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CONSPECTUS OF THE GENERA RADERMACHERA AND FERNANDOA IN INDO-MALESIA (BIGNONIACEAE)

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SUMMARY

In *Radermachera* 16 named species (among which three new) are keyed out. The genus *Mayodendron* is reduced to *Radermachera*; one new combination is made. One Phillippine species known only from a presumably lost type remains doubtful. About 34 names are put into synonymy, many of which for the first time. Species are listed and provided with references and critical notes; for most species the sheets examined are cited. Types are cited and all except one have been examined. Six names are excluded from the genus and are referred to other names. In the key to the species I have also included the species of genera similar to *Radermachera*, viz. *Pauldopia* and *Barnettia*, for the convenience of other workers.

The African genus *Fernandoa* is extended to occur in Indo-Malesia by the reduction of *Haplophragma*, *Spathodeopsis*, and *Hexaneurocarpon*, and to Madagascar by reduction of the genus *Kigelianthe*. A key is given to the six Indo-Malesian species, with references and specimens examined, and the six necessary new combinations are made. Domatia and stellate hairs are recorded for the first time.

INTRODUCTION

During the investigation of *Bignoniaceae* for revision in Flora Malesiana, I felt the necessity of examining continental Asian material of *Radermachera* in conjunction with those of the Philippine Islands, especially the species described by P. Dop from Indo-China and by Merrill from Hainan and the Philippines.

Besides the Rijksherbarium collections I held for a very long time a loan from the Arnold Arboretum, and a generous recent one. In addition I could borrow material from Kew, Edinburgh, Hong Kong, Michigan, Singapore, the U.S. National Herbarium, Washington, D.C., and from the Muséum National d' Histoire Naturelle de Paris, for which I am very grateful indeed, as these loans included many vital type specimens, some of which the only specimens known to exist of species. Among a large bunch of unnamed material graciously sent to me from Paris I found most interesting specimens, which led to rather radical, unexpected changes in the account of the Indo-Chinese *Bignoniaceae*.

Collecting numbers are only mentioned in so far as they have been examined and as far as they will not be incorporated in a future Identification List of Malesian specimens.

1. RADERMACHERA

Radermachera Zoll. & Mor. in Zoll., Syst. Verz. 3 (1854) 53, incl. sect. *Alatae* Steen., Acta Bot. Neerl. 2 (1952) 30.

Lagaropyxis Miq., Ann. Mus. Bot. Lugd. Bat. 1 (1864) 198.

Stereospermum pro sect. *Radermachera* et *Xylocarpaea* B. & H., Gen. Pl. 2 (1876) 1047.

Mayodendron Kurz, Prel. Rep. For. Veg. Pegu, App. D (1875) pl. 1 & 2; For. Fl. Burma 2 (1877) 232; K. Sch. in E. & P., Nat. Pfl. Fam. IV, 3b (1895) 244; Dop, Fl. Gén. I.—C. 4 (1930) 597; Chatterjee, Bull. Bot. Soc. Beng. 2 (1948) 74; Santisuk, Thai For. Bull. Bot. 8 (1974) 8.

Distribution: Sixteen species, in continental SE. Asia (India, Burma, Thailand, Indo-China, and S. China: Yunnan, Kwantung, Kwangsi, Hainan), Formosa, southern Ryu Kyu Is., and throughout Malesia except most Moluccas and New Guinea.

Notes. Apart from making reductions and describing three new species, I have reduced the monotypic genus *Mayodendron* to *Radermachera*.

The differences with *Radermachera* hitherto assumed were: occurrence of a false septum, ovules in two rows in each cell, a halfway spathaceous calyx, and cauliflorous short racemes.

It is remarkable that these statements were never well verified, although much new material had been collected. Obviously, Kurz's statement about the false septum rests on an erroneous observation taken from too young material; the septum is at maturity terete and corky; fruit valves, septum, and seeds are exactly similar to those in *Radermachera*. The ovules seem, if one slits the ovary along the attachment of the dissepiment, to be 1-seriate, but, turning the ovary 90° and observing the flat side of the dissepiment, they appear to be attached in many rows. Also in the fruit the seeds are in many rows. Cauliflory was at Kurz's time unknown in *Radermachera*, but since that time *R. cauliflora* was described from Mt. Kinabalu; both species also possess racemes instead of the panicles that are usual in *Radermachera*. The halfway slit calyx cannot well be called spathaceous, as the veins are indeed convergent to the apex but this apex ends in minute teeth close together; splitting of the calyx is often into irregular lobes.

It is, hence, clear that *Mayodendron igneum* belongs to *Radermachera*. As a matter of fact also in foliage it is closest allied to *R. cauliflora* with which it shares also its orange-red flower colour.

TENTATIVE KEY TO THE SPECIES OF RADERMACHERA AND ALLIED GENERA

1. Corolla tubular, funnel-, or salver-shaped, without clear distinction of a cylindrical basal and a rather abruptly widened or ventricose upper part of the tube with the stamens attached in the throat.
   2. Rachises narrowly winged and leaflets sessile; leaves 2-pinnate. Corolla tube curved, yellow with brown-red. Inflorescence not lacquered when young. Seeds wingless. Septum thin. Calyx open in bud, truncate.
      Pauldopia ghorta (Buch.-Ham. *ex* G. Don) Steen.
   2. Rachises not winged. Corolla tube straight. Seeds thinly hyaline-winged.
      3. Leaves in pseudo-whorls, 1-pinnate. Calyx and capsule covered with small tuberculate to warty glands. Capsule short (*c.* 15 cm), ellipsoid or oblong; septum cruciform in cross-section . . . . **Barnettia pagetii** (Craib) Santisuk
      3. Leaves not in pseudo-whorls, 2- or 3-pinnate. Calyx and fruit without warts or tuberculate glands. Capsule terete, cylindric. Septum corky, with impressions of seeds, but not cruciform by development of a pseudo-septum.
         4. Flowers in racemes, sometimes almost reduced to fascicles, almost always lateral, ramiflorous.
            5. Rachis of racemes terminal or axillary, very slender with widely spaced flowers, glabrous, 15—25 cm long. Calyx tubular, *c.* 10 by 4—5 mm at apex, very shortly 2-lobed, in the middle with a whorl of large glands. Corolla slender, *c.* 4—5 cm long, *c.* 0.8 cm wide at apex, yellow. Leaves 1-pinnate . . . . . **2. R. eberhardtii** P. Dop
            5. Calyx otherwise, not halfway with a whorl of glands. Leaves 2-pinnate.
               6. Corolla 5—7 cm long.

7. Calyx tubular, *c.* 2.5 cm long, 0.8—1 cm wide at mouth, glabrous, shortly and irregularly 2- or 3-lobed at apex, lobes *c.* 0.25 as long as the tube. Corolla tube slightly curved, widest at apex, with yellow and red limb. Racemes with thick rachis, up to 15 cm, glabrous.
12. R. ramiflora Steen.

7. Calyx 1.5—2(—2.5) cm long, tubular but halfway slit spathaceously, apex acutish with a few minute teeth or pointed. Corolla straight, 6—7.5 cm long, the upper portion of the tube through a slight contraction more or less barrel-shaped, widest below the limb, orange-yellow. Racemes very short, *c.* 1—2 cm, usually up to and including the calyx short pubescent. . . **7. R. ignea** (Kurz) Steen.

6. Corolla 3—4.5 cm long, not contracted below the limb, its lower part enclosed by the calyx. Calyx 1.2—1.8 cm long, glabrous or puberulous, mostly 3-lobed, but on one side deeper to halfway. Racemes very short up to *c.* 3 cm, terminal or mostly ramiflorous at the twig ends. Calyx red, corolla yellow. . . . . **6. R. hainanensis** Merr.

4. Flowers either in terminal thyrses, or only 3.5—4 cm long and white.

8. Calyx in bud obconical, thick, glabrous, *c.* 1 cm long, the apex *c.* 7—8 mm wide, stunted or slightly convex, with 5 glandular bulges; when mature *c.* 1.5 cm long, conically narrowed above the glandular peak-shaped bulges, and ending into two short lobes. Corolla yellow, with narrow tube, 5—6 cm long, at apex *c.* 1 cm wide. Leaves 2-pinnate.
14. R. stellata Steen.

8. Calyx not inflated in the middle with 5 peak-shaped glandular bulges and conically narrowed above these.

9. Corolla slender, 3.5—4.5 cm long.

10. Corolla with a strictly cylindric tube 2.5—3 mm wide. Calyx tubular, *c.* 1.5 cm long, with 3 or 4 very short lobes (*c.* 2—3 mm).
3. R. frondosa Chun & How

10. Corolla tube gradually widening to the apex, *c.* 6—7 mm wide below the limb. Calyx *c.* 1 cm long, irregularly split into 2 or 3 lobes.. . . . . **4. R. gigantea** (Bl.) Miq.

9. Corolla much larger, 6—7.5 cm or even longer. Calyx much larger (2.5—3 cm) and with much larger lobes. Capsule 0.8—1 cm wide, with sometimes woody valves. Corolla (pale) yellow (to creamy?).

11. Stamens 5, glandular hairy at their insertion. Calyx wide, campanulate, split halfway into acute lobes. Leaflets 7—15(—30) cm long.
10. R. pentandra Hemsl.

11. Stamens 4, glabrous at their insertion, didynamous. Calyx tubular to bottle-shaped, split only to 0.25 into blunt or rounded lobes. Leaflets narrow, small, long-acuminate, *c.* 4—7 cm long. Deciduous (always?) tree. . . . . **13. R. sinica** (Hance) Hemsl.

1. Corolla with a distinct cylindric basal and a rather suddenly widened upper part of the tube, the stamens inserted in the throat.

12. Leaves in pseudo-whorls, 1-pinnate. Calyx covered with small tuberculate or warty glands. Capsule short, ellipsoid or oblong, with scattered sunken glands, *c.* 15 cm. Thyrse sparsely stiff-stellate-hairy.
Barnettia kerrii (Barnett & Sandw.) Santisuk

12. Leaves not in pseudo-whorls. Calyx without tuberculate or warty glands. Capsule terete, mostly longer.
    13. Calyx cupular, stunted, 3—6 mm, in fruit sometimes very shallowly split. Corolla narrow, 2.5—3.5 cm, basal part of tube much longer than the calyx.
        14. Calyx 5—6 mm high, above the middle with a whorl of *c.* 10 compact gland-fields, at first sight resembling simple glands, finally circumscissile at the base. Corolla limb not microscopically lepidote. Seed body not very well delineated against the hyaline wings. Valves very thin, *c.* 3 mm wide. Leaves 2-pinnate; leaflets 5—8 by 2.5—4 cm, long acuminate, with some scattered glands underneath . . . . . **1. R. boniana** P. Dop.
        14. Calyx 3—5 mm, at or below the middle with a more irregular whorl of mostly less than 10 compact gland-fields, not circumscissile at base. Corolla limb microscopically lepidote. Seed body sharply delineated against the hyaline wings, most of it pellucid. Valves thin, *c.* 4—5 mm wide. Leaves 1-pinnate; leaflets broad-elliptic, only short-acuminate, 10—35 by 7—17 cm, with a usually dense gland-field at base underneath. **5. R. glandulosa** (Bl.) Miq.
    13. Calyx variously incised or lobed or larger or longer.
        15. Thyrse coarse, profusely branched, with rather foliaceous bracts at the articulations, hairy. Calyx ± regularly 5-lobed. Ovary tuberculate. Capsule woody, up to 1 m, 2—3 cm ∅, hard-tuberculate. Deciduous tree; leaf stalks and midrib above short-hairy. **15. R. xylocarpa** (Roxb.) K. Sch.
        15. Inflorescence without foliaceous bracts, glabrous. Calyx usually unequal-lobed. Ovary and capsule not tuberculate; capsule much thinner.
            16. Corolla tube glabrous inside, also at the insertion of the stamens; basal part wide, 1.5 by 0.8—1 cm (dried), obviously largely concealed in the smooth calyx which is 2—2.5 by 1.5—2 cm at the rim. Leaves very large, 3-pinnate. Corolla coarse, 6—7 cm. Bracts long, filiform, exceeding the buds . . . . . **9. R. peninsularis** Steen.
            16. Corolla tube glandular-hairy at the insertion of the stamens; basal part less wide. Bracts inconspicuous.
                17. Corolla white or pink, commonly with some yellow streaks in the mouth.
                    18. Calyx in mature buds globular, almost glandless, *c.* 8—9 mm ∅, in anthesis inflated hemispherical, *c.* 1.2 cm high, at the margin *c.* 1.5 cm ∅, the lobes only 2—3 mm. Corolla white, 5 cm, the basal part *c.* 1—1.2 cm long, upper part campanulately widened; lobes very crisped. **8. R. inflata** Steen.
                    18. Buds not globular and calyx not inflated in anthesis. Flowers mostly pinkish, with some yellow streaks in the mouth.
                        19. Calyx *c.* 1.8 cm long, narrow, strongly lengthwise costate with 5 or 6 ridges, cleft down halfway on one side, 3-toothed at apex. Corolla 4 cm long, with narrow tube. Leaves 1-pinnate, leaflets 5. . . **16. R. coriacea** Merr.
                        19. Calyx without ridges. Leaves 2-pinnate, rarely upper ones reduced to 1-pinnate.
                            20. Corolla *c.* 5—6 cm long. **4. R. gigantea** (Bl.) Miq.
                            20. Corolla *c.* 2.5—3.5 cm long. **11. R. pinnata** (Blanco) Seem.

17. Corolla yellow or orange.
    21. Leaves 1-pinnate; leaflets 2 (or 3) pairs, broad-elliptic to oblong, (6—)10—18 by (3.5—)5—7 cm. Calyx tubular, not or hardly oblique at apex, 11—15 by *c.* 4 mm, halfway (or lower) with a regular whorl of 10 condensed gland-fields; lobes 2—5 mm long (to halfway the calyx). Flowers in terminal raceme-like 10—25 cm long panicles, rarely lateral on the wood of twigs. Corolla narrow, the basal part of tube *c.* 1.5—1.8 cm, distinctly to far exceeding the calyx, in all 4—5 cm, tube 0.8—1 cm wide at the mouth.
    2. R. eberhardtii P. Dop
    21. Leaves (1—)2—3-pinnate; leaflets oblong, often very unequal-sided, 4—12 by 2—4 cm. Calyx more campanulate or obconical, often oblique, 10—20 by 6—7 mm, with a few scattered glands or gland-fields, 2- or 3-lobed to subspathaceous. Panicles short or raceme-like, 0.5—5(—10) cm. Basal part of tube of the corolla largely included in the calyx, corolla in all 3—6 cm long, *c.* 15—30 mm wide at the mouth.
    6. R. hainanensis Merr.

1. Radermachera boniana P. Dop

R. boniana P. Dop, Bull. Mus. Hist. Nat. Paris 32 (1926) 184; Fl. Gén. I.—C. 4 (1930) 586. — Type: *H. Bon 5682* (P), Tonkin, Mù Bóng, pr. Cho Trè.

Distribution. Tonkin; only known from the type.

Note. Allied to *R. eberhardtii* and also possessing the peculiar whorl of 10 condensed gland-fields on the calyx, but differing by the shorter entire calyx and 2-pinnate leaves.

2. Radermachera eberhardtii P. Dop

R. eberhardtii P. Dop, Bull. Mus. Hist. Nat. Paris 32 (1926) 233; Fl. Gén. I.—C. 4 (1930) 587, incl. var. *acuta* P. Dop, l.c. 588. — Lectotype: *Eberhardt 1594* (P), Tonkin, Hoi Mit, Prov. Thua-Thien; syntype: *Eberhardt 1655* (P), Lang-co, Prov. Thua-Thien. — Type of var. *acuta*: *Poilane 7422* (P), Annam, Lieu Chien pr. Tourane (fl.), *Poilane 7490*, ditto (fr.).

Distribution. Indo-China (Tonkin and Annam).

INDO-CHINA. *Clemens 4353; Eberhardt 1594, 1655, 2634; Poilane 7422, 7490.*

Note. The material is very homogeneous.

3. Radermachera frondosa Chun & How

R. frondosa Chun & How, Acta Phytotax. Sin. 7 (1958) 75, pl. 23. — *R. sinica* auct. *non* (Hance) Hemsl.: Merr., Lingn. Sc. J. 6 (1928) 286. — Type: *Tso & Chun 43631, 43842, immers. n. E/213* (of the latter number isotypes in A, L).

Distribution. Hainan and Kwantung (Chun & How, l.c.).

HAINAN. *Chun & Tso 43631, 43842, 44662; H. Fung 20577; Gressitt 1074; F. C. How 71745, 71938; F. C. How & N. K. Chun 70127; S. K. Lau 175, 1390, 2845, 3403, 5688, 6201, 28392; H. Y. Liang 62003, 62170, 63607, 65023, 66142; Steward & Cheo 1214; Tsang 475 (=LU 15974), 530 (=LU 17279); Tso & Chun 43842; C. W. Wang 32891, 33916.*

Note. A very characteristic species allied with *R. sinica* and with similar leaves but with a very slender, smaller corolla. The material is very homogeneous.

4. Radermachera gigantea (Bl.) Miq.

R. gigantea (Bl.) Miq., Ann. Mus. Bot. Lugd. Bat. 3 (1867) 250; Steen., Bull. Jard. Bot. Btzg III, 10 (1928) 253, incl. var. *aurantiaca* Steen., l.c. 257. — *Spathodea gigantea* Bl., Bijdr. (1826) 761. — *Lagaropyxis gigantea* Miq., Ann. Mus. Bot. Lugd. Bat. 1 (1864) 198, incl. f. *sumatrana* et *borneensis* Miq. — T y p e: *Blume 1277* (L), Java.

Bignonia amoena Wall., Pl. As. Rar. 2 (1831) 78, t. 183. — *Spathodea amoena* DC., Prod. 9 (1845) 208. — *R. amoena* Seem., J. Bot. 8 (1870) 146. — T y p e: *Wallich 6512* (K).

Bignonia oxyphylla DC., Prod. 9 (1845) 169. — T y p e: ? (DC).

Stereospermum hypostictum Miq., Sumatra (1861) 565. — T y p e: *Teysmann s.n.* (BO), W. Central Sumatra.

R. elmeri Merr., Bull. Govt. Lab. Philip. 29 (1905) 48. — T y p e: *Elmer 6179* (US), Philippines, Luzon.

R. biternata Merr., Philip. J. Sc. 1 (1906) Suppl. 238. — T y p e: *Merrill 568* (US), Philippines, Culion.

R. palawanensis Merr., Philip. J. Sc. 3 (1908) Bot. 336. — T y p e: *Foxworthy 699* (US), Philippines, Palawan, Victoria Peak.

R. elliptica Merr., Philip. J. Sc. 3 (1908) Bot. 334. — T y p e: *FB 11141* (K), Philippines, Luzon.

R. sibuyanensis Elmer, Leafl. Philip. Bot. 4 (1912) 1485. — T y p e: *Elmer 12060* (L), Philippines, Sibuyan.

R. elmeri var. *fragrans* Elmer, Leafl. Philip. Bot. 7 (1915) 2561. — *R. fragrans* Steen., Rec. Trav. Bot. Néerl. 24 (1927) 996. — T y p e: *Elmer 12681* (L), Philippines, Palawan.

R. punctata Elmer *ex* Steen., Rec. Trav. Bot. Néerl. 24 (1927) 982. — S y n t y p e s: *Elmer 14817, 16066* (L), Philippines, Luzon.

R. borneensis Steen., Bull. Jard. Bot. Btzg III, 10 (1928) 258, fig. 10. — T y p e: *bb 2490* (BO, L), SE. Borneo, Martapura.

D i s t r i b u t i o n. Continental SE. Asia (Assam: Khasia & Jaintia Hills; Burma: Manipur, Tavoy) and Malesia: Sumatra, Java, Borneo, Philippines, and Lesser Sunda Islands (Bali east to Alor), not in Malaya!

N o t e s. This is a heterogeneous species, especially in the Philippine Islands where there is, as usual, an obvious racial segregation which has given rise to many names, but where there is also the greatest diversity in variation, especially in Palawan. This will more amply be discussed in Flora Malesiana.

The species ranges from SE. continental Asia (Assam, Burma) to West & Central Malesia (not found in Malaya), as far east as the W. Philippines (Palawan, Culion), SE. Borneo, and the Lesser Sunda Islands (Alor).

It is closely allied to *R. pinnata*, which has in Malesia about the same range, but differs by flowers half the size of those of *R. gigantea*.

5. Radermachera glandulosa (Bl.) Miq.

R. glandulosa (Bl.) Miq., Ann. Mus. Bot. Lugd. Bat. 3 (1876) 250. — *Spathodea glandulosa* Bl., Bijdr. (1826) 763. — *Stereospermum glandulosum* Miq., Sumatra (1861) 240. — *Lagaropyxis glandulosa* Miq., Ann. Mus. Bot. Lugd. Bat. 1 (1864) 199. — T y p e: *Blume s.n.* (L), Java, Cheribon, Oct.

Bignonia porteriana Wall. *ex* DC., Prod. 9 (1845) 165. — T y p e: *Wallich, Cat. 6509* (K), Penang.

R. stricta Zoll. & Mor. *ex* Zoll., Syst. Verz. 3 (1854) 53. — T y p e: *Zollinger 3141* = *HZ 820* (BO), Java.

D i s t r i b u t i o n. Continental SE. Asia (Assam, Burma, Thailand, Laos, and China: Kwangsi, Kwantung) and Malesia: Malaya, Sumatra, Java.

N o t e. A homogeneous species; curiously not mentioned by Dop from Indo-China. I saw *Kerr 20887* from Laos; from S. China (Kwangsi) I saw *W. T. Tsang 22326*.

6. Radermachera hainanensis Merr.

R. hainanensis Merr., Philip. J. Sc. 21 (1922) 353; Groff c.s., Lingn. Agric. Rev. 3 (1925) 19. — T y p e: *McClure 7648* (A, NY), Hongkong Herb. 453 (phot. in A, type in HK).

R. pierrei P. Dop, Bull. Mus. Hist. Nat. Paris 32 (1926) 234; Fl. Gén. I.—C. 4 (1930) 589; Santisuk, Thai For. Bull. Bot. 8 (1974) 80. — T y p e: *Pierre 570* (A, K, P), Cambodia, Mt. Schral.

R. poilanei P. Dop, Bull. Mus. Hist. Nat. Paris II, 2 (1930) 155; Fl. Gén. I.—C. 4 (1930) 590. — T y p e: *Poilane 8759* (fl.), *5953* (fr.) (K, P), Annam, Ca-na, Prov. Phan-rang.

R. grandiflora P. Dop, Bull. Mus. Hist. Nat. Paris II, 2 (1930) 154; Fl. Gén. I.—C. 4 (1930) 589. — T y p e: *Poilane 9681* (P), Annam, Ba-ran, Prov. Phan-rang.

D i s t r i b u t i o n. Hainan, Indo-China, and Thailand.

HAINAN. *Hong Kong Herb. 453; F. C. How 70576, 72199; F. C. How & N. K. Chun 70297; S. P. Ko 52122; S. K. Lau 286, 3443, 5384, 25548; H. Y. Liang 61522, 62797, 65023; McClure 7648; W. T. Tsang 653 (=LU 16152); Tsang, Tsang & Fung 7 (=LU 17538).*
INDO-CHINA. *Clemens 3410; R. Muller 1064; Pierre 570; Poilane 5953, 6598, 8759, 9681.*
THAILAND. *Kerr 12337, 20865; RFD 25493; Smitinand 3182 (=RFD 19127), 3692 (=RFD 23971).*

N o t e s. The type of *R. hainanensis* Merr. consists of rather poor specimens taken from depauperate twig tops. Merrill described the leaves to be 1-pinnate, but in the New York isotype there is also a 2-pinnate leaf. The corolla is *c.* 3—3.5 cm long and yellow (Groff c.s., 1925), the lobes *c.* 5—6 mm; the glabrous calyx, *c.* 1.5 cm long and bearing a few scattered glands, is halfway spathaceously split, but the apex is 2-lobed; the inflorescence is short, either terminal or on the twigs. Other specimens from Hainan tally the type, e.g. *Lau 5384* and *Liang 61522* and *65023*. Many other specimens, however, have a puberulous inflorescence and a puberulous calyx which may be only 1 cm long, while leaves in large specimens are 2- or 3-pinnate. Sometimes their calyces are only 1-lobed and then they imitate those of *R. ignea*, in which the corolla, however, is much larger and not tubular-campanulate but ± constricted to the apex.

There are in Hainan, however, also specimens with a larger corolla, varying between 4 and 5 cm, viz.: *How 70576* 4 cm, *S.P. Ko 52122 c.* 4.5 cm, *Lau 286* 4.5—5 cm.

These specimens cannot be distinguished from others in Indo-China, whereas also the type specimens of *R. pierrei* and *R. grandiflora* have a corolla of 4.5 cm length, with lobes of *c.* 1 cm, and the latter also a spathaceous 2-lobed calyx. They cannot be separated from *R. hainanensis*.

From Annam there is one exceptional collection (*Clemens 3410*) with a corolla *c.* 6.5—7 cm long, but otherwise in leaf and stunted ramiflorous racemes not distinguishable, the only really strange feature being the note by the collectors that flowers would be pink, whereas they are in all other specimens said to be yellow and the calyx mostly red.

From Indo-China I have not seen specimens with such small flowers as in Hainan and also I have not seen a hairy calyx in Indo-Chinese specimens, both characters being obviously confined to Hainan populations.

Obviously, *R. hainanensis* is related to *R. ignea*, showing resemblance in the calyx and the often ramiflorous, stunted racemes, but differing radically in corolla shape.

7. **Radermachera ignea** (Kurz) Steen., *comb. nov.*

Spathodea ignea Kurz, J. R. As. Soc. Beng. 40, 2 (1871) 77; op. cit. 42, 2 (1873) 91. — *Mayodendron igneum* Kurz, Prel. Rep. For. Veg. Pegu, App. D. (1875) pl. 1 & 2; For. Fl. Burma 2 (1877) 232; Clarke, Fl. Br. Ind. 4 (1884) 381; K. Sch. in E. & P., Nat. Pfl. Fam. IV, 3b (1895) 244; Dop, Fl. Gén. I.—C. 4 (1930) 597, fig. 65: 5 & 6; Chatterjee, Bull. Bot. Soc. Beng. 2 (1948) 74; Santisuk, Thai For. Bull. Bot. 8 (1974) 8, fig. 4. — T y p e: *Brandis 1357* (CAL, K).

D i s t r i b u t i o n. N. Burma, N. Thailand, Laos, Annam, and S. China (Yunnan).

BURMA. Upper Burma: *Shaik Mokim s.n.*, May 1898.
THAILAND. N o r t h: *Garrett 157; Geesink & Santisuk 6005.*
LAOS. *Kerr 20909; Poilane 13608, 20592.*
ANNAM. *Poilane 22245.*
S. CHINA. Y u n n a n: *Esquirol 160704; C. W. Wang 72220A, 76561, 77932, 81026.*

Note. According to Santisuk this species is in Thailand chiefly confined to limestone rock hills in evergreen forest and shady places, and leafless while blooming. The latter statement does not hold true elsewhere.

8. Radermachera inflata Steen., *sp. nov.* — Fig. 1e—f.

Affinis *R. peninsularis*, sed florum gemmis globosis calyceque maturo valde inflato diversa; calyx 10—12 mm longus, glandulis nullis, lobis latissimis 2—3 mm tantum longis. Corolla alba, tubo inferne c. 1 cm, parte superiore campanulato-infundibulariformi-dilatato c. 3 cm diam., lobis crispatis 1—1.2 cm longis. Stamina apice tubi calycini partis inferioris inserta; basi filamentorum glandulis capitatis instructa. Folia 2-pinnata.

Type: *W. T. Tsang 28967* (P; iso in A, K, SING), Tonkin, Taai Wong Mo Shan, near Chuck-phai, Ha-coi, May—June 1939.

Leaves 2-pinnate, those present juvenile, *c.* 35 cm; leaflets lanceolate, acuminate, *c.* 5 by 1.5—2.5 cm; midrib and veins minutely puberulous on both sides; glands underneath few, scattered, and small. *Thyrse* terminal, at least 10 cm long. Buds globular, 8—9 mm ∅. *Calyx* wide-campanulate, inflated, glandless, about as wide as long or wider, *c.* 1.2 by 1.5 cm, with very short but wide lobes 2—3 mm long. *Corolla* white, 6 cm long, the basal part of the tube 1—1.2 cm, 4—5 mm wide, upper part funnel-campanulately widened, 3—3.5 cm, lobes *c.* 1 by 1.2 cm, crispate at the margin. Filaments capitate-glandular at the insertions.

Distribution. Tonkin, one collection only.

Note. Through the leaves reminding of small specimens of *R. peninsularis*, but quite different by the smaller crispate corolla and hairy filaments, different from all other species by the inflated shallowly lobed calyx and globular buds. The nearest allied species is possibly *R. gigantea*, in particular the Philippine forms described formerly as *R. elmeri*, etc.

9. Radermachera peninsularis Steen., *sp. nov.* — Fig. 1a—d.

R. borii auct. *non* Fischer: Santisuk, Thai For. Bull. Bot. 8 (1974) 30.

Affinis *R. sinica* sed forma longitudineque corollae diversa; corolla parte tubi inferiore cylindrica, parte superiore late infundibulariformi-campanulata; stamine apice partis inferioris tubi calyce inclusi inserta; corolla 6—7 cm longa; calyx 2—2.5 cm longus, sub plena anthesi laevis, basi haud sulcatus, glandulis planis 5 instructus.

Type: *Larsen, Nielsen & Santisuk 31239* (AAU), Peninsular Thailand, pr. Ao Luk, between Ohangnga and Krabi, 8°25' N, 99°15' E.

Leaves 2- or 3-pinnate, 60—80 cm; leaflets lanceolate-oblong, falcate-caudate, on both surfaces microscopically punctate, but only with a few scattered, very small larger glands, 5—10 by 2—2.5 cm; petiolules 0—3 mm; midrib and main nerves (*c.* 4 or 5 pairs) puberulous (as in *R. sinica*). *Inflorescences* terminal, similar to those in *R. sinica*; peduncle firm, 15—35 cm long, rachis 4—7 cm; full-grown pedicels 2.5—7 cm, halfway with 2 decussate linear bracteoles *c.* 1.5—3 cm long. Bracts long, linear, exceeding the buds, the lowest up to 5 cm long, upper ones 2.5—3 cm. *Calyx* campanulate, rather wide and thick, densely microscopically lepidote by granular glands, 2—2.5 by 1.5—2 cm at the limb, only slightly irregularly lobed for 30—40%, with 5 ± distinct gland-fields. *Corolla* white, 6—7 cm, incl. the entire (?) lobes, the basal part of the tube *c.* 1.5 by 0.2—1 cm, widest at base. *Filaments c.* 3 cm, glabrous; anthers glabrous, 4.5 mm; connective appendage small. *Ovary* glabrous. *Capsule* terete, tortuous, 60—70 cm by 3—5 mm.

Distribution. Peninsular Thailand (*Larsen c.s. 31239*; Prov. Pangnga, 8°25' N,

98°30′ E, *Geesink & Santisuk 5300* in AAU, L) and Malay Peninsula (Pahang: Cameron Highlands, *SF 32631* in A, BO, K, L, LAE, SAR, SING; *van Balgooy 2656* in L).

Notes. Both Thai collections were made in evergreen forest along stream on limestone, at 50 m alt., the Malay specimens in evergreen forest at *c.* 1200 m alt., but the specimens are strikingly similar. In both collections the flower colour was white.

In leaf- and corolla-shape this species shows also resemblance with *R. inflata*.

10. **Radermachera pentandra** Hemsl.

R. pentandra Hemsl., Hook. Ic. Pl. 28 (1902) t. 2728. — Type: *A. Henry 10909* (A, K), Yunnan, Mengtze.

Distribution. China (Yunnan).

CHINA. Yunnan: *Henry 10909; H. T. Tsai 52603; Wang & Liu 85376.*

Note. This is the coarsest species of the genus, well defined in several aspects. Curiously, the fruits are never so coarse as in *R. sinica*.

11. **Radermachera pinnata** (Blanco) Seem.

a. subsp. **pinnata**

R. pinnata (Blanco) Seem., J. Bot. 8 (1870) 147; Merr., Philip. J. Sc. 3 (1908) Bot. 337, incl. var. *glabra* Merr.; Sp. Blanc. (1918) 350. — *Millingtonia pinnata* Blanco, Fl. Filip. (1837) 501. — *Stereospermum pinnatum* F.-Vill., Nov. App. (1880) 151. — Neotype: *Merrill, Sp. Blanc. 834* (A, BO, K, L).

Millingtonia quadripinnata Blanco, Fl. Filip. (1837) 501. — *R. quadripinna* Seem., J. Bot. 8 (1870) 147. — *Stereospermum quadripinnatum* F.-Vill., Nov. App. (1880) 151. — Type: descr. by Blanco.

R. banaibana Bureau, Adansonia 2 (1861) 194. — *Stereospermum banaibanai* Rolfe, J. Linn. Soc. Bot. 23 (1884) 314. — Type: *Callery 50* (P), Philippines.

Stereospermum seemannii Rolfe, J. Linn. Soc. Bot. 23 (1884) 314. — Type: *Cuming 996* (BM, K), Philippines.

R. acuminata Merr., Philip. J. Sc. 3 (1908) Bot. 335. — Type: *BS 277* (US), Philippines, Guimaras Is.

R. mindorensis Merr., Philip. J. Sc. 3 (1908) Bot. 338. — Type: *Merrill 893* (US), Philippines, Mindoro.

R. fenicis Merr., Philip. J. Sc. 3 (1908) Bot. 335; Steen., Rec. Trav. Bot. Néerl. 24 (1927) 979, incl. var. *acuminata* Steen., l.c. 980. — Type: *BS 3583* (US), Philippines, Batanes Is.

R. whitfordii Merr., Philip. J. Sc. 7 (1912) Bot. 352. — Type: *FB 11817* (US), Philippines, Mindanao.

R. brachybotrys Merr., Philip. J. Sc. 26 (1923) 489. — Type: *BS 41688* (L), Philippines, Leyte.

R. sorsogonensis Elmer *ex* Steen., Rec. Trav. Bot. Néerl. 24 (1927) 973. — Type: *Elmer 15337* (L), Philippines, Luzon.

R. elegans Steen., Bull. Jard. Bot. Btzg III, 10 (1928) 252, fig. 8. — Type: *Koorders 16256* (BO, L), NE. Celebes, Minahasa.

Distribution. Celebes (incl. Muna I.), W. Moluccas (Sula Is.), and Philippines.

b. subsp. **acuminata** (Steen.) Steen., *comb. nov.*

R. lobbii (T. & B.) Miq. subsp. *acuminata* Steen., Bull. Jard. Bot. Btzg III, 10 (1928) 247, fig. 6. — Type: *F. H. Endert E 1309* (BO, iso in L), S. Sumatra, Lampong Dist., Tandjongkarang.

Spathodea lobbii T. & B., Nat. Tijd. Ned. Ind. 25 (1863) 413. — *R. lobbii* Miq., Ann. Mus. Bot. Lugd. Bat. 3 (1867) 250; Steen., Bull. Jard. Bot. Btzg III, 10 (1928) 243, fig. 5. — Type: *Lobb s.n.* (BO, L), Singapore, probably cultivated from seed in Hort. Bog.

R. corymbosa Steen., Bull. Jard. Bot. Btzg III, 10 (1928) 249, fig. 7. — Type: *Achmad 181* (BO, L), N. Sumatra, Simalur I.

Distribution. Malaya, Sumatra, Borneo, and the Philippines. Not in Java.

12. **Radermachera ramiflora** Steen.

R. ramiflora Steen., J. Bot. 72 (1934) 5. — Type: *Clemens 28672* (BO, iso in K, L), N. Borneo, Mt. Kinabalu.

Distribution. North Borneo (Mt. Kinabalu).

North Borneo. *Clemens 10273, 27392, 28672, 30355, 30364, 31717, 32216; KEP 80406; Nooteboom & Aban 1603; RSNB 4290; SF 26460.*

Notes. A very distinct endemic species, the only one with yellow flowers in Malesia. Carr (*SF 26460*) noted: calyx olive green flushed purple, corolla tube deep ochre yellow flushed orange, lobes deep orange inside.

In leaves it reminds of *R. inflata*, *R. peninsularis*, and *R. sinica*.

13. Radermachera sinica (Hance) Hemsl.

R. sinica (Hance) Hemsl., Hook. Ic. Pl. 28 (1902) sub t. 2728; Kanehira, Formosan Trees, rev. ed. (1936) 659, fig. 613; Liu, Ill. Lign. Pl. Taiwan 2 (1962) 1192, fig. 1002; H. H. Li, Woody Fl. Taiwan (1963) t. 338. — *Stereospermum sinicum* Hance, J. Bot. 20 (1882) 16. — Type: *C. Gerlach 20797* (K), China, Canton Prov. Described from cultivated, 2 year old, flowering sapling in Hong Kong Bot. Gard., raised from seed of Gerlach's collection.

R. tonkinensis P. Dop, Bull. Mus. Hist. Nat. Paris 32 (1926) 233. — Syntypes: *Poilane 10859* (P), fl.; *H. Bon 2420* (P), fr., Tonkin.

R. borii C. E. C. Fischer, Kew Bull. (1940) 197, *non sensu* Santisuk, Thai For. Bull. Bot. 8 (1974) 30. — Type: *N. L. Bor 2699* (K), Assam, Naga Hills.

Distribution. Continental SE. Asia, from Assam and N. Burma to Tonkin, S. China (Yunnan, Kwantung, Kwangsi), Formosa, and the southern Ryu Kyu Is.

Assam. *Bor 2699; Koelz 32758.*

North Burma. *Fields Clarke 20; Kermode 17319.*

Tonkin. *Bon 2420, 2753; Chevalier 27931; Poilane 10859.*

China. *Canton Christian College 3459; R. C. Ching 6322; Faurie 1640; K. M. Feng 12143, 12405, 13342, 14036; Forrest 7552, 8688, 24491; H. Fung 21078; Handel-Mazzetti 6285; Henry 1566; M. K. Li 2914, 2918; Liao & Kuo 1878; J. F. Rock 7230; Taam Ying Wah 1; H. T. Tsai 61454; W. T. Tsang 28008; C. W. Wang 73217; Y. K. Wang 493; T. T. Yii 16468.*

Formosa. *Keng & Kao K1279.*

Notes. In my opinion a characteristic, rather homogeneous species, with which *R. borii* and *R. tonkinensis* are clearly conspecific; this extends its range far westwards into NE. India. The midrib and larger veins are always puberulous, those in *Mayodendron* are completely glabrous. *J. F. Rock 7230, M. K. Li 2914, T. T. Yii 16468,* and *G. Forrest 8688* from Yunnan, all in immature fruit, have woody, hard-pustular-lenticellate valves, sometimes 1—2 cm wide, which is usually not the case; seeds and septum, however, are the same as in the thinner smooth capsules.

This beautiful species has also successfully been brought into cultivation in some botanic gardens in the Mediterranean; at Kew I saw herbarium material of flowering specimens from Les Cèdres, Cap Ferrat, Antibes (cult. Thuret), Lisboa (a. 1968).

14. Radermachera stellata Steen., *sp. nov.* — Fig. 1g—h.

Affine *R. hainanensi*, sed distincta ab ea ceterisque speciebus paniculis semper terminalibus 15—25 cm longis florumque gemmis obconicis truncatis, denique calycibus inflatis robustis subcylindricis, medio excrescentiis 5 truncato-conicis glanduliferis, apice lobis 2 vel 3 tenuibus brevibus submembranaceis instructis.

Type: *A. Pételot s.n.* (A), Tonkin, Prov. Langson, between Dong Mô and Van Linh, 9 June 1939.

Large glabrous tree. *Leaves* 2-pinnate, more or less congested at the twig ends, 30—50 cm long; leaflets 1—1.5 cm petiolulate, ovate-oblong, acuminate, 7—13 by 3—6.5 cm, smooth and somewhat glossy above, underneath with gland groups above the base of the

nerves. *Flowers* in rather lax terminal panicles, with thin and terete axes and stalks, *c.* 1 cm pedicellate. Buds obconical, thick, *c.* 7—10 mm long, at apex 6—7 mm wide, in the early stage stunted shallowly 5-knobbed, later apex conically developing; mature calyx ± fleshy, barrel-shaped inflated, 15—16 by 10 mm, halfway with 5 massive blunt-conical enatia with glandular top, above the knobs conically narrowed and thinner to almost papyraceous at the lobes; lobes 2 or 3, broad-triangular, 3—4 mm high. *Corolla* yellow, slender tubular, 4—5 cm long, the tube *c.* 1 cm wide at apex, inside on the base of the stamens and between them short glandular-hairy. *Ovary* glabrous; style 4 cm; ovules in both cells in several rows, the total number of ovules rather small in comparison with other species.

Distribution. Tonkin, known only from the type.

Note. The affinity of this new species is possibly with the Indo-Chinese representatives of the variable *R. hainanensis*; it differs from this and all other species by the peculiar calyx.

15. **Radermachera xylocarpa** (Roxb.) K. Sch.

R. xylocarpa (Roxb.) K. Sch. in E. & P., Nat. Pfl. Fam. IV, 3b (1895) 234. — *Bignonia xylocarpa* Roxb., Fl. Ind. ed. Carey 3 (1832) 108; Wight, Icon. 4 (1848) t. 1335 & 1336; Beddome, Fl. Sylv. (1870) 70, t. 70. — *Tecoma xylocarpa* G. Don, Gen. Syst. 4 (1837) 225. — *Spathodea xylocarpa* Brandis, For. Flora (1874) 349, t. 43. — *Stereospermum xylocarpum* B. & H., Gen. Pl. 2 (1876) 1047. — Type: Cult. Hort. Calc. (?), Deccan Peninsula.

Distribution. West India.

INDIA. Deccan Peninsula: *Christie MS—35; F. Gleadow 42; Meebold 8439; Ritchie 469; Saldanha 16324; Wight herb. prop. 2319.*

DOUBTFUL SPECIES

16. **Radermachera coriacea** Merr.

R. coriacea Merr., Philip. J. Sc. 3 (1908) Bot. 333; En. Philip. 3 (1923) 445. — Type: *Merrill 1099* (?, probably lost), Philippines, Luzon, Tayabas, eastcoast, pr. Baler, Sept. 1902, fl. fr.

Notes. Merrill keyed this 'very characteristic' species immediately out from the other Philippine species by the strongly longitudinally 5- or 6-ribbed calyx, combined with 1-pinnate leaves. Calyx 1.8 cm; cleft down on one side nearly to the middle, 3-toothed at apex. Corolla 4 cm, the tube rather narrow, slightly enlarged above. Leaflets 5, 7—14 by 3—4 cm. Panicles 15 cm.

The few rather large leaflets and the narrow corolla would suggest affinity with *R. eberhardtii*, but in that species the calyx is entirely smooth.

For the present the identity cannot be solved.

EXCLUDED SPECIES

Radermachera alata P. Dop, Bull. Mus. Hist. Nat. Paris 32 (1926) 184 = **Pauldopia ghorta** (Buch.-Ham. *ex* G. Don) Steen.

Radermachera bipinnata (Coll. & Hemsl.) Steen. *ex* Chatterjee, Bull. Bot. Soc. Beng. 2 (1948) 71 (*Tecoma bipinnata* Coll. & Hemsl.) = **Pauldopia ghorta** (Buch. -Ham. *ex* G. Don) Steen.

Radermachera bracteata P. Dop, Bull. Mus. Hist. Nat. Paris 32 (1926) 234 = **Fernandoa bracteata** (P. Dop) Steen.

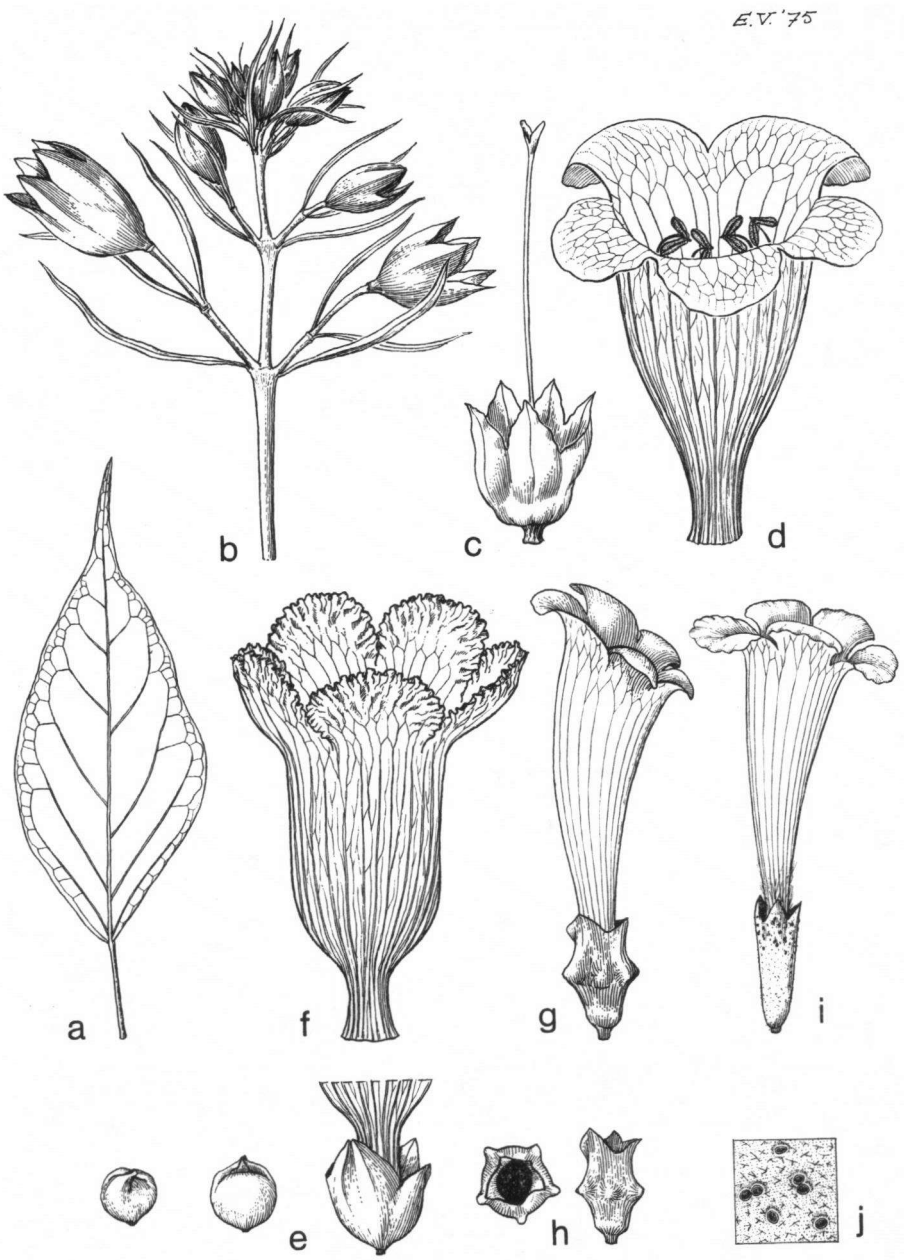

Fig. 1. *Radermachera peninsularis* Steen. a. Leaflet; b. apex of thyrse; c. calyx and style; d. corolla. — *R. inflata* Steen. e. Three stages in development of inflated calyx; f. corolla. — *R. stellata* Steen. g. Flower; h. calyx, lateral and apical views. — *Fernandoa bracteata* (P. Dop) Steen. i. Flower; j. detail of calyx showing stellate hairs and crateriform glands. — All nat. size, except j × 4 (a—d. *Larsen c.s. 31239*, e. & f. *W. T. Tsang 28967*, g & h. *Pételot 7260*, i & j. *Brillet, Chien-hoa no. 1*).

Radermachera brilletii P. Dop, Bull. Mus. Hist. Nat. Paris II, 2 (1930) 155 = **Fernandoa bracteata** (P. Dop) Steen.

Radermachera ghorta (Buch.-Ham. *ex* G. Don) Chatterjee, Bull. Bot. Soc. Beng. 2 (1948) 71 = **Pauldopia ghorta** (Buch.-Ham. *ex* G. Don) Steen.

Radermachera kerrii Barn. & Sandw., Kew Bull. 20 (1966) 233 = **Barnettia kerrii** (Barn. & Sandw.) Santisuk.

Radermachera pagetii Craib, Kew Bull. (1922) 173 = **Barnettia pagetii** (Craib) Santisuk.

Radermachera wallichii (Clarke) Chatterjee, Bull. Bot. Soc. Beng. 2 (1948) 72 (*Stereospermum wallichii* Clarke) = **Stereospermum neuranthum** Kurz.

2. FERNANDOA

Fernandoa Welw. *ex* Seem. (*sphalma Ferdinandia*), J. Bot. 3 (1865) 330, t. 37 & 38; op. cit. 4 (1866) 123; op. cit. 8 (1870) 280 (*sphalma Ferdinandoa*); op. cit. 9 (1871) 81; Sprague, Kew Bull. (1929) 44; Milne-Redhead, Kew Bull. 3 (1948) 171; Verdcourt, Kew Bull. 7 (1952) 364; Heine, Adansonia 4 (1964) 467—470; Gentry, Ann. Mo. Bot. Gard. 62 (1975) 480. — *Ferdinanda* B. & H., Gen. Pl. 2 (1876) 1047, *pro syn.*, *non* Lag. 1816. — *Fernandia* Baill., Hist. Pl. 10 (1891) 47; K. Sch. in E. & P., Nat. Pfl. Fam. IV, 3b (1895) 243. — *Kigelianthe* Baill., Hist. Pl. 10 (1891) 50; K. Sch. in E. & P., Nat. Pfl. Fam. IV, 3b (1895) 243; Perrier de la Bâthie, Fl. Madag. fam. 178 (1938) 18, fig. V. — *Ferdinandia* Welw. *ex* Seem. *sens.* Sprague, Fl. Trop. Afr. IV, 2 (1906) 516. — *Haplophragma* P. Dop, Bull. Soc. Bot. Fr. 72 (1925) 889; Steen., Rec. Trav. Bot. Néerl. 24 (1927) 998; Bull. Jard. Bot. Btzg III, 10 (1928) 262. — *Spathodeopsis* P. Dop, C. R. Ac. Sc. Paris 189 (1929) 1097; Bull. Mus. Hist. Nat. Paris II, 2 (1930) 152; Fl. Gén. I.—C. 4 (1930) 593. — *Hexaneurocarpon* P. Dop, C. R. Ac. Sc. Paris 189 (1929) 1097; Bull. Mus. Hist. Nat. Paris II, 2 (1930) 153; Fl. Gén. I.—C. 4 (1930) 606. — *Tisseranthodendron* Sillans, Bull. Soc. Bot. Fr. 98 (1951) 270—272, pl.; op. cit. 99 (1952) 173; op. cit. 100 (1953) 281—282.

The inclusion of some more species makes the following emendation necessary: *Leaflets* mostly rather thin and elliptic-oblong, acuminate, almost sessile, with some to many spot-like flat glands underneath towards the base; in all but one species small, triangular, hairy domatia are found in the nerve-axils. *Calyx* irregularly 2—5-lobed, with distinct prominent glands in the upper half. Calyx and inflorescence often with stellate hairs, sometimes on short multicellular stalks. *Ovary* terete to about square in CS, mostly densely appressed-hairy, in Indo-Malesia the cells with 3(—5) ribs and also the pod usually lengthwise ribbed or with elevated lines.

Distribution. Four species in tropical West and East Africa (Angola, Gabon, Congo, Cameroun, Tanganyika, Moçambique), 3 species in Madagascar, and 6 species in continental SE. Asia and N. Sumatra.

Notes. *Haplophragma* differs mainly from *Heterophragma* in having a simple, flat, thickish septum transverse to the valves, i.e. absence of a false septum. As the occurrence of the false septum, which can already be observed in the ovary, is so constant in *Markhamia*, *Dolichandrone*, and *Barnettia*, I believe this to be an important generic character.

I felt induced to reduce two monotypic genera described by P. Dop (l.c.) from Indo-China. Dop compared *Spathodeopsis* with the African *Spathodea*, mainly for reason of the calyx which is on one side somewhat deeper split than between the other lobes. Such unequal lobing occurs, however, also frequently in species of *Radermachera*, and is radically different from the really spathaceous calyces in *Spathodea*, *Markhamia*, and *Dolichandrone*.

As to *Hexaneurocarpum*, which is unfortunately as yet only known in fruit, the structure of the fruit, seed, and septum exactly matches that of *Haplophragma* and I can see no reason to keep it separate.

During a recent visit to Kew I saw incidentally material of the African genus *Fernandoa*, a genus of which the complicated generic nomenclature was exposed by Milne-Redhead (1948, l.c.) and its taxonomical distinction by Heine (1964, l.c.). Recently, Gentry (1975, l.c.) reduced the Madagascan genus *Kigelianthe* Baill. to *Fernandoa* and gave a key to all African-Madagascan species.

Schumann (1895, l.c.) placed *Fernandoa* next to *Heterophragma* and distinguished them by the shape of the corolla. Sprague (1906, l.c.) affirmed this affinity, saying that *Fernandoa* was distinct in having axillary thyrses and an annular disk. Since Dop split the genus *Heterophragma* into *Heterophragma sens. str.* and *Haplophragma* the disposition of *Fernandoa* came closest to *Haplophragma*.

In his classification of Afro-Asian *Bignoniaceae* (Bull. Soc. Hist. Nat. Toulouse 64, 1929: 644) Dop distinguished *Fernandoa* from *Haplophragma* in having a cup-shaped disk and lateral (often ramiflorous) inflorescences. However, as in the Sumatran *Haplophragma* both lateral and terminal inflorescences occur, this character becomes obsolete; I can also neither adhere generic significance to the shape of the disk, as annular and cupular is a matter of degree, nor to that of the shape of the corolla.

For these reasons I have come to the conclusion that the genera *Haplophragma* and *Fernandoa* are congeneric, the latter name being the oldest.

In addition, I have found that the species of both share two vegetative characters, namely that the almost always glabrous leaves are provided with small hairy domatia in the nerve-axils underneath and that the leaf glands underneath are few, flat ,and spot-like. Dr. H. Heine kindly checked this for all Afro-Madagascan species. These two vegetative characters also occur in all African and Madagascan species.

KEY TO THE INDO-MALESIAN SPECIES

1. Calyx densely rusty-tomentose, 2.5—3 cm, campanulate, feebly 5-ribbed. Leaflets wide-elliptic, (2—)3(—4) pairs, 7—24 by 4—19 cm, underneath densely brown-hairy by stellate hairs. Corolla tomentose outside, large and wide, *c.* 7 cm long. Ovary appressed-tomentose. Capsule 30—60 by 1.5—2.5 cm, with 4 or 5 ribs on each valve, rusty-tomentose . . . . . **1. F. adenophylla**
1. Calyx not densely rusty-tomentose, smaller. Leaflets underneath not densely brown-hairy by stellate hairs.
   2. Leaflets underneath rather laxly crisped-puberulous, more densely so on the midrib; no proper domatia; secondary veins rather distinctly trabeculate. Capsule (sec. Dop) ± quadrangular in CS, 40 by 4 cm, the valves thick, spongeous but rather woody. Septum thick, 2.5 cm by 4 mm in diameter. Seeds large, 5.5—6.5 by 2 cm. Flowers unknown. . . . . **3. F. brilletii**
   2. Leaflets underneath glabrous; domatia present, hairy. Capsule not quadrangular in CS.
      3. Leaf-index 2.5—3. Leaflets entire.
         4. Calyx rather wide, 1.8—2.5 cm long, at least 5 mm wide, with large glands in upper half. Ovary halves with 3 distinct ridges.
            5. Corolla very large, 8—10 cm, tube *c.* 4 cm wide at the mouth. Thyrse glabrous. Calyx glabrous, in bud with 5 ribs at least in upper half. Capsule 40 by 2.5—3 cm, 6-ribbed (sec. Dop) . . . . . **4. F. collignonii**
            5. Corolla much smaller, 4—5 cm long and rather tubular, *c.* 1 cm wide at the mouth, with strigose hairs at the base. Thyrse and calyx appressedly short stellate-pubescent. Capsule unknown. . . . . **2. F. bracteata**
         4. Calyx narrow-tubular, 1—1.2 cm long, 2.5—3 mm wide, only occasionally with a single gland at apex of tube, as the short, lateral and terminal thyrses densely appressed-hairy (partly stellate-hairy), at apex very shortly 2- or 3-lobed. Corolla with a cylindrical basal part of the tube *c.* 5 mm diameter, funnel-shaped, widened to the mouth, pale pinkish or white, the lobes

crisped, outside minutely puberulous. Ovary halves with 3 feeble ridges. Capsule linear, straight or twisted, not or hardly ribbed, lenticellate, 40—65 by 1—1.5 cm; valves coriaceous, not hard or woody; septum 8—10 mm wide. Seeds 4—5 cm including the short wings, 1 cm wide. . . **5. F. macroloba**

3. Leaf-index 1.5—2.2. Leaflets shallowly dentate or crenate, with a hydathode or gland near each tooth, to almost entire, 7—16 by 4.5—6.5 cm, the lowest pair broadly elliptic and smallest, suddenly acuminate. Capsule cylindric, to 100 by 1.5 cm, the valves rather thin, not woody, with 3—5 elevated ridges. Septum hard, *c.* 1 cm wide, 1.5—2 mm thick. Seeds *c.* 3—4 cm including the wings, 8—10 mm wide. Flowers unknown . . . . . **6. F. serrata**

1. **Fernandoa adenophylla** (Wall. *ex* G. Don) Steen., *comb. nov.*

Bignonia adenophylla Wall. [Cat. 6502 (1832) *nomen*] *ex* G. Don, Gen. Syst. 4 (1838) 221. — *Spathodea adenophylla* DC., Prod. 9 (1845) 206. — *Heterophragma adenophyllum* Seem. *ex* B. & H., Gen. Pl. 2 (1875) 1047; Kurz, For. Fl. Burma 2 (1877) 236; Clarke, Fl. Br. Ind. 4 (1884) 381. — *Haplophragma adenophyllum* P. Dop, Bull. Soc. Bot. Fr. 72 (1925) 887; Steen., Bull. Jard. Bot. Btzg III, 10 (1928) 265. — Type: *Wallich 6502* (G, iso in K, P), fl. fr., Ava, Prome.

Distribution. Assam to Tenasserim & Chittagong, Burma, Thailand, Indo-China, Andaman & Cocos Is., Malay Peninsula.

INDO-CHINA. Annam: *Poilane 27916, 28051.*

Note. Stands apart from the other species by very large leaflets, presence of pseudo-stipules, a very large rusty calyx, and large long-hairy corolla.

2. **Fernandora bracteata** (P. Dop) Steen., *nov. comb.* — **Fig. 11—j.**

Radermachera bracteata P. Dop, Bull. Mus. Hist. Nat. Paris 32 (1926) 234; Fl. Gén. I.—C. 4 (1930) 588. — Type: *Service Forestier du Tonkin s.n.* (P), fl., Moc Ha, Prov. de Son La, 7 Oct. 1924.
Radermachera brilletii P. Dop, Bull. Mus. Hist. Nat. Paris II, 2 (1930) 155; Fl. Gén. I.—C. 4 (1930) 588. — Type: *Brillet s.n.* (P), fl., Tonkin, Hoa Binh, Chien Hoa, No. 1.

Distribution. Indo-China: Tonkin. Only known from the type specimen.

Notes. As in *Radermachera* the ovary may be lepidote, but never tomentose as in these two *Radermacheras*, my curiosity was raised. Dop omitted to section the ovaries; this yielded the solution: they have a thick quadrangular ovary wall, each half of which, later developing into the fruit valves, has 3 ribs; the dissepiment carries 2 placentas with numerous ovules. This structure exactly matches that in other species of *Haplophragma* and that given by Dop for *Hexaneurocarpon*.

Dop indicated that both *Radermachera* species were very close; in fact the young inflorescence of *R. bracteata* carries fairly large, leafy, lanceolate bracts (as in *R. xylocarpa*), but they are caducous as in the type of *R. brilletii*.

The species is characterized by a slender tubular corolla and a narrow small calyx similar to that in *F. macroloba*. Unfortunately, no fruits are known as yet.

3. **Fernandoa brilletii** (P. Dop) Steen., *comb. nov.*

Hexaneurocarpon brilletii P. Dop, Bull. Mus. Hist. Nat. Paris II, 2 (1930) 153; Fl. Gén. I.—C. 4 (1930) 606, fig. 67: 3—6. — Type: *Brillet s.n.* (P), fr., Tonkin, Hoa Binh, No. 11.

Distribution. Indo-China: Tonkin (Hoa Binh), only known from the type.

Note. Obviously a clear-cut species, with broad-elliptic leaflets finely crisped-

pubertulous underneath, probably no domatia, and a very large quadrangular capsule with large septum and big seeds.

4. Fernandoa collignonii (P. Dop) Steen., *comb. nov.*

Spathodeopsis collignonii P. Dop, C. R. Ac. Sc. Paris 189 (1929) 1097, *'rossignolii'*; Bull. Mus. Hist. Nat. Paris II, 2 (1930) 152; Fl. Gén. I.—C. 4 (1930) 593, fig. 64: 1—6; Santisuk, Kew Bull. 28 (1973) 174; Thai For. Bull. Bot. 8 (1974) 10. — Type: *Collignon s.n.* (P), fl., Tonkin, Hoa Binh.

Distribution. N. Thailand and Indo-China.

THAILAND. North: Santisuk, l.c. (*non vidi*), *Winit 1788.*
INDO-CHINA. Tonkin: Santisuk, l.c. — Annam: *?Chevalier 38950* (fl. only); *Evrard 515; Poilane 6055.* — Laos: *?Poilane 2309* (sterile); *Spire 228.*

Notes. Santisuk correctly remarked that the pod depicted by Dop is immature; the mature capsule has straight prominent ribs, not undulated ones.

Poilane noted that this tree can attain 1 metre diameter and that its timber is good for all purposes, not being attacked by termites.

The magnificent colossal flowers are mentioned by Evrard to be orange red, but Poilane (*6055*) noted them to be white and to flower at an early age.

5. Fernandoa macroloba (Miq.) Steen., *comb. nov.*

Spathodea macroloba Miq., Sumatra (1861) 565. — *Heterophragma macrolobum* Backer *ex* Heyne, Nutt. Pl. Ned. Ind. (1927) 1371. — *Haplophragma macrolobum* Steen., Rec. Trav. Bot. Néerl. 24 (1927) 1002, fig. 13b, 14a—d; Bull. Jard. Bot. Btzg III, 10 (1928) 263, fig. 12. — Type: *Diepenhorst HB 2353* (U, iso in BO), fr., W. Sumatra, Priaman.

Distribution. North Sumatra.

6. Fernandoa serrata (P. Dop) Steen., *comb. nov.*

Haplophragma serratum P. Dop, Bull. Mus. Hist. Nat. Paris II, 2 (1930) 154; Fl. Gén. I.—C. 4 (1930) 592. — Type: *Brillet s.n.* (P), fr., Tonkin, Hoa Binh.

Distribution. Indo-China.

INDO-CHINA. Tonkin. Hoa Binh: *Brillet s.n., ditto, no. 10 leg. Brillet; Poilane 13012* (sterile). Annam: *Chevalier 38591, 39028 (leg. Fleury); Poilane 487, 12487.*

Notes. This species is only known in fruit. By the leaf-index and dentate leaf margin it can provisionally be kept apart, but more complete material from one tree may later show that it is the fruiting stage of *F. bracteata*. The leaf dentation is in some leaves hard to observe, e.g. in *Poilane 487* and may be due to juvenile leaves.

Poilane noted under his no. *13012*, which is a small tree, 4—5 m high, with mature capsules, that the species may attain large size and a diameter of 1 metre, and that it yields an excellent timber for all purposes which is not attacked by termites.

INDEX

Accepted names in roman, synonyms in *italics*, new names and new combinations in **bold type.** Figure before the colon refers to genus number, that behind the colon to species number; 'excl.' refers to names mentioned under 'Excluded' at the end of genus 1.