

# A monograph of the genera *Maranthes* Bl. and *Cyclandrophora* Hassk. (Chrysobalanaceae) of the Asiatic and Pacific area

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**A monograph of the genera *Maranthes* Bl.  
and *Cyclandrophora* Hassk. (Chrysobalanaceae)  
of the Asiatic and Pacific area.**

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1. The genera *Cyclandrophora* Hassk. and *Maranthes* Bl. are here segregated from the genus *Parinari* Aublet, in which they had been included formerly.

2. *Cyclandrophora* Hassk. forms a closely knit unit of species, represented in the area by 11 species, of which *C. penangiana* is new to science. The following new combinations are presented here:

*C. elliptica* (Kosterm.) Kosterm. & Prance; *C. latifolia* (Henderson) Prance; *C. elata* (King) Prance; *C. nannodes* (Kosterm.) Kosterm. & Prance; *C. indica* (Bedd.) Prance; *C. travancorica* (Bedd.) Prance; *C. villamilii* (Merr.) Prance; *C. scabra* (Hassk.) Kosterm.; *C. excelsa* (Jack) Kosterm.; *C. laurina* (A. Gray) Kosterm.

3. *Maranthes* Bl. is represented in the area with a single species:  
*M. corymbosa* Bl. *Parinarium palauense* Kanehira has been reduced to this species.

*Introduction and acknowledgments*

Almost 6 years ago I started the revision of Asiatic and Pacific *Parinari*. This proved to be not an easy task and the final manuscript was completed only after I had the opportunity in 1961 to examine and study the extensive material at Kew.

Here I met Dr. Yan PRANCE (now at New York Botanical Garden), who was engaged in a revision of the *Rosaceae-Chrysobalanoideae* (considered by him and by me to represent a separate family *Chrysobalanaceae*) on the generic level.

A fruitful cooperation developed, resulting in a combined conclusion, that either numerous genera allied to *Parinari* (e.g. *Licania*) had to be sunk in that genus, or that *Parinari* had to be split up. We finally chose the latter procedure, as well-defined groups of species could be segregated.

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Dr. PRANCE laid down these conclusions in his thesis (Oxford), which, after a considerable delay, will be printed now.

Meanwhile I carried on at the specific level, where other difficulties were encountered. The species of *Parinari*, *Cyclandrophora*, *Maranthes* and *Acioa* (the Asiatic species of this genus are considered by Dr. PRANCE to represent a genus, different from American and African *Acioa*) are so closely knit, that I tended to become a "lumper" before I became acquainted with some species in the field and discovered the organs which show differential characteristics (e.g. the stipules which are fugacious and badly represented in herbarium material).

The results of this study are presented in two papers, one dealing with *Maranthes* and *Cyclandrophora*, the other (to be printed in *Reinwardtia*) on *Parinari* proper, whereas *Acioa* has already been published in *Reinwardtia* (1965).

As Dr. PRANCE's combinations in *Cyclandrophora* have priority, although they have not been published yet, as these names figure in the MSS. of his thesis, I have cited here these combinations under his authorship and of *C. nannodes* under our combined names. The combinations not mentioned in PRANCE's thesis are here under my own name.

I wish to express here my gratitude to the Directors/Keepers of the Herbaria of Kew, Paris, Calcutta, Leiden for providing me material on loan and to the Directors/Keepers of the Herbaria of Kew, Paris, Calcutta, Leiden, Geneva, Bernice P. Bishop Museum, Harvard, Firenze, Fukuoka, Smithsonian Institution, Berkeley and others, where I have been granted hospitality during my stay in 1959 and in 1961.

### Discussion

The genus *Parinari* represents a heterogeneous group of species and the species inter se show differences of a greater magnitude than generic differences of genera allied to *Parinari*. The only character tying all species together is the ovary, which is attached laterally to the throat of the calyx tube.

Omitting DE CANDOLLE, we may accept that BENTHAM (in HOOKER, Fl. Nigrit.: 335. 1849) established the first subdivision of *Parinari*, mainly based on African species (although he included some Asiatic ones several of which he had not seen). He recognized the following sections: *Petrocarya* (Schreber) Benth. (*Balantium* Desv.); *Sarcostegia* Bth. (wherein wrongly included *Petrocarya excelsa* Jack) and *Neocarya* (purely African).

MIQUEL (Fl. Ind. Bat. 1(1): 353. 1855) subdivided *Parinari* in: *Petrocarya* Benth.; *Macrocarya* Miquel, with the same scope as *Cyclandrophora* in this paper and *Sarcostegia* Benth., which covers *Maranthes* of our paper (MIQUEL recognized 4 different species, which are fused here, but included also *Parinarium jackianum*, which actually belongs in subgenus *Macrocarya*).

J. D. HOOKER (Fl. Brit. India 2: 309. 1878) remarked that the Indian *Parinari* species were probably referable to several genera, distinguishable by their fruit more than by any floral characters. He divided the Indian species in three subgenera (suggesting a fourth one for *Petrocarya excelsa* Jack = *Parinarium jackianum* Bth., accepting JACK's misleading description of that species); he only named sub-genus 1

(*Grymania* (Presl) Hooker), which has the same scope as *Petrocarya* (Schreber) Benth. (or *Eu-Parinari* of Haumann); subgenus II, unnamed, is monospecific and includes what is now known as *Angelesia splendens* Korth. (referred by PRANCE and me to *Licania*); whereas (unnamed) subgenus III covers the genus *Cyclandrophora* as treated here.

Shortly afterwards MIERS (J. Linn. Soc. Bot. 17 : 333. 1880) criticised the scope of *Parinari* and again suggested dividing this genus into segregates, based upon fruit characteristics. As most of the fruit were unknown to him and as he accepted also JACK's misleading fruit description of *Petrocarya excelsa* (which belongs in *Cyclandrophora*), his suggestions were not accepted.

HAUMANN (Bull. Jard. Bot. Bruxelles 21 : 184. 1951) discussed the generic limits of *Parinari*. He recognized for the African species the following subgenera: *Sarcostegia* Bth. (our *Cyclandrophora*) and *Pellegriniella* (purely African). Both these genera are characterized by leaves lacking stomatal areoles on their lower surface and having often two glands at the base of the leaf. The other two genera: *Neocarya* (monotypical, African) and *Euparinari* Haumann have stomatal areoles and often glands on the petioles.

In the Asiatic species of *Parinari* the characteristic of the stomatal areoles does not hold true for *Euparinari*, as some species lack these (in our paper on *Parinari* these are grouped as a separate subgenus).

Characteristics of less importance, like the fleshy and almost symmetric perianth in subgenus *Sarcostegia* as opposed to membranous, unequal perianth in *Euparinari* holds true also for Asiatic species.

Recently PRANCE laid down his conclusions on a new classification of *Chrysobalanaceae* in a thesis, which will be published soon. PRANCE accepts *Chrysobalanaceae* as a separate family, herein following K. FRITSCH (1880).

The philosophy underlying his classification is clear: species in a genus like *Parinari* are often more different from each other than genera of *Chrysobalanoideae* are differing from *Parinari*. Either all genera should be combined under *Chrysobalanus* or genera like *Parinari* should be split up in smaller genera. He chose the latter way and I believe that the general trend in developing taxonomy is to give to those small entities generic rank in preference to making huge genera to be subdivided into sub-genera. There is no argument for or against one of these procedures as they both reflect phylogenetical views as far as they can be proved (and they cannot be proved). I have the feeling that only the argument of consistency (no genera with species which differ more amongst each other, than do the genera amongst each other) should preponderate here, if not the argument of practicability.

If swarms of species can be detected, characterized and separated from other swarms, even by a single character and provided that there are no intermediate cases for this single characteristic (i.e. the characteristic is a "strong" one), then there is no reason not to treat these as genera (which are certainly not less "natural" as "genera" based on more than one characteristic in case the latter characteristics are not so "strong" and more fluid).

Such a swarm of species is certainly *Cyclandrophora*, of which the fruit is ultimately one-celled with ruminant cotyledons. The "strong" characteristic is the ruminant



cotyledons, not the one-celled fruit, as the fruit is initially two-celled as in all other *Parinari* species.

*Maranthes* differs from *Parinari* sensu strictu, mainly by the construction and shape of its fruit, furthermore by the two distinct glands at the base of the leaf blade. Furthermore they have fleshy perianth leaves. Malesian *Maranthes* is exactly matched in generic characteristics by some African species.

For further discussions see under *Cyclandrophora* and under *Maranthes*.

### *Maranthes* Bl.

**Maranthes** Blume, Bijdr. Fl. Nederl. Ind. 2<sup>e</sup> Stuk : 89. 1825; Fl. Java, Praef. : VII. 1828 (as a syn. of *Exitelia* Bl.); Mus. Bot. Lugd. Bat. 2 : 99. 1856; Reichenbach, Consp. : 204. 1828 (*Maranthus*); Endlicher, Gen. : 1004. 1840 (as a syn. of *Exitelia* Bl.); Korthals, Verhand. Nat. Geschied. Ned. Overzeesche Bezitt., Bot. : 258. 1839-42; Steudel, Nom. ed. 2, 2 : 100. 1841 ; Miquel, Fl. Ind. Bat.1 (1) : 355. 1855; Mueller in Walp. Ann. 4 : 644. 1857; Bentham in Bentham & Hooker f. Gen. Pl. 1 : 607. 1865; Hooker f. in Martius, Fl. Bras. 14 (2) : 49. 1867; Durau, Index : 111. 1888; Boerlage, Handl. Fl. Ned. Ind. 1 : 424. 1890; de Dalla Torre & Harms, Gen. Siph. : 211. 1901; Post & Kuntze, Lexikon : 351. 1904 (*Maranthes* et *Maranthus*); Craib, Enum. Pl. Siam. 1 : 564. 1931; Prance, in the press.

*Exitelia* Blume, Fl. Java, Praef. : VII. 1828; Mus. Bot. l.c. : 99. 1856; Endlicher, Gen. : 1004, no. 5357. 1840; Steudel, Nom. ed. 2, 1 : 623. 1840; Spanoghe, Linnaea 15 : 174. 1841; Miquel, Fl. l.c. : 355. 1855; Mueller in Walp. Ann. 4 : 644. 1857; Flora 41 (16): 255. 1858 (*Eritelia*); Bentham in Bentham & Hooker f. Gen. Pl. 1: 607. 1865; Hooker f. in Martius, Fl. Bras. l.c. : 49. 1867; Durand, Index : 111. 1886; Boerlage, Handl. l.c. 1 : 424. 1890; de Dalla Torre, l.c. : 211. 1901; Post & Kuntze, Lexikon : 232. 1904 (*Exitelia* et *Exiteles* Miers).

*Grymania* Presl, Epimeliae Bot. : 193. 1848 (p.p.); Walp. Ann. 3 : 853. 1854; Durand, Index : 111. 1888 (as a syn. of *Parinarium* Juss.); de Dalla Torre, l.c. : 211. 1901; Post & Kuntze, Lexikon : 258. 1904 (as a syn. of *Ferolia* Barr. et *Hirtella* L.).

*Parinari* subgenus *Sarcostegia* Bentham in Hooker, Niger Fl.: 335. 1849, p.p. (*P. jackianum* Bth. exclud.); Miquel, Fl. Ind. Bat. 1 (1): 1855 (excl. *P. jackianum* Bth.).

TYPE SPECIES: *Maranthes corymbosa* Bl.

*Trees*. Living bark dark red. *Leaves* entire, alternate, stipulate, glabrous; petioles with two apical glands. Stipules stiff, early caducous, lateral to the petiole. *Flowers* in panicles. *Calyx* tube well developed; lobes 5, patent at anthesis, somewhat unequal. *Petals* 5, thin, spatulate, caducous in an early stage. Fertile *stamens* 25-30, the long, slender filaments attached to a thin rim; the sterile stamens represented by small teeth on the rim. *Ovary* sessile, attached laterally to the throat of the calyx tube, 2-celled, each cell with one ovule. Style slender, longer than the filaments, attached at the base of the ovary. *Fruit* consisting of a thin, fleshy exocarp, a hard, "marbled" mesocarp and a very thin endocarp which has a dense layer of brown, woolly hairs, filling the two cavities of the fruit. As a rule only one seed developed.

OBSERVATIONS: The genus is close to *Cyclandrophora* Hassk., from which it may be distinguished by the more numerous stamens, the foliar glands and especially by the fruit, which has no radial fibre layer, remains two-celled and the embryo is not ruminant. In the area treated here, only one species is represented.

*1. Maranthes corymbosa* Blume

**Maranthes corymbosa** Blume, Bijdr. Fl. Ned. Ind. 2e Stuk : 89. 1825 (sub Byttneriaceae); Mus. Bot. Lugd. Bat. **2** : 99. 1856 (as a syn. of *P. Maranthes* Bl.); Steudel, Nom. ed. 2, **2** : 100. 1841; Miquel, Fl. l.c.: 356. 1855; Mueller in Walp. Ann. **4** : 645. 1857; Flora **41** : 256. 1858; Koorders & Valetton in Meded.'s Lands Pl. tuin Buitenzorg **33** : 334. 1900; Merrill, Philipp. J. Sci. l.c.; Bibl. Enum. l.c. : 290. 1921; Enum. l.c. : 235. 1923; Craib, l.c.: 563. 1931; Kanehira, l.c. : 324. 1934.

*Exitelia corymbosa* (Bl.) Blume, Fl. Java 1, Praef. : VII. 1828 (without specific epithet); Mus. Bot. l.c. : 99 (as a syn. of *P. Maranthes* Bl.); Spanoghe, Linnaea **15** : 174. 1841; Miquel, Fl. l.c. 356. 1855; Miers, J. Linn. Soc. Bot. **17** : 336. 1879 (Exiteles); Koorders & Valetton, l.c.: 334. 1900.

*Ferolia corymbosa* (Miq.) O. Kuntze, Rev. Gen. Pl. **1** : 216. 1891.

*Parinarium corymbosum* (Bl.) Miquel, Fl. Ind. Bat. **1** (1) : 356. 1855 et : 1084. 1858; Ann. Mus. Bot. Lugd. Bat. **3** : 237. 1867; Pl. Jungh. ined.; Walp. Ann. **4** : 645. 1857; F. Villar, Nov. App. : 76. 1880; Vidal, Catal. Pl. Len. Sylv. Cult. Philipp.: 29. 1880; Filet, Plantk. Woordenb. Ned. Ind. ed. 2 : 183. 1888; Koorders & Valetton in Meded.'s Lands P. tuin Buitenzorg **33** (Bijdr. Kennis Boomsoorten Java 5) : 334. 1900 (as a syn. of *P. griffithianum* Bth.; syn. *P. polyneurum* Miq. except.); Backer, Schoolfl. Java. **1** : 446. 1911 (as a syn. of *P. griffithianum* Bth.); Moll & Janssonius, Mikrogr. Holz. Java **3** : 222. 1914; Merrill, Philipp. J. Sci. Bot. **10** : 309. 1915; Spec. Balancoanae : 162. 1918; Bibl. Enum. Born. Pl. : 290. 1921; Enum. Philipp. Flow. Pl. **2** : 235. 1923; Schneider, Bull. **14**, Bureau For. Philipp. : 114, tab. 2, fig. 13. 1916; Kanehira, Identif. Philipp. Woods Anat. Char. : 30. 1924; J. Dept. Agr. Kyushyu Imp. Univ., Fukuoka **4** : 324. 1934; Heyne, Nutt. Pl. Ned. Ind. ed. 2, **1** : 696. 1927; ed. 3, **1** : 696. 1950; Craib, Fl. Siam. Enum. **1** : 563. 1931; Yenko et al., Philipp. J. Sci. **55** (1) : tab. 6, fig. 1. 1934; Burkill, Dict. Econ. Prod. Mal. Pen. **2** : 1666. 1935; Corner, Wayside Trees Mal. **1** : 527, tab. 164 et 165. 1940; Meeuse et Adelbert in Backer, Fl. Java (emergency Ed.) Fam. 116 : 27. 1943; Backer & Bakh. f. Fl. Java **1** : 3. 1963; Browne, Forest Trees Sarawak & Brunei : 309. 1955 — Blume s.n., Java, Prov. Krawang near Tjiradja, Kituah incol. (L).

*Parinarium multiflorum* (Korth.) Miquel, Fl. Ind. Bat. **1** (1) : 356. 1855 et : 1084. 1858; Suppl. Sumatra : 115. 1860 et : 307. 1862; Walp. Ann. **4** : 646. 1857; Hooker f. Fl. Brit. India **2** : 310. 1878 (as a syn. of *P. griffithianum* Bth.); Villar, Nov. App. : 76. 1880 (as a syn. of *P. griffithianum* Bth.); Schumann & Hollrung, Fl. K. Wilhelmsl. Beih., Nachtr. : 93. 1889 (as a syn. of *P. griffithianum* Bth.); King, J. As. Soc. Bengal **66** (2) : 283. 1897 (as a syn. of *P. griffithianum* Bth.); Koorders & Valetton, l.c. : 334. 1900 (as a syn. of *P. griffithianum* Bth.); Backer, Schoolfl. Java **1** : 446. 1911 (as a syn. of *P. griffithianum* Bth.); Merrill, Philipp. J. Sci. **10** : 310. 1915; Bibl. Enum.

l.c. : 290. 1921 (as a syn. of *P. corymbosum* Miq.); Heyne, Nutt. Pl. Ned. Ind., ll. cc. (as a syn. of *P. corymbosum* Miq.).

*Maranthes multiflora* Korthals, Verhand. Natuurl. Geschied. Ned. Overzeesche Bezitt., Bot. : 259, tab. 70. 1839-42; Nederl. Kruidk. Arch. **3** : 281. 1855; Miquel, Fl. l.c. : 357. 1855; Blume, Mus. l.c. : 98. 1856; Mueller in Walp. Ann. **4** : 646. 1857; Flora **41** (16) : 256. 1858; Teijsmann & Binnendijk, Cat. Hort. Bogor. : 253. 1866 (nomen); Hooker f. l.c. : 310. 1878; Villar, l.c. : 76. 1880; Schumann & Hollrung, l.c. : 93. 1889; King, l.c. : 283. 1897; Koorders & Valetton, l.c. : 334. 1900 (as a syn. of *P. griffithianum* Bth.); Merrill, Philipp. J. Sci. l.c.; Bibl. Enum. l.c. : 290. 1921; Enum., l.c. : 235. 1923 (as a syn. of *P. corymbosum* Miq.); Ridley, Fl. Mal. Pen. **2** : 670. 1922.

*Exitelia multiflora* (Korth.) Walp., Rep. **5** : 115. 1845-46; Miers, J. Linn. Soc. Bot. **17** : 336. 1879 (Exiteles); Merrill, Bibl. Enum. l.c. : 290. 1921. — Korthals s.n., Borneo (L.)

*Parinarium griffithianum* Benth in Hooker, Niger Fl. : 334. 1849 (in adnot.); Fl. Austral. **2** : 426. 1864; Walp. Ann. **2** : 463. 1851-52; id. **4** : 645. 1857; Miquel, Fl. Ind. Bat. **1** (1) : 356. 1855 et : 1084. 1858; Blume, Mus. l.c. : 98. 1856; Hooker f. Fl. Brit. India **2** : 310. 1878; Miers, J. Linn. Soc. Bot. **17** : 336. 1879; Villar, Nov. App. : 76. 1880; Vidal, Sinopsis Pl. Len. Philipp. Atlas : 25, tab. 46, fig. A. 1883; Schumann & Hollrung, Fl. K. Wilhelmsh. : 93. 1889 (Beih., Nachtr.); Maingay, Kew Bull. **1890** : 122; Warburg in Engl. Bot. Jahrb. **13** : 321. 1890; King, J. As. Soc. Beng. **66** (2) : 283. 1897; Koorders, Meded.'s Lands Pl. tuin Buitenzorg **19** (Verslag Minahassa) : 448. 1898; Exkurs. Fl. Java **2** : 338. 1912; Koorders & Valetton, l.c. : 334-37. 1900; Atlas Baumarten Java : tab. 94. 1913; Bailey, Queensl. Fl. : 524. 1900; Compreh. Cat. Queensl. Pl. : 167. (nomen); Schumann & Lauterbach, Fl. Deutsche Schutzgeb. Südsee : 341. 1901; Ridley, Mal. Timmerhoutsoorten, Bull. Kol. Mus. Haarlem **27** : 60. 1903; Fl. Malay Pen **1** : 670. 1922; Dispersal Pl. World : 400. 1930; Perkins, Fragm. Fl. Philipp. : 118. 1904; Brandis, Indian Trees : 278. 1906; de Clercq, Nieuw Plantk. Woordenb. Ned. Ind. : 299. 1909; Merrill, Philipp. J. Sci. **1**, Suppl. : 60. 1906; id. **10**, l.c. : Spec. Blancoanae : 162. 1918 (as a syn. of *P. corymbosum* Miq.); Bibl. Enum. l.c. : 290. 1921; Enum. Philipp. Fl. Pl. **2** : 235. 1923 (as a syn. of *P. corymbosum* Miq.); Foxworthy, Philipp. J. Sci. **C-2** : 386. 1907; Whitford, Philipp. Bur. For. Bull. **10** (2) : 34, tab. 14, 15. 1911; Backer, Schoolfl. Java **1** : 446. 1911; Koorders-Schumacher, Syst. Verzeichn. **1** (1) : 20-22. 1914; Heyne, ll.cc. : 696; Craib, Fl. Siam. Enum. **1** : 563. 1931; Burkill, Dict. l.c. **2** : 1666. 1935 (as a syn. of *P. corymbosum* Miq.); Meeuse & Adelbert, l.c.; Backer & Bakh. f. l.c.

*Petrocarya griffithiana* (Bth.) Miers, J. Linn. Soc. **17** : 336. 1879 (Comb. not printed).

*Ferolia griffithiana* (Bth.) O. Kuntze, Rev. Gen. Pl. **1** : 216. 1891. — Griffith 2047/2 (K).

*Parinarium salicifolium* (Presl) Miquel (non Engler), Fl. Ind. Bat. **1** (1) : 357. 1855; Mueller in Walp. Ann. **4** : 646. 1857; Benth in Hooker, Fl. Austral. **2** : 427. 1864; Villar, Nov. App. : 76. 1880; Vidal, Phaner. Cuming. Philipp. : 111. 1885; Rev. Pl. Vasc. Philipp. : 121. 1886; Merrill, Philipp. J. Sci. **10** : 310. 1915; Spec. Blan-

coanae : 162. 1918 (as a syn. of *P. corymbosum* Miq.); Enum. Philipp. Fl. Pl. **2** : 235. 1923 (as a syn. of *P. corymbosum* Miq.).

*Grymania salicifolia* Presl, Epimeliae Bot. : 193. 1849; Walp. Ann. **3** : 854. 1853 et **4** : 646. 1857; Miquel, l.c. : 357. 1855; Mueller, l.c. ; Villar, l.c. : 76 (Grimania); Merrill, Philipp. J. Sci. : 10. l.c.; Enum., l.c. : 235.

*Ferolia salicifolia* (Presl) O. Kuntze, Rev. Gen. Pl. **1** : 216. 1891 — Cuming 1057.

*Parinarium racemosum* Vidal, Cat. Pl. Prov. Manila : 29. 1880; Merrill, Philipp. J. Sci. **10** : 310. 1915; Enum. Philipp. Flow. Pl. **2** : 235. 1923.

*Parinarium ? nitidum* (non Benth.) Koorders, Minahassa in Meded.'s Lands Pl. tuin Buitenzorg **19** : 448. 1898 — Koorders 18546 (BO).

*Parinarium spec.* Vidal, Rev. Pl. Vasc. Philipp. : 121. 1886. — Cuming 1057.

*Parinarium palauense* Kanehira, J. Dept. Agr. Kyushyu Imp. Univ., Fukuoka **4** 325. 1934; Bot. Mag. Tokyo **45** : 282. 1931; Fl. Micrones. : 129, tab. 1933. — Kanehira 469 (FU).

*Chrysobalanus ciliatus* Korthals ex Miquel, Fl. Ind. Bat. **1** (1) : 357. 1855; Mueller in Walp. Ann. **4** : 646. 1857.

*Maranthes speciosa* Korthals ex Miquel, Fl. Ind. Bat. **1** (1) : 357. 1855. — Korthals s.n., Martapura, Borneo (L).

*Polyalthia pulchrinervia* Boerlage, Cat. Pl. Hort. Bot. Bogor. : 20. 1899; Icones Bogor. **1** : 106. 1899; Merrill, Enum. Philipp. Fl. Pl. **2** : 235. 1923 (as a syn. of *P. corymbosum* Miq.); Kostermans, New & Crit. Mal. Pl. **4** : 40. 1955 (as syn. of *P. corymbosum* Miq.). — IV G. 42 (BO).

“*Alamag Blanco*”, Fl. Philipp. : 550. 1837; ed. 2 : 369. 1845; ed. 3, **2** : 319. 1879; Merrill, Spec. Blanco. : 162. 1918.

“*Pasac Blanco*”, Fl. Philipp. : 848. 1837; ed. 2 : 586. 1845; ed. 3, **2** : 270. 1879; Merrill, Spec. Blanco. : 162. 1918.

“*Lyusin Blanco*”, Fl. Philipp. ed. 2 : 369. 1845; ed. 3, **2** : 319. 1879; Merrill, Spec. Blanco : 162. 1918.

VERNAC. NAMES: *Siam*: Chi- kat- pen or Chi- ot- pen (Korat); *Malay Peninsula*: Merbatu layang; Chana; Mujagon; Sauh hutan; Sunko rimau; *Sumatra*: Kaju batu (Bangka); Kalek kureseng, K. parada (Menangkabau); *Java*: Gesing, Sulu or Solo, Triwulan, Wuloh (Javanese); Kituwak, Taritig, Tariti (Sundan.); Tariti tjamar (Malay); *Philippines*: Alamag (Tag.); Aningat (Ilk.); Arangan (Fagb.); Bagkangai (C. Bis.); Bakayau (Pang.); Bakoyan (P. Bis.); Barit (Bik., C. Bis.); Binggas (Ilk.); Bongog (S. L. Bis.); Dau (S.L. Bis.); Delebaybai (Tag.); Dumaga (Kuy.); Kagemkena (Ilk.); Kalakangan (Bag.); Kamuli tingan (Pamp.); Kagangan (Bag.); Kaphangan (Tag.); Karatak (Ilk.); Kulingan (Tag.); Lankangan (Lan.); Langog or Langug (Buk.); Liusin (Bik., S.L. Bis.); Liusin (Sbl., Tag., Bik.); Lumaluas (Mag.); Malapiga (Tag.); Malapuyan (Tag.); Maluktik (Sul.); Mata-mata (S.L. Bis.); Ogat (Bag.); Sabongkaag (Ilk., Ting); Salipungan (Neg.); Salutui (Neg.); Sarangan (S.L. Bis.); Sigaadan (Mag.); Tadiang manok (Ting., Tag.); Takdangan (Tag.); Tapgas (P. Bis.); Uasusa (Klg.); *S-E Celebes*: Kolaka; *N. Halmaheira*: Samolai (Gal.); *Tidore*:

Nongu; Latan (Aru Isl.); *Nw Guinea*: Niwa (Amberbakan); Maas or Naas (W Irian); Tienga or Koperar Manikiong; W Irian); *Bougainville Isl.*: Mon-warlu (Kugumaru); Marigai (Siwai dialect, Bouin); *Palau Isl.*: Apgau.

Large tree, up to 40 m high and 100 cm in diam. (exceptionally up to 160 cm in diam); bole cylindrical, slightly enlarged towards base without buttresses or these very small; free bole up to 20 m long; crown large, rather irregular with stout main branches, rather lax. Bark 3-5 mm, grey, smooth, but for some metres below the crown as a rule peeling off in large pieces, which start peeling at the basal side, which then curves upward, giving the tree a scaly appearance; living bark 10 mm, hard, brittle, beefy red, with a watery exsudate when cut, astringent; cambium dirty white; sapwood dirty white. The branchlets of the flush very thin, partly covered by a cobweb-like indumentum, very soon glabrous, showing numerous tiny, round, pale lenticels; branchlets dark (exceptionally—in exposed places—grey). The leaves of the flush with a sparse to dense cobweblike indumentum, especially on the lower surface; denser near the base, dense on the petiole; midrib below adpressed strigose; mature leaves glabrous, coriaceous, usually oblong-lanceolate or elliptical lanceolate, 2.5-8 × 7-15 cm (in young trees oblong, circa 5 × 10 cm and more, up to 19 cm long), apex acuminate, usually caudate-acuminate, sharp, base decurrent, cuneate, with two scutellate, round protruding concave, small glands on either side of the transitional zone of petiole and leafblade on the upper surface (rarely these glands absent); the leaves extremely brittle when dried; upper surface very metallic-glossy, drying black, lower one rather dull, drying brown; reticulation prominent on both surfaces, midrib on upper surface flat, prominent below; lateral nerves slender, prominent, 7-10 pairs, arcuate, erect-patent. Petiole slender, 5-6 mm long, glabrous, flat above, often becoming suberous. Stipules intrapetiolar, lanceolate, acute, 5-10 mm long, outside sparsely silky pilose, inside glabrous, margins pilose, often grown together, caducous at a very early stage. Flowers in condensed, often umbell-like, many-flowered, terminal panicles (sometimes panicles lax); inflorescences twice branched with a short peduncle, distant, short branches, sparingly pilose, glabrescent. Bracts at base of side branches ovate, acutish, 2-3 mm long, slightly pilose outside and at margin; other bracts more lanceolate, deciduous in a very early stage. Pedicels 2-3 mm long (after anthesis up to 5 mm), densely silky pilose to glabrous, merging into the short turbinate, densely silky or glabrous, 1.5-2.5 mm long calyx tube, which is glabrous within; calyx lobes fleshy, ovate to elliptic, obtuse, 2-4 mm long, unequal, incurved after anthesis. Petals white, with pinkish tinge, rather fleshy, glabrous (on the upper part and margins with a microscopical cobweblike pilosity), obovate to elliptic, up to 5-6 mm long, caducous in an early stage. Filaments white, slender, glabrous, 7-8 mm long, their bases connate into an 1-1.5 high, erect, membranous rim; the 25-30 fertile stamens at the opposite and lateral side of the style; the stamens at the side of the style reduced to small teeth on the rim. Ovary at the calyx throat, densely covered with a cotton-wool like very fine indumentum and on top of that stiff, silky, glossy bristles, especially near and on its basal part; the glabrous, greenish white style thicker than the filaments and much longer (up to 12 mm long); stigma broader than the style, truncate. Fruit ellipsoid, club-shaped, up to 1.5-2 × 3-4 cm; the woolly cobweb indumentum soon wearing off; exocarp thin, fleshy, sweet-acid, edible, 1 mm thick, in ripe condition violet black (yellow when half ripe); mesocarp very hard, 5 mm thick, in cross-section “marbled”; endocarp very thin, 0.5 mm, covered at the inside with a dense layer of brown, woolly hairs; fruit 2-celled, seed usually only in one cell, ellipsoid, flattened, up to 1.5 cm long and 7 mm in diam., partly pilose; seedcoat very thin; cotyledons flat-convex.

DISTRIBUTION: S Siam., Malay Peninsula, the Indonesian Archipelago, New Guinea, Solomon Is., Tropical Australia, Caroline Isl., from sea level to about 500 m altitude.



REPRESENTATIVE SPECIMENS: SIAM: Surat, Bangkrat, Febr., fl., *Kerr 18160* (C, E, K); *ibid.*, Pak Sai, March, fl., *Kerr 12503* (K); *ibid.*, Kaw Tao, April, fl., *Kerr 12727* (E, K); Trang, March, fl., *Van Pruk 655* (BKF, K); Raichawng, Tatanopa, Febr., fr., *Kerr 17040* (C, E, K); MALAY PENINSULA: Langkawi Isl., fr., *Curtis s.n.* (P), leaves  $6.5 \times 14$  cm; *ibid.*, Mt. Ray, Febr., fl., *Haniff s.n.* (SING); Penang, Gvt. Hill seedling, *Burkill 4605* (SING); *ibid.*, Muka Head, May, fr., *Curtis 2416* (K, P, SING); *ibid.*, March, fl., *Curtis 1514* (SING); Kedah, Polo Singsing, June, fr., *Curtis 2416* (SING); Perlis, Kang, March, fl., *Ridley 15214* (K, SING); Pahang, Temerloh-Pahang, June, young fr., *Awang 2396* (K, SING); *ibid.*, riverbank, March, fl., *Ridley 1354* (SING); *ibid.*, Tioman Isl., Isl. Chibeh, sea level, Aug., fl., *Corner S.F.N. 29825* (BO, K, SING); Negri Sembilan, Tampin-Seremban Rd., July, fr., *Burkill S.F.N. 2041* (SING); *ibid.*, Pasir Pandjang, June, fl., fr., *For. Dept. 0598* (K, SING, US) (large leaves); *ibid.*, July, fr., *Burkill 2041* (K); Selangor, Kepong, April, fl., *For. Dept. 24823* (SING); *ibid.*, For. Research Inst., July, fl., *Kep. 93389* (BO) et Sept., fl., *Kep. 75938* (L) et *75984* (BO, K, L, SING, US); Kepong Field 12, For. Res. Inst., March, fl., *Kep. 80233* (KEP, L, SING); Temerloh, June, fr., *For. Dept. 2396* (K); Johore, Sg. Rhu Reba, Jason Bay, low alt., June, fl., *Corner S.F.N. 28495* (BO, GH, K, SING); *ibid.*, Tinggi Isl., ster., *Burkill 910* (SING); Malacca, young fr., *Alvins 1193* (SING); *ibid.*, March, fl., *Alvins 977* (SING); *ibid.*, fl., fr., *Maingay 2602* (Kew Distr., 620)(K) et *1635* (Kew Distr. 620) (K); *ibid.*, fl., fr., *Griffith 2047/2* (C, K, L, LE, P, S), type of *P. griffithianum* Bth.); *ibid.*, Bukit Beruang, April, fl., *Holmberg 738* (SING); *ibid.*, *Alvins s.n.* (SING); *ibid.*, Aug., fr., *Goodenough 1389* (K); *ibid.*, Mt. Sabokor, April, fl., *Derry 1236* (SING) et Aug., fr., *Derry 1126* (SING); *ibid.*, Sg. Udang, Aug., fr., *Goodenough 1351* (SING); *ibid.*, Hulu Chembong, fr., *Derry 1001* (K, SING US); *ibid.*, Malacca, Cemetery, fr., *Hullett 716* (SING); Singapore Isl., Bukit Timah, April, fl., *Corner S.F.N. 34935* (BO, GH, K, SING); *ibid.*, Nov., fr., *Ngadiman S.F.N. 34549* (BO, GH, SING) et Sept., fl., *Ngadiman S.F.N. 37008* (GH, K, SING); Changhi, March, fl., *Hullett 855* (K) et *51* (SING); Fort Canning, fr., *Ridley 8085* (SING); Bot. Gard. Jungle, April, fl., *Hassan S.F.N. 36264* (GH, K, SING); *ibid.*, April, fl., *Nur S.F.N. 28328* (BO, K, SING); *ibid.*, Jan., fr., *Sinclair S.F.N. 10684* (A, BM, BO, E, FL, K, L, M, NY, SING); SUMATRA: Atjeh, Lho Seumawe, Blang Porok, alt. 200 m, ster., *bb 14509* (BO, L); Pakembaru, Simelungun, alt. 390 m, ster., *bb. 35332* (BO); Palembang Distr., Lematang Hilir, alt. 75 m, May, fl., *T. 3P. 818* (BO, K, L); *id.*, Nov., fr. (BO, L); *id.*, Dec., fr. (BO); *ibid.*, Gunungmegang, ster. *T. 3P. 818* (BO); Palembang, Merangat, ster., *Teijsmann H.B. 3711* (BO, FI, K, L, et *818* (K); S-W Sumatra, Minangkabau, Sidjudjung Pudah, alt. 300 m, ster., *bb 9094* (BO) et *bb 5522* (BO, K, L); Lampong Distr., Tarabangi, *H.B. 4506* (L), type of *P. multiflorum* Miq.; *id. 6477* (FI); *ibid.*, Seputih, Kotabumi, alt. 40 m, ster., *bb. 7641* (BO, L); N. Bangka, Blinju, Nov., fr., *Grashoff 74* (BO, L); S Bangka, Lobok Besar, alt. 20 m, Oct., fr., *Kostermans & Anta 1200* et *502*, fl. (A, BISH, BM, BO, BRI, CANB, K, KEP, L, LAE, NY, P, SYD, SING); *ibid.*, Sept., fl., *Kostermans & Anta 399* (BO, K, L); *ibid.*, Rindik, ster., *bb. 11303* (BO); *ibid.*, Toboali, ster., *bb. 1946* (BO); *ibid.*, fr., *Teijsmann s.n.* (BO, L); Belitung (Biliton), Tandjungpandan, Bantan, alt. 30 m, ster., *bb. 7565* et *6772* (BO); *ibid.*, fl., *van Rossum 19* (BO, K); Central Bangka, Terah, Dec., fl., fr., *bb. 34234* (BO, K, L); JAVA: W Java, Ujung Kulon Reserve, Peutjang Isl., coral limestone, low, Nov., fr. *Kostermans* (Unesco) 22 (A,

BH, BISH, BKF, BM, BO, BRI, CAL, CANB, G, K, KEP, L, NY, P, PNH, SAN, US); Street Sunda, Krakatau Isl., Isl. Rakata, ster., *Borssum-Waalke* 1062 (A, BO, K, L, SING); Bogor Distr., Janlappa, Nov., fr., *Ja* 6623 (BO, L); *ibid.*, Oct., fr., *Ja* 6212 (BO, L); *ibid.*, Jan., fr., *Ja* 6396 (BO) et fr., *Ja* 6869 (BO, K, L); *ibid.*, Tjampea, July, fr., *Koorders* 30442 (BO, L); *ibid.*, Depok, Aug., buds, *Koorders* 31044 (BO); culta in Hort. Bogor. sub *IV G* 42, type of *Polyalthia pulchrinervia* Boerl. (A, BO, K, L, SING), sub *IV H* 111 (BO), sub *IV H* 113, ster., (US), sub *IV H* 23, *IV H* 55, *IV H* 78, *IV H* 99, *C* 189 (BO); *ibid.*, ster., *Hasskarl s.n.* (L), local name Salam Andjieng (wrong; this is the name of an *Eugenia* spec. !); Krawang, Tjikampek, culta, Dec., fr., *Ja* 6012 (BO, L); South Priangan, Djampangkulon, Tjiratjap, ster., *Koorders* 6430 et 6431 (BO); *ibid.*, Isl. Nusagedeh in lake of Pendjaluh, July, fr., *Koorders* 3102 (BO) et ster., *Koorders* 47646 (BO); *ibid.*, Tjikankung, ster., *Ja* 1259 (BO); W Priangan, Mt. Bentang, ster., *Ja* 2314 (BO, L); Sukabumi Distr., Pelabuanratu, ster., *Koorders* 6425-6428 (BO) et 6429 (BO, L), 12128, 34253, 34274, 41345 (BO), fr., *Koorders* 34244 (BO, L); Oct., fr., *Koorders* 15731 (BO); CENTRAL JAVA: E Tegal, 100 m alt., Sept., fr. *Beumée* 4505 (BO); Samarang Distr., Kedungdjati, Nov., fr., *Koorders* 6443 (BO) et 25516 (A, BO, K, L, P); *ibid.*, July, fl., *Koorders* 6435 (BO), 6438 (BO, L) et 6440 (BO); *ibid.*, fr., *Koorders* 6436 (BO); *ibid.*, Aug., fl., *Koorders* 6433 (BO, G, L) et Sept., fl., *Koorders* 24960 (BO); *ibid.*, ster., *Koorders* 6437, 6439, 6442, 13690 (BO) et 6441 (BO, L); Karangasem, March, fr., *Koorders* 6450 (BO) et May, fl., *Koorders* 34938 (BO) et ster., *Koorders* 6448, 6449 et 28374 (BO); Distr., Djapara, Ngarengan, ster., *Koorders* 32970 (BO); *ibid.*, Sumanding, alt. 600 m, ster., *Ja* 3831 (A, BO, K); Distr. Rembang, Sedan, Nov., buds, *Koorders* 36455 (BO, L); Tjabah, ster., *Koorders* 42287, 42299, 42305, 42328, 42332 et 42394 (BO); W Sulang, fl., *Proefsta. s.n.* (BO, L, SING); Wonosobo, alt. 500 m, ster., *Ja* 2510 (BO, SING); Karanganyar, Pagebangan, alt. 200 m, ster., *Ja* 2524 (BO); Temanggung, Klatah, alt. 700 m, ster., *Ja* 2510 (BO); Blora, Sambong, alt. 150 m, ster., *Ja* 1819 (BO); E JAVA: Isl. Nusakambangan, ster., *Koorders* 20257 (BO, L) et 24595 (BO); Pasuruan S of Bantur, Gombangan, June, fl., *Backer* 30421 (BO, K, L) et 3924 (BO, L); *ibid.*, Sumber mandjung, K. Pare, June, young fr., *Koorders* 23409 (BO, BRI, K, L); Besuki: Puger, June, buds, *Mente* 1693 (BO); Djember, Puger, ster., *Koorders* 6452 (BO, L), 12688 et 13113 (BO); Banjuwangi, Rogodjambi, ster., *Koorders* 38897 (BO); LOCALITY NOT INDICATED: Sawarna, ster., *Blume s.n.* (L); *id.*, fl., *Blume* 1516 (BO, L), type of *Maranthes corymbosa* Bl.; *id. de Vriese s.n.* (L); *id.*, *Koorders* 6433 (= 651 b) (L), 6436 (= 53 d) (L), 36815, 25516, 23409 (K); PHILIPPINES: Luzon, Prov. Luzon, Aug., fr., *Alvarez F.B.* 13543 (BR, LE); *ibid.*, *Sulit PNH* (BR), very large leaves; Prov. of Laguna, S Maria Navitas, Febr., fr., *Curran F.B.* 10043 (BR, MO) et 8432 (US); Spec. Blancoanae, Febr., fl., 315 (BO, F, L, MO, US); Prov. of Isabella, San Mariano, Mt. Moises, April, fl., *Clemens* 16612 (UC); Prov. of Tarlac, Camilang, March, fr., *Zschokke F.B.* 15042 (BO, BR, CAS, LE); Prov. of Rizal, Antipolo, March, fr., *Merrill* 1686 (US); *ibid.*, Jan., fl., *Ramos B. Sc.* 2090 (GH, L, MO, P, SING); *ibid.*, Febr., fl., *Ahern's Coll. F.B.* 416 (BO, F, K, SING, US) and 1114 (BO, K, SING) et April, fl., *Ahern's Coll. F.B.* 2972 (BO, F, US); *ibid.*, Jan., fl., *Loher* 13919 (BO); *ibid.*, Paningtingan, March, fl., *Loher* 13567 (GH, UC); *ibid.*, Antipolo, Jan., buds, *Ramos B. Sc.* 2090 (BO); Prov. Negros occ., ster., *F.B.* 30119 (US); Prov. of Tayabas, Guimayangan, Jan.-Apr.,



fl., *Merrill 2002* (GH, K, US) et *2027* (GH); Prov. of Alvay, fl., *Cuming 1057* (C, K, MO, P), type of *G. salicifolia* Presl; Prov. Sorsogon, Irosin, Mt. Bulusan, May, fl., *Elmer 16092* (BISH, BO, C, D, F, GH, L, MO, P, S); Prov. of Camarines, April, fl., *Darling 18744* (L); *ibid.*, March, fl., *Alvarez F.B. 21242* (GH); *ibid.*, May, fr., *Alvarez F.B. 21428* (F, GH, US); *ibid.*, Mt. Isazog, May, fr., *Curran F.B. 10454* (US); Luzon Centr., Distr. of Morong, fl., *Loher 2229* (L); *ibid.*, fr., *Loher 2227* (L); *ibid.*, fl., *Loher 5974* (K); *ibid.*, Malatino, fl., *Vidal 299 et 1348* (K, L) et fr., *Vidal 753* (K, L); Prov. of Cagayan, May, young fr., *Klemme F.B. 7070* (BO, SING); Prov. of Ilocos Norte, Bangui, June, fr., *Felix F.B. 31100* (SING); *ibid.*, Mt. Darna, fl., *Edano PNH 18047* (BO, BR, L); Prov. of Ilocos Sur, Jan., fr., *Paraiso F.B. 23600* (GH); Prov. of Zambales, Jan., fr., *Medina F.B. 23548* (GH, US); *ibid.*, Nov., fl., *Curran & Merritt 8261* (US); *ibid.*, Jan., fl., *Curran F.B. 5907* (MO); Prov. of Pangasinan, May, fr., *Maneja F.B. 21815* (BO, MO, SING); *ibid.*, Salasa, Dec., fl., *Zschokke s.n.* (SING); *ibid.*, Bitayabalang, fr., *Vidal 1355* (K); Prov. of Nueva Eceya, Jan., fl., *Curran F.B. 8432* (BO, US); Montalban, fl., *Loher 5971 et 5980* (K, US); Arayat, June, fr., *Loher 2228* (K); Prov. of Bataan, Nov., fl., *Curran F.B. 5440* (SING); *ibid.*, Aug., fr., *Alvarez F.B. 13543* (BR, L, LE); *ibid.*, Lamao Distr., Mt. Mariveles, Febr., fl., *Borden 2724* (BO, F, K, SING, US) et *s.n.* (UC); *ibid.*, March, fr., *Williams 645* (GH, K, US) et fl., *Williams 565* (GH, K, US); *ibid.*, ster., *Curran B.Sc. 10798* (BR, LE); *ibid.*, Febr., buds, *Cruz F.B. 23888* (K, L, UC); *ibid.*, Sept., fr., *Rafael & Ponce F.B. 20751* (F, L, MO, SING, US); *ibid.*, March, fr., *Borden 184* (D, GH, UC, US); MINDANAO: Prov. of Davao, ster., *de Mesa F.B. 27536* (SING); *ibid.*, Mati, March, fl., *Ramos & Edano 49009* (BO, L, LE, SING, UC); *ibid.*, Naganaya, fl., *Miranda F.B. 25348* (UC, US); *ibid.*, Todaya, Distr. of Davao, Mt. Apo, July, fr., *Elmer 11208* (BISH, BO, E, F, GH, K, L, LE, MICH, MO, US); *ibid.*, June, fr., *Elmer 11012* (BISH, BO, E, F, GH, K, L, LE, MO, US); *ibid.*, Sept., fr., *Miranda F.B. 20531* (GH, MICH, US); Lamao, fl., *Borden s.n.* (UC); Prov. of Zamboanga Febr., buds, *Whitford & Hutchinson F.B. 9422* (SING); Prov. of Agusan, Cabadbaran, Mt. Urdaneta, Sept., fr., *Elmer 13922* (BISH, BO, E, F, GH, K, L, LE, MO, P, UC, US); *ibid.*, Sept., fr., *Elmer 13922* (BISH, BO, E, F, GH, K, L, LE, MO, P, UC, US); *ibid.*, Sept., fr., *Miranda F.B. 22068* (BO, F, GH, MO, P). SAMAR: Mt. Pua, Kasandig, April, fl., *Sulit et al. PNH 6466* (BR, GH, L); *ibid.*, Apr., fl., *Sherfese et al. F.B. 21088* (F, MO, US); Isl. Panay, Ilo-Ilo, *Vidal 299*, Gutierrez (K); Isl. Biliran, Mt. Suiro, 370 m, N slopes, April-May fl., *PNH 21479* (L); Isl. Leyte, April, fl., *Wenzel 1793* (F, GH, MO); *ibid.*, Tacloban, March, buds, *Wenzel 1793* (BO); Isl. Romblon, March, fl., *Elmer 12162* (BO, E, GH, K, L, LE, MO, US); MINDORO: Febr.-April, ster., *Merritt F.B. 9711* (BO) et Jan., fl., *Merritt F.B. 8639* (BO); Febr., fr., *Merritt F.B. 9708* (BO); *ibid.*, Paluan, March, fr., *For. Bur. 19357* (BO); PALAWAN: May, fl., *Merrill B. Sc. 1282* (BO, GH, L, MO, P, SING); *ibid.*, ster., *F.B. 29470* (UC); *ibid.*, fr., *Danao F.B. 23342* (US); *ibid.*, Puerto Princesa, Mt. Langogan, Febr., fl., *Ebalo 563* (GH); *ibid.*, Mt. Pulgar, April, fl., *Elmer 12960* (BISH, BO, E, F, GH, K, LE, P, US); BORNEO: N Borneo (Saba): Kinabatangan, Darasmakud, April, buds, *San 16851* (A, BO, BRI, K, KEP, L, SING); *ibid.*, Tenom, Pa'al Sapong, Oct., fl., *San 27297* (BO, K); Simporna, along seashore at Louk Sinalang, alt. 2 m, April, fl., *Mail B.N.B.F.D. 1839* (BO, GH, K), leaves 7×15 cm; Kalawat, April, fl., *Kiah S.F.N. 38981* (BO, K, L, SING); Sandakan, Kretam, May, fl., *San A 1888* (BO, K, SING);

E KALIMANTAN (Indon. Borneo): Tidung Lands, ster., *bb.* 17768 (BO, SING) et 17814 (BO, L); Berau, Kelai R. near Long Lanuk, 30 m alt., Oct., fr., *Kostermans* 21103 (A, BO, CANB, G, L); *ibid.*, Inaran, alt. 50 m, ster., *bb.* 12083 (BO); Sangkulirang Distr., Mt. Tepian Lobang, alt. 150 m, June, fl., *Kostermans* 5425 (A, BO, K, L, P, PNH SING); *id.*, young fr., June, *Kostermans* 5424 (A, BO, K, L, P, PNH); *ibid.*, ster., *bb.* 14654 et 14643 (BO, L); Mt. Iilas Bungaan, Sept., fl., *Kostermans* 13856 (A, B, BO, BRI, CAL, CANB, KEP, L, LAE, NY, P, SING); Mt. Sekrat, S of Sangkulirang, limestone, 100 m alt., July, young fr., *Kostermans* 5974 (A, BO, K, L, LAE, P, PNH, SING, SYDN); Balikpapan Distr., Sg. Riko, Muan, alt. 30 m, Nov., fl., *Kostermans* 4289 (A, BO, K, L, PNH, SING) et 4376 (A, BISH, BM, BO, BRI, CAL, CANB, K, L, LAE, P, PNH, SING); *ibid.*, Sg. Tiram, alt. 30 m, ster., *bb.* 25585 (A, BO, K, L, SING); *ibid.*, Sambodja R., alt. 30 m, Aug., fl., *Sabana* 25 et 27 (A, BO, CANB, K, L, NY, P, PNH); W Kutei, near Samarinda, Loa Djanan, April, fl., *Kostermans* 6573 (A, BO, K, L, PNH, SING); *ibid.*, Aug., fl., *bb.* 32351 (A, BO, K, L, NY, PNH, SING); *ibid.*, Sebulu R., ster., *bb.* 15752 (BO); *ibid.*, Djembajan R., ster., *bb.* 25133 (A, BO, K, L, SING); *ibid.*, Belajan R., Loa Lempong, March, fr., *Kostermans & Nedi* 740 (A, BM, BO, CANB, K, KEP, L, NY, P, PNH, SING); S-E KALIMANTAN: Tanah Bumbu, Village Baru, Dec., fr., *bb.* 13057 (BO, L); Sampit, Karuing, ster., *bb.* 9922 (BO, L); Asam, Sg. Najak, Sept., fl., *Dachlan* 2056 (BO, K, L, SING) et 1945 (BO); Pleihari, Kintap, alt. 250 m, Sept., fl., *bb.* 12892 (BO, L, SING); *ibid.*, Dec., fr., *bb.* 10584 (BO, L); Bandjarmasin, Martapura, fr., *Korthals s.n.* (L), type of *Maranthes multiflora* Korth.; *ibid.*, Aug., fl., *bb.* 2479 (BO); *ibid.*, fl., *Motley* 682 (K); Isl., Pelentuan, ster., *Teijsmann s.n.* (BO, K, L); BALI: Beliling, fr., *Teijsmann* 2744 *H.B.* (BO, L); Mt. Sangian, Negara, alt. 600 m, Aug., fr., *Kostermans et al.* 339 (A, BO, K, L, SING); SULAWESI (Celebes): Minahassa, Kajuwata, Jan., young fr., *Koorders* 18547 et 18548 (BO, L); *ibid.*, fr., *Koorders* 18546 (BO), type of *P. nitidum* Koorders; *ibid.*, ster., *Koorders* 18549 (BO); Madano, Parigi, Malakosa, alt. 60 m, ster., *bb.* 18802 (BO); *ibid.*, Gorontalo, Molinggapoto, alt. 30 m, ster., *bb.* 18018 (BO); *ibid.*, Bolaang Mongodow, Solog, alt. 200 m, ster., *bb.* 19608 (BO); *ibid.*, Langagon, alt. 100 m, ster., *bb.* 32489 (A, BO, L); *ibid.*, Boalemo, Bilato, alt. 50 m, ster., *bb.* 13829 et 15384 (BO); *ibid.*, Kewandang Distr., Titudu, Sept., fl., *bb.* 7508 (BO); *ibid.*, Banggao Distr., Bunta, alt. 65 m, ster., *bb.* 31870 (BO, L); CENTRAL CELEBES: Palopo Distr., Marepe, alt. 300 m, ster., *bb.* 20903 (BO, L); *ibid.*, Kaluhu, alt. 200 m, ster., *bb.* 20907 (BO); *ibid.*, Balka, alt. 100 m, Sept., buds, *bb.* 33078 (BO, L); *ibid.*, Padangalipan, ster., *bb.* 13531 (BO); Malili Distr., Masamba, Salulemo, ster., *bb.* 24507 (A, BO, L, SING); *ibid.*, Lampea, alt. 20 m, ster., *bb.* 23259 (BO, L); *ibid.*, near La Rona, ster., *bb.* 1816 (BO), 1818 (BO, L), 2383, 2396, 2408, 2327 (BO) et 1901 (BO, K, L); *ibid.*, near Usu, Dec., fr., *Cel/II-494* (BISH, BO, BRI, K, SING); *ibid.*, ster., *Cel/II-122* (BO); *ibid.*, ster., *Cel/III-177* (BO); *ibid.*, Oct., fls. & buds, *Cel/III-4* (BO, L); *ibid.*, ster., *Cel/IV-140* (BO); *ibid.*, Febr., young fr., *Cel/IV-141* (BO, L); *ibid.*, ster., *Cel/IV-142* (BISH, BO); *ibid.*, Kawata, Dec., fr., *Cel/II-445* (BO, L); *ibid.*, Nov., fl., *Kjellberg* 2877 (BO); *ibid.*, Margosuko, alt. 50 m, Sept., fl., *bb.* 32453 (A, BO, K, L, NY, SING); Palarahi, alt. 100 m, March, fr., *Kjellberg* 886 (BO); ISL. MUNA: Raha, ster., *bb.* 21367 (BO, P, SING) et 12370 (BO); *ibid.*, Oct., fl., *bb.* 4378 (A, BO, K, L); *ibid.*, Tampo, alt. 20 m, Oct., fl., *bb.* 23288 (A, BO, L, SING), 28289 (BO, P) et 2329 (BO, BRI); *ibid.*, Wakadea, Nov., fl.,

*bb.* 4983 (BO, K, L); ISL. BUTON: Distr. Sampolaura, ster., *bb.* 2251 (BO); ISL. BURU: Wae Mole, alt. 5 m, ster., *bb.* 24476 (BO, L); Sula Isl., Isl. N Mangoli, alt. 60 m, Sept., fl., *bb.* 29796 (A, BO, K, L, SING); *ibid.*, ster., *bb.* 29825 (A, BO, K, L, SING); Isl. Sanana, Kabau, ster., *bb.* 28876 (A, BO, K, L, NY, SING); Isl. Taliabu, Tdg. Waehaja, fr., *Atje* (Exped. Hulstijn) 284 (BO, L); TANIMBAR ISL.: Ottimer, ster., *bb.* 24381 (A, BO, K, L, NY, SING); ISL. WETAR: Kali M. Leraiten, N of Ilwahi, Apr., fr., *bb.* 27203 (A, BO, K, L, SING); locality not indicated, fl., *Riedel s.n.* (K); SUMBAWA: Bima, Ranggo, 240 m alt., ster., *bb.* 6931 (BO); E SUMBA: Djuli, alt. 250 m, ster., *bb.* 15136 (BO, L); G. Marara, alt. 510 m, ster., *bb.* 5412 (BO); FLORES: Mangarai, Batugong, alt. 200 m, ster., *bb.* 9973 (BO); *ibid.*, Ngada, alt. 800 m, Sept., fl., fr., *bb.* 21427 (BO); AMBOINA: Waai, alt. 40 m, ster., *bb.* 10122 (BO); E CERAM: Artafela, alt. 60 m, ster., *bb.* 25806 (A, BO, L, SING); *ibid.*, Mt. Kilia, Village Kiandarar, alt. 60 m, Aug., fl., *Buwalda* 5639 (A, BO, K, L); W CERAM: Riring, alt. 600 m, ster., *Rutten* 1733 (BO); *ibid.*, Kairatu, Gemba, June, fr., *Kuswata & Soepadmo* 117 (A, BO, K, L, P); *ibid.*, July, fr., *Kuswata & Soepadmo* 67 (A, BH, BISH, BM, BO, BRI, CAL, CANB, G, K, KEP, L, LAE, NY, P, PNH, SING, SYD, US); TIMOR: Artapupu, fl., *Teijsmann* 8954 (BO, K, L); *ibid.*, Mt. Harara, alt. 60 m, ster., *bb.* 5412 (BO); *ibid.*, Kupang, village Tjamplong, alt. 400 m, Aug., fr., *bb.* 6941 (BO) et May, fl., *bb.* 13620 (BO, L); *ibid.*, Isl., Semau, Atambua, ster., *de Voogd* 2329 (BO, L); Portuguese Timor, Lahane R., fr., *de Castro s.n.* (BO, L); Uato Carabao, Dec., fr., *van Steenis* 18236 (BO, L); E. Kai Isl., Culta in Hort. Bogor (BO, K, L); ARU ISL.: Dosinamalu, Isl. Watubakar, ster., *bb.* 25309 (A, BO, K, L, NY, SING); *ibid.*, Isl. Trangan, Village Ngaibor, June, fr., *Buwalda* 5398 (A, BO, BRI, K, L) et 25433 (A, BO, K, L, SING); NEW GUINEA: W Irian: Sidai, 65 km W of Manokwari, alt. 20 m, ster., *BW* 4478 (BO, L); Sorong, Mlasun Hill, E of Sorong, alt. 10 m, ster., *van Royen* 3403 (L); Isl. Misool, Fakaltip, alt. 50 m, Sept., fl., *Pleyte* 888 (A, BO, K, L, P, PNH, SING); Oransbari, Tansiki Distr., alt. 5 m, July, fl., *BW* 1332 (BO, K, L); *ibid.*, ster. *BW* 2630 (L); Sukarnopura (Hollandia), Gami Nomeling, alt. 15 m, ster., *BW* 1995 (L); *ibid.*, Nemo, alt. 6 m, ster., *BW* 2752 (L); along lake Sentani, alt. 75 m, Aug., fl., *BW* 3906 (BO, L); Hamadi near Sukarnopura (Hollandia), July, fl., *BW* 4796 (BO, L); *ibid.*, Berap (Nimburan), ster., *bb.* 28940 (A, BO, BRI, K, L, SING); Merauke, bank of Kerau R., Aug., fl., *van Royen* 4729 (BO, L); Memberamo, alt. 30 m, ster., *bb.* 31129 (BO, L); PAPUA: W Distr., Oriomo R., ster. *N.G.F.* 10442 (LAE); Papondetta, March, fl., *Cavenaugh N.G.F.* 2071 (L); Lower Fly R., eastbank opposite Sturtevant Isl., Oct., fl., *Brass* 8014 (BO, GH, K, L); K. August R., fr., *Hollrung* 850 (BO, K, LE, P); E. Div., Normanby IIs., Waikaiuna Bay, April, fl., *Brass & Womersley N.G.F.* 8645 (BO, GH, K, L, SING); *ibid.*, April, fl., *Brass* 25509 (K, L); Territory of NEW GUINEA: Centr. Div., Dieni, Onongo Rd., alt. 500 m, April, fl., *Brass* 3897 (BO, GH, K, L); W Div., Tararra, Wassi Kussa R., Dec., fl., *Brass* 8502 (BO, GH); Morobe Distr., Oomsis near Lae, alt. 100 m, March, fl., *White N.G.F.* 10473 (BO, K); *ibid.*, March, fl., *Henry N.G.F.* 11938 (BO); Morobe Distr. Busu R., Lae fl., *Womersley N.G.F.* 9080 (LAE); Yalu near Lae, March, fl., *Friar N.G.F.* 3339 (BO, GH, L, SING), very large leaves; Madang Distr., alt. 175 m, near Koropa village, Ramu valley, Aug., buds, *Hoogland* 5067 (K, L); Mantambu, May, fr., *Mair N.G.F.* 1876 (L); Sepik Distr., fl., *Ledermann* 8052 (K) et 7975 (E, SING); *ibid.*, Garamambu, Aug., fl., *Womersley N.G.F.* 3745 (GH, K); SOLOMON ISL.:

Santa Cruz group, Tavai Isl., ster., *Walker B.S.I.P.* 224 (GH, K); *ibid.*, Vanikoro near Lamina R., ster., *Walker B.S.I.P.* 219 (GH, K); Vanakoro, 100 m, May, buds, *Kajewski* 664 (GH); New Georgia group, Vangamu Isl., ster., *Walker & White B.S.I.P.* 161 (GH, K); *ibid.*, Duha Isl., Aug., fr., *Waterhouse* 261 (K); Bougainville Isl., Kugumaru, Buin, July, fl., *Kajewski* 1939 (BISH, C, GH, K, L, LE, P, S, SING); *ibid.*, June, fl., *Kajewski* 1872 (BISH, GH, L, P, SING); *ibid.*, fl., *Waterhouse* 4142 (K); *ibid.*, Koniguru, Buin, Aug., fr., *Kajewski* 2070 (BISH, GH, L, P); *ibid.*, Tonolei Harbour, Bouin, ster., *N.G.F.* 2874 (BO, L); NEW BRITAIN: Talasea Distr., April, fl., *White N.G.F.* 10933 (K, LAE); Sudest Isl., Joe Landing, Aug., fl., *Brass* 27725 (K); AUSTRALIA: N Australia, Port Darwin, fl., *Schultz* 531 (K, LE); *ibid.*, fl., *Schomburgk* 254 (BR, K); *ibid.*, fr., *Holz* 198 (herb. *Prager* 16142) (CAS, LE); Arnhem Land, edge of marsh, Oct., fl., *Specht* 1171 (CAS, K, L, LE, US); Cape York, March, fl., *Damel s.n. (Mueller s.n.)* (MICH, K); QUEENSL.: Albany Isl., fl., *Hill* 156 (K); near Caledon Bay, *sine coll.* (GH); VICTORIA: Port Essington, fl., *Gilbert s.n.* (K); *ibid.*, Aug., fl., *Holland* 247 (K); *ibid.*, fl., *Armstrong* (K); Victoria R., Quail Isl., fl., *Hood s.n.* (K); CAROLINES: Palau Isl., Aug., fr., *Kanehira F.N.* 2060 (P); *ibid.*, Febr., fl., *Koidzumi s.n.* (FI); Palau, Babeldaob, April, fl., *Fosberg* 32552 (US); *ibid.*, Mt. Luis-Almonogui, April, fr., *Kanehira & Hatusima F.N.* 4979 (GH); *ibid.*, Ngatpeng, Aug., fr., *Tuyama s.n.* (FI); Palau, Aimiruh, fr., *Kanehira* 2373 (= 5525) (FI); *ibid.*, *Nisida* 2753 (= 5526) (FI); *ibid.*, Aug., fr., *Kanehira* 1940 (= 5234) (FI, US); *ibid.*, Aug., fl., *Kanehira s.n.* (EI); *ibid.*, Armatin, July, fl., fr., *Kanehira* 469 (= 3592) (BISH, FI, GH, US), type of *P. palauense* Kanehira; *ibid.*, April, fl. *Takamatsu* 1535 (BISH, GH, K, US); *ibid.*, Kasahara, *Kanehira s.n.* (FI); *ibid.*, Ngarakabesang (Arakabesan), sec. for., occasionally, April, fr., *Fosberg* 32475 (US); *ibid.*, Garasumao, May fr., *Takamatsu* 1574 (BISH, GH); *ibid.*, Garudokku, April, fl., *Takamatsu* 1343 (BISH); Isl. Ngarmid, Lake Ngardok, alt. 25 m, March, fr., *Fosberg* 32330 (US), tree of 7 m high; Ogival, fr., *Kanehira F.N.* 2060 (K).

OBSERVATIONS: MERRILL (followed by KANEHIRA) gives the range of distribution as from India to Australia; so far the species is not known from India, its northern limit being Siam. HOOKER mentions a specimen of HELFER, collected either in Tenasserim of the Andamans. The tree occurs scattered on almost all kinds of soil (not in marshy soil) and is often emergent in the forest.

MIQUEL already in 1855 suggested that *P. griffithianum* Benth. might be conspecific with *P. corymbosum* Miq. Later HOOKER combined both.

MIQUEL based the description of *P. corymbosum* on fruiting material, where the infructescence is already glabrous, the main difference with his *P. multiflorum* of which he described flowering material. The indumentum of the inflorescence is very variable; the flowers may be almost glabrous to densely silky pilose, all intermediate stages are found.

For *P. multiflorum* he reports that the petals are pink, actually they are white with a pinkish tinge; moreover he reports 20-30 stamens, of which 11-12 should be fertile; this is certainly wrong; the number of fertile stamens is near 30.



*M. corymbosa* is a huge tree, easily recognized at a distance by its pale, smooth, grey bole with the upper part covered with large, at the base upturned loose parts of the bark, which gives the tree a very distinctive character.

Some specimens have been collected from trees only a few metres high and already flowering; apparently the tree may be appreciably stunted in an unfavourable habitat; the flowers of these specimens are somewhat smaller (calyx tube 2 instead of 4 mm; sepals 2, instead of 4 mm); in the specimen *Cel./II-496*, the calyx is only 2 mm with 2 mm with 2 mm long, ovate-orbicular sepals, the petals are 3× as long as the sepals; the style is exceptionally thick and long. This phenomenon is also found in *Cyclandrophora laurina* (A. Gray) Kosterm.

HOOKEER gives 5 mm as the length of the calyx tube, which is exaggerated. BACKER, l.c., reports an 8-10 mm long calyx; apparently he included the pedicel; I never found petals more than 6 mm long (BACKER reports 7-8 mm long petals).

The timber is too hard to be appreciated by local people, except in the Solomon Islands (cf. USE).

The stipules drop at such an early stage, that in the numerous material at hand, I only found 5 sheets with a few stipules; they are certainly intrapetiolar and double and not, as reported by KOORDERS and VALETON, lateral and single; rarely the two are coherent.

The leaves vary enormously in size; in old trees they are lanceolate with a long drawn-out acumen, which is a distinctive character. The base with its glands is constant in shape. Another peculiarity of the (artificially and naturally dried leaves) is the metallic sheen of the upper surface quite distinct from common glossiness. The petiolar glands are practically always present and give a useful differential clue with sterile specimens of e.g. *Acioa heteropetala*. The suberising of the petiole seems to be correlated with a very dry habitat, like the grey appearance of the branchlets.

The lateral nerves tend to run down the midrib for a short distance before joining them.

The veins on the lower leaf surface show under high magnification the common irregularly rimmed holes, which give *Cyclandrophora* species their asperity and which are considered to represent the bases of former hairs. As the hairs of *M. corymbosa* are, however, cobweb-like, I doubt this assumption.

The inflorescences are certainly terminal and represent panicles; as the lower branches are often longer, the whole becomes corymb-like. The ultimate ramifications bear only a few flowers.

In dried material the flowers are often nutant, but this is due only to a stage of wilting before the desiccation.

The calyx tube is almost regular, contrarily to HOOKEER's report. The sepals, imbricate in bud, are slightly unequal, some more ovate or ovate-orbicular, the others more elliptical.

The style is much thicker than the filaments, which is a distinctive feature and exceeds the stamens considerably.

The silky, strigose, erect hairs are not only restricted to the throat of the calyx tube at the base of the ovary, but are—although less—also found on the ovary itself, diminishing in number from base to apex.

The fruit has a fleshy, edible exocarp, which is exceptional in Asian Parinari. Hornbills are especially active in the distribution of the fruit and may well carry these over enormous distances, either in their crop or passing the digestive tract. Distribution from Borneo to Sumatra and from Borneo to Celebes is certainly feasible, as these big birds have been observed to cover such distances. Another agent for dispersal are the flying foxes (large fruit bats). The seeds are often abortive, which induced KOORDERS & VALETON to report, that in full grown fruit the ovule is still undeveloped.

The specimen: *Ahern's Coll.* from San Mateo, Rizal, has been distributed as *P. griffithiana*; it actually represents *Beilschmiedia roxburghiana* Nees (Laur.).

USE: The wood is not commonly used as it is too hard and heavy. In the Solomon Isl. it is used largely for building the "garamut" houses. It is further used for saltwater-piling (tops should be given, as soon as possible, a thorough coating of thick paint or hot tar), ties and paving blocks (impregnated), posts above stumps and general framing under cover, keels, etc. It gives good charcoal. It dulls saws very quickly. It is liable to termite attack.

WOOD: The wood is hard and heavy, varying from 47 to 62 lb. per cubic foot air-dry; heart wood reddish brown, the sapwood paler, not much distinguishable; grain straight or slightly crossed often with characteristic regular wave; texture moderately coarse. Heartwood sometimes streaked with very narrow, widely separated dark belts, which do not at all follow the growth rings; faint acid odour. Growth rings not evident; pores few, rather large, exclusively solitary, evenly distributed but with a tendency towards arrangement in echelon, with simple perforation plates; soft tissue distinct in wavy bands, independent of the pores and often crossing the rays slant-wise; rays fine and numerous.

The wood is difficult to saw and work, as it contains silica. It seasons well, except for a tendency to warp. It is hard and strong, and moderately durable, and is reported to be resistant to attack of marine borers and is rarely attacked by insects. Except for the difficulty in working, it is suitable for heavy interior construction, and in some countries it has been used for saltwater-piling. The supply is usually small (BROWN, SCHNEIDER). For a more detailed description of the wood cf. MOLL & JANSSONIUS.

### *Cyclandrophora Hassk.*

*Cyclandrophora* Hasskarl, *Flora* 25 (2), Beibl. 1 : 47. 1842; Tweede Catal. Pl. tuin Buitenzorg : 269. 1844 (as a syn. of *Parinarium*); Endlicher, *Gen. Mantissa*, Suppl. 3 : 103. 1843; Blume, *Mélanges Bot.* (ined. Sept. 1855) ex Mueller, *Flora* 41 (16) : 255. 1858 (as a section); Mueller in Walp. *Ann.* 4 : 645. 1857 (sectio *Parinari*); Van Steenis, *Bull. Bot. Gard. Buitenzorg*, Ser. 3, 17 : 461. 1948; Prance, in the press.

*Parinarium* (non Aublet) Bentham in Hooker, *Niger Fl.* : 333. 1849, p.p.; in Bentham & Hooker f. *Gen. Pl.* 1 : 607. 1865, p.p.; Miquel, *Fl. Ind. Bat.* 1 (1) : 354. 1855, p.p. (subgenus: *Macrocarya* Miq.); Blume, *Mus. Bot. Lugd. Bat.* 2 (6) : 94. 1856, p.p.; Mueller in Walp. *Ann.* 4 : 645. 1857 (sectio *Cyclandrophora*); Hooker

f. Fl. Brit. India **2** : 308. 1878, p.p. (subgenus III); King, J. As. Soc. Bengal **66** (2) : 276. 1897, p.p.; Koorders & Valetton, Bijdr. Kennis Boomsoorten Java 5 in Meded's. Lands Pl. tuin Buitenzorg **33** : 332 et 333. 1900, p.p.; Boerlage, Handl. Fl. Ned. Ind. **1** : 421 et 424. 1890, p.p.; Focke in Engler & Prantl, Nat. Pfl. fam. 3 (2) : 60. 1891. p. p.; Brandis, Ind. Trees : 278. 1906, p.p.; Koorders, Exkurs. Fl. Java **2** : 338. 1912, p.p.; Ridley, Fl. Mal. Pen. **1** : 666. 1922, p.p.; Meeuse & Adelbert in Backer, Fl. Java (emergency Ed.), Fam. **116** : 25. 1943, p.p.

*Petrocarya* (non Schreber) Jack, Malay Miscell. **2** (7) : 68. 1822, p.p. (reprint in Hooker's Compan. Bot. Mag. **1** : 220. 1836, Calcutta J. Nat. Hist. **4** : 164. 1843; Treubner's Miscell. Papers relating to Indochina **2** (2) : 279. 1887); Bentham in Hooker, Niger Fl. : 335. 1849, p.p.; Miquel, l.c. : 356, p.p.; Mueller in Walp. Ann. **4** : 644. 1857, p.p.; Flora, l.c. : 255, p.p.; Hooker f., Fl. Brit. India **2** : 312. 1878, p.p.

*Entosiphon* Beddome, Madras J. Sci., Ser. 3, **1** : 44. 1864; Durand, Index : 111. 1888 (as a syn. of *Parinarium*); Post & Kuntze, Lexikon : 199. 1904.

*Atunus* Rumphius, Herbar. Amboinense **1** : 171. 1741 (nec **3** : 95-96, tab. 63. 1743 = *Heritiera* Aiton; non *Amygdalis*, cf. Post & Kuntze, Lexikon, l.c.); Lamarck, Encycl. Méth. Bot. **1** : 329. 1783; Loureiro, Fl. Cochinch. : 295. 1790 (quoad nomen tantum); Hasskarl, Neue Schlüssel Rumph. Herb. Amboin. : 22. 1866; Greshoff, Schetsen Nuttige Ind. Pl. **10** : 37. 1894; Merrill, Interpret. Rumph. Herb. Amboin. : 247. 1917.

*Atuna* Rafinesque, Sylva Tellur. : 153. 1838; Merrill, Index Rafin. : 136. 1949.

TYPE SPECIES: *Cyclandrophora excelsa* (Jack) Kosterm.

*Trees* without or with small buttresses. Bark grey, rather smooth, often hoop-ringed. *Leaves* chartaceous to coriaceous, the lower leaf surface glabrescent, without stomatal areolation; reticulation marked by numerous holes with a rough margin, which make them—after drying—more or less scabrous to the touch, glandless. Stipules stiff, erect, carinate, narrow, lateral to the petiole and enveloping the bud. Petioles without glands. *Inflorescence* spike- or raceme-like, axillary and sub-apical, the flowers before anthesis for the greater part covered by large bracts which drop gradually acropetalously. *Calyx* tube well-developed conical; below the ovary the throat of the calyx tube has a zone covered densely with silky strigose hairs, pointed downward; lobes five, fleshy. *Petals* five, elongate, longer than the calyx lobes, early caducous, glabrous, membranous, longitudinally veined, base gradually narrowed. Fertile *stamens* about (10-)12-20, with slender filaments (longer than the petals), attached to a short, thin rim; the sterile stamens represented on the rim by short teeth. *Ovary* densely adpressed pilose, laterally attached to the throat of the calyx (which is slightly bulging there) with a basal, slender style, as long or longer than the stamens; stigma small, capitellate. *Fruit* ellipsoid to subglobular, laterally more or less flattened, lightbrown, outside roughish by a scalelike substance, one-celled (mature); exocarp thin, fleshy, mesocarp radially fibrous, endocarp thin, with short hairs; seedcoat thin, following the folds of the ruminant seed.

OBSERVATIONS: The genus is characterised by the glabrous leaves with holes on the small veins, the lack of glands and of stomatal areoles, the stiff, subacicular stipules, usually still persistent near the apical, full-grown leaf; the spike-or racemelike, axillar inflorescences with large bracts; the well-developed calyx tube, the numerous, very slender filaments, the long slender style; the fruit with a radially fibrous mesocarp



(not marbled) and the short hairs on the endocarp; the ultimately unilocular fruit with ruminant seed.

All species are closely knit together and show only minor differences. For the development of the fruit cf. under *C. excelsa* (Jack) Kosterm.

*Key to the species*

- 1a. Leaves broadly elliptic, rounded at both ends or apex shortly acuminate . . . . . 2
- b. Leaves oblong or lanceolate, top acuminate, base acutish, truncate or subcordate . . . . . 3
- 2a. Lateral nerves 12-14 pairs; apex shortly acuminate . . . . . 2. *C. latifolia*
- b. Lateral nerves 6-8 pairs; apex rounded . . . . . 1. *C. elliptica*
- 3a. Leaves stiffly coriaceous, almost sessile . . . . . 3. *C. elata*
- b. Leaves chartaceous to thinly coriaceous . . . . . 4
- 4a. Calyx tube slender, almost cylindrical . . . . . 5
- b. Calyx tube funnel shaped . . . . . 6
- 5a. Flowers 10-12 mm long . . . . . 4. *C. nannodes*
- b. Flowers 5-6 mm long . . . . . 5. *C. penangiana*
- 6a. Inflorescence sparsely pilose . . . . . 6. *C. indica*
- b. Inflorescence densely sericeous . . . . . 7
- 7a. Leaves lanceolate to ovate-lanceolate . . . . . 8
- b. Leaves ovate to ovate-oblong . . . . . 10
- 8a. Fertile stamens ca 12; petals longer than the calyx lobes . . . . . 7. *C. travancorica*
- b. Fertile stamens ca 15-20; petals as long as or shorter than the calyx lobes . . . . . 9
- 9a. Dried leaves very scabrous; calyx tube 7-10 mm long; lobes 5 mm long . . . . . 9. *C. scabra*
- b. Dried leaves only slightly scabrous; calyx lobes 4 mm long; pilosity of flowers shorter than in *C. scabra* . . . . . 8. *C. villamilii*
- 10a. Tree with fluted, short bole. Leaves gradually long-acuminate, base acutish or obtuse, very rarely subcordate . . . . . 11. *C. laurina*
- b. Tree with cylindrical, long bole. Leaves very shortly acuminate; base usually subcordate . . . . . 10. *C. excelsa*

**1. *Cyclandrophora elliptica* (Kosterm.) Kosterm. and Prance, comb. nov.**

*Parinari elliptica* Kostermans (basionym), *Reinwardtia* 7 : 48, tab. 2. 1965. — Parham s.n. (K).

VERNAC. NAME: Makita leka.

Small tree, 7-8 m high; branchlets slender with minute scattered, adpressed, strigose hairs; branches blackish or grey with numerous tiny lenticells, glabrous. *Leaves* chartaceous to rigidly chartaceous, elliptical, 4 × 6 to 9.5 × 15 cm, both ends rounded (rarely base acutish); upper surface glossy, glabrous, densely, prominulously reticulate, midrib slightly prominent, lateral nerves very slender; lower surface more dull, glabrescent (near the base adpressed strigose hairs subsistent), midrib strongly prominent, lateral nerves 6-8 pairs, slender, prominent, slightly arcuate-patent, reticulation prominulous with rough veins. Petiole about 5 mm long, glandless. Stipules aciculate, 10 mm long, caducous. *Panicles* depauperate, raceme-like, few-flowered, hardly and shortly branched, densely adpressed grey-strigose, slender, up to 7 cm long; bracts caducous. Pedicel 2-5 mm long. *Calyx* slender, about 5 mm, densely adpressed strigose, infundibuliformous, lobes ovate-elliptic, obtuse, up to 5 mm long, outside densely sericeous, inside less; petals not seen. Fertile *stamens* about 20, up to 9 mm

long, on an 1 mm high rim, sterile ones on the rim represented by short teeth. *Ovary* densely adpressed strigose; style glabrous, as long as the stamens, apex (stigma) truncate.

DISTRIBUTION: Fiji Islands.

REPRESENTATIVE SPECIMENS: FIJI ISLANDS, Viti Levu, Vunidava, sheltered valley, alt. 70 m, Jan., fl., *Parham s.n.* (K); Naitasiri, alt. 30 m, ster., *Peni Turaga s.n.* (K); locality not indicated, fl., *Horne 242* (K).

OBSERVATIONS: In leaf-shape the species resembles *C. latifolia* from the Malay Peninsula, but the apex is always rounded, moreover it has far less lateral nerves.

The local name is Makita leka which means the short makita; makita is the name for the common *C. laurina*.

According to PARHAM from the kernel an oil is obtained.

## 2. *Cyclandrophora latifolia* (Henderson) Prance

*Cyclandrophora latifolia* (Hend.) Prance, in the press.

*Parinarium latifolium* (non Exell) Henderson, Gard. Bull. Straits Settl. 7 : 102. 1933.

*Parinari latifrons* Kostermans, Reinwardtia 7 : 54. 1965. — Haniff S.F.N. 21119 (K).

*Treelet*, 3-5 m tall; branchlets densely woolly rusty-tomentellous, interspaced with long, curved, rusty hairs. *Leaves* chartaceous, broadly elliptic, 8-12 × 10-11.5 cm, base contracted into the petiole, rounded, apex shortly abruptly acuminate; upper surface glossy, glabrous, somewhat bullate, midrib prominent, pilose at base, lateral nerves filiformous, prominulous in a groove, reticulation impressed; lower surface minutely sparsely pilose (especially on the nerves), midrib strongly prominent, pilose, lateral nerves prominent, 12-14 pairs, erect-patent, slightly curved (strongly curved near margin), rather spaced, reticulation prominulous, veins rough. *Petioles* stout, 5-7 mm long, densely pale-brown-woolly. *Stipules* lanceolate, acute, keeled, slightly adpressed strigose, up to 11 mm. *Panicles* axillary, spike-like, up to 5 cm long, densely tawny silky; bracts ovate-lanceolate, acute, densely sericeous outside, adpressed pubescent inside, up to 15 mm long. *Calyx* tube narrowly cylindric, hardly gibbose, 7-11 mm long, sericeous; lobes unequal, lanceolate to oblong-ovate, acute, up to 10 mm long, outside sericeous (hairs long, the central part with strigose adpressed hairs), inside densely, shortly pubescent. *Petals* obovate, narrowed to the base, 10-11 mm long, 7-8 mm wide. *Stamens* about 20, inserted on a rim ca 2 mm high and pubescent within; filaments 10-12 mm long; sterile stamens tooth-like. *Ovary* densely strigose; style slender, as long as the stamens, truncate.

DISTRIBUTION: Malay Peninsula, only known from the type locality.

REPRESENTATIVE SPECIMEN: MALAY PENINSULA, Kedah-Perak Boundary, Bukit Kuala Batang near Gunong Bintang, April, fl., *Haniff S.F.N. 21119* (BO, GH, K, SING).

OBSERVATIONS: Closely related to *C. nannodes* Kosterm. & Prance; the latter might be only a variety, although so far no intermediate specimens have been collected.

### 3. *Cyclandrophora elata* (King) Prance

***Cyclandrophora elata*** (King) Prance, in the press.

*Parinarium elatum* King, J. As. Soc. Bengal **66** (2) : 280. 1897; Ridley, Fl. Mal. Pen. **1** : 669. 1922. — King's Coll. 3436 (holotypus); 3711 (paratypus) (CAL).

*Tree*, up to 45 m high and 1 m in diam. Branchlets stout, grey, glabrous, striate, the youngest ones covered with adpressed, strigose hairs. *Leaves* at last glabrous, stiffly coriaceous, ovate-elliptic, 6×11 to 8×19 cm, base truncate to sub-cordate, apex shortly acuminate; upper surface glossy, the rather broad midrib and slender lateral nerves prominulous; lower surface duller, midrib strongly prominent, lateral nerves 12 (-15) pairs, slightly arcuate, prominent; reticulation obscure on upper, slightly prominulous surface; midrib below at first with adpressed, strigose hairs; reticulation with rough-bordered pits. *Petiole* very short, stout, up to 4 mm long, glandless. *Stipules* stiff, lateral, lanceolate, acute, keeled, up to 17 mm long, persistent near the apical leaves. *Racemes* axillary and sub-terminal, densely brown sericeous, up to 5 cm long, consisting of a stout, main rachis and extremely short (indicative only) side branches. *Bract* at the base of the reduced side branch and one at the base of the flower pedicel ovate and lanceolate, acutish, 2-3 mm long, densely sericeous, present at anthesis. *Calyx* tube practically sessile, 3 mm long, obconical; lobes ovate, acute, ca 3 mm long, fleshy. *Petals* lanceolate, 6-7 mm long. *Fertile stamens* 15 with slender, up to 9 mm long filaments. *Ovary* densely sericeous; style slender, longer than the filaments, stigma minute, capitate. *Fruit* (immature) ellipsoid, 7.5×13 cm, lightbrown, rough.

**DISTRIBUTION:** Malay Peninsula, Borneo; rather rare.

**REPRESENTATIVE SPECIMENS:** MALAY PENINSULA: Perak, Larut, Oct., fl., *King's Coll. 3711* (DC, GH, K, L, LE, SING, UC) et fl., *id. 3436* (DC, K, L, LE, SING); BORNEO: Sarawak, Entajut R., Dec., fl., *Hose 475* (K); Brunei, Sg. Nelayan, March, young fr., *Flemmich Kep. 32570* (K) (doubtfull); *ibid.*, Bukit Patoi, alt. 100 m, fl., *Ashton Brun. 3184* (K), doubtfull; Sabah, Beaufort, fr., *San 25260* (K); Lahad Datu, near head of E Gajah R., N Borneo Timber Co Concession Area, Kretan, alt. 20 m, May, young fr., *Wood San A 3492* (A, KEP, L, MEL, SING).

**OBSERVATIONS:** The species is manifestly not allied to *Parinarium oblongifolium*, as suggested by KING, but is very close to *C. excelsa*, and differs mainly by the stiff, coriaceous leaves, which are almost sessile and perhaps by its smaller flowers. The specimen *Wood San A 3492* has a calyx tube of 5 mm and lobes also of 5 mm long.

### 4. *Cyclandrophora nannodes* (Kosterm.) Kosterm. & Prance

***Cyclandrophora nannodes*** (Kosterm.) Kosterm. & Prance, comb. nov.

*Parinari nannodes* Kostermans, *Reinwardtia* **7** : 50, tab. 4. 1965.

*Parinarium asperulum* (non Miquel) Ridley, Fl. Malay Pen. **1** : 670. 1922, quoad spec. Ridley 2653 (SING) et Curtis s.n. (SING). — Beccari P.B. 2955 (BO).

Small tree, 7-10 m tall, 7.5-15 cm in diam. Branchlets very slender, the youngest ones covered with a dense layer of dark brown, minute hairs and glossy adpressed, long, strigose hairs. *Leaves* rigidly chartaceous, oblong or lanceolate or ovate-oblong, 3 × 7 cm to 5 × 13 (-18) cm, base contracted into the petiole, shortly acuminate; apex conspicuously long and slender acuminate or caudate-acuminate; both surfaces glossy, upper surface in mature leaves smooth, often sub-bullate, midrib and the slender lateral nerves prominulous in a groove; lower surface with a prominent midrib with adpressed strigose hairs (soon glabrous) and 10-12 slender, prominulous, arcuate lateral nerves; secondary nerves prominulous forming a lax, smooth reticulation. Petiole 2-4 mm long, soon glabrous, glandless and becoming corky. Stipules stiff, erect, narrowly lanceolate, acute, outside laxly adpressed strigose or glabrous, tip with a tuft of stiff hairs, inside glabrous, 8-10 mm long, lateral of the petiole, enveloping the strigose axillary bud, caducous. *Inflorescences* axillary, spike-like, densely adpressed golden-brown sericeous, 3-7 cm long (flowers included), in bud with numerous large bracts and bracteoles; peduncle short; the densely sericeous flowers almost sessile with a deciduous, ovate, acute, 7 mm long bract at the base of the almost missing pedicel and a narrowly lanceolate, 3-4 mm long bracteole at the base of the calyx tube (this bracteole still present at anthesis). *Calyx* tube very slender, cylindrical, 10-12 mm long; calyx lobes oblong-ovate, acute, fleshy, unequal, ca 7 mm long, inside densely, minutely puberulous. *Petals* white, usually spatulate, rarely ovate, 8-12 mm long, base gradually narrowed. Fertile *stamens* pale blue or purplish, about 18-20, ca 12 mm long on a short rim. Style filiform, glabrous, 15 mm long with a minute, capitellate stigma. *Fruit* ellipsoid, 25 × 12 to 40 × 15 mm, base with an obscure neck, apex rounded, dark rusty brown, pustular (almost like the fruit of *Euphoria* species); outer crusty layer very thin; followed by a radial, fibrous layer of 2-2.5 mm and a very thin inner layer; seedcoat thin, enveloping the single ruminant seed, which fills completely the large central cavity.

**DISTRIBUTION:** The Malay Peninsula, Borneo in well-drained forests; rather common.

**REPRESENTATIVE SPECIMENS:** MALAY PENINSULA: Penang, buds, *Curtis s.n.* (SING); Pahang: Gabing Bintang, Sept., buds, *C.F. 3920* (SING); *ibid.*, Taliang R., July, fr., *Ridley 2603* (SING); NEGRI SEMBILAN: Mt. Angi, Oct., fl., *Symington F.D. 23343* (SING); *ibid.*, Dec., fl., *Holtum 9893* (BO, SING); *ibid.*, Dec., fl., *Osman F.D. 23722* (SING); *ibid.*, Dec., fl., *Tachun F.D. 23680* (SING); JOHORE: Sg. Kayu Ara, Mawai-Jamaluang Rd., low, May, fl., *Corner S.N.F. 29329* (BO, SING); *ibid.*, April, fl., *Corner S.F.N. 32745* (BO, SING); *ibid.*, Mt. Pulai, March, fl., *Sinclair S.F.N. 39511* (E, SING); BORNEO: Sarawak, Mt. Matang, Dec., fl., fr., *Beccari P.B. 2955* (BO) et *2510* (BO, G); *ibid.*, 100-500 m, Sept., buds, *Jacobs 5543* (B, BO, BH, CANB, G, K, L, SAR, US); Kuching, Semengoh For. Reserve, near tree 918, alt. 100 m, Sept., young fr., *Jugah s.n.* (A, BO, K, L, SAR); *ibid.*, near tree 3598, Aug., fl., *Rosli S. 14922* (A, BO, K, L, SAN, SAR, SING); *ibid.*, Aug., fl., *S. 14829* (BO, K, L, SAR, SING); *ibid.*, Sept., fl., *Bojeng bin Sitam 9378* (BO, K, L, SING); Sabah (N Borneo), hillside, Aug., buds, *Keith B.N.B.F.D. 6225* (L).

**OBSERVATIONS:** The species is closely related to *C. latifolia* but has narrow leaves with less lateral nerves and a caudate acumen.

The species related to *C. scabra*, but has differently shaped leaves which are more smooth and glossy; the veins (on the upper surface) have also rough pits. Young leaves are reticulate on both surface and not bullate.

5. *Cyclandrophora penangiana* Kosterm.

**Cyclandrophora penangiana** Kosterm. spec. nov.

*Parinarium asperulum* (non Miquel) King, J. As. Soc. Bengal **66** (2) : 281. 1897 (specim. Ridley 2603 except.).

TYPUS: *Curtis 203* (SING)

*Arbor* ramulis gracilibus glabrescentibus; foliis rigide chartaceis glabris lanceolatis vel ovato-lanceolatis basi cuneatis apice breve acuminatis utrinque nitidis prominulo-reticulatis, costis filiformibus utrinque 11-13, petiolis parvis gracilibus; inflorescentiis racemiformibus adpresse minute pilosis, bracteis magnis, tubo calycinum cylindricum gracile.

*Tree*, up to 20 m tall. Bark grey-brown, roughish. Branchlets slender, glabrescent, black (dried), glossy. *Leaves* stiffly chartaceous, glabrous, glossy and minutely, densely prominently reticulate on both surfaces, 2.5 × 6.5 to 3 × 9 cm (rarely 7 × 18 cm), base cuneate, apex shortly acuminate, midrib and lateral nerves prominulous on the upper surface; on the lower surface midrib prominent, lateral nerves filiformous, ca 10 pairs, prominulous. Petiole slender, ca 5 mm long, glandless. Stipules stiff, narrowly lanceolate, gradually acute, slender, glabrous, up to 7 mm long. *Inflorescences* axillary, racemiformous, densely pale brown, adpressed pilose, up to 5-7 cm long; bracts large, enveloping the buds, caducous at the base of the inflorescence at anthesis. *Calyx* tube narrowly cylindrical or infundibuliformous, 5-6 mm long; lobes 4 mm. *Stamens* ca 20, ca 8 mm long. Style filiformous, 10 mm long. *Fruit* ellipsoid, 2 × 3 cm, roughish outside; young fruit laterally flattened, top obtuse, truncate.

REPRESENTATIVE SPECIMENS: MALAY PENINSULA: Penang Isl., Gvt. Hill, 700 m, April, fl., *Haniff 9108* (BO, SING); *ibid.*, March, fl., *Curtis 203* (SING); *ibid.*, Moniot's Rd., May, fl., *Curtis 203* (SING); *ibid.*, Batu Terenggi, March, fl., *Curtis s.n.* (SING); *ibid.*, fr., *sine coll. no 12728* (BO); Chetty Temple Hill, Aug., young fr., *Nauen S.F.N. 37673* (SING); near Exp. Nursery, Apr., fl., fr., *Curtis 203* (SING); Perak, Larut, alt. 500 m, *King's Coll. 7568* (P, SING) et Oct., fl., *King's Coll. 3537* (BO, P, SING); Upper Perak, Ulu Kenderong Grik, March, fl., *F.D. 11594* (SING); locality not indicated, *Scotechini 1981* (SING).

OBSERVATIONS: The species is closely related to *C. nannodes*, but the leaves have a shorter acumen and the flowers are much smaller. In leaf shape the species resembles *C. villamilii* and *C. travancorica*.

6. *Cyclandrophora indica* (Bedd.) Prance

**Cyclandrophora indica** (Bedd.) Prance, in the press.

*Entosiphon indicum* Beddome, Madras J. Litt. Ser. 3, **1** : 45. 1864.

*Parinarium indicum* (Bedd.) Beddome, Icones Pl. Ind. Or. **22**, tab. 109. 1874; Fl. sylv. Ind. **1** : tab. 191. 1872; Hooker f. Fl. Brit. India **2** : 311. 1878; Koorders & Valetton, Bijdr. Kennis Boomsoorten Java 5 in Meded.'s Lands Pl. tuin Buitenzorg **33** : 337.1900 (quoad nomen; as a syn. of *P. scabrum* Hassk.); Gamble, Fl. Madras : 437. 1919.

*Ferolia indica* (Bedd.) O. Kuntze, Rev. Gen. Pl. **1** : 216. 1891. — Beddome s.n. (K).



“ A medium sized *tree*. *Leaves* elliptic-lanceolate, glabrous, 20-24.5×7.5 cm, slightly undulate, nerves 8-10 pair, strong beneath, much arched. *Petiole* very short. *Racemes* axillary and terminal, simple, stout, rarely divided at base, tomentose. *Flowers* shortly pedicelled, 1.25-1.70 mm long. *Calyx* tube campanulate, lobes ovate, acute. *Petals* ovate, sessile, shorter than the calyx lobes. Fertile *stamens* 12-15, unilateral, twice as long as the calyx lobes. *Ovary* hairy, 2-celled ” (HOOKER f. l.c.).

DISTRIBUTION: India, Wynaad.

REPRESENTATIVE SPECIMENS: INDIA: Wynaad, alt. 600 m, Jan., fl., *Beddome s.n.* (K); Carcoon Ghat, Wynaad, alt. 7-800 m, fr., *Beddome s.n.* (K); locality not indicated, fl., *Law s.n.* (K.)

OBSERVATIONS: Closely related to *C. laurina* A. Gray. Differs by the less dense tomentum of the inflorescence (according to BEDDOME's drawing and according to GAMBLE and information received from the Kew Herbarium). The glands are shown in the plate as small circular dots on the lower leaf surface near the petiole insertion; these glands are not present in *C. laurina* or *C. excelsa*.

I have not seen any specimens.

#### 7. *Cyclandrophora travancorica* (Bedd.) Prance.

***Cyclandrophora travancorica*** (Bedd.) Prance, in the press.

*Parinarium travancoricum* Beddome, *Icones Pl. Ind. Or.* 1 : 43, tab. 189. 1874; Hooker f. *Fl. Brit. India* 2 : 311. 1878; Gamble, *Man. Ind. Timb.* ed. 2 : 311. 1902; Brandis, *Ind. Trees* : 278. 1906; Bourdillon, *For. Trees Travancore* : 164. 1908.

*Ferolia travancorica* (Bedd.) O. Kuntze, *Rev. Gen. Pl.* 1 : 216. 1891. — Beddome 292 (K).

*Tree*, up to 25 m high; branchlets very slender, silky. *Leaves* chartaceous, glabrous, lanceolate, 2×8 to 3.5×12 cm, acuminate, base acute, prominulously, densely reticulate on both surfaces, midrib slightly prominent on upper, prominent on the lower surface; lateral nerves 12-16 pairs, filiformous, prominulous on both surfaces, arcuate; in young leaves the main nerves pilose on the lower surface. *Petiole* slender, 4 mm long, glandless. *Stipules* narrowly lanceolate, stiff, acute, 1 cm long, base 1 mm wide, at both sides of the petiole, enveloping the axillary bud. *Racemes* or spikes axillary, densely yellowish sericeous, up to 5 cm, long, few-flowered, simple or branched at base, consisting of a main peduncle of about 2 cm, the flowering part with bracts and bracteoles, caducous at anthesis. *Calyx* tube funnel-shaped, densely villous, 5-6 mm long; lobes ovate, acute, silky, 4 mm long. *Petals* pinkish or white, oblong-ovate, acute, as long or longer than the calyx lobes (up to 7 mm). Fertile *stamens* ca 12; filaments 1 cm long, glabrous. *Ovary* pilose; style 1 cm long, glabrous, stigma truncate. *Fruit* ellipsoid, smooth, 5 cm long, 4 cm in diam.

DISTRIBUTION: India, Travancore.

REPRESENTATIVE SPECIMENS: INDIA, TRAVANCORE: Courtallam, Rosemallay Coffee Estate, alt. 700 m, fl., *Beddome 292* (CAL, K); Merchiston Estate, Colatoor-polay, alt. 700 m, Dec., fl., *Bourdillon s.n.* (CAL) et April, fl., and one loose fruit, *Bourdillon 584* (K); *ibid.*, Dec., fl., *Lawson 34* (K).

OBSERVATIONS: The species is closely related to *C. penangiana*, but the flowers are larger with a broader tube; it has less fertile stamens and larger petals.

#### 8. *Cyclandrophora villamilii* (Merr.) Prance

*Cyclandrophora villamilii* (Merr.) Prance, in the press.

*Parinarium villamilii* Merrill, Philipp. J. Sci. Bot. **10** : 308. 1915; Enum. Philipp. Flow. Pl. **2** : 236. 1923 – Villamil F.B. 21863 (UC).

*Tree*, up to 25 m high and 40 cm in diam. with 10 m clear bole. Branchlets slender, the youngest ones adpressed-strigose. *Leaves* chartaceous, glabrous (except midrib below), lanceolate, 2×8 to 4×12 cm, base shortly cuneate, apex shortly acuminate, upper surface glossy, midrib and lateral nerves very slender, prominulous, reticulation dense, rather obscure; lower surface less glossy, minutely prominulously reticulate, midrib prominent, lateral nerves 10-13 pairs, slender, slightly arcuate, prominulous. Petiole slender, 3-4 mm, glandless, glabrescent. Stipules like those of *C. excelsa*, lanceolate, acute, 15 mm long, 4 mm wide at base, caducous. *Inflorescence* axillary, densely sericeous, up to 3 cm long, consisting of a slender main peduncle and a few, very short branches; bracts longer than the buds. *Fruit* (immature) ovoid-ellipsoid, 2×2.5 cm, brown-pustular, apex obtuse, laterally flattened, one-celled, cotyledons ruminant; calyx lobes below the fruit ovate; acutish, 4 mm long, outside densely shortly pilose, like the calyx; stamens perhaps about 15-20.

DISTRIBUTION: Philippines (Mindanao) and N Celebes.

REPRESENTATIVE SPECIMENS: PHILIPPINES: Mindanao, Distr. of Zamboanga, Margosatubig, June, fr., *Villamil 21863* (fragment in BO); CELEBES: Manado, Tondey, Oct., buds, *bb. 17159* (BO, L); near Popo, Tompasso, virgin forest Karawa, ster. *Koorders 16643* (BO, L); Menado, alt. 300 m, ster., *Koorders 16643* (L).

OBSERVATIONS: The species is closely related to *C. scabra*, but has less scabrous leaves and smaller flowers with hairs shorter than those in *C. scabra*, probably only a variety of *C. excelsa*.

#### 9. *Cyclandrophora scabra* (Hassk.) Kosterm.

*Cyclandrophora scabra* (Hassk.) Kosterm., comb. nov.

*Parinarium scabrum* Hasskarl (basionym), Tijdschr. Nat. Geschied. Physiol. **10** : 147. 1843 (nomen); Tweede Catal.'s Lands Pl. tuin Buitenzorg : 269. 1844 (nomen); Flora **27** (2) : 585. 1844 (diagnosis); Mueller in Walp. Rep. **5** : 647. 1845-46; Walp. Ann. **4** : 645. 1857; Flora **41** (= 16) : 255. 1858 (sphalm: sobrum); Miquel, Fl. Ind. Bat. **1** (1) : 354, tab. 5. 1855; Blume, Mus. Bot. Lugd. Bat. **2** (6) : 96. 1856, p.p.; Miers, J. Linn. Soc., Bot. **17** : 336. 1879; Filet, Plantk. Woordenb. Ned. Ind. ed. 2 : 180. 1888, p.p.; King, J. As. Soc. Bengal **66** (2) : 281. 1897 (quoad nomen tantum); Koorders & Valetton, Bijdr. Kennis Boomsoorten Java 5 in Meded.'s Lands Pl. tuin Buitenzorg **33** : 337. 1900; pro minima parte (quoad var. lanceolatum K. & V.); de Clercq, Nieuw Plantk. Woordenb. Ned. Ind. : 299. 1909, p.p.; Koorders, Gedenkboek Junghuhn : 169. 1910 (quoad nomen tantum, specimen est Hiptage spec.,



Malpighiaceae<sup>1</sup>); Exkurs. Fl. Java 2 : 338. 1912, p.p.; Koorders-Schumacher, Syst. Verzeichn. 1 (1), Fam. 127 : 22. 1914, p.p.; den Berger in Meded. Proefsta. Thee 97 : tab. 22. 1926, p.p.; Heyne, Nuttige Pl. Ned. Ind., ed. 2, 1 : 697. 1927; ed. 3, 1 : 697. 1950 (quoad nomen tantum); Meeuse & Adelbert in Backer, Fl. Java (emergency Ed.), Fam. 116. : 26. 1943, p.p.

*Petrocarya scabra* (Hassk.) Miers, J. Linn. Soc., Bot. 17 : 336. 1897.

*Ferolia scabra* (Hassk.) Kuntze, Rev. Gen. Pl. 1 : 216. 1891. — Illustrative specimen: Kostermans & Anta 1136 (BO).

*Parinarium glaberrimum* (non Hassk.) Miquel, Ann. Mus. Bot. Lugd. Bat. 3 : 237. 1867, p.p.; (non Hassk.) Filet, Plantk. Woordenb. Ned. Ind., ed. 2 : 180. 1888, p.p.; (non Hassk.) Koorders & Valetton, l.c. : 337. 1900, p.p.; (non Hassk.) Heyne, Nuttige Pl. ll.cc., p.p.; Meeuse & Adelbert, l.c. : 26. 1943, p.p.

*Parinarium glaberrimum* var. *lanceolatum* (T. & B.) Koorders & Valetton, Bijdr. Kennis Boomsorten Java 5 in Meded.'s Lands Pl. tuin Buitenzorg 33 : 338. 1900 (p.p., quoad specim. Java); Koorders in Gedenk. Junghuhn, l.c. : 169. 1910 (quoad nomen tantum).

*Parinarium lanceolatum* Teijsmann & Binnendijk, Catal. Hort. Bogor. ined. : 255. 1854; id. : 253. 1866; Koorders & Valetton, l.c. : 334 — Sine coll. e Montis Saribu; lectotypus: Hort. Bogor. sub IV H 9, fl. (BO).

Large tree, up to 30 m tall with 12 m cylindrical bole; bark brownish grey, roughish. Branchlets slender, the youngest ones minutely pilose and sparsely adpressed strigose. Leaves chartaceous, glabrous, lanceolate to ovate-lanceolate, 3 × 11.5 to 6.5 × 18 cm; both surfaces rather glossy; the young leaves (dried) very scabrous to the touch and densely, minutely, prominently reticulate, base acute or cuneate, apex acuminate, with sharp tip; midrib and lateral nerves prominent on upper surface; lateral nerves slender, 12-14 pairs, erect-patent, slightly arcuate (at margin arcuate). Petiole about 5 mm long, glandless, slightly winged. Stipules stiff, lanceolate-linear, arcuate, adpressed pilose. Inflorescences axillary, up to 2-2.5 cm long, densely pale brown sericeous with very short slender, distant branchlets and a slender main peduncle. Calyx tube 7-10 mm long, infundibuliformous, gibbose; lobes 5 mm long, ovate-oblong, acutish. Stamens ca 18, about 8 mm long; style glabrous, as slender as the filaments and about as long. Ripe fruit unknown. Young fruit similar to that of *C. excelsa*.

DISTRIBUTION: S-W Java.

REPRESENTATIVE SPECIMENS: JAVA: without locality, fl. (L); culta in Hort. Bogor. sub IV H 13a, fl. (BO, KEP, LAE, MEL, PNH, SING); *ibid.*, sub IV H 14, fl. (BO); *ibid.*, sub IV H 18, fl. (A, BO, CAL, K, KEP, LAE, MEL, NY, P); *ibid.*, sub IV H 18b, ster. (BO); *ibid.*, sub IV H 9, fl. (BO, K, P), lecto-type of *P. lanceolatum* T. & B.; sine collector, sine numero, manu Blume: *P. scabrum* Hassk., Miquel (L); S-W Java, Palabuanratu, ster., Koorders 9464 (BO, loose leaves only), 9873 (BO, L), 12292 with flower buds (BO), 33055 (BO).

<sup>1</sup> Cf. Hallier, Beih. Bot. Centralbl. 39 (1) : 161. 1921.

OBSERVATIONS: *Parinarium scabrum* was mentioned by HASSKARL in 1843 without description but the local (Sundanese = W Javanese) name is given as Kiso-reca, apparently a misprinting for Kisokka; this same vernacular name is also cited for *P. glaberrimum* Hassk. In Oct. 1844 the species is mentioned again in HASSKARL'S Tweede Catal. (together with *P. glaberrimum* Hassk.) again without description. In 1844 (*Flora* 27 (2) : 585) the following description is given: *Altior, vasta, foliis ovato-oblongis acuminatis basi acutis scabris*.

The vernacular name is given as Kisokka (in Sundanese). Evidently HASSKARL'S plant was from W Java and most likely described after a living specimen of which no herbarium material was conserved. The poor description alone is insufficient to identify the species. But, taking into account, that only two wild species of *Parinari* (sect. *Cyclandrophora*) are or were found in Java and the material collected by KOORDERS in S-W Java conforms with HASSKARL'S meagre description, we may assume that these represent *P. scabrum* Hassk.

In the Botanic Garden in Bogor a tree is growing, said to be from Java, of which the leaves conform with HASSKARL'S description of *P. scabrum* and with KOORDERS'S specimens. It is perhaps from this tree, that material was sent by TEIJSMANN to Leiden, as representing *P. scabrum*.

KOORDERS & VALETON recognized the variety: *lanceolatum*, which is based partly on KOORDERS'S Javanese material; but they included also other material, which represents *C. laurina*.

*Parinarium lanceolatum* Teijsmann & Binnendijk, for the first time mentioned and described in their non-edited Flora of 1854 is almost certainly the tree grown in the Bogor Garden. The tree has the same long, cylindrical, roughish, brown-grey bole as that of *C. excelsa* (which is *P. glaberrimum* Hassk.), but the leaves are narrower with a longer acumen and an acute base; the young leaves are (dried) much more scabrous than those of either *P. jackiana* Bth. or *P. laurina* A. Gray. In fresh condition the leaves differ from both afore mentioned species by having prominent lateral nerves on their upper surface, whereas the two others have them prominulous in a groove. The size of the flowers of *P. scabrum* is intermediate between those of *C. excelsa* and *C. laurina*; the inflorescence consists of a loose panicle with distant raceme-like branches; the inflorescence is much shorter and more slender than that of *C. laurina* A. Gray and more paniculate and more open and slender than that of *C. excelsa*. In this characteristic and in the leaf shape *C. scabra* strongly resembles *P. villamilii* Merr., but the latter is insufficiently known.

MIQUEL'S plant is perhaps based on the material of *P. lanceolatum* T. & B.

The stipules of *C. scabra* resemble those of *C. laurina* (narrow and very acute), but are smaller.

#### 10. *Cyclandrophora excelsa* (Jack) Kosterm.

*Cyclandrophora excelsa* (Jack) Kosterm., comb. nov.

*Petrocarya excelsa* W. Jack (basionym), Malay Miscell. 2 (7) : 68. 1822; reprint in Hooker's Compan. Bot. Mag. 1 : 220. 1836; reprint in Calcutta J. Nat. Hist. 4 : 164.

1843; reprint in Trübner's *Miscell. Papers relating to Indochina* **2** (2) : 279. 1887; Walp. *Rep.* **2** : 7. 1843; Bentham in Hooker, *Niger Fl.* : 335. 1849; Miquel, *Fl. Ind. Bat.* **1** (1) : 356. 1855; Mueller in Walp. *Ann.* **1** : 270. 1847-48; **4** : 644. 1857; *Flora* **41** (16) : 255. 1858; Hooker f. *Fl. Brit. India* **2** : 312. 1878.

*Parinarium jackianum* Bentham in Hooker, *Niger Fl.* : 335. 1849; Miquel, *Fl. Ind. Bat.* **1** (1) : 356. 1855; Mueller in Walp. *Ann.* **4** : 644. 1857; *Flora* **41** (16) : 255. 1858; Hooker f. *Fl. Brit. India* **2** : 312. 1878; Burkill in *J. Straits, Br. Roy. As. Soc.* **73** : 250. 1916; Merrill, *J. Arnold Arb.* **33** : 239. 1952.

*Ferolia jackiana* (Bth.) O. Kuntze, *Revisio Gen. Pl.* **1** : 216. 1891. — Lectotypus: Kostermans & Anta 1136 (lectotypus propos.).

*Parinarium glaberrimum* (Hassk.) Hasskarl, *Tijdschr. Nat. Geschied. & Physiol.* **10** : 147. 1843 (nomen); *Tweede Catal.'s Lands Pl. tuin Buitenzorg* : 269. 1844 (diagnosis); *Flora* **27** (2) : 583. 1844 (diagn. ampl.); *Aanteek. over het Nut door de Bewoners van Java aan eenige Planten van dat Eiland toegeschreven* 81, no 614 (Amsterdam). 1845; Mueller in Walp. *Rep.* **5** : 647. 1845-46; in Walp. *Ann.* **4** : 645. 1857; *Flora* **41** (16) : 255. 1858; Miquel, *Fl. Ind. Bat.* **1** (1) : 355. 1855; *Ann. Mus. Bot. Lugd. Bat.* **3** : 237. 1867, p.p.; Blume, *Mus. Bot. Lugd. Bat.* **2** (6) : 98. 1856; Miers, *J. Linn. Soc. Bot.* **17** : 336. 1879 (quoad nomen); Filet, *Plantk. Woordenb. Ned. Ind. ed. 2* : 180. 1888, p.p.; Koorders & Valeton, *Bijdr. Kennis Boomsorten Java 5 in Meded.'s Lands Pl. tuin Buitenzorg* **33** : 337. 1900, p.p.; Meeuse & Adelbert in Backer, *Fl. Java (emergency Ed.)*, *Fam.* 116 : 26. 1943, p.p.

*Cyclandrophora glaberrima* Hasskarl, *Flora* **25** (2), *Beibl.* **1** : 47. 1842 (diagn.); *id.* **27** (2) : 583. 1844 (nomen); *Tweede Catal.'s Lands Pl. tuin Buitenzorg* : 269. 1844 (combined generico-specific description); van Steenis, *Bull. Bot. Gard. Buitenzorg*, ser. 3, **17** : 461. 1948.

*Petrocarya glaberrima* (Hassk.) Miers, *J. Linn. Soc. Bot.* **17** : 336. 1879.

*Ferolia glaberrima* (Hassk.) O. Kuntze, *Revis. Gen. Pl.* **1** : 216. 1891.

*Parinarium scabrum* var. *macrophylla* (T. & B.) Koorders & Valeton, *Meded.'s Lands Pl. tuin Buitenzorg* **33** : 338. 1900.

*Parinarium macrophyllum* Teijsmann & Binnendijk, *Catal. Hort. Bogor.* : 253. 1866; *Flora* **49** : 438. 1866; *Natuurk. Tijdschr. Ned. Ind.* **29** : 256. 1867; Miquel, *Ann. Mus. Bot. Lugd. Bat.* **3** : 237, tab. 5. 1867; Filet, *Plantk. Woordenb. Ned. Ind. ed. 2* : 180. 1888; *Anon. Kew Bull.* **1892** : 47; Boerlage in Greshoff, *Schetsen nuttige Ind. Pl. no 10* : 38. 1894; Koorders & Valeton, *l.c.* : 337; Merrill *Interpret. Rumph. Herb. Amboin.* : 247. 1917 (quoad nomen); Heyne, *Nuttige Pl. Ind.*, ed. 2, **1** : 697. 1827 et ed. 3, **1** : 697. 1950 (quoad nomen) — *Culta in Hort. Bogor. e Bantam., Kidammaran incol.; sine coll., sine num. (BO).*

*Parinarium ellipticum* Teijsmann & Binnendijk, *Catal. Hort. Bogor. ined.* : 255. 1854; *id.* : 253. 1866; Koorders & Valeton, *l.c.* : 337; Merrill, *Interpret., l.c.* : 247 (quoad nomen).

*Parinarium scabrum* var. *ellipticum* (T. & B.) Koorders & Valeton, *l.c.* : 338. 1900. — *culta in Hort. Bogor., e Bantam; sine coll. et sine num. (BO).*

*Parinarium asperulum* Miquel, Fl. Ind. Bat., Suppl. Sumatra : 115. 1860 et : 307. 1862; King, J. As. Soc. Bengal **66** (2) : 281. 1897, p.p.; Koorders & Valetton, Bijdr. Kennis Boomsoorten Java in Meded.'s Lands Pl. tuin Buitenzorg **33** : 337. 1900, p.p.; Ridley, Fl. Pen. **1** : 670. 1922, p.p.; Burkill, Dict. Econ. Prod. Malay Pen. **2** : 1666. 1935, p.p.

*Ferolia asperula* (Miq.) O. Kuntze, Revisio Gen. Pl. **1** : 216. 1891.

*Cyclandrophora asperula* (Miq.) Prance, in the press — Teijsmann s.n., Lubu-Alang (U).

*Parinarium scabrum* (non Hassk.) Blume, Mus. Bot. Lugd. Bat. **2** (6) : 96. 1856, p.p.; (non Hasskarl) Miers, J. Linn. Soc. Bot. **17** : 336. 1879; (non Hassk.) Filet' Plantk. Woordenb. Ned. Ind., ed. 2 : 180. 1888; (non Hassk.) King, J. As. Soc. Bengal **66** (2) : 281. 1889; (non Hassk.) Koorders & Valetton, l.c. : 337, p.p. (P' indicum exclud.); Atlas Baumarten Java: tab. 110. 1913; (non Hassk.) de Clercq' Nieuw Plantk. Woordenb. Ned. Ind. : 299. 1909, p.p.; Koorders, Gedenk. Junghuhn' : 169. 1910 (quoad nomen tantum, specim. est Hiptage, Malpighiaceae); Koorders, Exkurs. Fl. Java **2** : 338. 1912, p.p.; (non Hassk.) Backer, Schoolfl. Java **1** : 445, 1911; (non Hassk.) Koorders-Schumacher, Syst. Verzeichn. **1** (1), Fam. 127 : 22. 1914, p.p.; (non Hassk.) Ridley, Fl. Malay Pen. **1** : 669. 1922, p.p.; (non Hassk.) den Berger, Meded. Proefsta. Thee **97** : tab. 22. 1926, p.p.; Heyne, Nuttige Pl. Ned. Ind., ll.cc. : 697, p.p.; (non Hassk.) Nayaranaswami, J. Asiat. Soc. Beng. ser. 2, **27** : 368. 1931; Meeuse & Adelbert in Backer, Fl. Java (emergency ed.), Fam. 116 : 26. 1943, p.p.

*Parinarium spicatum* King, J. Asiat. Soc. Bengal **66** (2) : 279. 1897; Ridley, Fl. Malay Pen. **1** : 669. 1922 — King's Coll. 6145. 10326 (CAL).

*Parinari* spec., Merrill, Univ. Calif. Publ. Bot. **15** : 94. 1921 — Elmer 21501 (UC).

Large tree, up to 45 m high and 60 cm in diam., buttresses small, thick, often transversally wrinkled (like an elephant's foot), 50 cm high (rarely up to 1 m high, but then going down steeply and concave at base), out 50 cm. Bole cylindrical, up to 15-20 m high, hoop-ringed. Bark hard, dark redbrown to brownish grey, roughish; outer bark 0.5-2 mm thick, cracked in tiny rectangular pieces. Living bark up to 10 mm thick, purplish red, turning dark purple on exposure; sapwood 1 cm, pinkish; heartwood hard, dark red. Young branchlets sparsely and adpressed strigose, or the pilosity lacking, soon glabrous; branches slender, glossy dark green (drying black), fractiflex; older branches grey. *Leaves* rigidly chartaceous to coriaceous, ovate to ovate-oblong, 2 × 4.5 to 5 × 12 cm, base contracted into the petiole, sub-cordate, slightly cuneately decurrent, apex shortly, rather broadly, bluntly acuminate; both surfaces prominulously reticulate; upper surface glossy, lower one less glossy with prominent midrib and 9-12 pairs of erect-patent, somewhat arcuate, slender, prominent lateral nerves (when fresh sunken into a groove); in between each pair of lateral nerves a more slender one, which does not reach the margin. Petiole slender, ca 5 mm long, soon glabrous, glandless. Stipules lateral covering the pilose axillary bud, lanceolate, acute, slightly widened somewhat below the apex, 8-15 mm long, boat-shaped, keeled, adpressed strigose to glabrous with a small hair brush at the tip; usually still present in submature leaves, below the apex slightly broadened. *Inflorescences* axillary, densely yellow-brown sericeous, spicate, single or 2 or more together on a very short main peduncle, 2-2.5 cm long. *Calyx* tube 4 (-7) mm with a

tiny, persistent bract at base and on the 1-2 mm long branch a larger bract. Lobes oblong-ovate, obtuse, 3-4 (-5) mm long, silky inside. *Petals* white to blueish-white, oblong, caducous. *Stamens* 18, ca 8 mm long, slender. Style glabrous, filiformous, ca 12-15 mm long.

*Fruit* sub-obovoid to globose with a short broad neck at the base (which disappears later), laterally flattened, light brown, pustular,  $3.5 \times 5$ , rarely  $4.5 \times 7$  cm; fibrous mesocarp 5-8 mm; inner layer thin, very shortly brown pilose; seed coat thin; seed ruminant.

**DISTRIBUTION:** Malay Peninsula, Sumatra, W Java (perhaps extinct), Borneo. Up to 1000 m alt., not rare but very scattered.

**REPRESENTATIVE SPECIMENS:** MALAY PENINSULA: Pahang, Tdg. Pasir, July, fl., *Muhamad C.F. 2799* (SING); *ibid.*, Rompin, Oct., fr., *Soh, F.D. 15497* (SING); Perak, Goping, alt. 200 m, May, fr., *King's Coll. 6145* (P); *ibid.*, Ulu Bubong, alt. 200 m, June, buds, *King's Coll. 10326* (P. SING); Selangor, Rantau Panjang For. Res., Aug., ster., *Ngah, F.D. 32306 et 32307* (SING); Johore, Mawai, June, fr., *Ngadiman, S.F.N. 37412* (SING); *ibid.*, Sg. Kahang, March, fr., *F.D. 5867* (SING); Singapore, Chan Chu Kang, Dec., fr., *Ridley 1898* (SING); Malacca or Negri Sembilan, fr., *Alvins 992 (= 1114)* (SING); SUMATRA: Atjeh, Langsa, Gvt. Rubber Estate, ster., *bb. 2585* (L); Tapanuli, Sibolga, Sibung-Sibung, ster., *bb. 1936 et 19349* (BO, L); Inderagiri, Muara Pedjangki, alt. 60 m, ster., *bb. 27448* (A, BO, L); *ibid.*, Keritang, alt. 40 m, July, fl., *bb. 28663* (A, BISH, BO, K, L, NY, SING), the smallest leaves ( $2 \times 4$  cm), the calyx only 3 mm long; Kuantan Distr., Sg. Besar, alt. 120 m, ster., *bb. 24048* (BO, L); WEST COAST: Lubu-Alung, ster., *Teijsmann 848 H.B.* (BO), type of *P. asperulum* Miq.; Painan, Barung-balantai, ster., *S.W.K. I-37* (BO); Palembang District, Banjuasin & Kubu regions, alt. 15 m, Aug., buds, *Thorenaar 133. 1P. 802* (BO, K, L, U); *id.*, Jan., ster. (BO, L); *id.* Sept., buds (A, BO, L); *ibid.*, Oct., young fr., *133. E. 1P. 911* (BO, L); *ibid.*, ster., *Grashoff 941* (A, BO, L), leaves of  $9 \times 19$  cm; *ibid.*, Bajunglintjir, alt. 15 m, Dec., young fr., *T. 1163* (BO, L); Lematang Ilir, Gunung Megang, alt. 75 m, Oct., fl., *E. 3P. 1159* (BO, L) et Febr., fr. (BO) et Dec., young fr. (BO); *ibid.*, Aug., fl., *bb. 35169* (A, BO, K, L, NY, SING); *ibid.*, Febr., fr., *T. 3P. 356* (BO) et Dec., young fr. (A, BO, K, L); *ibid.*, Oct., buds, *133 E. 3P. T. 338* (BO); *ibid.*, Semangus, alt. 75 m, ster., *bb. 31762* (BO, L) et *bb. 32092* (A, BO, L); Musi Hulu, ster., *Grashoff 173* (BO, K, L); Muara Enim Distr., Tjaban For. Res., Sept., young fr., *Kostermans 12021* (A, BISH, BO, CAL, CANB, K, L, SING); *id.*, ster., *Kostermans S. 129* (A, BO, G, K, L, LAE, P, SING); Palembang, Panerokan, ster., *Buurman van Vreeden 56* (BO); Mentawai Isl., Isl. Siberut, ster., *bb. 17471 et 17483* (BO); Bangka, Lobok Besar, alt. 20 m, sandy soil, Sept., buds, *Kostermans & Anta 864* (A, BO, K, L, LAE, P, PNH, SING, SYD); *ibid.*, Oct., fl., *Kostermans bb. 34178* (A, BO, K, L, NY, P, SING, US); *ibid.*, Oct., fl., *Kostermans & Anta 1034* (A, BISH, BO, CANB, K, KEP, L, LAE, NY, P, PNH, SYD); *ibid.*, Oct., fl., *Kostermans & Anta 1136* (A, BO, K, L, SING); Rindik, ster., *bb. 11818* (BO); Isl. Belitung (Biliton), ster., *bb. 11835* (BO). BORNEO: SARAWAK: Bukit Raya, Kapit, alt. 450 m, April, fr., *S. 17767* (A, BO, K, L, SAN, SING); Ulu Sepako, Belaga, alt. 100 m, April, fr., *S. 18216* (A, BO, K, L, MEL, SAN, SAR, SING); Lundu, Mat. Perigi, alt. 100 m, March, fr., Paie, *S. 13322* (A, BO, K, L, SAN, SAR, SING); Serian Distr. Mt. Gaharu, Sabal For. Res., June, fl., *Nahar, S. 12678* (A, BO, K, L, SAN, SAR); Kuching, Mt. Selang, alt. 500 m, March, fr., *Bujang, S. 12296*



(A, BO, K, L, SAN, SAR); BRUNEI: Ulu Supon, Tutong, seasonally swamped, alt. 15 m, Jan., fr., *Ashton, Brun. 854* (BO, K); SABAH (N Borneo): Sepilok For. Res., Sandakan, Nov., young fr., *Kadir, A 602* (BO, SING); Tawao, fr., *Elmer 21501* (P, SING); W KALIMANTAN (Indon. Borneo): Melawi, Tjatit, Mt. Tengkujung, alt. 425 m, ster., *bb. 26453* (A, BO, L); *ibid.*, Mt. Bedjaos, alt. 250 m, Jan., fr., *bb. 26841* (A, BO, K, L, SING); *ibid.*, Mt. Batunadjur, alt. 120 m, Jan., ster., *bb. 31641* (A, BO, L); *ibid.*, Kelupuk, alt. 450 m, ster., *bb. 29088* (A, BISH, BO, K, L, NY, PNH, SING); Simpang, Peni Tjontong, alt. 27 m, April, ster., *bb. 13522* (BO); *ibid.*, Kualam, alt. 50 m, Febr., fr., *bb. 8677* (BO, L); *ibid.*, Djerungkung, alt. 25 m, ster., *bb. 8316* (BO, L); Lower Matan, Mt. Kedijuk, alt. 35 m, ster., *bb. 14431* (BO, L); Sambas, Perigilimus, alt. 300 m, ster., *bb. 6067* (BO, L); Liangganggang, ster., *Hallier B. 3004* (A, BO, K, L); E. Kalimantan, Bulungan, Nunukan Isl., alt. 4 m, ster., *bb. 18178* (BO, L); *ibid.*, alt. 5 m, ster., *bb. 29351* (A, BO, L, SING); *ibid.*, N. part, alt. 20 m, Dec., fr., *Kostermans 9166* (A, BM, BO, CAL, CANB, K, L, NY, P, PNH, SING); N Nunukan, Oct., young fr., *Kostermans 8635* (A, BO, K, L, NY, P, SING); Tidung Lands, Sg. Sekakis, alt. 10 m, ster., *bb. 18325* (BO, L, SING); Berau, Mt. Ilas Bungaan alt. 400 m, Sept., fr., *Kostermans 13931* (A, BO, K, L, PNH, SING); *ibid.*, Domaring, alt. 150 m, ster., *bb. 18853* (BO, L); *ibid.*, Long Lanuk, alt. 50 m, ster., *bb. 18462* (BO, L); *ibid.*, Teluk Bajur, periodically inundated, alt. 0 m, Nov., fr., *Kostermans 21631* (A, BO, CANB, G, K, L, LAE, P, SING, US); E. Kutei, Mt. Medadem, N-W of Sangkulirang, alt. 150 m, Aug., fr., *Kostermans 13338* (A, BO, K, L, LAE, P, SING); *ibid.*, Sg. Kerajan, N-E of Sangkulirang, alt. 30 m, July, young fr., *Kostermans 5834* (A, BO, K, L, PNH, SING); W. Kutei, Tundjung Plateau (Mahakam R.), Padang Luwai, July, fr., *Kostermans 12531* (A, BO, CANB, K, L, NY, P, SING); Mt. Palimasen near Tabang on Belajan R., alt. 400 m, yellow sandy loam, Sept., fr., *Kostermans 13127* (A, BM, BO, BRI, CAL, CANB, K, KEP, L, LAE, NY, P, PNH, SING); Kelindjau R., Mendom, alt. 50 m, Aug., fr., *bb. 29237* (A, BO, K, L, NY, SING); *ibid.*, Long Bleh, Jan., fl., *Schut K. 2* (A, BO, K, L, LAE, P, SING); *ibid.*, Sebintulung, alt. 10 m, ster., *bb. 15813* (BO); Takat, alt. 40 m, ster., *bb. 12546* (BO); Muara Antjalong, ster., *bb. 16514* (B, L), *16557* (BO, L), *16565* (BO, L); lower Mahakam R., Loa Djanan near Samarinda, alt. 30 m, April, young fr., *Kostermans 6524* (A, BO, BRI, CAL, K, L, NY, P, PNH, SING); *ibid.*, Aug., buds, *bb. 32346* (A, BO, K, L, NY, SING); Djembajan R., Sg. Djambu, alt. 6 m, ster., *bb. 24673* (A, BO, L); Tdg. Bangko, mouth of Mahakam R., white sands, alt. 20 m, May, young fr., *Kostermans 7015* (A, BISH, BO, BRI, CAL, CANB, NY, P, PNH, SING) et *7041* (A, BISH, BM, BO, BRI, K, L, NY, P, PNH, SING); *ibid.*, Aug., fr., *Kostermans 7700* (A, BO, BRI, K, L, LAE, PNH, SING); Balikpapan Distr., Sg. Wain, alt. 50 m, ster., *bb. 34257* (BO); S-E Kalimantan, Tanah Bambu, Kampong Baru, alt. 25 m, Jan., fl., fr., *bb. 13392* (BO, L); Puruktjahu, Briwit, alt. 90 m, Febr., ster., *bb. 10908* (BO); *ibid.*, Muara Djaan, alt. 100 m, ster., *bb. 10512* (BO); Martapura, Kalaan, ster., *bb. 12048* (A, BO, L); S Kalimantan, Sampit, Barunang, alt. 20 m, ster., *bb. 9892* (BO)

OBSERVATIONS: *Parinarium jackianum* Bth. is based on *Parinarium excelsum* Jack (non Sabine). Of JACK's species no material is extant. MIQUEL already suggested that it should be very near to his *Parinarium asperulum*. JACK's description matches the latter species indeed perfectly and as of the four most common species of *Parina-*

rium of JACK's type locality (*P. corymbosa*, *P. asperula*, *P. costata*, *P. sumatrana*), *P. asperulum* Miq. fits JACK's description, there would be every reason to reduce *P. asperulum* Miq. to *P. jackiana* Bth., but for the discrepancy in the description of the fruit, which has puzzled everybody. The fruit is described as being two-celled with one cell with a seed and the other cell above the fertile one seedless. Moreover the seed is described as being slender with leaflike cotyledons. This does not fit *Parinarium* and most authors have concluded that JACK confused the fruit of another plant with his species.

I have been lucky to collect many young and old fruit of *P. asperulum* Miquel, which lead to the following observation.

In fruit, already 2 or more cm long there are *two* cavities, separated by the thin endocarp; both cavities may contain the still undeveloped seed (cf. observation of KOORDERS & VALETON, that the development of the seed is very much retarded in comparison with that of the fruit). In a later stage only one seed develops and this seed is slender and has leaf like cotyledons; later the developing seed presses the separating wall (endocarp) against the wall of the other cavity and the fruit becomes one-celled; later the seed becomes ruminant.

This explains JACK's description; the sterile cell might be in a certain stage indeed a little above the fertile one.

As the size of the fruit, as indicated by JACK represents indeed the stage of being 2-celled, there is no objection any more to relegate *P. asperulum* Miquel to *P. jackianum* Bth.

*Parinarium glaberrimum* was originally published as *Cyclandrophora glaberrima* by HASSKARL (Flora **25** (2), Beibl. 1 : 47. 1842); the diagnosis is a combined generic-specific one.

No specimens are indicated (HASSKARL described his species from living plants), but the article (in which this species appeared) contains descriptions of Javanese plants only and moreover the species is provided with a Sundanese (= West Javanese) vernacular name (Ki Sokka; Ki = tree; Sokka = Ixora).

Hence we may assume that HASSKARL based his species on a Javanese plant contrary to KOORDERS' and VALETON's statement, that the type specimen was from Amboina and cultivated in the Bogor Botanic Garden.

Another argument to uphold this assumption is, that HASSKARL in his "Schlüssel" to Rumphius' Herbarium Amboinense identified *Atun* as a *Parinarium* species, but he did not cite this as *P. glaberrimum*.

The first description of *P. glaberrimum* is short; salient characters are the ovate and ovate-oblong, shortly acuminate leaves with a cordate base; the tree was described as large; there should be no woolly hairs in the fruit cavity and there should be only 4 petals.

Next the species is mentioned in an article of HASSKARL in Tijdschr. Nat. Geschied. & Phys. (**10** : 147. 1843); here the name *Cyclandrophora* is accompanied by the word MSS., which implies, that HASSKARL had not yet seen his article in Flora 1842. He now incorporates *Cyclandrophora* in *Parinarium*. Moreover a second species (*P. scabrum*) is mentioned; neither of the two is described, but both bear the native name: Kisoreca (sic! = Kisokka).



In Oct. 1844 in his Tweede Cat. (: 269), both species are enumerated again under *Parinarium* (with the synonyms: *Petrocarya* Schreb. and *Cyclandrophora* Hassk. MSS.). For *P. glaberrimum* a short description is given in a foot-note (hence MERRILL, Enum. Philipp. Fl. Pl. 2 : 236. and KANEHIRA are wrong in quoting this as an omen nudum); this description is an excerpt of that of 1842.

Apparently both species were grown in the Botanic Garden.

Finally in 1844 (in Flora 27 (2) : 583) *P. glaberrimum* is amply described; both the references of 1842 and of the Catalogue of 1844 are now cited; still no specimens are cited, but it is said that *P. glaberrimum* is from the mountain regions of W Java and called in Sundanese (= W Javanese) Kisokka.

He says furthermore that it is close to *P. excelsum* Jack (= *P. jackianum* Bth.).

In the Leiden Herbarium a specimen from HASSKARL'S Herbarium (which was sent to Leiden by TEIJSMANN twenty years later) is conserved, which might or might not represent *P. glaberrimum*; the label bears no indication of the origin of the specimen, nor is there any writing of HASSKARL. It matches startlingly the material collected by REINWARDT and FORSTER in Amboina. This specimen probably represents *P. laurinum* from Amboina.

The only way to typify HASSKARL'S *P. glaberrimum* is by inference and by material from plants from Java.

From Java only 3 species of *Parinari* are known (*P. sumatrana*, *scabra* and *glaberrima*). *P. laurina* A. Gray does not occur in Java, nor in Sumatra; hence it is unlikely that HASSKARL'S *P. glaberrimum* should be conspecific with *P. laurina*.

In the Botanic Garden there is still a Javanese tree growing, which fits HASSKARL'S description. It is a tall tree (*P. laurina* is a small or medium tree) and the leaves are shortly acuminate (in *P. laurina* they are gradually and long acuminate). It is perhaps from this tree that material of *P. macrophyllum* T. & B. was collected, when it was still young and the leaves larger.

As the chances that a plant from S Sumatra is found in S-W Java are stronger, than that a species from Borneo and unknown from Sumatra should be found in W Java and as extant, cultivated material from Java fits HASSKARL'S description and as this is conspecific with *P. asperulum* Miquel, a very common tree in S Sumatra, we may assume that *P. asperulum* Miq. and *P. glaberrimum* Hassk. are conspecific.

The branchlets are as a rule covered by sparse strigose, adpressed hairs or are glabrous; in some specimens, however, they (and also the stipules) are covered with a dense layer of minute, brown hairs, on top of which are the strigose hairs (*bb.* 18462, 17183).

The leaves of saplings of *P. jackiana* are as large as those of *P. laurina*, but have a still shorter acumen. A specimen, collected by myself in Sumatra from a sapling of 3 m high has leaves with a very conspicuous acumen (L).

The leaves differ enormously in size; those of the specimen *Kostermans 13127* from a mountainous region (400 m) with poor soil being smallest; similar small leaves (2×4 cm) are also found in the specimen *Ngah F.D. 32306* from Selangor (but the same specimen has leaves of 3×7 cm) and in the specimen *Kostermans 12531* from very poor, sandy soil.

The fruit are usually cylindrical and are more flattened than those of *P. laurina*; sometimes the fruit are flat-globose. The inner layer of the fruit lacks the woolly

hairs of the section *Euparinari*, but they are certainly densely, shortly pilose. The fruit are smaller than those of *P. laurina*.

The calyx may be as small as 4 mm with 4 mm long lobes (*King's coll. 6145*). The petals are described as white or blue, usually they have a colour in between these two, usually violet-blue at the base and white higher up; the size of the flowers may differ too, but they are always smaller than those of *P. laurina* and the inflorescence is shorter.

I have chosen a specimen from Bangka as an illustrative specimen for this species, pending the establishment of a lecto-typus, if indeed no material of JACK should be extant.

The flowers have 5 petals (HASSKARL mentioned 4), as was already stated by BOERLAGE in GRESHOFF (for *P. laurina*). The number of stamens seems to vary between 12 and 20. The fibrous mesocarp cracks when the fruit has dropped and does not become soft as in *Parinari*.

#### 11. *Cyclandrophora laurina* (A. Gray) Kosterm.

***Cyclandrophora laurina*** (A. Gray) Kosterm., comb. nov.

*Parinarium laurinum* A. Gray (basionym), Botany Cpt. Wilkes United St. Explor. Exped. **1** : 490, tab. 55. 1854; Mueller in Walp. Ann. **4** : 646. 1857; Seeman, Viti : 75; App. : 436. 1862; Hemsley, Report Challenger, Bot. Juan Fernandez, Moluccas, etc. : 237. 1885; Guppy, Solomon Isl. and their Natives : 296. 1887; Koorders & Valeton, Meded.'s Lands Pl. tuin Buitenzorg **33** : 337. 1900, p.p. (as a syn. of *P. scabrum* Hassk.); Burkill, J. Linn. Soc. **30** : 36. 1901; Schumann & Lauterbach, Fl. Deutsche Schutzgeb. Südsee : 341. 1901; Bailey, Compreh. Cat. Queensl. Pl. : 167. 1909; Merrill, Philipp. J. Sci. Bot. **10** : 310. 1915; in J. Straits, Br. Roy. As. Soc. Spec. Number : 81. 1917 (as a syn. of *P. glaberrimum* Hassk.); Interpret. Rumph. Herb. Amboin. : 247. 1917; Enum. Philipp. Fl. Pl. **2** : 236. 1923; Schneider, Bull. Forestry Philipp. **14** : 114. 1916; White, Proc. Roy. Soc. Queensl. **39** (6) : 63. 1927 (nomen); Kanehira, Bot. Mag. Tokyo **45** : 282. 1931; J. Jap. Bot. **16** (8) : 471. 1940; J. Dept. Agric. Kyushyu Imp. Univ., Fukuoka **34** : 325. 1934 — Cpt. Wilkes s.n. (US).

*Parinarium margarata* A. Gray, Botany Cpt. Wilkes Unit. St. Explor. Exp. : 489. 1854; Atlas **1** : tab. 54. 1857; Mueller in Walp. Ann. **4** : 646. 1857; Seemann, Viti, App. : 436. 1862. — Cpt. Wilkes s.n., Sandalwood Bay, Fiji (US).

*Parinarium glaberrimum* (non Hassk.) Miquel, Ann. Mus. Bot. Lugd. Bat. **3** : 237. 1867, p.p.; (non Hassk.) Seemann, Viti, App. : 436. 1862; (non Hassk.) Miers, J. Linn. Soc. Bot. **3** : 237. 1879; (non Hassk.) Fiji, Filet, Plantk. Woordenb. Ned. Ind. ed. 2 : 180. 1888, p.p.; (non Hassk.) Schumann & Hollrung, Fl. K. Wilhelmsh. Beih., Nachtr. : 93. 1889; Pl. Bamml. in Notizbl. Bot. Gart. Berlin **1** : 49. 1901; (non Hassk.) Boerlage in Greshoff, Schetsen Nuttige Ind. Pl. no 10 : 37, tab. 10. 1894; "de Ind. Mercur" **17** (44), tab. 1894; (non Hassk.) Sadebeck, Kulturgew. Deutsch Kolon. : 232. 1899; (non Hassk.) Koorders & Valeton, l.c. : 337. 1900 (pro minima parte; cum var. genuina K. & Val. l.c. : 338); (non Hassk.) Schumann & Lauterbach, Fl. Deutsch Schutzgeb. Südsee : 341. 1901; (non Hassk.) Schneider, Bull. **14**, Bur. For. Philipp. : 114. 1916; (non Hassk.) Merrill, Interpret. Rumph. Herb. Amboin. :

247. 1917; J. Straits Br. Roy. As. Soc. **76** : 82. 1917; Bibliogr. Enum. Born. Pl. : 290. 1921 (*glaberrimum*); Enum. Philipp. Fl. Pl. **2** : 236. 1923; Univ. Calif. Publ. Bot. **15** : 92. 1929; (non Hassk.) Heyne, Nuttige Pl. Ned. Ind. ed. 2, **1** : 697. 1927 et ed. 3, **1** : 697. 1950, p.p.; (non Hassk.) Kanehira, Bot. Mag. Tokyo **45** : 282. 1931; Fl. Micrones. : 127, fig. 42. 1933; Dept. Agr. Kyushyu Imp. Un., Fukuoka **34** : 325. 1934; Enum. Micron. Pl. : 324. 1936; J. Jap. Bot. **16** (8) : 471-475, 4 fig. 1940 (in Japan.); extract idem, Jap. J. Bot. **11** : (96), no. 317. 1940-41; (non Hassk.) Burkill, Dict. Econ. Prod. Mal. Pen. **2** : 1667. 1935 (quoad nomen); (non Hassk.) Meeuse & Adelbert in Backer, Fl. Java (emergency Ed.), Fam. 116 : 26. 1943, p.p.; (non Hassk.) Yuncker, Bishop Mus. Bull. **184** : 40. 1945; (non Hassk.) Kraemer, Trees W Pacific Region : 108, fig. 33. 1951; (non Hassk.) Glassman, Bishop Mus. Bull. **209** : 73. 1952; (non Hassk.) McCarthy, Austral. Mus. Mag. **13** : 149. 1960.

*Parinarium macrophyllum* (non Teijsm. & Binnend.) Merrill, Interpret. Rumph. Herb. Amboin. : 247. 1917.

*Parinarium amboinense* Teijsmann & Binnendijk, Cat. Hort. Bogor. ined.: 254. 1854 — culta in Hort. Bogor. e Amboina, Teijsmann s.n. (BO).

*Parinarium hahlii* Warburgh in “ Der TROPENPFLANZER ” **6** : 370. 1902; Kanehira, J. Jap. Bot. **16** (8) : 471. 1940; Glassmann, Bull. Bishop Mus. **209** : 73. 1952 (as a syn. of *P. glaberrimum* Hassk.) — Warburgh, Ponape (B).

*Parinarium mindanaense* Perkins, Fragm. Fl. Philip. : 119. 1904; Merrill, Philipp. J. Sci. Bot. **10** : 210. 1915 (as a syn. of *P. laurinum* A. Gray); Interpret. Rumph. Herb. Amboin. : 247. 1917 (as a syn. of *P. glaberrimum* Hassk.); Enum., l.c. : 236. — Warburgh 14484 (B).

*Parinarium curranii* Merrill, Philipp. J. Sci. Bot. **4** : 264. 1909; id. **10** : 310. 1915 (as a syn. of *P. laurinum* A. Gray); J. Straits Br. Roy. As. Soc. l.c. : 82; Interpret. l.c. : 247. 1917 (as a syn. of *P. glaberrimum* Hassk.); Enum. Philipp. Fl. Pl. l.c. : 236. — Merrill 2614, holotypus; Curran F.B. 10575, paratypus.

*Parinarium racemosum* (non Vidal) Merrill, Gvt. Lab. Publ. (Philipp.) **17** : 19. 1904; Enum. Philipp. Fl. Pl. **2** : 236. 1923.

*Parinarium insularum* (non A. Gray) Merrill, Philipp. J. Sci. Bot. **10** : 310. 1915; Seemann, Viti. App. : 436. 1862. — Vaupel 237.

*Parinarium warburgii* Perkins ex Merrill, J. Straits Br. Roy. As. Soc. **76** : 82. 1917.

*Parinarium corymbosum* (non Miq.) Kanehira, Enum. Micrones. Pl. : 324. 1936, p.p. ; J. Jap. Bot. **16** (8) : 471. 1940, p.p.

*Parinarium scabrum* (non Hassk.) Koorders & Valetton, Meded.'s Lands Pl. tuin Buitenzorg **33** : 337. 1900, p.p. (cum var. *genuina* K. & V. et var. *lanceolatum*, p.p. quoad cit. spec. Fiji); (non Hassk.) Merrill, Philipp. Bur. For. Bull. **1** : 22. 1903; J. Straits Br. Roy. As. Soc. l.c. : 82. 1917. Bibliogr. Enum. Born. Pl. : 290. 1921 (*scaberrimum*); Enum. Philipp. Fl. Pl. **2** : 236. 1923; Univ. Calif. Publ. Bot. **15** : 92. 1924; (non Hassk.) de Clercq, Nieuw Plantk. Woordenb. Ned. Ind. : 299. 1909; (non Hassk.) Kanehira, J. Jap. Bot. **16** (8) : 471. 1940 .

*Atuna racemosa* Rafinesque, Sylva Tellur. : 153. 1838; Merrill, Index Rafin. : 136. 1949.

*Atunus rumphius*, Herbar. Amboinense 1 : 171-172, tab. 66. 1741; Lamarck, Encycl. Méth. Bot. 1 : 329. 1783 (quoad nomen); Poiret, Suppl. 5 : 254. 1817 (quoad nomen); Loureiro, Fl. Cochinch. : 295. 1790 (quoad nomen); Henschel, Clavis Rumph. : 144. 1833 (quoad nomen); Hasskarl, Neue Schluessel in Abh. Naturf. Gesellsch. Halle 9 : 164. 1864 (excl. syn.); Boerlage in Greshoff, Schetsen, l.c. : 37; Merrill, Interpret. Rumph. Herb. Amboin. : 247. 1917.

*Atunus moluccanus* Reinwardt ex Boerlage in Greshoff, Schetsen Nuttige Ind. Pl. no. 10 : 38. 1894.

VERNAC. NAMES: *Philippines*: Botabon, Butabul, Getabon (Tagb.); Botga (Bik); Pantog-usa (Kuy); Pinai (Bis, P); Tabong (Bag.); Tabon-tabon (C, Bis, Bik, Mbo); Tambon-tambon (P, Bis); *Borneo* : Belibu (Iban); Kukut (Sarawak); *Amboina*: Atong; *Celebes*: Lomo (Makassar); Samaka (Bugis); *Ternate*: Saja; *New Guinea*: Low tukwa (Salawati; Manikiong language); *Solomon Isl.*: Do-omu; *New Britain*: Latita (W Nakanai); Axkull (S New Britain); *Bougainville*: Itor; *Fiji*: Makita; *Samoa*: Ifi-ifi; *Tonga*: Hea or Seea; *Carolines*: Gritting or Agaritin (Palau); Yarade or Adidi (Yap).

Usually small *tree*, rarely up to 22 m high and 60 cm in diam., branched almost to the ground, rarely with a large bole; bole smooth, fluted. Wood heavy, redbrown. Branchlets glabrous or (rarely) adpressed strigose. *Leaves* broadly ovate to ovate-oblong or elliptic, 7.5×22 to 12.5×33 cm or lanceolate, 2.5×10 to 5.5×25 cm, chartaceous to rigid chartaceous, base contracted into the petiole, rounded to subcordate, apex gradually acuminate, both surfaces prominulously reticulate, glabrous or adpressed strigose near the petiole-insertion on the lower surface, midrib prominent on both surfaces, lateral nerves slender, prominulous on upper (in fresh leaves in a groove), prominent on lower surface, (6-) 12-13 pairs, straight to slightly arcuate (the lower ones more patent). Stipules lanceolate, stiff, acute, up to 20 mm long, 1-1.5 mm wide at the base, glabrous (and with an apical tuft of hairs) or adpressed strigose (especially along the midrib), not broadened near the apex, enveloping the densely silky, adpressed strigose buds. Petiole stout or slender, 3-5 (-8) mm long, densely pilose (hairs minute, pseudo-stellate) or glabrous. The pseudo-racemes axillary, usually 1 or 2 on a very short main peduncle, densely pale brown, minutely sericeous, lateral branches 3-5 mm long, the entire raceme(s) up to 8-15 cm long with a bare lower part, upper part and flowerbuds completely covered by bracts before anthesis. Bracts ovate, acute, up to 8 mm long. *Flowers* subsessile with a small bract at the base. Pedicels 0.5-1 mm long with a 7 mm long, lanceolate bract at their base. *Calyx* funnel-shaped, 5-10 mm long; lobes 4-7 mm long, ovate-oblong or ovate, acutish, fleshy, concave, often keeled at apex, densely silky on both surfaces. *Petals* ovate-oblong, acutish, thin, up to 10 mm long, violet-blue to white. Filaments up to 12-20, pale blue, 15 mm long on a thin rim of 1-2 mm high; sterile ones toothlike on the rim. *Ovary* densely adpressed sericeous-strigose; style as long or longer than the filaments (ca 12 mm), slender; stigma minute. *Fruit* sub-globose, slightly flattened laterally (especially when young), up to 7.5 cm in diam., other characteristics as in *C. excelsa*. Fruiting pedicel up to 10 mm long and 6 mm in diam; mesocarp with bristle-like, radical fibres embedded into a more amorphous tissue, 11 mm thick, endocarp of a fibrous tissue, the fibres parallel to the wall, 2-3 mm thick, the inner layer membranous, shortly densely pilose.

DISTRIBUTION: Philippines, Borneo, Amboina, Celebes, Ternate, New Guinea, Solomon Isl., New Britain, Fiji, Samoa, Tonga, Carolines.



REPRESENTATIVE SPECIMENS: JAVA: culta in Hort. Bogor e Amboina sub *IV H6*, June, fr., *Kostermans 9986* (A, BO, K, L, PNH); *ibid.*, Dec., fl., *Kostermans 11105* (A, BISH, BO, BRI, CAL, CANB, K, KEP, L, LAE, NY, P, PNH, US); culta sub *IV H6*, ster. (US); culta sub *IV H8* et *a.*, Nov., fl. (A, BO, CAL, CANB, L, LAE, MEL, SAN, US); sub *IV H 12* (BO, K, L), very large leaves; PHILIPPINES: Luzon, Prov. of Albay, Montufar, March, fl., *Vidal (K)*; *ibid.*, June, fl., *Curran, For. Bur. 10575* (L, P, US); Prov. of Camarines, Paracale, Nov., Dec., fr., *Ramos & Edano, B. Sc. 33462* (BO, K, L); Prov. Camarines Norte, ster., *Magistrado, For. Bur. 28142* (SING); Prov. of Capiz, Febr., fl., *Herro, For. Bur. 23953* (GH, US); Laguna Prov., Mt. Makiling, May, fl., *Sulit, PNH 7092* (GH); Mindanao, Misamis, Aug., fl., *Quimpo, For. Bur. 30466* (UC); Distr. of Davao, Todaya, Mt. Apo, July, fl., fr., *Elmer 11237* (BISH, BO, GH, K, L, LE, MO, P, US), leaves of  $9.5 \times 38$  and of  $4.5 \times 13$  cm; Davao Prov., Miran R., Mt. Apo, Sept., fr., *Edano 1439* (BO, GH, L, SING); Surigao Prov., Apr., fr., *Ramos & Pascasio, Bur. Sci. 34380* (BO, L); *ibid.*, April, fl., *Wenzel 3249* (BO, BR, GH, K, MO, UC), stamens blue; *ibid.*, ster., *Ahern 3755* (BO, US); *ibid.*, *Malonga, For. Bur. 2600* (GH, K, US); Zamboanga Distr., Jan., fr., *Franco, For. Bur. 27792* (GH); Isl. Panay, Libacao, Capiz Prov., April, fr., *Ramos & Edano, Bur. Sci. 31452* (GH, K, UC); Prov. of Capiz, Febr., fl., *Herro, For. Bur. 23953* (GH, US); Isl. Balabac, Nov., fl., *Ramos & Edano, Bur. Sci. 49875* (BO, SING, UC), leaves ovate,  $12 \times 25.5$  cm; Isl. Sibuyan, Capiz Prov., Magallanes, Mt. Gitting-Giting, April, fr., *Elmer 12383* (BISH, BO, F, GH, K, L, MO, P, US); Negros occ., ster., *Masias et al., For. Bur. 30129* (UC); Isl. Palawan, Prov. of Palawan, Puerto Princessa, Mt. Pulgar, May, fl., *Elmer 13163* (BISH, BO, F, GH, K, L, LE, MO, P, US); *ibid.*, Sept., fr., *Merrill 7255* (K, L, P, US); *ibid.*, May, fl., Danao, *For. Bur. 21573* (F, K, L, P, US); *ibid.*, May, fl., Merrill, *Bur. Sci. 1266* (BO, DC, GH, L, MO, P, SING); *ibid.*, fr., Cenabre et al., *For. Bur. 27881* (GH); Damaran Isl., July-Aug., young fr., Cenabre, *For. Bur. 29978* (L, LE, US); CELEBES: S-E Peninsula, Lepo-Lepo near Kendari, Beccari July 1874 (FI); BORNEO: Sabah (N Borneo): Sept., Oct. fr., Villamil, *Bur. Sci. 1196* (BO, US); Kinabatangan, Batuputeh, level land, Febr., fl., *Madin, B.N.B.F.D. 1644* (BO, GH, K); Lahad Datu, N-E slope of Mt. Silam, 12 miles W-S-W of Lahad Datu, alt. 200 m, March, fr., *San 15011* (A, BO, BRI, K, KEP, L, SING); Lokapas, Beng. Kudat, alt. 20 m, ster., *B.N.B.F.D. 1819* (BO, K); Simporna, Sg. Gajah, level land, Febr., fl., *Mail, B.N.B.F.D. 1661* (BO, GH, K, O); Tawao, Elphinstone Prov., fl., *Elmer 20714* (BISH, BO, BRI, C, D, F, GH, K, L, MO, S, SING), et 20758 (BISH, BO, BRI, C, D, F, GH, K, L, MO, S, SING) et young fr., *Elmer 21753* (BISH, BO, BRI, C, D, F, GH, K, S, SING); Tawao, Timbu Mata Isl. For. Res., alt. 100 m, hillside, Aug., fl., *Keith, F.D. 6225* (BO, K, SING) et fl., young fr., *Keith 6224* (BO, SING); W Kalimantan (Indon. Borneo), Pontianak, Batu Ampar, ster., *bb. 13728* (BO, L); Amboina, Febr., fr., *Rant 321* (BO); Waai, June, fr., fl., *Teijsmann s.n.* (BO, K, L); ster., *Robinson 273* (BO, GH, K, L, US); ster., *Latuperissa 321* (BO); ster., *Reinwardt s.n.* (BO, L), type of *Atunus moluccanus* Rwdt. ex Boerlage; *id.*, July, fl., fr., *Reinwardt 140* (BO, L); *id.*, fr., *Beccari s.n.* (FI); fl., fr., *Forbes 3289* (FI, GH, L); Laha, fl., *Forsten s.n.* (BO, L); *ibid.*, ster., *Bolten s.n.* (BO); Waai, ster., *Teijsmann H.B. 5060* (BO, L); village Hukurila, April, fl., et young fr., *Kornassi 1142* (BO, K, L); WEST CERAM: Kairatu, Gemba, June, fl., fr., *Kuswata & Soepadmo 94* (A, BO, CANB, K, L, LAE, P, SING)



et 45 (A, BO, K, L, P, SING); NEW GUINEA: W Irian, Fakfak, Anahasi (Babo), alt. 50 m, May, fr., *bb.* 32693 (A, BO, L); Babo, ster., *bb.* 32708 (A, BO, L); Oct., young fr., *BW.* 1453 (BO, L); Wasabori near Serui, ster., *Aet & Idjan* 488 (BO); Japen (Mariattu), Serui, alt. 350 m, ster., *bb.* 30373 et 30377 (A, BO, L, SING); *bb.* 30491 (A, BO, K, L, SING) et *bb.* 30535 (A, BO, L); Salawati Isl., Kaloah, alt. 2 m, Oct., fl., *BW.* 4202 et 4205 (BO, L); et young fr., *BW.* 1453 (BO, L); PAPUA: W Div., Oriomo R., Jan., fl., fr., *White & Gray, N.G.F.* 10373 (BO) et ster., (*N.G.F.* 13194 (LAE)); Rabaul, March, fl., *Waterhouse* 410 (HG); SOLOMON ISL.: Bougainville, Kugumaru, Buin rainforest, alt. 150 m, Sept., fr., *Kajewski* 1802 (BISH, BO, L, S, SING); *ibid.*, Marmaromino rainforest, 50 m, Sept., fr., *Kajewski* 2211 (BISH, BO, GH, SING); San Cristoval Is., Waimamura, near coast, common, Sept., fl., *Brass* 2851 (BISH, BO, GH, L, SING); Ysabel Isl., Maringue Hill forest, alt. 500 m, common, Dec., fl., *Brass* 3296 (BISH, BO, GH, L); New Georgia near Minda, Oct., fr., *Walker & White, B.S.I.P.* 170 (GH); *ibid.*, Vanganu group, Patutiva Pt., Oct., fl., *Walker & White, B.S.I.P.* 170 A (GH); NEW BRITAIN: Bismarck Arch., W. Nakanai, Malalia near Cape Hoskins, Aug., ster., *Floyd, N.G.F.* 6567 (BO, GH, L); Bismarck Arch., New Britain, Keravat, March, fl., *Barrau* 617 (BISH); S New Britain, Eleak, ster., *N.G.F.* 10062 (BO); *ibid.*, Rakunat, Nodup, Gazelle Penins., ster., *Waterhouse* 963 (L); *ibid.*, ster., *Waterhouse* 240 (OXF); SAMOA ISL.: Isl. Savaii, above Sili, alt. 300 m, Nov., fl., *Christophersen* 3272 (BISH), leaves long and narrow, 2.5 × 11 inch, longpointed; *ibid.*, Nov., fl., *Christophersen* 3242 (BISH, BO); *ibid.*, back of Safune, Aug., fr., *Christophersen* 2442 (BISH); Tuhavesi, ster., *Mead* 1994 (K); Savaii, Oct., fl., *Vaupel* 237 (BISH, K, MO, US); *ibid.*, fl., *Whitmee s.n.* (GH, K); Manua, Ofu, Dec., fl., *Reinecke* 46 (BISH, DC); Lotofaga, S coast of Upolo, Aug., fr., *Mckee* 2928 (BISH, L); Upolo, Vaialele Mts., Aug., fr., *Christophersen* 351 (BISH); Samoa, locality not indicated, *Cp. Wilkes s.n.*, fl. (P.); Apia, ster., *Wilder* 402 (BISH) et Jan., fr., *Wilder* 409 (BISH); *ibid.*, Aug., fl., *Christophersen* 344 (BISH); Tutuila Isl., July, fr., *Setchell* 325 (BISH); *ibid.*, back of Papago, Dec., fr., *Garber* 892 (BISH); Uvea, ster., *Burrows* 1023 (BISH) et 1024, fl. Nov. (BISH); TONGA: Eua Isl., Liku forest, fr., *Parks* 16339 (BISH, D, GH, MO, US); Vavau, ster., *Yunker* 16119 (BISH) et May, fr., *Yunker* 16205 (BISH); Isl. Tongatapu, March, fl., *Yuncker* 15261 (BISH); Tonga, fl., *Mckee* 101 (BISH); Fiji Isl., fl., *Horne* 242 (BO, GH, K), cited as var. *lanceolata* of *P. scabra* by Koorders & Valetton; Viti, fl., fr., *Seemann* 146, anno 1860 (GH, P); Viti Levu, Mba (Nandi), vicinity of Tumbenasole valley, Namosi Creek, alt. 200-450 m, May-June, fr., *Smith* 4723 (BISH, GH, L, LE, S, US), small-flowered; Viti Levu, Mbua, April-May fr., *Smith* 1713 (BISH, BO, C, GH, K, S, UC, US); *ibid.*, vicinity of Nasimu, 9 miles from Suva, alt. 150 m, Oct., fr., *Gillespie* 3648 (BISH, BO, GH, K, P, S, UC); Namosi, 450 m, Sept., fl., *Gillespie* 2569 (BISH); *ibid.*, Mathuata, Seangangga Plateau, Korovuli R., alt. 100 m, Nov., fr., *Smith* 6680 (BISH, K, L, US); Fiji, ster., *Prince Anno* 1898 (GH); Viti Levu, ster., *Parham* (K); *ibid.*, Tabua Leva, fr., *Alviso* 15554 (GH); Viti Levu, Tholo West, Akivatu, July, fr., *Degener* 1554 (BISH); *ibid.*, Rewa, March, fl., *McDaniels* 1019 (BISH); Vanua Levu Thakaundrove, Jamawai R., Jan., fr., *Degener & Ordenez* 14100 (BISH, GH, K, UC); CAROLINE ISL.: Ponape, loose fr., *Hallier s.n.* (L); Truk, fl., culta; *ibid.*, fr., *Wong* 273 (K); *ibid.*, Jan., fl., *Koidzumi s.n.* (TI); Palau, Katelwell (Aimio), Sept., fl., *Tuyama s.n.* (TI); *ibid.*, Aimirik, April, buds,

*Kanehira & Hatusima F.N. 4593* (= 8958) (TI); *ibid.*, Baberudaibu, Garbadok, Aug., seedling, loose fruit of 8 cm diam., almost globular, *Tuyama s.n.* (TI).

OBSERVATIONS: *C. laurina* has been included by most botanists in *C. glaberrima* (= *C. excelsa*), but as has been pointed out under *C. excelsa*, *C. laurina* does not occur wild in Java.

The species was mentioned already by RUMPHIUS as "Atun"; he described it as a smallish tree with a fluted bole (the specimen *Kornassi 1142* was of a flowering tree only 7 m tall). The trees grown in the Botanic Garden in Bogor, grown from Amboina material (perhaps brought back from Amboina by REINWARDT) fit RUMPHIUS' description perfectly. They are now about 15-20 m tall with a smooth, fluted bole, a crown almost reaching to the ground and large, thin, gradually acuminate leaves, exactly like those pictured by GRESHOFF.

HASSKARL'S *P. glaberrimum* was described from living material, collected in Bantam (W Java). As herbarium facilities were not established in Bogor before 1844, already one year after HASSKARL had left for Europe and TEIJSMANN and later BINNENDIJK from 1850 onwards made collections from the trees in the Garden, to be sent to Leiden, it is quite possible that the two species were mixed or that *P. glaberrimum* was not represented in the Garden and the material, assumed by TEIJSMANN to be *P. glaberrimum* was actually collected from the Amboinese *P. laurinum* trees.

It is rather confusing, that young leaves of *C. excelsa* (*P. glaberrimum*) are as large as those of *C. laurina* (the Grashoff and Buurmann van Vreeden specimens of *P. asperulum* Miq. = *C. excelsa* Kosterm., from Sumatra, have leaves of 9×19 and 13×29 cm respectively); the only difference is the short acumen in *C. excelsa* as opposed to the gradual long drawn-out point of *C. laurina*. In fresh condition a difference in the stipules may be observed, which are slightly widened below the apex only in *C. excelsa*.

I believe, that the specimen in Leiden, marked *P. glaberrimum* Hassk. (perhaps in TEIJSMANN'S handwriting) and considered by VAN STEENIS to represent the type specimen of that species, actually is *C. laurina*, picked from the Amboinese trees; the specimen startlingly matches the material of *C. laurina* collected by *Reinwardt & Forster* in Amboina.

As pointed out under *C. excelsa*, Hasskarl would have certainly (in his "Schlüssel" for Rumphius' Herbarium Amboinense) referred "Atun" to *P. glaberrimum*, if he had been convinced that his Javanese *P. glaberrimum* should be conspecific with the Amboinese plant, but he merely referred Atun to *Parinarium* species.

As both species are so closely related and, a part from the leaf and stipule characteristics, are only separable by the size of the flowers and the shape of the tree bole and crown, I should not be surprised that hybrids between the two exist. *C. laurina* is in some places already a semi-cultigen.

The fruit is very hard and RUMPHIUS suggested that the name "Atun" might be a corruption of the Amboinese "hatu", which means stone. RUMPHIUS, 200 years ago, described the fruit better than any modern botanist; he reports the lateral compression and the imperfect suture or ridge at the top. He says, that the plant is rare in Amboina, but cultivated.

The thick, woody mesocarp, consisting of radial fibres, cracks into irregular pieces, when fallen, giving the embryo the opportunity to develop; these cracks

appear after drying. This is entirely different from the way *Parinari* seeds develop; there the outer, soft layer, rots away and the hard, stony mesocarp remains unaltered; no cracks appear. The cotyledons are white, turning reddish after cutting (tannin); they are very astringent; the seedcoat is very thin and smooth and follows the wrinkles of the ruminant embryo, giving the seed some resemblance to brains.

The plate for REINWARDT's plant in Amboina was made by BIK, who accompanied REINWARDT. This drawing, which is conserved in the Leiden Herbarium, is reproduced in GRESHOFF's article.

The petals are violet at base, gradually turning into white towards their tips. The number of stamens seems to vary between 12 to 20. The ovary is distinctly two-celled and as in all *Cyclandrophora* species the fruit is also initially 2-celled, but only one seed develops, which presses the dividing, thin wall against the opposite wall of the sterile cavity, which results in a ultimately mono-locular fruit.

The pilosity of the branchlets and stipules varies between entirely glabrous and a dense, microscopic indumentum of short hairs, topped by adpressed, strigose hairs. Such hairy specimens are found over the entire distributional area. The leaves vary considerably in size and the smallest ones resemble closely those of *C. villamilii* (which may be a variety). The broadest leaves were observed in the specimen *Edano 1439* (11 × 24 cm). The leafbase is in rare cases somewhat unequal.

The type specimen of *P. margarata* (K) consists of one leaf, of which the base has disappeared; the reticulation is more lax than usual; the number of lateral nerves is less (6 pairs) and they are more spaced; the perfectly globose fruit is 10 cm in diam.; without more material at hand, it is not possible to find out, whether it merits specific rank.

The length of the calyx tube seems to vary considerably; a specimen, collected by *Hallier* in the Caroline Islands (L) consists of a package of loose flowers with an extremely short tube; this might represent a different species.

The flowers are very shortly stalked (and not sessile); the pedicel forms a continuation of the calyx tube and may be differentiated from it only by the presence of a bract at the base of the tube.

The branchlets have, like in all *Cyclandrophora* species a typical fractiflex structure.

*Chrysobalanus racemosus* Roxburgh (Fl. Indica, ed. Carey 2 : 506. 1832; reprint : 405. 1874), based on a specimen of the Calcutta botanical Garden and originating from the Moluccas, might be this species, but without a type specimen this remains pure speculation. The description of the fruit certainly does not fit a *Parinari* species, not even a *Rosaceae* and hence ROXBURGH's binomial might be disposed of as a "mixtum compositu".

USE: The fruit are not in high esteem as human food, but are relished by wild boar. In Amboina a dish, called koku koku is prepared from the mashed seeds and raw or fried small fish, ginger, onions, chillies and lime juice.

In the Fiji islands the seeds are scraped, pounded and squeezed and the fragrant juice (which is called Ammon in Truk, Carolines) is mixed with coconut-oil for making a scented hair-oil.

Everywhere the mashed seeds often mixed with the latex of the breadfruit and warmed up, are used for caulking boats.

The seeds are also used for preparing the heads of deceased chieftains (McCARTHY). RUMPHIUS recognized the variety Atun Mamina, which is more oily and sweeter. According to him the mashed seeds are considered a remedy against irregular menstruation and are also a constipative (tannic acid !). Mixed with paint the crushed seeds are used to paint the planks of housewalls, which give them a red colour and prevents borer-attack.

SADEBECK reports that the seeds were sent to Germany for investigation on economic properties for the drying oil, but no success is reported; according to GRESHOFF the oil content is 31 per cent.

The leaves of the large-leaved plants in Fiji are used for thatching house-walls.

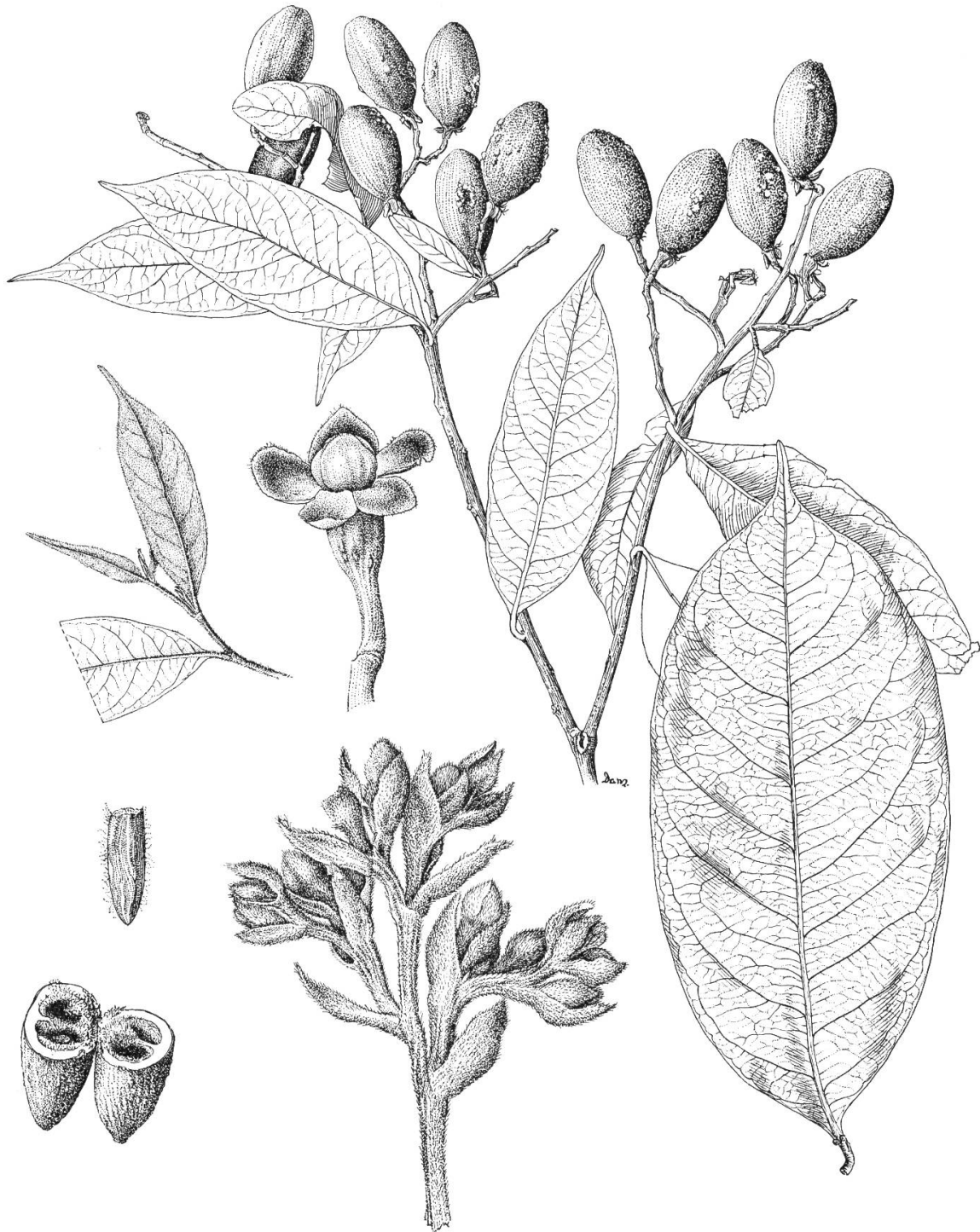


Fig. 1. — *Maranthes corymbosa* Blume





Fig. 2. — *Maranthes corymbosa* Blume



Fig. 3. — *Maranthes corymbosa* Blume

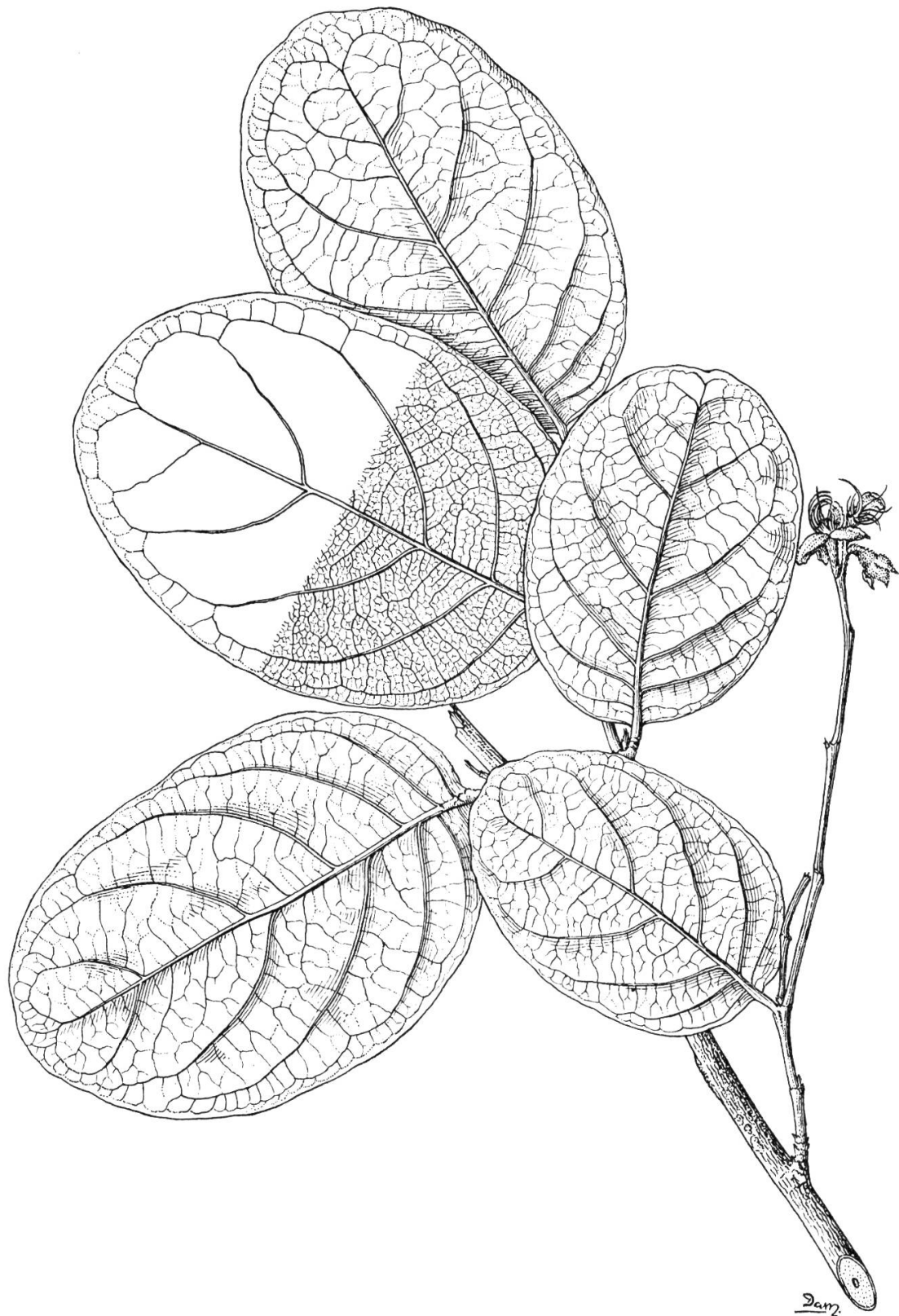


Fig. 4. — *Cyclandrophora elliptica* (Kosterm.) Kosterm. & Prance

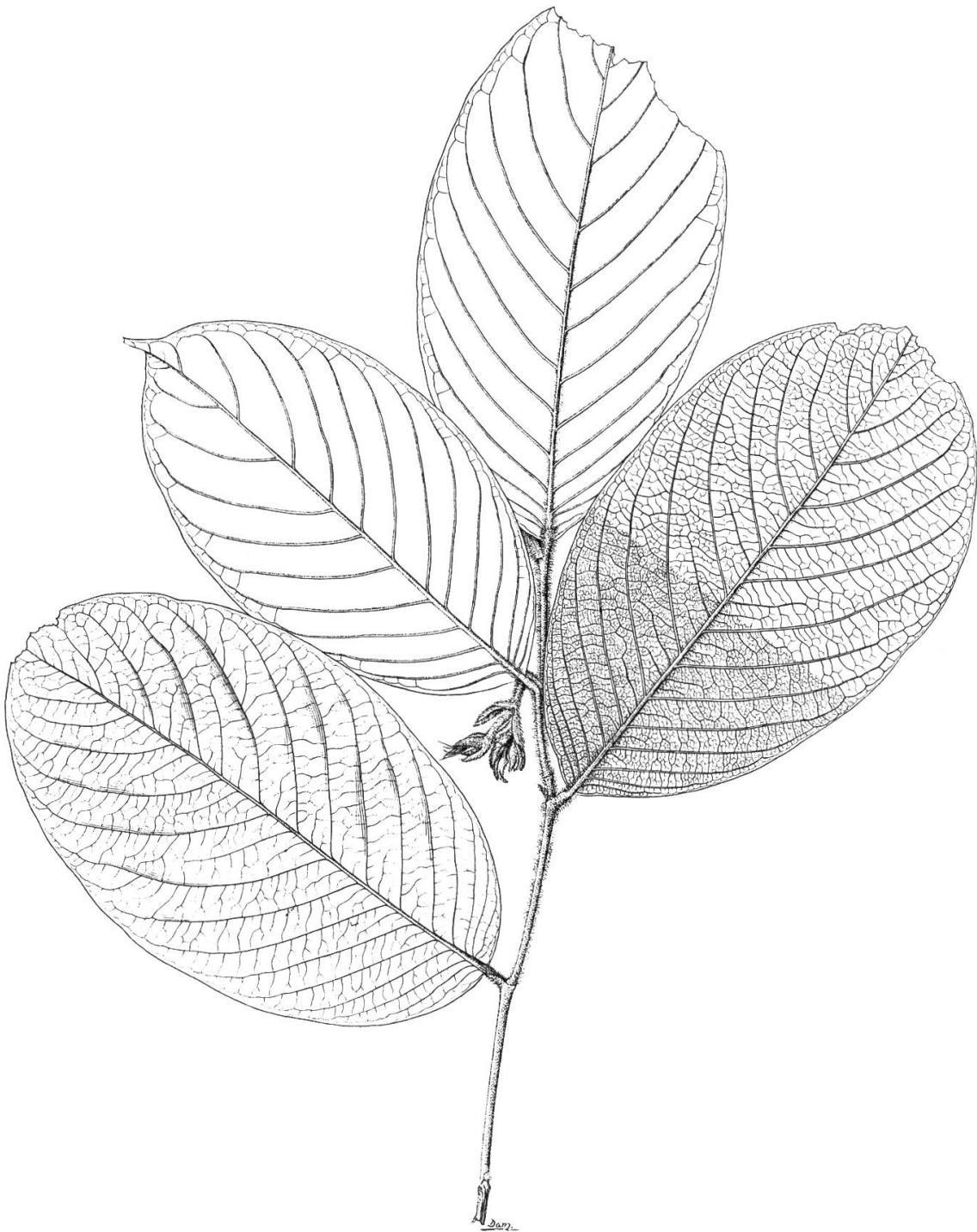


Fig. 5. — *Cyclandrophora latifolia* (Hend.) Prance, holotype

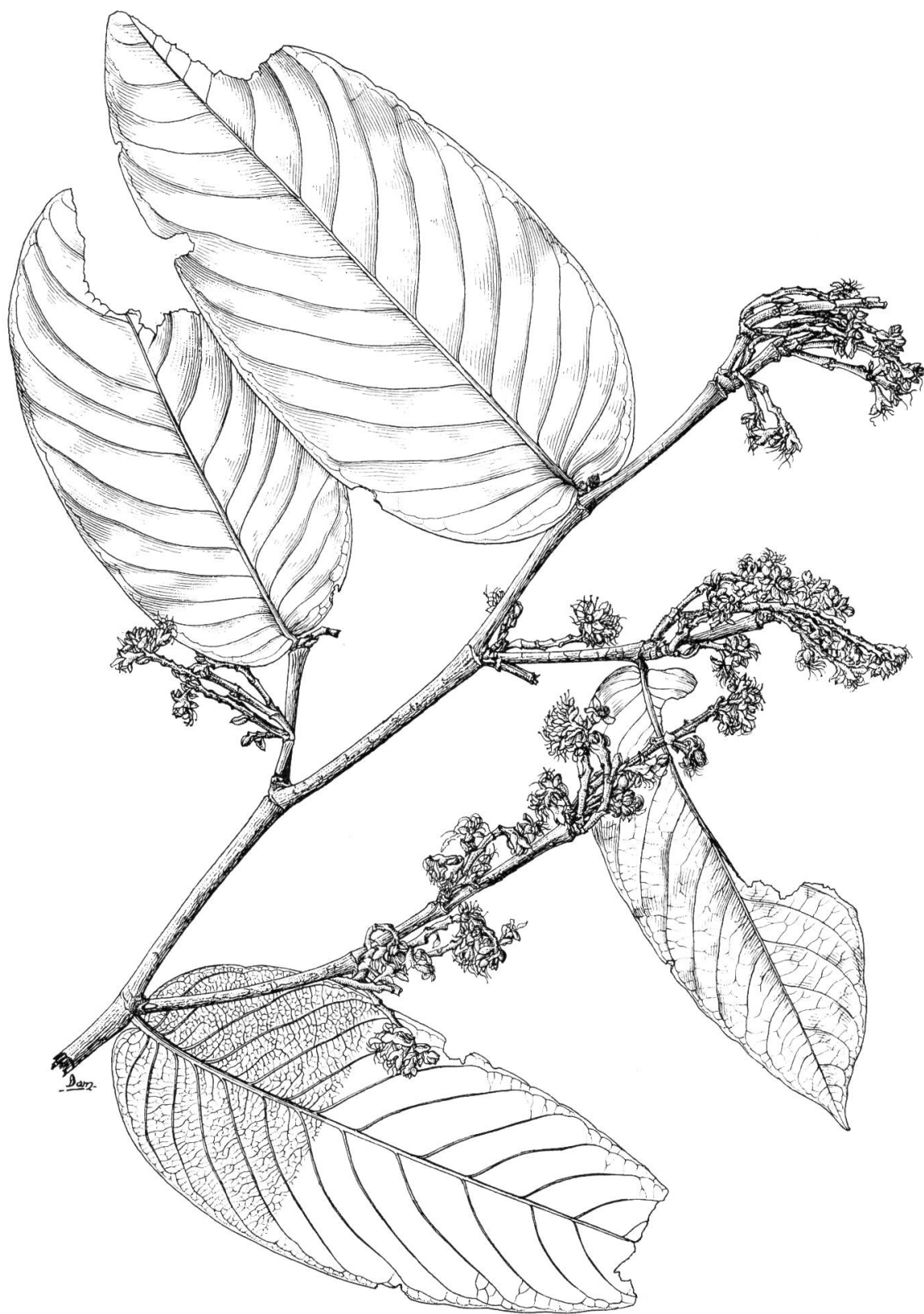


Fig. 6. — *Cyclandrophora elata* (King) Prance, isotype (SING)





Fig. 7. — *Cyclandrophora elata* (King) Prance



Fig. 8. — *Cyclandrophora nannodes* (Kosterm.) Kosterm. & Prance



Fig. 9. — *Cyclandrophora penangiana* Kosterm.

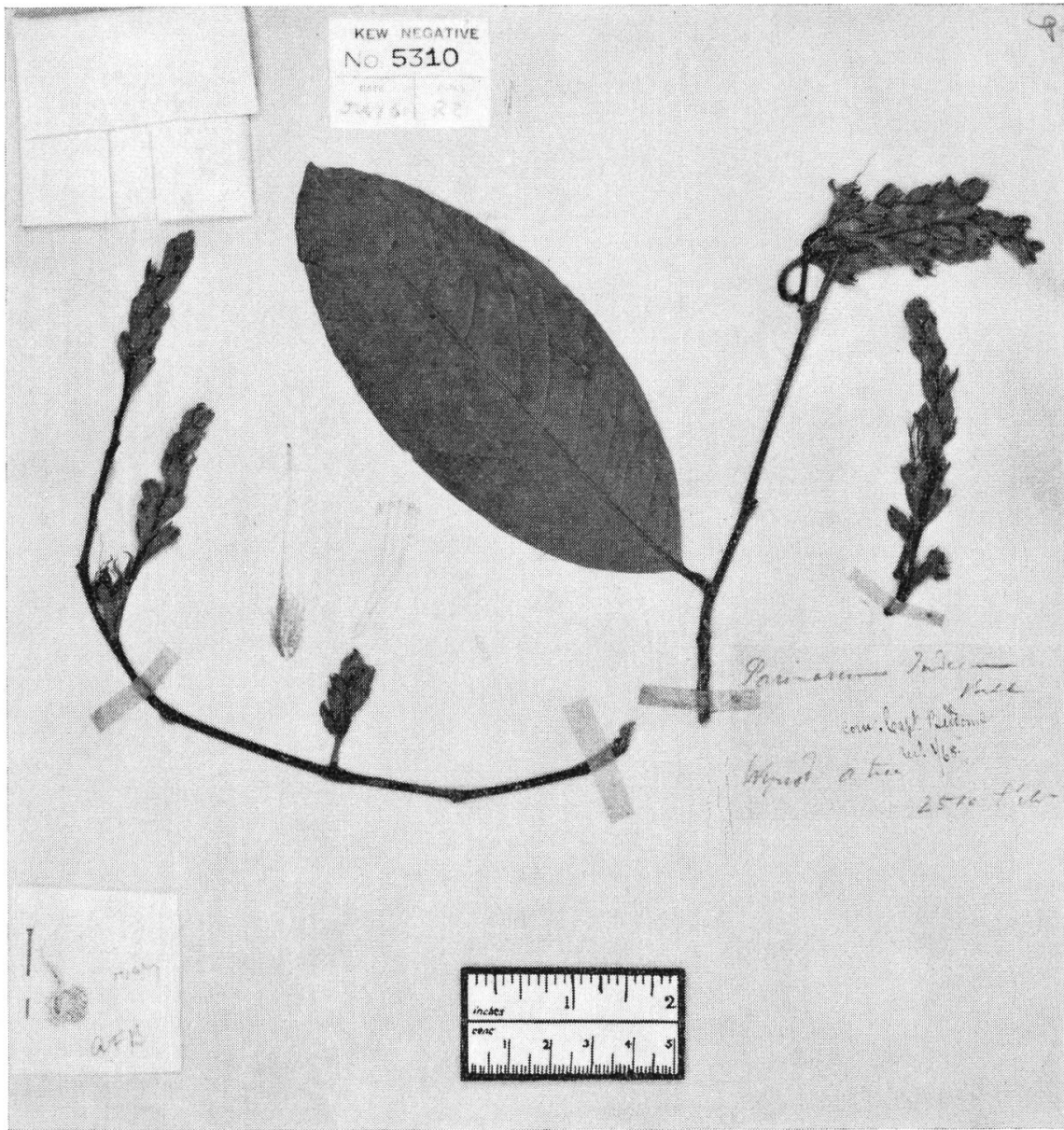


Fig. 10. — *Cyclandrophora indica* (Bedd.) Prance, holotype

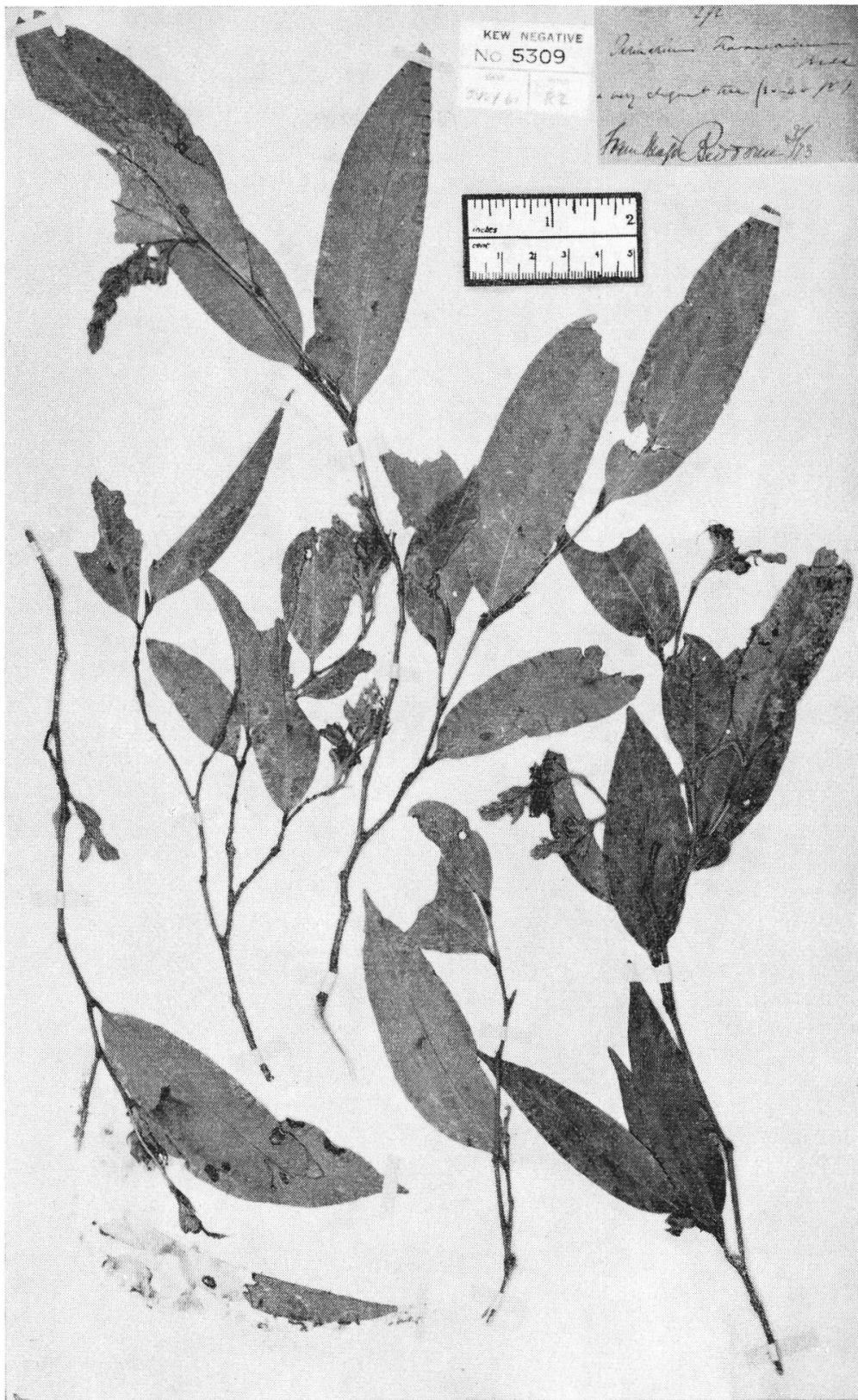


Fig. 11. — *Cyclandrophora travancorica* (Bedd.) Prance, holotype



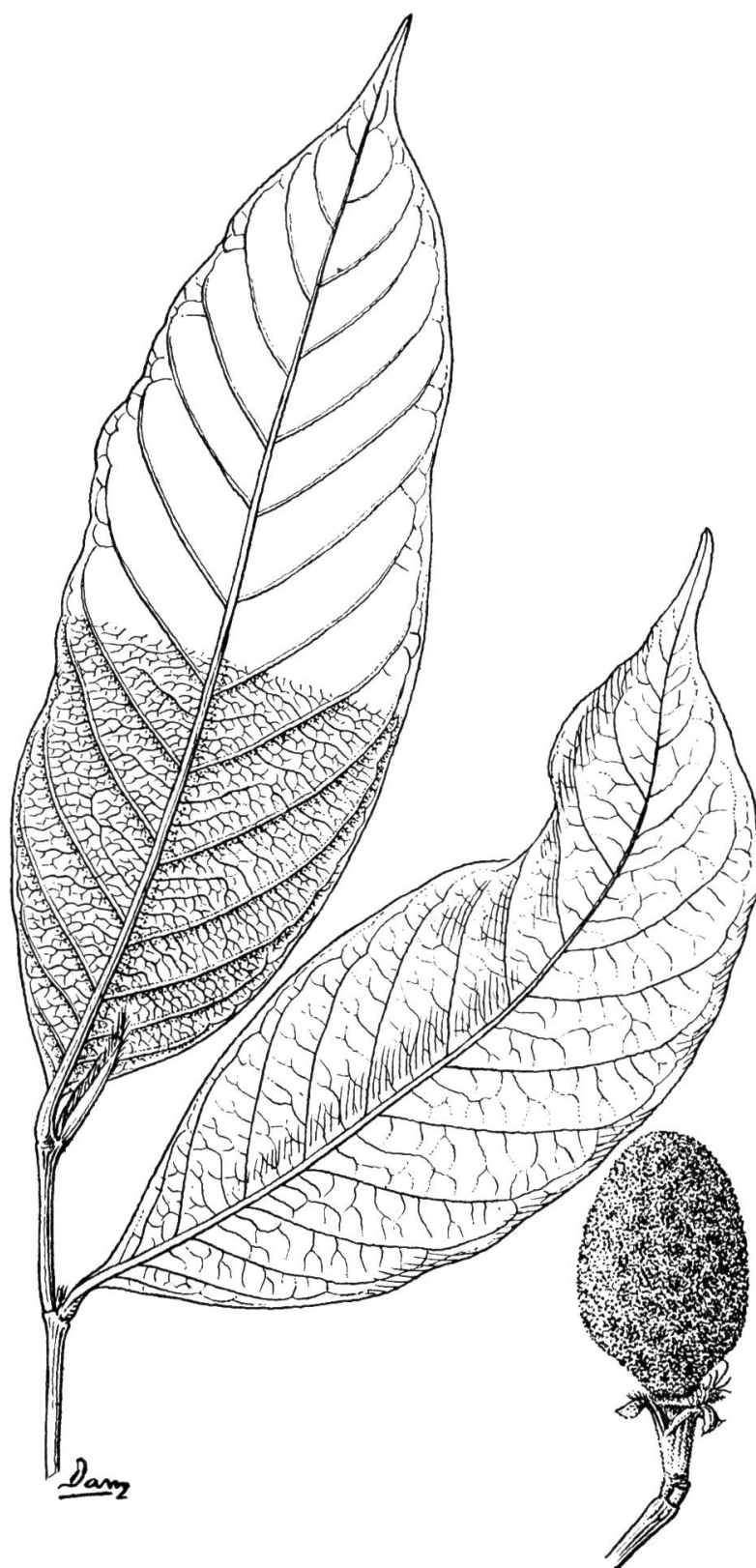


Fig. 12. — *Cyclandrophora villamilii* (Merr.) Prance, isotype



Fig. 13. — *Cyclandrophora scabra* (Hassk.) Kosterm., after spec. cult. IV H 14 (BO)



Fig. 14. — *Cyclandrophora excelsa* (Jack) Kosterm., after Schut K2 Borneo (BO)



Fig. 15. — *Cyclandrophora laurina* (A. Gray) Kosterm.



Fig. 16. — *Cyclandrophora laurina* (A. Gray) Kosterm., seedling