REINWARDTIA
Published by Herbarium Bogoriense, Kebun Raya Indonesia
Volume 2, Part 2, pp. 185-224 (1953)

THE GENUS TETRACERA (DILLENIACEAE) IN THE EASTERN OLD WORLD

(With Plate 1)

R. D. HOOGLAND*

SUMMARY

1. An account of the genus *Tetracera* L. in the eastern Old World (Asia, Malaysia, Australia, New Caledonia) is given. The Malaysian species have already been included in the revision of the Dilleniaceae in "Flora malesiana" (I 4: 141-149. 1951).
2. The main part of the present paper consists of a key to the species, followed by a systematic treatment of the 15 species admitted for the region.
3. Latin diagnoses are given for three new subspecies under *Tetracera asiatica* (Lour.) Hoogl. and two new varieties under *Tetracera nordtiana* F. Muell.
4. A number of species are reduced either to the rank of variety or to synonymy.
5. Distribution-maps are provided for the species of which a relatively large; number of specimens has been studied.

INTRODUCTION.—The present paper forms an extension of my revision of the genus *Tetracera* L. in "Flora malesiana" (I 4: 141-149. 1951) and the revision now covers, besides Malaysia, continental Asia (Ceylon and Hainan included), Australia, and New Caledonia.

The study was made possible by the loan of specimens from several herbaria, which have been indicated in the citation of type specimens by the abbreviations proposed by Lanjouw *[in-* Reg. *Veg.* 2 (Ind. Herb. 1): 106-117. 1952] as follows:

A	Arnold Arboretum Herbarium, Harvard University, Jamaica Plain, Mass.
BM	Department of Botany, British Museum (Natural History), London.
BO	Herbarium Bogoriense, Bogor, Java,
BR	Herbier du Jardin Botanique de l'£tat, Bruxelles.
BRT	Botanical Museum and Herbarium, Brisbane.
BRSL	Botanical Institute, Wroclaw (formerly Breslau).
C	Universitetets Botaniske Museum, Copenhagen.
CAL	The Indian Botanic Garden and Herbarium, Calcutta,
CGE	Botanical Museum and Herbarium of the University, Cambridge (England).
DD	Forest Research Institute Herbarium, Dehra Dun.
E	Herbarium of the Royal Botanic Garden, Edinburgh.
FI	Erbario del Instituto Botanieo dell' University, Firenze.
G	Institut de Botanique Systématique de l'Université, Genève.
GH	Gray Herbarium, Harvard University, (Jambridge, Mass.

Botanist , Flora Malesiana Foundation, now C. S. I. R.O., Canberra, A. C.T., Australia.

-; [REINWARDTIA, Vol. 2, Part 1 was issued September 12, 1952]

GL Botanical Department Herbarium, Glasgow.
GRO Botanisch Laboratorium der Rijksuniversiteit, Afdeling Plantensystematiek, Groningen.
IFI Herbarium of the Imperial Forestry Institute, Oxford.
K The Herbarium, Royal Botanic Gardens, Kew, Surrey.
L RIjksherbarium, Leiden.
LINN Herbarium of the Linnean Society of London, London.
M ' Botanische Staatssammlung, Miinehen.
MEL Botanic Gardens and National Herbarium, Melbourne.
MICH Herbarium of the University of Michigan, Ann Arbor, Mich.
MO Herbarium of the Missouri Botanical Garden, St. Louis, Mo.
NY Herbarium of the New York Botanical Garden, New York, N. Y.
OXF Oxford University Herbarium, Oxford.
P Laboratoire de Phanerogamie du Muséum National d'Histoire Naturelle, Paris.
5 Naturhistoriska Riksmuseet, Stockholm.
SING Herbarium of the Botanic Gardens, Singapore.
U Botanisch Museum en Herbarium, Utrecht.
UC University of California Herbarium, Berkeley, Calif.
UPS Botaniska Museet, Uppsala.
US United States National Herbarium, Washington, D. C.

I wish to express here my indebtedness to the Directors and Keepers of these herbaria for their valuable help in putting their specimens at my disposal.

The detailed citation of specimens examined has been omitted and in its place distribution-maps have been prepared for the species of which a relatively large number of specimens have been studied. All specimens studied by the author have been provided with an identification-label.

TETRACERA L.

Tetracem L., Sp. PI. 533. 1753; Gen. Pl., 5th Ed., 237. 1754; DC, Syst. 1; 397. 1818; Prod. 1: 67. 1824; Roxb., Fl. ind., ed. Carey, 2: 646. 1832; Hook. f. & Thorns., PI. ind. 1: 62. 1855; Miq., Fl. Ind. bat. 1 (2): 8. 1859; Benth. & Hook, f, Gen. PI. 1: 12. 1882; Drury, Handb. Ind. Fl. 1: 9. 1864; Miq. *in* Ann. Mus. bot. Lugd. Bat. 4: 74. 1868; Hook. f. & Thorns, *in* Fl. Br. Ind. 1: 81. 1872; Kurz, For. Fl. Br. Burma 1: 22. 1877; Eichl., Blutendiagr. 2: 251. 1878; Martelli *in* Becc, Malesia 3: 150. 188G; King in J. As. Soc. Beng. 58 (2) : 362. 1889; K. Schum. & Hollr., PI. Kais. Wilhelmsl. 47. 1889; Boer]., Handl. 1 (1) : 6. 1890; Trim., Handb. Fl. Ceyl. 1: 6. 189S; Gilg in Engl. *6* Prantl, Nat. PflFam. 3, 6: 110. 1895; Pritzel *in* Bot. Jb. 24: 352. 1897; F. M. Bail., Queensl. Fl. 1: 8. 1899; Ridl. in J. Str.Br. R. A. S. 33: 37. 1900; K. Schurn. & Laut, Fl. deut. Schutzgeb. Sudsee 444. 1901; Brand., Ind. Trees 4. 1906; Fin. & Gagnen.- in Fl. gen. Ind.-Ch. 1: 12. 1907; Back., Fl. Batavia 1: 3. 1907; Schoolfl. Java 8. 1911; Koord., ExkFl. Java'2: 600. 1912; Ridl. in Saraw. Mus. J. 1: 68. 1913; Merr., Bibl. En. Born. PI. 281. 1921; Ridl., Fl. Mai. Pen. 1: 4. 1922; Drels *in* Bot. Jb. 57: 439. 1922; Merr., En. Philip, fl. PI. 3; 58. 1923; Craib, Fl. siam. En. 1: 19. 1925; Gilg & Werderm. *in* Engl. & Prantl, Nat. PflFam., 2nd Ed., 21: 16. 1925; Back., Beta. PI. Java (Nooduitg.) 4 (Fam. 80) : 1. 1942; Hoogl. *in* PL mal. I 4: 141. 1951.

Delima L., Gen. PI., 5th Ed., 231. 1754; Syst., 10th Ed., 1076. 1759; DC, Syst. 1: 397. 1818; Prod. 1: 67. 1824; Hook. f. & Thorns., Fl. ind. 1: 61. 1855; Miq., Fl. Intl. bat. 1 (2); 7. 1859; Benth. & Hook, *t.*, Gen. PI. 1: 12. 1862; Triana & Planch. *in* Ann. Sci. nat., Bot. IV 17: 20. 1862; Drury, Handb. Ind. Fl. 1: 11. 1864; Miq. *in* Ann. Mus. bot. Lugd. Bat. 4: 73. 1868; Hance *in 3.* of Bot. 7: 115. 1869; Hook. f. & Thorns, *in* Fl. Br. Ind. t : 31. 1872; Kurz, For. Fl. Br. Burma 1: 22. 1877; King in J. As. Soc. Beng. 38 (2): 361. 1889; BoerL, Handl. 1 (1) > 6. 1890; Trim., Handb. Fl. Ceyl. 1: 5. 1893; Brand., Ind. Trees 5. 1906; Ridl. *in* Saraw. Mus. J. 1: 58. 1613; Fl. Mai. Pen. 1: 3. 1922; Burk., Diet. econ. Prod. Mai. Pen. 776. 1935.

Korosvel Adans., Fam. des PI. 2: 442. 1763.

Assa Houtt., Nat. Hist. 5: 275. 1776; Christm. & Panz., PflSyst. 1: 40. 1779.

Enryandra Foist., Char. Gen 81. 1776.

Wahlbomia Thunb. in Vet. Akad. Handl., Stockh., 215. 1790; Eafin., Sylva tellur. 105. 1838 *("Valbomia").*

Roehlingia Dennst., Schluess. Hort. malab. 31. 1818.

Bleiastis Rafin., Sylva tellur. 165. 1838.

Leontoglossttm Hance *in* Walp., Ann. 2: 18. 1859.

Delimopsis Miq., Fl. Ind. bat. 1 (2): 9. 1859.

TYPE SPECIES.—*Te t ra ce ra: T. volubilis* L., 1753, *I.e.* (Central America).— *Delima: D. sarmentosa* L., 1759, *I.e.* r= *T. scandens* (L). Merr. — *Korosvel:* "Korosvel. Herm. Zeyl. 19." 1717 = *T. asiatica* (Lour.) Hoogl. subsp. *zcylanica* Hoogl. — *Ass a: A. indica* Houtt. ex Christm. & Panz., 1779, *Lc.* — *T. indica* (Houtt. ex Christm. & Panz.) Merr. — *Euryandra: E. scandens* Forst., 1776, *I.e.* = *T. euvyandra* Vahl. — *Wahlbom* in: *W. indica* Thunb., 1790, *I.e.* = *T. indica* (Houtt. ex Christm. & Panz.) Merr. — *Roehlingia: R. suaveolens* Dennst., 1818, *I.e.* = *T. akara* (Burm. f.) Merr. — *E l e i a s t i s: E. laevis* (Vahl) Rafin., 1838, *I.e.* = *T. indica* (Houtt. ex Christm. & Panz.) Merr. — *Leontoylussu m: L. scabrum* Hance, 1851, *Lc.* = *T. asiatica* (Lour.) Hoogl. subsp. *asidtica.* — *Delimopsis: D. hirsnta* Miq., 1859, *I.e.* = *T. askitica* (Lour.) Hoogl. subsp. *sumatrana* Hoogl.

Shrubs, sometimes straggling, or lianas, with flexuous branches; older branches with flaky bark with longitudinal fissures. Leaves spirally arranged, simple, petiolate, without stipules; base decurrent; margin manifestly dentate, most distinctly so in upper half of leaf, with teeth at apex of nerves to entire; leaves penninerved, often scabrid on one or both sides; petiole short, slightly channelled above. Inflorescences few- to many-flowered panicles, terminal or axillary, often with bracts; peduncle distinct or not. Flowers fragrant, actinomorphic, bisexual. Sepals 4—6, rarely up to 15, imbricate, persistent, often reflexed when flowering and fruiting, circular to oval with rounded apex and base and usually ciliate margin. Petals 3—5, caducous, obovate-spathulate with slightly emarginate apex, narrowed towards the base, whitish, often slightly reddish. Stamens ~ (about 60—500) ; filament thin; anther with broadened connective; thecae divergent towards the base, touching each other at the apex or more or less separated (connective in the latter case often emargrinate between thecae), usually lateral, rarely more or less on outer side of connective, opening with longitudinal slit. Carpels 4—1, free, each with short style ending in hardly differentiated stigma; placentae marginal, adaxial, each with single row of 1—10 ovules. Fruits coriaceous

capsules, opening with longitudinal slits along ventral and dorsal suture into two valves, with short beak, one- to few-seeded. Seeds glossy dark-brown to black with abundant endosperm and microscopically small embryo *(cf.* Pritzel, 1897, *I.e.),* arillate; aril fleshy, fimbriate or laciniate at margin for 1/3 to nearly the whole length.

HISTORY OF THE GENUS. — The genus *Tetracera* was founded by Linnaeus (1753, 1754) on a single species from Central America. The genus *Delima,* already mentioned by Linnaeus in 1748 (Fl. zeyl. 92) was not included in the first edition of "Species Plantarum" (1753), though it was included in the fifth edition of "Genera Plantarum" (1754); a single species was described in the tenth edition of "Systema Naturae" (1759). Triana & Planchon (1862) were the first to reduce *Delima* to *Tetracera,* as the only differential character (the single carpel, to which in some flowers a second is added) does not justify its distinction as a separate genus. Nevertheless, it was still treated as such by Ridley (1922) and, following him, by Burkill (1935).

The other generic names, proposed for species from the region concerned, have hardly been taken up after their first publication.

RELATIONSHIPS.—The genus *Tetracera* was included by Gilg & Werdermann (1925) in the tribus Tetracereae; in my opinion it is justifiable to raise this tribus to the rank of a subfamily *{cf.* Blumea 7: 7. 1952). Related genera within this subfamily are found only in the New World *(Davilla, Guratella, Doliocarpus).* The subfamily is primarily characterized by the structure of the stamens (broadened and, sometimes, thickened connective).

Within the genus, Gilg & Werdermann distinguished three sections. The first of these, *Empedoclea* (St. Hi].) Gilg, is found only in the New World (Brazil). The other two sections agree with the former genera *Tetracera* L. *s.s.* (section *"Eutetracera"* Gilg) and *Delima* L. [section *Delima* (L.) Gilg.]. As far as the species revised here are concerned, these sections do not form natural taxa; I can not judge about the New World species. According to the principal characters of these two sections (the number of carpels) the first four species of the present revision would belong to *Delima.* For *Tetracera, scandens* and *T. asiatica* I am not able to indicate any relationship with other species; *T. glaberrima,* is most closely related to *T. akara,.* and *T. maingayi* to *T. fagifolia,* thus both to species with a greater number of carpels.

DISTRIBUTION.—The genus is pantropical with the exception of the Pacific Islands east of New Britain and New Caledonia. The species themselves all have a more or less restricted area. None of those considered here has been found outside the region concerned.

All species occur in the lowland, rarely above 600m altitude; the highest collection known to me is from about 1500 m *(T. asiatica*, Cambodia). No general habitat can be indicated for the genus, some species occurring in forests, others in scrub or even more open places.

VERNACULAR NAMES.—The Malay name mempelas (ampalas, ampelas, empelas, mumplas) is in general use in western Malaysia, often with epithets which are not specific. Akar (= root or liana) is found in some names. The Sundanese name is assahan.

USES.—The scabrid leaves of some species are used as sandpaper; hence the Malay name for sandpaper has been derived from the plant name: mempelas. The stems are sometimes used as cordage.

NOTE.—The generic description above has been based on the species studied, thus exclusive of the African and American species. The following additions to the description are taken from the generic description by Gilg & Werdermann: Sometimes trees. Sepals 3—15, "usually 5." Petals 1—6, "usually 5." Filaments very rarely more or less highly united to fascicles. "Anthers usually extrorse, very rarely introrse." The parts between inverted commas certainly do not hold for the species studied here; the other parts are additions outside the variability of the genus in the region treated in the present revision.

KEY TO THE EASTERN OLD WORLD SPECIES OF TETRACERA

1. Carpels in most flowers solitary, but often in some flowers of the same plant 2 carpels.
   2. Carpels and capsules glabrous or with minute scales.
      ',i. Sepals 4; inflorescences up to 5-flowered, usually axillary; flowers about 2.5 cm across . . . . . *d. T. glaberrima*
      3. Sepals 5; inflorescences lo- and mure-flowered, terminal; flowers about 1—15 cm across.
         4. Sepals glabrous inside . . . . . 2. *T. asiatica*
         4. Sepals sericeous inside . . . . . *4. T. maingayi*
   2. Carpels and capsules hirsute . . . . . 1. *T, scandens*
1. Carpels in all flowers 2—4.
   5, Carpels and capsules hirsute all over their whole surface.
      6. Indument of carpels consisting of rather thin villous hairs, caducous. Species from W Malaysia . . . . . 14. *T. arborescens*
      G. Indument of carpels consisting of rather rigid, straight hairs, persistent. Species from E Malaysia.
         7. Inflorescenses 2—4-flowered; hairs of the carpels about 2 mm long. 5. *T. lanuginosa*
         7. Inflorescenses 15—50-flowered; hairs of the carpels about 0.5 mm long. 6. *T. uordtiana*
   5. Carpels and capsules glabrous, with minute scales, or with few strigose hairs on the back only.

8. Sepals 4; inflorescenses few- (up to 12-) flowered, terminal or axillary, without leaves in the basal part; flowers about 2.5—3 cm across.
9. Sepals glabrous inside . . . . . 1. *T. indica*
9. Sepals sericeous inside . . . . . 8. *T, akara*
8. Sepals 5—6; inflorescenses many- (15- and more-, rarely less-) flowered, terminal, often with small leaves in basal part, sometimes on short axillary few-leaved branch; flowers about 0,8—2.5 cm across.
10. Sepals all glabrous inside.
11. Branches of inflorescenses strigose . . . . . 9. *T. loureiri*
11. Branches of inflorescenses with single appressed to distant hairs as well as stellate groups of shorter hairs . . . . . 12. *T. korthalsii*
10. Sepals, at least 3 inner ones, sparsely to densely sericeous inside.
12. Two outermost sepals glabrous inside . . . . 13. *7'. macrophylla*
12, All sepals sericeous inside.
13. Stamens extrorse; apex of leaves usually rounded; flowers rather large (15—20 mm across) . . . . . 11. *T. curyandra*
13. Stamens latrorse; apex of leaves usually obtuse to acute; flowers rather small (8—15mm across).
14. Younger sterile branches absolutely glabrous. 10. *T. daemeliana*
14. Younger sterile branches always more or leas hairy.
15. Younger branches villous; leaves immediately below the inflorescences small (about 4 x 3 cm), obovate; sepals subequal . . . . . 14. *T. arborescens*
15. Younger branches strigose; leaves immediately below the inflorescences larger, elliptic to oblong; two outer sepals distinctly smaller than inner ones. . . 15. *T. fagifolia*

1. TETRACERA SCANDENS (L.) Merr. — Fig. 1

[Fmtis urens aepera Rumph., Herb. amb. 5: 13 *pi.* 9*[1] 1747.]

Tragia scandens L. *in* Stickm., Herb. amb. 18. 1754; Amoen. acad 4: 128. 1759.

Delima sarmentosa L-, Syst., 10th Ed., 1076. 1759; Miq., Fl. Ind. bat. 1 (2): 7. 1859; Vill., Nov. App. 2. 1880; Ridl., Fl. Mai. Pen. 1: 3. 1922.

Tetracera, sarmodosa (L.) Vahl, Symb. bot. 3: 70. 1794; Roxb., Fl. ind., ed. Carey, 2: 645. 1832, p.p.; Blanco, Fl. Filip., 2nd Ed., 320. 1845; 3d Ed., 2: 227. 1878; Merr. *w* Govt Lab. Philip. Publ. 27: 15. 1905; Hunter (ed. by Ridl.I *hi* J. Str. Br. R. A. S. 53: 97. 1909; Merr., Fl. Manila 331. 1912.

Delima hebecarpa DC, Syst. 1: 407. 1818; Deless., Ic. sel. PL 1: *pi* 72* 1821; DC, Prod. 1: 70. 1824.

Delima intermedia Bl.,[t] Bijdr. 1: 4. 1825; Schlecht. *in* Linnaea 1: 492. 182G; Hassk., PI. jav. rar. 176. 1848.

Delima tripetala Bl. *ex* Spreng., Syst veg. 2: 597. 1825; G. Don, Gen. Hist, dichl. PI. 1: 71. 1831.

Delima frangulaefolia Presl, Rel. Haenk. 2: 73. 1835—6; Vill., Nov. App. 2. 1880.

Delima aspera Blanco, Fl. Filip. 429. 1837; 2nd Ed., 299. 1845; 3d Ed., 2: 191 *pi. 190*** 1878.

Tetracera monocurpa Blanco, Fl. Filip. 459. 1837.

An asterisk indicates an uncoloured illustration; a double asterisk a coloured one.

Delima sarmentosa var. *hebecarpa* (DC.) Hook. f. & Thorns., Fl. ind. 1: 61. 1855; Miq., PI. Ind. bat. Suppl. 618. I860; *in* Ann. Mus. bot. Lugd. Bat. 4: 73. 1868; Hook. f. & Thorns, in PL Br. Ind. 1: 31. 1872; Kurz *in* J. As. Soc. Beng. 43 (2) : 45. 1874; King in J. As. Soc. Beng. 58 (2) : 362. 1899.

Delima sarmentosa var, *jl* Miq., Fl. Ind. bat. 1 (2) : 7. 1859 (= *Delima hebecarpa* DC).

Tetracera sarmentosa var. *hebecarpa* (DC.) Martelli *in* Becc, Malesia 3: 150. 1886; Vid., Rev. PI. Vase. Pilip. 36. 1886; Pin. & Gagnep. « Bull. Soc. bot. Fr, Mem. 4: 4. 1906; in Fl. gdn. Ind.-Ch. 1: 16. 1907.

Tetracera hebecarpa (DC.) Boerl., Cat. Hort. bot. bogor. 3. 1899; Back., Fl. Batavia 1: 4. 1907; Schoolil. Java 8. 1911; Koord., EjtkFl. Java 2: 600. 1912; Ciaib, Fl. siam. En. 1: 19. 1925.

Tetracera xcaudens (L.) Merr., Int. Rumph. Herb. amb. 365. 1917; Brown, Minor Prod. Philip. For. 3: 59. 1921; Merr., Bibl. En. Born. PL 382. 1921; En. Philip, fl. PI. 3: 59. 1923; Back., Bekn. Fl. Java (Nooduitg.) 4 (Fam. 80): 2. 1942; Henders., Mai. wild Flow. 1: 19. 1949; Hoogl. *in* Fl. mal. I 4: 143. 1951.

Tetracera vnlubilis Auct, *(non* L.); Merr., Spec, blanc. 362, 1918, in error, *T. scandens* being intended.

Tetracera scandens var. *hebecarpa* (DC.) Heyne, Nutt. PL Ned. Ind., 2nd Ed., 1070. 1927.

Delima scandens Burk., Diet. econ. Prod. Mal. Pen. 1: 776. 1935, doubtlessly based on *Tragia scandens* L., though not expressly stated.

TYPES.—*Tragia scandenx:* Rumphius, *I.e. pi. !}.* — *Delima sarmentosa:* lectotype in LINN. — *Delima hebecarpa:* La Haye *s.n.,* Java; lectotype in G (original of Delessert's figure, 1821). — *Delima intermedia:* Blume *s.n.,* Java; leetotype in L. — *Delima tripetala:* Java; unknown to me. — *Delima fra,ngnlaefolia:* Haenke *s.n.,* Luzon; holotype in Herb. Prague, not seen. — *Delima as]tera & Tetracera monocarpa:* Blanco *s.n.,* Malinta, Philippines; probably lost.

Small shrub (up to 2 m high) or climbing or creeping woody vine (up to 30m long), much-branching; trunk up to 16cm thick; branches strigose, glabrescent, younger ones light brown, older ones with light grey bark. Leaves oblong to obovate, (3.5—)6—15(—20) X (1.5—)3—7 (—9) cm, with (6—)10—14(—20) nerves on either side; apex rounded to obtuse; base obtuse; margin entire to distinctly dentate, most so in saplings; nerves slightly curving upward, ending in apex of teeth; leaves above sometimes slightly glossy, sparsely strigose to glabrous on intervenium, sparsely pubescent on midrib, beneath dull, sparsely pubescent to glabrous on intervenium, strigose on nerves and midrib, without or with slightly to distinctly developed hairy domatia in axil of nerves, particularly upper ones, scabrid on both sides; petiole (4—)6—12(—15) mm, sparsely pubescent above, strigose beneath. Inflorescences terminal, up to 40 x 20 cm, up to 200-flowered, often in basal part with 1—5 small leaves; branches strigose, extreme ones most densely so; bracts usually caducous, lanceolate, 3 x 1 mm, acute at apex, attached with broad base, glabrous above, strigose beneath. Flowers 6—8 mm across; pedicel 2—6 mm, rather densely strigose, without or with 1—2 bracteoles; bracteoles 1 x 0.5 mm. Sepals 4, on same plant in about 5% of flowers 5, reflexed, about 3 x 2 mm, scabrid, slightly strigose outside, smooth, glabi'ous

inside, ciliate at margin. Petals 3, 3—5 X 2—3.5 mm, white, yellowish white, or reddish white. Stamens about 65—80, 3 mm long, white, with thecae touching each other at apex. Carpels 1(—2), densely hairy with rigid, appressed, 0.4—0.7 mm long hairs, ovoid, 0.75—1 X 0.5—0.75 mm with 3 mm long style, with about 10 ovules. Fruits ovoid, about 1 0 x 6 mm, acute with 1—3 mm long beak, with 0.5—2 mm long rigid, appressed haira, reddish brown, glossy, 1(—2)-seeded. Seeds ovoid, about 4 x 3 mm, (flossy black; aril 2—3 mm long, scarlet, fimbriate for 3/4 - 9/10 of its length.

FIG. 1. *Tetracera scandens* (L.) Merr.

DISTRIBUTION.—Southern China (Yunnan), Burma (Arracan, Tenasserim), Peninsular Siam, Indo-China (Cambodia, Cochinchina), Nicobar Islands, Sumatra, Malay Peninsula, Banka, Java, Borneo (only Kuching and British North Borneo), Philippines, Celebes, Kangean Islands, and Lesser Sunda Islands (Bali, Sumbawa, Flores).

ECOLOGY.—Common at low altitudes (up to 500 m), in Yunnan at 950 m; in thickets, scrub, hedges, secondary forests, open primary forests, and teak-forests (Central & East Java), on moist to rather dry soil, often on riverbanks.

VERNACULAR NAMES.—Siam: kapot (Prachuap), pet kai (Songkla), pot (Puket), pot kai (Patalung). Sumatra: akar ampala (Priaman), akar (am) pelas (Palembang), ampelas padang (Bengkalis), baik sipi hendak.

hasahan (Lampung), galinggin (Asahan), ompe (Atjeh). Malay Peninaula: akar ampelas hari betina, ampelas hari (Malacca), akar ampelas tikus (Pahang), akar ampelas puteh, ampelas tikus (Sungei Ujong State), akar pelah (Trengganu), ampelas (Kuala Lumpur, Pahang, Penang), ampelas hari betina *(fide* Ridley), ampelas kasap (Taiping), ampelas putih *(fide* Ridley), ampelas rimau (Kuala Lumpur). Java: (akar) ampelas hari betina, (akar) ampelas ojod, (akar) ampelas putih, (akar) ampelas tikus (Malay), areuj ki assahan, areuj ki assahan lalaki, kaju as(s)ahan, ki asahan, asahan areuj (Sundanese), bo, debo, dembo, kroko, kroko ojod, ojal, roko, rokokan, singaran (Javanese). Borneo: agupit, kerubkerub (Bajau), akar ampelas (Kudat, Membakut), akar pampan (Kinabatangan), ampelas (Bajau, Bingawa, Papan, Tawao), ampelas akar (Bukit Padang), kariskaris, panpan (Sungei). Philippines: anggi'-git (Tagb.), dangilian (Bag.), eses na bagin, malbastigbalang, tagbalang (Tag.), malakatmon (Pamp., Tag.), pakiling (Sbl.). Celebes: lumpiwi apaelae (Galiraeng). Kangean: ampelas. Bali: bun api-api.

USES.—The leaves are used for polishing wood and *(fide* Rumphius) metal. The stems may be used as cordage. The medical use is unimportant *(cf.* Burkill, 1935).

The glabrous-fruited form, in the present paper considered to represent a distinct species, *Tetracera, asiatiea* (Lour.) Hoogl., was formerly included in the present species.

The genus *Delima* was first proposed by Linnaeus in his "Flora zeylanica." The species which occurs in Ceylon is not the present one, but *Tetracera asiatiea* (Lour.) Hoogl. The specimen in the Linnaean herbarium, however, is a fruiting specimen of the present species of unknown provenance. This specimen is considered to represent the lectotype of *Delima sarmentosa* L.

Rumphius' illustration is not very good. After comparison of his description and plate with the present species it is however safe to identify Rumphius' plant with the present species rather than with *Tetracera nordtiana* F. Muell., the only species which is known from Amboina. *Tragia scandens* L. antedates *Delima sarmentosa* L., which was erroneously omitted from the first edition of the "Species plantarum."

2. TETRACERA ASIATICA (Lour.) Hoogl. — **Fig.** 2

[Fructus indicus savuieutosus Burm., Thes. zeyl. 101. 1737.]
{Delima. L., Fl. zeyl. 92. 1748.]
Scauieria asiatica Lour., Fl. cochinch. 341. 1790.
Leontogloesum ecabrum Hance *in* Walp., Ann. 2: 18. 1851.
Delima sarmentosa var. *glabra* Hook. f. & Thorns., Fl. ind. 1: 61. 1855; *in* Fl. Br. Ind. 1: 31. 1872; King in J. As. Soc. Beng. 58 (2) : 362. 1889.
Detimopsis kirsuta Miq., Fl. Ind. bat. 1 (2i : 10. 1859; ibid. Suiipl. 152, 618. 1860.
Delivia sarmentosa f. *liirsutio-r* Miq. *hi* Ann. Mus. bot. Lugd. Bat. f: 73. 1868.
Tetracera hirsuta (Miq.) Boerl., Cat. Hort. bot. bogcr. 3. 189S.

Tetracera sarmentosa var. *hirsuta* (Miq.) Fin. & Gagnep. lit Bull. Soc. bot. Fr., Mem. 4: 4. 1906.

Tetracera levinei MeiT. *in* Philip. J. Sci., Bot. 8: 147. 1918.

Tetracera asiatica (Lour.) Hoogl. *in* Fl. mal. I 4: 143. 1951.

Delima sarmentosa Auct. *(nov* L.); Burm. f, Fl. ind. 122 *pi. 37."* 1768; Gaertn., Fruct. Sem. PI. 2: 112 *pi. 106.'"* 1791; DC, Syst. 1; 407. 1818; Lara., Illustr. 3: *pi. 1,75** 1823; DC, Prod. 1: 69.1824; Hook, *in* Curt., Bot. Mag. 58: *t. Sons.*"* 1831; Drury, Handb. Ind. Fl. 1: 12. 1864; Schnizl., Iconosx 3: *vl- 177."* 1843-70; Kurz, For. Fl. Br. Burma 1: 22. 1877; Trim., Handb. Fl. Ceyl. 1; 5. 1893; Gamble, List Darjeeling Distr. Beng. 1. 1896; Man. Ind. Timb., 2nd Ed., 3. 1902; Prain, Beng. PI. 195. 1903; Brand., Ind. Trees 5. 1906; Parkinson, For. Fl. Andam. Isl. 72. 1923; Kanjilal, Kanjilal, & Das, Fl. Assam 1: 10. 1934.

Tetracera sarmentosa Auct. *[von* (L.) Vabl]; Roxb., Fl. ind., ed. Carey, 2; 645. 1832, p.p.; Hanee in J. Linn. Soc, Bot. 8; 99. 1873; Forb. & Hemsl. in J. Linn. Soc, Bot. 23; 22. 1886; Fin. & Gagnep. *in* Bull. Soc. bot. Fr., Mem. 4: 3. 1906, p.p.; *in* Fl. gen. Ind.-Ch. 1; 15. 1907, p.p.; Crev. & Petel. in Bull. econ. Ind.-Ch. II 32: 19. 1929; Cowan & Cowan, Trees N. Bens. 8. 1929; Crook, Fl. PI. Hongkong, Ran.—Meliac. 22." 1930; Gagnep. *in* Fl. gen. Ind.-Ch., Suppl. 1; 20. 1938.

Tetracera scandens Auct. *[non* (L.| Merr.]; Merr. *in* Lingn. Sci. J. 5: 128. 1927; Alston *in* Trim., Handb. Fl. Ceyl. 8 (Suppl.) : 3. 1931; Merr. *in* Trans. Am. phil. Soc. II 24 (2): 264. 1935; Masamune, Fl. kainant. 205. 1943.

TYPES.—*Seguieria asiatica:* d'Alleizette s.»., Tonkin, near Jen Hay, April 1908; ' neotype in L. — *Leontoglossum scabnim:* Seemann 2461, China; holotype in BM. — *Delima sarmentosa* var. *glabra:* Wallich 6632, Sylhet, February 1829; lectotype in K, isotypes in BM, CAL, CGE, G. — *Delimopsis kirsuta: "Davilla hirsuta* T.'& B."; holotype in U, isotype in L; probably from cultivation in the Botanic Garden, Bogor, or from the Lampung, Sumatra. — *Delima sarmentosa* f. *hirsntior:* is based on the preceding. — *Tetracera levinei:* Levine 1794, Canton & vicinity, October 22, 1927; holotype in A, isotypes in E, GH, MO.

Small shrub (up to 3 m high) or climbing or creeping liana (up to 6 m long), much-branching; branches scabrid, sparsely strigose with 1 mm long hairs with or without sparsely to profusely distributed, small, divergent tufts of 3—12, shorter (0.3—0.5 mm) hairs or hirsute to sparsely so with 1 mm long hairs and also profusely distributed, small, divergent tufts of 3—12, shorter hairs, glabrescent, older branches smooth, brown or reddish brown. Leaves oblong, (3—)5—11(—15) x (1.5—)2—5(—7.5) cm, with (5—)10—14(—20) nerves on either side; apex obtuse to acute, sometimes rounded; base acute; margin slightly emarginate at end of nerves or entire to distinctly dentate; nerves ending mueronately in margin, or in apex of teeth where present; leaves above deep lustrous green, more or less shining, sparsely strigose with 1 mm long hairs on intervenium, glabrous to hirsute with up to 2 mm long hairs, particularly in basal part, on nerves and midrib, beneath light green, glabrous to sparsely stellate-hairy with some solitary hairs on intervenium, sparsely strigose with or without rather sparsely distributed tufts of 3—8, short hairs, or hirsute with 1.5—2.5 mm long hairs as well as rather sparsely distributed tufts of short haira on nerves and midrib; petiole 5—10(—15) mm, strigose or hirsute and with tufts of shorter hairs beneath, glabrous

to hirsute above. Inflorescences terminal, 10—25 x 5—15 cm, 30—150-flowered, often with 1—4 small leaves in basal part; branches scabrid, sparsely strigose or strigose with (sometimes profusely distributed) tufts of smaller hairs, or hirsute with tufts of small hairs; bracts usually caducous, lanceolate, 3 x 1 mm, acuminate at apex. Flowers 7—10 mm across; pedicel 1—5 mm, the indument like that of extreme branches of inflorescences, without or with 1—2 bracteoles; braeteoles 1 x 0.5 mm. Sepals 5, reflexed, 2 outermost ones about 2 x 1.5 mm, 3 inner ones about 4 x 3 mm, scabrid, sparsely hirsute with 0.2—0.4 mm long hairs outside, smooth, glabrous inside. Petals 3, 3—4 X 2—3 mm, white, yellowish white, or greenish white. Stamens about 100—125, 3—4 mm long, whitish yellow, the thecae slightly separated at apex. Carpels 1(—2), glabrous, 0.75—1 x 0.5—0.75 mm with 0.3 mm long style, with about 10—12 ovules. Fruits ovoid, 6—10 x 4—6 mm, acute with 2—5 mm long beak, glabrous, purplish, shining, 1(—2)-seeded. Seeds ovoid, 4 x 3mm, glossy black; aril up to 5mm long, fimbriate for 1/2—2/3 of its length with rather broad fringes.

Subsp. ASIATICA.

Segitieria asiatica Lour. — *Leontoglossnm scabrum* Hance. — *Tetracera levinci* ,Merr. — *Tetracera asiatica* (Lour.) Hoogl.

Branches sparsely strigose with 1 mm long hairs. Leaves glabrous on intervenium, sparsely strigose on nerves and midrib beneath; petiole strigose beneath. Branches of inflorescences sparsely strigose.

Subsp. **andamanica** Hoogl., *subsp. nov.*

Tetracera asiatica subsp. *andamanica* Hoogl. *in* Fl. mal. I 4: 144. 1951, cum desev. angl.

Delima sarmcntosa var. *fflabra* Hook. f. & Thorns., p.p., lectotypo incluso.

TYPE.—Dr. King's Collector 337, Port Bhing, Andamans, July (5, 1884; holotype in L, isotypes in CAL, G, K.

Ramis novellis et ramis inflorescentiarum strigosis et pilis stellato-fasciculatis; foliis nervis facie inferiore strigosis, intervenio glabris.

Branches sparsely strigose together with sparsely to profusely distributed small divergent tufts of about 3—12, shorter (0.3—0.5 mm long) hairs. Leaves glabrous on intervenium, sparsely strigose on nerves and midrib beneath; petiole strigose beneath. Branches of inflorescences sparsely strigose to strigose, with also on thicker branches, very sparsely distributed, and on extreme branches, up to densely distributed tufts of smaller hairs.

Subsp. SUMATRANA Hoogl.

Tetracera asiatica subsp. *sumatrana* Hoogl. *in* Fl. mal. I 1: 144. 1951.

Delimopsis hirsnta Miq. — *Delima sarnientoea* f. *hirsutior* Miq. — *Tetracera hirsuta* (Miq.) Boerl. — *Tetracera sarmentosa* var. *hirsata* (Miq.) Fin. & Gagnep., quoad typ.

TVPE.—Same as for *Delimopsis hirsuta* Miq.

Branches hirsute to sparsely so, with in addition profusely distributed, small, divergent tufts of about 3—12, shorter hairs. Leaves with sparsely distributed tufts of 3—8, divergent hairs of 0.3—0.5 mm, as well as with a smaller number of identical, but solitary hairs on intervenium, on nerves and midrib beneath hirsute with 1.5—2.5 mm long hairs as well as (particularly on the sides) rather sparsely distributed tufts of hairs like those on intervenium; petiole hirsute beneath, together with tufts of shorter hairs like those on midrib, hirsute above. Branches of inflorescences hirsute with 1.5—2.5 mm long hairs as well as tufts of smaller hairs, the latter on extreme branches up to densely distributed.

Subsp. zeylanica Hoogl., *subsp. nov.*

[Fructus indicus sarmentosus Burm.] — *[Delima* L.]

TYPE.—Anonymus G9, Ceylon; holotype in L.

Ramis novellis et rwtnis inflorescentiarum strigosis et pilis stellutofascicvlatis; foliis nervis facie inferiore strigosis et pilis stellato-fasciculatis, intervenio facie inferiore pilis stellato-fasciculatis.

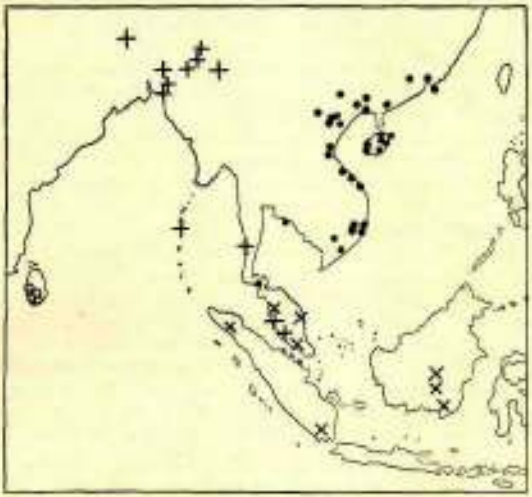
Branches sparsely strigose as well as with sparsely to profusely distributed, small, divergent tufts of about 3—12, shorter (0.3—0.5 mm long) hairs. Leaves with sparsely distributed tufts of 3—8 divergent hairs of 0.3—0.5 mm, as well as with smaller number of identical, but solitary hairs on intervenium, sparsely strigose with about 1 mm long hairs, particularly on central part, as well as rather sparsely distributed, small tufts like those on intervenium, particularly on sides, on nerves and midrib, beneath. Branches of inflorescences sparsely strigose, with also rather densely to densely distributed tufts of smaller hairs.

DISTRIBUTION.—Ceylon and from Assam and South China to Borneo and South Sumatra. Subspecies *asiatica* in South China (Kwangsi, Kwangtung, and Hainan), Indo-China, and Siam; subspecies *andamanica* in Darjeeling, Assam, Bengal, Andaman Islands, South Burma (Tenasserim), and Malay Peninsula (Perak, Selangor); subspecies *sumatrana* in Sumatra, the Malay Peninsula, and Borneo; subspecies *zeylanica* in Ceylon. The subspecies are geographically isolated except subspecies *andamanica* and subspecies *sumatrana*, which are both found in the Malay Peninsula.

ECOLOGY.—Subspecies *asiatica* along roadsides, in scrub, hedges, thickets, open forests, and, rarely, in woods; generally at low altitudes, up to 1500 m (Cambodia) ; flowering from March to November, fruiting from May to February. Subspecies *andamanica* in evergreen forests (Assam) and "hill jungle" (Andamans), up to 650m altitude; flowering from May to October, fruiting from June to February. Subspecies *sumatrana* in primary forest, up to 1300 m (Atjeh). Subspecies *zeylanica* rare in woods at low altitude; flowering in August and September.

VERNACULAR NAMES.—India: ou-lota, oua-lota, panilewa (Ass.), bau-taruk (Daff.) , samphot-rikang (Mik.) , aithlang shrui (Kuki) , hruisen (Tipp.) , tiegdi-douka (Cach.) *(fide* Kanjilal, Kanjilal, & Das). China: sahan yau ma (Cantonese), shap ip t'ang, sut t'ang (Hainan). Indo-China: cay chay chiu (Annamese: Vinh), cay giay chiu (Annamese: Ba

ngoi), chong kho (Tonkin, Yen Vuc), dak kuon *(fide* Gagn'epain), day chiu (Annamese: Quang Tri and Nhatrang), day sanh (Mg, Rhanh Hoa), gay-sac, gay-trieu (Tonkin), giay chieu (Annamese: Bien Hoa and Vinh Yen), giay chiu (Annamese: Huë and Thua Thien), sang at (Moi, Quang Tri), vie chieu (Annamese: Tourane). Ceylon: corose-wel, korasawel, korese wel, korosse (Singhalese). Malay Peninsula: memplas rimau (Kemaman; noted under subspecies *sumatrana).*



PIG. 2. *Tetrucet-a aBialica-* (Lour.) Hoogl.: ssp. *aeiatica* (•, ssp. *andamavica* Hoogl. (+), ssp. *mntatrava* Hoogl. (x), ssp. *zeylctniea* Hoogl. (o).

USES.—The stems of subspecies *asiatica* are used for binding purposes in Indo-China, its leaves are used for cleaning tin-ware in China. Subspecies *sumatrana* is used in the Malay Peninsula for polishing wood.

I have preferred to give the infraspecific taxa the rank of subspecies rather than of varieties for the following reasons: (i) the marked geographical distribution of each, centering in the Malay Peninsula, where three of the subspecies occur; (ii) the absence of intermediate forms; (iii) in addition to the differences in the composition of the indument the subspecies show a markedly different habit of the leaves.

Merrill (1935, *I.e.),* in his discussion of the binomials proposed by Loureiro, gives under *Tetracera scandens* (from which I have separated the present species) the following of Loureiro's names as synonyms: *Actaea aspera, Calligonum asperum,* and *Seguieria asiatica.* Of these *Actaea aspera* and *Cailigonum asperum* are excluded here on account of the fruit, said to be a berry in both of them. For *Cailigonum asperum,* Loureiro expressly stated the difference from *Seguieria asiatica* and *Delima sarmentosa* Burm. f. (Fl. ind.) : "Minime vero ad istas aceedit ratione fructus"; for *Seguieria asiatica* the fruit is indicated to be a capsule. The axillary flowers in spicate racemes and the quadrifid calyx and corolla in *Actaea aspera,* the hispid fruit and deeply bipartite stigma in *Cailigonum asperum* can only give more support to my opinion. The only point likely to raise doubt as to *Seguieria asiatica* is the absence of a corolla, which is, however, considering the caducous corolla of the Dilleniaceae, not a point to which great value can be attached.

The species is here separated from *Tetracera scandens* (L.) Merr. (formerly usually known as *Delima,* or *Tetracera, sarmentosa),* in which it has been currently included, on account of the following distinctive characters: (i) its glabrous carpel and fruit *(T. scandens,* hirsute) and (ii) its pentamerous calyx *(T. scandens,* tetramerous or in a few flowers on the same plant pentamerous). *Tetracera scandens* has the centre of its distribution in Malaysia, *T. asiatica* in continental Asia.

From Borneo the species is known only from sterile specimens, having slightly larger leaves than the specimens of the same subspecies from Sumatra. The specimens from Korthals are provided with the manuscript name *"Tetracera setigera* Khs," mentioned by Miquel *{in* Ann. Mus. bot. Lugd. Bat. 4: 75. 1868) under *T. scaberrima* Miq.

3. TETRACERA GLABERRIMA Martelli

Tetracera glaberrima Martelli m Becc, Malesia 3: 150. 1886; Boerl., Cat. Hort. bot. bogor. 3. 1899; Merr., Bibl. En. Born. PI. 381. 1921; Hoogl. in Fl. mal. I 4: 148. 1951.

TYPE.—Beccari Piante Bornensi 298, Kuching, Sarawak, August 1865; bolotype in Fl, isotypes in BM, G, K, M, NY, S.

Scandent shrub; branches glabrous, younger ones brown, older ones greyish white. Leaves elliptic to obovate, (2.5—)5—9(—15) X (1.5—)2—4 (—0) cm, with (8—)5—7(—9) nerves on either side; apex distinctly acuminate; base acute; margin entire; nerves slightly curving upward, ending in margin mucronately; leaves glossy, glabrous above, less glossy, glabrous on intervenium, sparsely strigose along midrib and nerves beneath, smooth on both sides; petiole 3—8 mm, glabrous. Inflorescences axillary, up to 4 x 2.5 cm, 1—5, usually 3-flowered; peduncle 0.5—1 cm,

like branches sparsely strigose, without bracts. Flowers about 2.5 cm across; pedicel 7—12 mm, sparsely strigose to glabrous, without or with 1—2 minute bracteoles. Sepals 4, 8—10 x 5—7 mm, glabrous outside, glabrous to sparsely sericeous inside, not ciliate at margin. Petals 4, 10—12 x 6—8 mm, white. Stamens about 100, 5 mm long, the thecae touching each other at apex. Carpels 1(—2), glabrous, 1.5 x 1 mm with 0.5—4 mm long style, with about 10 ovules. Fruits with 1(—2) capsules developed in each flower; capsules ovoid, 15 X 10mm, acute with 2—3mm long, slightly lateral beak, glabrous, glossy, 1(—3)-seeded. Seeds ovoid, glossy black, 3—4 x 2—3 mm; aril 5 mm long, laciniate with broad slips to about 1/2 of its length.

DISTRIBUTION.—Borneo (Kuching), once collected; formerly cultivated in the Botanic Garden of Bogor from unknown provenance.

VERNACULAR NAME.—In the Botanic Garden, Bogor, the Sundanese name aroy kiasahan was noted.

The species is closely related to *T. akara* (Burm. f.) Merr. The characters in common are the sericeous inner side of the sepals, the structure of the inflorescences, the tetramerous calyx, and the large flowers; the differences are the less dense sericeous indument on the inner side of the sepals, the slightly broader leaves, and the solitary carpels.

4. TETRACERA MAINGAYI Hoogl.

Delimit laeuis Maing. IT King *in* J. As. Soc. Beng. 5S (2) : 362. 1889, nun *Tetracera hevis* Vahl.

Tetracera muingayi Hocgl. *in* Fl. mal. I 4: 144. 1951 (= *Delima laevis* Maing. ex King).

Tetracera borncenaw Auct. (noil Miq.l; Kidl., Fl. Mal. Pen. 1 : 8. 1922.

Tetracera. sumatrana Auct. *(non* Miq.l ; Ridl., Fl. Mal. Pen. 1: <: 1922, p.p.

TYPE—Maingay 1570 (Kew Distribution 10), Malacca, April 10, 1867; holotype in CAL, isotype in K.

Scandent shrub; branches strigose-hirsute with solitary hairs and hairs in divergent tufts of 2—5 each, glabrescent, younger ones scabrid, later smooth. Leaves oblong, (3.5—)7.5—15(—20) x (1.7—)3—6(—9) cm, with 8—11 nerves on either side; apex acute, somewhat acuminate; base rounded to obtuse; margin entire; nerves curving upward, not reaching margin; leaves shining, glabrous or sparsely strigose only on base of midrib above, dull, hirsute with divergent tufts of 2—5, 0.2—0.4 mm long hairs to glabrous on intervenium, rather densely strigose-hirsute with 0.75—1.5 mm long hairs on midrib and nerves beneath, smooth on both sides; petiole 10—20 mm, slightly winged, 2—3 mm broad, glabrous to sparsely strigose along the middle above, glabrous to strigose-hirsute beneath. Inflorescences terminal, 15—20 X 10—20 cm, up to 250-flowered, often with 1—3 small leaves in basal part; branches strigose-hirsute like younger sterile branches, slightly scabrid; bracts caducous, lanceolate, 3—6 X 1—2 mm, acute at apex, attached with broad base, glabrous above, strigose beneath. Flowers 12—15 mm across; pedicel 1.5—4mm, strigose-hirsute like branches of inflorescences, without bracteoles. Sepals

5, 2 outermost ones 3.5 x 3 mm, 3 inner ones 5 X 3.5—4.5 mm, all scahrid, 2 outermost ones sparsely strigose in central part, 3 inner ones completely glabrous outside, all with smooth inner surface, densely sericeous except for 0.5—1 mm broad glabrous margin. Petals 3, about 7 x 4 mm. Stamens about 110, 2.5 mm long, with thecae distinctly separated at apex, connective not emarginate between thecae. Carpels 1, glabrous, 1.8 x 1.4 mm, gradually tapering into 1.2 mm long style, with about 6 ovules. Fruits oblong, 8—12 X 3—4 mm, acute with 2—3 mm long beak, glabrous, dull, 1—2-seeded. Seeds unknown to me.

DISTRIBUTION.—Malay Peninsula (Penang, Malacca, Selangor), ?Borneo.

ECOLOGY.—Climber in low altitude (up to 200 m) forests.

VERNACULAR NAMES.—Malay Peninsula: akar mempelas (Selangor), akar mempelas betina (Alvins 1066, without locality). Borneo: akar amplas.

The species is more closely related to *Tetracera fagifolia* Bl. than to the other species with single carpels.

The Borneo record is uncertain. The only specimen bears the indications: "Borneo, no 1703, Remow, no information" (SING).

5. TETRACERA LANUGINOSA Diels

Tetracera laimginosa Diels in Bot. Jb. 57: 439. 1922.

TYPE.—Ledermann 8586, April River, Sepik Region, New Guinea, September 8. 1912; leetotype (isotype) in BM, isotype in K.

Scandent shrub; branches hirsute with single, up to 2 mm long and stellately grouped, about 0.1 mm long hairs, slightly scabrid. Leaves elliptic, 5—6 x 3—3.8 cm, with 9—12 nerves on either side; apex and base rounded; margin entire; nerves curving upward, ending close to or in margin; leaves slightly shining, rather sparsely hirsute with thin, rather rigid, up to 2 mm long hairs above, the under surface dull, sligthly more densely hirsute than above, with stellate groups of about 0.1 mm long hairs, mainly on nerves; petiole 10—15 mm, long-hirsute with single hairs above, hirsute with long and stellate groups of very short hairs beneath. Inflorescences axillary, 2—4-flowered; branches hirsute like younger sterile branches; bracts lanceolate, about 4 x 2 mm, glabrous above, hirsute beneath with long and stellate groups of small hairs. Flowers about 18 mm across (or more?). Sepals 5, 2 outermost ones 4 x 4 mm, 3 innermost ones 6 x 7 mm, lanuginose outside with in addition stellate groups of small hairs, glabrous to very sparsely and shortly strigose inside. Petals 3. 9 x 6 mm, on outer side on central part with stellate groups of hairs as well as a few lanuginose hairs. Stamens about 500, 2.5—3 mm long, the thecae strongly separated at apex. Carpels 2—3, densely covered, mainly in basal part, with 2 mm long, rather thin, ferrugineous hairs, each carpel 1.5 x 1 mm with 2 mm long style. Fruits unknown.

DISTRIBUTION.—New Guinea (April River, Sepik region), only knowr. from the type collection.

ECOLOGY.—In primary forest, at 50—100 m altitude.

In the original description Diels indicates that the number of sepals is seven to eight. The only flowerbud I studied had five sepals and three petals, the latter not much differing from the first. The fact that the petals, which are somewhat larger than the innermost sepals, are slightly hairy outside may have confused Diels. In some other species, e.g. *T. fagifolia* Bl., the differences between the innermost sepals and the petals also hardly exist, except that there the indument on the inner and outer side is found only in the sepals.

6. TETRACERA NORDTIANA F. Muell. — Fig. 3

Tetracera nordtiana F. Muell., Fragm. 5: 1. 1865; F. M. Bail., Synops. Queensl. PI, 3. 1883; K. Schum. & Hollr., Fl, Kais. Wilhelmal. 47. 1889; F. M. Bail., Queensl. Fl. 1: 9. 1899; K. Schum. & Laut., Fl. deut. Sehutzgeb, Siidsee 444. 1901; F. M. Bail., Compr. Cat. Queensl. PI. 18 *f. 3."* 1909; Hoogl. in Fl. mal. 14: 144. 1951.

Tetracera wuthiana F. Muell., Fragm. 10: 49. 1876; F. M. Bail., Synops. Queensl. Fl. 3. 1883; Queensl. Fl. 1: 10. 1899; Compr. Cat. Queensl. PI. 18. 1909; *in* Dept Agric. Brisb. Bot. Bull. 18: 3. 1916.

Tetracera everillii F. Muell., Descr. Notes Papuan PI. 7: 25. 1886.

Tetracera moluccana Martelli HI Becc, Malesia 3: 153. 1886; Kaneh. & Hatus. *in* Bot. Mag., Tokyo 57: 63. 1943.

Tetracera coivleyana F. M. Bail, *in* Dept Agric. Brisb. Bot. Bull. 5: 7. 1892; Queensl. Fl. 1: 9. 1899; Compr. Cat. Queensl. Fl. 18 /. *Sbis.'* 1909.

Tetracera boerhgei Merr., Int. Rumph. Herb, ami), 366. 1917.

Tetracera floribunda Diels *in* Bot. Jb. 57: 440. 1922.

Tetracera pilophylla Diels in Bot. Jb. 57: 440. 1922.

Tetracera euryandra Auct. (noM Vahl) ; Eoxb., Fl. ind., ed. Carey, 2: 646. 1832.

Tetracera volubilis Auct. (no« L.); Kendle *in* J. of Bot. 59 (Suppl.) : 2. 1923.

TYPES.—Tetracera nordtiana: Dallachy *s.n.,* Rockinghams Bay, Meunga Creek, **January** 4, 1846; lectotype in MEL, isotype in BM. — *Tetracera wuthiana:* Dallachy *s.n.,* Rockingham's Bay, November 21, 1865; lectotype in MEL, istotypes in BM, BRI, K. — *Tetracera everillii:* Bauerlen 472, Fly River (Branch), October 1885; holotype in MEL, isotype in BRI. — *Tetracera inohiccana:* Beceari *s.n.,* Piante delle Molucche, Amboina, 1873; holotype in Fl. — *Tetracera cowleyana:* Cowley *s.n.,* Cairns, Queensland (Cook Distr.); holotype in BRI, isotype in MEL. — *Tetracera boerlagei:* Robinson Plantae Rumphianae amboinenses 485, Amboina, July—November 1913; isotypes in BO, K, L. — *Tetracera floribunda:* Ledermann 10723a, Malu, Sepik Region, January 1913; probably lost. — *Tetracera pilophylla:* Ledermann 8937, Etappenberg, Sepik Region, October 2, 1912; isotypes in K, SING.

Shrub or large climber (up to 10 m long) ; branches often slightly scabrid, strigose to hirsute, sometimes together with stellate groups of very short hairs, glabrescent, older branches smooth. Leaves elliptic or ovate to oblong or lanceolate, (3—) 5—10(—15) X (2—) 3—5(—7) cm, with (6—)12—16(—24) nerves on either side; apex and base rounded to acute, margin entire to distinctly dentate; nerves curving upward, ending in margin, or in apex of teeth where present; leaves above glabrous or hirsute with single hairs or shortly hirsute with stellate groups of hairs together with longer solitary hairs on intervenium, nerves, and midrib, beneath

glabrous or hirsute with solitary hairs or shortly hirsute with stellate groups of hairs, together with longer solitary hairs on intervenium, sparsely strigose to strigose or strigose-hirsute or hirsute on nerves and midrib; petiole 5—15 ram, as to indument like leaves. Inflorescences terminal, often on short axillary few-leaved branches, 5—15(—30) x 3—6(—15) cm, 15—50-flowered; branches as to indument like younger sterile branches; bracts partly caducous, lanceolate, 2 x 0.5 mm, acute at apex. Flowers 6—10 mm across; pedicel 0.5—2 mm, as to indument like extreme branches of inflorescences. Sepals 4—5, reflexed, 2 outermost ones 1.5—2 x 1.5—2 mm, 2—3 inner ones 3—4.5 X 2—3.5 mm, densely and shortly stellate-hairy or strigose or densely villous outside, glabrous or, rarely, slightly sericeous in central part inside, ciliate at margin. Petals 3, 5—6 X 3—4 mm, white. Stamens about 140, 4—5 mm long; thecae strongly separated at apex; connective slightly to deeply emarginate between thecae. Carpels 2—4, usually 3, densely covered with rather rigid, about 0.5 mm long hairs, ovoid, 2 X 1.5 mm with 1—2 mm long style, with about 10 ovules. Fruits with 2—3(—4) capsules developed in each flower; capsules ovoid, 5—8 X 3—5 mm, rounded to acute with]—2 mm long beak at. apex, rather rigidly hairy, slightly glossy, usually 1-seeded. Seeds ovoid, about 3 X 2.5 mm, glossy black; aril about 5 mm long, red or crimson, laciniate at margin to 2/3—4/5, of its length with rather broad slips.

Var. NORDTIANA.

Tctracera nordtiana F. Muell. var. *nordthina;* Hoogl. *in* Fl. mal. I 4: 145. 1951.
Tetraccra nordtiatia F. Muell. — *Tctracera pilophylla* Diels.

Younger branches strigose or strigose-hirsute with up to 1 mm long hairs together with stellate groups of much shorter, 0.1—0.2 mm long hairs, sparsely to profusely distributed (up to nearly covering whole surface). Leaves sparsely to rather densely covered with stellate groups of 8—15 very short, 0.1—0.2 mm long hairs (in transitional 'forms to variety *molnccana* groups of 2—6 hairs of 0.2—0.5 mm) together with 0.4—0.8 mm long single hairs above, intervenium of lower surface as upper, on nerves strigose with up to 1 mm long hairs. Sepals densely covered with stellate groups of very short hairs accompagnied by fewer solitary 0.2—0.5 mm long hairs outside, glabrous inside. Capsules rather small, about 5 x 3 mm.

Var. WUTHIANA (F. Muell.) Hoogl.

Tetracera nordtiana var. *wutkiana* (F. Muell.) Hoogl. *in* Fl. mal. I 4: 145. 1951.
Tetraccra wuthiana F. Muell.

Younger branches strigose with up to 1.5 mm long hairs. Leaves glabrous above, beneath glabrous on intervenium, sparsely strigose on nerves and midrib. Sepals strigose with 0.2—0.5 mm long hairs outside, glabrous inside. Capsules rather small, about 5 x 3 mm.

Var. **louisiadica** Hoogl., *var. nov.*

Tetracera nordtiana var. *louisiadica* Hoogl. *in* Fl. mal. I 4: 145. 1951, cum descr.

angl

TYPE.—MacGregor s.n., Joannet Island, Louisiades, 1888; holotype in **MEL,** isotype in L.

Ramis inflorescentiarum et ramis novellis hirsutis et villosis; sepalis intus glabris, extus villosis; foliis facie superiore intervenio sparsim hirsutis, nervis hirsutis, facie inferiore intervenio villosis, nervis strigosis.

Younger branches strigose-hirsute with up to 0.8 mm long hairs and a rather dense, closely appressed indument of shorter, villose hairs. Leaves above hirsute with up to 0.5 mm long hairs, moat densely so on nerves and midrib, beneath densely shortly villose on intervenium, strigose-hirsute on nerves and midrib. Sepals densely villose outside, glabrous inside. Capsules rather small, about 5 x 3 mm.

Var. MOIUCCANA (Martelli) Hoogl.

Tetracera nordtiana var. *mohiccaim* (Martelli) Hoogl, *in* Fl, mal. I 4: 145. 1951. *Tetracera moluccana* Martelli. — *Tetraceru cowleyana* F. II. Bail. — *Tetracera boerlagei* Merr. — *fTetracera floribuvda* Diels.

Younger branches strigose to hirsute with up to 1.5 mm long hairs. Leaves sparsely hirsute with rather rigid, up to 1.5 mm long hairs on intervenium, slightly more densely so on nerves and midrib above, beneath glabrous to hirsute with up to 1.2 mm long hairs on intervenium, strigose to hirsute with up to 1.5 mm long hairs on nerves and midrib. Sepals strigose with up to 0.7 mm long hairs, solitary or in groups of 2—5, outside, glabrous inside. Capsules rather large, about 8 x 5 mm.

Var. EVERILLII (F. Muell.) Hoogl.

Tetracera nordtiana var. *crcrillii* (F. Muell.) Hoogl. in Fl. mal. I 4: 145. 1951. *Tetracera everillii* F. Muell.

Younger branches hirsute with up to 2 mm long hairs as well as a closely appressed indument of shorter, villose hairs. Leaves hirsute with up to 3 mm long hairs on both sides, slightly more densely so on midrib beneath. Sepals densely villose outside, glabrous inside. Capsules rather large, about 8 x 5 mm.

Var. **celebica** Hoogl., *var. nov.*

Tetracera nordtiana var. *celebica* Hoogl. *in* Fl. mal. 1 4: 145. 1951, **cum** deser. angl. TYPE.—Elbert 3S82, Kabaena Island, SE Celebes, October 26, 1909; holotype in L.

Ramis inflorescentiarum et ramis novellis dense hirsutis; sepalis intus partim sparsim senceis, extus strigoso-hirsutis; foliis hirsutis ambis faciebus.

Younger branches rather densely hirsute with up to 0.7 mm long hairs. Leaves hirsute with up to 1 mm long hairs on both sides, most densely so on midrib beneath. Sepals strigose-hirsute with 0.1—0.3 mm long hairs, partly in groups of 2—5, outside, slightly sericeous in central part inside. Capsules unknown.

DISTRIBUTION.—From south-eastern Celebes (Kabaena Island) eastward to the Louisiades and. north-eastern Queensland; variety *nordtiana*

in New Guinea and Queensland; variety *moluccana* in the Moluccas, Am Islands, New Guinea, and Queensland; variety *wuthiana* in Queensland and a transitional form to variety *nordtimm* in SE New Guinea (Koitaki); variety *everillii* in SE New Guinea (Fly River); variety *celebica* in Kabaena Island (SE Celebes); variety *louisiadica* in the Louisiades. A single sterile collection is known from New Britain (Kew Herbarium) ; it probably belongs to variety *moluccana.*

FIG. 3. *Tetracera nordtiana* F. Muell.: var. *nordtiana* (•), vai. *wutniana* (F. Muell.) Hoogl. (X), var. *everillii* (F. Muell.) Hoogl. (+), var. *moluccana* (Martelli) Hoogl, (c), var. *celebica* Hoogl. (•), var. *louisiadica* Hoogl. (T .

ECOLOGY.—Climber in rain forest, from sea-level to about 1000 in altitude.

VERNACULAR NAMES.—A m b o i n a: talir hassat, hassat, and hassat cotel. Probably also gumi uccu in T e r n a t e *(fide* Rumphius).

The species is remarkably polymorphic, but the varieties as distinguished here mainly on the character of the indument do not appear to deserve higher taxonomic rank, many intermediate forms occurring. Most typical variety *nordtiana* has an indument of stellate groups of very short hairs on intervenium and young branches; this typical form I have seen only from Australia. Most of the New Guinea collections which I refer to this variety have the hairs in the stellate groups longer and in smaller groups, and often mixed. with single hairs as in variety *moluccana. Tetracera pilophylla,* of which I have seen only an infructescence (and no leaves), may come nearest to the most typical variety *nordtiana.* Carr 12832 (Koitaki, Territory of Papua) represents an intermediate form between variety *nordtiana* and variety *wuthiana.* In variety *celebica* an

additional character is found in the indument on the inner side of the sepals. Though this character is often of specific value in *Tetracera,* I prefer to keep the specimen within *T. nordtiana* in view of the great variability of the species, in which variety *celebica* is inserted easily, and the imperfect condition in which it is known.

Variety *nordtiana* and variety *wuthiana* have in general smaller, elliptic, variety *moluccana* larger, oblong, leaves. Variety louisia*dica* in this respect is nearest to variety *nordtiana,* but is only known from a single collection; variety *everittii* and variety *celebica,* both also known only from single collections, are nearest to variety *moluccana.* However, this character of the leaf is not constant and, as in the case of the indument, many intermediates occur.

The varietal status of *T. floribunda* Diels cannot be decided with certainty from the description.

Funis urens glabra Rumph. (Herb. amb. 5: 12. 1747) may be this species as has been suggested by Merrill. The description, however, is very defective.

7. TETRACERA INDICA (Houtt. ex Christm. & Panz.) Merr. — Plate 1, Fig. 4

Assa Houtt., Nat. Hist. 5: 275 pi. *21 f. 1."* 1776.

Asm indica Houtt. *ex* Christm. & Panz,, PflSyst. 4: 40, *pi. 26 f. 1."* 1779.

Wahlbomia in&iea Thunb. in Vet. Akad. Handl., Stockh. 216 *pi.* 9* 1790; Lam.. Illustr. 3: *pi 485.** 182S.

Assa exotica Gmel., Syst. 839. 1791.

Tetracera laevis Vahl, Symb. bot. 3: 71. 1794.

Tetracera assa DC, Syst. 1; 402. 1818; Prod. 1: 68. 1824; Hook. f. & Thorns., PI. ind. 1: 63. 1855; Miq., Fl. Ind. bat. 1 (2): 8. 1859; Drury, Handb. Ind. Fl. 1: 9. 1864; Miq. *in* Ann. Mus. bot. Lugd. Eat 4: 74. 1868; Hook, f. & Thorns, in Fl. Br. Ind. 1: 31. 1872; Kurz in J. As. Soc. Beng. 43 (2): 45. 1874; For. Fl. Br. Burma 1: 22. 1877; King in J. As. Soc. Beng. 58 (2): 362. 1889; Brand., Ind. Trees 5. 1906; Fin. & Gagnep. in Bull. Soc. bot. Fr., Mem. 4: 3. 1906; *in* Fl. gen. Ind.-Ch. 1: 14.* 1907; Back., Fl. Batavia 1; 3. 1907; Schoolfl. Java 9. 1911; Koord., ExkFl. Java 2: 600. 1912; Ridl., Fl. Mai. Pen. 1: 5. 1922; Craib, Fl. siam. En. 1: 19. 1925; Gagnep. *in* Fl. gen. Ind.-Ch., Suppl. 1: 18. 1938.

Tetracera wahlbomia DC, Syst. 1; 403. 1818; Prod, t: 68. 1824.

Tetracera malabarica Lam., Illustr. 3: 32 *pi. isr, f. 1."* 1823.

Tetracera dichotoma BL, BJjdr. 1; 4. 1825.

Tetracera gracilis Bl., Bijdr. 1: 4. 1825; Miq., Fl. Ind. bat, 1 (2): 9. 1859.

Tetracera trigyna Roxb., Fl. ind., ed. Carey, 2: 645. 1832; Hunter (ed. by Ridl.) in J. Str. Br. R. A. S. 53: 98. 1909.

Eleiastis laevis (Vahl) Eafin., Sylva tellur. 165. 1838.

Tetracera indica (Houtt. ex Christm. & Panz.) Merr., Int. Rumph. Herb. amb. 367. 1917; Back. & Sloot., Theeonkr. no. 174.* 1924; Heyne, Nutt. PL Ned. Ind., 2nd Ed., 1070. 1927; Burk., Diet. econ. Prod. Mai. Pen. 2143. 1935; Back., Bekn. Fl.

Java (Nooduitg.) 4 (Fam. 80) : 3. 1942; Henders., Mai. wild Flow. 1: 20 /. *s.* * 1949; Hoogl. *in* Fl. mal. I 4: 146 /. *1.'* 1951.

Assa tetragynia Houtt. *ex* Stapf, Ind. lond. 1: 331. 1929; misinterpretation ol' text of Houttuyn, 1776, *I.e.*

Eugenia malaccensis Auet. *(non* L.); Bm-m. f., Fl. ind. 114. 1768; *cf.* Steenis. in Bull. bot. Gard. Buitenz. **III** 18: 459. 1950.

TYPES.—*Assa, Assa itidica, Assa exotica, Tetracera assa, Assa tetragynia:* Herbarium Houttuyn, Planta Ind. Orient, Java; holotype in L (original of Houttuyn's figure). — *Wahlbomia indica, Tetracera wahibomia;* Herbarium Thunberg; holotype in UPS. — *Tetracera luevis:* Herbarium Vahl, dedit Lamarck; holotype in C. — *Tetracera malabarica:* herbarium Lamarck; holotype in P (original of Lamarck's figure). — *Tetracera dichotoma:* Blume *s.n.,* Java; holotype in L. — *Tetracera gracilis:* Blume **1638, Java;** holotype in L. - *Tetracera trigyna:* Wallich 6629A (Herbarium Roxburgh) ; lectotype in K, isotype in BR.

Small shrub, up to 2 m high, or small liana, up to 6 m long, creeping on the ground or clambering upwards over other plants, much branching, younger branches strigose, reddish green, smooth, older ones glabrous with greyish brown bark. Leaves elliptic to oblong or obovate, (3.5—)6—10(—20) x (1.5—)3—B(—9) cm, with (7—)9—11(—15) nerves on either side; apex obtuse to acute, not or only slightly acuminate; base acute; margin entire to, usually, more or less dentate; nerves slightly curving upward, ending mucronateiy in apex of teeth; leaves above often glossy, glabrous on intervenium, sparsely pubescent on midrib, beneath dull, slightly pubescent to glabrous on intervenium, rather densely to very sparsely strigose on midrib and nerves, without or with only very inconspicuous hairy domatia,- on both sides smooth; petiole (4—)6—10(—15) mm, sparsely pubescent above, strigose beneath. Inflorescences terminal, sometimes (particularly on climbing plants) on short lateral few-leaved branches, up to 8 X 6 cm, (2—) 4—7(—12) -flowered; peduncle 0.5—2 cm, like branches strigose to strigose-hirsute; bracts lanceolate, 2.5—12 X 1—5 mm, acute at apex, attached with broad base, glabrous above, strigose beneath. Flowers 2.5—3cm across; pedicel 8—15mm, strigose, hairs patent near apex, most densely hairy immediately below flower, without or with 1—3 bracteoles; bracteoles lanceolate, 3—4 X 0.8—1.2 mm. Sepals 4, 8—10 x 7—9 mm, glabrous on both sides, yellowish green or slightly tinged with red. Petals (3—)4(—5), 12—15 x 6—8 mm, reddish white. Stamens about 375, 6—8 mm long, red, white at base, with thecae touching each other at apex. Carpels 3—4, glabrous except for few 0.5 mm long, appressed, stiff hairs on back, 1.5 x 1mm with 5 mm long style, with about 10—15 ovules. Fruits with (1—)2—3(—4) capsules developed in each flower; capsules almost globular, about 10 mm in diameter with 2—6 mm long beak, glabrous, glossy, red or reddish brown, 1—7-, usually 2-, seeded. Seeds ovoid, 3—4 X 2—3 mm, glossy black; aril 8—10 mm long, bright red, fimbriate nearly to its base.

DISTRIBUTION.—Assam, Bengal (Chittagong), Burma (Pegu), Siam, Indo-China (Cambodia, Cochinchina), China (Fukien), Sumatra, Malay Peninsula, Banka, Java, Madura, Kangean.

ECOLOGY.—Small shrub in open places, e.g. recently .abandoned fields; low liana, climbing over low shrubs, in brushwood and open forests, common in the Malay Peninsula and Java, less common in South Indo-China and Sumatra, rarely collected in the other parts of its area; at low altitudes, up to 600 m.

Fie. 1. *Trtracera indica* (Houtt. ex Christm. & Panz.) Merr.

VERNACULAR NAMES.—Siam; pot luan (Songkla), pot lun (Krabi), yan pad lun (Trang). Intlo-China: cay giay chieu, cheait betao *(fide* Gagnepain), chon que (Moi; Bien HoA). Sumatra: aplas kedjong (Djambi), baih siepiek, baih sipiek suloh, sipik suluh, wajit sipit (Lampung), djelati (Palembang), memplas gadja (East Coast). Malay Peninsula: akar pulas puyio, ma ampalasu akar (Malacca), ampelas lichin *(fide* Burkill), ampelas mihsak (Trengganu), ampelas minyak, ampelas payah *(fide* Ridley), kalintat niamok (Singapore). Banka: akar tempelas. Java: akar mempelas (tempelas), empelas (mempelas) akar (Malay), (areuj) ki as(s)han, (kaju) asahan (Sundanese), bo (Javanese). Kangean: buko-buko.

USES.—The stems may be used as cordage. The leaves, though smooth on both sides, are said to be used as sandpaper (Burkill, 1935). The medical use is unimportant (Burkill, 1935).

The type specimen of Assa *indica* Houtt. ex Christm. & Panz., present in the Rijksherbarium, Leyden, agrees with the figure of Houttuyn, the latter being the reverse image of the actual specimen. This is perhaps the first specimen known from Ilouttuyn's collection which could be identified as his with certainty *(cf.* Merrill *in* J. Arn. Arb. 19: 291. 1938).

Tetraceru hygrophila Kurz (nomen nudum) is represented in the Calcutta and Kew herbaria by sterile specimens (Kurz 1809 from Pegu) probably belonging to the present species. The only Bengal record is a small-leaved, sterile specimen collected by Hooker f. & Thomson (K), the

only Assam record a specimen in the Pierre herbarium (P), communicated by T. Anderson. The only Chinese record is based on a specimen in the Arnold Arboretum herbarium (H. H. Chung 7051, Fukien, without exact locality).

8. TETRACERA AKARA (Burm. f.) Merr. — Fig. 5

[Akdra-Patsjoti Rheede, Hort. malab. 5: 15 *pi. 8** 1085.]

Calophyllmn akara Burm. f., PI. ind. 121. 1768.

Roehlingia suaveolens Dennst., Schliiss. Hort. ind. malab. 31. 1818.

Tetracera rkeedii DC, Syst. 1: 402. 1818; Prod. 1: 68. 1824; Wight & Am., Prod. PI. Pen. Ind. or. 1: 5. 1834; Wight, Ic. PI. Ind. or. 1: *pi. 70."* 1838; Drury, Hanilb. Ind. PI. 1: 9. 1864.

Tetracera sericea BL, Bijdr. 1: 3. 1825; Miq., Fl. Ind. bat. 1 (2): 9. 1859.

Tetracera axillaris Martelli *in* Bece., Malesia 3: 151. 1886; Merr., Bibl. En. Born. PI. 381. 1921.

Tetracera assa "vai[1]." Ridl. *in* J. Str. Br. R. A. S. 33: 37. 1900.

Tetracera sylvestris Ridl. in J. Str. Br. R. A. S. 54: 8. 1910; Fl. Mai. Pen. 1: 6. 1922.

Tetracera akara (Burm. *I.)* Merr. *in* Philip. J. Sci. 19: 366. 1921; Hoogl. *in* Fl. mal. I 4: 146. 1951.

Tetracera laevis Auet. (noil Vahl) ; DC, Syat. 1: 401. 1818; Prod. 1: 68. 1824; Hook. *!.* &. Thorns., Fl. ind. 1: 62. 1855; Miq. m Ann. Mus. bot. Lugd. Bat. 4: 74. 1868; Hook. f. & Thorns, *in* Fl. Br. Ind. 1: 31. 1872; Trim., Handb. Fl. Ceyl. 1: 6. 1893; Brand., Ind. Trees 5. 1906; Fin. & Gagnep. *in* Bull. Soc. bot. Fr., Mem. 4: 3. 1906, p.p.; Back., Schoolfl. Java 9. 1911; Gamble, Fl. Pres. Madras 1: 7. 1915; Back., Beta. Fl. Java (Nooduitg.) 4 (Fam. 80) : 2. 1942.

Tetracera assa Auct. *(nc-n* DC.); Hassk., PI. jav. rar. 177. 1848.

TYPES.—*Calophyllnm akara, Roehlingia suaveolens, Tetracera rheedii: Akdra-Patsjoti* Rheede, *I.e., pi. 8. — Tetracera sericea:* Blume 835, Gunung Seribu, Java; holotype in L. — *Tetracera axillaris:* Beccari Piante Bornensi 2844, Gunung Wah, Sarawak, November 1866; lectotype in Fl, isotype in K. — *Tetracera sylvestris:* Ridley 6179, Garden Jungle, Singapore, April 1894; lectotype in SING, isotypes in BM, CAL.

High climbing- or creeping liana, up to 25 m long, with bright brown trunk, up to 6 cm thick, much-branching; younger branches strigose, older ones glabrous with bright brown to whitish bark. Leaves oblong to lanceolate, (5—)g—13(—22) x (1.5—)3.5—6(—10.5) cm, with (5—)6—8(—10) nerves on either side; apex distinctly acuminate; base acute; margin entire to slightly undulate or dentate; nerves curving upward along margin, sometimes with vein towards margin, ending mucronately in apex of teeth; leaves above glossy bright green, glabrous on intervenium, glabrous to slightly pubescent on nerves, beneath dull, glabrous on intervenium, sparsely strigose on nerves, without or with only slightly developed hairy domatia, on both sides smooth or, rarely, slightly scabrid; petiole (3—)5—7(—10) mm, glabrous to slightly pubescent above, sparsely strigose beneath. Inflorescences terminal or axillary, up to 8 by 6 cm, (2—)5—8(—12)-flowered; peduncle 0.5—1.5(—3.0) cm, like branches sparsely

hirsute to glabrous; bracts lanceolate, about 2 x 1 mm, acute at apex, attached with broad base, glabrous to slightly hirsute above, sparsely to densely strigose-hirsute beneath. Flowers 2.5—3.0 cm across; pedicel 10—25 mm, sparsely hirsute to glabrous, without or with 1—2 bracteoles; bracteoles lanceolate, about 1 X 0.5 mm. Sepals 4, 8—10 X 6—8 mm, often reflexed in fruit, green or reddish green, glabrous outside, densely whitish or yellowish sericeous except 1—2 mm broad glabrous margin inside, ciliate at margin. Petals 3—4, 12—15 x 6—8 mm, white or greenish white. Stamens about 230, 7—8 mm long, yellowish white with grey tips, the thecae touching each other at apex. Carpels 3(—4), glabrous, 1.5 X 1 mm with 5 mm long style, with about 10 ovules. Fruits with (1—) 2—3 capsules developed in each flower; capsules almost globular, about 10 mm in diameter with 1—3 mm long beak, glabrous, glossy, 1—2-seeded. Seeds ovoid, 2—4 x 1—3mm, glossy black; aril 6mm long, fimbriate for 1/2—3/4 of its length.

DISTRIBUTION.—Deccan Peninsula (Malabar, Travancore), Ceylon, Indo-China (Cambodia), Sumatra, Malay Peninsula, West Java, Borneo, and Celebes.

FIG. 5. *Tetmcerci akara* (Burm. f.) Merr.

ECOLOGY.—Climber in lowland forests, up to 750 m altitude.

VERNACULAR NAMES.—India: akara patsjoti (Malabar), tilo sameno (Brachm.). Ceylon: et-korasa-wel. Sumatra: daun amplas (Palembang). Malay Peninsula: akar rusa-rusa, mumplas rimba (Malacca). Java: aroj pengasaman (Sundanese). Borneo: daun ampelas (Pulau Kuwala).

USES.—The leaves are said to be used as sandpaper, though the surface is hardly rough (Polak 2120, Borneo). The stems are used for ropes.

This species is most commonly known under the name *Tetracera laevis* Vahl which, however, is identical with *T. indica* (Houtt. ex Christm. & Panz.) Merr., as is evident from the type specimen in the Copenhagen herbarium.

Tetracera axillaris Martelli represents a small-leaved form, which has been collected only in Borneo. I do not think it to be of any taxonomic value.

The only specimen from Indo-China (Pierre 763, Samrongtong Province, Cambodia) much resembles *T. indica;* the inner side of the sepals has the sericeous indument as is found in the present species, though it is distinctly less dense than in all other specimens. The identity of this specimen appears somewhat dubious.

The species is closely related to *T. indica;* the main difference is the indument on the inner side of the sepals. With exclusion of the specimen just cited this character is very clear and sharp. In addition the acuminate apex of the leaf and the generally more glossy and darker appearance of the upper side of the leaves are usually characteristic of 2'. *akara.* The latter is found almost exclusively in forests, *T. indica* mostly in much more open, low vegetation.

9. TETKACERA LOUEEIRI (Fin. & Gagnep.) Pierre ex Craib. — Fig. 6

Tetracera assa var. *hnreiri* Fin. & Gagnep. *in* Bull. Soc. hot. Fi\, Mem. 4: 3. 1906.

Tetracera sarmentosa var. *loitreiri* (Fin. & Gagnep.) Fin. & Gagnep. *in* PI. gen. Ind.-Ch. 1: 16. 1907; Craib in Aherd. Univ, Studies 57: 4. 1912.

Tetracera fragrana Ridl. *m* J. Str. Br. R. A. S. 59: 62. 1911; Fl. Mai. Pen. I : 6. 1922; lion Wildem. & Dur. 1899.

Tetracera loureir! (Fin. & Gagnep.) Pierre M Craib in Kew Bull. 1922: 1(55; Craib, Fl. siam. En. 1: 20. 1925; Gagnep. *in* Fl. gen. Ind.-Ch., Suppl. 1: 28. 1938; Hoogl. in Fl. mal. I 4; 147. 1951.

Tetracera kampotensifi Gagnep. *in* Not. ayst. 6: 40. 1987; *in* Fl. gen. Ind.-Ch., Suppl. 1: 18/..?.* 1938.

TYPES.—*Tetracera assa* var. *hnreiri:* Zimmermann 74, Bangkok, Siam, 1899; lectotype in P, isotypes in BM, BO, BR, G, K, L, U. — *Tetracera fragravs:* Ridley 15183, Chupcng, Perlis; leetotype in SING, isotype in K. — *Tetracera kampotensis:* Chevalier 31763, Kampot, Cambodia, March 18—19, 1914 (collector: Fleury); holotype in P.

Woody vine with flexuous branches; branches sparsely strigose, glabrescent, sometimes slightly scabrid. Leaves elliptic to oblong, (1.5—)6—10(—13) x (1_)3_5(_7) cm, with (3—)8—12(—15) nerves on either side; apex rounded to obtuse; base obtuse to acute; margin entire to distinctly dentate; nerves slightly curving upward, ending in margin or in apex of teeth; leaves above glossy, glabrous except the sparsely strigose

basal *Vs* of the midrib, beneath dull, glabrous on intervenium, glabrous to sparsely strigose on nerves, sparsely strigose on midrib, without or with only inconspicuous hairy domatia, on both sides smooth or only slightly scabrid, with many small circular spots; petiole (4—)7—10mm, glabrous to sparsely strigose above, sparsely strigose beneath. Inflorescences terminal, 10—20 x 5—10 cm, about 40—80-flowered, often with 1—2(—4) leaves in basal part; branches sparsely strigose, extreme ones most densely so; bracts lanceolate, 4—10 x 1—3 mm, acute at apex, attached with broad base, glabrous above, sparsely strigose on midrib beneath, sparsely ciliate at margin. Flowers 8—11mm across; pedicel 3—7mm. sparsely strigose, without or with 1—3 bracteoles; bracteoles lanceolate, 2—3 X 0.5—1 mm, glabrous, ciliate at margin. Sepals 5, 2 outermost ones 4—5 x 3—3.6 mm, 3 innermost ones 6—7 x 4—5 mm, glabrous, slightly scabrid outside, glabrous, smooth inside, ciliate at margin. Petals 3, 5 x 2.5 mm, white or pink. Stamens about 150, 4—5 mm long, the theeae distinctly separated to nearly touching each other at apex; connective only slightly emarginate between theeae. Carpels (2—)3, glabrous, 1.5 X 1 mm with 2.5 mm long style, each with about 8—16 ovules. Fruits with 1—3 capsules developed in each flower; capsules ovoid, 7—8 x 5—6 mm," acute with 2 mm long beak, glabrous, glossy, 1—2-seeded. Seeds globular, 2—3 mm in diameter, glossy dark brown; aril asymmetric, on one side 5—6, on other 2—3 mm long, laciniate to1/8—1/4 of its length.

FIG. 6. *Tetracera loureiri* (Fin. & Gagnep.) Pierre ex Craib.

DISTRIBUTION.—Around the Gulf of Siam, on the west coast of the Malay Peninsula from Kedah to Setul, on the east coast from Singora northward, in Indo-China on the east coast north to Bleu Hoa Province.

ECOLOGY.—Climber in open forests, scrubs, and hedges, from sea-level up to 400 m altitude.

VERNACULAR NAMES.—S i a m: baw rakhon (Koh Chang), lin rat (Lam Nang Eong), rot sukon (Singora), tana kim (Chantaburi), thao kapot bai suam, thao harakon, thao orakon (Prachuap), yan pot (Nakawn Sritamarat). I n d o - C h i n a: bay giay omen, giay chien (Annamese: Bien Hoa), chait betao (Moi: Bien Hoa), dak kuon *(fide* Gagnepain), day chien (Cochinchina), giey no nuoc hon (Cambodia).

The species is not closely related to *T. korthalsii* Miq., as might be suggested by its position in the key. In addition to the character given in the key, the species differ in the following characters: *T. loureiri* has generally narrower and thicker leaves, it has often in a number of flowers only two carpels, it has small circular spots on both sides of the leaves,

which are not found in *T. korthalsii*, the thecae are much less separated at the apex in *T. loureiri* than in *T. korthalsii*. The latter is related to *T. fagifolia*, Bl., whereas there are no species closely related to *T. loureiri*.

10. TETRACERA DAEMELIANA F. Muell.

Tetracera daemeliana F. Muell., Fragm. 5: 191. 1865; F. M. Bail., Synops. Queensl. Fl. S. 188S; Queensl. Fl. 1: 10. 1899; Compr. Cat. Queensl. PI. 18. 1909; White *in* Contr. Arn. Arb. 4: 71. 193.3.

TYPE.—Daemel *s.n.,* Cape York, October; holotype.in MEL, isotype in BRI.

Large woody vines, much branching; branches glabrous, smooth. Leaves subcoriaceous, oblong to narrowly obovate, (6—)14—20(—23) x (2.5—)5—7(—8) cm, with (8—)10—14 nerves on either side; apex acute to obtuse; base acute; margin entire; nerves curving upward, each anastomosing with the next one through a secondary nerve; leaves more or less shining, glabrous above, dull, glabrous beneath, smooth on both sides; petiole 6—20 mm, winged, 2—4 mm broad, glabrous. Inflorescences terminal, up to 20 x 10 cm, up to 200-flowered, often with 1—2 small leaves in basal part; branches, particularly extreme ones, sparsely strigose; bracts ovate, 2.5 X 1.5 mm, broadly acute at apex, attached by broad, rounded base, glabrous above, strigose beneath. Flowers 12—15 mm across; pedicel 2—3 mm, sparsely strigose, without or with 1—3 minute bracteoles. Sepals 5—6, 1—2 outermost ones 4—5 x 3—4 mm, inner ones about 6 X 4.5 mm, very sparsely strigose to glabrous, slightly scabrid outside, sparsely to rather densely short-sericeous, smooth inside, ciliate at margin. Petals 3, 6—7 x 3.5—4 mm, rather thick, greenish white or cream-coloured. Stamens about 110—150, 5—6 mm long, the thecae manifestly separated at apex; connective slightly emarginate between thecae. Carpels 3, glabrous except for some 0.2 mm long stiff hairs on the back, each carpel 1.5 x 1.5mm; style 2"mm long; ovules about 10. Fruits with 2—3 capsules developed in each flower; capsules ovoid, 1 0 x 6 mm, acute with 1 mm long beak, glabrous, dull, 1-seeded. Seeds ovoid, 4 x 3 mm, glossy black; aril unknown to me.

DISTRIBUTION.—Queensland (Cape York Peninsula: Etty Bay, Johnstone River, Daintree River, Barron River).

ECOLOGY.—Climber in rainforests and scrub, at low altitudes; collected in flower in October, November, and December, in fruit in March.

11. TETRACERA EURYANDRA Vahl

Euryandra aeandem Forst., Char. Gen. 41 *pi. J,l".* 1776.

Tetracera em-yandra. Vahl, Symb. bot. 3: 71. 1794; DC, Syst. 1: 402. 1818; Deless., Ic. sel. PI. 1: *pi. 70*.* 1821; Lam., Illustr. 3: *pi. i83*.* 1823; DC, Prod. 1; 68. 1824; Labill., Sert. austr.-caled. 55 *pi. 55".* 1825; Montrous. *in* Mem. Acad. Lyon 10: 175. 1860; Fin. & Gagnep. m Bull. Soc. bot. Fr., Mem. 4; 2. 1906, p.p.; *in* Fl. gen. Ind.-Ch. 1: 13. 1907; Guill. *in* Ann. Mus. col. Marseille II 9: 93. 1911; *in* Bull. Soc. bot. Fr. 67: 47. 1920.

Tetracera billardieri Martelli in Becc, Malesia 3: 152. 1886.

Tetraeera seandens (Foist.) Gilg & Werderm. *in* Engl. & Prantl, Nat. PflFam., 2nd Ed., 21: 18. 1925; DSnik. *in* Vierteljahrsschr. naturf. Ges. Zürich 78: 206. 1933; Guill., Fl. Nouv.-Cal. 213. 1948; won (L.) Merr. 1917.

TYPES:—*Ewryandra, seandens, Tetraeera euryandra:* Forster 137, 228, New Caledonia; lectotype in BM, isotypes in BM, S. — *Tetraeera billardieri:* De la Billardière *s.n.,* New Caledonia; lectotype in G.

Woody vine, much branching; branches strigose with 0.5 mm long hairs, glabrescent. Leaves oval to elliptic, (3.5—)6—10(—15) x (2—)3—5(—7) cm, with (6—)8—10(—12) nerves on either side; apex rounded, sometimes slightly emarginate, to obtuse, often mucronate; base rounded to obtuse; margin entire; nerves curving upward, each anastomosing with the next one through a secondary nerve; leaves glossy, glabrous above, slightly glossy, glabrous on intervenium, glabrous to sparsely strigose on midrib and nerves beneath, smooth on both sides; petiole 10—20 mm, slightly winged, about 1.5 mm broad, glabrous above, sparsely strigose beneath, ciliate at margin, mainly in lower part. Inflorescences terminal, 5—15 X 3—9 cm, 20—125-flowered, sometimes with 1(—2) small leaves in basal part; branches strigose with 0.5mm long hairs; bracts caducous, oblong, 6—10 X 2—4 mm, obtuse at apex, attached by broad, rounded base, sparsely strigose above, strigose beneath. Flowers 15—20 mm across; pedicel 1—3 mm, strigose, without or with 1—3 bracteoles; bracteoles oblong, 2—4 x 1—2 mm. Sepals 5—6, 2 outermost ones about 5 x 4 mm, inner ones about 1 0 x 8 mm, sparsely strigose, smooth outside, sparsely sericeous with 0.2—0.3 mm long hairs inside, ciliate at margin. Petals *S,* 9 X 5 mm, white. Stamens about 250, 4—6 mm long, the thecae on outer side of broadened connective, extrorse, nearly touching each other on outer side, distinctly separated on inner side, manifestly separated at apex. Carpels 2—3, glabrous, 2 x 1,5 mm with 4 mm long style, ovules about 10. Fruits with 2—3 capsules developed in each flower; capsules ovoid, 10—12 x 8—10 mm, acute with 1—2 mm long beak, glabrous, shining, 1—4-seeded. Seeds ovoid, flattened, 4 x 3.5 mm, 2.5 mm thick, slightly glossy, black; aril 6—10 mm long, fimbriated to "/IO of its length.

DISTRIBUTION.—New Caledonia, all over the island.

ECOLOGY.—On plains, in open forests, on edge of forests, and in riverside-scrub; from low altitude up to 700 m; collected in flower in October to January, in fruit in October to April.

There is one collection from Indo-China in the Paris herbarium (Spire 74, from Laos) which does not seem very reliable. The species was included in the "Flore générale de l'Indo-Chine" on account of this specimen. I think the record should be neglected, as from a geographical point of view the occurence in Indo-China is improbable and an interchange of labels may be possible.

12. TETRACERA KORTHALSII Miq. — Fig. 7

Tetraeera korthalsii Miq. *in* Ann. Mus. bot. Lugd. Bat. 4: 75. 1868; Merr., .BibI, En. Born. PI. 381. 1921; Hoori. *in* Fl. mal. I 4: 147. 1951.

Tetracera subrottmda Elm. *in* Leafl. Philip. Bot. 5: 1771. 1913; Mere., En. Philip, fl. PI. 3: 59. 1923; Elm. ex. Prain, Ind. kew. Suppl. 5: 257. 1921 *C suhrotundata",* error for the preceding).

Tetracera clmeri Meir. in Univ. Calif. Publ. Bot. 15: 104. 1929.

TYPES:—*Tetracera korthalsii:* Korthals *s.n.,* Tewe River, Borneo: lectotype in L. — *Tetracera siibrotundu:* Elmer 13048, Puerta Prineesa, Palawan, April 1911; lectotype (isotype) in L, isotypes in A, BM, BO, CAL,, E, PI, G, GH, K, MO, K U, US. — *Tetracera clmeri:* Elmer 2137G, Tawao, British North Borneo, October 1922—March 1923; holotype in UC, isotypes in A, BM, BO, C, G, GH, K, L, MO, NY, P. SING, U.

Large climbers or creepers, much-branching; branches scabrid, striguse to hirsute with 1 mm long hairs, sometimes also small tufts of 0.2—0.4 mm long hairs, glabrescent. Leaves oval to elliptic-oblong or obovate, (3.5—) 6.5—17(—22) X (2.3—)4—8(—13) cm, with (6—)10—16(—20) nerves on either side; apex rounded to acute, sometimes slightly acuminate; base rounded to acute; margin slightly dentate; nerves slightly curving upward, ending in apex of teeth; leaves above hirsute to sparsely strigose to glabrous on intervenium, glabrous on nerves, glabrous on upper part of midrib, short-hirsute to glabrous on basal part, beneath sparsely hirsute to glabrous on intervenium, hirsute to strigose on nerves and midrib, on both sides smooth to slightly scabrid; petiole (5—)8—20(—SO) mm, slightly winged, short-hirsute to glabrous above, hirsute to strigose beneath. Inflorescences terminal, 10—30(—100) X 6—20 cm, 40—200- and more-flowered, often with 1—2 small leaves in basal part; branches densely to slightly hirsute to strigose with solitary, 1 mm long hairs and small fascicles of 0.2—0.4mm long hairs; bracts caducous, lanceolate, 3—5 x 1—2 mm, acute at apex, attached by broad base, glabrous above, strigose to hirsute beneath. Flowers about 10mm across; pedicel 1.5—2.5mm, as to indument like extreme branches of inflorescences, without or with 1—2 bracteoles; bracteoles caducous, lanceolate, 1.5 x 0.5 mm. Sepals 5{—6), 2 outermost ones 4 x 3 mm, 3(—4) inner ones 5—5.5 x 4—5 mm, glabrous or sparsely strigose-hirsute with small fascicles of short hairs on central part, scabrid outside, glabrous inside, not ciliate at margin. Petals about 5 x 3.5 mm. Stamens about 125, 3.5—4 mm long, with thecae strongly separated at apex. Carpels 3, glabrous or covered by minute scales, ovoid. 1.3 X 1 mm with 1—2 mm long style, with about 9 ovules. Fruits with 1—3 capsules, developed in each flower; capsules ovoid, 7 x 4 mm, acute with 1—2 mm long beak, glabrous, glossy, 1-seeded. Seeds ovoid. 4.5 x 3.5 mm, glossy black; aril mainly one-sided, 2.5—5 mm long, fimbriate with broad lobes to 1/3—1/2 of its length.

Var. KORTHALSII.

Tetracera korthalsii var. *korthalsii;* Hoogl. in Fl. mal. I 4: 147. 1951.

Leaves elliptic-oblong or obovate, (3.5—) 6.5—17(—20) x (2.3—) 4—8(—16) cm; apex acute or slightly acuminate; base acute; petiole (5—) g—20(—30) mm.

Var. SUBROTUNDA (Elm.) Hoogl.

Tetracera korthalsii var. subrotunda (Elm.) HOOKI. in Fl. mal. I 4: 147. 1951. *Tetracera aubrotunda* Elm. — *Tetracera elmeri* Merr.

Leaves broadly oval to nearly circular, (6.5—)8.5—22 x (4—)5.5—13 cm; apex and base rounded; petiole 12—30 mm.

DISTRIBUTION.—Variefj *korthalsii* in Borneo (eastern half), Celebes, and Moluccas (Taliabu Island); variety *subrotunda* in British North Borneo and Palawan.

ECOLOGY.—Climber in forests at low altitudes, up to 700 m.

VERNACULAR NAMES.—Empelas (Malay, Sandakan), Pampad (Dusun, Sandakan).

USES.—The leaves are used for polishing wood.

The differences between the two varieties are found in the shape and, to a lesser degree, in the size of the leaves. *Tetraceru elmeri* Merr. represents a hirsute form.

FIG. 7. *Tetracera korthatiii* Miq.: var. *korthalsii* ( ), var. *subrotunda* (Elm.) Hoogl. (X).

The species is closely related to and much resembles *T. fagifolia* BL, differing- from the latter by the absence of the sericeous indument on the inner side of the sepals.

13. TETRACERA MACROPHYLLA Wall, ex Hook. 1 & Thorns.— Fig. 8

Tetracera macrocarpa Wall., Cat. no. 6628, 182S, nomen nudum.

Tetracera macrophylla Wall, *ex* Hook. f. & Thorns., Fl. ind. 1: 63. 1855; Miq., PI. **Ind.** bat. 1 (2): 8. 1859; Hook. f. & Thorns, in Fl. Br. Ind. 1: 32. 1872; King in J. As. Soc. Beng. 58 (2): 363. 1889; Gamble, Man. Ind. Timb., 2nd Ed., 3. 1902; Ridl., Fl. Mal. Pen. 1: 4. 1922; Hoogl. *in* Fl. mal. I 4: 147. 1951.

Tetracera scaberrima Miq., Fl. Ind. bat. 1 (2) : 9. 1859; in Ann. Mus. bot. Lugd. Bat. 4: 75. 1868; Merr., Eibl. En. Born. PI. 382. 1921.

Tetracera teysmannii Mai-telli *in* Becc, filalesia 3: 150. 1886.

Tetracera radnla Martelli *in* Becc, Malesia 3: 153. 1886; Merr., Bibl. En. Born. PI. 382. 1921; non Martius 1863.

Tetracera grandis King in J. As. Soc. Beng. 58 (2) : 363. 1889; i« Ann. roy. bot. Card. Calc. 5: 115 *pi. 119.** 1896; Eidl., Fl. Mal. Pen. 1: 4. 1922.

Tetracera havilavdii Ridl. *in* Kew Bull. **1912:** 381; Merr., Bibl. En Born PI 381. 1921.

Tetracera scabricaulis Ridl. *in* Kew Bull. 1912: 381; Merr., Bibl En Born PI. 382. 1921.

TYPES.—*Tctracera- macrophylta*: Wallieh 6628, Singapore, 1822; lectotype in K, isotypes in BM, CAL, CGE, G. — *Tetracera scaberrima:* Teysmann 452HB, Lubukalung, Sumatra West Coast; holotype in U, isotypes in BO, L. — *Telracera Uysmannii:* Beccari s.n, cultivated in the Botanie Garden, Bogor (Buitenzorg), from Banka; holotype in FI. — *Tetracera radula:* Beccari Piante Bornensi 3448, Sungei Kantu, Pontianak, May 1867; holotype in FI. — *Tetraceta grandis:* Seortechini *g.n.*, Perak; holotype in CAL, isotypes in BM, FI, K, SING, UC. —tetra*cera havilandii:* Haviland 1811, near Kuching, Sarawak, October 28, 1892; holotype in K. — *Tetracera scabricaulis:* Creagh s.n,, Sandakan, British North Borneo, April 20, 1895; holotype in K.

Woody vine, up to 10 m long, or tree(?), with winding or straight branches; branches strongly scabrid to smooth, densely hirsute with 1—1.5 mm long single hairs and stellate groups of about 0.3 mm long hairs, glabrescent. Leaves elliptic to oblong, (5—)8—15(—30) X (3—)5—10(—17) cm, with 8—12(—17) nerves on either side; apex and base rounded to obtuse; margin slightly emarginate at end of nerves, entire or slightly dentate with nerves ending in apex of teeth; nerves slightly curving upward, ending mucronately; upper surface of leaves often slightly glossy, the intervenium rather densely hirsute with single, 1—2 mm long hairs and, at extreme basal part only, few stellate groups of 0.3 mm long hairs to nearly glabrous, midrib densely to slightly hirsute with both kinds of hairs, under surface densely hirsute with both kinds of hairs to nearly glabrous, margin ciliate with 1—2 mm long single hairs only near base, very scabrid to smooth on both sides; petiole 15—30 mm, winged, 2—4 mm, in leaves in base of inflorescences 5—8 mm, broad, slightly to densely (most densely beneath) hirsute with both kinds of hairs, with single longer hairs mainly along edge. Inflorescences terminal, 10—40 X 4—15 cm, (20—) 50—125(—200)-flowered, often with 1—4 small leaves in basal part; branches more or less densely velvety-hirsute like younger sterile branches; bracts oblong, 5—10(—20) x 2—4(—8) mm, acute at apex, attached by a broad base, densely hirsute with single hairs above, with single and stellate groups of hairs beneath, ciliate at margin. Flowers 2—2.5 cm across; pedicel 4—20 mm, densely hirsute like extreme branches of inflorescences, without or with 1—3 bracteoles; bracteoles oblong, 2—4 x 1—2 mm, acute at apex, attached by a broad base, as to indument like bracts. Sepals 5—6, 2 outermost ones 8—9 x 7—8 mm in flower, 9—12 x 6—8 mm in fruit, inner ones 11—12 x 8—9 mm in flower, 12—15 x 7—9 mm in fruit, all more or less densely velvety, scabrid outside, 2 outermost ones glabrous, inner ones sericeous except 1—2 mm broad margin, smooth inside, all ciliate at margin, greenish, turning to red in fruit. Petals 3, 8—11 x 5—7 mm, rather thick, not emarginate at apex, attached by rounded, 1—1.5 mm broad base. Stamens about 375, 4—7 mm long, the thecae distinctly separated at apex, connective strongly emarginate between thecae. Carpels 3—4, glabrous except few strigose hairs on back, 2 X 1.5 mm with 4 mm long style, with about 14 ovules. Fruits with 2—3 (—4) capsules developed in each flower; capsules ovoid, 8—10 X 6—8 mm, acute with 2—3 mm long beak, glabrous, glossy brown, 1—2-seeded. Seeds ovoid, 6—7 x 4—5mm, glossy black; aril mainly one-sided, 5—9 mm long, slightly laciniate for about 1/8 of its length.

DISTRIBUTION.—Sumatra, Malay Peninsula, Banka, Borneo.

ECOLOGY,—Climber in dry aa well as in swampy forests and thickets, up to 300 m altitude. According to Ridley very common in the Malay Peninsula, but rarely in flower.

FIG. 8. *Tttmccnt macrophylla* Wall, ex Hook. f. & Thorns.

VERNACULAR NAMES.—Sumatra: akar ampaleh riembu (West Coast). Malay Peninsula: ampelas gajah (Alvins 600, without locality), ampelas lidah kuching, ampelas rimbah (Malacca), ampelas rimau *(fide* Ridley). Borneo: akar tembara (W. Kutei), ampalas (Sarawak).

USES.—The medical use is unimportant *(cf. B*urkill, 1935).

Within this species the size and shape of the leaves and their scabridness is very variable. Some specimens from the Malay Peninsula are nearly smooth, most specimens are very scabrid. Small-leaved specimens are the type specimen of *T. seabricaulis* Ridl. and Forbes 3059 from Sumatra. The type specimen of *T. havilandii* Ridl. is a short one-leaved fruiting branch with a small, rather smooth leaf, possibly only part of an infructescence.

The most typical feature of the species is the absence of an indument on the inner side of the two outermost sepals, whereas the inner sepals have a dense sericeous indument.

14. TETRACERA ARBORESCENS Jack. — Fig. 9

retracera *arborescens* Jack hi Mai. Misc. 1 (5) : 45. 1820; DC, Prod. 1: 69. 1824; Miq., Fl. Ind. bat. 1 (2) : 9. 1859; Gage & Boik. *in* J. Str. Br. R. A. S. 73: 242. 1916; Hoogl. *in* Fl. Mai. I 4: 148. 1951; Meir. *in* J. Arn. Arb. 33: 248. 1952.

retracera *laavigata* Miq., Fl. Ind. bat. 1 (2): 8. 1859; *in* Ann. Mus. hot. Lugd. Bat. 4: 74. 1868; Men-., Bibl. En. Born. PI. 382. 1921.

Tetracera subcordata Boerl., Cat. Hort. bot. bogor, 3. 1899.

Tetracera lucidu Wall., Cat. no. G631. 1828, nomen nudum; e,c Ridl., Fl. Mai. Pen. 1: B. 1922.

Tetracera lucida var. *lanugmosa* Ridl., Fl. Mai. Pen. 1: 5. 1922.

Tetracera euryandra Auct. *(non* Vahl); Hook. f. & Thorns., Fl. Ind. 1: 63. 1855; Miq., PL Ind. bat. 1 (2): 8. 1859; in Ann. Mus. bot. Lugd. Bat. 4: 75. 1868; Hook, f. & Thorns. « Fl. Br. Ind. 1: 32. 1872; King *in* J. As. Soc. Beng. 58 (2) : 362. 1889; Fin. & Gagnep. *in* Bull. Soe. bot. Fr., Mem. 4: 2. 1906, p.p.; Back., Sehoolfl. Java 9. 1911.

TYPES:—*Tetracera arboresceiis:* Jack *x.n.,* Tapanuli, W Sumatra. 1829 (?); holotype in L. — *Tetracera Uievigata:* Teysmann 457HB, Sibogu, Sumatra West Coast; holotype in U, isotypes in BO, CAL, PI, L, MEL. — *Tetracera subcordatn:* Boerlage *s.n.,* cultivated in Hortus Bogoriensis no. XI. A. 74, May 17, 1890; holotype in BO, isotypes in CAL, K, L. — *Tetracera lucida:* Wallich 6631, Singapore, September 1822; lectotype in K, isotypes in CAL, CGE. — *Tetracera lucida* var. *lanuginosa:* Kunstler 5579, Larut, Perak, February 1884; holotype in SING, isotypes in CAL, K.

Strong, woody climbers, up to 8 m long, or shrubs, or (?) small trees, much-branching; branches villose to densely villose-floccose with rusty brown tomentum, glabrescent. Leaves subcoriaceous, obovate to elliptic-oblong, those below inflorescences distinctly smaller [(2—)3—4(—6) x (1—)2—3(—4) cm] than those lower at branches [(4—)6—10(—15) x (2—)3—5(—8) cm], all with (4—)5—6(—8) nerves on either side; apex rounded or obtuse to acute or acuminate; base obtuse to acute; margin entire; nerves curving upward, ending 0.5—1 mm from margin; leaves above bright green, often slightly glossy, short-strigose to glabrous on basal part of midrib, further on villose-floccose to glabrous, glabrescent, beneath slightly to densely villose-floccose, glabrescent on intervenium, strigose to glabrous on midrib and nerves beneath, smooth on both sides; petiole 3—5(—8) mm, villous-floccose, glabrescent, short-strigose to glabrous on central part above, strigose beneath. Inflorescences terminal, up to 15 x 6 cm, (6—)10—15-flowered, usually with some (1—7) small leaves in the basal part to high up in the panicle; branches villous-floccose, glabrescent, or hirsute, extreme ones most densely so; bracts caducous, lanceolate, 3—6 X 1—2 mm, .acute at apex, attached by broad base. Flowers about 15mm across; pedicel (2—)4—10mm, villous-floccose, glabrescent, without braeteoles. Sepals 5—6, about 5 x 3 mm in flower, 7 x 3 mm in fruit, reddish yellow, outside sparsely to densely villous-hirsute, mainly in central part, glabrescent in fruiting state, slightly scabrid, inside densely sericeous except 0.5—1 mm broad glabrous margin, densely ciliate at margin. Petals 3, 5 X 4 mm, white. Stamens about 110—150, 4—5 mm long, the thecae slightly to manifestly separated at apex. Carpels 3, glabrous to hirsute or villous, 1.25 x 0.75 mm; style 0.5—3 mm long; ovules about 10—12. Fruits with 2—3 capsules developed in each flower; capsules ovoid, 7 x 4 mm, acute with 2—3 mm long beak, glabrous or, rarely, villose-floccose, glossy, 1-seeded. Seeds ovoid, 2—3 X 1—2 mm, glossy black; aril 3—5 mm long, laciniate with broad lobes to about 1/2 of its length.

DISTRIBUTION.—Sumatra (Tapanuli, East Coast), Malay Peninsula, Banka, Billiton, Borneo, and ?Java (Korthals: Papandajan).

ECOLOGY.—In swampy forests, riverside shrubs, open jungle, and on borders of woods, only at low elevations. Probably rarely in flower.

VERNACULAR NAMES.—Sumatra: andor ruhas igung (Tapanuli), mohi-mohi (Sibolga). Malay Peninsula: akar mamplas paya (Malacca). Banks: akar tamplas (tempelas). Billiton: akar memplas.

The type specimen of Jack has a label *"Tetracera arborescens* WJ. Tappanooly," probably in Jack's handwriting, and "Legit Jack Sumatra Occident. 1829" in Hasskarl's handwriting. The original description is insufficient for specific distinction and the binomial has never been interpreted before.

FIG. 9. *Tetracera urborescens* Jack.

The species is most closely related to *T. fagifolia* Bl., but differs mainly in the shape and size of the leaves, in the venation, and in the indument of the younger parts. The venation in *T. arborescens* is reticulate, in *T. fagifolia* parallel, at about right angles to the nerves, but as to this character intermediates are sometimes found.

The hairy-fruited form has on the carpels and capsules an indument which agrees with the indument on the younger vegetative parts. In these specimens the indument is generally denser than in the specimens with glabrous carpels. The hairs are distinctly thinner than in those species, where the carpels are constantly hairy {*T. scandens* (L.) Merr., *T. lanuginosa* Diels, and *T. nordtiana* F. Muell.].

15. TBTEACERA FAGIFOLIA Bl. — Fig. 10

Tetracera fagifoliu Bl., Bijdr. 1: 4. 1825; Miq., PI. Ind. bat. 1 (2): 9. 1859; in **Ann.** Mus. hot. Lugd. Bat. 4: 75. 1808; Ridl. *in* J. Str. Br. R. A. S. 54: 10. 1909; PI. Mai. Pen. 1: 6. 1922; Hood, *in* Fl. mal. 14: 148 /. *2."* 1961.

Tetracera rigida Bl., Bijdr. 1: 4. 1825; Jliq., Fl. **Ind.** bat. 1 (2) : 9. 1859; Back., SchooHl. **Java** 9. 1811; Bekn. Fl. Java (Nooduit$_{E.}$) 4 (Fam. 80) : 2. 1942.

Tetracera blumei Walp., Rep. 1: 67. 1842.

Tetracera sumatrana Miq., Fl. Ind. bat. Suppl. 1 : 618, 619. 1861; Ridl., Fl. Mal. Pen. 1: 6. 1922, p.p.

Tetracera fapifolia f. *submtegeryima* Miq. *hi* Ann. Mus. bot. Lup:d. Bat. 4: 75. 1868.

Tetracera borneensis **Miq.** *in* **Ann.** Mus. bot. Lugd. **Bat.** 4: 76. **1868; Merr., Bifal.** En. Born. PI. 381. 1921.

Tetracera obovata Boerl., Cat. Hort. bot. bogor. 3. 1899.

Tetraccra philippinensis Merr. *in* Philip. J. Sci., Eot. 9: 375. 3 014; En. Philip, fl. PI. 3: 58. 1923.

Tetratiera obliquinervia Elm. in Leafl. Philip. Bot. 7: 2621. 1915.

TYPES:—*Tetracera jagifolia, Tetracera blamei:* Blume *s.n.*, Bantam, Java; holotype in L. — *Tetracera rigida, Tetracera fagifolia i. wibintegerrima* (lectotypc) : Blume 1734, Java; lectotype in L. — *Tetraccra suwatrana:* Teysmann 4454HB, Natar, Lampung, Sumatra, December 29, 1857; holotype in U, isotypes in BO, CAL, L. — *Tetracera borneensis:* Korthals s.»-., Pulu Lanipei, Borneo; holotype in L, isotypc in U. — *Tetracera, pkilippineims:* Wenzel 812, Leyte, June 2, 1914; isotypes in A, BM, G, MO, US. — *Tetracera obliquinervia:* Elmer 13862, Cabadbaran, Agusan Province, Mindanao, September 1912; isotypes in A, BM, BO, CAL, E, FI, G, GH, K, MO, NY, U.

Scandent shrubs, up to 14 m high, much-branching; branches sparsely strigose, glabrescent, slightly scabrid. Leaves elliptic to lanceolate, (2.4—)6—20(—30) X (1.9—)3—1C(—13) cm, with (6—) 10—16(—23) nerves on either side; apex rounded to acute, sometimes slightly acuminate; base rounded to acute, sometimes asymmetric; margin entire to slightly dentate; nerves curving upward, either ending in margin or following margin closely until next nerve, anastomosing with the latter either directly or through major venation; leaves above rather dark green, shining to dull, smooth to very slightly scabrid, very sparsely hirsute to glabrous on intervenium, densely short-hirsute to glabrous on nerves and midrib', beneath bright green, dull, smooth, sparsely hirsute to glabrous on intervenium, strigose to very sparsely so on nerves and midrib; petiole 7—20(—30) mm, winged, 2—4 mm broad, densely hirsute, mainly on central part, to glabrous above, more or less strigose beneath, ciliate at margin. Inflorescences terminal, often on rather short axillary few-leaved branches, 15—40 x 8—25 cm, 40—250-flowered, often with 1(—3) small leaves in basal part; branches scabrid, densely to slightly hirsute with small tufts of stellate groups of 0.2—0.4 mm long hairs, in larger inflorescences only on extreme branches, basal branches of larger inflorescences slightly strigose with single 1 mm long hairs; bracts caducous, lanceolate, 3—7 X 1—2 mm, acute at apex, attached by broad base. Flowers 8—12 mm across; pedicel 1—5 mm long, hairy like extreme branches of inflorescences. Sepals 5(—6), 2 outermost ones 4 x 4 mm, 3(—4) inner ones 5.5—7 x 4.5—5.5 mm, hirsute with hairs solitary to arranged in small groups to glabrous, scabrid outside, inside sparsely to densely sericeous for basal part extending to 1/4—1/2 of length and 1/4.—1/2 of breadth on outermost one, for 1/3 to nearly whole sepal on innermost one, with gradually increasing sericeous surface between. Petals 3, 6 x 4 mm, white. Stamens about 80, 4.5—6 mm long, white, the thecae distinctly separated at apex, connective slightly emarginate between thecae. Carpels 3, ovoid, 2 X 1.5 mm, acute at apex, tapering into 1—3 mm long style, with about 10 ovules. Fruits ovoid, 5—8 x 4—6 mm, tapering into 1—3 mm long beak, with 2—3 capsules developed in each flower; capsules ovoid, 5—8 x 4—6 mm, tapering into 1—3 mm long beak, glabrous, glossy, 1(—2)-seeded. Seeds ovoid, 5 X 3 mm; aril one-sided, up to 7 mm longj divided to 1/4— 1/2 of its length with broad lobes.

Var. PAGIFOLIA.

Tctracem fagifolia var. *fagifolia;* Hoogl. *in* Fl. mal. I *i:* 148 f.2.* 1951.
Tetracera fagifolia Bl. — *Tetracera rigida* Bl. — *Tetracera blumei* Walp. — Tetracera sumatrana Miq. — *Tetracera fagifoUa* f. *subintege-rrima* Miq. — Tetracera *obovata Boerl.* — *Tetracera philippineusis* Merr. — *Tetraccra obliqllincrvia* Elm.

Leaves elliptic to oblong, length about 1.4—2.25 x breadth, (4—) 7_20(—30) x (2.3—)5—10(—13) cm, with (7—) 12—16(—23) nerves on either side; margin entire to slightly dentate; nerves curving upward, ending in margin,

Var. BORNEENSIS (Miq.) Hoogl.

Tetracera fagifolia var. *borneensis* (Miq.) Hoogl. *in* Fl. mal. I 4: 148. 1951.
Tetracera bomee-nsis Miq.

Leaves elliptic to lanceolate, length about 1.4—3.5 x breadth, (2.4—) 6—13(—18) X (1.9—)2.7—5.5(—6.5) cm, with (6—) 8—10(—14) nerves on either side; margin entire; each nerve following the margin closely until it meets the next one, anastomosing with the latter either directly or through major venation.

FIG. 10. *Tetracera fagifoUa* Bl.: var. *fagifoUa* (9), var. *borneensis* (Miq.) Hoogl. (+).

DISTRIBUTION.—Variety *fagifoUa* in Sumatra (also Simalur and Siberut), Malay Peninsula (Johore only), West Java, Borneo, and Philippines; variety *borneensis* in Sumatra, Malay Peninsula (Singapore only), Banka, Borneo, and Celebes. Variety *fagifoUa* is the most common form in Sumatra, variety *horneensis* in Borneo.

ECOLOGY.—Climber in primary forest, scrub, or bamboo forest, variety *fagifolia* only known from primary forest, 100—750 m altitude, variety *bomeensis* on Mt. Kinabalu up to about 1300 m, but from here known sterile only.

VERNACULAR NAMES.—Sumatra: alor ampaleh (Simalur), ampalu riembu (Lampung), sapbet (Siberut). Java: aroy (ki) assahan, kiassahan, ki saun-(Sundanese). Philippines: balau-balau (Mbo). All these vernacular names have been noted with specimens belonging to variety *fagifolia*.

The two varieties show a marked difference in general appearance. Generally specimens can be easily located, but there is a relatively small number of intermediate specimens.

Doubtful species

TETRACERA TRIPETALA Turcz.

Tetracera tripetala, Turcz. *in* Bull. Sec. Nat. Mosc. 36 (1): 547. 1863.

This species was described from a specimen collected by Horsfield in Java. It is impossible to identify the species from the description; most probably it is identical with *Tetracera fagifolia* El., of which species a specimen collected by Horsfield in Java is present in the Calcutta herbarium.

Excluded and invalidly published names

Actaea aspera Lour. (Fl. cochinch. 332. 1790) is considered a synonym of *Tetracera scandens* (L.) Merr. by Merrill (A commentary on Loureiro's "Flora Cochinchinensis" *in* Trans. Am. phil. Soc. N.S. 24: 264. 1935). It is excluded here: see this paper under *T. asiatica* (Lour.) Hoogl.

Calligonum asperum Lour. (Fl. cochinch. 342. 1790) likewise cited by Merrill *(1.* c.) as a synonym of *Tetracera scandens* (L.) Merr., is also excluded here: see this paper under *T. asiatica* (Lour.) Hoogl.

Tetracera aspera (Lour.) Eaeusch. (Nomencl., 3rd Ed., 147. 1797) is based on *Calligonum asperum* Lour. (1790; see above) and, therefore, excluded here. The binomial, which was not included in the "Index kewensis," antedates *Tetracera aspera* (Aubl.) Willd. (Sp. PI. 2: 1241. 1799; *Tigarea aspera* Aubl., PI. Gui. fr. 2: 918. 1775) by two years. The correct name for this South American species most probably is *Tetracera tigarea* DC. (Syst. 1: 403. 1818).

Delima piripu DC. (Syst. 1: 408. 1818), based on *Piripn Rheede* (Hort. malab. 7: 101 *pi. 54-* 1688), is no Dilleniacea, but *Polygonum chinense* L. *(cf.* Hook. f. & Thorns., Fl. Br. Ind. 1: 62. 1855).

Trachytella, DC. (Syst. 1: 410. 1818) with two species:

Trachytella actaea DC. *(I.e.),* baaed on *Actaea aspera* Lour. (1790); see above.

Trachytella calligonum DC. *(I.e.),* based on *Calligonum asperum* Lour. (1790); see above.

Tetracera juncea Hort. Angl. ex Steud. (Nomencl., 2nd Ed., 2: G70. 1821), included in the "Index kewensis," was published as a nomen nudum only; as origin Australia was indicated.

Tetracera heyneana Wall. (Cat. no. 6630. 1828), included in the "Index kewensis," was published as a nomen nudum only; the specimen is an Euphorbiaceous plant.

Traxilisa Rafin. (Sylva tellur. 161. 1838), with one species:

Traxilisa aspera (Lour.) Rafin. *(op. cit.* p. 162), based on *Calligonum asperum* Lour. (1790) ; see above.

Tetracera hygrophila Kurz (For. Fl. Br. Burma 1: 22. 1877), included in the "Index Kewensis," was published as a nomen nudum only; the specimen in the Calcutta herbarium, which is sterile, probably represents *Tetracera indica* (Houtt. ex Christm. & Panz.) Merr.

Tetracera borneensis Auct. (non Miq.) ; Rolfe *(in* J. of Bot. 23: 209. 1885; Vidal, Revis. PI. Filip. 36. 1886), described after the specimen. Vidal 940 from Luzon, represents *Dillenia luzoniensis* (Vidal) Martelli ex Dur. & Jacks.

Trachytella, aspera DC. was cited by Forb. & Hemsl. *(in* J. Linn. Soc, Bot. 23: 22. 1886—8) as a synonym under *Tetracera sarmentosa* (L.) Vahl.

Tetracera corymbosa Lignier & Bey *(in* Bull. Soc. linn. Normandie V 5: 163. 1902), included in "Index kewensis," was published as a nomen nudum only; New Caledonia.

Tetracera graudiuscida F. Muell. & Tate ex Dur. & Jacks. (Ind. kew. Suppl. 1: 422. 1906, error). The binomial intended is *Teucrium grandiusculumF.* Muell. & Tate (TO Trans. Proc. roy. Soc. S. Austral. 13: 108. 1890).

INDEX

New names and the final members of new combinations are in **bold** face type.