

## FLORAE MALESIANAE PRAECURSORES LI. APOCYNACEAE I.

### 1. CARISSA, 2. CATHARANTHUS, 3. MELODINUS, 4. LEUCONOTIS, 5. CHILOCARPUS

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#### SUMMARY

Of the 5 genera mentioned in the title a revision is given of the species of the Malesian region.

Critical notes are made on delimitation, subdivision, and/or distribution of *Carissa*, *Melodinus*, and *Chilocarpus*; *Neokeithia* is reduced to *Chilocarpus* which genus exhibits an unusual array of variation in fruit structure.

Keys to the Malesian species are presented of *Melodinus*, *Leuconotis*, and *Chilocarpus*. The keys are followed by an enumeration of these species; each species is provided with a brief synonymy and an account of its distribution and ecology. Essential extensions of previous knowledge of distribution are documented briefly by citing select collections.

Various reductions of species are made. In *Melodinus* 2 new species are described, in *Leuconotis* 1 new variety; in *Chilocarpus* 6 new species, 1 new variety, and 2 new combinations are proposed.

An account of all specimens examined will appear in a separate Identification List.

#### I. CARISSA L.

The area of the genus *Carissa* furnishes a good example for the relations of the Malesian flora to tropical Africa. In Malesia only *C. papuana* Markgr. is indigenous, viz. in New Guinea and the Aru Islands. Australia has 6 species. According to Brandis (For. Fl. 321) *C. carandas* L. is a cultivar of the Indian *C. spinarum* DC.; it is cultivated in Malesia and from SW. China to the Mascarene Islands.

Nine species have been described for the Indian region and Ceylon, two others from Indochina and Thailand.

Two of the Indian species, represented in the Deccan Peninsula, resemble so much the African *C. edulis* Vahl, that they got reduced to it by Pichon (Mém. Inst. Sc. Madag. B 2, 1949, 127). In the Seychelles and Madagascar *C. edulis* is variable and several varieties have been distinguished. In Africa, where it occurs throughout the tropical part, it is, however, uniform.

Ten more species are endemic in Madagascar, the Mascarenes, and the Comores.

The remaining 11 species (including those described under *Acokanthera* G. Don) are distributed from southern Arabia (Yemen) and Eritrea through East Africa to South Africa.

**I. *Carissa papuana* Markgr., Nova Guinea 14 (1925) 278.**

*Distribution*: Aru Islands: Lutor (*Beccari 6396*). S. New Guinea: Okaba (*Branderhorst 64*,

holotype U); Merauke (*Koch 402, McKee 1681, van Royen 4552*). SE. New Guinea: Fly River region (*Brass 6463, Carr 11403*).

*Ecology*: Acacia-Melaleuca forest, copses near sea shore, among mangrove, swampy forest.

#### INSUFFICIENTLY KNOWN SPECIES

***Carissa axillaris* Roxb., Fl. Ind. 2 (1824) 526 (Moluccas).**

#### 2. CATHARANTHUS G. Don

*Catharanthus roseus* (L.) G. Don is indigenous in Madagascar. This is proved by Miller in his 'Figures of the most beautiful, useful and common plants described in the Gardeners Dictionary' 2 (1757) 124: 'The seeds of this plant were brought from Madagascar to Paris, and sown in the King's Garden at Trianon, where they succeeded; and from thence I was furnished with the seeds, which succeeded in the Chelsea Garden.' (See Stearn, Lloydia 29, 1965, 197).

Recently this species has become important as a source of the bis-indolic alkaloids Vincristine and Vinblastine.

Malagasian people chew the leaves in order to dull the feeling of hunger.

#### 3. MELODINUS Forst.

Against Bentham's differentiation of the syncarpous *Apocynaceae* into genera with unilocular and those with bilocular ovary (B. & H., Gen. Pl. 2, 1876, 683—684), Pichon has demonstrated that this character is not constant (Mém. Mus. Hist. Nat. Paris II, 24, 1948, 112). Therefore, *Clitandropsis* Sp. Moore and *Pseudowilloughbeia* Markgr. fall under *Melodinus* Forst.

This implicates to allow some variation of the mouth scales of the corolla.

In section *Melodinus* — represented in Malesia by *M. cumingii* A. DC., *forbesii* Fawc., *monogynus* Roxb., *philippinensis* A. DC. — two longitudinal folds are found between every two corolla lobes. Above the mouth their ends become free.

In sections *Pleurophacelus* K. Sch. and *Clitandropsis* (Sp. Moore) Pich. — this comprising *M. novoguineensis* (Wernh.) Pich., *grandiflorus* Markgr., and *gracilis* Markgr. — the free ends are missing or very short and the two folds are united into one (transition observed in *M. coriaceus* Oliv.).

In *M. acutus* Markgr. of New Guinea, belonging to the Australian section *Dichostemma* F. v. M., their ends are split into several lobules.

#### KEY TO THE MALESIAN SPECIES

1. Corolla cream-coloured, lobes erect in bud, acute, without a lateral protrusion, only their covered border slightly auriculate at the base. Ends of the mouth scales split into several lobules. Inflorescences axillary, short. Corolla tube narrowly infundibuliform at the mouth. Stamens below the middle of the tube . . . . . 18. *M. acutus*
1. Corolla white, lobes inflexed in bud, their covered border with a lateral protrusion. Mouth scales with simple ends.
  2. Inflorescence terminal, large, corymbose, sometimes with additional ones in the uppermost leaf axils often as long as the subtending leaves. Corolla large, (10—)15—20 mm  $\varnothing$  when expanded, tube infundibuliform, 10—20 mm long, lobes at least half as long. Stamens below the middle of the tube.
  3. Corolla tube pilose inside up to the mouth, lobes with a short, rounded lateral protrusion, in bud inflexed not beyond the mouth. Mouth scales paired.

4. Leaves obtuse. Calyx lobes ciliate, otherwise glabrous. Corolla lobes obtuse at their erect top.
  1. *M. philippinensis*
4. Leaves acute. Calyx lobes velvety (except in *M. monogynus*). Corolla lobes apiculate at their erect top.
  5. Leaves lanceolate, 7 by 2 cm. Calyx lobes ovate-oblong, acuminate. Corolla lobes scarcely oblique. . . . . 2. *M. lanceolatus*
  5. Leaves oblong, acute, with rounded base, 8—25 by 2.5—8 cm. Calyx lobes obtuse. Corolla lobes distinctly oblique.
  6. Young branches, leaves, and inflorescences pubescent. Calyx lobes velvety. Corolla lobes indistinctly apiculate at their erect top. Mouth scale tips of each pair distant from each other, glabrous. Style very short. . . . . 3. *M. cumingii*
  6. Plant glabrous. Calyx lobes glabrous, remotely ciliate. Corolla lobes distinctly apiculate at their erect top. Mouth scale tips of each pair close to each other, pilose. Style distinct, 1.5 mm, longer than the ovary . . . . . 4. *M. monogynus*
3. Corolla tube inside only with a low ring of hair tufts above the stamens. Corolla lobes with a conspicuous lateral protrusion, this acute and inflexed beyond the mouth in bud. Mouth scales papillose, not pilose . . . . . 5. *M. forbesii*
2. Inflorescences axillary, thyrsoïd, much shorter than the subtending leaf. Corolla small, 2.5—4(—14) mm Ø when expanded. Corolla tube 2.5—7 mm (14 mm in *M. grandiflorus*), constricted at the mouth. Mouth scales simple, short. Stamens in or above the middle of the corolla tube.
  7. Lateral protrusion of the corolla lobes fringed. Corolla tube pilose inside below the stamens. Fruit globose or slightly pear-shaped, not ellipsoidal.
  8. Inflorescence loose, internodes of its main axis several mm long.
    9. Leaves oblong, 9—13 by 3.5—4.5 cm; nerves horizontal, very numerous, 1—2 mm spaced. Peduncle of inflorescence 12—15 mm, longer than the first internode of the axis . . . . . 6. *M. densestriatus*
    9. Leaves elliptic, ovate, or lanceolate; nerves 5—15 mm spaced, often with shorter interstitial ones.
      10. Leaves lanceolate, about three times as long as broad, 7—14 by 1.8—5 cm; nerves 7—8 pairs. Corolla tube 2.5 mm. Style almost none. . . . . 7. *M. lancifolius*
      10. Leaves elliptic or ovate, about twice as long as broad.
        11. Leaves broad-elliptic with rounded base, 10—17.5 by 5—10 cm; nerves 13—14 pairs, 10—12 mm distant. Inflorescence 3 cm, peduncle 20 mm. Corolla tube 6—7 mm . . . . . 8. *M. elliptifolius*
        11. Leaves ovate-elliptic with broadly narrowed base, 10—18 by 3.5—7.5 cm; nerves 10—18 pairs, 7—10 mm distant. Inflorescence 1.5—2 cm, peduncle 2—6 mm. Corolla tube 3—4.5 mm.
        12. Inflorescence broad, about 1 : 1, divaricate, peduncle 5 mm, lateral axes spreading, their first internode 4 mm long. Fruit somewhat pear-shaped, 5 by 3.5 cm . . . . . 9. *M. perakensis*
        12. Inflorescence oblong, about 3 : 2, peduncle 2—6 mm, lateral axes erect, their first internode 2 mm. Fruit globose (unknown in *M. kopsiaefolius*).
        13. Leaves coriaceous, 10—18 by 4.5—7.5 cm. Rachis of inflorescence with 2 internodes of 2 mm. Pedicels stout, 2 mm. Corolla tube 3 mm, limb in bud half as long . . . . . 10. *M. kopsiaefolius*
        13. Leaves subcoriaceous or firmly membranaceous, 6—10(—14) by 2—4.5(—6) cm. Rachis of inflorescence with 2 or 3 internodes of 4 mm. Pedicels slender, 2—4 mm. Corolla tube 4—4.5 mm, limb in bud less than half as long . . . . . 11. *M. luzoniensis*
    8. Inflorescence contracted, its main axis with very short, almost invisible internodes.
      14. Leaves thick-coriaceous, obtuse, almost obovate, 9 by 4.5 cm. Inflorescence subsessile . . . . . 12. *M. coriaceous*
      14. Leaves subcoriaceous only, acuminate, nearly lanceolate-elliptic.
        15. Peduncle 3—4 mm. Corolla tube 4 mm. . . . . 13. *M. orientalis*
        15. No peduncle. Corolla tube 2.5 mm . . . . . 14. *M. micranthus*
  7. Lateral protrusion of the corolla lobes not fringed, truncate or acute. Corolla tube glabrous inside. Fruit ellipsoidal.
    16. Leaves lanceolate, caudate-acuminate, 5—9 by 1.5—4 cm. Inflorescence slender. Corolla tube 2.5 mm, lobes laterally acute, limb in bud obtuse . . . . . 15. *M. gracilis*
    16. Leaves elliptic, short-acuminate at both ends, 5—12 by 2—5 cm. Inflorescence more stout. Corolla tube 6—14 mm, lobes laterally truncate, limb in bud acutish.

17. Leaves 5—11 cm, nerves 15—20 pairs, 4 mm spaced. Peduncle 2—3 mm. Corolla tube 5—6 mm. . . . . 16. *M. novoguineensis*  
 17. Leaves 8—12 cm, nerves 12 pairs, 8 mm spaced. Peduncle 10—15 mm. Corolla tube 14 mm. . . . . 17. *M. grandiflorus*

ENUMERATION OF THE MALESIAN SPECIES

1. **Melodinus philippinensis** A. DC., Prod. 8 (1844) 330. — *M. monogynus* var. *philippinensis* (A. DC.) Hall. f. Jahrb. Hamb. Wiss. Anst. 17 Beih. 3 (1900) 165.

*Distribution*: Philippines (Mindoro).

*Ecology*: Rain-forest at low altitudes.

2. **Melodinus lanceolatus** Merr., Philip. J. Sc. 27 (1925) 52.

*Distribution*: Philippines (Luzon).

3. **Melodinus cumingii** A. DC., Prod. 8 (1844) 330, var. **cumingii**.

*Distribution*: Philippines (Luzon, Bohol).

*Ecology*: Forests at low altitudes.

var. **apoensis** (Elm.) Markgr., *nov. comb.* — *M. apoensis* Elm., Leaf. Philip. Bot. 4 (1912) 1459.

*Distribution*: Philippines (Mindanao).

*Ecology*: Forests at about 1100 m.

4. **Melodinus monogynus** Roxb., Fl. Ind. 2 (1824) 56.

*Distribution*: Sikkim, Assam (Silhet, Khasia), Malay Peninsula (Penang, Perak).

*Ecology*: Rain-forest, rare.

5. **Melodinus forbesii** Fawc. in Forbes, Nat. Wand. (1885) 510. — *M. monogynus* var. *minor* Hall. f., Jahrb. Hamb. Wiss. Anst. 17 Beih. 3 (1900) 165. — *M. landolphioides* Laut. & K. Sch. in K. Sch. & Laut., Fl. Schutzgeb. (1901) 500. — *Neowollastonia tabernaemontanooides* Wernh., Trans. Linn. Soc. II, Bot. 9 (1916) 110.

*Distribution*: Lesser Sunda Islands: Flores (*Kostermans 298, Schmutz 1651 & 1918*); Alor (*Jaag 336 & 1453*); Timor (*Forbes 3708, Cinatti 26, van Steenis 18161*). Tanimbar Islands: Jamdena I. (*van Borssum Waalkes 3273*). Kei Islands: Kei Ketjil, Tual (*Beccari 6354 & 6359*). Aru Islands: Djabu Lengan I. (*Beccari 6393*); Papakula I. (*Jensen 259*). Moluccas: Ceram ('Awahya' = Wahai, leg. Teysmann ? cult. *Hort. Bog. X.C. 38 a, b, c; X.C. 69; X.C. 73*). New Guinea (frequent). Schouten Islands: Biak I. (*Britton & Winder 80*). New Britain (*Panoff 214, NGF 21847 & 36779*).

*Ecology*: Rain-forest from sea-level — even swampy palm forests — up to 1200 m, often also flowering in secondary growth.

6. **Melodinus densestriatus** Markgr., *nov. sp.* — Frutex scandens. *Folia* tenuiter coriacea, supra vix lucida, petiolus  $\frac{1}{2}$ —1 cm, lamina 9—13 × 4,5—5 cm, oblongo-elliptica, breviter et obtuse acuminata, basi sinuato-cuneata; nervi laterales numerosissimae, rectangulariter patentés, 1—2 mm inter se distantes, tenerae sed distinctae. *Inflorescentiae* axillares, laxae, pauciflorae, 3 cm longae, pedunculi 12—15 mm. *Flores* 7 mm longi, flavi. *Lobi calycis* orbiculares, ciliati. *Corollae* hypocrateriformis tubus 4 mm longus, in media parte paulum inflatus, extus glaber, intus infra stamina vix barbatus; squamae fauciales breves, duae ante quemque lobum corollae. Lobi corollae valde obliqui, lateraliter caudati, fimbriati.

*Stamina* medio tubo inserta, antherae ovato-oblongae, obtusae. *Ovarium* truncatum, biloculare, multiovulatum. *Stylus* brevis sed distinctus. *Stigma* breviter conicum, antheras non attingens. *Fructus* globosus, 6 cm diam., aurantiacus, extus durus, intus pulposus. *Semina* (immatura) obovata.

SE. NEW GUINEA. Isuarava, 400—500 m, forest, fl. 12-2-1936, Carr 15540 (holotype SING), fr. 26-3-1936, Carr 16257. Morobe Dist.: Sattelberg, 900 m, fl. 22-11-1935, Clemens 961 (L).

*Note.* This species is remarkable and easily distinguished by its *Lepinia*-like leaves with dense nervation. It belongs to the section *Pleurophacelus* K. Sch. with axillary few-flowered inflorescences and with fringed lateral elongation of the corolla lobes.

**7. *Melodinus lancifolius*** Ridl., Kew Bull. (1934) 123.

*Distribution:* North Borneo.

**8. *Melodinus elliptifolius*** (Quis. & Merr.) Pich., Mém. Mus. Hist. Nat. Paris II, 24 (1948) 128. — *Willughbeia elliptifolia* Quis. & Merr., Philip. J. Sc. 37 (1928) 194.

*Distribution:* Philippines (Mindanao).

*Ecology:* Rain-forest at low altitudes.

**9. *Melodinus perakensis*** K. & G., J. As. Soc. Beng. 74, ii (1907) 414.

*Distribution:* Malay Peninsula (Perak).

*Ecology:* Limestone hills at low altitudes.

**10. *Melodinus kopsiaefolius*** Markgr., *nov. sp.* — Frutex ad 20 m scandens. *Folia* coriacea, glabra, ovato-elliptica, breviter acuminata, basi late angustata, 10—18 × 4,5—7 cm, petiolus 1 cm, nervi laterales 15—18 in utroque latere, 7—10 mm inter se distantes sed nervis interstitialibus parallelis aucti. *Inflorescentiae* axillares, 2 × 1,5 cm, pedunculus 2—4 mm, internodia rhachidis 2, breves (2—1 mm). Pedicelli 2 mm. *Lobi calycis* ovati, obtusi, ciliati, 1,2 × 1 mm. *Corollae* albae tubus extus glaber, 3 mm longus, in fauce constrictus et quinque-sulcatus, intus infra stamina pilosus; lobi oblique acuti, 1,5 mm longi, lateraliter elongati et apice fimbriati, in alabastrum obtusum contorti. *Stamina* infra faucem inserta, antherae ovatae, acutae, 1 mm longae. *Ovarium* conicum, bicarpellatum, uniloculare, multiovulatum. *Stylus* crassus, brevissimus. *Stigma* cylindricum, longe apiculatum, antheras paene attingens.

WEST BORNEO. Sarawak: 5 th Division, Lawas Dist., Bukit Bugoh, Ulu Sungei Kapulu, ridge in semi-heath forest, 750 m, S 25267 E. Wright (holotype L); Lundu Dist., G. Gading, lowland Dipterocarp forest, S 13577.

*Note.* This species represents a connecting link between *M. perakensis* K. & G. and *M. luzoniensis* (Merr.) Pich. both in morphological and in geographical respects.

**11. *Melodinus luzoniensis*** (Merr.) Pich., Mém. Mus. Hist. Nat. Paris II, 24 (1948) 129. — *M. globosus* (Elm.) Pich., l.c. — *Willughbeia luzoniensis* Merr., Philip. J. Sc. 4 (1909) Bot. 320. — *Chilocarpus globosus* Elm., Leaf. Philip. Bot. 4 (1912) 1454.

*Distribution:* Philippines (Luzon, Sibuyan, Panay, Catanduanes).

*Ecology:* Primary forests at low and medium altitudes.

**12. *Melodinus coriaceus*** Oliv. in Hook., Ic. Pl. 18 (1888) t. 1758.

*Distribution:* Malay Peninsula (Penang, Perak, Malacca).

*Ecology:* Hill forests.

**13. *Melodinus orientalis*** Bl., Bijdr. (1826) 1026. — *Tabernaemontana orientalis* G. Don, Gen. Syst. 4 (1838) 92. — *M. fasciculatus* Bl., Mus. Bot. Lugd.-Bat. 1 (1850) 155. — *M. laevigatus* Bl., l.c. — *M. laxiflorus* Bl., l.c. — *Willughbeia umbrosa* Bl., l.c. 154. — *M. citriflorus* K. & G., J. As. Soc. Beng. 74, ii (1907) 413.

*Distribution*: Malay Peninsula (Penang, Perak, Kelantan, Pahang, Johore), Sumatra, Java, Borneo. Rather frequent.

*Ecology*: Rain-forest up to 1350 m (Java) on ridges, hillsides, and riverine tracts, mixed Dipterocarp forest (Borneo), on sandy loam, basalt, and limestone.

*Vernacular names*: *Gokeng* (Perak), *kapalasar*, *areuj bawang* (Java), *tjempaka kuning*, *akar tempirik* (Borneo).

**14. *Melodinus micranthus*** Hook. f., Fl. Br. Ind. 3 (1882) 629.

*Distribution*: Malay Peninsula (Penang, Negri Sembilan, Malacca, Johore, Singapore).

*Ecology*: Rain-forests, scarce.

**15. *Melodinus gracilis*** (Markgr.) Markgr., *nov. comb.* — *Pseudowillughbeia gracilis* Markgr., Bot. Jahrb. 61 (1928) 174.

*Distribution*: East New Guinea.

*Ecology*: Rain-forests, 300—1000 m, often on ridges, also in *Fagaceae-Anisoptera* forest.

**16. *Melodinus novoguineensis*** (Wernh.) Pich., Mém. Mus. Hist. Nat. Paris II, 24 (1948) 129. — *Willughbeia novoguineensis* Wernh., Trans. Linn. Soc. Bot. II, 9 (1916) 108.

— *Clitandropsis papuana* Sp. Moore, J. Bot. 61 (1923) Suppl. p. 31. — *Clitandropsis novoguineensis* Sp. Moore ex Markgr., Nova Guinea 14 (1926) 279. — *Clitandropsis crassifolia* Kaneh. & Hatus., Bot. Mag. Tokyo 55 (1941) 494, f. 5.

*Distribution*: New Guinea, Solomon Islands. Rather frequent.

*Ecology*: Mountain forests, (700—)800—2400 m (Western Highlands) with *Fagaceae*, on rocky clay and limestone.

*Vernacular name*: *Tombehu* (Enga dial.).

**17. *Melodinus grandiflorus*** (Markgr.) Markgr., *nov. comb.* — *Clitandropsis grandiflora* Markgr., Brittonia 2 (1936) 140.

*Distribution*: East New Guinea.

**18. *Melodinus acutus*** (Markgr.) Markgr., *nov. comb.* — *Clitandropsis acuta* Markgr., Notizbl. Berlin-Dahlem 15 (1940) 130. — *Clitandropsis clemensiae* Merr., J. Arn. Arb. 29 (1948) 163.

*Distribution*: East New Guinea: Boridi (*Carr 14364*, lectotype L, 13002, 13008); Isuarava (*Carr 15335*); Morobe Dist. (*Clemens 6592*, NGF 23267 & 27644); Eastern Highlands Dist. (NGF 9576, Brass 31621 & 32302).

*Ecology*: Mountain rain-forest, *Castanopsis*-oak forest, from 1400 to 1900 m.

#### INSUFFICIENTLY KNOWN SPECIES

***Melodinus curvinervius*** Boerl., Bull. Inst. Bot. Btzg 5 (1900) 10.

***Melodinus ovalis*** Boerl., l.c. 12.

**Melodinus pulchrinervius** Boerl., l.c. 10.

**Melodinus rhytidiphyllus** Boerl., l.c. 10.

#### 4. LEUCONOTIS Jack

##### KEY TO THE MALESIAN SPECIES

1. Leaves thin, oblong-elliptic, caudate-acuminate, pilose below, lateral nerves almost horizontal, 7—12 pairs. Calyx lobes pilose, leafy, protracted into a linear obtuse blade, as a whole 6 mm long. Corolla lobes pilose outside. Fruit pear-shaped . . . . . **1. L. eugenifolia**
1. Leaves firmly coriaceous, glabrous, short-acuminate, lateral nerves not horizontal, rarely more than 8 pairs. Calyx lobes scarious, glabrous, not protracted, 2—3 mm long. Corolla lobes glabrous or papillate outside.
  2. Peduncles 2—4 cm. Fruit oblong-ovate, with a sharp-edged, lowly conical base. **2. L. anceps**
  2. Peduncles 0.2—1.5 cm. Fruit pear- or plum-shaped, without a sharp-edged base.
    3. Leaves oblong-elliptic, nerves about 7—8 pairs. Inflorescences subsessile . **3. L. crassifolia**
    3. Leaves short-elliptic, nerves 2—7 pairs. Peduncles of inflorescences 1—1.5 cm.
      4. Leaves coriaceous in general, lateral nerves 5—7 pairs, 1—1.5 cm spaced, gradually bent without any sharp angle.
        5. Outer pair of calyx lobes larger than the inner one (4—5 against 3 mm). Corolla tube 1.5—2.3 mm  $\varnothing$ . Fruit pear-shaped. . . . . **4. L. maingayi**
        5. All 4 calyx lobes equally wide (1.5—2 mm). Corolla tube 1—1.3 mm  $\varnothing$ . Fruit plum-shaped **5. L. griffithii**
      6. Leaves elliptic, short-acuminate, c. 9 by 4 cm. Fruit ellipsoidal, c. 4 by 2.5 cm **var. griffithii**
      6. Leaves lanceolate, long-acuminate, c. 5—8 by 2.5 cm. Fruit almost globular, c. 3.5 by 3 cm . . . . . **var. sumatrana**
    4. Leaves heavily coriaceous, nerves 2—4 pairs, 2—3 cm spaced, the uppermost often still farther from the apex, all rather straight, joining the marginal nerve by a sharp angle **6. L. subavenis**
    7. Leaves 7—13 by 3.5—5 cm, nerves 4(—6) pairs, springing subhorizontally from the midrib, the uppermost less than 3 cm from the apex. Calyx lobes 2.5—3 mm. Corolla lobes 3.5 mm **var. subavenis**
    7. Leaves 14—17 by 6—7 cm, nerves 2—4(—5) pairs, the uppermost more than 3 cm from the apex. Calyx lobes 3.5—4 mm. Corolla lobes 4 mm. . . . . **var. elastica**

##### ENUMERATION OF THE MALESIAN SPECIES

**1. *Leuconotis eugenifolia*** A. DC., Prod. 8 (1844) 331. — *L. cuspidata* Bl., Mus. Bot. Lugd.-Bat. 1 (1849) 112.

*Distribution*: Malay Peninsula (from Penang and Wellesley to the very south), Riouw Islands (Akur, *Buwalda 6906*), Sumatra, Borneo. Frequent.

*Ecology*: Rain-forest, also peat forest, at low altitudes.

*Vernacular names*: *Gitan ketjil*, *polai i aku*, *penowah*, *rambong akar* (Sum.), *nge ri* (Selangor).

**2. *Leuconotis anceps*** Jack, Trans. Linn. Soc. 14 (1823) 121, pl. 4. — *Willughbeia borneensis* Merr., J. Mal. Br. R. As. Soc. 1 (1923) 28.

*Distribution*: Sumatra, Borneo. Frequent.

*Ecology*: Rain-forest up to 1600 m, also heath forest.

*Vernacular name*: *Kai* (Kinabatangan).

**3. *Leuconotis crassifolia*** Boerl., Bull. Inst. Bot. Btzg 5 (1900) 9.

*Distribution*: Borneo (Sarawak).

*Ecology*: Rain-forest at low altitudes.

*Use*: Dried latex for sticking parang blades into handles (Iban).

*Vernacular name*: *Akar kawit*.

4. *Leuconotis maingayi* Dyer *ex* Hook. *f.*, Fl. Br. Ind. 3 (1882) 628.

*Distribution*: Malay Peninsula (from Perak southward).

5. *Leuconotis griffithii* Hook. *f.*, Fl. Br. Ind. 3 (1882) 628.

*Distribution*: Malay Peninsula (from Kelantan southward).

var. *sumatrana* Markgr., *nov. var.* — Folia minora, 5—8 cm longa, 2,5 cm lata, sublanceolata, longius acuminata. Fructus subglobosi, 3,5 cm longi, 3 cm lati.

SUMATRA. West Sumatra: near waterfall 'Sarasa Bunto' (Harau), fr. 12-12-1956, *W. Meijer & Vermeulen* 5406 (L); Central Sumatra: W. Indragiri, Taluk region, Hutan Pulau Lawas, lowland Dipterocarp forest on flat sandy soil, fl. 22-1-1956, *W. Meijer* 4384 (L, holotype). Vern. 'akar tjirik murai'.

6. *Leuconotis subavenis* Boerl., Bull. Inst. Bot. Btzg 5 (1900) 9. — *L. elastica* Becc., For. Borneo (1902) 358, 359, f. 59; 562, 563. — *L. maingayi* (*non* Dyer) Ridl., Kew Bull. (1934) 123.

*Distribution*: Borneo.

*Ecology*: Rain-forest on sandy loam and sandstone, also peat.

*Vernacular name*: *Kawit* (Iban).

var. *elastica* (Becc.) Markgr., *nov. comb.* — *L. elastica* Becc., l.c.

*Distribution*: Borneo: Kuching (*Beccari* 899 & 2291); Bako National Park (S. 17823, *Bisset* 784); Bintulu (*Beccari* PB 3708).

*Ecology*: Primary forest intermediate between heath forest and mixed Dipterocarp forest, on leached yellow sand, sandstone plateau.

*Note*. This variety presents a peculiar leaf nervation: the uppermost pair of lateral nerves is far from the top, in general there are only 2 pairs and then the uppermost in the middle of the blade length. A strong marginal nerve runs to the top. There are, however, transitions to var. *subavenis*.

#### INSUFFICIENTLY KNOWN AND EXCLUDED SPECIES

*Leuconotis intermedia* Boerl., Bull. Inst. Bot. Btzg 5 (1900) 7. — Insufficiently known; even a line is missing in the original description.

*Leuconotis tenuifolia* Engl., Bot. Jahrb. 7 (1886) 470 = *Garcinia* sp. (*Guttiferae*).

#### 5. CHILOCARPUS Bl.

Most species of *Chilocarpus* Bl. are represented in western Malesia, especially in Borneo, radiating into southern Burma, southern Indochina, and southern Upper Thailand. One species is known in the Nilgherries, one in the Philippines, and one has a disjunct area from Celebes to New Guinea.

Two characters allow to distinguish *Chilocarpus* at first sight from its related genera: — (1) Numerous glands at the lower leaf surface; among related genera these are found only in *Leuconotis* Jack, but combined with tetramerous flowers. — (2) Globose, obtuse



limb in bud of the corolla, the whole flower thus resembling a drumstick. *Willughbeia* Roxb. has an oblong, obtuse limb in bud, *Melodinus* Forst. an ovate-acuminate one, in *Urnularia* Stapf the corolla tube is globular and broader than the limb in bud. The colour of the flower changes with age from creamy through yellow and orange to brownish red.

If fruits are at hand, they afford a differential character of special importance. They do not remain closed as the berries of the related genera, but dehisce into two valves corresponding to the carpels. Their mesocarp is scarcely fleshy, their endocarp hard and dry. The seeds lie in a scanty pulp. At their funicular end they have a thick orange-yellow aril like a small radially divided collar. It contrasts with the black or brown testa.

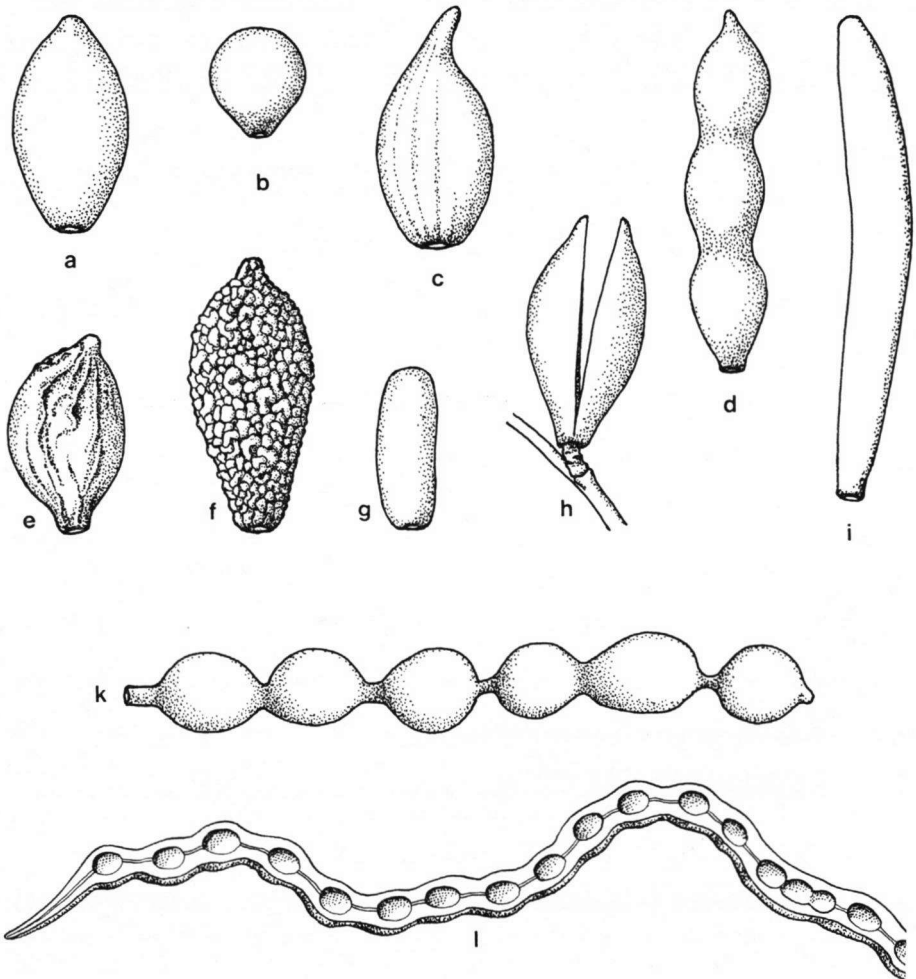


Fig. 1. Fruits of *Chilocarpus* species. — a. *costatus* Miq. — b. *embelioides* K. & G. — c. *rostratus* Markgr. — d. *beccarianus* Pierre — e. *vernicosus* Bl. — f. *tuberculatus* Markgr. — g. *decipiens* Hook. f. — h. *suaveolens* Bl. — i. *kuchingensis* Markgr. — k. *conspicuus* (Steen.) Markgr. — l. *torulosus* (Boerl.) Markgr., valve of carpel, inside view. All  $\times \frac{1}{2}$ .

Fruits and seeds of this genus are remarkably polymorphous. Most species have an ellipsoidal or  $\pm$  globose fruit, obtuse or acuminate. In others it is oblong, often expanded around the seeds, and more or less constricted between them. The first step in this direction may be observed in *Ch. decipiens* Hook. f. Its fruit reaches 6 by 2 by 2 cm and has no or almost no constrictions. This shape is shared by *Ch. kuchingensis* Markgr. (14 cm long) and *Ch. beccarianus* Pierre (12 cm long). The fruits of *Ch. torulosus* (Boerl.) Markgr. and of *Ch. steenisianus* Markgr. may become 40—50 cm long and only 7—10 mm broad. Where the seeds lie tightly to each other, the fruit constrictions are slight; where a seed has not developed, the fruit diameter is only 3—4 mm. As the seeds belong to 2 placentas, they do not lie exactly in one row, and consequently the narrower fruits get a somewhat twisted shape. In *Ch. conspicuus* (Steen.) Markgr. the joints of the fruit may be 25 mm thick and the constrictions only 4 mm. There is always a narrow canal running through the constricted parts.

It is a difficult task to attribute such different fruits to definite species if they have not been collected together with flowers.

From the outset flowers and fruits have been known of *Ch. torulosus* (Boerl.) Markgr., *costatus* Miq. (by the synonymous *Ch. diepenhorstii* Miq.), *decipiens* Hook. f., *embelioides* K. & G., *tuberculatus* Markgr., *leytensis* Elm., *minutiflorus* K. & G., *rostratus* Markgr., *steenisianus* Markgr., *suaveolens* Bl., and *vernicosus* Bl.

For the correlation of flowering and fruiting specimens of the remainder I have applied the following viewpoints: greatest possible conformity of the leaves, of the arrangement and structure of fruiting and flowering inflorescences, and of the localities. By this way fruits have been correlated to the flowering stages (or vice versa) of *Ch. beccarianus* Pierre, *denudatus* Bl., *conspicuus* Markgr., *kuchingensis* Markgr., *obtusifolius* Merr. Future complete collections will show whether these correlations are correct.

The seeds, distinguished from all neighbouring genera by the presence of the above-mentioned aril, are smooth in most species, at most slightly knobbed (cf. Blume, Mus. Bot. Lugd.-Bat. 1, 1850, tab. 53), but in some species, notably *Ch. beccarianus*, *decipiens*, *conspicuus*, and *steenisianus*, they are irregularly folded. Amidst of this labyrinth of testa and endosperm the cotyledons are folded in a similar way. A good figure and exact description of the peculiar situation has been given by Van Heel (Proc. K. Ned. Ak. Wet. A'dam C 73, 1970, 298—301).

Two of the species with extremely long, moniliform fruits, collected without flowers, have formerly been described by Van Steenis as a new genus *Neokeithia* (Bull. Bot. Gard. Btzg III, 17, 1948, 407—408). In the meantime it has been perceived that *Neokeithia torulosa* (Boerl.) Steen. correlates with *Chilocarpus anguineus* Stapf, of which flowers and fruits had become known together. Moreover, the above-mentioned series of fruit forms is connected with the other species by *Ch. decipiens*. Labyrinth seeds are found in 4 of the long-fruited species (*Ch. beccarianus*, *conspicuus*, *decipiens*, and *steenisianus*), whereas *Ch. kuchingensis* and *torulosus* have smooth seeds. Also the two types of leaf nervation — main laterals more distinct than interstitials, or numerous laterals all alike — are distributed in a similar way, and the long or short inflorescences as well. So it is impossible to maintain *Neokeithia* as a distinct taxon.

Another peculiarity of some *Chilocarpus* species are the intermediate bracteoles. They are found in *Ch. tuberculatus* Markgr., *nigrescens* K. & G., *suaveolens* Bl., and *vernicosus* Bl., figured by Blume, l.c.: 4 or more decussate pairs of empty bracteoles are densely arranged on the pedicel, below the calyx.

A further peculiarity deserves to be mentioned: the umbel-like ending of the last inflorescence branches in *Ch. beccarianus*, *embelioides*, *kuchingensis*, *leytensis*, *obtusifolius*,

*torulosus*. It is the result of a strong abbreviation of the basal axes of the last few dichasia. Thus all their flowers seem to arise from one point. (See Merrill's figure of *Ch. obtusifolius* in Pap. Mich. Ac. Sc. 19, 1934, tab. 35).

## KEY TO THE MALESIAN SPECIES

1. Leaf nerves conspicuously prominent below, main laterals more distinct than interstitials, 6—8 mm distant, marginal nerve conspicuous, 1—2 mm inside the margin. Corolla tube 5—10 by 1—1.5 mm, bud of lobes 2.5—3.5 mm  $\varnothing$ , the upper edge of their lateral protrusion beginning by a distinct corner.
  2. Plants  $\pm$  hirtellous. Peduncle 2—4 cm. Corolla tube 10 mm. Fruit moniliform, 25 by 1 cm. Seeds irregularly folded. . . . . 1. *Ch. steenisianus*
  2. Plants glabrous. Peduncle 0.5—2(—3.5) cm. Fruit ellipsoidal or subglobular (where known).
    3. Leaves elliptic, 8—10 by 3—4 cm. Partial inflorescences congested. Peduncle 0.5—1.5 cm. Pedicels with intermediate bracteoles. Corolla tube 5 mm. Fruit unknown<sup>1)</sup>. . . . . 2. *Ch. nigrescens*
    3. Leaves elliptic or obovate, 12—22 by 5—9 cm. Partial inflorescences remote from each other. Peduncle 1—2(—3.5) cm. Corolla tube 6—10 mm. Fruit ellipsoidal or subglobular. Seeds smooth
      3. *Ch. costatus*
      4. Corolla tube (8—)10(—12) mm . . . . . var. *costatus*
      4. Corolla tube 6 mm . . . . . var. *borneensis*
1. Leaf nerves scarcely or not prominent below, main laterals as distinct as interstitials, 2—4 mm distant, marginal nerve indistinct, 1 mm or less inside the margin. Corolla tube 1.5—6 by 0.4—1 mm, bud of lobes 1.5—2 mm  $\varnothing$ , the upper edge of their lateral protrusion beginning softly rounded.
  5. Inflorescences stout, rachis and peduncle 2—3 mm  $\varnothing$ . Flowers crowded at the ends of the inflorescence branches.
    6. Leaves elliptic, shortly acuminate, 8—15 by 3.5—6 cm. Inflorescences all axillary, peduncle 0.5—2 cm. Pedicels with intermediate bracteoles. Corolla tube 5—7 mm. Fruit ellipsoidal, acuminate, 5—10 by 4—5 by 3.5—4.5 cm, sparsely set with rows of acutish warts. Seeds smooth
      4. *Ch. vernicosus*
    6. Leaves largely obovate, obtuse, with cuneate base, 12—13 by 6—7 cm. Inflorescences terminal and axillary. Peduncle 3 cm. Pedicels without intermediate bracteoles. Corolla tube 3—4 mm. Fruit unknown. . . . . 5. *Ch. obovatus*
  5. Inflorescences slender, rachis and peduncle 1—1.5 mm  $\varnothing$ . Flowers not crowded (crowded in *Ch. enervis* and *rostratus* with sessile inflorescences).
    7. Inflorescence lax, longer than the petiole of the subtending leaf, mostly about as long as the whole leaf.
    8. Ends of the inflorescence branches  $\pm$  umbel-like by contraction of 2—3 dichasia. Peduncles 3—6(—8) cm.
      9. Leaves chartaceous, elliptic, acuminate, 7—12 by 2.5—4.5 cm.
        10. Lateral nerves very distinct below. Corolla tube 4 mm long. Fruit ellipsoidal, 7 by 3 by 2.5 cm. Seeds smooth . . . . . 6. *Ch. leytenis*
        10. Lateral nerves moderately distinct below. Corolla tube shorter than 4 mm.
          11. Leaves dark green. Corolla tube 1.5 mm long. Fruit globular, 3 cm  $\varnothing$ . Seeds smooth, not in one row. . . . . 7. *Ch. embelioides*
          11. Leaves light green, elliptic to lanceolate. Corolla tube 2.5—4 mm long.
            12. Leaves  $\pm$  lanceolate. Inflorescence shorter than the subtending leaf. Corolla tube 2.5 mm long. Fruit moniliform, 30—50 cm long, 8 mm broad. Seeds smooth,  $\pm$  in one row. . . . . 8. *Ch. torulosus*
            12. Leaves elliptic-acuminate. Inflorescence as long as or longer than the subtending leaf. Corolla tube 3—4 mm long.
              13. Leaf blades not decurrent into the petiole, moderately gland-dotted below. Inflorescences puberulent. Fruit moniliform, 15—20 cm long, 2.5 cm broad. Seeds irregularly folded . . . . . 9. *Ch. conspicuus*
              13. Leaf blades decurrent into the petiole, densely gland-dotted below. Inflorescences glabrous. Fruit oblong-obovate, 5 cm long, 2—2.5 cm broad. Seeds smooth. . . . . 10. *Ch. amboinensis*
    9. Leaves coriaceous.

<sup>1)</sup> Probably like that of the related *Ch. costatus*, but the intermediate bracteoles get lost.

14. Leaves elliptic, acuminate at both ends, rather sparsely gland-dotted below (0—4 glands pro mm<sup>2</sup>). Inflorescence stout, peduncle 1.5 mm  $\varnothing$ , composed of a terminal and two axillary thyrsi into a broad, corymbose synflorescence. Fruit cylindrical with slight constrictions, 12 cm long. Seeds irregularly folded, arranged in one two-sided row.
- 11. Ch. beccarianus**
14. Leaves obovate, obtuse, densely gland-dotted below (5—8 glands pro mm<sup>2</sup>). Inflorescence lax, not composed into a large corymb, peduncle less than 1 mm  $\varnothing$ . Seeds smooth, in two or more irregular rows.
15. Leaves oblong-obovate, at most half as broad as long. Corolla tube 4 mm long. Fruit ellipsoidal, 5.5 by 2.5 by 2 cm. . . . . **12. Ch. obtusifolius**
15. Leaves rhombic-obovate, at least half as broad as long. Corolla tube 3 mm long. Fruit cylindrical, 14 by 2 by 2 cm . . . . . **13. Ch. kuchingensis**
8. Ends of inflorescence branches not umbel-like, ending into free, loose dichasia. Peduncles 0.5—4 cm.
16. Inflorescences terminal and axillary, as long as the subtending leaf, with spreading branches 2—3 cm long; peduncle 2—4 cm. Pedicels with intermediate bracteoles. Fruit oblong, 6 by 1.5 by 1.5 cm. Seeds irregularly folded . . . . . **14. Ch. decipiens**
16. Inflorescences axillary only, shorter than the subtending leaf, with branches 3—5 mm long; peduncle 4—10 mm. Pedicels without intermediate bracteoles. Fruit narrowly ellipsoidal. 5 by 2 by 1.5 cm. Seeds smooth . . . . . **15. Ch. denudatus**
7. Inflorescences contracted, not longer than the petiole of the subtending leaf. Seeds smooth.
17. Leaves chartaceous or subcoriaceous, lanceolate or elliptic-acuminate, broadest in the middle. Inflorescence buds without resin. Flowers not crowded.
18. Leaves lanceolate, 5—6.5 by 2—3.5 cm. Inflorescences without intermediate bracteoles. Corolla tube 2.5 mm long. Fruit ellipsoidal, acuminate, 6 by 3 by 3 cm
- 16. Ch. minutiflorus**
18. Leaves elliptic-acuminate, 8—12 by 4—5 cm. Inflorescences with intermediate bracteoles. Corolla tube 4—6 mm long. Fruit ellipsoidal, obtuse . . . . . **17. Ch. suaveolens**
17. Leaves coriaceous, obovate, broadest above the middle, obtuse or scarcely acuminate. Inflorescence buds resiniferous. Flowers densely crowded.
19. Leaves  $\pm$  4 times as long as wide, conspicuously cuneate. Fruit coarsely verrucose, ellipsoidal, shortly acuminate, 7 by 3 by 3 cm. . . . . **18. Ch. tuberculatus**
19. Leaves  $\pm$  twice as long as wide, sinuously and more shortly narrowed at the base. Fruit ellipsoidal, long-acuminate, 7 by 4 by 4 cm . . . . . **19. Ch. rostratus**

#### ENUMERATION OF THE MALESIAN SPECIES

**1. Chilocarpus steenisianus** Markgr., *nov. sp.* — Frutex scandens. Ramuli compressi, fusco-hirtelli. *Folia* subcoriacea, subtus hirtella (saltem ad nervos), elliptica, utrimque acuminata, 14—20  $\times$  4—8 cm; nervi subtus valde prominuli, laterales 15—18 paria, recti, 7—8 mm inter se distantes, nervo marginali 1,5 mm intra marginem coniuncti, nervis interstitialibus e marginali oriundis aucti. Petiolus canaliculatus, 1—1,5 cm longus. *Inflorescentiae* axillares, hirtellae, thyrsoidae, binodes; pedunculus 2—4 cm longus, ramuli 1—3 cm longi. *Flores* ad apices ramulorum congesti; pedicelli 2 mm longi, bracteolis intermediis carentes. *Calycis lobi* ovati, 1 mm longi, extus hirtelli. *Corollae* tubus cylindricus, prope basin ampliatus, 10 mm longus, 1,2 mm latus, lobi in alabastrum globosum, 2 mm latum contorti, lateraliter in caudam 4 mm longam, angulose oriundam elongati. *Stamina* prope basin tubi inserta, antherae oblongae, 1,2 mm longae. *Caput stigmatidis* turbinatum, breviter apiculatum. *Stylus* 1,2 mm longus. *Ovarium* conicum, glabrum, 1 mm altum. *Fructus* (immaturus) pendulus, moniliformis, acuminatus, 40 cm longus, stipite 4 cm longo stipitatus, articuli 18  $\times$  7 mm, partes constrictae 10  $\times$  3 mm, canali 0,5 mm lato perscurae. *Semina* oblonga, (immatura) 12  $\times$  4 mm, irregulariter plicata, arillo basali 4 mm lato coronata.

BORNEO. Central East Borneo: West Kutai, L. Ibut, high brook bank, in forest, 200 m, fl. & fr. 25-8-1925, *Enderb 2872* (holotype, L). — Sarawak: Matang, fl. May 1866, *Beccari PB 1659* (FI).

SUMATRA. Riouw Res., Indragiri uplands, Kuala Belilas, primary marshy forest, fl. 27-4-1939, *Buwalda* 6613, 6709.

*Note.* The flowering specimens have been attributed to the fruit-bearing holotype because they agree in leaf nervation and presence of indument.

**2. *Chilocarpus nigrescens* K. & G., J. As. Soc. Beng. 74, ii (1907) 404.**

*Distribution:* Malay Peninsula (Penang, West Hill, Curtis).

*Ecology:* Hill forest up to 1000 m, local.

**3. *Chilocarpus costatus* Miq., Fl. Ind. Bat. 2 (1856) 393. — *Ch. diepenhorstii* Miq., Sum. (1861) 552. — *Ch. maingayi* Dyer ex Hook. f., Fl. Br. Ind. 3 (1882) 627. — *Ch. aurantiacus* Ridl., Kew Bull. (1926) 73. — Fig. 1a.**

*var. costatus.* — Corolla tube (8—)10(—12) mm long.

*Distribution:* Malay Peninsula (common from Lower Thailand through Wellesley, Penang, Perak, Trengganu, Pahang, Selangor, Malacca, Johore), Sumatra, Mentawai Islands (Siberut, *Boden Kloss 14500*, type of *Ch. aurantiacus* Ridl.).

*Ecology:* Rain-forest, up to 1000 m.

*Vernacular names:* *Gĕtah gĕrip puteh* (Mal.), *akar mĕngkaku* (Temuan), *akar tandok*, *akar bijawa* (Simalur).

*var. borneensis* Markgr., *nov. var.* — Tubus corollae 6 mm longus.

BORNEO. Kinabalu, Tenompok, 1500 m, fl. 7-6-1932, *Clemens 29827* (holotype, L), *Clemens 29827 A*; Dallas, 900 m, *Clemens 27054*; Marai Parai spur, *Clemens 11089*; Ulu Kapitang, 1200 m, *Carr 26786*; Mesilau River, *Chew & Corner RSNB 4320*; Ulu Langanani, *Chew, Corner & Stainton 1246*.

*Ecology:* Mossy Dipterocarp forest.

**4. *Chilocarpus vernicosus* Bl., Mus. Bot. Lugd.-Bat. 1 (1850) 152. — *Ch. enervis* Hook. f., Fl. Br. Ind. 3 (1882) 626. — *Ch. cantleyi* K. & G., J. As. Soc. Beng. 74, ii (1907) 403. — Fig. 1e.**

*Distribution:* Malay Peninsula (Perak, Selangor, Johore, Malacca, Singapore), Sumatra (Lubuk Gedang, *van Romburgh*), and Borneo.

*Ecology:* Lowland Dipterocarp forest, swamp forest, hillside forest.

*Note.* The holotype of *Ch. enervis* Hook. f. in the Kew herbarium (*Maingay 1044* of the Kew distribution = Maingay's own number *3063*, from Malacca), covered by Hooker's description of 1882, has proved to be *Ch. vernicosus* Bl., a species at that time not known to occur in the Malay Peninsula, but now represented by several collections. Unfortunately, later on a plant from Perak collected in 1885 by Cantley, has been added to the same sheet, and under the same name. Both have loose fruits. By observing thoroughly these fruits King and Gamble apparently have been led to the opinion that they might be 'either smooth or much corrugated and tubercled' (cf. J. As. Soc. Beng. 74, ii, 1907, 403). Really the second plant, with the warty fruit, is another species with sessile, densely clustered inflorescences, described here as *Ch. tuberculatus* Markgr.

**5. *Chilocarpus obovatus* Markgr., *nov. sp.* — Frutex scandens glaber. Ramuli crassi. Folia coriacea, lucida, obovata, apice obtusa, basi cuneata, 10—12 × 5—6 cm, nervi laterales numerosi, principales 3—4 mm inter se distantes, sed interstitialibus aucti, nervo**

marginali 1—1,5 mm ante marginem coniuncti; petiolus crassus, 1 cm. *Inflorescentiae* terminales et axillares, thyrsoidaeae, multiflorae, pedunculus ad 3 cm longus, 3 mm crassus; pedicelli 2 mm. *Lobi calycis* orbiculares, ciliati, 1 mm. *Tubus corollae* cylindricus, medio inflatus, 3 mm longus, lobi falcati, 2 mm alti, lateraliter ad 4 mm rotundato-elongati. *Stamina* medio tubo affixa, antherae ovatae, 0,7 mm. *Ovarium* oblongum, 1 mm altum. *Caput stigmatis* turbinatum, 0,3 mm altum, breviter biapiculatum, antheras attingens.

BORNEO. Sarawak: Gunong Balang, Botang-Lupar, fl. 4-1867, *Beccari PB 3266* (holotype, FI); Bukit Mersing, Anap, basalt ridge, Dipterocarp forest 800 m, 19-9-1964, *S 22174 Sibat ak Luang*. Vern. 'akar kawit' (Iban dial.).

*Ecology*: Swamp forest, mixed Dipterocarp forest.

*Note*. Because of its coarse, lax inflorescences the new species approaches *Ch. vernicosus* Bl. This, however, differs by elliptic-acuminate leaves and shorter inflorescences.

**6. *Chilocarpus leytensis*** Elm., Leaf. Philip. Bot. 4 (1912) 1453.

*Distribution*: Philippines: Leyte, Palo (fr. *Elmer 7359*, fl. *Wenzel 315*); Bucas Grande (*BS 35114 Ramos & Pascasio*).

*Ecology*: Primary rain-forest at low altitude.

**7. *Chilocarpus embelioides*** K. & G., J. As. Soc. Beng. 74, ii (1907) 401. — **Fig. 1b.**

*Distribution*: Malay Peninsula: Perak; Trengganu (*SF 39858*). Anambas Islands: Jemaja (fl. 15-4-1928, *Henderson 20388 & 20516*); Lingga Archipelago: P. Bakong, 20 m (fl. 19-8-1919, *Bünnemeijer 7576*).

**8. *Chilocarpus torulosus*** (Boerl.) Markgr., *nov. comb.* — *Alyxia torulosa* Boerl., Bull. Inst. Bot. Btzg 5 (1900) 12. — *Ch. anguineus* Stapf in Hook., Ic. Pl. IV, 10 (1913) t.2993. — *Neokeithia torulosa* (Boerl.) Steen., Bull. Bot. Gard, Btzg III, 17 (1948) 408. — **Fig. 1l.**

*Distribution*: Borneo: Muara Teweh (*van Romburgh 54*); Gunong Gading (*S 13329*); Bukit Naoung (*S 19370*); Belajan R. (*Kostermans 10294*); Mt. Bongo (*Haviland 2060*); Kuala Belalong (*BRUN 5656*); Kinabalu (*SF 27875*).

*Ecology*: Mixed Dipterocarp forest on sandy clay.

**9. *Chilocarpus conspicuus*** (Steen.) Markgr., *nov. comb.* — *Neokeithia conspicua* Steen., Bull. Bot. Gard, Btzg III, 17 (1948) 407. — *Ch. gracilis* Markgr., Mitt. Bot. Staatssamml. München 1 (1950) 27. — **Fig. 1k.**

*Distribution*: Borneo: R. Belait (*Ashton 231*); Kinabalu (*Clemens 31651*, fl., type of *Ch. gracilis*; *Clemens 31147*, fr., holotype of *Ch. conspicuus*, L; *Clemens 30486, 50381*; *SF 26484*; *Chew & Corner 7045*).

*Ecology*: Primary rain-forest, often on riverside.

*Note*. The flowering specimens have been attributed to the fruit-bearing holotype because of the outstandingly slender branches and rachis, the leaves, and the localities.

**10. *Chilocarpus amboinensis*** Markgr., *nov. sp.* — *Frutex scandens*. Ramuli teretes. *Folia* coriacea, glabra, subtus dense glanduloso-punctata, lanceolato-elliptica, lamina in petiolum decurrente, 8—12 cm longa, 3—4 cm lata, nervi laterales numerosi, subtus satis prominuli, interstitialibus aucti, nervus marginalis in ipso margine subrevoluto situs. *Inflorescentiae* axillares, interdum etiam terminalis addita, folio fulcranti subaequilonga; pedunculus 2—5 cm longus, nodi rhachidis 2—3 remoti. *Flores* subumbellati. *Pedicelli* 2—4 mm longi. *Calycis lobi* rotundato-ovati, 0,5 mm longi, breviter ciliati. *Corollae*

aurantiaca tubus 3—4 mm longus, lobi acuti, in alabastro 2 mm alti, lateraliter ad 3 mm arcuato-clongati. *Antherae* 0,5 mm longae. *Ovarium* conicum, 0,5 mm longum. *Fructus* luteus, oblongo-obovatus, basi cuneatus, laevis, 5 × 2,5 × 2 cm. *Semina* subglobosa, laevia, 5 mm diam., arillus aurantiacus.

MOLUCCAS. Ambon: Latua, fl. & fr., *Boerlage 434*; Waai Jua Mati, 200—300 m, fl. 18-4-1918, *Kornassi 1170* (L); Waai, slope of Mt. Salahutu, 300—600 m, fr. 13-7-1959, *Kuswata & Soepadmo 293* (holotype, L).  
CELEBES. (?) *De Vriese & Teysmann*.

NW. NEW GUINEA. Sorong, hills S. of the town, fl. 7-4-1954, *van Royen 3324*. Vern. 'aikaduka' (Biak dial.), extract of dried bark used against malaria.

*Note.* This is the '*funis pulassarius*' of Rumphius, *Herb. Amb. 5* (1747) 34, tab. 21.

**11. *Chilocarpus beccarianus*** Pierre, *Bull. Soc. Linn. Paris II, 1* (1898) 101. — **Fig. 1d.**

*Distribution:* Borneo: Sarawak, Marop (young fl. April 1867, *Beccari PB 3280*); Kuching (*Beccari PB 559*; *Haviland s.n.*); Miri (fl. 3-4-1966, *S 24744*); Anap, Bukit Mersing (*S 21947*); Bako Nat. Park (*S 17934*); Trusan (*Haviland s.n.*): Kinabalu (*Clemens 26907*, *31125*, *31591*, *31715*, *40400*). Sandakan: Sibuga forest (*SAN 27713*).

*Ecology:* Mixed Dipterocarp forest, especially on ridges with sandy soil, heath forest.

**12. *Chilocarpus obtusifolius*** Merr., *Pap. Mich. Ac. Sc. 19* (1934) 188, pl. 35.

*Distribution:* Malay Peninsula: Johore, Kuala Sedili (fl. 24-6-1959, *Kadim & Noor 158 = SF 501934*; *H. M. Burkill 1865 = SF 501502*); Kota Tinggi (fr. Jan. 1910, *Ridley 15343*). Sumatra: Kuala, Lundut concession, near Aek Kanopan (fl. 1917, *Bartlett 6954, 7349*). Borneo: Samarinda, Loa djanan (fr. 14-4-1952, *Kostermans 6695*); Tawau (fr. 7-11-1955, *SAN 17193 Wood*); Miri, Lambir Hills Forest Reserve (fr. 11-6-1961, *SAN 4377 Dan bin Hj. Bakar*); Bintulu (Sarawak) (fr. Aug. 1867, *Beccari PB 3702*); Brunei, Sungei Lumut (fr. 25-8-1960, *SF 10424 Sinclair & Kadum bin Tassim*); Tutong Dist., Kpg. Telisei (*van Niel 4279*); Belait Dist., Seria (*van Niel 4352*).

*Ecology:* Rain-forest, especially in peat swamp forests.

**13. *Chilocarpus kuchingensis*** Markgr., *nov. sp.* — **Fig. 1i.** — Frutex scandens.

Ramuli quadranguli viscidii. *Folia* coriacea, glabra, rhombeo-elliptica, apice obtusa, basi sinuato-angustata, pleraque (6—)8(—9) × (4—)4,5(—5) cm, supra nitida, subtus opaca et dense glanduloso-punctata. *Nervi laterales* distincti, numerosi, horizontales, principales 3 mm inter se distantes, interstitialibus aucti. *Petiolus* crassus, 1,5—2 cm longus. *Inflorescentiae* terminales et axillares, laxae, graciles. *Pedunculus* 5—8 cm longus. *Pedicelli* 4 mm longi, 0,3 mm crassi, ad apicem ramulorum umbelliformiter collecti. *Calycis lobi* suborbiculares, ciliati, 1 mm alti. *Corollae* luteae tubus 4 mm longus, lobi in alabastro 1 mm alti, margine superiore sine angulo in partem lateralem, obtusiusculam, 3,5 mm longam desinentes. *Antherae* ovatae, 0,7 mm longae. *Caput stigmatis* turbinatum, antheras attingens. *Ovarium* conicum, 1 mm altum. *Fructus* e ramulis inflorescentiae ad 4 mm incrassatis dependentes, aurantiaci, cylindrici, leviter incurvi, obtuse acuminati, non articulati, polyspermi, 14 × 2 × 2 cm. *Semina* laevia, globosa, nigra, 7 mm diam.

BORNEO. Kuching, fl. 24-2-1893, *Haviland 2299* (holotype, L); *Beccari PB 2018*; Semengoh For. Res. near Kuching, fl. 16-3-1961, *S 12844*; Stamping near Kuching, heath forest, fr. 6-1-1966, *S 22773*; Baram Dist., Marudi For. Res., 'kerangas' forest, *Chew Wee Lek 967*; Lundu Dist., G. Pueh, 1500 ft. lowland Dipterocarp forest, *S 13705*.

*Ecology:* Lowland Dipterocarp forest, 'kerangas' forest.

**14. *Chilocarpus decipiens* Hook. f., Fl. Br. Ind. 3 (1882) 627 — Fig. 1g.**

*Distribution:* Malay Peninsula (frequent in Perak, Pahang, Selangor, Negri Sembilan, Malacca, Johore). Sumatra: East Coast, Simelungun (*Rahmat si Toroes 1428*), Labuan Batu (*Rahmat si Toroes 3927, 4181*).

*Ecology:* Primary rain-forest.

*Vernacular name:* Akar surapat jantan (Negri Sembilan).

**15. *Chilocarpus denudatus* Bl., Bijdr. (1826) 1025. — *Hunteria atroviridis* Wall., Cat. (1829) n. 1614, nomen. — *Hunteria atrovirens* G. Don, Gen. Syst. 4 (1838) 105, *descr. brev.*, based on Wallich's name. — *Ch. atroviridis* Bl., Mus. Bot. Lugd.-Bat. 1 (1850) 153. — *Winchia atroviridis* Kurz, For. Fl. Burma 2 (1877) 170. — *Ch. alyxifolius* Pierre, Bull. Soc. Linn. Paris II, 1 (1898) 102.**

*Distribution:* From Burma, Cochinchina, and Thailand through the Malay Peninsula (Lower Thailand, Perak, Selangor, Malacca) to Central and South Sumatra (Tapiianuli = 'Hoch-Ankola', *Junghuhn; Forbes 1406, 2272*), Borneo (Sungei Landak, *Teysmann 11241; Sarawak, Mt. Dulit, Richards 1463*), and Java to the Lesser Sunda Islands (Bali: G. Batu Kau, *Sarip 366*).

*Ecology:* Rain-forest up to 1000 m.

**16. *Chilocarpus minutiflorus* K. & G., J. As. Soc. Beng. 74, ii (1907) 405.**

*Distribution:* Lower Thailand: Surat, Kan Pa-njan (*Kerr 1150*); Malay Peninsula: Perak, Larut (*King's coll. 7550*, holotype, K).

*Ecology:* Rain-forest, rare.

**17. *Chilocarpus suaveolens* Bl., Bijdr. (1826) 1025. — *Ch. compositus* Bl., Mus. Bot. Lugd.-Bat 1 (1850) 152. — *Ch. densiflorus* Bl., l.c. 152. — *Ch. globuliferus* Bl., l.c. 152. — *Ch. suaveolens* var. *cuneatus* Bl., l.c. 152. — *Ch. suaveolens* var. *borneensis* Hall. f., Jahrb. Hamb. Wiss. Anst. 17 (1899) 150. — *Ch. suaveolens* var. *salaccensis* Hochr., Candollea 5 (1934) 176. — Fig. 1h.**

*Distribution:* Mentawai Islands: Siberut (fl. 6-10-1924, *Iboet 348*). Sumatra. Java (frequent). Borneo: Kapuas (*Teysmann 7907*); Landak (*Teysmann 11341*); Sebalouw (*Teysmann 10816*); Suka Lanting (*Hallier f. 100*); Sungei Sambas (*Hallier f 1095*). Moluccas: Sula Islands, Sula Sanana, between Sanana and Molbufa (*Bloembergen 4289*).

*Ecology:* Primary and secondary rain-forests, Dipterocarp forests.

*Vernacular names:* *Tjankankan lalakk* (Java), *teiteiket* (Siberut), *karet tjari onurai* (Sum.).

**18. *Chilocarpus tuberculatus* Markgr., nov. sp. — Fig. 1f. — Frutex scandens glaber. Ramuli leviter compressi. Folia coriacea, glabra, obovato-cuneata, obtuse acuminata, supra mediam longitudinem basin versus stricte cuneata, 7—12 × 2,5—5 cm; nervi laterales indistincti, numerosi, principales 4 mm inter se distantes, interstitialibus aucti; petiolus 1—1,5 cm longus. Inflorescentiae axillares, brevissimae, juveniles resina obtectae; pedunculus 0,5 cm longus, pedicelli 1 mm longi, bracteolis intermediis obsiti. Lobi calycis oblongi, 2 mm longi. Tubus corollae luteae 6 mm longus, in media parte inflatus, lobi 2 mm alti, in appendicem lateralem 4 mm longum rotundato-elongati. Antherae ovatae, 1,3 mm longae. Caput stigmatum turbinatum, breviter apiculatum. Ovarium conicum, minute tuberculatum, 0,5 mm altum. Fructus late ellipsoideus, saepe breviter apiculatus, 8 × 3,5 × 3,5 cm, verrucis obtusis rudis humilibus obsitus. Semina laevia, ellipsoidea, nigra, 7 × 5 × 5 mm, arillo 5 mm lato ad funiculum instructa.**



MALAY PENINSULA. Perak, Thaiping, 100 ft, Jan. 1885, *Cantley 25*; Larut, 300—500 ft, open rocky creek, rich soil, April 1885, *King's coll. 3203, 3786, 7532*; Kelan Injor, April 1892, *Wray 4026*; Bujong Malacca, Sept. 1898, *Ridley s.n.*

SUMATRA. Tanang Talu, 1100 m, 18-6-1917, *Binnemeijer 1136*.

*Ecology*: Rain-forest on rich, rocky soil.

**19. Chilocarpus rostratus** Markgr., *nov. sp.* — **Fig. 1c.** — Frutex scandens. Ramuli crassiusculi. *Folia* coriacea, glabra, obovato-elliptica, apice non acuminata, basin versus infra mediam longitudinem sinuato-angustata, non cuneata, 8—11 by 3,5—6 cm, supra nitida; nervi laterales satis indistincti, numerosi, recti, principales 3—4 mm intra se distantes, interstitialibus aucti, nervo marginali vix 1 mm intra marginem ciniuncti; petiolus 1—1,5 cm longus. *Inflorescentiae* axillares, contractae, sessiles, pauciflorae, in alabastro resina obtectae; pedicelli bracteolis intermediis obsiti. *Calycis lobi* oblongi, ciliati, 1,2 mm longi. *Corollae* luteae tubus 5 mm longus, lobi falcati, 2 mm alti, lateraliter ad 3 mm elongati. *Antherae* oblongae, 1 mm longae. *Caput stigmatis* turbinato-cylindricum. *Stylus* 1 mm longus. *Ovarium* late conicum, 0,3 mm altum. *Fructus* aurantiacus, ellipsoideus, rostratus, laevius, interdum longitudinaliter costatus, 6—7 by 3—4 by 3—4 cm. *Semina* numerosa, ellipsoidea, laevia, nigra, 7 by 4 by 4 mm; arillus aurantiacus.

BORNEO. Kuching, fl. & fr. 29-11-1894, *Haviland & Hose 3490* (holotype, K); Kapuas, fr. *Teysmann s.n.*; fr. *Main 2111*; Kuching, fr. *Hewitt 2*; Marop, *Beccari PB 3315*; Beaufort Dist., fl. *SAN 49271*; Lundu Dist., *S 13571*; Kinabalu, fl. *Clemens 26794, 27338, 32838, 40647, 50067*.

*Ecology*: Primary rain-forest, lowland Dipterocarp forest, up to 1500 m.

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