

DILLENiaceae (R. D. Hoogland, Leyden)

Trees, shrubs, lianas or perennial herbs. *Leaves* spirally arranged, opposite in one species only (Madagascar). Blade simple or, rarely, (only in *Acrotrema*) to threefold pinnatisect. Stipules absent, but in *Acrotrema* and a number of species of *Dillenia* petiole with stipule-like, often wholly or partly caducous wings. Inflorescence cymose or racemose, sometimes reduced to a single flower, terminal or axillary. *Flowers* ♂, actinomorphic to (mainly in the androecium) zygomorphic, hypogynous, mostly yellow or white. Sepals (3-) 4-5 (-20), imbricate, persistent in fruit. Petals (2-) 3-5 (-7), caducous usually within half a day after opening of the flower, imbricate in bud, all equal, apex rounded or emarginate. Stamens ∞-3, often partly staminodial, free or partly coherent by their filaments, centrifugal. Anthercells basifix, oblong to linear, opening with an apical pore or a longitudinal slit. Carpels 1-±20, free or connate along the central axis only, with free styles. Ovules ∞-1, anatropous, apotropous, on an axile placenta. *Fruit* dehiscent or indehiscent, in the latter case permanently enclosed by the sepals. Seeds arillate or with a rudimentary aril, with abundant endosperm and a minute, straight embryo.

Distr. Ca 10 genera, of which one circumtropical (*Tetracera*), 3 confined to tropical S. America, one in the Old World tropics from Madagascar to the Fiji Islands (*Dillenia*), one endemic in Ceylon (*Schumacheria*), one in S. India, Ceylon, and the Malay Peninsula (*Acrotrema*, fig. 5), one endemic in Borneo (*Didesmandra*), one endemic in Australia (*Pachynema*), and one on the southern hemisphere from Madagascar to the Fiji Islands, mainly in Australia (*Hibbertia*, fig. 3). Many species are relatively limited in distribution, none is distributed throughout Malaysia.

Ecol. Most Malaysian species occur in primary or secondary evergreen forests. A few deciduous species of *Dillenia* are found in monsoon forests or in savannahs, some *Tetraceras* in open vegetation and thickets and both species of *Hibbertia* in open scrub.

In size *Hibbertia* shows the biggest development among the genera with over 100 *spp.*, next in sequence are *Dillenia* with ca 55 *spp.* and *Tetracera* with over 30 *spp.* Most representatives are found in the everwet parts of the tropics, but the ability of the family to produce drought-resistant forms is distinctly shown by various xerophilous species of *Hibbertia* and *Pachynema*, showing remarkable adaptations and reductions in foliage and habit.

As to altitudinal distribution the tropical representatives are generally confined to the tropical zone proper, i.e. below 1000 m. Exceptions are *Hibbertia scandens*, found both at low altitude in the Aru Islands and at ca 2300 m on Mt Arfak, and some species of *Dillenia*, which may occasionally be found up to 1800 m.

Notes. A more extensive treatment of *Dillenia*, including all extra-Malaysian species, will be published in Blumea vol. 7, a similar treatment of *Tetracera* for Asia, Malaysia, Australia, and the Pacific will be published in Reinwardtia vol. 1. Latin diagnoses of new taxa will be given there.

Additional species of *Hibbertia*, and possibly also of the other Australian genus *Pachynema*, can be expected to occur in favorable localities in the extreme Eastern part of Malaysia.

For a proper identification of *Dilleniaceae* it is of primary importance to have flowering material, fruits is less important. Sterile material is almost worthless.

KEY TO THE GENERA

1. Receptacle flat. Carpels completely free or loosely coherent along their adaxial side.
 2. Stamens ∞, free.
 3. Anthercells parallel, connective linear.
 4. Small perennial herbs. Petiole with amplexicaul wings 3. *Acrotrema*
 4. Small shrubs or climbers. Leaves clasping, but not completely amplexicaul 2. *Hibbertia*
 3. Anthercells diverging towards the base, connective broadened 1. *Tetracera*
 2. Androecium consisting of 2 groups, each of 1 stamen and 4 staminodes with coherent filaments 4. *Didesmandra*
1. Receptacle between the carpels conical. Carpels distinctly coherent along their adaxial side 5. *Dillenia*

1. TETRACERA

LINNÉ, Sp. Pl. (1753) 533; Gen. Pl. ed. 5 (1754) 237.—*Delima* LINNÉ, Gen. Pl. ed. 5 (1754) 231.—*Assa* HOUTT. Nat. Hist. 5 (1776) 275.—*Wahlbomia* THUNB. Vet.

Akad. Handl. Stockh. (1790) 215.—*Eleiastis* RAFIN. Sylva Tellur. (1838) 165.—*Delimopsis* MIQ. Fl. Ind. Bat. 1, 2 (1859) 9.

Shrubs, sometimes straggling, or lianas. *Leaves* simple, often scabrid on one or both sides. Petiole short, furrowed. Panicles axillary or terminal, few- to many-flowered. *Flowers* actinomorphic, fragrant. Sepals 4–5, persistent, often reflexed when in fruit. Petals 3–5, caducous, with emarginate apex, whitish or slightly reddish. Stamens ∞, with broadened connective, thereby anthercells divergent towards the base. Carpels 1–4, free, with a short style, ending in a simple stigma, with 4–20 ovules. *Capsule* coriaceous, opening with 1–2 longitudinal slits, ovoid with a short beak, one- to few-seeded. Seed glossy dark brown to black. Aril fleshy, cup-shaped, reddish or purplish, enveloping at least the base of the seed, equal- or unequal-sided with fimbriate or lacinate apical margin.

Distr. The only pantropical genus in the family, absent, however, from the Pacific area except New Caledonia. The Malaysian species are confined to the Asiatic-Australian region. There are two local endemics, viz *T. maingayi* HOOGL. in the Malay Peninsula and *T. lanuginosa* DIELS in New Guinea. The other Malaysian species have rather large areas.

Ecol. Lianas in rain-forests, on forest margins and in hedges; some species occur as shrubs in open country. Usually below 500 m alt., rarely up to 1300 m. None of the Malaysian *spp.* shows a distinct flowering-time.

Vern. The Malay name *ampalas* (*ampēlas*, *ēmpēlas*, *mēmpēlas*, *mumplas*) is in use throughout W. Malaysia for the whole genus, some species being distinguished by epithets. *Akar* = root or liana is also found in a number of combinations.

Uses. The scabrid leaves of some species are used as a substitute for sandpaper; the Malay name for sandpaper has been derived from the plantname: *mēmpēlas*. The stems can be used as cordage.

Notes. The genus *Delima* L., still kept apart by RIDLEY (Fl. Mal. Pen. 1, 1922, 3), is included here in *Tetracera*, as has been done already by VAHL (Symb. Bot. 3, 1794, 70). GILG & WERDERMANN (in ENGL. & PR. Nat. Pfl. Fam. 2nd ed., 21, 1925, 18) retain *Delima* as a section of *Tetracera*. It should be noted, however, that the differences between *Delima* and *Eutetracera* are only found in the number of carpels, being 2–6 in *Eutetracera*, 1 in *Delima*, usually however on the same plant in a number of flowers 2. Of the 4 Malaysian species, belonging to the section *Delima*, 2 show close relationships to species belonging to the section *Eutetracera*, viz *T. glaberrima* MARTELLI to *T. akara* (BURM. f.) MERR. and *T. maingayi* HOOGL. to *T. jagifolia* BL. *Delima* can be retained as a section on practical grounds only; it does not form a natural taxon.

KEY TO THE SPECIES

1. Carpels 1, in a few flowers on the same plant 2 (section *Delima*).
 2. Carpels and fruit hirsute 1. *T. scandens*
 2. Carpels and fruit glabrous or with minute scales.
 3. Inflorescence up to 5-flowered, usually axillary. Flower ca 2½ cm diam. Sepals 4 2. *T. glaberrima*
 3. Inflorescence at least 15-flowered, terminal. Flower ca 1–1½ cm diam. Sepals 5.
 4. Sepals glabrous inside 3. *T. asiatica*
 4. Sepals sericeous inside 4. *T. maingayi*
1. Carpels 2–4 (section *Eutetracera*).
 5. Carpels and fruit hairy over the whole surface.
 6. Indumentum of the carpels consisting of rather thin villose hairs, caducous. Species from W. Malaysia 12. *T. arborescens*
 6. Indumentum of the carpels consisting of rather rigid, persistent, straight hairs. Species from E. Malaysia.
 7. Hairs of the carpels ca 2 mm long. Inflorescence 2–4-flowered 5. *T. lanuginosa*
 7. Hairs of the carpels ca ½ mm long. Inflorescence 15–50-flowered 6. *T. nordtiana*
 5. Carpels and fruit glabrous or with minute scales or with few rigid hairs on the back only.
 8. Sepals 4. Inflorescence up to 12-flowered, terminal or axillary, without leaves in the basal part. Flower ca 2½–3 cm diam.
 9. Sepals glabrous inside 7. *T. indica*
 9. Sepals sericeous inside 8. *T. akara*
 8. Sepals 5–6. Inflorescence at least 15-flowered, rarely less-flowered, terminal, often with small leaves in the basal part, or axillary, but then always on a few-leaved branch. Flower ca 1–2½ cm diam.
 10. Sepals glabrous inside.
 11. Branches of the inflorescence strigose, without stellate groups of shorter hairs. 9. *T. loureiri*
 11. Branches of the inflorescence with single strigose to hirsute hairs, together with stellate groups of shorter hairs 10. *T. korthalsii*

10. Sepals, at least the 3 inner ones, sparsely to densely sericeous inside.

12. Two outer sepals glabrous inside 11. *T. macrophylla*

12. All sepals sericeous inside.

13. Younger branches villose. Leaves under the inflorescence small (ca 4 by 3 cm), obovate. 12. *T. arborescens*

13. Younger branches strigose. Leaves under the inflorescence larger, elliptic to oblong. 13. *T. fagifolia*

1. *Tetracera scandens* (L.) MERR. Int. Rumph. (1917) 365; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 2.—*Funis urens aspera* RUMPH. Herb. Amb. 5 (1747) 13, t. 9.—*Tragia scandens* L. in STICKM. Herb. Amb. (1754) 18; AMOEN. Acad. 4 (1759) 128.—*Delima sarmentosa* L. Syst. ed. 10 (1759) 1076; MIQ. Fl. Ind. Bat. 1, 2 (1859) 7; VILLAR, Nov. App. (1880) 2; RIDL. Fl. Mal. Pen. 1 (1922) 3.—*Tetracera sarmentosa* VAHL, Symb. Bot. 3 (1794) 70; ROXB. Fl. Ind. ed. CAREY 2 (1832) 645, p.p.; BLANCO, Fl. Filip. ed. 2 (1845) 320; *op. cit.* ed. 3, 2 (1878) 227; MERR. Govt Lab. Publ. Philip. 27 (1905) 15.—*Delima hebecarpa* DC. Syst. 1 (1818) 407; DELESS. Ic. Sel. Pl. 1 (1821) t. 72.—*Delima intermedia* Bl. Bijdr. 1 (1825) 4; HASSK. Pl. Jav. Rar. (1848) 176.—*Delima frangulaefolia* PRESL, Rel. Haenk. 2 (1835–6) 73; VILLAR, Nov. App. (1880) 2.—*Delima aspera* BLANCO, Fl. Filip. (1837) 429; *op. cit.* ed. 2 (1845) 299; *op. cit.* ed. 3, 2 (1878) 191, t. 190.—*Tetracera monocarpa* BLANCO, Fl. Filip. (1837) 459.—*Delima sarmentosa* var. *hebecarpa* Hk. f. & Th. Fl. Ind. 1 (1855) 61; MIQ. Fl. Ind. Bat. Suppl. 1 (1860) 618; MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 73; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 31; KING, J. As. Soc. Beng. 58, 2 (1889) 362.—*Delima sarmentosa* var. β MIQ. Fl. Ind. Bat. 1, 2 (1859) 7.—*Tetracera sarmentosa* var. *hebecarpa* MARTELLI in BECC. Malesia 3 (1886) 150; VIDAL, Rev. Pl. Vasc. Filip. (1886) 36.—*Tetracera hebecarpa* BOERL. Cat. Hort. Bog. (1899) 3; BACK. Fl. Batavia 1 (1907) 4; SCHOOLF. Java (1911) 8; KOORD. Exk. Fl. Java 2 (1912) 600.—*Tetracera volubilis* MERR. Spec. Blanc. (1918) 362, *sphalm.*, non L.—*Tetracera scandens* var. *hebecarpa* HEYNE, Nutt. Pl. (1927) 1070.—*Delima scandens* BURK. Dict. (1935) 776.

Liana (up to 30 m) or small shrub (up to 2 m). Leaves oblong to obovate, ca 6–15 by 3–7 cm, scabrid, apex and base rounded to obtuse. Petiole ca 6–12 mm. Inflorescence terminal, many-(up to ca 200)-flowered, with in the basal part 1–5 leaves, up to ca 40 by 20 cm. Flower ca 6–8 mm diam. Sepals 4, on the same plant in some (ca 5%) of the flowers 5, ca 3 by 2 mm, scabrid outside. Petals 3. Stamens 3 mm long; anthercells reaching each other at the apex. Carpels with 0.4–0.7 mm long rigid hairs; ovules ca 10. Capsule ovoid, ca 10 by 6 mm, 1(–2)-seeded. Seeds 4 by 3 mm. Aril 2–3 mm long, fimbriate for $\frac{3}{4}$ – $\frac{9}{10}$ of its length.

Distr. S. China (Yunnan), Burma, S. Siam, S. Indo-China, Andaman Islands, in *Malaysia*: throughout W. Malaysia, not E of the Philippines, Celebes and the Lesser Sunda Islands (Flores).

Ecol. Creeper or climber in thickets and secondary forests, especially on riverbanks and near the seacoast; in more open vegetation forming small shrubs. From sea-level up to 1000 m, rarely above 500 m.

Vern. Sumatra: *akar ampala* (Priaman), *a. (rēm)pēlas* (Palemb.), *baik sipi hendak* (Lamp.), *galinggin* (Asahan), *hasahan* (Lamp.), *mēmpēlas padang* (Bengkalis), *ompe* (Atjeh). Malay Peninsula: *akar mēmpēlas hari bētina*, *a. m. tikus*, *a. m. puteh*, *a. pēlah*, *ampēlas hari (bētina)*, *a. puteh*, *a. kasap*, *a. rimau*, *a. tikus*. Java: (*akar*) *mēmpēlas hari bētina*, *a. m. ojad*, *a. m. putih*, *a. m. tikus*, *kaju as(s)ahan*, *ki asahan* (Mal.); *areuj ki assahan lalaki*, *a. ki assahan*, *ki asahan*, *asahan areuj*, *kroko ojad* (Sund.); *bo*, *dēbo*, *dēmbo*, *kroko*, *ojal*, *roko*, *rokokan*, *singaran* (Jav.). Kangean: *ampēlas*. Borneo: *agupit* (Bajau), *akar ampalas*, *ampalas* (Malay), *kērūb kērūb* (Bajau), *panpan* (Sungei). Philippines: *dangilian* (Bag.), *malakatmon* (Tag., Pamp.), *malbastigbalang* (Tag.), *pakiling* (Sbl.). Celebes: *lum-piwi apaēlaē*. Bali: *bun api-api*.

Uses. The leaves are used for polishing wood and metal. The stems may be used as cordage. Medical use is unimportant, cf. BURKILL, l.c.

Notes. The glabrous-fruited form, described as *Delima sarmentosa* var. *glabra* by Hk. f. & Th. Fl. Ind. 1 (1855) 61 is considered here as a separate species; cf. *T. asiatica* (LOUR.) HOOGL.

2. *Tetracera glaberrima* MARTELLI in BECC. Malesia 3 (1886) 150.

Scandent shrub. Branches glabrous. Leaves elliptic to obovate, ca 5–9 by 2–4 cm, rather coriaceous, bright glossy green above, not scabrid, with acuminate apex. Petiole 3–8 mm. Inflorescence axillary, 1–5-, usually 3-flowered. Flower ca 2½ cm diam. Sepals ca 9 by 6 mm, glabrous to sparsely sericeous inside. Petals 4. Stamens 5 mm long; anthercells reaching each other at the apex. Carpels with ca 10 ovules. Capsule ovoid, ca 15 by 10 mm with a 2–3 mm long beak, 1–3-seeded. Seeds 3–4 by 2–3 mm. Aril 5 mm long, lacinate to about halfway its length.

Distr. *Malaysia*: Borneo (Kuching); has been cultivated in the Botanic Gardens at Bogor.

Notes. The species is most closely related to *Tetracera akara* (BURM. f.) MERR., from which it differs by the single carpel, the less densely sericeous inside of the sepals, and the relatively broader leaves.

3. *Tetracera asiatica* (LOUR.) HOOGL. *comb. nov.*—*Seguiera asiatica* LOUR. Fl. Coch. (1790) 341.—*Delima sarmentosa* (non L.) BURM. f. Fl. Ind. (1768) 122, t. 37; DC. Syst. 1 (1818) 407; Prod. (1824) 69; TRIM. Handb. Fl. Ceyl. 1 (1893) 5.—*Tetracera sarmentosa* (non VAHL) ROXB. Fl. Ind. ed. CAREY 2 (1832) 645, p.p.—*Leontoglossum scabrum* HANCE in WALP. Ann. 2 (1851) 18.—*Delima sarmentosa* var. *glabra* Hk. f. & Th. Fl. Ind. 1 (1855) 61; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 31.—*Delimopsis hirsuta* MIQ. Fl. Ind. Bat. 1, 2 (1859) 10; Suppl. 1 (1860)

152, 618.—*Delima sarmentosa* f. *hirsutior* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 73.—*Tetracera hirsuta* BOERL. Cat. Hort. Bog. (1899) 3.—*Tetracera levinei* MERR. Philip. J. Sc. Bot. 8 (1918) 147.—*Tetracera scandens* (non MERR.) MERR. Lingn. Sc. J. 5 (1927) 128.—*Davilla hirsuta* TEYSM. & BINN. ms.

Small shrub (to 3 m) or liana (to 12 m) with scabrid branches. *Leaves* oblong, 6–12 by 3–5½ cm, scabrid. *Petiole* 5–10 mm. *Inflorescence* terminal, 30–150-flowered, in the basal part often with 1–4 leaves, 10–25 by 5–15 cm; branches scabrid. *Flower* ca 8–10 mm diam. *Sepals* 5, the outer two 2 by 1½ mm, the inner three 4 by 3 mm, scabrid outside. *Petals* 3. *Stamens* 3–4 mm long; anthercells slightly separated at the apex. *Carpels* with ca 10–12 ovules. *Capsule* ovoid, ca 6–10 by 4–6 mm with a 2–5 mm long beak, 1(–2)-seeded. *Seeds* 4 by 3 mm. *Aril* 5 mm long, fimbriate for ½–⅔ of its length.

Distr. Ceylon, Assam, Bengal, Andaman Islands, E. Siam, Indo-China, S. China, in *Malaysia*: Sumatra, Malay Peninsula, and ?Borneo.

Notes. The species has been separated from *Tetracera scandens* (L.) MERR., in which it has been included until now as a glabrous-fruited variety, as it appeared that the difference in the carpel is connected with the number of sepals. The calyx in *T. scandens* is tetramerous, only in a few flowers on the same plant pentamerous, in *T. asiatica* it is in all flowers pentamerous.

Within the species 4 subspecies can be recognized. They differ in the shape of the leaf, but the most characteristic and constant difference is found in the structure of the indumentum. As to this character no intermediate forms have been found. The 2 extra-Malaysian subspecies are geographically isolated; these are *ssp. zeylanica* HOOGL. in Ceylon, and *ssp. asiatica* in E. Siam, Indo-China and S. China (Kwangsi, Kwangtung and Hainan). The areas of the two Malaysian subspecies overlap in the Malay Peninsula.

ssp. andamanica HOOGL. *ssp. nov.*

Young branches sparsely strigose together with sparsely to profusely distributed divergent tufts of ca 3–12 shorter (0.3–0.5 mm long) hairs; branches of the inflorescence similar. *Leaves* generally narrower than in the second Malaysian subspecies, with acute to obtuse apex and base.

Distr. Assam, Bengal, Andaman Islands, in *Malaysia*: Malay Peninsula (rare).

ssp. sumatrana HOOGL. *ssp. nov.*—*Delimopsis hirsuta* MIQ. *l.c.*—*Delima sarmentosa* f. *hirsutior* MIQ. *l.c.*—*Tetracera hirsuta* BOERL. *l.c.*—*Davilla hirsuta* TEYSM. & BINN. ms.

Young branches hirsute with 1½–2½ mm long hairs together with profusely distributed divergent tufts of ca 3–12 shorter (0.3–0.5 mm long) hairs; branches of the inflorescence similar. *Leaves* with rounded apex and rounded to obtuse base.

Distr. Malaysia: Sumatra, Malay Peninsula and ?Borneo.

Ecol. In forests, up to 1300 m.

Notes. The Borneo record is based on sterile material only (*Tetracera setigera* KORTH. ms.).

4. *Tetracera maingayi* HOOGL. *nom. nov.*—*Delima laevis* MAING. ms. ex KING, J. As. Soc. Beng. 58, 2 (1889) 362.—*Tetracera borneensis* (non MIQ.) RIDL. Fl. Mal. Pen. 1 (1922) 6.

Scandent shrub. *Leaves* oblong, ca 7½–15 by 3–6 cm, with acute, somewhat acuminate apex, coriaceous, shining above. *Petiole* 10–20 mm. *Inflorescence* terminal, rather many-flowered (up to 250), basal part often with 1–3 leaves. *Flower* ca 12–15 mm diam. *Sepals* 5, the outer two 3½ by 3 mm, the inner three 5 by 3½–4½ mm, scabrid outside. *Petals* 3. *Stamens* 2½ mm long; anthercells manifestly separated at the apex. *Carpel* 1, with ca 6 ovules. *Capsule* oblong, 8–12 by 3–4 mm, with a 2–3 mm long beak. *Seeds* unknown.

Distr. Malaysia: Malay Peninsula (Malacca, Selangor, Penang) and ?Borneo.

Ecol. Seems to be rare in lowland forests up to 200 m.

Vern. Malay Peninsula: *akar mēmpēlas*, *a. m. bētina*. Borneo: *akar amplas*.

Notes. The specific epithet *laevis* is already occupied in *Tetracera*, hence a new name is needed. The single Borneo record is based on a specimen in the Singapore herbarium bearing the inadequate indication 'Borneo, Remow, 1703'.

5. *Tetracera lanuginosa* DIELS, Bot. Jahrb. 57 (1922) 440.

Liana. Branches hirsute with up to 2 mm long hairs, together with groups of very small, stellately grouped hairs (0.1 mm long). *Leaves* elliptic, 5–7 by 3½–4½ cm, slightly scabrid, with rounded apex and base, rather sparsely hirsute with up to 2 mm long, rather rigid hairs. *Petiole* 10–15 mm. *Inflorescence* terminal on a few-leaved lateral branch, few (2–4)-flowered, ca 3–4 cm long. *Flower* ca 15 mm diam. *Sepals* 5, approximately circular, the outer two ca 4 mm diam., the inner three ca 6 by 7 mm, lanuginose outside together with stellate groups of short hairs, glabrous to very sparsely shortly strigose inside. *Petals* 3, ca 9 by 6 mm. *Stamens* 2½–3 mm long; anthercells strongly separated at the apex. *Carpels* 2–3, with ca 2 mm long, rather thin, ferruginous hairs. *Fruit* unknown.

Distr. Malaysia: NE. New Guinea (April River, Sepik District), once collected.

Ecol. Primary forest; *fl.* in September.

6. *Tetracera nordtiana* F.v.M. Fragm. 5 (1865) 1; BAIL. Queensl. Fl. 1 (1899) 9; SCHUM. & HOLLER. Fl. Kais. Wilh. (1899) 47; SCHUM. & LAUT. Fl. Deut. Schutzgeb. Südsee (1901) 444; BAIL. Compr. Cat. Queensl. Pl. (1909) 18, f. 3.—*Tetracera euryandra* (non VAHL) ROXB. Fl. Ind. ed. CAREY 2 (1832) 646.—*Tetracera wuthiana* F.v.M. Fragm. 10 (1876) 49; BAIL. Queensl. Fl. 1 (1899) 10.—*Tetracera everillii* F.v.M. Descr. Notes Pap. Pl. 7 (1886) 25.—*Tetracera moluccana* MARTELLI in BECC. Malesia 3 (1886) 153.—*Tetracera cowleyana* BAIL. Dept Agric. Brisb. Bot. Bull. 5 (1892) 7; Queensl.

Fl. 1 (1899) 9; Compr. Cat. Queensl. Pl. (1909) 18, f. 3bis.—*Tetracera boerlagei* MERR. Int. Rumph. (1917) 366.—*Tetracera pilophylla* DIELS, Bot. Jahrb. 57 (1922) 440.—*Tetracera volubilis* (non L.) RENDLE, J. Bot. 59 Suppl. (1923) 2.

Shrub or large climber, up to 10 m high, with slightly scabrid branches. Leaves elliptic to lanceolate, ca 5–10 by 3–5 cm, with rounded to acute apex and base. Petiole 5–15 mm. Inflorescence terminal, 15–50-flowered, often with 1–3 leaves in the basal part. Flower ca 6–10 mm diam. Sepals 4–5, the outer two circular, ca 1½–2 mm diam., the inner two or three ovate, ca 3–4½ by 2–3½ mm, glabrous or rarely sericeous inside, scabrid outside. Petals 3. Stamens 4–5 mm long; anthercells strongly separated at the apex. Carpels 2–4, usually 3, with rather rigid, 0.5 mm long hairs thinner than

in *T. scandens* (L.) MERR., with ca 10 ovules. Capsules ovoid, 5–8 by 3–5 mm with a 1–2 mm long beak, 1-seeded. Seed ca 3 by 2½ mm. Aril 5 mm long, lacinate to 2/3–3/4 of its length.

Distr. Queensland (E. coast), in *Malaysia*: SE. Celebes (Kabaena Island), Moluccas (Mangoli of the Sula group, Ceram, Ambon, Aru Islands), New Guinea, and Louisiades.

Notes. A very variable species, of which 6 varieties are distinguished here between some of which intermediate forms occur. Most of these have been described as separate species, but to my opinion the differences do not justify to keep them apart. As they show no geographical exclusion I have provisionally accepted them as varieties instead of subspecies. For further study more material, with notes on the habitat, is highly desirable.

KEY TO THE VARIETIES

1. Sepals slightly sericeous inside var. *celebica*
1. Sepals glabrous inside
2. Leaves glabrous above var. *wuthiana*
2. Leaves more or less hairy above
3. Leaves relatively small, ca 5–7 by 3–4 mm. Capsules relatively small, ca 5 by 3 mm.
4. Indumentum consisting of strigose or strigose-hirsute hairs together with stellate groups of shorter hairs var. *nordtiana*
4. Indumentum consisting of strigose-hirsute hairs together with shorter, villose hairs var. *louisiadica*
3. Leaves relatively large, ca 8–10 by 4–5 cm. Capsules relatively large, ca 8 by 5 mm.
5. Sepals villose outside var. *everillii*
5. Sepals strigose outside, with hairs single or in groups of 2–5 var. *moluccana*

var. *nordtiana*.—*T. nordtiana* F.v.M. l.c.—*T. pilophylla* DIELS, l.c.—*T. volubilis* (non L.) RENDLE, l.c.

Young branches, branches of the inflorescences, leaves and outer side of the sepals with strigose or strigose-hirsute hairs, together with stellate groups of shorter hairs. Sepals glabrous inside. Capsules rather small, ca 5 by 3 mm.

Distr. Queensland, in *Malaysia*: Moluccas (Aru Islands), E. New Guinea.

Ecol. Rain-forest climber.

Notes. The Malaysian specimens show transitions to var. *moluccana* (MARTELLI) HOOGL.

var. *everillii* (F.v.M.) HOOGL. *stat. nov.*—*T. everillii* F.v.M. l.c.

Young branches, branches of the inflorescences, and leaves hirsute with up to 2 mm long hairs. Sepals villose outside, glabrous inside. Capsules rather large, ca 8 by 5 mm.

Distr. *Malaysia*: SE. New Guinea (Fly River, once collected).

var. *wuthiana* (F.v.M.) HOOGL. *stat. nov.*—*T. wuthiana* F.v.M. l.c.

Young branches, branches of the inflorescences, and nerves on the lower side of the leaves strigose, leaves glabrous above. Sepals sparsely strigose outside, glabrous inside.

Distr. Queensland, in *Malaysia*: an intermediate form to var. *nordtiana* in New Guinea (CARR 12832, Koitaki).

Ecol. In forest ca 300 m alt.

var. *moluccana* (MARTELLI) HOOGL. *stat. nov.*—*T. euryandra* (non VAHL) ROXB. l.c.—*T. moluccana* MARTELLI l.c.—*T. cowleyana* BAIL. l.c.—*T. boerlagei* MERR. l.c.

Young branches and branches of the inflorescences strigose to hirsute with up to 1½ mm long hairs. Leaves sparsely hirsute with rather rigid, up to 1½ mm long solitary hairs. Sepals strigose with up to 0.7 mm long hairs, single or in groups of 2–5, outside, glabrous inside. Capsules rather large, ca 8 by 5 mm.

Distr. Queensland, in *Malaysia*: Moluccas, Aru Islands, New Guinea.

Vern. Amboina: *talir hassat*, *hassat* and *hassat cotel*. Probably also: *gumi uccu* (fide RUMPHIUS) in Ternate.

Notes. *Funis urens glabra* RUMPH. Herb. Amb. 5 (1747) 13 may be this species, as has been suggested by MERRILL. The Rumphian description, however, is very defective.

var. *louisiadica* HOOGL. *var. nov.*

Young branches and branches of the inflorescences strigose-hirsute with up to 0.8 mm long hairs, together with a rather dense indumentum, closely appressed, of shorter, villose hairs. Leaves hirsute with up to 0.5 mm long hairs, most densely so on the nerves above, densely shortly villose on the intervenium, strigose-hirsute on the nerves beneath. Sepals densely villose outside, glabrous inside. Capsules rather small, ca 5 by 3 mm.

Distr. *Malaysia*: Louisiades (Joannet Island, once collected).

var. celebica HOOGL. *var. nov.*

Young branches and branches of the inflorescence rather densely hirsute with up to 0.7 mm long hairs. Leaves hirsute with up to 1 mm long hairs. Sepals slightly sericeous in the central part inside, strigose-hirsute with 0.1–0.3 mm long hairs, partly in groups of 2–5, outside.

Distr. *Malaysia*: SE. Celebes (Kabaena Island).

7. *Tetracera indica* (CHRISTM. & PANZ.) MERR. Int. Rumph. (1917) 367; BACK. & SLOOT. Theeconkr. (1924) no 174; HEYNE, Nutt. Pl. (1927) 1070; BURK. Dict. (1935) 2143; MERR. J. Arn. Arb. 19 (1938) 354; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 3.—*Eugenia malaccensis* (non L.) BURM. f. Fl. Ind. (1768) 114; cf. STEEN. Bull. Bot. Gard. Btzig 18 (1950) 459.—*Assa* HOUTT. Nat. Hist. 5 (1776) 275, t. 26, f. 1.—*Assa indica* HOUTT. ex CHRISTM. & PANZ. Pfl. Syst. 4 (1779) 40, t. 26, f. 1.—*Wahlbomia indica* THUNB. Vet. Akad. Handl. Stockh. (1790) 215, t. 9.—*Assa exotica* GMEL. Syst. (1791) 839.—*Tetracera laevis* VAHL, Symb. Bot. 3 (1794) 71, non al.—*Tetracera assa* DC. Syst. 1 (1818) 402; Hk. f. & Th. Fl. Ind. 1 (1855) 63; MIQ. Fl. Ind. Bat. 1, 2 (1859) 8; MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 74; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 31; KING, J. As. Soc. Beng. 58, 2 (1889) 362; BACK. Fl. Batavia 1 (1907) 3; BACK. Schoolff. Java (1911) 9; KOORD. Exk. Fl. Java 2 (1912) 600; RIDL. Fl. Mal. Pen. 1 (1922) 5.—*Tetracera wahlbomia* DC. Syst. 1 (1818) 403.—*Tetracera malabarica* LAMK. Illustr. 3 (1823) 32, t. 485, f. 1.—*Tetracera dichotoma*

BL. Bijdr. 1 (1825) 4.—*Tetracera gracilis* BL. *ibid.*; MIQ. Fl. Ind. Bat. 1, 2 (1859) 9.—*Tetracera trigyna* ROXB. Fl. Ind. ed. CAREY 2 (1832) 645; HUNTER (ed. by RIDL.) J. Str. Br. R. A. S. 53 (1909) 98.—*Eleiastis laevis* RAFIN. Sylva Tellur. (1838) 165.—Fig. 1.

Shrub to 2 m or liana to 5 m. Leaves elliptic to oblong or obovate, ca 6–10 by 3–5 cm, usually rather thin, slightly glossy above, not scabrid, with acute to obtuse apex. Petiole ca 6–10 mm. Inflorescence terminal on the main branch or on few-leaved axillary branches, few (usually 4–7) flowered, up to 8 by 6 cm. Flowers ca 2½–3 cm diam. Sepals 4, 8–10 by 7–9 mm, glabrous. Petals 3–5, usually 4, reddish white. Stamens 6–8 mm long; anthercells reaching each other at the apex. Carpels 3–4, with a few rigid hairs on the back, ovules ca 10–15. Capsules globular, ca 10 mm diam., with a 2–6 mm long beak, 1–7-, usually 2-seeded. Seeds 3½ by 2½ mm. Aрил 8–10 mm long, finely fimbriate to nearly its base.

Distr. From Chittagong to S. Burma, S. Siam and S. Indo-China, once collected in China (Fukien), in *Malaysia*: Sumatra, Malay Peninsula, Java, Madura, and Kangean.

Ecol. Small shrub in open places; low liana, climbing over low shrubs, in brushwood and open forest. From sea-level to 600 m. According to BACKER & VAN SLOOTEN, *l.c.*, propagation mainly by suckers.

Vern. Sumatra: *aplas kédjong* (Djambi), *baih siepiek*, *bait siepiek suloh* (Lamp.), *djélati* (Pal.), *mémpas gadja* (Sum. E. Coast), *sipik suluh* (Lamp.) *wajit sipit* (Mengg.). Malay Peninsula: *akar pulas duyio*, *ampalas* (*ampélas*, *émpélas*, *hémpeélas*, *mémpeélas*), *ampalas lichin*, *a. mihsak*, *a. minyak*, *a. payah*, *kalintat niamok*, *ma ampalasu akar*. Banka: *akar témpélas*. Java: *akar mémpélas* (*témpélas*), *asahan*, *émpé as* (*mémpeélas*) *akar*, *kaju as(s)ahan* (Mal.); (*areuj*) *ki as(s)ahan* (Sund.); *bo* (Jav.). Kangean: *buko-buko*.

Uses. For cordage; leaves (BURKILL, *l.c.*) as sandpaper? Medical use unimportant, cf. BURKILL, *l.c.*



Fig. 1. *Tetracera indica* (CHRISTM. & PANZ.) MERR. with buds, flowers, and fruits (right lower corner). Palembang (DE VOGD).

8. *Tetracera akara* (BURM. f.) MERR. Philip. J. Sc. 19 (1921) 366.—*Akara-Patsjoti* RHEEDE, Hort. Mal. 5 (1685) 15, t. 8.—*Calophyllum akara* BURM. f. Fl. Ind. (1768) 121.—*Tetracera laevis* (non VAHL) DC. Syst. 1 (1818) 401; Hk. f. & Th. Fl. Ind. 1 (1855) 62; MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 74; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 31; BACK. Schoolff. Java (1911) 9; Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 2.—*Tetracera sericea* BL. Bijdr. 1 (1825) 3; MIQ. Fl. Ind. Bat. 1, 2 (1859) 9.—*Tetracera assa* (non DC.) HASSK. Pl. Jav. Rar. (1848) 177.—*Tetracera axillaris* MARTELLI in BECC. Malesia 3 (1886) 151.—*Tetracera assa* var. RIDL. J. Str. Br. R. A. S. 33 (1900) 37.—*Tetracera sylvestris* RIDL. J. Str. Br. R. A. S. 54 (1910) 8; Fl. Mal. Pen. 1 (1922) 5.

High climbing or creeping liana, up to 25 m. Leaves oblong to lanceolate, ca 8–13 by 3½–6 cm, rather coriaceous, bright glossy green above, not scabrid, with acuminate apex. Petiole 5–7 mm.

Inflorescence terminal or axillary, few-(usually 5-8)-flowered, up to 8 by 6 cm. *Flowers* ca 2½-3 cm diam. Sepals 4, 8-10 by 6-8 mm, glabrous outside, densely sericeous on the centre inside. Petals 3-4, white or greenish white. Stamens 7-8 mm long; anthercells reaching each other at the apex. Carpels 3-4, with ca 10 ovules. *Capsules* globular, ca 10 mm diam., with a 1-3 mm long beak, 1-2-seeded. Seeds 3 by 2 mm. Aril 6 mm long, firm-briate for ½-¾ of its length.

Distr. S. India, Ceylon, in *Malaysia*: Sumatra, Malay Peninsula, W. Java, Borneo, and Celebes.

Ecol. In lowland forests, up to 750 m alt.

Vern. Sumatra: *daun amplas* (Pal.). Malay Peninsula: *akar, akar rusa-rusa, mumpas rimba*. Java: *aroy pêngasaman* (Sund.).

Notes. *T. axillaris* MARTELLI represents a small-leaved form, to my opinion of no taxonomical value. The acuminate, glossy leaves are typical for the species.

9. *Tetracera loureiri* (FIN. & GAGNEP.) CRAIB, Kew Bull. (1922) 165; Fl. Siam. En. 1 (1925) 20.—*Tetracera assa* var. *loureiri* FIN. & GAGNEP. Bull. Soc. Bot. Fr. Mém. 4 (1906) 3.—*Tetracera sarmentosa* var. *loureiri* FIN. & GAGNEP. Fl. Gén. I. C. 1 (1907) 16.—*Tetracera fragrans* RIDL. J. Str. Br. R. A. S. 59 (1911) 62; Fl. Mal. Pen. 1 (1922) 6, non WILDEM. & DUR. (1899).

Low climber. *Leaves* elliptic to oblong, ca 5-11 by 2½-6 cm, rather coriaceous, not or slightly scabrid, with rounded or obtuse apex. Petiole ca 7-10 mm. Inflorescence terminal, many-(usually 40-80)-flowered, often with 1-2(-4) leaves in the basal part, 10-20 by 5-10 cm. *Flower* ca 10 mm diam. Sepals 5, the outer two ca 4½ by 3½ mm, the inner three 6½ by 4½ mm, slightly scabrid outside. Petals 3. Stamens 4-5 mm long; anthercells manifestly separated to nearly reaching each other at the apex. Carpels 2-3, with 8-16 ovules. *Capsules* ovoid, 7½ by 5½ mm with a 2 mm long beak, 1-2-seeded. Seeds 2-3 mm diam. Aril unequal-sided, 2-6 mm long, lacinate to ½-¾ of its length.

Distr. Siam and S. Indo-China, in *Malaysia*: only in the N. of the Malay Peninsula.

Ecol. In thickets and hedges, from sea-level up to 400 m.

Vern. In the Malay Peninsula noted only: *mèmpélas*.

10. *Tetracera korthalsii* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 75; MERR. En. Born. (1921) 381.—*Tetracera subrotunda* ELM. Leaf. Philip. Bot. 5 (1913) 1771.—*Tetracera elmeri* MERR. Univ. Calif. Publ. Bot. 15 (1929) 194.

Large climber or creeper with scabrid branches. *Leaves* broadly elliptic to elliptic-oblong or obovate, smooth to slightly scabrid on both sides. Inflorescence 40-200- or more-flowered, terminal, basal part often with 1-2 leaves, 10-30(-100) by 6-20 cm, with more or less scabrid branches. *Flower* ca 10 mm diam. Sepals 5(-6), the outer two 4 by 3, the inner three (or four) 5 by 4 mm, scabrid outside. Petals 3. Stamens 3½-4 mm long; anthercells strongly separated at the apex. Carpels 3,

with ca 9 ovules. *Capsules* ovoid, ca 7 by 4 mm with a 1-2 mm long beak, 1-seeded. Seeds 4½ by 3½ mm. Aril unequal-sided, 2½-5 mm long, lacinate to ½-¾ of its length.

Distr. *Malaysia*: Borneo, Palawan, Celebes, W. Moluccas (Taliabu of the Sula group).

Notes. The species can be divided into 2 varieties on account of the leaf-shape; there are no differences in floral characters and intermediate forms are unknown.

var. *korthalsii*.

Leaves elliptic-oblong, ca 6½-17 by 4-8 cm; apex acute or slightly acuminate, base acute. Petiole ca 8-20 mm.

Distr. *Malaysia*: Borneo, Celebes, W. Moluccas (Taliabu).

Ecol. Climber in forests, up to 700 m alt.

Vern. Borneo: *èmpélas* (Mal.), *pampad* (Dusun).

Uses. Used for polishing wood.

var. *subrotunda* (ELM.) HOOGL. stat. nov.—*Tetracera subrotunda* ELM. l.c.—*Tetracera elmeri* MERR. l.c.

Leaves broadly elliptic, ca 8½-22 by 5½-13 cm; apex and base rounded. Petiole 12-30 mm.

Distr. *Malaysia*: Br. N. Borneo (Tawao), Philippines (Palawan).

Ecol. A large climber in primary forest at low alt.

Notes. *Tetracera elmeri* MERR. represents a hirsute form.

11. *Tetracera macrophylla* WALL. ex Hk. f. & Th. Fl. Ind. 1 (1855) 63; MIQ. Fl. Ind. Bat. 1, 2 (1859) 8; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 32; KING, J. As. Soc. Beng. 58, 2 (1889) 363; RIDL. Fl. Mal. Pen. 1 (1922) 4; BURK. Dict. (1935) 2143.—*Tetracera macrocarpa* WALL. Cat. (1828) no 6628, nomen.—*Tetracera scaberrima* MIQ. Fl. Ind. Bat. 1, 2 (1859) 8; Ann. Mus. Bot. Lugd. Bat. 4 (1868) 75; MERR. En. Born. (1921) 382.—*Tetracera teysmannii* MARTELLI in BECC. Malesia 3 (1886) 150.—*Tetracera radula* MARTELLI in BECC. Malesia 3 (1886) 153; MERR. En. Born. (1921) 382, non MARTIUS (1863).—*Tetracera grandis* KING, J. As. Soc. Beng. 58, 2 (1889) 363; Ann. Roy. Bot. Gard. Calc. 5 (1896) 115, t. 129; RIDL. Fl. Mal. Pen. 1 (1922) 4.—*Tetracera havilandii* RIDL. Kew Bull. (1912) 381.—*Tetracera scabricaulis* RIDL. Kew Bull. (1912) 381.

Liana up to 10 m or ?tree; younger branches usually more or less scabrid. *Leaves* elliptic to oblong, ca 8-15 by 5-10 cm, little to very scabrid, with rounded to obtuse apex and base. Petiole ca 15-30 mm long, 2-4 mm broad, up to 8 mm broad in the leaves at the base of the inflorescences. Inflorescence terminal, 25-200-flowered, often with 1-4 leaves in the basal part, 10-40 by 4-15 cm; branches scabrid with stellate groups of hairs. *Flower* ca 2-2½ cm diam. Sepals 5-6, the outer two 8-9 by 7-8 mm, the inner 3-4 11-12 by 8-9 mm, scabrid outside. Petals 3, rather thick, apex not emarginate. Stamens 5-7 mm long; anthercells mani-

festly separated at the apex, connective strongly emarginate between them. Carpels 3-4, with a few rigid hairs on the back, with *ca* 14 ovules. *Capsules* ovoid, 8-10 by 6-8 mm with a 2-3 mm long beak, 1-2-seeded. Seeds 6½ by 4½ mm; aril unequal-sided, 5-9 mm long, slightly lacinate over *ca* 1/3 of its length.

Distr. *Malaysia*: Sumatra, Malay Peninsula, Banka, Borneo.

Ecol. Climber in dry as well as in swampy forests, up to 300 m alt. Seems to be rarely in flower.

Vern. Sumatra: *akar ampaleh riambu* (Sum. W. Coast). Malay Peninsula: *ampalas gajah* (= elephant or big a.), *a. rimau* (= tiger a.), *a. rimbah*, *a. lidah kucing* (= cat's tongue a.). Borneo: *akar tembara* (W. Kutei), *ampalas* (Saraw.).

Uses. Medical use unimportant, cf. BURKILL, *l.c.*

Notes. The species is very variable as to leaf-size and degree of scabridness; it is most easily recognized by its calyx (outer two sepals glabrous, inner sepals densely sericeous inside) and rather large flowers.

12. *Tetracera arborescens* JACK, Mal. Misc. 1, 5 (1820) 45; MIQ. Fl. Ind. Bat. 1, 2 (1859) 9; GAGE & BURK. J. Str. Br. R. A. S. 73 (1916) 242.—*Tetracera euryandra* (non VAHL) HK. f. & TH. Fl. Ind. 1 (1855) 63; MIQ. Fl. Ind. Bat. 1, 2 (1859) 8; Ann. Mus. Bot. Lugd. Bat. 4 (1868) 75; HK. f. & TH. Fl. Br. Ind. 1 (1872) 32; KING, J. As. Soc. Beng. 58, 2 (1889) 362; BACK. Schooffl. Java (1911) 9.—*Tetracera laevigata* MIQ. Fl. Ind. Bat. 1, 2 (1859) 8; Ann. Mus. Bot. Lugd. Bat. 4 (1868) 74.—*Tetracera subcordata* BOERL. Cat. Hort. Bog. (1899) 3.—*Tetracera lucida* WALL. Cat. (1828) no 6631, *nomen*; RIDL. Fl. Mal. Pen. 1 (1922) 5.—*Tetracera lucida* var. *lanuginosa* RIDL. *ibid.*

Strong woody climber, shrub or ?small tree. Younger branches villose to densely villose-floccose. *Leaves* obovate to elliptic-oblong, *ca* 6-10 by 3-5 cm, coriaceous, not scabrid, the upper ones under the inflorescence 3-4 by 2-3 cm, often villose-floccose when young. Petiole 3-5 mm. Inflorescence terminal, (6-)10-50-flowered, up to 15 by 6 cm. *Flower* *ca* 15 mm diam. Sepals 5-6, *ca* 5 by 3 mm, slightly scabrid outside. Petals 3, white. Stamens 4-5 mm long; anthercells slightly to manifestly separated at the apex. Carpels 3, with *ca* 10-12 ovules. *Capsules* ovoid, 7 by 4 mm with a 2-3 mm long beak, 1-seeded. Seeds 2½ by 1½ mm. Aril 3-5 mm long, lacinate to half its length.

Distr. *Malaysia*: Sumatra (Tapanuli, East Coast), Malay Peninsula, Banka, Billiton, Borneo, and ?W. Java (Papandajan, KORTHALS).

Ecol. Swampy forests, riverside scrubs, only at low altitudes.

Vern. Sumatra: *andor ruhas igung* (Tapan.), *mohi-mohi* (Sibolga). Banka: *akar tēmpēlas*. Billiton: *akar mēmplas*.

Notes. JACK's description is insufficient. From study of a specimen of JACK, present in the Leyden herbarium, it is clear that the present species was meant.

13. *Tetracera fagifolia* BL. Bijdr. 1 (1825) 4; MIQ. Fl. Ind. Bat. 1, 2 (1859) 9; Ann. Mus. Bot. Lugd.

Bat. 4 (1868) 75; RIDL. J. Str. Br. R. A. S. 54 (1909) 10; Fl. Mal. Pen. 1 (1922) 6, *non* WILLD. ex SCHLECHT. (1833).—*Tetracera rigida* BL. Bijdr. 1 (1825) 4; MIQ. Fl. Ind. Bat. 1, 2 (1859) 9; BACK. Schooffl. Java (1911) 9; Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 2.—*Tetracera blumei* WALP. Rep. 1 (1842) 67.—*Tetracera sumatrana* MIQ. Fl. Ind. Bat. Suppl. 1 (1861) 618, 619.—*Tetracera fagifolia* f. *subintegerrima* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 75.—*Tetracera borneensis* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 76; MERR. En. Born. (1921) 381.—*Tetracera obovata* BOERL. Cat. Hort. Bog. (1899) 3.—*Tetracera philippinensis* MERR. Philip. J. Sc. Bot. 9 (1914) 375; En. Philip. 3 (1923) 58.—*Tetracera obliquinervia* ELM. Leaf. Philip. Bot. 7 (1915) 2621.—Fig. 2.

Liana, up to 14 m high, branches slightly scabrid. *Leaves* elliptic to lanceolate, more or less coriaceous, usually shining. Petiole *ca* 7-20 mm. Inflorescence terminal, *ca* 40-250-flowered, often with 1(-3) leaves in the basal part, *ca* 15-40 by 8-25 cm; branches scabrid, with small tufts of 0.2-0.4 mm long hairs on the extreme branches only. *Flower* *ca* 8-12 mm diam. Sepals 5(-6), the outer two 4 by 4 mm, the inner 3(-4) 5½-7 by 4½-5½ mm, scabrid outside. Petals 3. Stamens 4½-6 mm long; anthercells manifestly separated at the apex, connective somewhat emarginate between them. Carpels 3, with *ca* 10 ovules. *Capsules* ovoid, 5-8 by 4-6 mm, with a 1-3 mm long beak, 1(-2)-seeded. Seeds 5 by 3 mm. Aril *ca* 7 mm long, unequal-sided, lacinate to 1/4-1/2 its length.

Distr. *Malaysia*: Sumatra, Malay Peninsula, Banka, W. Java, Borneo, Philippines.

Notes. The 2 varieties, distinguished here, differ only in their vegetative parts. There is a relatively small number of intermediate forms.

The first to consider *T. fagifolia* BL. and *T. rigida* BL. as conspecific was MIQUEL (1868) *l.c.*, who used the first name.

var. *fagifolia*.

Leaves *ca* 12-16-nerved, 1.4-2.25 times as long as broad, *ca* 7-20 by 5-10 cm; the lateral nerves curving upward, ending in the margin.

Distr. *Malaysia*: Sumatra (incl. Simalur and Mentawai), Malay Peninsula (Johore), W. Java, Borneo, Philippines.

Ecol. Climber in primary forest, in scrub or in bamboo forest, 100-750 m alt.

Vern. Sumatra: *alor ampaleh* (Simalur), *ampalu riambu* (Lamp.), *sapbet* (Siberut). Java: *aroy (ki) assahan*, *kiassahan*, *ki saun* (Sund.). Philippines: *balau-balau* (Mbo).

var. *borneensis* (MIQ.) HOOGL. *stat. nov.*—*Tetracera borneensis* MIQ. *l.c.*

Leaves *ca* 8-10-nerved, 1.4-3.5 times as long as broad, *ca* 6-13 by 2.7-5.5 cm; lateral nerves not quite reaching the margin.

Distr. *Malaysia*: Sumatra (Muara Mengkulen, once collected), Banka, Borneo, SE. Celebes (Kendari).

Ecol. Primary forest; on Mt Kinabalu up to 1300 m.

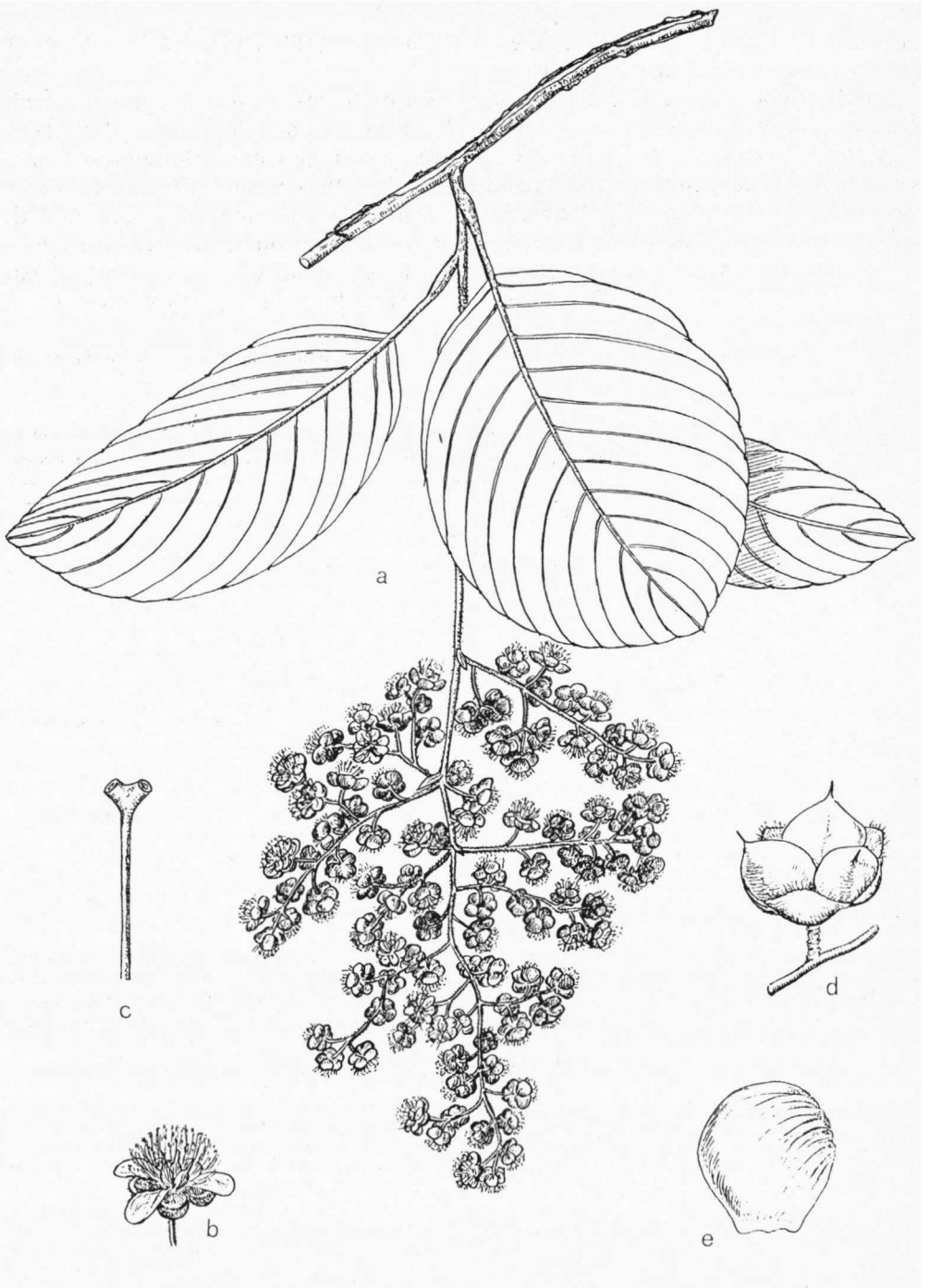


Fig. 2. *Tetracera fagifolia* BL. a. Flowering branch, $\times \frac{2}{3}$, b. flower, $\times 2$, c. stamen, $\times 7$, d. fruits, $\times 2$, e. seed enveloped by aril, $\times 4$.

2. HIBBERTIA

ANDR. Bot. Rep. (1800) t. 126; B. & H. Gen. Pl. 1 (1862) 14; BTH. Fl. Austr. 1 (1863) 17; BAIL. Queensl. Fl. 1 (1899) 11.

Small ericoid or erect shrubs, rarely trees or lianas, mostly much branched. *Leaves* spirally arranged, rarely opposite (Madagascar), simple, often with reflexed margins. Inflorescence dichasial, usually reduced to a few-flowered pseudo-raceme, spike or to solitary flowers. Bracts and bracteoles often present. *Flowers* sessile or shortly pedicellate. Sepals 5. Petals 5(-3). Stamens \sim -3, often partly staminodial, either surrounding the carpels regularly or reduced on one side, free or slightly connate at the basis, introrse, opening with longitudinal slits, rarely with apical pores. Carpels \sim -1, with 15-1 ovules, free. Style filiform, usually curved or recurved. *Follicles* usually one-seeded. Seed arillate.

Distr. A large genus with ca 100 species in Australia and Tasmania, 20 in New Caledonia, one in the Fiji Islands, two in extreme Eastern Malaysia, and one in Madagascar (fig. 3).

KEY TO THE SPECIES

1. Stamens and staminodes all placed on one side of the carpels. Carpels 2. Shrubs . . . 1. *H. banksii*
1. Stamens placed regularly round the carpels, without staminodes. Carpels 5. Scandent 2. *H. scandens*

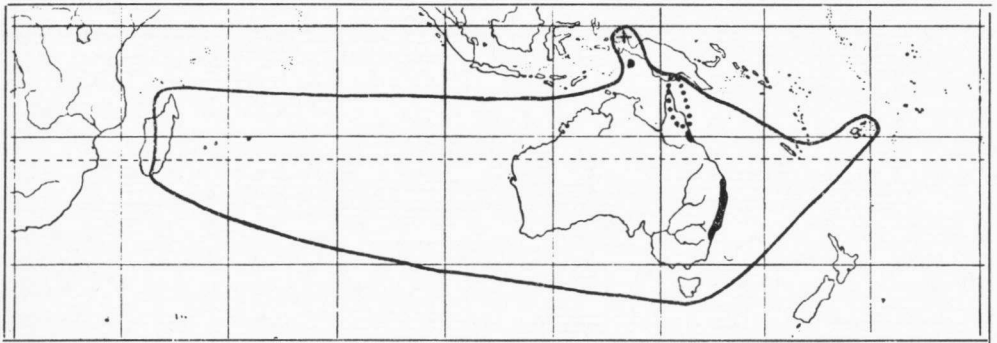


Fig. 3. Distribution of the genus *Hibbertia*. Separately indicated are the areas of *H. banksii* (R.Br. ex DC.) BTH. (—), *H. scandens* (WILLD.) DRYAND. (3 black spots), and *H. scandens* var. *novoguineensis* (GIBBS) HOOGL. (+).

1. *Hibbertia banksii* (R.Br. ex DC.) BTH. Fl. Austr. 1 (1863) 20; BAIL. Queensl. Fl. 1 (1899) 12; BANKS & SOLANDER, Illustr. Bot. Cook's Voy. 1 (1900) 5, t. 2; A. C. SMITH, J. Arn. Arb. 22 (1941) 497.—*Hemistemma banksii* R.Br. ex DC. Syst. 1 (1818) 414.

Shrub 1-2 m. *Leaves* oblong-lanceolate with a few obtuse teeth, stiff with recurved margins, glossy green above, pubescent below with a rusty brown tomentum on the nerves and a yellowish tomentum on the intervenium, 5-15 by 0.7-3 cm. Raceme axillary, 5-12-flowered, 4-6 cm long. *Flowers* almost sessile. Sepals oblong, acute, densely hairy outside, 8 by 4 mm. Petals yellow, obovate with emarginate apex, 14 by 7 mm. Stamens ca 25, 3 $\frac{1}{2}$ mm long; staminodes ca 12, on the outside of the stamens, 2.7 mm long. Carpels densely hairy, with 3 ovules. *Follicles* one-seeded, thin-walled. Seed with membranaceous aril.

Distr. N. Queensland, E. coast, rare, in *Malaysia*: S. New Guinea, Wassi Kussa River region, once collected (fig. 3).

Ecol. The only New Guinea specimen was found in *Agonis* scrub.

2. *Hibbertia scandens* (WILLD.) DRYAND. in KON. & SIMS, Ann. Bot. 2 (1807) 525.—*Dillenia scandens* WILLD. Sp. Pl. 2 (1799) 1351.—*Hibbertia volubilis* ANDR. Bot. Rep. (1800) t. 126; BTH. Fl. Austr. 1 (1863) 37; BAIL. Queensl. Fl. 1 (1899) 16.—*Dillenia volubilis* VENT. Choix (1803) 11.—*Hibbertia novoguineensis* GIBBS, Phytogr. & Fl. Arfak Mts (1917) 148; KANEH. & HATUS. Bot. Mag. Tokyo 57 (1943) 63.—Fig. 4.

Low scandent shrub. *Leaves* lanceolate, acute to acuminate, slightly hairy above, rather densely to densely hairy beneath, 3-12 by 0.4-2 $\frac{1}{2}$ cm. *Flowers* solitary on short few-leaved side-stalks, ca 4 cm diam. Sepals ovate, acute, densely hairy outside, woody, 15-18 by 8-9 mm. Petals yellow, obovate with slightly emarginate apex, ca 2 by 1.4 cm. Stamens \sim , 7-9 mm long. Carpels glabrous, with 6 ovules. *Follicles* 1-6-seeded. Seed with membranaceous aril.

Distr. Australia along the E. coast except the extreme North, S to ca 35°, in *Malaysia*: Aru Islands (Trangan: BUWALDA 5510) and NW. New Guinea (Arfak Mts) (fig. 3).

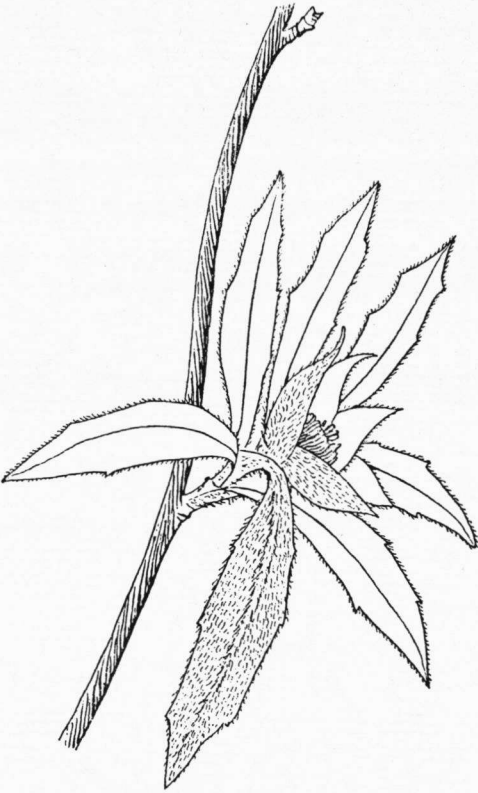


Fig. 4. *Hibbertia scandens* (WILLD.) DRYAND. var. *novoguineensis* (GIBBS) HOOGL., nat. size.

Ecol. In Trangan at low alt., on the Arfak Mts between 2000 and 3000 m in low spinneys on burnt open summit.

Notes. In *Malaysia* two varieties can be distinguished on the leaf-shape: var. *scandens* with leaves rather densely hairy beneath, 6–12 by 1.2–2½ cm (Trangan Island), and var. *novoguineensis* (GIBBS) HOOGL. stat. nov. (*H. novoguineensis* GIBBS) with leaves densely hairy beneath, smaller and narrower, 3–8½ by 0.4–1 cm (Arfak Mts). The stamens in the type specimen of *H. novoguineensis* are 7 mm long, in the collection of KANEHIRA & HATUSIMA 9 mm, in var. *scandens* they are 9 mm. In var. *novoguineensis* the anthercells are relatively longer than in var. *scandens*. These differences, however, do not justify to my idea the distinction of the two forms as separate species.

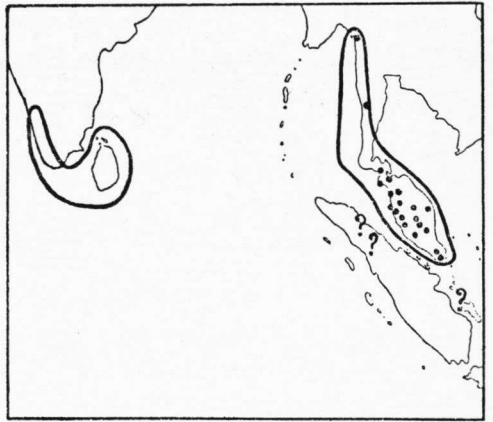


Fig. 5. Geographical distribution of the genus *Acrotrema*; the dots represent the localities of *A. costatum* JACK, the question marks doubtful records of this species.

3. ACROTREMA

JACK, Mal. Misc. 1, 5 (1820) 36; HK. f. & TH. Fl. Ind. 1 (1855) 64; B. & H. Gen. Pl. 1 (1862) 13; HK. f. & TH. Fl. Br. Ind. 1 (1872) 32; TRIM. Handb. Fl. Ceyl. 1 (1893) 6.

Perennial herbs with a horizontal, woody rhizome. *Leaves* all radical or on a short stem, simple, pinnatisect or pinnate, the petiole with sheathing, membranaceous, caducous wings. Inflorescence a terminal raceme, sometimes reduced to a single flower, with membranaceous bracts. *Flowers* 5-merous. Stamens 15–∞, usually in 3 bundles alternating with the carpels. Carpels usually 3, slightly coherent in the centre, with linear, recurved styles, with 2–6 or 10–20 ovules. *Follicles* irregularly dehiscent, with 1–15 seeds. Seeds with a white membranaceous aril.

Distr. Ca 10 spp., 1 in the Deccan Peninsula and 8 in Ceylon, 1 in Lower Burma, Peninsular Siam and the Malay Peninsula (fig. 5).

1. *Acrotrema costatum* JACK, l.c.; KING, J. As. Soc. Beng. 57, 2 (1890) 361; HK. f. & TH., l.c. (1855) 65; KURZ, Nat. Tijds. Ned. Ind. 27 (1864) 175; HK. f. & TH., l.c. (1872) 32; GAGE & BURK.

J. As. Soc. Str. Br. 73 (1916) 242; MERR. En. Born. (1921) 382; RIDL. Fl. Mal. Pen. 1 (1922) 7; BURK. Dict. (1935) 41; HENDERS. Mal. Wild Fl. 1 (1949) 20, f. 9.—Fig. 6.

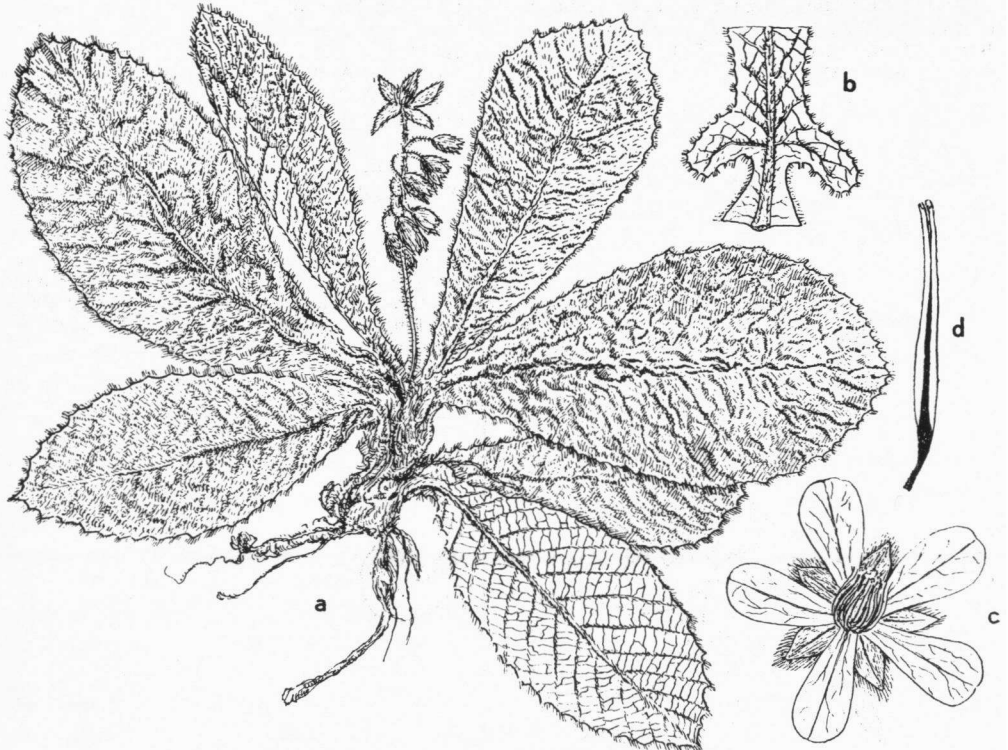


Fig. 6. *Acrotrema costatum* JACK. a. Habit, $\times 2/3$, b. leafbase, $\times 2/3$, c. flower, $\times 4/3$, d. stamen, $\times 7$.

Stem from very short up to 25 cm long. *Leaves* obovate, dentate, base auriculate, hairy, deep green, often with a whitish line along the midrib, 7–25 by 3–10 cm; petiole 1–2(–6) cm. Raceme 9–13 cm, erect, ca 10–12-flowered; bracts ca 6 by 2 mm. *Flowers* yellow, diam. 3 cm, opening singly; pedicel 5–15 mm long. Carpels 3, with 2–6 ovules. *Follicles* enclosed by the sepals. Seeds finely echinate.

Distr. Lower Burma, Peninsular Siam, in *Malaysia*: Malay Peninsula, N. Sumatra?, Banka?

Ecol. In dense, wet forests or on moist shady rocks; up to 1000 m alt.

Vern. Once noted: *punai tanah* (Pahang).

Notes. One Sumatra record is based on a specimen, collected by BATTEN POOLL, labeled only: Sumatra, 1939; the other is based on a note by JACK (cf. GAGE & BURK. *l.c.*). Of the Banka record (cf. KURZ, *l.c.*) I have seen no material. The Borneo record of MERRILL, *l.c.*, was based on a specimen of *Neurocalyx* sp. (Rubiaceae).

4. DIDESMANDRA

STAPF in HOOK. Icon. t. 2646 (1900).

Woody plants with scabrid, hairy branches. *Leaves* with amplexicaul sheath and short petiole. *Flowers* regular in calyx and corolla, zygomorphic in androecium and gynoecium, placed one-sided on simple or bifurcate branches of a 4–6-branched panicle with reduced central axis, almost sessile. Sepals and petals 5. Stamens in 2 bundles on the adaxial side of the carpels, each bundle consisting of 1 stamen and 4 staminodes with connate filaments, the stamen uncinately curved, exceeding the staminodes, with longitudinally dehiscent linear anthercells, the connective forming a deltoid membrane above the cells, the staminodes only slightly curved. Carpels 2, with a long filiform style; ovule 1, inserted at the base. *Fruit* a nut. Seed with a thin membranaceous aril.

Distr. Monotypic, known only from Borneo.

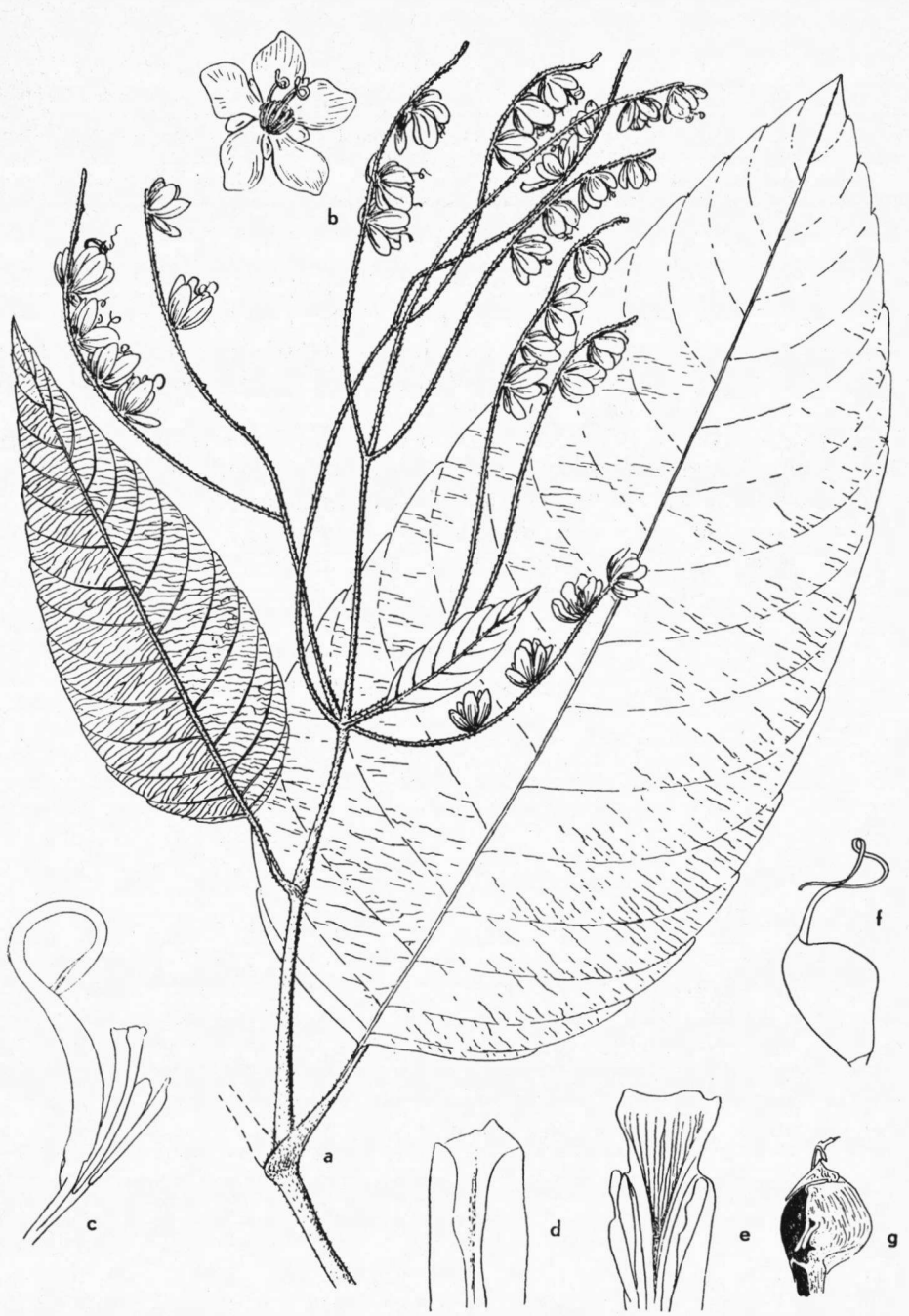


Fig. 7. *Didesmandra aspera* STAFF. a. Habit, $\times 1/2$, b. flower, $\times 1/2$ (after STAFF), c. stamen and 4 staminodes, $\times 3$, d. tip of staminode, $\times 10$, e. ditto of stamen, $\times 10$, f. ovary, $\times 3$, g. seed (black) with unilateral aril, $\times 3$.

Notes. Most closely allied to *Schumacheria* VAHL from Ceylon, which has many stamens in one bundle, without staminodes.

1. *Didesmandra aspera* STAPP, *l.c.*; MERR. EN. Born. (1921) 382.—Fig. 7.

Plant ca 2½ m high. *Leaves* scabrid, ovate, apex acute, base rounded, margin slightly toothed, 15–30 by 7–13 cm, 12–16-nerved; nerves prominent and hairy beneath; petiole channelled, 1½–3 cm. Inflorescence 15–20 cm long. Flowers ca 5 cm

diam. Sepals elliptic-oblong, the 2 outer ones smaller. Petals obovate, 25 by 13 mm, yellow. Filament 2 mm long, 1 mm thick, anther 17 mm long, sterile anthers 8–10 mm. Carpels and fruit glabrous; style 15–20 mm.

Distr. *Malaysia*: Borneo (Sarawak), twice collected.

5. DILLENIA

LINNÉ, *Sp. Pl.* 1 (1753) 535; *Gen. Pl. ed. 5* (1754) 239.—*Wormia* ROTTB. Nye Samml. Danske Vid. Selsk. Skrift. 2 (1783) 532.—*Lenidia* THOU. *Gen. Nov. Madag.* (1806) 17.—*Colbertia* SALISB. *Parad. Lond.* (1807) *sub t.* 73.—*Capellia* BL. *Bijdr.* (1825) 5.—*Reifferscheidia* PRESL, *Rel. Haenk.* 2 (1836) 74.—*Capellenia* BL. *ex HASSK. Cat. Pl. Hort. Bog.* (1844) 187.

Trees or shrubs, often with reddish bark peeling off in thin papery scales. *Leaves* spirally arranged, simple. Petiole in a number of species with usually wholly caducous, rarely partly or wholly persistent, broad wings, amplexicaul in the young leaf and then enclosing and protecting the terminal bud. *Inflorescence* a composed or simple raceme, in a number of species reduced to solitary flowers, usually terminal on consequently sympodial branches, in one species axillary; one species with terminal and cauline inflorescences, some other (mainly extra-Malaysian) ramiflorous with fascicled flowers. Bracts small, caducous, or obsolete. Bracteoles well developed in some *spp.*, in others obsolete. *Flowers* actinomorphic. Sepals (4–)5(–6), in a few species more, concave. Petals 5, in some species absent, in one species 4–6, usually obovate with rounded apex, yellow or white, rarely reddish. Stamens ∞, all of approximately the same length or of different lengths arranged in 2 or more, not always sharply separated groups; occasionally part of the outermost stamens staminodial, in some species a wholly staminodial outer group, in one species a wholly staminodial inner group. Anthercells parallel, opening usually with a terminal pore, less often with longitudinal slits. Carpels 4–20, coherent along the cuneate central part of the receptacle, with filamentous or linear, more or less spreading styles; stigma in most *spp.* indistinct, only in 2 species (*D. serrata* THUNB. and *D. celebica* HOOGL.) distinct, knoblike. Ovules 6 to ca 60. *Fruit* either dehiscent, the rather fleshy carpels spreading like a star, or indehiscent, enclosed by the more or less enlarged and thickened sepals. Seeds arillate or exarillate, glabrous or rarely finely echinate.

Distr. Ca 60 *spp.*, from Madagascar and the Seychelles to the Fiji Islands, in the North to the S. slopes of the Himalayas, Yunnan, Kwangsi and Kwangtung, in Australia only one species on the E. coast of Queensland; not in New Caledonia. The most widespread species are *D. indica* L. (from India to Borneo and Java) and *D. pentagyna* ROXB. (*cf.* fig. 12). There are a number of local endemics, particularly in the Philippines, New Guinea, and the Pacific Islands.

Ecol. Most species occur in evergreen forests on dry to very wet soil. Some deciduous species are found in monsoon forests or savannahs, one evergreen species in savannahs of New Guinea and N. Australia. As to altitudinal distribution the species generally occur below 1000 m, but some are occasionally found above this altitude, up to 2000 m; one species (*D. montana* DIELS) has been collected only above 1000 m.

Stilt-roots occur constantly only in a few species, *viz* *D. borneensis* HOOGL., *D. eximia* MIQ., and *D. reticulata* KING; in a few others they may be occasionally developed, *e.g.* in *D. papuana* MARTELLI and *D. albiflos* (RIDL.) HOOGL.

The leaves of saplings and young plants are often considerably larger than those of the full-grown plants. In most cases these leaves are relatively narrower, without showing a distinct dimorphism. In

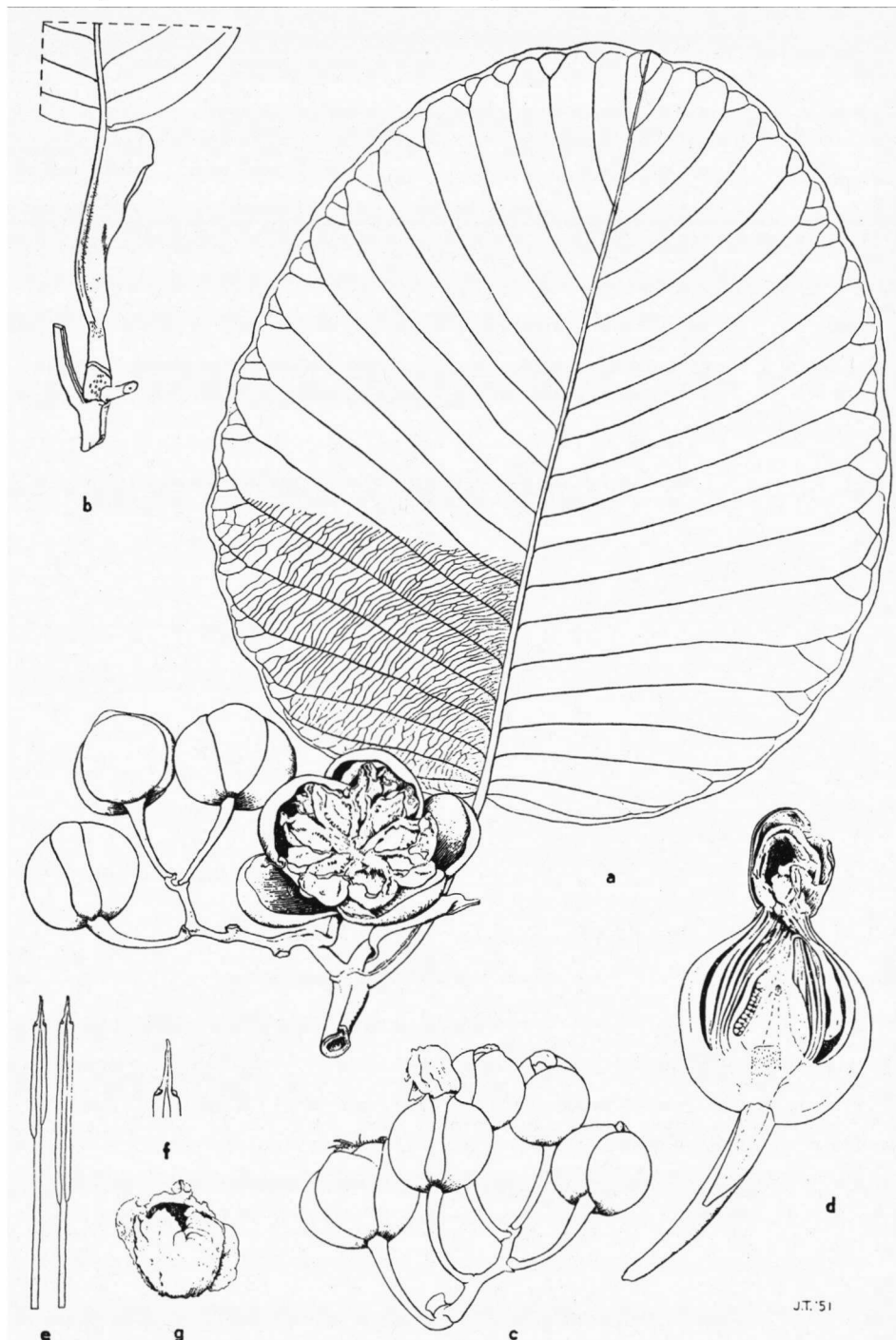


Fig. 8. *Dillenia papuana* MARTELLI. *a*. Fruiting branch, $\times \frac{2}{3}$, *b*. winged petiole of young leaf, $\times \frac{2}{3}$, *c*. inflorescence, $\times \frac{2}{3}$, *d*. longitudinal section of flower during full anthesis, $\times \frac{4}{5}$, *e*. stamens, $\times 2$, *f*. apex of anther, $\times 4$, *g*. seed with aril, $\times 2$.

D. ferruginea (BAILL.) GILG from the Seychelle Islands, however, a distinct leaf-dimorphism is found between these leaves. In a less degree this is found in Malaysia in *D. pentagyna* ROXB. and probably in *D. pteropoda* (MIQ.) HOOGL.

In some species the petals drop without having opened in anthesis. In Malaysia this is found only in *D. papuana* MARTELLI and some other New Guinean species.

The dispersal of fruits and seeds is effected mainly by animals. The indehiscent fruits would be eaten mainly by mammals, the arillate seeds of the species with dehiscent fruits by birds. Transport by water is a means of dispersal in *D. indica* L.

Uses. Though sometimes used for light constructions, the wood is generally of low value because of the short durability. *D. pentagyna* ROXB. is used for making a charcoal of good quality.

The indehiscent fruits of some species are eaten, in particular in curries and jellies; they have an acid taste. Mixed with syrup they make a cough cure, and they are sometimes used for washing the hair.

Because of the beautiful flowers and foliage a number of species are suitable as ornamental trees or shrubs, e.g. *D. indica* L., *D. philippinensis* ROLFE, and *D. suffruticosa* (GRIFF.) MARTELLI.

Wood anat. MOLL & JANSSONIUS, Mikr. Holzes 1 (1906) 67: ground tissue originally described as libriform fibers which error was later corrected into fibertracheids, see also REINDERS, Handl. Pflanzen-anatomie 4 ed. Wageningen (1915) 142-147; PEARSON & BROWN, Comm. Timb. 1 (1932) 1; VESTAL, Philip. J. Sc. 64 (1937) 205; DEN BERGER, Med. Proefstat. Boschwezen 13 (1926) 118 (handlens). *D. excelsa* (= *Wormia excelsa*): M. & Js p. 69. *D. indica*: M. & Js p. 71; P. & B. p. 3. *D. pentagyna*: M. & Js p. 78; P. & B. p. 7. *D. obovata* (= *D. aurea*, non SMITH): M. & Js p. 76. *D. parviflora* GRIFF. (extra-Malaysian): P. & B. p. 6.

Vern. The Malay name '*simpur*' (*simpoh*, *sěmpur*, etc.) is in general use throughout W. Malaysia, some species being distinguished by epithets. In the Philippines '*katmon*' is in general use.

Notes. Several classifications of the genus have been proposed, the basic one usually being in *Dillenia* and *Wormia* as separate genera or subgenera on account of the fruit (indehiscent *versus* dehiscent) by some authors, on account of the seed (exarillate *versus* arillate) by others. Other subgeneric classifications are based on the base of the petiole (amplexicaul *versus* non-amplexicaul) or on the structure of the androecium. It is impossible, however, to distinguish groups, characterized by the combination of more than one character; relationships within the genus are reticulate.

MARTELLI in BECC. Malesia 3 (1886) 150-167 was the first to unite the genera *Dillenia* and *Wormia*. He listed the species of both genera, but failed to make formally the new combinations, which have been ascribed to him by DUR. & JACKS. in the first supplement of Index Kewensis.

An important character of the androecium is the position of the anthers *in bud*; in a number of species the inner row is reflexed outwards. This may be permanent in anthesis. I have used the term 'straight' or 'straight or slightly curved' in all other cases.

The sequence of the species as adopted here reflects as far as possible their affinity.

KEY TO THE SPECIES

1. Basis of the petiole, later leaf-scar, completely amplexicaul.
2. Petiolar wings not constricted below the blade. Nervation of the wings not sharply separated from that of the blade, though often less distinct.
 3. All stamens of approximately the same length. Flowers white 1. *D. pteropoda*
 3. Androecium consisting of small staminodes on the outside and stamens of different lengths, the length increasing towards the centre. Flowers yellow 15. *D. suffruticosa*
2. Petiolar wings more or less constricted below the blade. Wings without distinct nervation or nervation different and independent from that of the blade.
 4. Sepals 8 or more.
 5. Sepals 8-9, not much different in size 13. *D. marsupialis*
 5. Sepals 11-17, distinctly increasing in size towards the centre 14. *D. reifferscheidia*
 4. Sepals 4-6, usually 5.
 6. Stamens gradually decreasing in size towards the centre of the flower, the innermost ones staminodial 12. *D. fagifolia*
 6. Stamens all of approximately the same length or the innermost ones longer than the outer ones. If present, staminodes on the outside.
 7. All stamens of approximately the same length.
 8. Carpels hirsute.
 9. Inflorescence simple, distinctly zigzag. Flower ca 6½ cm diam., yellow 2. *D. beccariana*
 9. Inflorescence usually composed, with only slightly zigzag axes. Flower ca 4 cm diam., white. 3. *D. albiflos*
 8. Carpels glabrous.
 10. Stigma distinct, knoblike. Flowers apetalous.
 11. Petiolar wings semi-obcordate. Flowers rather large (e.g. stamens ca 9-11 mm long). 4. *D. serrata*
 11. Petiolar wings broadly linear. Flowers smaller (e.g. stamens ca 6-7 mm long). 5. *D. celebica*

10. Stigma indistinct. Flowers with (caducous!) petals.
12. Upper part of petiolar wings persistent 6. *D. ovalifolia*
12. Petiolar wings wholly caducous.
13. Carpels 4-6, usually 5 10. *D. fischeri*
13. Carpels 7-15.
14. Stamens with a 1-2 mm long acumen at the apex 7. *D. papuana*
14. Connective at most slightly exceeding the anthercells.
15. Younger parts with dense villose indumentum 8. *D. montana*
15. Younger parts glabrous or slightly hirsute.
16. Leaves ovate, *ca* 15-19-nerved. Sepals *ca* 25 by 22 mm 9. *D. schlechteri*
16. Leaves elliptic, *ca* 6-9-nerved. Sepals *ca* 15 by 12 mm 11. *D. quercifolia*
7. Innermost stamens longer than the outer ones, with the apical part reflexed outward *in bud*.
17. Apex of petiolar wing for *ca* 1/4 or more of its length exceeding its insertion to the petiole.
18. Flowers solitary on a pedicel, terminal. Apex of the petiolar wings rounded.
19. Flowers *ca* 6-8 cm diam. Carpels 6-9 16. *D. ochreata*
19. Flowers *ca* 20 cm diam. Carpels 14-16. 17. *D. megalantha*
18. Flowers in a 2-3-flowered raceme. Apex of the petiolar wings obtuse 18. *D. talaudensis*
17. Apex of the petiolar wing not or hardly exceeding its insertion to the petiole.
20. Upper part of petiolar wings persistent 19. *D. alata*
20. Petiolar wings wholly caducous, or at most small auricles persistent near the basis of the blade.
21. Petiolar wings elliptic-oblong. Flowers large, more than 10 cm diam. 20. *D. philippinensis*
21. Petiolar wings narrower. Flowers smaller, up to 10 cm diam.
22. Leaves elliptic to oblong, rather coriaceous, 5-8-nerved 21. *D. diantha*
22. Leaves oblong to lanceolate, not coriaceous, 8-20-nerved.
23. Apex of the leaf acuminate. Plant often cauliflorous. Flowers whitish 22. *D. bolsteri*
23. Apex acute. Plant not cauliflorous. Flowers yellow.
24. Leaves glabrous, 8-12-nerved 23. *D. auriculata*
24. Leaves, at least the young ones, strigose on the nerves beneath, 10-18-nerved. 24. *D. castaneifolia*
1. Basis of the petiole, later leaf-scar, not completely amplexicaul, clasping up to 3/4 of the branch.
25. Inflorescence or solitary flowers typically terminal on leaf-bearing branches, often later lateral, leaf-opposed. Branches consequently sympodial.
26. Deciduous trees, with stilt-roots. Inflorescence appearing with the leaves, often immediately at its base with 2 or 3 branches, forming a loose cluster.
27. Carpels 4-6. Stamens all of approximately the same length. Flowers apetalous 25. *D. eximia*
27. Carpels 7-10. Stamens not all of the same length. Flowers with (caducous!) petals.
28. Carpels 7-8. Petiole densely hirsute above, nearly glabrous beneath 26. *D. borneensis*
28. Carpels 9-10. Petiole more densely hairy beneath than above 27. *D. reticulata*
26. Evergreen trees, without stilt-roots. Inflorescence never branched immediately at its base. Flowers either solitary or in a raceme.
29. Stamens all of approximately the same length. Pedicel with 3 large verticillate bracteoles. Leaves densely velvety tomentose beneath 28. *D. hookeri*
29. Stamens in 2 sharply separated groups of different length. No such bracteoles. Leaves not densely velvety tomentose beneath.
30. Carpels less than 12.
31. Carpels 6 or more.
32. Flowers in 4 to many-flowered inflorescences.
33. Inflorescence continuously growing. Upper internodes of inflorescence up to 1 cm long. Leaves 6-15 by 3-7 cm 29. *D. luzoniensis*
33. Inflorescence with only short time of growth. Internodes of inflorescence longer. Leaves 15-30 by 7-10 cm 30. *D. excelsa*
32. Flowers solitary or in up to 3-flowered inflorescences.
34. Leaves small (up to 7 by 2 1/2 cm), lanceolate, coriaceous 31. *D. sibuyanensis*
34. Leaves much larger.
35. Leaves elliptic with rounded apex. Flowers *ca* 16 cm diam 32. *D. ovata*
35. Leaves oblong with obtuse to acute apex. Flowers *ca* 6 cm diam 33. *D. sumatrana*
31. Carpels 4-5 34. *D. monantha*
30. Carpels 15-20 35. *D. indica*
25. Flowers either axillary on leaf-bearing branches or solitary or in fascicles on leafless branches.
36. Carpels 5-6. Flowers small, *ca* 2 1/2-3 1/2 cm diam.
37. Flowers axillary. Evergreen species with small leaves 36. *D. pulchella*
37. Flowers in twig-born fascicles. Deciduous species with large leaves 37. *D. pentagyna*
36. Carpels 9-11. Flowers large, *ca* 15 cm diam. 38. *D. obovata*

1. *Dillenia pteropoda* (MIQ.) HOOGL. *comb. nov.*—*Wormia pteropoda* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 77.—*Dillenia papyracea* MERR. Philip. J. Sc. Bot. 9 (1915) 520; En. Philip. 3 (1923) 61.—*Dillenia megalophylla* MERR. Philip. J. Sc. 14 (1919) 421; En. Philip. 3 (1923) 60.—*Wormia papyracea* GILG & WERDERM. in ENGL. & PR. Nat. Pfl. Fam. ed. 2, 21 (1925) 35.

Large tree, up to ca 40 m high, up to 1¼ m diam. Bark red-orange, peeling off in plates. Leaves elliptic, subcoriaceous, ca 17–21-nerved, 30–100 by 16–60 cm, blade with rounded to obtuse apex, obtuse to acute base and entire to slightly undulate-dentate margin. Petiole ca 5–10 cm long, wings up to 2½ cm broad, often caducous. Raceme simple, ca 4–7-flowered, up to 40 cm long. Flowers ca 10 cm diam. Sepals 5, ca 25–33 by 20–22 mm, slightly to densely velvety outside. Petals white, ca 45–50 by 30–32 mm. Stamens ca 700, 14–18 mm long. Carpels 8–12, ca 10 by 3½ mm, with ca 1 cm long styles, each with ca 25 ovules. Fruit dehiscent. Seeds surrounded by a basal, loose, somewhat cup-shaped aril.

Distr. *Malaysia*: Philippines (N. Luzon, Mindanao) and N. Moluccas (Halmahera, Batjan).

Ecol. In primary forests, often along streams, from sea-level up to 500 m.

Vern. Philippines: *tukoran* (Lan.), *malaigang* (Sul.). Moluccas: several names recorded, but none constant.

Notes. TEJSMANN 5886 from Batjan probably represents leaves from a coppice or from a young plant. The leaves are manifestly dentate and have a very short petiole. They are narrower than in the other specimens, ca 90 by 28 cm, with more lateral nerves (ca 40–50).

Dillenia papyracea MERR. and *D. megalophylla* MERR. differ only in the length of the pedicel; this does not seem sufficient argument to keep the two separated. From the Moluccas (including the type specimen) only sterile material is available.

2. *Dillenia beccariana* MARTELLI in BECC. Malesia 3 (1886) 158; MERR. En. Born. (1921) 382.—*Wormia beccariana* RIDL. Saraw. Mus. J. 1 (1913) 71.

Small tree, up to 6 m high. Leaves oblong to narrowly obovate, ca 20–30-nerved, 18–45 by 8–16 cm, with obtuse, often acuminate apex, rounded to obtuse base and slightly to manifestly dentate margin. Petiole ca 3–6 cm long; wings near their base 4–9 mm broad, gradually narrowing towards the base of the blade, coherent with the blade over a breadth of 1½–2 mm, when older loosening from the base of the blade and near the base of the petiole, but not caducous. Raceme up to 20-flowered, up to 60 cm long, distinctly zig-zag. Flowers ca 6½ cm diam. Sepals 5, ca 17–20 by 14–15 mm. Petals yellow, ca 33 by 22 mm. Stamens ca 130, 11–13 mm long. Carpels 5–6, ca 8–10 by 2 mm with ca 5 mm long styles, the carpels and the base of the styles densely covered with rigid, up to 2 mm long hairs; each with ca 20 ovules. Fruit dehiscent, but the carpels possibly only slightly spreading, the young fruit not enclosed by the sepals. Carpels 25 by 16 mm, 1–3-seeded. Seeds 4

by 2½ mm, with a 0.2–0.4 mm long membranaceous aril.

Distr. *Malaysia*: Borneo (Sarawak).

Ecol. In low altitude forests.

Vern. *Simpoh*, *s. delaki* (= male s.), *pētasi*.

Notes. Closely related to *D. albiflos* (RIDL.) HOOGL.

3. *Dillenia albiflos* (RIDL.) HOOGL. *comb. nov.*—*Wormia albiflos* RIDL. J. Str. Br. R. A. S. 54 (1910) 6; Fl. Mal. Pen. 1 (1922) 9.—*Wormia beccariana* (non RIDL.) CORN. Gard. Bull. S.S. 10 (1939) 4; Wayside Trees Malaya (1940) 205.

Tree, up to 17 m high, with red bark, rarely with few stilt-roots. Leaves elliptic to oblong, ca 15–35-nerved, 20–40 by 9–20 cm, with rounded to acute, often slightly acuminate apex, rounded to obtuse base, and slightly undulate to manifestly dentate margin. Petiole ca 2½–4 cm long; wings near the base 5–11 mm broad, gradually narrowing towards the base of the blade, coherent with the blade over a breadth of 1–2 mm, when older loosening from the base of the blade and near the base of the petiole, but not caducous. Inflorescence pendent, up to 30-flowered, composed, being a raceme with the second and often third flower replaced by a secondary raceme, the branches slightly zig-zag. Flowers ca 4 cm diam. Sepals 5, ca 15–20 by 12–14 mm. Petals pale cream white, ca 20 by 13 mm. Stamens ca 160, 5½–8 mm long. Carpels 5–6, ca 4–5 by 1½ mm with ca 5 mm long styles, the carpels and the lower half of the styles rather densely covered with rigid, 0.4–0.7 mm long hairs, each with ca 10 ovules. Fruit dehiscent, the sepals in fruit enlarged to 25 by 15 mm. Carpels 10 by 12 mm, 1–2-seeded. Seeds 4 by 3 mm, finely echinate, with a 1 mm long membranaceous aril.

Distr. *Malaysia*: S. Malay Peninsula (E. Johore).

Ecol. In dry forest and on dry hillocks in swamps, at low altitude.

Vern. Only noted: *simpoh*.

Notes. Closely related to *D. beccariana* MARTELLI, from which it differs by the composed inflorescence, white, slightly smaller flowers and less densely hairy carpels with distinctly shorter hairs. According to CORNER (fieldnote) the biggest trees have the biggest leaves.

4. *Dillenia serrata* THUNB. Trans. Linn. Soc. 1 (1791) 201; MIQ. Fl. Ind. Bat. 1, 2 (1859) 685; MERR. Int. Rumph. (1917) 368.—*Sangium* RUMPH. Herb. Amb. 2 (1741) 142, t. 46.—?*Songium* RUMPH. Herb. Amb. 2 (1741) 140, t. 45.—?*Dillenia elliptica* THUNB. Trans. Linn. Soc. 1 (1791) 200; MARTELLI in BECC. Malesia 3 (1886) 161; MERR. Int. Rumph. (1917) 367; HEYNE, Nutt. Pl. (1927) 1071.

Rather large tree, up to 30 m high and 70 cm diam., with thinly scaling, reddish gray bark. Leaves oblong to lanceolate, 16–35-nerved, 20–45 by 8–19 cm, with rounded to acute apex, obtuse to acute base, and nearly entire to manifestly dentate margin. Petiole 2½–6½ cm long, with half-obcordate, caducous wings. Wings broadening towards the apex, the apex rounded, extending

distinctly above its insertion, at the basis 5–8, near the apex 15–30 mm broad, glabrous to densely sericeously hirsute beneath. Raceme 2–6-flowered, up to 15 cm long with straight to rather tortuous axis. *Flowers* probably apetalous, *ca* 7½ cm diam. Sepals 5, *ca* 40 by 25 mm, densely sericeously hirsute outside. Stamens *ca* 750, 9–11 mm long. Carpels *ca* 18–19, *ca* 4½ by 1½ mm, with *ca* 8 mm long, in the basal half parallel, in the apical half slightly spreading styles with a cushion-shaped stigma, stigma *ca* 0.4 mm thick and 1 mm diam.; each carpel with 5–9 ovules. *Fruit* indehiscent, yellowish, appressed globular, 3½ cm high, 6 cm diam. including the enclosing sepals. Sepals in fruit enlarged to 6½ by 5½ cm, at the base up to 3 mm thick, not completely covering the carpels at the apex. Carpels 25 by 16 mm, up to 5-seeded. Seeds black with reticulate surface, exarillate.

Distr. *Malaysia*: Celebes, Buton, and Muna Islands.

Ecol. In primary forests up to 180 m.

Uses. The fruit is eaten.

Vern. Celebes: *děngěn*, *d. bolusu*, *děngilo*, *dongi*, *wuaděngi*. Muna: *sonih*.

Notes. THUNBERG's binomial is wholly based on *Sangius* RUMPH. RUMPHIUS' description and plate are sufficient for the recognition of the species. *Dillenia elliptica* THUNB. is wholly based on *Songium* RUMPH. The identification of this species is much less certain, but the present species is the only one, that RUMPHIUS' description and plate can be compared with, except that the flowers in RUMPHIUS' species are solitary.

5. *Dillenia celebica* HOOGL. *spec. nov.*

Tree, up to 30 m high, 50 cm diam., with small buttresses, greyish brown bark, slightly flaky in large plates, and greyish red heartwood. *Leaves* elliptic-oblong, *ca* 15–20-nerved, 13–18 by 6–10 cm, with obtuse to acute, often slightly acuminate apex, rounded-obtuse to obtuse base, and undulate to dentate margin. Petiole 4–8 cm long, with usually 2½–5 mm, rarely up to 10 mm broad wings; wings with slightly auriculiform apex, caducous. Raceme 1–5-flowered, up to at least 4 cm long. *Flowers* apetalous, *ca* 4½ cm diam. Sepals 5, *ca* 21–25 by 16–19 mm, sericeous outside. Stamens *ca* 300, 6–7 mm long. Carpels *ca* 11, *ca* 8 by 3½ mm, with *ca* 7 mm long spreading styles with a cushion-shaped stigma, stigma *ca* 0.3 mm thick and 0.8 mm diam.; each carpel with 3–4 ovules. *Fruit* unknown.

Distr. *Malaysia*: N. and C. Celebes.

Uses. The wood is used for house-building.

Notes. Closely related to *D. serrata*, also endemic of Celebes, from which it differs by the much longer petioles, the shape of the petiolar wings, and the much smaller number of carpels. The 2 species are the only ones, where a distinct, knoblike stigma is found in *Dillenia*.

6. *Dillenia ovalifolia* HOOGL. *spec. nov.*—*Dillenia alata* MARTELLI in BECC. *Malesia* 3 (1886) 157, *quoad desc.*

Tree, up to 30 m high, 60 cm diam., with abso-

lutely glabrous branches. *Leaves* rather coriaceous, elliptic to nearly orbicular, 8–13-nerved, 7–27 by 6–22 cm, with rounded apex and base and slightly undulate margin; in bud folded thus as to leave a faint, longitudinal line between each pair of lateral nerves. Petiole 4½–10 cm long, with 5–10 mm broad wings, with a horseshoe-shaped cushion at the insertion. Wings linear with rounded apex, partly caducous, the part falling off being the whole breadth at the base of the petiole, gradually narrowing to a wholly persistent wing at ½–¾ of the petiole; apex auriculate, the auricles of both wings coherent above the petiole, extending slightly above the blade. *Flowers* solitary, terminal, soon lateral, leaf-opposed. Peduncle 5½–7 cm long, at the base triangular in transverse section. Sepals 5, the outer 2 *ca* 25–28 by 19–20 mm, the inner 3 35–40 by 20–22 mm, glabrous or not. Petals white, at least 25 by 18 mm. Stamens *ca* 900, 5–7 mm long, with a 0.7–0.8 mm long acumen. Carpels 7–8, glabrous, *ca* 9 by 2½ mm with 13 mm long styles, each with *ca* 8 ovules. *Fruit* dehiscent. Carpels *ca* 17 by 10 mm, 1-seeded. Seeds *ca* 5 by 3½ mm, enclosed by a 3 mm long aril.

Distr. *Malaysia*: Moluccas (Halmahera, Morotai) and Japen Island near NW. New Guinea (Geelvink-Bay).

Ecol. In primary forest, from sea-level to 1000 m.

Vern. Japen Island: *karoe ai* and *wadajouw*.

Notes. For the identity of *Dillenia alata* MARTELLI see p. 164. The impression on the leaf, caused by the folding in bud, has not been noted so clearly in any other *Dillenia*.

The specimens from the Moluccas differ from those from Japen Island, which are entirely glabrous, by a dense short sericeous indumentum on the young branches, on the basal part of the nerves on the lower surface of the leaves, on the lower side of the petiole, on the peduncle, and on the outer side of the sepals. They represent a distinct variety, *var. sericea* HOOGL. *var. nov.*

7. *Dillenia papuana* MARTELLI in BECC. *Malesia* 3 (1886) 156.—*Wormia pteropoda* (non MIQ.) BOERL. *Cat. Bog.* (1899) 5.—*Dillenia calothyrsa* DIELS, *Bot. Jahrb.* 57 (1922) 437.—*Wormia calothyrsa* GILG & WERDERM. in ENGL. & PR. *Nat. Pfl. Fam.* ed. 2, 21 (1925) 35.—*Wormia papuana* GILG & WERDERM. *l.c.*—*Wormia macrophylla* (non G.&W.) A. C. SMITH, *J. Arn. Arb.* 22 (1941) 498.—**Fig. 8, 9.**

Tree, up to 30 m high, 1 m diam., often with buttresses, with pale reddish brown bark peeling off in very thin papery scales. *Leaves* elliptic to ovate, *ca* 20–25-nerved, 15–40 by 10–35 cm, on young trees and saplings narrower, *ca* 30–35-nerved, 50–100 by 25–50 cm, with rounded to obtuse apex, rounded base, and undulate to slightly dentate margin. Petiole 4–8 cm long, on young trees and saplings up to 10 cm, with half-obcordate, rarely oblong, caducous wings. Wings usually broadening towards the apex, the apex rounded, extending distinctly above its insertion, at the basis 6–10, near the apex up to 35 mm broad. Raceme 4–7-flowered, up to 8 cm long with tortuous axis.



Fig. 9. *Dillenia papuana* MARTELLI. Trees ca 30 m tall, ca 1 m diam., in 2 m deep inundated flood-plain forest. This type of forest was inundated Jan. to May 1939. Bernhard Camp, Idenburg River, West New Guinea (BRASS, ARCHBOLD Expeditions).

Flowers probably never quite expanding, the sepals only slightly diverging, the petals falling off without spreading. Sepals 5, *ca* 30–40 by 25–40 mm. Petals yellow, cucullate when falling, 25–45 by 12–25 mm. Stamens *ca* 185–250, 13–24 mm long (but in a single flower all of approximately the same length), with a 1–2 mm long, acute acumen above the anthercells. Carpels 10–15, *ca* 10–15 by 2–3 mm, with 11–15 mm long styles, each with *ca* 25 ovules. *Fruit* dehiscent. Carpels 25–35 by 16–24 mm, one-seeded. Seeds 6 by 5 mm, black, enclosed by a rather thick fleshy aril.

Distr. *Malaysia*: Tanimbar and Aru Islands, New Guinea, and islands in the Geelvink Bay.

Ecol. In primary forest at low altitudes, on dry or temporarily flooded soil (fig. 9), once collected at *ca* 2000 m.

Uses. Said to supply a good timber.

Vern. Tanimbar Islands: *kamjemeje*. New Guinea: several noted, but none constant.

8. *Dillenia montana* DIELS, Bot. Jahrb. 57 (1922) 437.—*Wormia montana* GILG & WERDERM. in ENGL. & PR., Nat. Pfl. Fam. ed. 2, 21 (1925) 35.

Tree, *ca* 35 m high with 15 m clear trunk, *ca* 40 cm diam., with reddish brown papery scaly bark and brown wood. Younger branches densely villose. *Leaves* elliptic to ovate-elliptic, 9–14-nerved, *ca* 10–21 by 6–17½ cm, with rounded, slightly acuminate apex, rounded base, and dentate margin, more or less villose on both sides. Petiole 2½–7 cm long, with linear-oblong, caducous wings. Raceme 2-flowered, up to 6 cm long, with densely villose axis. *Flowers* incompletely known, possibly never quite expanding. Sepals 5, the two outermost ones *ca* 30 by 30 mm, the three innermost ones *ca* 35 by 30 mm, the outer ones slightly villose outside. Petals 5, yellow. Stamens *ca* 90, 20 mm long. Carpels 8–9, *ca* 18 by 4 mm, with 9 mm long, only slightly spreading styles; each carpel with 13–14 ovules. *Fruit* unknown.

Distr. *Malaysia*: NE. New Guinea (Central Highlands and Hunstein Range).

Ecol. In forests, 1350 and 2000 m.

Vern. *Burra* (Arona), *warawaka* (Aiyura).

Notes. The species is closely related to *Dillenia schlechteri* DIELS and *D. papuana* MARTELLI.

9. *Dillenia schlechteri* DIELS, Bot. Jahrb. 57 (1922) 438.—*Dillenia alata* var. *macrophylla* LAUT. Bot. Jahrb. 45 (1911) 362.—*Dillenia macrophylla* DIELS, Bot. Jahrb. 57 (1922) 437.—*Wormia schlechteri* GILG & WERDERM. in ENGL. & PR. Nat. Pfl. Fam. ed. 2, 21 (1925) 35.—*Wormia macrophylla* GILG & WERDERM. in ENGL. & PR. Nat. Pfl. Fam. ed. 2, 21 (1925) 35.—*Wormia nitida* A. C. SMITH, J. Arn. Arb. 22 (1941) 499.

Large tree, up to 35 m high, 2 m diam., with buttresses to 3 m tall, 1 m long; bark reddish brown, flaky; wood reddish brown, hard and heavy. *Leaves* broadly ovate, *ca* 15–21-nerved, 11–30 by 7½–21 cm, with rounded apex, rounded, slightly cordate base, and slightly undulate margin. Petiole 4–9 cm long, with 4–8 mm broad wings.

Raceme 2–6-flowered, up to *ca* 7 cm long. *Flowers* probably never quite expanding, the sepals only slightly diverging, the petals falling off without spreading. Sepals 5, *ca* 25 by 22 mm. Petals bright yellow, cucullate when falling, *ca* 33 by 28 mm. Stamens *ca* 100, 14–17 mm long. Carpels 8–11, *ca* 8–9 by 2–2½ mm, with 10–12 mm long styles, each with *ca* 14–18 ovules. *Fruit* dehiscent, the sepals enlarged to *ca* 35 by 30 mm. Carpels *ca* 25 by 18 mm, 1-seeded. Seeds *ca* 4 by 3 mm, enclosed by a 2½ mm long aril.

Distr. New Ireland, in *Malaysia*: E. New Guinea.

Ecol. In primary forests, in New Guinea found only between 1300 and 1700 m, in New Ireland at low altitude.

Uses. The durable wood is used for building purposes.

Vern. Once noted: *manaya* (Kuni language).

10. *Dillenia fischeri* MERR. Philip. J. Sc. Bot. 9 (1915) 518; En. Philip. 3 (1923) 60.—*Wormia fischeri* GILG & WERDERM. in ENGL. & PR. Nat. Pfl. Fam. ed. 2, 21 (1925) 35.

Tree, up to 20 m high. *Leaves* elliptic-oblong to oblanceolate, coriaceous, *ca* 7–11-nerved, 6½–14 by 2.8–6½ cm, with rounded apex, obtuse to rounded base, and nearly entire to dentate, mainly in the upper part of the leaf, margin. Petiole 1½–3 cm long, with linear, 1 mm broad, caducous wings. Inflorescence terminal on the leaf-bearing branches or lateral on the older branches in the axil of a leaf-scar; raceme 2–6-flowered, sometimes with one lateral branch, up to 5 cm long. *Flowers* *ca* 6 cm diam., on a 3–6 cm long pedicel. Sepals 4–6, usually 5, *ca* 13–16 by 8–12 mm. Petals as many as sepals, white, *ca* 30 by 14 mm. Stamens *ca* 120–160, the outer ones slightly longer, 9 mm, than the inner ones, 7 mm. Carpels 4–6, usually 5, *ca* 7 by 2½ mm, with 5–8 mm long styles, each with 8–10 ovules. *Fruit* unknown.

Distr. *Malaysia*: Philippines (known only from Mindanao, Butuan subprov.).

Ecol. In semi-open forests at low altitude.

11. *Dillenia quercifolia* (WHITE & FRANCIS ex LANE POOLE) HOOGL. *comb. nov.*—*Wormia quercifolia* WHITE & FRANCIS ex LANE POOLE, For. Res. Terr. Papua & N. Guinea (1925) 116; WHITE & FRANCIS, Proc. Roy. Soc. Queensl. 38 (1926) 242, f. 9 (1927).

Large tree, *ca* 35 m high with 28 m clear trunk *ca* 1.2 m diam., with reddish, papery scaly bark and yellow to rose-brown wood. *Leaves* elliptic 6–9-nerved, 8–15 by 4½–12 cm, with obtuse to rounded, minutely acuminate apex, obtuse to rounded base, and more or less undulate margin, glabrous. Petiole 3–4 cm long, the wings 3–7 mm broad. Raceme 2–4-flowered, up to *ca* 5 cm long with tortuous axis. *Flowers* *ca* 4–5 cm diam. Sepals 5, 12–16 by 10–13 mm. Petals not known from open flowers. Stamens *ca* 60, 10 mm long. Carpels 7–10, usually 8, *ca* 5 by 2 mm, with 7 mm long style, each with 8–9 ovules. *Fruit* unknown.

Distr. *Malaysia*: New Guinea.

Ecol. 'Flowers July to August in N. Division' (LANE POOLE).

Vern. *Lalagi* (Buna & Binandele).

12. *Dillenia fagifolia* HOOGL. *spec. nov.*

Large tree, nearly 50 m high with 30 m clear trunk, ca 1 m diam., with branched buttresses and reddish brown, papery scaly bark; wood pinkish or pale red brown. *Leaves* elliptic, 17–19-nerved, 12½–16 by 8–10 cm, with obtuse apex, obtuse to rounded base, and entire to very slightly undulate margin. *Petiole* 5–5½ cm long, with 7–8 mm broad wings. *Raceme* 6-flowered, with tortuous, ca 6 cm long axis. *Flower* known only in bud. *Sepals* 5, the outermost one (and probably in the open flower the other ones of approximately the same size) 22 by 25 mm. *Petals* present. *Stamens* in 2 rather distinct groups, the outer ones, ca 60, fertile, decreasing in size towards the centre, 5–2½ mm long, with 0.3 mm long acute acumen; the inner ones, ca 90, sterile, ca 1 mm long. *Carpels* 12, in bud ca 2 by 1 mm, with 1 mm long style, each with 12–14 ovules. *Fruit* unknown.

Distr. Malaysia: E. New Guinea (once collected near Aitape, L. S. SMITH, N.G.F. 1229).

Vern. *Ainedin* (But near Wewak).

Notes. The species is only very imperfectly known. The structure of the androecium, however, is so characteristic, that the said specimen certainly represents a new species. This type of androecium was not yet known in *Dillenia*.

13. *Dillenia marsupialis* HOOGL. *spec. nov.*—*Dillenia ochreata* (non MARTELLI) MERR. En. Philip. 3 (1923) 61.

Small tree. *Leaves* elliptic to oblong, ca 13–16-nerved, 12–20 by 5½–10 cm, with rounded or obtuse, ± distinctly acuminate apex, obtuse to acute base, and nearly entire to distinctly dentate margin, entirely glabrous. *Petiole* 1½–4 cm long, with nearly circular to obovate wings. *Wings* up to 35 by 22 mm with rounded apex and entire margin, glabrous, wholly caducous. *Flowers* terminal, solitary, ca 10 cm diam. *Sepals* 8–9, the outermost ones only slightly smaller than those towards the centre, 3½–4 by 2½–3 cm. *Petals* unknown. *Stamens* in 2 groups, the outer group ca 260, ca 13 mm long, straight in bud, the inner group ca 75, ca 23 mm long, with their apex reflexed in bud. *Carpels* ca 15, ca 12 by 2 mm, with ca 20 mm long, recurved styles, each with 7–10 ovules. *Fruit* indehiscent, subglobose, 4–5 cm diam. including the enclosing sepals. *Carpels* ca 25 by 12 mm, 1–2-seeded. *Seeds* enclosed by a membranaceous aril.

Distr. Malaysia: Philippines (Luzon, Panay, and Catanduanes).

Ecol. On forested slopes, up to 1200 m alt.

Notes. Closely related to *Dillenia reifferscheidia* VILLAR, not to *D. ochreata*, though its leaves resemble very much that species. It is easily recognized from the latter species by the larger number of sepals and larger flowers and fruits.

14. *Dillenia reifferscheidia* VILLAR, Nov. App. (1880) 3; BLANCO, Fl. Filip. ed. 3 (1880) t. 344; VIDAL, Rev. Pl. Vasc. Filip. (1886) 38; MERR. En. Philip. 3 (1923) 61.—*Reifferscheidia speciosa* PRESL, Rel. Haenk. 2 (1836) 74, t. 62.—*Dillenia speciosa* GILG in ENGL. & PR. Nat. Pfl. Fam. 3, 6a (1893) 124, non THUNB. (1790).—*Dillenia reifferscheidia* var. *rosea* ELM. Leaf. Philip. Bot. 3 (1923) 61.

Tree, up to ca 11 m high, 60 cm diam. *Leaves* elliptic to obovate, ca 14–20-nerved, ca 15–40 by 10–30 cm, with rounded apex and base and slightly to manifestly dentate margin. *Petiole* 3–4 cm long, strigose beneath, with obovate wings. *Wings* ca 3–5 by 2¼–4 cm, with rounded apex and entire margin, more or less woolly hairy beneath, wholly caducous. *Flowers* terminal, solitary or less often 2–3 together, if solitary with 2–5 or without bracteoles, if 2 (resp. 3) 1 (resp. 2) with and 1 without bracteoles; ca 17½ cm diam. *Sepals* 11–17, the outer ones ca 20 by 22 mm, the inner ones ca 65 by 40 mm. *Petals* white or, rarely, rose red (var. *rosea* ELM.), ca 9 by 5 cm. *Stamens* in 2 groups, outer group ca 375, 11 mm long, straight in bud, inner group ca 60, 25 mm long, with their apex reflexed in bud. *Carpels* ca 15, ca 12 by 3 mm, with ca 18 mm long, recurved styles, each with 9–12 ovules. *Fruit* indehiscent, subglobose, 5–8 cm diam. including the enclosing sepals. *Carpels* 20–25 by 10–12 mm, 1–4-seeded. *Seeds* black, enclosed by a membranaceous aril.

Distr. Malaysia: Philippines (from the S. half of Luzon to Mindanao, not in the Westernmost islands).

Ecol. In primary forests in humid regions with abundant rainfall, from low altitude to ca 1000 m.

Uses. Construction timber tree. The fruit makes a good preserve.

Vern. *Balali* (Bik.), *katmón* (Tag., P. Bis.), *k. kadlagan* (Bik.), *k. kalabáw* (Tag.), *paláli* (Bik.).

15. *Dillenia suffruticosa* (GRIFF.) MARTELLI in BECC. Malesia 3 (1886) 163; MERR. En. Born. (1921) 384; DE WIT, Bull. Bot. Gard. Btzg, III, 18 (1949) 208.—*Wormia suffruticosa* GRIFF. Not. 4 (1854) 706; Ic. Pl. As. (1854) t. 649; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 35; KING, J. As. Soc. Beng. 58, 2 (1889) 364; RIDL. J. Str. Br. R.A.S. 54 (1910) 5; BACK. Schoolf. Java (1911) 10; KOORD. Exk. Fl. Java 2 (1912) 601; BLAAUW, Trop. Nat. Schets. Kleur. (1913) 17, t. 12; RIDL. Fl. Mal. Pen. 1 (1922) 8; BURK. Dict. (1935) 2265; CORN. Gard. Bull. S. S. 10 (1939) 9; Wayside Trees Malaya (1940) 207, pl. 53; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 4.—*Wormia excelsa* (non JACK) Hk. f. & Th. Fl. Ind. 1 (1855) 67.—*Wormia subsessilis* MIQ. Fl. Ind. Bat. Suppl. (1860) 619; Ann. Mus. Bot. Lugd. Bat. 1 (1864) 315, t. 9; *ibid.*, 4 (1868) 77; RIDL. J. Str. Br. R.A.S. 54 (1910) 4; Fl. Mal. Pen. 1 (1922) 7, f. 2.—*Wormia burbidgei* HOOK. f. Bot. Mag. (1880) t. 6531.—*Dillenia burbidgei* GILG in ENGL. & PR. Nat. Pfl. Fam. 3, 6 (1893) 123.—*Wormia subsessilis* var. *borneensis* RIDL. J. Str. Br. R.A.S. 54 (1910) 6.—*Dillenia suffruticosa* var. *borneensis* RIDL. Saraw. Mus. J. 1

(1913) 71; MERR. En. Born. (1921) 384.—*Dillenia* sp. DE VOOGD. Trop. Natuur 21 (1932) 61 —Fig. 10.

Large shrub, up to 10 m high. *Leaves* elliptic to obovate, *ca* 12–20-nerved, *ca* 15–25 by 8–12 cm, blade with ± obtuse apex and base and entire to dentate margin, glabrous above or sometimes



Fig. 10. *Dillenia suffruticosa* (GRIFF.) MARTELLI, Palembang (DE VOOGD).

slightly woolly on young leaves, beneath slightly to densely woolly on the lateral nerves, on both sides of the central nerve (continuing on the petiole), and along the line which delimits the bud-enclosing part of the leaf-basis. Petiole *ca* 2–6 cm long with up to 1½ cm broad, usually persistent wings. Raceme usually simple, sometimes composed, *ca* 5–12-flowered. *Flowers* *ca* 8–11 cm diam. Sepals 5, *ca* 15–22 by 8–12 mm, in fruit enlarged to *ca* 18–25 by 10–15 mm. Petals bright yellow, *ca* 40–50 by 25–30 mm. Staminodes *ca* 100, 6 mm long. Stamens *ca* 175, the outer ones 8 mm long, straight in bud, the inner ones 13 mm long, with their apex reflexed in bud, with intermediate lengths. Carpels 5–8, usually 7, *ca* 5 by 2 mm, with yellowish white, *ca* 1 cm long styles, each with 7–10 ovules. *Fruit* dehiscent. Carpels red, *ca* 20–25 by 10–16 mm, each 1–4-seeded. Seeds brown or black, with a membranaceous, scarlet aril.

Distr. *Malaysia*: Sumatra (Palembang), Malay Peninsula, Riouw- and Lingga-Archipelagos, Natuna, Banka, Billiton, W. Java, and Borneo. Contrarily to the opinion of DE WIT I do not believe that the species is indigenous in W. Java. All collections are made within a relatively small area

around Bogor and of fairly recent date, all made at least 30 years after the introduction of the species into the Botanic Garden. Moreover, the species easily naturalizes, e.g. in Jamaica, where it has become abundant.

Ecol. In marshes, along streams, and on the margin of forests, often forming thickets, from sea-level up to 500 m. Flowering continuously, each flower open for one day only, between 2 flowers of the same raceme a difference of *ca* 3–4 days. Fruit ripe after 36 days (CORNER, 1940); seeds eaten by birds.

Uses. Sometimes planted as an ornamental.

Vern. Malay Peninsula: *simpoh*, *s. ayer* (= water s.), *s. gajah* (= elephant or big s.), *s. pasir* (= sand s.). Natuna: *simpur*. Banka: *simpong*, *sipur*, *kaju simpur* (= tree s.), *kembang mēsimpur* or *masimpur* (= flower s.), *mininpor*, *simpur prampuan* (= female s.). Billiton: *simpur*. Borneo: *dungin* (Dusun), *simpur*, *simpur*, *s. bini* (= female s.), *s. ayer* (Mal.).

16. *Dillenia ochreate* (MIQ.) TELISM. & BINN. Cat. Hort. Bog. (1866) 178, *nomen*, ex MARTELLI in BECC. Malesia 3 (1886) 178; HEYNE, Nutt. Pl. (1927) 1072.—*Wormia ochreate* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 77, t. 1; KOORD. Meded. Pl. T. 19 (1898) 327.

Tree, up to 15 m high and 35 cm diam. *Leaves* ovate or elliptic-oblong, *ca* 15–18-nerved, 10–20 by 4½–10 cm, with acute, often slightly acuminate, less often obtuse apex, rounded to acute base, and nearly entire to slightly dentate margin, glabrous. Petiole *ca* 16–20 mm long, with broad half-obcordate wings; wings *ca* 16–18 by 13–15 mm, with entire margin, glabrous, caducous. *Flowers* solitary, terminal, *ca* 6–8 cm diam. Sepals approximately circular, 2–2½ cm diam., glabrous. Petals yellow, 4 by 3½ cm. Stamens *ca* 165, the outermost ones *ca* 7½ mm long, straight in bud, the innermost ones *ca* 12 mm long, with the apex reflexed in bud, with intermediate lengths. Carpels 6–9, *ca* 7 by 2½ mm, with 7 mm long styles; each with 8 ovules. *Fruit* indehiscent, pale green, slightly depressed-globular, *ca* 32 mm diam., 26 mm high. Carpels very slightly spirally twisted, *ca* 15 by 12 mm, 1-seeded. Seeds *ca* 5 by 4 mm, very finely densely echinate, enclosed by a 10 mm long, rather fleshy aril.

Distr. *Malaysia*: NE. Celebes (Minahasa).

Ecol. In forests from low altitude to 800 m, often found on volcanic sand.

Vern. *Kelemur* (Alf.); some other names noted, but not constant.

17. *Dillenia megalantha* MERR. Philip. J. Sc. Bot. 9 (1914) 519; WESTER, Philip. Agr. Rev. 14 (1921) 242; MERR. En. Philip. 3 (1923) 60.—*Dillenia mindanaensis* ELM. Leaf. Philip. Bot. 7 (1915) 2611; WESTER, Philip. Agr. Rev. 14 (1921) 287, t. 27b; MERR. En. Philip. 3 (1923) 60.—*Wormia megalantha* GILG & WERDERM. in ENGL. & PR. Nat. Pfl. Fam. ed. 2, 21 (1925) 35.

Tall tree, up to 20(–40?) m high, 40 cm diam., with brown and gray bark, scaling off in thin plates.

Leaves oblong to oblanceolate, *ca* 25–35-nerved, 25–70 by 8–25 cm, with acute, often slightly acuminate apex, rounded base, and manifestly dentate margin. Petiole 2½–5 cm long, with obovate wings; wings 2½–5 by 1½–3 cm (on saplings up to 10 by 6 cm), with rounded apex and slightly to manifestly dentate margin, caducous. *Flowers* solitary, terminal, *ca* 20 cm diam. Sepals elliptic, 25–40 by 20–30 mm. Petals yellow, *ca* 10 by 7½ cm. Stamens in 2 distinct groups, the outer ones *ca* 600, 10–12 mm long, straight in bud, the inner ones *ca* 100, 17–25 mm long, with their apex reflexed in bud; on the outside a small number of staminodes, 6–14 mm long. Carpels 14–16, *ca* 10 by 3 mm with 22 mm long styles, each with *ca* 25 ovules. *Fruit* indehiscent, 5–7½ cm diam. including the enclosing sepals, which are *ca* 7 by 5 cm, at the basis 8 mm thick. Carpels *ca* 25 by 11 mm, 1-seeded. Seeds obovoid, 6 by 4 mm, finely shortly echinate, with an 8 mm long, membranaceous aril.

Distr. *Malaysia*: Philippines (S. Luzon to Mindanao, absent from N. Luzon to Palawan).

Ecol. In primary forests at low altitude, up to 1000 m.

Uses. The fruit is eaten.

Vern. *Kalambog* (Bag.), *katmón* (Bik., S.L. Bis., Bag.), *katmón-bayani* (Tag.), *lumbóg* (Sub.), *paláli* (Sub.).

18. *Dillenia talaudensis* HOOGL. *spec. nov.*

Small tree, *ca* 8 m high, 11 cm diam.; branches glabrous. *Leaves* elliptic or ovate, 18–20-nerved, 20–30 by 14–21 cm, with obtuse to rounded apex with small acumen, rounded base, and slightly dentate margin. Petiole 3½–5 cm long, with caducous wings. Wings obovate, up to 12 mm broad, the apex extending about ½ cm above the insertion, ending into a mucronate acumen. Raceme 2–3-flowered, with 10–12 cm long axis. *Flowers* known only in bud and as young fruit, on a short, thick pedicel. Sepals 5, the outer 2 *ca* 21 by 19 mm, the inner 3 *ca* 30 by 23 mm. Petals in bud up to 22 by 15 mm. Stamens in 2 distinct groups, the outer ones, *ca* 250, *ca* 6 mm long in bud, 10 mm in the young fruit, straight in bud, the inner ones, *ca* 80, *ca* 11 mm long in bud, 19 mm in the young fruit, with their apex reflexed in bud. Carpels 14, *ca* 5 by 1.3 mm in bud, with 11 mm (in the young fruit 20 mm) long styles, each with 8–11 ovules. *Fruit* unknown.

Distr. *Malaysia*: Salibabu Island, Talaud group N of Celebes, once collected.

Ecol. Common in secondary forest.

Uses. The fruit is eaten uncooked.

Vern. *Luaran'a*.

19. *Dillenia alata* (R.Br. ex DC.) MARTELLI in BECC. *Malesia* 3 (1886) 157.—*Wormia alata* R.Br. ex DC. *Syst.* 1 (1818) 434; *Prod.* 1 (1824) 75; BTH. *Fl. Austr.* 1 (1863) 16; MQ. *Ann. Mus. Bot. Lugd. Bat.* 4 (1868) 78; F.v.M. *Fragm.* 7 (1871) 124; BAIL. *Queensl. Fl.* 1 (1899) 10; BANKS & SOL. *Ill. Bot. Capt. Cook's Voy.* 1 (1900) 5, t. 1; BAIL. *Compr. Cat. Queensl. Pl.* (1909) 18, pl. 2; BRASS, *J. Arn. Arb.* 19 (1938) 186, pl. 222.—*Lenidia alata*

POIR. *Dict. Sc. Nat.* 25 (1822) 448.—*Wormia apetalata* GAUD. in FREYC. *Voy. Bot.* (1826) 476, t. 99.—*Dillenia apetalata* MARTELLI ex DUR. & JACKS. *Ind. Kew. Suppl.* 1 (1902) 136.

Tree, up to 20 m high, 60 cm diam., with reddish brown bark peeling off in thin papery flakes, and crooked branches. *Leaves* ovate to elliptic, *ca* 8–14-nerved, 8–25 by 5–15 cm, with rounded apex and base and entire, slightly recurved margin. Petiole 2½–4 cm long, with 2–6 mm broad wings; wings narrowing towards the base of the blade, partly caducous, leaving behind a ½ mm broad part on the lower ½–⅓ of the petiole, the wing on the upper ⅔–¼ permanent. Raceme 2–4-flowered. *Flowers* *ca* 7½ cm diam. Sepals 5, the outer 2 circular, 1.3 cm diam., the inner 3 elliptic-ovate, 2 by 1½ cm. Petals yellow, 40 by 25 mm. Stamens in 2 distinct groups, the outer ones *ca* 100, 7–8 mm long, straight in bud, the inner ones *ca* 18, 11–13 mm long, with their apex reflexed in bud. Carpels 6–8, deep crimson, *ca* 10 by 4 mm, with red, *ca* 14 mm long styles, each with *ca* 8 ovules. *Fruit* dehiscent. Carpels 18–20 by 10–14 mm, 1–3-seeded. Seeds 4 by 3 mm, black, enclosed by a membranaceous, waxy white aril.

Distr. E. Coast of N. Queensland, S to about 20° S, in *Malaysia*: Waigeo and S. New Guinea.

Ecol. In *Malaysia* found in savannah forests.

Notes. The first description of the species was that by DC. (1818) *l.c.* under the name *Wormia alata* R.Br., citing *Dillenia alata* BANKS as a synonym. The first legitimate transfer to *Dillenia* was effected by MARTELLI (1886), who, however, described a specimen of *Dillenia ovalifolia* HOOGL.

20. *Dillenia philippinensis* ROLFE, *J. Linn. Soc.* 21 (1884) 307; VIDAL, *Rev. Pl. Vasc. Filip.* (1886) 37; MERR. *Fl. Manila* (1912) 331; WESTER, *Philip. Agr. Rev.* 8 (1915) 104, t. 7a; MERR. *Sp. Blanc.* (1918) 263; BROWN, *Minor Prod. Philip. For.* 2 (1921) 338, f. 62, 63; MERR. *En. Philip.* 3 (1923) 61.—*Dillenia indica* (non L.) BLANCO, *Fl. Filip.* (1837) 472; VILLAR, *Nov. App.* (1880) 3.—*Dillenia speciosa* (non THUNB.) BLANCO, *Fl. Filip. ed.* 2 (1845) 329, ed. 3, 2 (1878) 244, atlas t. 199.—*Dillenia catmon* ELM. *Leaf. Philip. Bot.* 7 (1915) 2610; MERR. *En. Philip.* 3 (1923) 59.

Tree, up to 17 m high, 60 cm diam., with rather low-attached crown, reddish bark, and dark wood. *Leaves* elliptic or ovate to lanceolate, *ca* 10–15-nerved, 8–25 by 6–16 cm, chartaceous, with rounded to obtuse, often slightly acuminate apex, rounded to obtuse base, and slightly dentate or undulate margin. Petiole 3½–5 cm long, with half-elliptic to half-oblong, 3–12 mm broad, caducous wings. Inflorescence a 1–2-, rarely 3-flowered raceme with 5–16 cm long axis. *Flower* *ca* 10–15 cm diam. Sepals 5, the two outer ones *ca* 1.8 by 1.8 cm, the 3 inner ones 2–2½ by 1.7–2 cm. Petals white, 4–7 by 2–5 cm. Stamens in 2 distinct groups, the outer ones, *ca* 230, yellow, 11 mm long, straight in bud, the inner ones, *ca* 40, purplish, 15–23 mm long, with their apex reflexed in bud. Carpels 10–12, 7–9 by 2½–3 mm, with linear, *ca* 17 mm long, spreading styles, each with 10–12 ovules. *Fruit* in-

dehiscent, depressed-globose, 4–5 cm high, 5–6 cm diam. including the enclosing slightly fleshy sepals. Carpels slightly spirally twisted, fleshy, 20 by 13 mm, 1–4-seeded. Seeds 5 by 3 mm, very finely echinate, at the base enclosed by a 2 mm long, membranaceous aril.

Distr. *Malaysia*: Philippines from the Babuyan Islands to the Sulu Archipelago, not in Palawan.

Ecol. Common in forests at low and medium altitudes, rarely above 1000 m, once collected at 1800 m.

Uses. The pulp from the fruit is eaten; it makes an excellent sauce or jam and is used, mixed with sugar, as a cough cure. It is also used for cleansing the hair. A red dye is obtained from the bark.

Vern. The following vernaculars are in use: *balale*, *balobayauak*, *bihis*, *biskan*, *bolobayauak*, *cachuchio*, *dingin*, *kalambúgí*, *kambúg*, *katmón*, *kulambúg*, *paláli*, *palále*, and *pamalalien*, the most frequently used ones being *katmón* and *palale*.

Notes. MERR. (1923, *l.c.*) distinguishes a *var. pubifolia*, which differs from the typical form by the hirsute inflorescences and sepals and the pilose underside of the leaves. The differences are only very slight.

21. *Dillenia diantha* HOOGL. *spec. nov.*

Tree, up to 25 m high, 60 cm diam. *Leaves* elliptic to oblong, 5–8-nerved, *ca* 6–12 by 4½–7½ cm, with rounded to obtuse or slightly emarginate apex, rounded to obtuse base, and slightly undulate to dentate margin, glabrous. Petiole 1½–4 cm long, with linear-lanceolate, 1–2 mm broad wings; wings with rounded or auriculiform apex, caducous. Inflorescence a 2-flowered raceme, less often flowers solitary; axis 1½–4 cm long. *Flowers* *ca* 9 cm diam. Sepals 5, elliptic, *ca* 22 by 15 mm. Petals yellow, *ca* 45 by 29 mm. Stamens in 2 distinct groups, the outer ones *ca* 155, 9–10 mm long, straight in bud, the inner ones *ca* 20, 13–15 mm long, with their apex reflexed in bud. Carpels (5–)7–9, glabrous to sparsely shortly hirsute, mainly in the apical part, *ca* 9 by 2½ mm, with *ca* 15 mm long styles. Cell-wall inside the apical part and wall of the stylar canal hirsute. Each carpel with 9–11 ovules. *Fruit* dehiscent, the sepals enlarged to *ca* 28 by 20 mm. Carpels 18 by 16 mm, showing the hirsuteness inside the apical part. Seeds unknown.

Distr. *Malaysia*: Philippines (Luzon).

Ecol. In forests at low altitude.

Uses. The wood is used for building purposes.

Vern. *Babacao* (Ibanag dial.), *malacatmon* (Tag.), *marapalali* (Ilocane).

Notes. The leaves of the species are similar to those of *D. luzoniensis* and *D. monantha*; the species is easily distinguished by the winged petiole and consequently amplexicaul leaf-scar.

22. *Dillenia bolsteri* MERR. Philip. J. Sc. Bot. 7 (1912) 305; En. Philip. 3 (1923) 59.—*Dillenia cauliflora* MERR. Philip. J. Sc. Bot. 9 (1915) 517; En. Philip. 3 (1923) 60.

Tree, up to 20 m high. *Leaves* elliptic-oblong, *ca* 15–20-nerved, 10–25 by 4–11 cm, with acuminate apex with *ca* 1 cm long acumen, acute to obtuse

base, and slightly dentate margin, most strongly so in the upper part of the leaf. Petiole 2–4½ cm long, with lanceolate, 4–6 mm broad wings; wings villose-pubescent beneath, caducous. Inflorescence either a terminal, 2–4-flowered, up to 10 cm long raceme, or cauline with a woody, sparingly branched axis with flowers solitary or in 2-flowered racemes terminal on this sympodially built axis. Cauline inflorescence with ovate bracts, representing the winged petiole of the normally developed leaf, conduplicate, *ca* 10–20 mm long, 2 × 5–10 mm broad, amplexicaul, leaving amplexicaul scars on the axis. *Flowers* *ca* 6 cm diam. Sepals 5, elliptic, *ca* 20 by 16 mm. Petals whitish, 30 by 13 mm. Stamens in 2 distinct groups, the outer ones *ca* 160, 5–5½ mm long, straight in bud, the inner ones *ca* 25, 7–8½ mm long, with their apex reflexed in bud. Carpels 8–10, *ca* 6 by 3 mm with cylindrical, 7 mm long styles, each with 6–8 ovules. *Fruit* indehiscent, globular, *ca* 2½ cm diam. including the enclosing sepals, which are up to 30 by 30 mm, at the base 0.4 mm thick. Carpels *ca* 15 by 9 mm, 1-seeded. Seeds obovate, 5 by 3½ mm, exarillate.

Distr. *Malaysia*: Philippines (Samar, Leyte, and Surigao Prov. of Mindanao).

Ecol. In primary forests at low altitude.

Notes. The present species is the only one in *Dillenia* where these sympodially built cauline inflorescences are found. The twig-born and cauline inflorescences of *Dillenia pentagyna* and related species most probably are monopodial and comparable with the inflorescences of *Dillenia pulchella*.

23. *Dillenia auriculata* MARTELLI in BECC. Malesia 3 (1886) 159.—*Wormia auriculata* GILG & WERDERM. in ENGL. & PR. Nat. Pfl. Fam. ed. 2, 21 (1925) 35; A. C. SMITH, J. Arn. Arb. 22 (1941) 501.

Slender, tall tree, up to 30 m high, with flaky reddish brown bark. *Leaves* oblong, *ca* 8–12-nerved, 7–16 by 3–7 cm, with rounded-obtuse to acute apex, rounded to obtuse base, and entire to slightly undulate margin, glabrous. Petiole 1½–5 cm long, with up to 7 mm broad, linear-lanceolate wings; wings caducous except often a small, up to 5 mm long, upper part, remaining as 2 small auricles below the blade. Raceme 1–3-flowered, up to 11 cm long. *Flowers* *ca* 8–10 cm diam. Sepals 5, the outer 2 *ca* 17–19 by 15–17 mm, the inner 3 *ca* 25–30 by 20–24 mm. Petals narrowly obovate, yellow, *ca* 40 by 16 mm. Stamens in 2 distinct groups, the outer ones *ca* 225, 8–10 mm long, straight in bud, the inner ones *ca* 28, *ca* 18 mm long, with their apex reflexed in bud; yellow. Carpels 6–10, *ca* 8 by 3 mm, with linear, red, 16 mm long styles; each with 8–11 ovules. *Fruit* unknown.

Distr. *Malaysia*: New Guinea.

Ecol. On riversides and in ridge forests. *Ca* 1 m long proproots are noted for this species.

24. *Dillenia castaneifolia* (MIQ.) MARTELLI ex DUR. & JACKS. Ind. Kew. Suppl. 1 (1902) 136 (*castaneefolia*); DIELS, Bot. Jahrb. 57 (1922) 438.—*Wormia castaneifolia* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 78; MARTELLI in BECC. Malesia

3 (1886) 164 (*castaneaeifolia*); MIQ. *ex* HOOK. *f.* & JACKS. *Ind. Kew.* 2 (1895) 1233 (*castaneaeifolia*).—*Wormia macdonaldi* F.V.M. *Vict. Natural.* 2 (1886) 146; *Bot. Centralbl.* 26 (1886) 114.—*Dillenia misorensis* MARTELLI in BECC. *Malesia* 3 (1886) 160.—*Dillenia albertisiana* MARTELLI in BECC. *Malesia* 3 (1886) 161.—*Wormia longepetiolata* WARB. *Bot. Jahrb.* 13 (1891) 378.—*Dillenia pedunculata* K. SCHUM. & LAUT. *Fl. Deut. Schutzgeb. Südsee* (1901) 445.—*Dillenia macdonaldi* MARTELLI *ex* DUR. & JACKS. *Ind. Kew. Suppl.* 1 (1902) 136.—*Wormia hirta* RIDL. *Trans. Linn. Soc. Bot.* 9 (1916) 13.—*Dillenia longepetiolata* DIELS, *Bot. Jahrb.* 57 (1922) 436.—*Dillenia hirta* DIELS, *Bot. Jahrb.* 57 (1922) 436.—*Dillenia castaneaeifolia* var. *dolichobotrys* DIELS, *Bot. Jahrb.* 57 (1922) 439.—*Wormia misorensis* GILG & WERDERM. in ENGL. & PR. *Nat. Pfl. Fam. ed.* 2, 21 (1925) 35.—*Dillenia alata* var. *macrophylla* (non LAUT.) LANE POOLE, *Rep. For. Res. Papua* (1925) 116.

Tree, up to 20 m high, 50 cm diam., with light brown heartwood. *Leaves* oblong to elliptic-oblong, *ca* 10–16-nerved, 10–25 by 5–15 cm, with acute to rounded apex and base and entire to slightly dentate margin. Petiole 1½–6 cm long, with 4–7 mm broad wings; wings narrowing towards the base of the blade, caducous. Raceme 1–6-flowered, up to 30 cm long. *Flowers* 6½–9 cm diam. Sepals 5, the outer 2 elliptic to circular, 15 by 12–15 mm, the inner 3 obovate, 20–30 by 15–18 mm. Petals deep lemon yellow, 40–50 by 25–30 mm. Stamens in 2 distinct groups, the outer ones *ca* 250–300, 6½–8 mm long, straight in bud, the inner ones *ca* 23–35, 11–14 mm long, with their apex reflexed in bud; on the outside often a number of staminodes (up to 25). Carpels 8–10, red, 6–7 by 1½–2 mm, with 9–11 mm long styles, each with *ca* 6–12 ovules. *Fruit* dehiscent, when ripe with carmine red sepals enlarged to 30–40 by 17–20 mm. Carpels 15 by 10 mm, 1-seeded. Seeds 4 by 3½ mm, enclosed by a membranaceous aril.

Distr. Malaysia: New Guinea and islands in the Geelvink Bay.

Ecol. In primary and secondary forests, usually on riversides.

Vern. Oesang, wesang (Dutch New Guinea).

Notes. The species is very variable in size of the leaves, less so in the leaf-shape, and in the length of the inflorescence. These forms, described as separate species or varieties, are connected with each other by intermediate forms, and considered here to represent one, polymorphic species, the most polymorphic one found in the genus.

25. *Dillenia eximia* MIQ. *Fl. Ind. Bat. Suppl.* (1860) 620; *Ann. Mus. Bot. Lugd. Bat.* 4 (1868) 79; MERR. *En. Born.* (1921) 383.—*Dillenia crassisepala* MARTELLI in BECC. *Malesia* 3 (1886) 156; MERR. *En. Born.* (1921) 383.—*Wormia scortechinii* KING, *J. As. Soc. Beng.* 58, 2 (1889) 365.—*Wormia kunstleri* KING, *J. As. Soc. Beng.* 58, 2 (1889) 366.—*Dillenia scortechinii* RIDL. *J. Str. Br. R. A. S.* 54 (1910) 7; *Fl. Mal. Pen.* 1 (1922) 12.

Deciduous tree, up to 40 m high, 70 cm diam., with large buttresses, passing into stilt-roots.

Leaves elliptic to obovate, *ca* 18–28-nerved, 15–25 by 9–15 cm, with rounded to obtuse apex, obtuse to somewhat cordate base, and entire to undulate-dentate margin; in saplings longer and narrower, 45–80-nerved, 35–75 by 13–25 cm. Petiole 3–7 cm long, in saplings up to 17 cm. Inflorescence a (3–) 5–12(–18)-flowered composed raceme, forming a loose cluster. *Flowers* appearing with the leaves, apetalous, *ca* 2½ cm diam. Sepals 5, about circular, 9–12 mm diam. Stamens all of approximately the same length, *ca* 150–180, 4½–5½ mm long; margin of the anthercells ciliate. Carpels 4–6, usually 5, white, *ca* 3½ by 1½ mm, with 5 mm long, white styles, each with *ca* 30 ovules. *Fruit* indehiscent, dark green, slightly flattened-globular, *ca* 30 mm diam., 25 mm high including the enclosing sepals, which are up to 40 by 27 mm, at the basis up to 8 mm thick. Carpels 10 by 7 mm, 1–2-seeded. Seeds 5½ by 3½ mm, with a rudimentary, about 0.2 mm long aril.

Distr. Malaysia: Sumatra, Malay Peninsula, and Borneo.

Ecol. In primary forests at low altitude (to 300 m), on wet to rather dry soil. *Fl.* in the Mal. Pen. from March to May, *fr.* from April to July; in Sumatra and Borneo *fl.* from July to Nov., *fr.* from Nov. to Jan.

Uses. The wood is rarely used in house-building.

Vern. Mal. Pen.: *simpoh, s. jangkang* (=stilted s.), *merah*. Sumatra: *bawal* (Djambi), *bira* (Indr.), *djangkang* (Pal.), *gawal, gawar* (Indr.), *mempelu* (Sum. E. Coast), *sédjèrangkong* (Pal.), *simar timbaho darat* (Tapan.), *simpur, s. kidjang, s. rawang* (Pal.). Borneo: *bèriga, riga* (Daj.), *djongong* (Mal.), *entepung rimba* (Mal.), *ketang bajut* (Daj.), *kadjang* (Mal.), *markadjang* (Daj.), *suretang* (Daj.), *tèmpuru* (Daj.).

26. *Dillenia borneensis* HOOGL. *spec. nov.*

Tree, probably deciduous, up to 40 m high, 70 cm diam., with stilt-roots. *Leaves* elliptic to elliptic-oblong or obovate, *ca* 25–35-nerved, 25–40 by 12–20 cm, with rounded apex, obtuse base, and minutely undulate-dentate margin. Petiole 4–9 cm long, densely sericeously hirsute above. Inflorescence a 3–10-flowered composed raceme, forming a loose cluster. *Flowers* appearing with the leaves, *ca* 6 cm diam. Sepals 5, elliptic, 1.2–2 by 0.8–1.4 cm. Petals yellow, *ca* 2½ by 1½ cm. Stamens *ca* 335, in 2 distinct groups, either the outer group all of the same length, *ca* 8 mm long, straight in bud, the inner group *ca* 14 mm long, with their apex reflexed in bud, or the stamens of the outer group gradually decreasing in size towards the centre from 11 to 4 mm, with their apex more or less inflexed in bud, those of the inner group *ca* 13 mm long, with their apical part (*ca* 2 mm) reflexed. Carpels 7–8, *ca* 8 by 1 mm, with *ca* 8 mm long styles, each with *ca* 25–50 ovules. *Fruit* unknown.

Distr. Malaysia: Borneo.

Ecol. In primary and secondary forest at low altitude.

Vern. Gèrige, riga, rogung (Daj.), *simpur* (Mal.).



Fig. 11. *Dillenia reticulata* KING with stilt-roots in the Mal. Peninsula. *Courtesy For. Res. Institute, Kepong.*

Notes. Most specimens have the second type of androecium; the first type was found only in one collection, which agrees with the species in all other characters. As, however, the flowers in this specimen (JAHERI 840) are not attached to the specimen, but added loose, I have not given this form varietal rank, though I am convinced that the flowers belong to the specimen. When better known, the two forms may have to be distinguished as separate varieties. The species is strongly characterized by the densely hirsute upper side of the petiole.

27. *Dillenia reticulata* KING, J. As. Soc. Beng. 58, 2 (1889) 367; RIDL. Fl. Mal. Pen. 1 (1922) 11; FOXW. Mal. For. Rec. 3 (1927) 148 (with 2 plates); BURK. Dict. (1935) 810.—*Wormia mollissima* BOERL. Cat. Hort. Bog. (1899) 5.—? *Dillenia rhizophora* BOERL. & KOORD. in KOORD.—SCHUM. Syst. Verz. 2 (1910) 36.—Fig. 11.

Deciduous tree, up to 40 m high, 17 cm diam., with conspicuous stilt-roots. *Leaves* elliptic or elliptic-oblong to obovate, *ca* 25–35-nerved, 15–30 by 10–20 cm, with rounded to slightly emarginate apex, obtuse to rounded or cordate base, and entire to slightly undulate-dentate margin. Petiole 4–10 cm long. Inflorescence a (3–)5–10(–15)-flowered composed raceme, forming a loose cluster. *Flowers* appearing with the leaves, *ca* 8 cm diam. Sepals 5, broadly elliptic, *ca* 20–25 by 16–20 mm. Petals yellow, *ca* 35 by 16 mm. Stamens *ca* 400–440, all straight in bud, those of the outer whorl *ca* 11 mm long, those immediately within this whorl 5 mm long, the size gradually increasing towards the centre of the flower to 9 mm in the innermost ones. Carpels 9–10, *ca* 6 by 1½ mm, with 5–6 mm long styles, each with 50–70 ovules. *Fruit* indehiscent, greenish yellow, slightly flattened-globular, *ca* 35 mm diam, 30 mm high including the enclosing sepals, which are up to 45 by 42 mm, at the base 6 mm thick. Carpels 16 by 8½ mm, 1–3-seeded. Seeds 3½ by 2½ mm, with a rudimentary, *ca* 0.2 mm long aril.

Distr. *Malaysia*: Sumatra, Malay Peninsula, and Borneo.

Ecol. In primary forests at low altitude, on wet to rather dry soil. The stilt-roots are also developed when the tree grows in a never-flooded habitat. As far as can be derived from the few collections, the flowering- and fruiting-time agree with those of *Dillenia eximia* MIQ.

Vern. Mal. Pen.: *simpoh*, *s. jangkang* (=stilted s.), *s. paya* (=marsh s.). Borneo: *simpur*, *témpuran*.

Notes. In the vegetative state the species is not distinguishable with certainty from hirsute forms of *Dillenia eximia* MIQ. *Dillenia rhizophora* BOERL. & KOORD. is such a status, most probably referable to the present species.

On account of the hairyness of the carpels two varieties can be distinguished: *var. reticulata* with the carpels hirsute in the apical part, and *var. psilocarpella* HOOGL. *var. nov.* with glabrous carpels. The first variety is known only from the Malay Peninsula, the second from the whole area of the species.

28. *Dillenia hookeri* PIERRE, Fl. For. Coch. 1 (1879) t. 5; FIN. & GAGNEP. Fl. Gén. I.C. 1 (1907) 20; CRAIB, Fl. Siam. En. 1 (1925) 22.

Tree, 10–15 m high, or, more often, low shrub, ½–2 m high, with reddish wood. *Leaves* oblong to oblanceolate, *ca* 30–40-nerved, 17–22 by 7–9 cm, with rounded, sometimes slightly acuminate apex, acute base, and entire to slightly dentate margin, densely velvety-tomentose beneath. Petiole 1½–4 cm long. *Flowers* single, rarely 2, terminal, 4–5 cm diam., the pedicel with 3 verticillate bracteoles; bracteoles lanceolate, 20–35 by 7–10 mm. Sepals 5–6, ovate to elliptic, *ca* 15 by 10 mm, densely silky hairy outside. Petals yellow, *ca* 25 by 13 mm. Stamens *ca* 200, all of approximately the same length, 8–10 mm long, with sharply emarginate apex. Carpels 6–7, *ca* 5 by 1½ mm with 11 mm long styles, each with *ca* 18 ovules. *Fruit* indehiscent, 2–2½ cm long including the enclosing sepals, which are up to 25 by 14 mm. Carpels 14 by 6 mm, 1–5-seeded. Seeds obovate, 3½ by 3 mm, exarillate.

Distr. Indo-China and Siam, N. to *ca* 17° N, in *Malaysia*: only in Peninsular Siam.

Ecol. In open deciduous forests and savannahs.

Notes. PIERRE *l.c.* describes and figures the stamens as being of different lengths, arranged in 2 groups. I analysed several flowers, but always found all stamens of approximately the same length. This species is the only Malaysian one, which combines this character with a not amplexicaul leaf-basis.

29. *Dillenia luzoniensis* (VIDAL) MARTELLI *ex* DUR. & JACKS. Ind. Kew. Suppl. 1 (1902) 136; MERR. Philip. J. Sc. 1 (1906) Suppl. 95; En. Philip. 3 (1923) 60.—*Wormia luzoniensis* VIDAL, Rev. Pl. Vasc. Filip. (1886) 36; ELMER, Leaf. Philip. Bot. 7 (1915) 2622.—*Tetracera borneensis* (non MIQ.) VIDAL, Rev. Pl. Vasc. Filip. (1886) 36.

Small tree, *ca* 5 m high. *Leaves* subcoriaceous, elliptic to oblong, *ca* 6–12-nerved, 6–15 by 3–7 cm, with rounded to slightly emarginate apex, rounded base, and entire to slightly undulate margin, glossy. Petiole ½–1 cm long. Raceme terminal, later lateral, leaf-opposed, with only one flower at the same time, up to 40 cm long with 30 scars of fallen flowers; axis more or less zig-zag. *Flowers* 6–8 cm diam. Sepals 5, elliptic, 15–18 by 10–14 mm. Petals yellow, 4–5 by 3–4 cm. Stamens in 2 distinct groups, the outer ones *ca* 120, 8 mm long, straight in bud, the inner ones *ca* 50, 14–20 mm long, with their apex reflexed in bud; on the outside often a few staminodes, 7 mm long. Carpels 7–8, *ca* 8 by 2½ mm, with 10 mm long styles, each with *ca* 16 ovules. *Fruit* dehiscent, the sepals pink, enlarged to *ca* 25 by 15 mm. Carpels 17 by 14 mm, 1–2-seeded. Seeds ovoid, 3 by 2 mm, enclosed by a membranaceous, up to 5 mm long aril.

Distr. In *Malaysia*: Philippines (Palawan, Luzon).

Ecol. On riverbanks in forests at low altitude.

Notes. AS MERRILL (1923) included under the species a number of specimens of *Dillenia diantha* HOOGL. his data on vernacular names and altitudinal distribution are not reliable. He gives as the altitudinal limit 1200 m.

30. *Dillenia excelsa* (JACK) GILG in ENGL. & PR. Nat. Pl. Fam. 3, 6 (1893) 123; MERR. En. Born. (1921) 383; En. Philip. 3 (1923) 60; HEYNE, Nutt. Pl. (1927) 1072.—*Wormia excelsa* JACK, Mal. Misc. 2, 7 (1822) 69; DE VRIESE, Pl. Ind. Bat. Or. (1856) 79, t. 6-7; MIQ. Fl. Ind. Bat. 1, 2 (1859) 10; MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 76; KOORD. & VAL. Bijdr. 1 Booms. Java (1894) 168; MOLL & JANS. Mikr. Holz. Jav. Baumart. 1 (1906) 71; BACK. Schoolfl. Java (1911) 10; KOORD. Exk. Fl. Java 2 (1912) 600; KOORD. & VAL. Atl. Baumarten Java 1 (1913) f. 4; GAGE & BURK. J. Str. Br. R. A. S. 73 (1916) 243; CORN. Gard. Bull. S. S. 10 (1939) 5; Wayside Trees Malaya (1940) 206; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, p. 3.—*Capellia multiflora* BL. Bijdr. 1 (1825) 5.—*Capellia multiflora* BL. ex HASSK. Cat. Hort. Bog. alt. (1844) 178.—*Capellia pauciflora* ZOLL. & MOR. Syst. Verz. (1845-6) 35.—*Wormia oblonga* WALL. Cat. (1828) no 951, nomen; HK. f. & TH. Fl. Ind. 1 (1855) 67; MIQ. Fl. Ind. Bat. 1, 2 (1859) 11; HK. f. & TH. Fl. Br. Ind. 1 (1872) 35; KING, J. As. Soc. Beng. 58, 2 (1889) 364; RIDL. Fl. Mal. Pen. 1 (1922) 9.—*Wormia grandifolia* MIQ. Fl. Ind. Bat. Suppl. (1860) 619.—*Wormia excelsa* f. *grandifolia* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 76.—*Wormia excelsa* var. *borneensis* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 77.—*Dillenia magnoliaefolia* MARTELLI in BECC. Malesia 3 (1886) 155.—*Dillenia glabra* MARTELLI in BECC. Malesia 3 (1886) 157; MERR. En. Born. (1921) 383.—*Dillenia tomentella* MARTELLI in BECC. Malesia 3 (1886) 159; MERR. En. Born. (1921) 383.—*Dillenia mattanensis* MARTELLI in BECC. Malesia 3 (1886) 160; MERR. En. Born. (1921) 383.—*Dillenia oblonga* GILG in ENGL. & PR. Nat. Pl. Fam. 3, 6 (1893) 123.—*Dillenia pauciflora* GILG in ENGL. & PR., Nat. Pl. Fam. 3, 6 (1893) 123.—*Wormia pauciflora* KOORD. & VAL. Bijdr. 1 Booms. Java (1894) 169; BACK. Schoolfl. Java (1911) 10.—*Capellia pauciflora* ZOLL. & MOR. ex HOOK. f. & JACKS. Ind. Kew. 1 (1895) 415.—*Wormia tomentella* RIDL. J. Str. Br. R. A. S. 33 (1900) 37; J. Str. Br. R. A. S. 54 (1910) 5; Fl. Mal. Pen. 1 (1922) 9; BURK. Dict. (1935) 2265.—*Dillenia secunda* HUNTER (ed. by RIDL.) J. Str. Br. R. A. S. 53 (1909) 98.—*Dillenia excelsa* var. *borneensis* MERR. En. Born. (1921) 383.—*Wormia excelsa* var. *pubescens* CORN. Gard. Bull. S. S. 10 (1939) 7.—*Wormia excelsa* var. *tomentella* CORN. Gard. Bull. S. S. 10 (1939) 8.—*Dillenia excelsa* var. *pubescens* CORN. ex MASAMUNE, En. Phan. Born. (1942) 463.—*Dillenia excelsa* var. *tomentella* CORN. ex MASAMUNE, En. Phan. Born. (1942) 463.

Tree, up to 40 m high with 20 m clean trunk, 75 cm diam., with gray to brown bark, scurfy with reddish scales, and red to dark brown heartwood. Leaves coriaceous, elliptic to oblong, ca 10-13-nerved, 15-30 by 7-10 cm, with rounded to acute, sometimes slightly acuminate apex, acute, often unequal-sided base, and slightly undulate, entire or dentate margin, glossy. Petiole 2-5 cm long. Raceme simple or composed, the only lateral branch at the place of the second flower, up to 12-flowered, sometimes some inflorescences crowd-

ed at the end of a branch and inflorescence therefore seemingly up to 30-flowered. Flower 7-10 cm diam., the pedicel distinctly thickened at the apex. Sepals 5, elliptic to ovate, 20-25 by 13-16 mm, glabrous to rather densely tomentose outside. Petals bright yellow, 40-50 by 25-33 mm. Stamens in 2 distinct groups, the outer ones ca 300, 10-11 mm long, straight in bud, the inner ones ca 30, 16-20 mm long, with their apex reflexed in bud. Carpels 5-10, usually 6-8, 12-14 by 2½ mm, with 16-20 mm long, pink styles, each with 20-25 ovules. Fruit dehiscent. Carpels 18-20 by 12-16 mm, yellowish green outside, whitish inside, 1-3-seeded. Seeds 6 by 4 mm, dark brown, with a 2-3 mm long, red, membranaceous aril.

Distr. *Malaysia*: Sumatra, Malay Peninsula, Banka, W. Java (E. to Nusa Kambangan), Borneo, and Philippines (Balabac Island, S of Palawan).

Ecol. In forests on rather dry to swampy soil, often along streams.

Uses. The wood, which has a durability indoors of 15-20 years, is sometimes used in housebuilding.

Vern. A large number of vernaculars has been noted: Sumatra: *ampalu*, *a. rimbo* (Tapan., Sum. W. Coast), *bahah falah* (Simalur), *boengah-simpur* (= flower-s.) (Indrag.), *enèh* (Enggano), *kalek bakoerok* (Tapan., Sum. W. Coast), *nilau birrih* (Djambi), *peileggoa* (Mentawai), *pisang mawe* (Sum. E. Coast), *simpur* (Djambi, Sum. E. Coast, Palembang, Benk.), *s. aréng* (Lamp.), *s. ayer* (Lamp.), *s. kimbe* (Palemb.), *s. lakki* (Banka), *s. pérampuan* (Lamp.), *s. rawang* (Lamp., Palembang), *s. rimba* (Benk., Banka, Palembang), *s. talang* (Palemb.), *s. tjipuh* (Sum. E. Coast), *s. way* (Lamp.), *sisitoeë* (Atjeh). Malay Peninsula: *kambai hutan*, *penaga hlui*, *simpur*, *s. ayer*, *s. padi*, *s. pagar*, *s. pasir*, *s. paya*. Java: *djadjatian* (Sund.), *drègèl* (Jav.), *ki sègèl*, *sègèl*, *sèmpur sègèl*, *s. tjai* (Sund.), *s. batu*, *s. lanang* (Jav.), *simpur* (Mal.), *wuru* (Jav.). Borneo: *alang-alung* (Daj., Punan), *djamihing* (Mal., Bondarese), *djelangin* (Tidung, Batajan), *djengin* (Mal., Berauw.), *djing*, *djochin* (Daj.), *gara* (Daj., Kapuas), *kadjamihing* (Daj., Kapuas; Mal., Sampit), *kajuringin* (Daj.), *kandikara* (*kèndikara*, *kandikara*) (Mal., Kutinese), *kanigara* (*kèinigara*, *kali-gara*) (Bandjar., Bondar., Mal.), *kègihing*, *urib* (Daj.), *panpan* (Dusun rungus), *randaman* (Banggi), *ringin* (Daj., Dusun), *simpurotan* (Mal., Br. N. Borneo), *simpur* (Mal., Br. N. Borneo), *s. bukit* (Mal., Sarawak), *s. laki* (Mal., Brunei, Sarawak and Sandakan), *tidahura*, *tjumihing* (Daj., Siangese). In the Bahasa Indonesia *kèndikara* has been accepted.

Notes. CORNER (1939, *l.c.*) distinguishes 2 varieties besides the typical form. *Dillenia excelsa* var. *pubescens* (CORN.) CORN. ex MASAMUNE is distinguished by the tomentose-hirsute indumentum on the outer side of the sepals, continuing on the pedicel and the axis of the inflorescence. This is the commonest form of the species in the Malay Peninsula and is also found in Sumatra, Borneo, and the Philippines. In Borneo intermediates to the typical form with glabrous sepals are frequent. *Dillenia excelsa* var. *tomentella* (MARTELLI) CORN. ex MASAMUNE is distinguished by the hirsute indu-

mentum on the intervenium on the lower side of the leaf; it is found in Sumatra, the Malay Peninsula, Banka, and Borneo.

The species is rather variable, but is easily recognised by the rather large, coriaceous, lucid leaves, and the typically thickened apex of the pedicel, which occurs in most species, but is in none so pronounced.

31. *Dillenia sibuyanensis* (ELM.) MERR. Philip. J. Sc. Bot. 9 (1914) 332; En. Philip. 3 (1923) 62.—*Wormia sibuyanensis* ELM. Leaf. Philip. Bot. 5 (1913) 1772.

Shrub, 3 m high or higher, with smooth bark, scaling off in plates. Leaves rigidly chartaceous, narrowly obovate to oblanceolate, ca 7–9-nerved, 3½–7 by 1.1–2½ cm, with acuminate apex, acute base, decurrent along the petiole, and entire to slightly undulate margin; glossy above. Petiole 1–1½ cm long. Flowers solitary or, rarely, in a 2–3-flowered raceme, ca 5 cm diam. Sepals 7–9, elliptic to obovate, the outer ones ca 12 by 7 mm, the inner ones ca 15 by 10 mm. Petals lemon yellow, ca 3 by 1.3 cm. Stamens in 2 distinct groups, the outer ones ca 70, 7–8 mm long, straight in bud, the inner ones ca 20, 12–16 mm long, with their apex reflexed in bud. Carpels 5–8, usually 7, bright red, ca 6–8 by 1½–1.8 mm, with 12 mm long, white styles, each with 6 ovules. Fruit dehiscent. Carpels 15 by 10 mm, 1-seeded. Seeds obovate, 3½ by 2.8 mm, enclosed by a yellow, membranaceous aril.

Distr. *Malaysia*: Philippines (Sibuyan Isl.).

Ecol. Scattered along forested river banks from about sea level to 300 m.

32. *Dillenia ovata* WALL. Cat. (1828) no 945, *nomen*; Hk. f. & Th. Fl. Ind. 1 (1855) 70; MIQ. Fl. Ind. Bat. 1, 2 (1859) 12; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 36; PIERRE, Fl. For. Coch. 1 (1879) t. 10; KING, J. As. Soc. Beng. 58, 2 (1889) 366; BACK. Fl. Batavia 1 (1907) 5; BACK. Schoolfl. (1911) 11; KOORD. Exk. Fl. Java 2 (1912) 601; RIDL. Fl. Mal. Pen. 1 (1922) 11; BURK. Dict. (1935) 810; CORN. Wayside Trees Malaya (1940) 204; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 5.

Tree, up to 30 m high and 1 m diam. but usually smaller, 6–12 m high and 30–40 cm diam., with rather knotted trunk and low-attached crown. Leaves ovate or elliptic, ca 18–25-nerved, 10–25 by 7–13 cm, on saplings ca 50-nerved, 30–60 by 14–18 cm, with rounded to obtuse, on saplings acute apex, rounded to acute, often unequal-sided base, and entire to obscurely dentate margin. Petiole ca 2½–5 cm long. Underside of the leaf and petiole hirsute-tomentose. Flower ca 16 cm diam. Sepals 5, elliptic, 25–30 by 16–27 mm, the innermost ones the narrowest, the two outer ones densely villose outside, the third one with one glabrous margin, the inner ones densely villose on the central part only. Petals yellow, 6½–7½ by 5–6 cm. Stamens in 2 distinct groups, the outer ones, ca 450, 16–20 mm long, straight in bud, the inner ones, ca 25, 25 mm long, with their apex reflexed in bud. Carpels 8–12, usually 10, 6–7 by 2–2½ mm, with 20 mm long, yellowish white styles; each with ca

50 ovules. Fruit indehiscent, dull yellow, depressed-globose, ca 4½ cm high, 6 cm diam. including the enclosing sepals, which are ca 7½ by 5½ cm, at the base 1½ cm thick. Carpels ca 22 by 10 mm, each with 1–7 seeds in glutinous pulp. Seeds obovoid, 5 by 4 mm, black, glabrous, exarillate.

Distr. Siam and Indo-China to ca 17° 30' N, in *Malaysia*: Sumatra, Malay Peninsula (except Malacca and Johore), Banka. In Java cultivated only.

Ecol. On sandy or rather dry spots, in belukar, at low alt.

Uses. The wood is used in Indo-China for making small objects.

Vern. *Simpoh ajer* (Mal. Pen.), *simpur laki* (*lalaki*) (Banka) (= male s.), *s. minjak*, *ranggang wakka* (S. Sum.).

33. *Dillenia sumatrana* MIQ. Fl. Ind. Bat. Suppl. (1860) 620.—*Dillenia meliosmaefolia* Hk. f. & Th. Fl. Br. Ind. 1 (1875) 36; RIDL. J. Str. Br. R. A. S. 54 (1910) 7; Fl. Mal. Pen. 1 (1922) 12; HEYNE, Nutt. Pl. (1927) 1072; BURK. Dict. (1935) 810; CORN. Gard. Bull. S. S. 10 (1939) 3; Wayside Trees Malaya (1940) 204.—*Wormia meliosmaefolia* KING, J. As. Soc. Beng. 58, 2 (1889) 365; Ann. Roy. Bot. Gard. Calc. 5 (1896) 115, t. 130.—*Wormia parviflora* RIDL. J. Str. Br. R. A. S. 54 (1910) 6; Fl. Mal. Pen. 1 (1922) 9.—*Dillenia elmeri* MERR. Pl. Elm. Born. (1929) 195.

Tree, up to 20 m high, 35 cm diam., with reddish brown bark. Leaves oblong, ca 15–20-nerved, 16–30 by 7–16 cm, with acute to acuminate apex, acute to obtuse base, and nearly entire to manifestly dentate margin. Petiole 1½–5 cm long. Flowers solitary or in a 2(–3)-flowered raceme with the flowers attached close to each other, ca 6 cm diam. Sepals 5, ovate, 10–14 by 9–11 mm, densely silky hirsute outside. Petals yellow, ca 25 by 15 mm. Stamens in 2 distinct groups, the outer ones ca 200, 6–7½ mm long, straight in bud, the inner ones ca 18–20, 10–11 mm long, with their apex reflexed in bud. Carpels 7–10, white, ca 4–5 by 1½ mm, with white, 5–6 mm long styles, each with 15–20 ovules. Fruit indehiscent, yellow or orange-yellow, about globular, 2–2½ cm diam. including the enclosing sepals, which are up to 35 by 20 mm, up to 2½ mm thick at the base. Carpels ca 12 by 7 mm, 1–2-seeded. Seeds 5 by 3½ mm, exarillate.

Distr. *Malaysia*: Sumatra (incl. Nias and Siberut Islands), Malay Peninsula (W.-side only), and Borneo (Sarawak and Br. N. Borneo).

Ecol. In forests at low altitude to ca 350 m.

Uses. The wood is sometimes used in house-building.

Vern. Malay Peninsula: *simpur*, *s. bukit*, and *s. padi*. Sumatra: *sipang-sipang* and *duwa saopang* (Sum. E. Coast), *wahom bouho* (Nias), *surumak d'elok* (Simalur).

34. *Dillenia monantha* MERR. Philip. J. Sc. Bot. 9 (1914) 321; En. Philip. 3 (1923) 60.

Smooth-barked tree, up to 17 m high. Leaves subcoriaceous, elliptic-oblong to lanceolate, ca 7–9-nerved, 8–14 by 3½–7 cm, with rounded to obtuse, rarely acute apex, obtuse to acute base, and slightly

undulate-dentate margin, glossy. Petiole 5–25 mm long. *Flowers* solitary, terminal, ca 10 cm diam. Sepals 5, 15–22 by 12–15 mm. Petals yellow, ca 50 by 28 mm. Stamens ca 110, the outer ones from 9 mm long, straight in bud, the inner ones up to 15 mm long, with their apex reflexed in bud, with intermediate lengths. Carpels 4–5, ca 7–8 by 1½ mm, glabrous to sparsely hirsute with 0.2–0.4 mm long, rather rigid hairs, each with 11–16 ovules. Styles 8 mm. *Fruit* dehiscent, carpels ca 15 by 13 mm.

Distr. *Malaysia*: Philippines (from Palawan to Busuanga).

Ecol. In dry secondary forests and in open grasslands at low altitudes.

Vern. *Malacatmon* (Palawan).

35. *Dillenia indica* LINNÉ, Sp. Pl. (1753) 535; BURM. f. Fl. Ind. (1768) 124; MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 79; HK. f. & TH. Fl. Br. Ind. 1 (1872) 36; KING, J. As. Soc. Beng. 58, 2 (1889) 366; KOORD. & VAL. Bijdr. 1 Booms. Java (1894) 161; GAMBLE, Man. Ind. Timb. 2nd ed. (1902) 4; MOLL & JANS. Mikr. Holz. Jav. Baumart. 1 (1906) 71; BACK. Schooffl. Java (1911) 10; KOORD. Exk. Fl. Java 2 (1912) 601; KOORD. & VAL. Atl. Baumart. Java 1 (1913) f. 2; MERR. En. Born. (1921) 383; TROUP, Sylvicult. Ind. Trees 1 (1921) 3; WESTER, Philip. Agr. Rev. 14 (1921) 277; RIDL. Fl. Mal. Pen. 1 (1922) 10; GILG & WERDERM. in ENGL. & PR. Nat. Pfl. Fam. ed. 2, 21 (1925) 34, f. 25; HEYNE, Nutt. Pl. (1927) 1072; BURK. Dict. (1935) 809; BLATTER & MILLARD, J. Bomb. Nat. Hist. Soc. 38 (1936) 415, pl. 29, 31 & 32; Some Beautiful Ind. Trees (1937) 45 and 3 pl.; CORN. Wayside Trees Malaya (1940) 204, pl. 52; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 4.—*Syalita* RHEEDE, Hort. Mal. 3 (1683) 39, t. 38–39; ADANS. Fam. Pl. 2 (1763) 364.—*Dillenia speciosa* THUNB. Trans. Linn. Soc. 1 (1791) 200; SM. Exot. Bot. 1 (1804) 3, t. 2, 3; ROXB. Fl. Ind. ed. CAREY 2 (1832) 650; HK. f. & TH. Fl. Ind. 1 (1855) 69; MIQ. Fl. Ind. Bat. 1, 2 (1859) 11.—*Dillenia elongata* MIQ. Fl. Ind. Bat. 1, 2 (1859) 12.—*Dillenia indica* f. *elongata* MIQ. Ann. Mus. Bot. Lugd. Bat. 4 (1868) 79.

Tree, up to 30 m high, 120 cm diam., with rather crooked trunk and irregular, usually rather lowly (up to 15 m) attached crown. *Leaves* bright green above, oblong, ca 25–50-nerved, 10–35 by 5–13 cm, on saplings and young trees up to 70 by 18 cm, with acute to acuminate apex, rounded to acute base, and slightly to manifestly dentate margin. Petiole 2½–7½ cm long, on saplings and young trees up to 15 cm. *Flower* 15–20 cm diam. Sepals 5, elliptic, 4–6 by 3–5 cm, up to 1 cm thick at the base. Petals white, 7–9 by 5–6½ cm. Stamens in 2 distinct groups, the outer ones, ca 550, 13–15 mm long, straight in bud, the inner ones, ca 25, 20–22 mm long, with their apex reflexed in bud; yellow. Carpels 14–20, ca 14 by 3 mm, yellowish green, with linear-lanceolate, white, 25 mm long, up to 3½ mm broad styles; each with 40–80 ovules. *Fruit* indehiscent, yellowish green, 8–10 cm diam. including the enclosing sepals, which are up to 15 by 12 cm, 2½ cm thick at the base. Carpels ca 35

by 15 mm, each with 5 or more seeds in colourless glutinous pulp. Seeds reniform, 4 by 6 mm, black, finely echinate, exarillate.

Distr. Ceylon, India (Deccan Peninsula, Bengal, Assam), S. China (Yunnan), Burma, Siam, Indo-China, in *Malaysia*: Sumatra, Malay Peninsula, W. and M. Java, Borneo.

Ecol. Mainly on stony banks of rivulets (Saraca-streams, CORNER) and rivers, mainly at low elevation up to 500 m. Once collected at 1700 m (Atjeh, Sumatra).

Uses. The fruit, in particular the enclosing sepals, is eaten fresh and in curries and jellies. With syrup a cough mixture is made from it. The wood, which is moderately hard and has a durability under water of ca 3 years, is sometimes used for house-building or gunstocks (India). The species is planted rather often as an ornamental tree.

Vern. The Malay name, in use in Sumatra, the Malay Peninsula and Java is *simpur* or *s. ayer* (= water s.). In Sundanes the name is *sempur*, *s. batoe* (= stone s.) or *s. tjai* (= water s.), in Javanese *sempeo* or *kosar*. In the Philippines, where the species is cultivated, it is known under the Singhalese name *hondapara*. Engl.: *elephant-apple*.

Notes. The dispersal of the seeds is said to be effected by animals, among others by elephants (BLATTER & MILLARD), or with current water. In the latter case the seeds may germinate in the fruit, which is left behind on the bank of a river, often partly filled up with mud, which gives a favorable substratum for the germination.

36. *Dillenia pulchella* (JACK) GILG in ENGL. & PR. Nat. Pfl. Fam. 3, 6 (1893) 123; MERR. En. Born. (1921) 383; HEYNE, Nutt. Pl. (1927) 1072.—*Wormia pulchella* JACK, Mal. Misc. 2, 7 (1822) 70; HK. f. & TH. Fl. Ind. 1 (1855) 68; MIQ. Fl. Ind. Bat. 1, 2 (1859) 11; HK. f. & TH. Fl. Br. Ind. 1 (1872) 36; KING, J. As. Soc. Beng. 58, 2 (1889) 365; GAGE & BURK. J. Str. Br. R. A. S. 73 (1916) 243; RIDL. Fl. Mal. Pen. 1 (1922) 9; BURK. Dict. (1935) 2265; CORNER, Wayside Trees Malaya (1940) 206.—*Dillenia micrantha* MARTELLI in BECC. Malesia 3 (1886) 156; MERR. En. Born. (1921) 383.—*Dillenia parvifolia* MARTELLI in BECC. Malesia 3 (1886) 158; MERR. En. Born. (1921) 383.

Tree, up to 40 m high with 25 m clean trunk, 90 cm diam., with reddish bark. *Leaves* elliptic to obovate, 4–8-, usually 6–7-nerved, ca 5–12 by 3½–6½ cm, with rounded, sometimes slightly emarginate, to obtuse apex, acute base, decurrent along the petiole, and entire margin. Petiole 1–1½ cm long. *Flowers* axillary, solitary or 2(–3) serially placed, less often 3–6 on the apical part of a branch in the axil of distinct leaf-scars. *Flowers* ca 3½ cm diam., on 2½–7½ cm long pedicels. Sepals 5, ovate to elliptic, the outer one ca 8½ by 7 mm, the inner four 12–16 by 8–11 mm. Petals yellow, about oblong, 20 by 9 mm. Stamens in 2 distinct groups, the outer ones ca 110, 4–4½ mm long, straight in bud, the inner ones ca 10, 10–11 mm long, distinctly thicker than those of the outer group, with their apex reflexed in bud; opening with lateral longitudinal slits. Carpels 4–6, usually 5, ca 4–4½

by 1–1½ mm, with 5½–6½ mm long styles; each with 7–10 ovules. *Fruit* dehiscent. Carpels ca 15 by 12 mm, 1–2-seeded. Seeds obovate, 3 by 2 mm, enclosed by a red, membranaceous aril.

Distr. Malaysia: Sumatra (not in the Lampung Distr.), Malay Peninsula, Riouw- and Lingga Archipelagos, Banka, and Borneo (only W. Borneo, Sarawak, and Br. N. Borneo).

Ecol. In primary or old secondary lowland forests, on wet, often peaty soil. Seems to be flowering at irregular intervals.

Uses. The wood, which is hard and heavy, is of good quality and is used in house-building.

Vern. Sumatra: *djaha keling* (Pal.), *dungun* (Sum. E. Coast), *simar pimasa* (Tapan.), *simpur paja* (Sum. E. Coast). Mal. Pen.: *simpur ayer* (= water s.), *s. paya* (= marsh s.), *s. paya hitam* (= black marsh s.). Riouw-Arch.: *pérepát darat*. Borneo: *debak lulus, ilas* (Daj.), *simpur bukit, s. laki, s. paya, s. rimba* (Brunei and Br. N. Borneo).

Notes. The present species is the only one in *Dillenia* with axillary flowers. Probably the inflorescences of a group of cauli- and ramiflorous species, of which *Dillenia pentagyna* ROXB. is the only Malaysian representative, are comparable to the 3–6-flowered leafless branches, which sometimes occur in the present species, in which the axis is reduced.

37. *Dillenia pentagyna* ROXB. Pl. Corom. 1 (1795) 21, t. 20; Fl. Ind. ed. CAREY 2 (1832) 652; Hk. f. & Th. Fl. Ind. 1 (1855) 71; MIQ. Fl. Ind. Bat. 1, 2 (1859) 12; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 38; KURZ, For. Fl. Br. Burma 1 (1877) 21; PIERRE, Fl. For. Coch. 1 (1879) pl. 6–8; KOORD. & VAL. Bijdr. 1 Booms. Java (1894) 163; FIN. & GAGNEP. Fl. Gén. I.C. 1 (1907) 19; BACK. Schoolfl. Java (1911) 11; KOORD. Exk. Fl. Java 2 (1912) 601; KOORD. & VAL. Atl. Baumart. Java 1 (1913) f. 3; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 5.—*Colbertia coromandeliana* DC. Syst. 1 (1818) 435.—*Wormia coromandelina* SPRENG. Syst. 2 (1825) 631.—*Colbertia augusta* WALL. Cat. (1828) no 948, *nomen*; G. DON, Gen. Syst. 1 (1831) 77 (*Wormia augusta* STEUD. Nomencl. ed. 2, 2, 1821, 789, *nomen*).—*Dillenia augusta* ROXB. Hort. Beng. (1814) 43, *nomen*; Fl. Ind. ed. CAREY 2 (1832) 652.—*Colbertia minor* ZOLL. & MOR. Nat. Gen. Arch. N. I. 2 (1845) 579.—*Dillenia floribunda* Hk. f. & Th. Fl. Ind. 1 (1855) 71; Hk. f. & Th. Fl. Br. Ind. 1 (1872) 38 (*Wormia floribunda* STEUD. Nom. ed. 2, 2, 1821, 789, *nomen*; *Colbertia floribunda* WALL. Cat., 1828, no 950, *nomen*).—*Dillenia pentagyna* var. *augusta* KURZ, J. As. Soc. Beng. 43, 2 (1874) 46.—*Dillenia baillonii* PIERRE ex LANESS. Pl. Util. Colon. Fr. (1886) 281, 702; FIN. & GAGNEP. Fl. Gén. I.C. 1 (1907) 19.—*Dillenia minor* GILG in ENGL. & PR. Nat. Pfl. Fam. 3, 6 (1893) 125.—*Dillenia hainanensis* MERR. Lingn. Sc. J. 13 (1934) 64.

Deciduous tree, up to 25 m high, with usually rather crooked, up to 12 m high clear trunk, to 1 m diam. Bark smooth, grayish, peeling off in thin scales. *Leaves* elliptic-obovate, ca 25–50-nerved, 20–50 by 10–20 cm, with rounded to obtuse

apex, acute base, decurrent along the petiole, and manifestly dentate to nearly entire margin. Petiole 1½–5 cm long, slightly winged with permanent, not amplexicaul wings. Leaves on saplings and young plants oblanceolate, up to 75-nerved, up to 120 by 40 cm, with up to 15 mm broad petiolar wings, not sharply separated from the blade, distinctly nerved like the blade. *Flowers* 2–7 in a fascicle on an up to 3 mm long, short shoot with hairy bracts, on branches of 6 mm and more diam.; flowering mainly when leafless. Flowers 2½–3 cm diam., on a 2½–6 cm long pedicel without bracteoles. Sepals 5, elliptic, 8–12 by 5–9 mm. Petals yellowish or whitish, 15–20 by 5–10 mm. Stamens in 2 distinct groups, the outer ones 60–90, 2½–4 mm long, straight in bud, the inner ones 10, 6–9 mm long, with their apex reflexed in bud, opening with longitudinal slits. Carpels 5(–6), ca 3½–4 by 1.2–1.5 mm, with 4 mm long styles; each with 5–20 ovules. *Fruit* indehiscent, approximately globular, yellow, orange or red, 15 mm diam., 13 mm high including the enlarged, fleshy sepals, which are up to 16 by 14 mm, up to 3 mm thick at the base. Carpels ca 8 by 5 mm, 1(–2)-seeded. Seeds ovoid, 5 by 3½ mm, exarillate.

Distr. In monsoon-regions, in continental Asia: India (Deccan Peninsula, N. to United Prov. and Assam), Burma, Andamans, Siam, Yunnan, Indo-China, and Hainan, in *Malaysia*: M. and E. Java (W to Cheribon), Kangean, S. Celebes (Makassar and Muna Isl.), and Lesser Sunda Islands (Timor, Sumba, and Wetar) (*cf.* fig. 12).

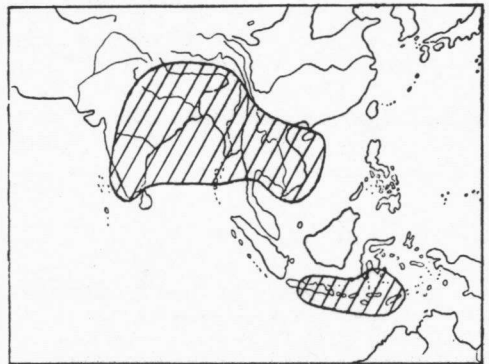


Fig. 12. Geographical distribution of *Dillenia pentagyna* ROXB. (disjunct shaded areas).

Ecol. In primary and teak forests, also in fire-savannahs, up to 1000 m alt., on periodically often very dry localities. Seems to be rather fire-resistant. *Fl.* June–November, at one locality all trees approximately at the same time.

Uses. The wood, though of rather good quality, is rarely used because of its crookedness; a rather good charcoal is made of it.

Vern. *Djunti* (Sund.), *sémpu* (Jav.) and *sumpor* (Mad., also in Kangean) in Java, *rondomi* in Muna, *kahalaló* and *papunuk* in Wetar.

Notes. The species is the only Malaysian representative of a small group of deciduous trees



Fig. 13. *Dillenia obovata* (BL.) HOOGL. G. Pantjar, West Java (DE VOOGL).

with fascicled flowers; the other species are found only in the monsoon-regions of continental Asia.

38. *Dillenia obovata* (BL.) HOOGL. *comb. nov.*—*Colbertia obovata* BL. Bijdr. 1 (1825) 6; HASSK. Pl. Jav. Rar. (1848) 175.—*Wormia obovata* SPRENG. Cur. Post. (1827) 213.—*Dillenia ornata* WALL. Pl. As. Rar. 1 (1830) 21, t. 23; PARKINSON, Ind. For-ester 61 (1935) 451, pl. 28, f. 1.—*Dillenia aurea* (non SM.) HK. f. & TH. Fl. Ind. 1 (1855) 70, *p.p.*; DE VRIESE, Pl. Ind. Bat. Or. (1856) 80; MIQ. Fl. Ind. Bat. 1, 2 (1859) 12; Ann. Mus. Bot. Lugd. Bat. 4 (1868) 80; HK. f. & TH. Fl. Br. Ind. 1 (1872) 37, *p.p.*; PIERRE, Fl. For. Coch. 1 (1879) pl. 11–13; KING, J. As. Soc. Beng. 58, 2 (1889) 367; KOORD. & VAL. Bijdr. 1 Booms. Java (1894) 165; FIN. & GAGNEP. Fl. Gén. I.C. 1 (1907) 21; BACK. Fl. Batavia 1 (1907) 21, 385; Schoolfl. Java (1911) 11; KOORD. Exk. Fl. Java 2 (1912) 601; KOORD. & VAL. Atl. Baumart. Java 1 (1913) f. 1; RIDL. Fl.

Mal. Pen. 1 (1922) 11; HEYNE, Nutt. Pl. (1927) 1071; BURK. Dict. (1935) 809, *p.p.*; CORN. Wayside Trees Malaya (1940) 201, pl. 50, 51; BACK. Bekn. Fl. Java em. ed. 4 (1942) fam. 80, 5.—*Dillenia harmandii* GAGNEP. Not. Syst. 6 (1937) 39.—Fig. 13.

Deciduous tree, with rather crooked trunk, up to 35 m high with up to 14 m clear trunk, to 70 cm diam. *Leaves* obovate, dull with a waxy coating beneath, *ca* 30–45-nerved, 20–40 by 12–20 cm, with rounded, on young plants and saplings acute, apex, acute, gradually narrowing base, and entire to slightly dentate margin. Petiole 1½–4 cm long. *Flowers* solitary, rarely 2 or 3, at the end of short side-branches, near the basis of the peduncle with a number of bracts, flowering mainly before the appearance of the leaves. *Flowers* 14–16 cm diam. Sepals 5, elliptic, *ca* 30–38 by 20–30 mm. Petals bright yellow, 6½–8 by 4½–5½ cm. Stamens in 2 distinct groups, the outer ones yellow, *ca* 200–240, 12–13 mm long, straight in bud, the inner ones

yellowish white, ca 40–55, 22–24 mm long, with their apex reflexed in bud. Carpels ca 9–11, ca 13 by 2 mm, with 20 mm long styles, each with 25–35 ovules. *Fruit* indehiscent, yellow or orange-coloured, approximately globular, 35–40 mm diam. including the enlarged fleshy sepals, which are up to 50 by 40 mm, 6 mm thick at the base. Carpels ca 25 by 10 mm, 1- to few-seeded. Seeds 5 by 3½ mm, exarillate, embedded in transparent slime.

Distr. Lower Burma, Indo-China, and Siam, in *Malaysia*: Northern part of the Malay Peninsula, S. Sumatra, and W. Java.

Ecol. In secondary forests, on stony, period-

ically rather dry soils. *Fl.* at the end of the relatively dry period, about April in the Malay Peninsula, July to October in S. Sumatra and W. Java.

Uses. The fruit is eaten in curries, the wood sometimes used in house-building.

Vern. Mal. Pen.: *simpur*. Sumatra: *simpur*, *s. bĕnĕr*, *s. rimba*, *s. talang*. Java: *sĕmpu* (Jav.), *sĕmpur*, *s. batu* (Sund.).

Notes. *Dillenia aurea* SM. is a closely related species, occurring in NE. India and N. and Central Burma; cf. PARKINSON (1935). The differences in reproductive parts are slight, but the leaf-shape in adult state is very characteristic.

Excluded and doubtful

Dillenia grandifolia WALL. Cat. (1828) no 946, *nomen*; HK. f. & TH. Fl. Ind. 1 (1855) 71; MIQ. Fl. Ind. Bat. 1, 2 (1859) 12; HK. f. & TH. Fl. Br. Ind. 1 (1872) 38; KING, J. As. Soc. Beng. 58, 2 (1889) 368; RIDL. J. Str. Br. R. A. S. 59 (1911) 61; Fl. Mal. Pen. 1 (1922) 11; CRAIB, Fl. Siam. En. 1 (1925) 22; CORN. Wayside Trees Malaya (1940) 203.

The type-collection consists of leaves from a young tree or sapling and is referable either to *Dillenia ovata* WALL. ex HK. f. & TH. or to *Dillenia reticulata* KING. Most of the later literature refers to specimens belonging to the latter species. From study of the leaves of saplings of both species, which come into consideration, the identity must be decided.

Dillenia indica var. *aurea* (SM.) O.K. Rev. Gen. Pl. 1 (1891) 4.

KUNTZE, when making this new combination, had a specimen of *Dillenia ovata* WALL. ex HK. f. & TH., from cultivation in the Botanic Gardens at Bogor. *Dillenia aurea* SM. is an Indian species; cf. *sub D. obovata* (BL.) HOOGL.

Tetracera tripetala TURCZ. Bull. Soc. Nat. Mosc. 36, 1 (1863) 547.

The description is insufficient for identification. Of the Javanese species *Tetracera fagifolia* BL. comes nearest to it; most probably the species will have to be reduced to it.