Biol. Abstr. 27: 2026. 1953; Mold., Phytologia 4: 178. 1953; Mold., Resume 201 & 456. 1959; Whitmore, Gard. Bull. Singapore 32: 20. 1967; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Altschul, Drugs Foods 247. 1973; Mold., Phytologia 25: 233 (1973) and 31: 390 & 398. 1975; Mold., Phytol. Mem. 2: 327, 408, & 549. 1980; Mold., Phytologia 55: 339. 1984.

Illustrations: Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21: pl. 26. 1907; Bakh., Journ. Arnold Arb. 10: 68/69 & 71/72, pl. 16 & 17. 1929.

A medium-sized, slender tree, to 25 m. tall, the clear bole to 13 m. high, obscurely angular, not buttressed, to 45 cm. in diameter at breast height, the bark about 12 mm. thick; outer bark pale-brown, longitudinally fissured and tending to form scales, with a few, large, coarse, pustular lenticels present, about 4 mm. thick; inner bark with alternating yellow and white layers; wood very soft, the sapwood 5--7.5 cm. thick, pale-straw, the heartwood pinkish-brown; branchlets thick, obtusely tetragonal, sparsely lenticellate, the youngest ones densely tomentose, eventually glabrescent; leaves decussate-opposite; petioles semi-terete, 2--4 cm. long, slightly canaliculate above, at first densely tomentellous, eventually glabrescent; leaf-blades large, coriaceous, obovate-subrotund, 10--17 cm. long, 9--16 cm. wide, shiny dark-green and glabrous above, much paler beneath, apically rounded, marginally entire or irregularly repand, basally cuneate to short-acuminate and subdecurent or sub-obtuse, sparsely puberulent especially on the venation beneath, basally with 2 rather large glands which are concave beneath and bullate above, penninerved but basally subplinerved; midrib impressed and glabrous above, prominent and short-puberulent beneath; secondaries 5--9 per side, ascending, marginally anastomosing, impressed and glabrous above, prominent and sparsely puberulent beneath, the basal ones much longer than the others, giving rise on the outer side to pinnate veinlets; veinlet reticulation dense, prominent beneath; inflorescence terminal, conspicuous, pyramidal, pedunculate, bracteate, about 15 cm. long and 10--12 cm. wide, densely hirsute-tomentellous throughout, the lower portion branched, the 7--9 opposite branches long-stalked; peduncle and rachis depressed-quadrangular, 2.5--3.5 cm. long; flowers conspicuous, sessile, 3--5-fasciculate in the axils of bracts; bracts sessile, ovate-oblong or subrotund, concave, 5--7 mm. long, about 5 mm. wide, internally (axially) glabrous, externally (abaxially) tomentellous; calyx cupuliform, about 5 mm. long (in bud), externally densely villous and with 2--4 small discoid glands, internally glabrous and rather shiny, subtruncate, the rim unequally and obtusely 5-dentate, not much enlarged in fruit; open corolla not seen, but in bud externally densely villous, internally partially pubescent; stamens 4, didynamous; ovary oval, sessile, externally pubescent but soon glabrescent; fruit drupaceous, subglobose, fleshy, 2.5--3 cm. wide, apically depressed, glabrous, shiny, blue when mature, the endocarp thickly woody.

This variety is based on *Brass* 695 from a riverine forest, at 1000 feet altitude, at Iawarere, Papua, New Guinea, collected on November 25, 1925, and deposited in the Herbarium Bogoriense at Buitenzorg, Java. Bakhuizen (1929) reports that the fruit of this plant is eaten by cassowaries and that the taxon "is closely related to *Gmelina moluccana* (Bl.) Backer, from which it differs in its sessile cymes, globose fruits and rounded leaves with shortly acuminate, subdecurrent base".

Smith collected what appears to be this plant in an oak forest on ridges at 1500 feet altitude, reporting the vernacular name, "along-aya". The variety has been collected in fruit in November.

Citations: NEW GUINEA: Papua: *Brass* 695 (Bz--21325--type, Bz--21326--isotype, Bz--25583--isotype, Ld--photo of type, N--photo of type); L. S. Smith 1345 (Ng--6595). MOUNTED ILLUSTRATIONS: Bakh., Journ. Arnold Arb. 10: pl. 16 & 17. 1929 (Ld, N); Nieuwenhuis, Ann. Jard. Bot. Buitenz. 21: pl. 26. 1907 (Ld).

GMELINA SESSILIS f. *RAMIFLORA* (Mold.) Mold., stat. nov.

Synonymy: *Gmelina sessilis* var. *ramiflora* Mold., Phytologia 4: 178--179. 1953.

Bibliography: Mold., Biol. Abstr. 27: 2026. 1953; Mold., Phytologia 4: 178--179. 1953; Mold., Résumé 201 & 456. 1959; Whitmore, Gard. Bull. Singapore 32: 20. 1967; Mold., Fifth Summ. 1: 337 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 327 & 549. 1980; Mold., Phytologia 55: 334. 1984.

This form differs from the typical form of the species in having conspicuously branched inflorescences, the branches 3--4.5 cm. long, the individual flowers on stout pubescent pedicels about 2 mm. long, conspicuously bracteate.

The form is based on *Ebertus Meijer Drees* 371 from Bernhard Bivak, Hollandia, West Irian, New Guinea, collected on July 26, 1938, and deposited in the Herbarium Bogoriense at Buitenzorg, Java.

Collectors describe this plant as a large tree, to 140 feet tall, the crown narrow, dark, leafy, the clear bole to 80 feet high, narrowly buttressed and channeled to 5 feet up, 40--90 cm. in diameter at the base, the bark 1.5 cm. thick, the outer bark gray-brown, very slightly longitudinally fissured, otherwise fairly smooth, the inner bark pale yellow-brown tinged with green beneath the fissures on the back, pale-brown flecks on a cream background within, rapidly staining pinkish-brown on exposure, the sapwood 7.5--10 cm. deep, whitish, the heartwood very pale yellow-brown, the leaves rather thick, dull dark-green above, pale brownish-hairy beneath, with a few, small, flat glands present on the under surface near the apex of the petiole, the inflorescence dark brown-hairy (including the outside of the corolla in bud), the corolla pale-purple or pale-blue and whitish, with a yellow streak down the center of the lower lip, the mature fruit bluish, subglobular, about 2.5 cm. in diameter, apically flattened when immature.

The plant has been collected at 1400 m. altitude, growing as a canopy rainforest tree, in fruit in February, but was encountered by Smith at only 25 m. altitude. The vernacular name, "kalo", has been reported for it on *Anang* 53, a collection, however, which is sterile,

exhibiting only leaves.

That this plant may represent only a form, rather than a true variety, of *G. sessilis* seems to be indicated by Whitmore's assertion (1967) that "The difference between *G. sessilis* and *G. moluccana* is slight and not absolute; for instance the Lae sheet of NGF 0883 has simple spikes, and the Leiden sheet [has] branching ones, and both sheets have big foliaceous bracts partially enclosing the flower". He differentiates the 3 taxa as follows:

Leaf-blades densely velvety-hairy beneath, without conspicuous glands; inflorescence axes stout.

Flowers sessile, partially covered by large triangular bracts about 12 mm. long; inflorescence a simple spike...*G. sessilis*.

Flowers stalked, not covered; bracts smaller, lanceolate; inflorescence usually branched, paniculate.....*G. moluccana*.

Leaf-blades glabrous and shiny beneath, with a pair of conspicuous glands at the base of the midrib; inflorescence axes slender.....*G. dalrympleana*.

Citations: NEW GUINEA: Territory of New Guinea: Schlechter 16441 (S); L. S. Smith 1221 (Ng--6600, Ng). West Irian: Anang 53 [Boschproefst. bb.28955] (Bz--21311); Brass 12751 (A); Meijer Drees 371 [Boschproefst. bb.25693] (Bz--21332--type, Ld--photo of type, N--isotype, N--photo of type).

GMELINA SINUATA Link, Enum. Hort. Berol. 2: 128. 1822.

Synonymy: *Gmelina sinuata* Hort. ex Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040. 1893. *Gmelina sinuata* Herrenh. ex Mold., Alph. List Inv. Names Suppl. 1: 10 in syn. 1947.

Bibliography: Link, Enum. Hort. Berol. 2: 128. 1822; Sweet, Hort. Brit., ed. 1, 323 (1826) and ed. 2, 417. 1830; G. Don in Sweet, Hort. Brit., ed. 3, 551. 1839; Schau. in A. DC., Prodr. 11: 680. 1847; Buek, Gen. Spec. Syn. Candoll. 3: 200. 1858; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 1040 (1893) and imp. 2, 1: 1040. 1946; Mold., Alph. List Inv. Names 10. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 127, 160, & 186. 1949; Mold., Résumé 163, 218, 297, & 456. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 1040. 1960; Mold., Fifth Summ. 1: 276 & 363 (1971) and 2: 524 & 880. 1971; Mold., Phytol. Mem. 2: 263, 354, & 549. 1980; Mold., Phytologia 55: 335 & 471. 1984.

Link's (1822) original description of this taxon is merely "*Gm. sinuata*. Hort. Herrenh. Hab..... C. Folia juniore acute angulata subtus glabra rotundata". The type, obviously, was from a cultivated plant, probably deposited in the Berlin herbarium and now destroyed.

Jackson (1893) gives the origin of this plant as "Ind. or.?" [=eastern India], but Sweet (1830) and Loudon (1832) assert without question that it was introduced from "E. Indies" [East Indies, now Indonesia] into British gardens in 1824. The only common name listed for it is "sinuated gmelina".

The Munich specimen, cited below, was probably taken from a cutting of the type plant in Berlin -- it is sterile, exhibiting only what appears to be a very young shoot or seedling sprout, whose leaves are not sinuate but very coarsely dentate with 2 or 3 very ir-

regular, almost lobe-like, triangular teeth on each side [reminiscent of Link's descriptive "acute angulata"], with apparently a detached older leaf which is actually sinuate-margined. The toothed material is a perfect match for seedling material of *Gmelina arborea* Roxb. as illustrated by Troup (1921), fig. 294 g & h, and it is my opinion that *G. sinuata* may possibly be nothing more than juvenile *G. arborea* Roxb. or *G. arborea* f. *dentata* Mold., although Link's description of glabrous leaves argues potently against any such disposition. The lack of inflorescences renders its position in the key to taxa given by me earlier in this series highly problematic.

Citations: CULTIVATED: Germany: *Herb. Kummer s.n.* [hort. bot. monac. 1842] (Ld--photo, Mu--1369).

GMELINA SMITHII Mold., *Phytologia* 6: 326--327. 1958.

Bibliography: Mold., *Phytologia* 6: 326--327. 1958; Mold., *Biol. Abstr.* 33: 1215. 1959; Mold., *Résumé* 201 & 456. 1959; Hocking, *Excerpt. Bot. A.5*: 44. 1962; G. Taylor, *Ind. Kew. Suppl.* 13: 61. 1966; Mold., *Fifth Summ.* 1: 337 (1971) and 2: 880. 1971; Hartley, *Dunstone, Fitzg., Johns, & Lamberton, Lloydia* 36: 293. 1973; Farnsworth, *Pharmacog. Titles* 9 (1): xii (1974) and 9 (3): x. 1974; Mold., *Phytol. Mem.* 2: 327 & 549. 1980; Mold., *Phytologia* 55: 334. 1984.

A medium-sized to tall tree, 18--90 m. tall, with a broad crown, the clear bole rising to 30 m., hollow at the base, unbuttressed or narrowly buttressed to 2.5 m., about 1 m. in diameter [girth?] at breast height; bark 0.8--2 cm. thick, the outer bark pale blue-gray or brownish-white to gray-brown, shallowly and irregularly fissured, with scattered cracks and with large flattened pustular lenticels, the under bark green, the inner bark yellow- or yellowish-brown, occasionally streaked with green on the back, brownish within, paler inwards, with a slight odor; wood light, soft, straw- or cream-color, the heartwood brown; branchlets rather stout, obtusely tetragonal, subglabrous, brunnescent; nodes plainly annulate; principal internodes 1.5--2 cm. long; leaves numerous, decussate-opposite; petioles short, about 1 cm. long, glabrate; leaf-blades firmly chartaceous or subcoriaceous, usually irregularly wrinkled in drying, pale- or olive-green and shiny above, mostly brownish scaly beneath, glabrous on both surfaces, 7--15 or more cm. long, 4--10 or more cm. wide, apically rounded or acute, marginally entire, basally rounded or acute; midrib flat above, prominent beneath; secondaries slender, 6 or 7 per side, ascending, not much arcuate, joined in many loops near the margins, obscure above, prominulous beneath; vein and veinlet reticulation sparse, mostly indiscernible above and obscure beneath; inflorescence terminal, widely paniculate, to 30 cm. long and wide, the branches ascending or widely divaricate, densely many-flowered, densely brown-pubescent on the younger parts, glabrescent on the older parts and completely smooth in age; bractlets numerous, lanceolate or narrow-elliptic, about 5 mm. long and 2--3 mm. wide, narrowed at both ends, densely puberulent on both surfaces, mostly hiding the buds and calyxes, sometimes blackish, caducous; pedicels very slender, 3--4 mm. long, or occasionally the

basal ones to 10 mm. long, densely brown-pubescent; buds sometimes blackish in drying; flowers without fragrance; calyx campanulate, about 4 mm. long and wide, externally densely pubescent throughout, the rim 4-toothed; corolla red or pale-blue to mauve or white, bilabiate, the lower lip with a yellow blotch or 2 yellow spots drawn out into lines inwards; anthers brown; fruit at first green or "dull blackish-green", turning reddish to red.

The type of this species is *L. S. Smith 1064* from Aiyura, at an altitude of 6000 feet, in the central highlands of northeastern New Guinea, collected in October, 1944 (although the label on the type specimen gives the date as "1/12/44", apparently in error), deposited in the herbarium of the Department of Forests at Lae, Papua New Guinea.

Collectors have encountered this plant in disturbed montane forests, lower montane rainforests with *Cinnamomum*, *Elmerrillia*, and *Symplocos*, and primary forests 30--40 m. tall on rocky slopes facing the sea, at 1825 m. altitude, in flower in June and August, in fruit in July, and in both flower and fruit in October and November. The vernacular names, "kaboya" and "yabeina", have been reported.

Jacobs refers to the "innovations at first brown". The corollas are described as "red" on *LAE.62098*, "pale-blue" on *Smith 1064*, "white to mauve" on *NGF.25552*, and "white with a yellow blotch on the tip" on *Jacobs 9536*. Hartley & al. (1973) cite *Hartley 12065* from Akuna.

The species is obviously very closely related to *G. lepidota* Scheff.

Citations: NEW GUINEA: Papua: *Barrett 4167* (Ng--6601). Territory of New Guinea: *Jacobs 9536* (W--2758504); *Kairo NGF.25552* (Mu); *Katik & Eddowes LAE.62098* (Mu); *L. S. Smith 1064* (Ld--isotype, Ng--16968--type, Ng--isotype).

GMELINA TOMENTOSA Fletcher, Kew Bull. Misc. Inf. 1938: 204--205. 1938.

Bibliography: Fletcher, Kew Bull. Misc. Inf. 1938: 204--205, 422, & 423. 1938; Mold., Known. Geogr. Distrib. Verbenac., ed. 1, 60 & 93. 1942; Hill & Salisb., In. Kew. Suppl. 10: 100. 1947; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 138 & 186. 1949; Anon., Kew Bull. Gen. Ind. 134. 1959; Mold., Résumé 178 & 456. 1959; Mold., Fifth Summ. 1: 296 (1971) and 2: 880. 1971; Mold., Phytol. Mem. 2: 286 & 549. 1980; Mold., Phytologia 55: 334, 337, 432, 474, 480, & 497. 1984.

A shrub, 2.5--3 m. tall; branchlets obtusely tetragonal, at first conspicuously tomentose, finally glabrous, armed with a few 5-mm-long spines; leaves decussate-opposite; petioles 1.5--3.5 cm. long, densely tomentose; leaf-blades ovate (when young) or deltoid (when mature), 3--8 cm. long, 3--7 cm. wide, apically rounded or broadly obtuse, marginally entire and ciliate, basally subcuneate or deltoid, fulvous-appressed-tomentose above, fulvous-tomentose and glanduliferous beneath, the glands round or quadrangular, white, and sessile; midrib conspicuous above, prominent beneath; secondaries 4--6 pairs, conspicuous above, prominent beneath; tertiaries trans-

verse, strong, numerous, parallel; inflorescence terminal, 2--5 cm. long; bracts small, lanceolate, about 4 mm. long and 1 mm. wide, tomentose; calyx externally tomentose and glanduliferous, the glands mostly white, with a few large black ones interspersed, the calyx-tube about 3 mm. long, internally glabrous, the rim with 4 teeth about 0.5 mm. long, often almost sinuate-lobate; corolla externally tomentose and white-glanduliferous, the tube 2 cm. long, internally glabrous, the limb bilabiate, the posterior lip 10 mm. long and wide, the inferior lip 3-lobed and 18 mm. long, the lobes apically rounded; stamens 4, two 21--22 mm. long and attached 9 mm. above the base of the corolla-tube, the other two 9--10 mm. long and attached 8 mm. above the base; anthers 2.5 mm. long; style 3 cm. long; ovary 2 mm. wide, externally glabrous.

This species is based on *Noe 211* from Korat, Ban Chum Seng, Rachisima, Thailand, deposited in the Kew herbarium. Thus far, the species is known to me only from the original description. Fletcher (1938) affirms that it is related to *G. elliptica* J. E. Sm., differing in having its leaf-blades basally deltoid and tomentose above and its corollas larger.

GMELINA TONKINENSIS Mold., *Phytologia* 1: 419. 1940.

Bibliography: Mold., *Phytologia* 1: 419. 1940; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 1, 59 & 93. 1942; Hill & Salisb., *Ind. Kew. Suppl.* 10: 100. 1947; Mold., *Known Geogr. Distrib. Verbenac.*, ed. 2, 136 & 186. 1949; Mold., *Résumé* 176 & 456. 1959; Mold., *Fifth Summ.* 1: 301 (1971) and 2: 880. 1971; Mold., *Phytol. Mem.* 2: 293 & 549. 1980.

A somewhat spiny shrub; branchlets very slender, the younger parts densely short-pubescent with fulvous hairs, the older parts merely densely puberulent, sparsely but prominently lenticellate; leaves decussate-opposite; petioles very slender, 0.8--6 cm. long, densely short-pubescent with fulvous hairs like the young twigs; leaf-blades thin-chartaceous or membranous, ovate, 3.7--13 cm. long, 2.5--9.1 cm. wide, apically acute or short-acuminate, marginally entire, basally cordate or truncate to abruptly acute, very sparsely strigillose-pubescent (especially along the larger venation) above, becoming glabrous in age, densely short-pubescent beneath over the lower puberulence; inflorescence terminal, racemiform; calyx small, with distinctive large glands at its apex; corolla yellow; fruit fleshy, yellow-green (immature?).

This species is based on *Benedict Balansa 3807* from along the sides of the road leading from Tuchap to the rocks of Notre Dame, Tonkin, Vietnam, collected in May or June, 1887, and deposited in the Leningrad herbarium. Material has been misidentified and distributed in some herbaria as *G. asiatica* L.

Citations: VIETNAM: Annam: *Pételot 4536* (N). Tonkin: *Balansa 3807* (K--isotype, L--type, Ld--photo of type, N--isotype, N--photo of type), *4972* (K).

[to be continued]



Moldenke, Harold N. 1984. "Additional notes on the genus *Gmelina*. V." *Phytologia* 56, 154–182.

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