BLUMEA

Vol. IX, No. 1, blz. 1—273.

Uitgege[...]ksherbarium,
Publis[...]eiden, Nederland.

THE GENERA AECIDIUM, UREDO AND PUCCINIA OF PERSOON

by

IVAR JØRSTAD

(Norwegian Plant Protection Institute, Oslo)

Issued 1. VII. 1958

According to the International Code of Botanical Nomenclature, Art. 23, the nomenclature of the *Uredinales*, *Ustilaginales* and *Gasteromycetes* begins with Persoon's "Synopsis Methodica Fungorum", published in 1801. His descriptions, however, are partly not very explicit and as, according to the Code, Art. 69, rust names are valid solely in so far as they refer to "spores giving rise to basidia", *i.e.* the teleuto-stage, the present author found it desirable to examine Persoon's collection of rusts preserved in the Rijksherbarium, Leiden. Through the courtesy of Dr. R. A. Maas Geesteranus, Mycologist of the Rijksherbarium, all specimens of the genera *Aecidium*, *Uredo* and *Puccinia* were lent to the Botanical Museum of the University of Oslo, where the author got the opportunity of examining them. The collection contained 792 numbers, comprising 221 species of rusts, 19 species of smuts, and 14 species of other fungus groups. A complete list of determinations is filed in the Rijksherbarium. The main aim was to find suitable lectotypes for Persoon's taxa of 1801, among specimens containing teleuto. And owing to the type method now being established (Code, Art. 18) it seems natural to consider a *Uredo* name valid if the type contains teleuto, even if this stage has not been mentioned in the author's description of the species in question (cp. D. P. Rogers, Mycologia, 45 pp. 150—251, 1948, and D. B. O. Savile, Canadian Journ. Bot., 3 p. 490, 1955). This view makes Persoon's names *Uredo betae* and *U. viciae-fabae* valid.

However, most of the specimens had clearly been collected after 1801 and were consequently unsuitable as material for lectotypes. This younger material contains many species that are not mentioned in Syn. Meth. Fung. and consequently not treated in the present publication. For the taxa established by Persoon in 1801 have particularly been taken into consideration those specimens that in Persoon's handwriting are solely furnished with the same name (or sometimes with a somewhat differing one) as in Syn. Meth. Fung. and without author name, or sometimes with Persoon's own. Most of the other specimens of the same taxa are also labeled solely or partially by Persoon, but have not been taken into consideration as material for lectotypes because the names do not correspond with those in Syn. Meth. Fung., or are obviously younger than 1801 (e.g. if published by De Candolle, Link, or other contemporary authors). Many of these

specimens Persoon had received from other botanists, particularly Chaillet, Balbis, and Mougeot. Only one specimen presumably older than 1801 is mentioned as having been received from another person, viz. Smith (presumably J. E. Smith in England); it is labeled *Uredo linearis ft. Polypodii* and contains *Hyalopsora polypodii* (Diet.) Magn.

For several taxa in Persoon's herbarium (to a very great extent among the smuts) suitable type material was not found; among the smuts it was possible to select one type only, viz. for *Uredo Anemones* = *Urocystis anemones* (Pers.) Wint. Types have not been selected for varieties and for invalid species (thus for none of the taxa under *Aecidium),* but for valid species of *Uredo* and *Puccinia* in so far as suitable type material was present, viz. for 5 species of *Uredo* and 8 species of *Puccinia.*

Usually Persoon's specimens are not furnished with locality name and collecting date, and often the name of the host is not given. Many specimens are given the epithet "Doublett", but some of the so-called doublets are more representative than the main specimens; the latter are even sometimes lacking.

In the present text are, as a general rule, under each of Persoon's species and variety names, first mentioned those specimens that are considered to be older than 1801 and are corresponding with Persoon's names in Syn. Meth. Fung. Subsequently, beginning with a new text line, are mentioned the presumably younger specimens of the same taxa, or of other taxa in the herbarium furnished with the same name.

The number after the specific and varietal names of Persoon refer to the corresponding page in Syn. Meth. Fung. The numbers between brackets denote the herbarium numbers of the Rjjksherbarium under which the material is being preserved.

AECIDIUM.

1. AECIDIUM OOTCNUIUM (Syn. 205).

"Aecidium cornutum. Vosges" on *Sorbus aiicuparia* (910.256-1771); "Aecidium cornutum sur le Sorbier cultivé, misit Smith" on *Sorbus aucvparia* (910.255-243) — Gymnosporangium cornutum Arth., I.

"Aecidium cornutum var. in Amelanchier" (910.255-214); "Aecidium cornutum [Persoon's handwriting], Aecidium amelanchieri" (from Chaillet) (910.255-229) — Gymnosporangium amelanchieris E. Fisch., I.

"Aecidium cornutum" on *Mespilus germanica* (910.255-215); "Aecidium Mespili Decand., Aecidium Oxyacanthae?" (910.255-228); "Aecidium cornutum var." (910.250-1613) — Gymnosporangium confusum Plowr., I.

2. AECIDIUM CAXCELIATITM (Syn. 205).

"Aecidium cancellatum" on pear leaves (910.255-126, 910.255-217, 910.255-231) — Gymnosporangium fuseurn DC. (syn. *G. sabinae* Wint), I.

3. AECIDIUM OXYACANTHAE (Syn. 206).

"Aecidium Oxyacanthae Syn. Fung." on *Crataegus* (910.255-412) — (lymnosporangium clavariiforme (Pers.) DC, I.

"Aecidium laceratum Dec, Ae. Oxyacanthae P. Syn. fung." on *Cratae--fjus* (910.250-1545) — G. clavariiforme, I.

4. AECIDIUM RHAMNI (Syn. 205).

No suitable type material.

"Aecidium Rhamni, sur le Nerprum purgatif" [= *Khamnus catharticus]* (from Dclastre) (910.255-87)—Puccinia coronata Corda, I.

5. AEcroniM GAL.II (Syn. 207).

"Aecidium Galii" on *Galium uliginosum* (910.250-1593) — Puccinia punctata Link, I. — Persoon in Syn. Meth. Fung, gives the host as *Galium boreale,* but no accidial stage is known for this species.

6. AECIDIUM RUMICIS (Syn. 207).

"Aecidium Rumicis" on *Rumex aquatious* (910.255-338) and *Rumex* sp. (910.255-353) — Puccinia phragmitis (Schum.) Körn., I.

"Aecidium rubellum Gmel." on *Rumex* sp. (910.255-71) and *R. aquaticus* (910.255-85) — P. phragmitis, I.

6/3. AECIDIUM GROSSULARIAE (Syn. 207).

No suitable type material.

"Aecidium Grossulariae Decand." on *Ribes grossularia* (910.250-1577); "Aecidium Ribis alpini" (from Chaillet) on *R. alpinum* (910.255-72) — Puccinia caricina DC. (syn. P. *pringsheimiana* Kleb.), I.

7. AECIDIUM PRENAOTHIS (Syn. 208).

"Aecidium Prenanthis S. F. (Germania)" on *Lactuca muralis* (910.255-416) — Puccinia prenanthis Kunze, I, and P. opizii Bub., I. This number also contains P. dioicae Magn. (syn. P. *silvatica* Schroet.), I, on *Taraxacum.*

"Acid, prenanthis Syn. Fung." [Persoon's handwriting], "Aecidium hieracii Paludosi" (from Chaillet) on *Crepis paludosa* (910.255-384) — Puccinia major Diet., I.

8. AECIDIUM CRASSUM (Syn. 208).

"Aecidium crassum" on *Rhamnus frangula* (910.250-1627) — Puccinia coronata Corda.

The following specimens contain the same rust on the same host: "Aecidium Pomaceorum" (from Junghuhn) (910.255-402) and "Aecidium Rhamni" (910.255-73).

8/3. AECIDIUM PICABIAE (Syn. 208).

"Aecidium Ficariae" (910.250-1580, 910.250-1595) — Uromyces dactylidis Otth s. 1. (syn. *Urom. poae* Rabh.), I. The former number also contains *Viola* sp. with Puccinia violae DC, I.

9. AECIDIUM ASPKRIFOLJI (Syn. 209).

"Aecidium Asperifoliorum" probably on *Anchusa officinalis* (910.255-122). — Puccinia recondita Rob. (syn. P. *rubigo-vera* Wint., *P. dispersa* Eriks. & Henn.), I.

10. AECIDIUM TUSSILAGJNIS (Syn. 209).

"Aecidium Tussilaginis" (910.255-89, 910.255-407) — Puccinia poarum Niels. I. The former number also contains Coleosporium tussilaginis (Pers.) Lév., **II** + III.

"Aecidium tussilaginis. Hb. Junghuhn" (910.255-75) — P. poarum, I.

11. AECIDIUM BERBERIDIS (Syn. 209).

"Aecidium Berberidis" (910.255-106, 910.255-116, 910.255-119, 910.255-120) — Puccinia graminis Pers., I, in number 910.255-116 spermogonia only.

"Aecidium Berberidis y. elongatum" (from Chaillet) (910.255-121); "Aecidium Berberidis c. fructigenum" (from Chaillet 1821) (910.255-105) — P. graminis, I.

"Aecidium Berberidis *fi.* Campanulatum fl. fr." (from Chaillet) (910.255-104) — Puccinia arrhenatheri (Kleb.) Eriks., I.

12. AECIDIUM OROBI (Syn. 210).

"Aecidium Orobi" on *Lathyrus montanus* (910.255-398) — Uromyces fabae DeBary var. orobi (Schum.) J0rst. [= *JJrom. orobi* (DC.) L6v.], I. *(Urom. fabae* DeBary = Urom. viciae-fabae (Pel's.) Otth, see p. 10).

13. AECIDIUM RANUNCULI ACRIS (Syn. 210).

No suitable type material.

"Aecidium Ranunculi. Dedit DeC, Aecidium Ranunculacearum Dec," on *Ranunculus repens* (910.255-88) — Uromyces dactylidis Otth s. 1., I. This number also includes "Aecidium in Ranunculo montano", viz. the race Uromyces poae-alpinae Rytz of Urom. dactylidis s. 1.

14. AECIDIUM ALLJI URSINI (Syn. 210).

"Aecidium allii in allio ursino" [not Persoon's writing] (910.255-125^ — Puccinia sessilis Schneid., • I.

15a. AECIDIUM EUPHORBIAE (Syn. 211).

"Aecidium Euphorbiae" at least in part on *Euphorbia cyparissias* (910.250-1599) — As Persoon in Syn. Meth. Fung, gives *Euph. cyparissias* as the host of *Ae. Euphorbiae,* the present specimen must be considered belonging to Uromyces pisi (DC.) Otth s. 1. (cp. Hylander, J0rstad & Nannfeldt, Opera Bot. Soc. Bot. Lund., 1, **1 p. 93, 1953).** However, *Ae. euphorbiae* Pers. is commonly used as a collective name for indeterminable aecidial stages on species of *Euphorbia.*

"Aecidium Cyparissiae" (910.250-1586) — Uromyces pisi Otth

s. 1., I. — "Aecidium Euphorbiae. Hb. Junghuhn" (910.250-1583) and "Aecid. scutellatum" (910.255-351) are on *Euphorbia* spp. and may be placed under Ae. euphorbiae Pers. (coll.).

15b. AECIDIUM TRAGOPOGI (Syn. 211).

No suitable type material.

"Aecidium cichoracearum. Sub hoc nomine dedit Dec." on *Tragopogon* (910.255-239) — Puccinia hysterium (Str.) Röhl. (syn. P. *tragopogonis* Corda), I + III; "Puccinia Hyst. mixta cum Uredine candido et Aecidio Tragopogi (910.263-331) — P. hysterium, (I) + III, and Albugo tragopogi S. P. Gray; "UTedo Hysterium. Tragop. pratens." (from Strauss) (910.263-322) — P. hysterium, III.

16. AECIDIUM SII PALCARIAE (Syn. 212).

"Aecidium Sii Palcariae" (910.255-385) — Puccinia falcariae (Spreng.) Puck., I.

"Aecidium Palcariae. Hb. Junghuhn" (910.250-1597) — P. falcariae, I.

17. AECIDIUM ANEMOXES (Syn. 212).

"Aecidium Anemones (Anem. nemorosa)" (910.255-110) — Ochropsora ariae (Puck.) Syd., I.

"Aecidium punctatum" on *Anemone nemorosa* (910.255-405) — Ochropsora ariae, I.

18. AECIDIUM PUNCTATUM (Syn. 212).

No suitable type material.

"Aecidium quadrifidum" on *Anemone ranunculoides* (910.255-127) — Tranzschelia pruni-spinosae (Pers.) Diet., I; "Aecidium quadrifidum Decand. In Anem. hortensis" (910.255-433) — Tr. discolor (Puck.) Tranz. & Litv., I; "Sphaeria Anemones, Aecidium quadrifidum. Mai, no. 254. Pontery" (910.255-403) — Tr. discolor, I.

19. AECIDIUM PINI (Syn. 213).

"Aecidium Pini" (910.255-400, 910.255-429) — Cronartium flaccidum (Alb. & Schw.) Wint. s. 1. (includes also the non-alternating aecidial stage), I.

"Aecidium Pini var. Perid'. columnare" (910.255-142) — Cronart. flaccidum s. 1., I; "Aecidium Pini, feuille de pinus maritima" (910. 355-415) — Coleosporium tussilaginis (Pers.) Lév. s. 1., I; "Aecidium Pini Pers. in foliis Pini sylvestre" (from Mougeot) (910.255-409) — Coleosp. tussilaginis s. 1., I.

. UREDO.

1. UREDO MYOOPHILA (Syn. 214).

"Uredo mycophila", also labeled "Trichoderma mycophila Sweidnitz" and "Sepedonium mycophilum Link" (910.264-163); '"Uredo mycophila", also labeled "Mycobanche chrysosperma" and "Sepedonium chrysospermum"

(910.264-167); both on *Boletus* — Sepedonium chrysospermum Bull, ex Pr.

2a. UREDO OONFLUENS *a.* RIBIS ALPINI (Syn. 214).

"Uredo confluens" (910.264-389 pr.p.; 910.264-390) — Melampsora cf. ribesii-purpureae Kleb. (belonging to M. epitea Thiim.), I.

2/8. UREDO CONHLUENS /3. MERCURLALIS FERENNIS (Syn. 214).

"Uredo confluens" (910.264-386; 910.264-389 pr.p.) — Melampsora rostrupii Wagn. (belonging to M. populnea (Pers.) Karst.), I.

3. UREDO ALCHEMILLAE (Syn. 215).

No material present of Trachyspora intrusa (Grev.) Arth. on *Alchemilla "vulgaris"*, the primary uredo of which Persoon described.

"Uredo Alchemillae Pers. in fol. Rubi saxatilis" (from Kunze) (910.264-972) — Gymnoconia peckiana (Howe) Trott, I; "Uredo. In Alchemilla alpina" (from Balbis) (910.264-224) — Trachyspora melospora (Therry) Tranz., III.

4. UREDO EUPHORBIAE HELIOSOOPIAE (Syn. 215).

No suitable type material.

"Uredo" (host given as "Euph. dendroid.", but the label probably belongs to number 910.264-287, see below) on *Euphorbia helioscopia* and *Euph. falcata* (910.264-292); "Uredo. Euphorbia peplus" (910.264-293); "Uredo Euphorbiae var. in foliis Euphorbiae helioscopiae" (from Mougeot) (910.264-560). — All contain II of Melampsora euphorbiae (Schub.) Cast. (syn. *M. helioscopiae* Wint.) on *Euphorbia helioscopia.*

40. UREDO EUPHORBIAE EXIGUAE (Syn. 215).

"Uredo Euph. exiguae" (910.264-561, 910.264-562) — Melampsora euphorbiae (Schub.) Cast., II + III.

"Uredo punctata" (from DeCandolle) on *Euphorbia peplus* (910.264-198); "Uredo" on *Euph.* cf. *dendroides* (910.264-287); "Uredo Cyparissiae Euph." (from Balbis) on *Euph. cyparissias* (910.264-366, 910.264-367); "Uredo Euphorbiae" on *Euph. peplus* (910.264r-557). — All contain II of M. euphorbiae, the first-mentioned number also III.

5. UREDO ROSAE CENTIFOLIAE (Syn. 215).

No material with this label.

6. UREDO MINIATA (p. 216).

"Uredo miniata P." on *Rosa* sp. (910.264-159); "Uredo rosaeae. U. miniata" on *Rosa* sp. (cult.) (910.264-158) — Phragmidium mucronatum (Pers.) Schlecht, I + II.

"Uredo ornata" on *Rosa* sp. (910.264-49) — Phr. tuberculatum J. Miill., I; "Uredo Rosae var." on *Rosa* sp. (910.26-4-140) — Phr. mucronatum, 11+ (III).

Sec also *Puccinia mucronata,* p. 14.

6«. UKEDO EGLANEERIAE (Syn. 216).

No material with this label.

6j8. UREDO LINI (Syn. 216).

No suitable type material.

"Uredo" on *IAmim maritimum* (910.264-281) — Melampsora lini (Ehrenb.) Lév., II + III.

7a. UREDO LINEARIS *a.* ITOIMENTI (Syn. 216).

"Uredo linearis" on leaves possibly belonging to *Avena sativa* (910.263-319) — Puccinia coronata Corda, II + III (alsp trace of P. graminis Pers., Ill); "Uredo linearis Persi Syn. Fung." on similar leaves as in the foregoing (910.263-323) — P. cf. coronata II. No. 910.263-319 seems valid, but *P. linearis* Rohl. (= *P. graminis* Pers.) saves the name *P. coronata.*

"Uredo linearis" (from Mougeot) on leaves probably of *Avena sativa* (910.263-320) — P. cf. coronata, II; "Uredo linearis Pers." (from Mougeot) on *Phalaris aruvdinacea* (910.263-318) — Ustilago echinata Schroet.; "Uredo linearis?" on gramineous leaves (910.264-187) — P. striiformis West. (syn. *P. glumarum* Eriks. & Henn.), II, and P. cf. coronata, II.

7)8. UREDO POLYPODII (Syn. 217).

"Uredo Polyp, frag." (from Smith, but Persoon's handwriting) (910.264-117) — Hyalopsora polypodii (Diet.) Magn., II.

"Uredo Polypodii mihi, in foliis Polypodii Dryopteridis" (from Mougeot, not Persoon's handwriting) (910.264-113, 910.264-115) — Hyalopsora aspidiotus (Magn.) Magn., II.

8. UREDO CAMPANULAE (Syn. 217).

"Uredo Campanulae Syn. fung." on *Campanula trachelium* (910.263-186, 910.263-189) — Coleosporium campanulae Lév. (belonging to Col. tussilaginis (Pers.) Lév. s. 1.), II.

"Uredo campanulae var., in foliis Ranunculacearum" (from Mougeot) (910.263-185); "an Uredo campan.?" (from Balbis) (910.263-178) — Col. campanulae, II, in the first-mentioned number also III, both on *Campanula trachelium.*

9. UREDO SONCHI ARVENBBS (Syn. 217).

No material on *Sonchus arvensis* which Persoon gives as the host.

"Uredo sonchi" on *Sonchus oUraceus* and *palustris* (910.264^66) and on *Sonchus palustris* (910.264-70) — Coleosporium sonchi (Str.) Lév. (belonging to Col. tussilaginis (Pers.) Lév. s. 1.), II + III.

10a. UREDO FARINOSA a. UREDO CAPKEAE (Syn. 217).

"Uredo capreae" on *SaUx caprea* (910.263-154) — an Melampsora capraearum Thiim. (syn. *M. larici-capraearum* Kleb.), II.

"Uredo" on *Salix caprea* (910.264-47) — M. capraearum, II + HI; "Uredo capraearum" (from DcCandolle) (910.263-158); "Uredo populina var. in fol. Pop. albo" (from Balbis) (910.264^102, 910.264-107

pr.p.); "Uredo" (910.264-299) — an M. caprаearum, II, on *Salix caprea.*

"Uredo Salicis capraeae" on *Salix nigricans* (910.264-94, 910.264r-99); "Uredo Salicis. In Salice serpyllifolii" (from Balbis) (910.264-87); "Uredo" on *Salix purpurea* (910.264r-217) — Melampsora epitea Thiim., II.

10)8. UREDO SENBCTONIS (Syn. 218).

"Uredo senccionis" on *Senecio sylvaticus* (910.264-64, 910.264-71) — Coleosporium senecionis Tul. ex Kickx (belonging to Col. tussilaginis (Pers.) L6v. s. 1.), II + III.

11. UREDO BUBI FROTIOOSI (Syn. 218).

No suitable type material.

"Uredo in rubo fruticosa" (from Balbis) (910.264-232) — Kuehneola uredinis (Link) Arth., II, and Phragmidium violaceum (C. P. Schultz) Wint., 11 + III; "Uredo?" (910.264-277) — Phr. bulbosum (Str.) Schlecht. (syn. *Phr. rubi* (Pers.) Wint.), II.

See also *Puccinia mucronata* /?. *Puccinia Rubi,* p. 15.

12. UREDO BUBI IDAEI (Syn. 218).

No suitable type material.

"Uredo gyrosa Rebent., Montagne, Ardennes, mis. Lfcveillé" (911.143-21); "Uredo gyrosa Rebent., Ardennes, mis. Dr. Montagne" (911.143-22); "Aeeidium columellatum Schum., Aec. gyrosum" (910.255-24); U. gyrosa Rebent., Uredo Rubi Idaei Syn. fung." (910.263-342); "Uredo Rubi Idaei, U. gyrosa Rebent. (910.264-142); "Uredo" (910.264-225) — Phragmidium rubi-idaei (DC.) Karst., I, on *Rubns idaeus.*

See also *Puccinia mucronata p. Puccinia Rubi,* p. 15.

13. UREDO TUSSELAOINIS (p. 218).

"Uredo Tussilaginis" (910.264r-17; 910.264r-18, *lectotype)* — Coleosporium tussilaginis (Pers.) Lfrv., II + III. The teleuto-stage is abundant and clearly indicated in Persoon's description "unctis subconcentricis miniato-rubris".

"Uredo Tussilaginis Syn., Caeoma compransor Schlecht. — Link" (910.264-19) — Col. tussilaginis, II + III.

14. UREDO POFULTNA (Syn. 219).

"Uredo populina P. Syn. fung., prope Parisios" on *Popxdus balsamifera* (910.264-112) — Melampsora larici-populina Kleb., 11 +III, The teleuto-stage is not mentioned in Persoon's description, but even if recognized as instrumental in making his name valid, *Mel. populina* is already occupied, because *Mel. populina* ("Pers.") Lév., Ann. Sci. Nat., Bot., 8 p. 375, 1847, is based upon *Sclerotium populneum* Pers. (= *Mel. populnea* (Pers.) Karst.) on *Populus tremula,* although Léveillé changed "populnea" to "populina".

"Uredo populnea" (910.264-116); "Uredo populina, U. cylindrica Dec." (910.264-120, 910.264-121); "Uredo longicapsula Decand." (910.264-171)

— Mel. larici-populina Kleb., II, in the last-mentioned number also III, all on *Populus balsamifera.*

"Uredo. Populi fastigiatae prope Parisios" (910.263-1158); 911.143-16); "Uredo" (910.264r-282 pr. p.) — Mel. larici-populina, II,' in the first-mentioned number also a little III, all on *Populus nigra.*

140. UREDO BETUUNA (Syn. 219).

"Uredo betulina" on *Betula verrucosa* (910.264^730, 910.264r-796, 910.264^797, 910.264r-798) — Melampsoridiurn betulinum (Ft.) Kleb., II, in 910.264-797 also III.

"Uredo betulina var." on *B. verrucosa* (910.264-107 pr.p.); "Uredo" on *B. verrucosa* (910.264-282 pr. p.); "Uredo Betulae" on *B. nana* (from Balbis) (910.264-751, 910.264-789) — M. betulinum, II, in 910.264-282 also III.

15a. UREDO FUSTULATA *a.* EpiuoBn (Syn. 219).

"Uredo pustulata" on *Epilobium* sp. (910.264-190; 910.264-191, the latter number also labeled "Uredo epilobiae") — Pucciniastrum epilobii Otth, II.

15j8. UREDO CERAOTII (Syn. 219).

No material present.

16. UREDO MENTOAE (Syn. 220).

"Uredo Menthae Link" on *Mentha sylvestris* (910.264^-184) — Puccinia menthae Pers., II + III.

"Uredo Labiatarum £. Melissophylli fl. fr." (from Chaillet) (910.263-317); "Uredo Menthae Pers.?" on *Mentha* (pr.p. *M. aquatica)* (from Delastre) (910.264r-162); "Uredo menthae Pers. in Thymo acino" (from Kunze) (910.264-179); "Uredo. Clinop. vulgare" (910.264^-221); "Caeoma Calaminthae, in foliis Cl. Nepetae" (from Nees) (910.264-775) — P. menthae, II.

"Uredo Menthae Syn. fung., U. Labiatarum v. Mentharum Decand." on *Mentha* sp. (910.264^168, 910.264r-169); "Uredo Calaminthae" (from Strauss) (910.264-168, 910.264^169) — P. menthae, II + III.

See also *Puccinia menthae,* p. 13.

17. UREDO SCUTELLCATA (Syn. 220).

"Uredo scutellata" on *Euphorbia cyparissias* (910.264-77, *lectotype)* Uromyces scutellatus (Pers.) Lév., III.

"Uredo excavata *fi.* in Euphorbia oleaefolia" (from DeCandolle) (910.264-553 pr.p., 910.264-55) — Urom. scutellatus, III; "Uredo scutellata" on *Medicago sativa* (from Smith) (910.264^68, 910.264-80) — Urom. striatus Schroet., III.

18. UREDO BETAE (Syn. 220).

"Uredo Betae" (910.264-729; 910.264-741, *Uctotype)* — Uromyces betae (Pers.) Tul., II + III. In 910.264-741 a beet leaf with plenty of uredosori, and a few teleutosori not easily seen, in 910.264-729 a beet leaf with uredosori only.

18)8. UKEDO CONVOLVULI (Syn. 221).

"Urcdo Convolvuli" on *Polygonum convolvulus* (910.264-385, 910.264-388) — Puecinia polygoni-amphibii Pers. var. convolvuli Arth, II. In Syn. Meth. Fung. Persoon gives the host as *Convolvulus arvensis,* but this apparently is an error for *Polyg. convolvulus.*

"Uredo Polygonorum Decand." (910.264^-124); "Uredo polygonorum D." (from Mougeot) (910.264-l?5); "Uredo polygonorum" (910.264-130) — P. polygoni-amphibii var. convolvuli, II, in the first-mentioned number also III, all on *Polyg. convolvulus.*

19. UKEDO SUAVEOLENS (Syn. 221).

"Uredo suaveolens" (910.264-23, 910.264-32) — Puecinia punctiformis (Str.) Röhl. (syn. *P. obtegens* Tul., *P. suaveolens* Rostr.), 0 + primary II.

"Uredo suaveolens. In fol. Serratulae off." (910.264-35); "Uredo Serratulae arvensi" (910.264r-78); "Uredo punctiformis. Cnic. arvens." (from Strauss) (910.264-188 pr.p., 910.264^199 pr.p.) — P. punctiformis, 0 + primary II, in 910.264-199 also secondary II + HI., all on *Cirsium arvense.*

20. UREDO VICIAE PABAE (Syn. 221).

"Uredo Pabae Syn. Fung." on *Vicia faba* (910.264-550, *lectotype;* 910.264-551) — Uromyces viciae-fabae (Pers.) Otth (syn. *Vrom. fabae* DcBary), II, in the first-mentioned number also III.

"Puecinia" on *Vicia* sp. (from Mougeot) (910.263-160): "Uredo Orobi *p.* Decand. in Orobo verno" (910.264-146); "Uredo Orobi nigri (from Chaillet) (910.264r-150); "Uredo Orobi 0. verni" (from Chaillet) (910.264-154, 910.264-155); "Uredo in Vicia bithynica" (from DeCandolle) on *Vicia* spp. (910.264-222, 910.264-234); "Uredo Fabae Decand." on *Vicia faba* (910.264-543, 910.264-547) — Urom. viciae-fabae, 11 + III (in 910.264-146, 910.264-222 and 910.264^-543 II only, in 910.263-160 III only).

21a. UTCEDO APPENDICIILATA a. UREDO PHASEOLT (Syn. 222).

"UTcdo appendiculata 0. Phaseoli" (910.264-957; 910.264-981, *lectotype*) — Uromyces appendiculatus (Pers.) Ung., II + III.

21y. UREDO GENISTAS TJNCTORIAE (Syn. 222).

No suitable type material.

"Uredo Lathyri" on *Lathyrus* sp. (910.263-316); "Uredo Pisi *B.* Lathyri in L. pratensis" [really on *Pisum sativum]* (from Nees) (911.143-14) — Uromyces pisi (DC.) Otth, III in the former number, II + III in the latter.

21y. UREDO GENIHTAE TINCTORIAE (Syn. 222).

"Uredo Genistae" on *Genista tinctoria* (910.264-531, 910.264r-536) -- Uromyceslaburni (DC.) Otth (syn. *Urom. genistae-tinctoriae* (Pers.) Wint., II + III.

"UTedo Cytisi, in Cytiso Laburni" (from Balbis) (910.264-565, 910.264-576) — Urom. laburni, III.

22. UREDO BUIXATA (Syn. 222).

"Uredo bullata", apparently on *Conium maculatum,* on old stem (910.264-795) — Puccinia conii Puck., III.

"Puccinia?, Uredo Bullata, Bullaria Bullata Decand. E Gallia prope Pontery, in Conio maculato" (910.263-1166); "Uredo bullata P. Syn. fung., Bullaria umbelliferarum Dec., Puccinia Bullaria Link. Prope Parisios (S. Germain)" (910.263-1168); "Uredo bullata P., Bullaria Umbelliferarum Dec. Ex Germania" (910.263-1169) — P. conii, III, on old stems apparently all belonging to *Conium maculatum.*

"Uredo Conii" (from Strauss), on leaf (910.264^-383) — P. Conii, II.

Conium maculatum must, be considered the type host of *Uredo bullata* Pers., but *Puccinia bullata* Link 1816 is a different species (cp. Hylander, J0rstad & Nannfeldt, Opera Bot. Soc. Bot. Lund., 1, 1 p. 36, 1953).

23. UREDO DIANTHI (Syn. 222).

No material labeled "Uredo Dianthi" or belonging to *Puccinia dianthi* Niessl.

24. UREDO ANEMONES (Syn. 223).

"Uredo Anemones" on *Anemone nemorosa* (910.264-934 pr. p.; 910.264r-944, *lectotype)* — Urocystis anemones (Pers.) Wint.

25a. UREDO CANDIDA <X UREDO THLASPEOS (Syn. 223).

No material with this label.

"Uredo Candida, auf Raphanus Raphanistr., Berl. 17" (910.263-155, 910.263-176); "Uredo Candida, Arabis alpina" on *Capsella bursa-pastoris* (910.263-177); "Uredo Candida. Sinapis arvensis" (910.263-184, 910.263-188); "338. Cochlearia armoracea" (910.264^204; "Uredo. Thlaspeos Bursae pastoris" (910.264-213); "Uredo cruciferarum" on *Cardamine* sp. (from DeCandolle) (910.264-384); "Uredo alpina, Uredo. Candida" on *Arabis* sp. (910.264r-933); "Uredo armoraciae" on *Armoracia rusticana* (910.264-938, 910.264-948) — Albugo cruciferarum S. F. Gray (syn. *Cystopus candidus* (Pers. ex Chev.) L6v.).

See also below, under y. *Uredo Alyssi* and *Uredo Cheiranthi.*

25p. UREDO TRAGOPOGI (Syn. 223).

"Uredo Candida var. Tragopogi" (910.263-156, 910.263-157) — Albugo tragopogi S. F. Gray (syn. *Cystopus cubicus* (Str. ex Ung.) L6v.).

"Uredo Psylli" (910.263-144, 910.264-197); "Uredo Candida. In allii", on *Tragopogon* (910.263-187); "Uredo Candida" on *Tragopogon* (910.263-331 pr. p.; 910.264-991 pr. p.); "Uredo. In Scorzonera hispanica" (from Balbis) (910.264-211, 910.264-300); "Uredo valerianae" (910.264-264); "Uredo pulvere albo in Matricaria" (910.264-280, 910.264-290); "Uredo cubica Str. in fol. Scorzonerae" (from Nees) (910.264-375); "Uredo alba Pers." (910.26+-939) — Albugo tragopogi, all on compositous hosts.

25y. UREDO ALYSSI (Syn. 223).

"Uredo Candida v. Alyssi" (910.263-159, 910.264-164) — Albugo <* rue if era rum S. F. Gray.

26. UREDO CHEIRANTHI (Syn. 224).

"Uredo lactea S. Cheiranthi incani. Aecidium candidum Cheiranthi" (910.263-325) — Albugo cruciferarum S. F. Gray.

21<x. UREDO SEGETUM a. UREDO HORDEI (Syn. 224).

No suitable type material.

"Uredo Ustilago y. Hordei" on barley (910.264-12 pr.p.) — Ustilago segetum (Pers.) Ditm. (syn. *V. hordei* (Pers.) Lagh.).

27)8. UREDO TRJTCCI (Syn. 224).

No material present.

27y. UREDO AVENAE (Syn. 224).

No suitable type material.

"Uredo Ustilago y. Hordei" on oats (910.264-12 pr.p.) — Ustilago segetum (Pers.) Ditm. (syn. *U. levis* (Kell. & Sw.) Magn.).

278. UREDO PANICS MILIACEI (Syn. 224).

No material present.

27E. UREDO DECIPIENS (Syn. 225).

No material present.

28. UREDO CARICIS (Syn. 225).

No suitable type material.

"Uredo segetum var. caricis. DC. in Herb. Pers." (910.264r-268) — Cintractia carieis (Pers.) Magn.'s. 1.; two host specimens, the one apparently *Carex panicea* and the other *Carex fusca.*

"An Uredo Caricis" (from Balbis) on wheat (910.263-146, 910.263-151) — Puccinia graminis Pers., Ill; in the former number also Phyllachora graminis (Pers. ex Fr.) Fuck, on a grass leaf, in the latter number also Schizonella melanogramma (DC.) Schroet. on *Carex digitata,*

29. UREDO TRAGOPOGI PRATENSB (Syn. 225).

No suitable type material.

"Uredo receptaculorum Dec, Uredo Tragopogi P. Syn." (910.264-55, 910.264-180); Ustilago Uredo receptaculorum Decand., U. Tragopogi pratensis Syn. fung. p. 225" (910.264^172) — Ustilago tragopogi-pratensis (Pers.) Rouss.

30. UREDO VIOLJVCEA (Syn. 225).

No suitable type material.

"Uredo violacea Syn. fung., Ur. antherarum Dec." on *Stellaria* sp. (910.264-4); "Uredo violacea! Pers. Syn.?, Uredo antherarum Dec; *A.* Lychnidis dioicae. *B.* Dianthi Carthusianorum. *C.* Silenes nutantis" (from Delastre) (910.264-5); "Uredo violacea in Lychnide dioica" (910.264-34, 910.264-258) — Ustilago violacea (Pers.) Rouss.

PUCCINIA.

1. PUOCINIA ANEMONES (Syn. 226).

"Puccinia Anemones nemorosae. Ex alpinis" (910.264-943, *lectotype)*; "Puccinia anemones (Urcdo)" (910.264-954) — Tranzschelia anemones (Pers.) Nanni

"Puccinia anemones Pers. syn. Stirp. Crypt, voges. rhenan. fasc. 11, no. 191" (from Mougcot) (910.263-449) — Tr. anemones.

2. PUCCINIA PRUNI SPINOSAE (Syn. 226).

No suitable type material.

"Puccinia Pruni" (910.263-33, 910.263-35); "Puccinia Pruni" (from Decandolle) (910.264-98); "Puccinia Pruni" (from Balbis) (910.264-192); "Puccinia Pruni (Uredo)" (910.264-200) — Tranzschelia pruni-spinosae (Pers.) Diet, II + III (in the two first-mentioned numbers III only); all on plum leaves.

"Uredo Prunastri" on *Prunus spinosa* (from Chaillet) (910.264-97) — Tr. pruni-spinosae, II.

3. PUCCIXIA MENTHAE (Syn. 227).

"Puccinia menthae" (910.264^-170, *lectotype)* — Puccinia menthae Pers., II + III. On one large leaf, 11,5 X 5,5 cm, not reminding of *Mentha aquatica,* which in Syn. Meth. Fung, is given as the host. Teleutospores finely punctate.

"Puccinia menthae. Env. de Paris" (from Léveillé) on *Mentha* sp. (910.263-1049); "Puccinia Clinopodii Cand.?" (from Chaillet) (910.264-392) — P. *menthae,* in the former number III only, in the latter II + III.

See also *Uredo Menthae,* p. 9.

4. PUOCINTA VALANTIAE (Syn. 227).

"Puccinia valantiae" (910.264-1, *lectotype);* "Puccinia (Uredo) Valantiae" (910.263-49) — Puccinia celakovskyana Bub., II + III. Both specimens are on *Galium cruciata. — P. celakovskyana* must be considered synonymous with *P. valantiae* Pers. Of the microform at present passing as *P. valantiae* Pers., Persoon's herbarium does not contaii any material. See also below, p. 18.

P. *celakovskyana* is closely allied to P. *punctata* Link, the diploid phase of which is represented by the following specimens: "P. galiorum Link [Persoon's handwriting], Puccinia Gallii sylvatici" (from Chaillet), II + III (910.263-465); "Puccinia gallii, sur le gallium palustre" (from Delastre), HI (910.263-474); "P. galiorum Link [Persoon's hand], Puccinia Gallii Molluginis" (from Chaillet), III (910.26&-475); "Puce, gal-Horum Link [Persoon's hand] (from Chaillet), (II) + III (910.263-477); "Puccinia difformis, (Salii sylvestr. Germania" (from Kunze), II + III (910.263-1038); "Urcdo gallii, sur gallet de Marais" [= G. *palustre]* (from Delastre), II (910.264-532).

Sec also *Aecidiwm GaUi,* p. 3.

5. PUOCINIA POLYGONI AMPHIBII (Syn. 227).

"Puccinia Polygoni amphibii. Uredo Polygoni" (910.264-114, *lectotype;* 910.264-133) — Puccinia polygoni-amphibii Pers., II + III. The epithet "Puccinia Polygonii amphibii" clearly belongs to 910.264-114, but has by some error been glued on 910.264-123, which contains Puce, gentianae; 910.264-114 is now labeled "Uredo Polygoni", as also 910.264-133.

"Puccinia Persicariae" (from Chaillet) (910.263-22); "Uredo" (910. 264-39) — P. polygoni-amphibii, in the former number III, in the latter II + III.

6. PUOCINIA POLYGONI AVICULARIAE (Syn. 227).

"Puccinia Polygoni avicularíae" (910.263-25, *lectotype;* 910.264-129) — Uromyces polygoni-avicularíae (Pers.) Karst., II, in 910.263-25 also HI.

"Uredo polygonorum" on *Polygonum avicidare* (910.264-128) — Urom; polygoni-avicularíae, 11 + III.

7. PUOCINIA CIBCAKAE (Syn. 228).

"Puccinia Circaeae" on *Circaea intermedia* (910.264^-394; 910.264-397, *lectotype)* — Puccinia circaeae Pers. Both collections also contain Pucciniastrum circaeae (Wint.) Speg., II.

8. PUCCINIA GRAMENIS (Syn. 228).

"Puccinia graminis" on gramineous culms (910.263-497; 910.263-499, *lectotype)* — Puccinia graminis Pers., III.

"An Uredo Caricis" (from Balbis), on wheat (910.263-146 pr.p.; 910.263-151 pr.p.); "Puccinia graminis Pers." (from Mougeot), on culms (910.263-480 pr.p.); "Puccinia graminis" (from Mougeot), on culm (910. 263-492) — P. graminis, III.

9. PUOCINIA JUNIPERI (Syn. 228).

"Puccinia Juniperi", probably on *Juniperus sabina* (910.263-221) — Gymnosporangium fuscum DC. (syn. *6. sabinae* Wint.), III. The younger name *G. juniperi* Link refers to another species.

Puccinia Juniperi Syn. fung., Gymnosporangium conicum Hedw. fil." (910.263-1041); "Podisoma Juniperi Link, Puccinia Juniperi Syn. fung." (910.263-218) — Oymnosp. clavariiforme (Pers.) DC.

10. PUCCINIA POTENTILLAE (Syn. 229).

Apparently no type material preserved.

"Uredo Potentillarum var. Decand." on *Potentilla* sp., II (910.264-101); 910.264-103 pr.p.); "Sphaeria potentillae" (from Chaillet) on *Potentilla argentea,* III (910.264-108); "Puccinia Potentillae" on *Potentilla* sp. (not *P. argentea),* II + III (910.264^-109); "Uredo Potentillae in Pot. verna", I or II (910.264-111) — Phragmidium potentillae (Pers.) Karst.

lla. PUCCINIA MUGROXATA a. PUCCINIA ROSAE (Syn. 230).

"Puccinia mucronata *a.* Rosae" (910.26^-17, *lectotype);* "Puccinia mucronata 0. Rosac" (910.263-23); both on *Rosa* sp. (cult.) — Phragmidium mucronatum (Pers.) Schleeht., II + III.

"Puccinia (Uredo) rosae" on a small-leaved rose (910.263-29); "Puccinia Rosae Decand., in foliis Rosarum in hortis" (from Mougeot) (910. 263-31); "Uredo" on *Rosa* sp. (cult.) (910.264^295) — Phr. mucronatum, II + III.

"Puccinia Rosae" on "R. rubiginosu" and "Rosa alpina" (910.264-50), the former with Phr. tuberculatum J. Müll., Ill, and the latter with- Phr. fusiforme Schroet., II + III.

See also *Uredo mimata,* p. 6.

11β. PUCCINIA RUBI (Syn. 230).

"Puccinia mucronata var. Rubi" on *Rubus "fruticosus"* (910.263-24) — Phragmidium bulbosum (Str.) Schlecht. (syn. *Phr. rubi* (Pers.) Wint.), Ill; "Puccinia mucronata 0. Rubi" on *Rubus idaeus* (910.263-20) •— Phr. rubi-idaei (DC.) Karst., III. This corresponds to the text in Syn. Meth. Fung, for this rust: "Autumno in foliis *Rubi fruticosi* praesertim, rarius et *Rubi Idaei* invenitur".

"Puccinia mucronata" (910.263-12, 910.263-28) —Phr. bulbosum, Hi on *Rubus* sp., Phr. violaceum (Schultz) Wint., Ill, on *Rubus* sp., and Phr. rubi-idaei, III, on *Rubus idaeus*; "Puccinia mucronata. In Rubo fruticoso" (910.263-26) — Phr. bulbosum (II) + III, and Phr. violaceum, III, each on a different species of the *R. fruticosus* group; "Puccinia mucronata in Rubo Idaeo" (910.263-27) — Phr. rubi-idaei, III; "Puccinia in rubo cacsio" (910.263-120) — Phr. bulbosum, 11 +III; "Puccinia rubi in rubo idaeo" (from DeCandolle) on *Rubus "fruticosus"* (910.264-134) — Phr. violaceum, III; "(Uredo) Puccinia rubi" on *R. "fruticosus"* (910.264^144) — Phr. violaceum, II + III.

Sec also *Uredo Rubi fruticosi* and *U. Rubi Idaei,* p. 8.

REVIEW OP PERSOON'S SPECIES AND VARIETIES.

The numbers given below of Persoon's taxa are those in Synopsis Methodica Fungorum. The lectotype numbers refer to the herbarium numbers of the Rijksherbarium.

AECIDIUM.

None of the names are valid, as the likely type material, when present, consists of the aecidial stage only„ what apparently is the case also where likely type material is lacking.

UREDO.

For the purpose of the present treatise the species and varieties may he divided up as follows:

A. Taxa the names of which start with Fries, Systema Mycologicum.

1. Uredo mycophila =. Sepedonium chrysospermum Bull, ex Fr.

25. U. Candida *a.* Thlaspeos and y. Alyssi = Albugo cruciferarum S. F. Gray; *ft.* Tragopogi = A. tragopogi S. F. Gray.

26. U. Cheiranthi = A. cruciferarum S. F. Gray.

B. Bust taxa represented by caeoma, suitable type material lacking.

5. U. Rosae eentif olia, considered = Phragmidium mucronatum (Pers.) Schlecht. No material present.

12. U. Bubi Idaeo = Phr. rubi-idaei (DC.) Karst.

C. Bust taxa represented by caeoma (in No. 6 also uredo), suitable type material present.

2a. U. confluens a. Bibis alpini = Melampsora c£. ribesii-purpureae Kleb.

2/?. U. confluens *p.* Mercurialis perennis = Mel. rostrupii G. Wagn. (belonging to Mel. populnea (Pers.) Karst. s. 1.).

6a. U. miniata (a. Eglanteriae) = Phragmidium mucronatum (Pers.) Schlecht.

D. **Bust taxa represented by uredo, suitable type material lacking.**

3. U. Alchemillac = Trachyspora intrusa (Grev.) Arth.

4. U. Euphorbiae Helioscopiae = Melampsora euphorbiae (Schub.) Cast. (syn. *Mel. helioscopiae* Wint.).

6j8. U. miniata *p.* Lini = Mel. lini (Ehrepb.) Lév.

9. U. Sonchi arvensis = Coleosporium sonchi (Str.) Lév. (belonging to Col. tussilaginis (Pers.) Lév. s. 1.). From Persoon's description only the presence of uredo can be concluded, but very possibly the type material, which is lacking, also carried teleuto. In Nos. 910.264-66 and 910.264—70, on *Sonchus oleraceus* and *palustris* and in Persoon's handwriting labeled "Uredo Sonchi", both uredo and teleuto occur. But anyway, *Col. sonchi* must be considered conspecific with *Col. tussilaginis.*

11. U. Rubi fruticosi, considered = Phragmidium rubi ("Pers.") Wint. = Phr. bulbosum (Str.) Schlecht.

15)8. U. pustulata *ft.* Cerastii, considered = Melampsorella caryophyllacearum Schroet. No material present.

2ip. U. appendiculatus *p.* Pisi sativi, considered = Uromyces pis^(DC.) Otth.

E. **Bust taxa represented by uredo, suitable type material present.**

7p. U. linearis *p.* Polypodii = Hyalopsora polypodii (Diet.) Magn.

8. U. campanulae = Coleosporium campanulae L6v. (belonging to Col. tussilaginis (Pers.) Lév. s. 1.).

10a. U. farinosa a. Uredo capreae, probably = Melampsora caprae arum Thüm.

15a. U. pustulata a. Epilobii = Pucciuiastrum cpi1obii Otth.

150. U. Betae *p.* Convolvuli = Puccinia polygoni-amphibii Pers. var. convolvuli Arth. — Persoon erroneously gave the host as *Convolvulus arvensis* and consequently this rust does not represent the uredo-stage of *P. convolvuli* Cast, as generally believed.

19. U. suaveolens = Puceinia punctiformis (Str.) Böhl. (syn. *P. suaveolens* Rostr.).

F. **Rust taxa represented by uredo and teleuto, but only uredo was described by Persoon. Suitable type material present.**

4fi. U. Euphorbiae .helioscopiae /?. Euphorbiae exiguae = Melampsora euphorbiae (Schub.) Cast.

la. U. linearis *a.* frumenti = Puceinia ooronata Corda. — *P. linearis* Böhl. is synonymous with *P. graminis* Pers.

10/3. U. farinosa *ft.* Senecionis = Coleosporium senecionis Tul. ex Kickx (belonging to Col. tussilaginis (Pers.) L6v. s. 1.).

14. U. populina = Melampsora larici-populina Kleb. — *Mel. populina* L6v. is synonymous with *Mel. populnea* (Pers.) Karst.

14/?. U. populina *ft.* betulina = Melampsoridium betulinum (Pr.) Kleb.

16. U. Menthae = Puceinia menthae Pers. (seebelow,p. 18).

18. U. Betae = Uromyces betae (Pers.) Tul. Persoon\s name may be considered valid. *Lectotype* 910.264-741.

20. U. Viciae Pabae = Uromyces fabae de Bary, but this name may now be changed to Urom. viciae-fabae (Pers.) Otth, Mitth. Naturf. Ges. Bern, 1863 p. 86 (however, Otth erroneously cited DC. instead of Pers.). *Lectotype* 910.264^550).

fl. **Bust taxa under Uredo, but the teleuto-stage was described by Persoon. Suitable type material present, except in No. 23.**

13. U. Tussilaginis = Coleosporium tussilaginis (Pers.) Lév. *Lectotype* 910.264-18.

17. U. scutellata = Uromyces scutellatus (Pers.) Lév. *Lectotype* 910.264-77.

21«. U. appendiculata *a.* Phaseoli = Uromyces appendiculatus (Pers.) Ung. *Lectotype* 910.264r-281.

21y. U. appendiculata y. Genistae tinctoriae = Uromyces laburM (DC.) Otth (syn. *JJrom. genistae-tinctoriae* (Pers.) Wint.).

22. U. bullata = Puccinia conii Puck. — *Puccima bvllata* Link is synonymous with *P. ribis* DC. *P. bullata* (Pers.) Wint., which is used as a collective name for certain brachyforms on members of various umbelliferous genera, is invalid and must be cancelled. At least some of the rust forms in question may be placed with *P. angelicae* (Schum.) Puck.

23. U. Dianthi = Uromyces dianthi Niessl (Niessl did not cite **Pers.)**. Material lacking.

TT. **Smut taxa, suitable type material of which is lacking (of Nos. 270., 8., e. no material is present).**

27a. U. segctum *a.* Bordei and y. Avenae = Ustilagohordei (Pers.) Lagh. (syn. *Ust. levis* (Kell. & Sw.) Magn.). It seems that the species name should be changed to Ust. segetum (Pers.) Ditm.

27)8. U. segetum *p.* Tritici = Ustilago tritici Jens., which by

some authors is now considered synonymous with *list nuda* (Jens.) Bostr.

278. U. segetum 8. Panici miliacei = Sphacelotheca destruens (Schlecht.) Stev. & A. G. Johns.

27c. U. segetum *e.* decipiens = Tilletia decipiens (Pers.) Körn. This name should be changed to Tilletia sphaerococca (Bahh.) Fisch. v. Waldh., as *T. decipiens* is based upon a variety and is a younger name than *TJredo sphaerococca* Babh.

28. U. Caricis = Cintractia caricis (Pers.) Magn. s. 1. Ace. to J. I. Liro, Die Ustilagineen Pinnlands, II p. 236, 1938, *Carex pihdifera* is the type host.

29. U. Tragopogi pratensis = Ustilago tragopogi-pratensis (Pers.) Bouss.

30. U. violacea = Ustilago violacea (Pers.) Puck.

I. **Smut taxon with suitable type material present.**

24. U. Anemones = Urocystis anemones (Pers.) Wint. *Leetotype* 910.264-944.

PUOCENIA.

A. Teleuto present, suitable type material lacking.

2. P. Pruni spinosae = Tranzschelia pruni-spinosae (Pers.) Diet.

10. P. Potentillae = Phragmidium potentillae (Pers.) Karst.

B. **Teleuto present, suitable type material present.**

1. P. Anemones = Transchelia anemones (Pers.) Nannf. *Lectotype* 910.264-943.

3. P. Menthae = Puccinia menthae Pers. *Lectotype* 910.264r-**17Q,** on *Mentha* sp.

4. P. Valantiae = P. ċelakovskyana Bub. *Lectotype* 910.264-1. —*It is quite clear, as well from the material in Persoon's herbarium, as from his descriptions in Syn. Meth. Fung, and in Observationes Mycologicae, 2 p. 25, 1799, that *P. valantiae* Pers. is not the microform on *Galium* passing under this name, but that it corresponds to *P. celakovskyana* Bub. The latter rust I think ought to be incorporated in *P. punctata* Link s. 1. (cp. also H. S. Jackson, Mem. Torrey Bot. Club, 18 p. '8, 1931), but this question I find it best to hold open for the moment. It would certainly be highly desirable, if possible, to avoid exchanging the well-known name *P. punctata* for *P. valantiae.* The latter name is commonly but erroneously used for the above-mentioned microform, the valid name of which is perhaps P. *heterochroa* Bob. ex Desm., Ann. Sci. Nat., Ser. 3, 14 p. 108," 1850, **on *Galium cruciata* and *vernum.* However, Desmazieres cites *Puccinia Galii** *verni* Ces. in Babh., Herb, viv., No. 1092 (edited 1846) as a synonym, and if not a nomen nudum, this name has priority. Of the older synonyms of "P. *valantiae"* cited in P. & HI Sydow, Monogr. Ured., 1 p. 217, 1904, the following ones are Hot tenable: *P. stellatarum* Duby (1830) referring

to-P. *punctata* and P. *crucianellae* Desm., P. *galii-cruciatae* Duby (1830) to P. *celakovskyana (P. galii-crutiati* Johnst. (1831) is a homonym), and *P. clavuligera a. galiorum* Wallr. (1831) to P. *punctata.*

5. P. polygoni amphibii = P. polygoni-amphibii Pers. *Lectotype* 910.264^114.

6. P. polygoni avicullariae = Uromyces polygoni-avicullariae (Pers.) Karst. *Lectotype* 910.263-25.

7. P. Circaeae = P. circaeae Pers. *Lectotype* 910.264-397.

8. P. graminis = P. graminis Pers. *Lectotype* 910.263-499, on gramineous culms.

9. P. Juniperi = Gymnosporangium fuscum DC. — *G. juniperi* Link is another rust species.

lla. P. mucronata «. Rosae = Phragmidium mucronatum (Pers.) Schlecht. *Lectotype* 910.263-17, on *Rosa* sp. (cult.).

110. P. mucronata 0. Rubi, considered = Phr. rubi (Pers.) Wint, (i. 6. Phr. bulbosum (Str.) Schlecht.), but Persoon's supposed original material contains not only *Phr. bulbosum,* but also *Phr. rubi-idaei* (DC.) Karst.

Conclusion.

In the present paper are established lectotypes for the following valid species:

Coleosporium tussilaginis (Pers.) Lév., on *Tussilago farfara.*
Phragmidium mucronatum (Pers.) Schlecht., on *Rosa* sp. (cult.).
Puccinia circaeae Pers., on *Circaea intermedia.*
— graminis Pers., on an indeterminable gramineous host.
— menthae Pers., on *Mentha* sp.
— polygoni-amphibii Pers., on *Polygonum amphibium.*
— valantiae Pers. (syn. P. *celakovskyana* Bub.), on *Galiwn cruciata.* — P. *valantiae* auct. = P. *punctata* Link.
Uromyces appendiculatus (Pers.) Ung., on *Phaseolus vulgaris.*
— betae (Pers.) Tul., on *Beta vulgaris.*
— polygoni-avicullariae (Pers.) Karst., on *Polygonum aviculare.*
— scutellatus (Pers.) L6v., on *Euphorbia cyparissias.*
— viciae-fabae (Pers.) Otth, on *Vicia faba.*
Urocystis anemones (Pers.) Wint., on *Anemone nemorosa.*

The following species are validly published, but Persoon's names can-Not be used, because when placed in the correct genus the names of the new combinations were already occupied by other species:

Puccinia Juniperi = Gymnosporangium fuscum DC. (not *G. juniperi* Link).
Uredo bullata = Puccinia conii Puck, (not P. *buMata* Link = P. *ribis* DC.).
— *Dianthi* = Uromyces dianthi Niessl.
— *linearis a. frumenti* = Puccinia coronata Corda (not P. *linearis* Röhl. = P. *graminis* Pers.).
— *populina* = Mclampsora larici-populina Kleb. (not *M. populina* L6v. = *M. populnea* (Pers.) Karst.).

For the following valid species suitable type material is lacking:

.*Puccinia Potentillae* = Phragmidium potentillae (Pers.) Karst.

— *Pruni spinosae* = Tranzschelia pruni-spinosae (Pers.) Diet.

***Uredo Caricis* = Cintractia caricis (Pers.) Magn. s. 1.**

— *segetum a. Hordei* = Ustilago segetum (Pers.) Uitm. (syn. *TJ. hordei* (Pers.) Lagh.).

— *Tragopogi pratensis* == Ustilago tragopogi-pratensis (Pers.) Bouss.

REVISION OF THE 8APOTAGEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

XIII.*) Chrysophyllum L.

by

W. VINE
(Rijksherbarium, Leiden)
(Issued 1. VII. 1958)

In the present study only those species of the genus *Chrysophyllum* have been incorporated which are found in the area covered by the Flora Malcsiana, as well as those of Australia and New Caledonia.

We express our most sincere thanks to the Curators of the State University at Leiden for allowing a grant, enabling a visit at the herbarium of Paris, to the Directors of the herbaria of Bogor, Brisbane, Canberra, Florence, Jamaica Plain, Kepong, Kew, Lae, Leiden, London, Melbourne, Montpellier, New York, Paris, Singapore, Sydney, Utrecht and Zürich for putting their respective material at our disposal, to Dr Bakhuizen van den Brink for rivising the Latin descriptions and to Miss M. van Leeuwen for doing most of the typewriting.

The abbreviations of the herbaria used in this paper and those on ***Leptostylis, Pycnandm*** **and** ***Magodendron*** **are those proposed by Lanjouw** and Stafleu in the Index Herbariorum ed. 2.

Chrysophyllum L., Sp. PL, ed. I, 1753, 192; Gen. PL ed. I, 1737, 361 et ed. V, 1754, 88; G. Don, Gen. Gard. Syst. Diet. IV, 1838, 31; DC., Prodr. VIII, 184*, 156; Miquel, FL Ind. Bat. II, 1859, 1034 et in Martius, PL Bras. VII, 1863, 87; Bentham & Hooker, Gen. PL II, 1876, 653; Burck, Ann. Jard. Bot. Buitenzorg V, 1886, 4; Engler, Bot. Jahrb. XII, 1890, 519; Boerlage, FL Ned. Ind. II, 1891, 306; Baillon, Hist. PL XI, 1891, 293; Koorders & Valeton, Bjjdr. Boomsoorten Java I, 1894, 128; Engler in Engler & Prantl, Nat. Pflz. Fain., ed. I, IV, 1897, 147; Bailey, Queensl. FL III, 1900, 953; King & Gamble, Journ. As. Soc. Beng. LXXIV, 1905, 158 et 368; H. J. Lam, BulL Jard. Bot. Buitenzorg, sér. Ill, VII, 1925, 186; Baehni, Candollea VII, 1938, 429; Guillaumin, BulL Soc. Bot. Pr. 91, 1944, 69 (key only) — *Nycterisition* Ruiz & Pav., Gen. PL Peruv., !797, 30; G. Don, I.e. — *Anwrphospermuni* F. v. MuelL, Fragm. VII, 1870, 112; Baillon, Hist. PL.XI, 1891, 285; Engler in Engler & Prantl,

*) I—III in Blumca VI, 3, 1952, 547—595; IV—V in Bhimea VII, 2, 1953, 3«4-412; IVa in Blumoa VII, 3, 1954, 481-483; Ha, IVb, Va, VI-IX in Blumea VIE, 2, 1957, 201—513; X—XII in Nova Guinea N.S. 8, 1, 1957, 87—128; XIII—XVI in the present issue.

Nat. Pflz. Pam., ed. I, IV, 1897, 150; Baehni l.c. 417 — *Niemeyera* P. v. Muell., Fragm. VII, 1870, 114 non P. v. Muell., Pragm. VI, 1867, 96;' Angler, 1. c, 149; Baehni, 1. c. 469 — *Ochrothallus* Pierre ex Planchon, Etude sur les Prod. Sapot., 1888, 26, *nomen-*, Baillon, Hist. PI. XI, 1891, 298, *descr.* — *Trouettia* Pierre ex Baillon, Bull. Soc. Linn. Par. II, 1891, 903; Hist. PI. XI, 1891, 295.

Shrubs and trees. *Leaves* alternate, circular to linear-oblong or obovate to oblanceolate, apex rounded to acuminate, base cuneate to rounded, chartaceous to firmly coriaceous, stipules absent; midrib flat, impressed or crested above, prominent to very prominent below, secondary nerves 6—31, straight or curved, tertiary nerves irregularly, longitudinally or transversely reticulate. Inflorescences 2 - multi-florous, iji the axils of leaves or their scars. *Flowers* ≤f, perhaps with one exception, pedicellate to sessile. *Calyx* with 5(—6) lobes, usually glabrous within. *Corolla* slightly shorter to thrice as long as the sepals, usually exsert, with (4—)5—11 lobes, tube as long as the lobes or shorter. *Stamens* (4r—)5—10, 1 opposite each petal, usually inserted in corolla-throat. *Staminodes* none. Disk usually lacking. *Ovary* villous or glabrous, 1—10-celled, cells 1-ovuled; style 0.3—4 times as long as the ovary. *Fruits* with thick to very thin pericarp, 1—8-seeded; testa very hard and thick to papyraceous; scar narrow or broader and lateral or covering nearly the whole surface of the seed; albumen none to copious.

Type species: *Chrysophyllum cainito* L.

Distr.: Tropical and subtropical America, tropical West-Africa, 1 species in Asia, 3 in Australia, 3 in New Guinea and 16 in New Caledonia.

As Baehni (1938) already pointed out, Linnaeus' interpretation of the generic limitations of *Chrysophyllum* varied considerably in respective publications, but more recent authors agree, that this genus is characterized by 5-merous flowers, containing 5 sepals, 5 petals, 5 epipetal stamens and no staminodes.

When studying the genera *ChrysophyUvmi* and *OchrothcMus* of S.E. Asia and New Caledonia, and *Niemeyera* and *Amorphospermum* of Australia, it appeared to be necessary to unite them. Though there were very few deviations from the 5-merous calyx (only in two species some 6-merous calices were found), there appeared to be important differences in the corolla.

In 14 species 5 corolla-lobes were found, in 10 other species deviations from this number existed. The following list shows, that it is impossible to delimitate with this characteristic the genera *Chrysophyllum* and *Ochrothallus*, which has twice as many petals as sepals:

NUMBER OF PETALS:

Chrysophyllum	spec. 14	5[1])
	wagapense	(4—)5
	lissophyllum	4—6
	heteromerum	5—7
	antilogum	5—6(—8)
	gordoniaefolium	6—8

francii	7—10
lamii	8
sessilifolium	8—11
multipetalum	9—10
litseiflorum	10

In all species mentioned staminodes are lacking and the stamens are epipetalous.

As there are no other distinguishing features, the genera *Chrysophyllum* and *Ochrothallus* are to be united.

As for *Amorphospermum* and *Niemeyera,* these genera differ from Chrysophyllum by the much larger extension of the scar over the surface of the seed. Variations in the extension of the scar, however, are considered less important than flower-characteristics, which are the same as those **of *Chrysophyllum.* For this reason *Amorphospermum* and *Niemeyera* are** also inserted into *Chrysophyllum.*

Thus *Chrysophyllum* is delimited to other genera by a 5(—6) merous calyx, epipetalous stamens in the same number as the petals and by the absence of staminodes.

A disk is found in two species only: *C. novoguineense* Vink and *C. Utseiflorum* (Guill.) Vink.

Only a part of the genus — those species occurring in S.E. Asia, New Caledonia and Australia — was revised, and no attempt was made to check the interrelationships. Therefore in the descriptive part the species are arranged geographically:

I. Introduced from America:
Species 1 and 2.
II. India to Bismarck Arch.:
Species 3.
III. New Guinea:
Species 4, 5 and 25.
IV. New Caledonia:
Species 6—21.
V. Australia:
Species 22—24.

There appears to be a correlation of transversely reticulate tertiary nerves with secondary ones diminishing near the margin and of irregularly or longitudinally reticulate tertiary nerves with secondary ones archingly joined near the margin. The exceptions are *C. novoguineense* (Guill.) Vink and *C. chartaceum* (Bailey) Vink.

Key to the species

1a.	**Tertiary nerves transverse**	**2**
b.	**Tertiary nerves irregularly or longitudinally reticulate**	**13**
2a.	**Leaf base rounded, secondary nerves curved**	**3**
b.	**Leaf base cuncate to obtuse, secondary nerves curved or straight**	**4**

') For irregular flowers in *C. oainito* L. see: Nozeran, Ann. Sc. Nat., Bot., 2me K'<*., 1955, 187.

3a. Leaves glabrous on cither side; pedicels filiform, 12—14 mm long; corolla ca.. 3 mm long, glabrous, lobes (4—)5; ovary glabrous. *New Caledonia* 10. C. wagapense Guill.

b. Leaves brown woolly, glabrcscent on either side, indumentum longer persistent below, turning grey; pedicels 5—10 mm long, not filiform; corolla ti—7 mm long, on the back of the lobes light brown tomentoso, lobes 8—11; ovary villous. *New Caledonia*. . . . . 9. C. aessUifolium Pancher & Sebert

4a. Flowers sessile. 5

b. Flowers pctiolcd. 9

5a. Leaves with a closely apprcssed indumentum below. 6

b. Leaves patently hairy or glabrous below. 7

6a. Petioles 1.5—2 cm long; corolla-lobes 9—10; ovary villous. *New Caledonia* 11. C. multipeLatum Vink

b. Petioles 2—3 cm long; corolla-lobes 5; ovary glabrous. *New Caledonia* 12. C. gatopense Guill.

7a. Sepals with indumentum within. *New Guinea* 5. C. papuanicum (Pierre) van Boy en

b. Sepals glaibrous within. 8

8a. Fruit 15—30 by 15—25 mm; testa papyraceous. *Australia* 22. C. chartaceum (Bailey) Vink

b. Fruit 30—60 by 25—50 mm; testa hard, bony. *Australia* 23. C. pniniferum F. v. M.

9a. Pedicels 1—2 mm long. 10

b. Pedicels 5—12 mm long. 11

3Ou. Indumentum on lower side of the leaves patent; petioles 0.7—1.5 cm long; calyx-lobes with indumentum on either side. *New Guinea* 5. C. papuanicum (Pierre) van Boyen

b. Indumentum on lower side of the leaves apprcssed; petioles 2—3 cm long; calyx-lobes glabrous within. *New Caledonia* . . . 12. C. gatopense Guill.

lla.[1] Secondary nerves 10—14, curved; leaves 14—19.5 by 4—6.5 cm; petioles 1.5—2.5 cm long. *New Caledonia*. . . . . 7. C. gordonlaefolium Moore

b. Secondary nerves 20—30, straight or very slightly curved; leaves 15—48 by 6—18 cm; petioles 2—4.5 cm long. 12

12a. Sepals 3.0—3.5 by 2.0—3.5 mm; pistil 9 mm long. *New Caledonia* 6. C. "balansae Baillon

b. Sepals 2 by 1.5 mm; pistil 4 mm long. *New Caledonia* . . 8. 0. comptonli Moore

13a. Flowers sessile. 14

b. Flowers long or shortly petiolcd. 19

14a. Calyx patently hairy. 15

b. Calyx apprcssedly hairy. 16

15a. Leaves ferruginous-hirsute below; petioles 3—4 cm long; sepals with indumentum within. *New Guinea*. . . . . 6. C. papuanicum (Pierre) van Boyen

b. Leaves glabrous below; petioles 0.5—2 cm long, sepals glabrous within. *Australia* 22. C. chartaceum (Bailey) Vink

16a. The leaves circular or elliptical to obovate. 17

b. The leaves oblong or linear-oblong to oblanceolate. . . . . IS

17a. Corolla 3—4 mm long; petioles 0.3—1.5 cm long; midrib minutely crusted above. *Australia*. . . . . 24. C. antilogum (F. v. M.) Vink

b. Corolla 2 mm long; petioles 1.1—2.4 cm long; midrib not crested above. *New Caledonia*. . . . . 16. C. sarlinii Guill.

18a. Secondary nerves minutely impressed to invisible above; corolla-tube glabrous without; style 1.5—2.0 mm long; ovary 4—5-celled; fruit ellipsoid-obovoid, without .gynophore; scar covering less than half of the surface of the seed. *New Caledonia*. . . . . 14. C. lissophyllum Pierre

b. Secondary nerves slightly prominulous above; corolla-tube with some scattered apprcssed colourless hairs without (magnification 30 X); style 3.5—4.0 mm long; ovary 1—3-celled; fruit almost globular, with a 5—20 mm long gynophore; scar covering nearly the whole surface of the seed. *Australia* 24. C. antilogum (F. v. M.) Vink

[1]) See also p. 73 where a new species, closely related to *fk* gordoniaefolium Moore, is described after this publication was made ready for printing.

19a. Lcafbase rounded. *New Caledonia* . . . . 18. C. **francii** Guill. & Dub.
b. Lcafbase cuneatc to obtuse 20
20a. Stigma distinctly 5—11-lobcd 21
b. Stigma not lobed . . . . '. 22
21a. Leaves reddish ferruginous-sericeous below, turning greyish brown; stigma 7—11-lobed; ovary 7—10-cclled; fruit up to 55 by 40 mm, *4*—8-sceded. *America, introduced in Java* . . . . **1. C. cainlto** L.
b. Leaves ferruginous-sericeous below, quickly turning greyish brown, later on smoke-grey-sericeous, ultimately glabrcscent; stigma 5-lobed; ovary 5-celled; **fruit 15—01 by 8—11 mm, 1-secded.** ***America, introduced in Malay Peninsula*** **2. C. oliviforme** L.
22a. Ovary glabrous 23
b. Ovary villous 27
23a. Secondary nerves curved 24
b. Secondary nerves straight 25
24a. Leaves chartaccous; sepals with indumentum within; disk cupuliform, appressed to ovary. *New Guinea* . . . . 4. **C. novoguineense** Vink
b. Leaves firmly coriaceous; sepals glabrous within; no disk present. *New Caledonia* **12. C. gatopense** Guill.
25a. Leaves oblanceolate, 2.0—2.5 cm wide; secondary nerves 15—17; pedicels *4*—7 mm long, glabrous; corolla ca. 10-lobed. *New Caledonia* 15. C. litseiflorum (Guill.) Vink
b. Leaves linear-oblong to oblong-obovate or oblong to obovate, (2.5—)3—5.5 cm wide; secondary nerves 8—14 or 21—31; pedicels 1—3 mm long, with indumentum; corolla 5—7-lobed 26
26a. Secondary nerves 21—31, archingly joined. *New Caledonia* **13. G. heteromerum Vink**
b. Secondary .nerves 8—14, diminishing near margins, sometimes connected by tertiary nerves. *New Caledonia* . . . . **12. C. gatopense** Guill.
27a. Secondary nerves diminishing near margins; sepals with indumentum within. *New Guinea* . . . . 5. 0. **papuanicum** (Pierre) van Boyen
b. Secondary nerves archingly joined; sepals glabrous within 28
28a. Petioles 1 cm or more long 29
b. Petioles leas than 1 cm long 30
29a. Leaves (2.5—)3.0—4.5(—5) cm wide; secondary nerves 21—31, angle with midrib 70°—85°; petioles 1—3 cm long; pedicels more than 2 mm long. *New Caledonia* 13. C. **heteromerum** Vink
b. Leaves 1—3.5 cm wide; secondary nerves 15—25, angle with midrib 55°—**70°;** petioles 0.7—1.2 cm long; pedicels 0—2 mm long. *New Caledonia* **14. C. llssophyllum** Pierre
'lOa. Corolla ferruginous- to dark brown sericeous without. *Neto Caledonia* **17. C. deplanchei** Baill.
b. Corolla glabrous without 31
•*la. Leaves usually acuminate, chartaceous, dark coloured above; pedicels 3—6 mm long; fruit 5—4(—1)-seeded. *India to Bismarck Arch.* 3. **C. lanceolatum** (Bl.) DC.
b. Leaves not acuminate, coriaceous, light coloured above; pedicels less than 3 mm long 32
32a. Leaves oblong to linear-oblong, sometimes oblanceolate, 4—15 cm long; secondary nerves 15—25, angle with midrib 55°—70°; branchlets 3—<5 mm thick. *New' Caledonia* . . . . 14. 0. lissophyUum Pierre
b. Leaves elliptical to obovatc, 1.5—5.0 cm long; secondary nerves 8—13, angle with midrib 40°—60°; branchlets 1—4.5 mm thick 33
33a. The leaves 0.6—1.3 cm wide, apex acute to rounded; angle between secondary nerves and midrib 40°—50°; leaves purple to reddish brown below. *New Caledonia* 19. C. **intermedium** Baill.
b. The leaves 1.8—5.0 cm wide, apex broadly rounded to obtuse; angle between secondary nerves and midrib 50°—60°; leaves light greyish brown below. *New Caledonia* . . . . **20. C. cochleare** Vink

Insufficiently known:

21. **C. glabrisepalum Guill.** *(New Caledonia)*

1. 0. cainito L., Sp. PL ed. 1, 1753, 192; DC., Prodr. 8, 1844, 157; De Vriese, Tuinb. fl. 3, 1856, 220; Miquel in Martius, PI. Bras. 7, 1863, 94; Koorders & Valenton, Atl. Baumart. 4, 1915, t. 617; Merrill, Bnum. Phil. Flow. PI. Ill, 3,' 1923, 288.

Trees, up to 20 m high. Branchlets terete, 2.5—6 mm in diam., light brown to ash-grey, reddish ferruginous-sericeous, glabrescent. *Leaves* diffuse, oblong to obovate, • (5.5—)6,5—11 (—15.5) by 3—6 cm, apex obtuse, shortly acuminate, acumen up to 0.8 cm long, or sometimes emarginate, base broadly cuneate, often shortly decurrent; reddish ferruginous-sericeous on either side, very quickly glabrescent above, becoming nitidous, turning dark reddish ferruginous-sericeous below, ultimately greyish brown coloured, chartaceous; midrib impressed above, very prominent below, secondary nerves 16—24, ascending at an angle of 70°—85°, straight or very slightly curved, archingly joined, prominulous to faint on either side, tertiary nerves longitudinally reticulate, reticulation **near margins** more or less irregular, faint to very faint above, inconspicuous to very faint below, often between every two secondary nerves one or two tertiary ones somewhat more distinct and subparallel to secondary ones; petioles 0.6—1.7 cm long, canaliculate above, rounded below, ferruginous- to brownish subsericeous. *Inflorescences* 5—35-florous, in the axils of leaves or their scars; pedicels 5—15 mm long, ferruginous- to brownish sericeous; bracteoles basal, circular, ca 0.5 by 0.5 mm, indumentum as sepals. *Sepals* 5, circular to ovate, apex rounded to obtuse, ferruginous-sericeous without, margins laying inside in hud with a glabrous border, with some scattered hairs within. *Corolla* ca 4 mm long, tube ca 2 mm long, glabrous, lobes 5, ovate, 1.5—2 by 1.7—2.3 mm, rounded to obtuse, brown sericeous without, margins with a glabrous border, glabrous within. *Stamens* 5, inserted in corolla-throat, filaments deltoid, apex filiform, ca 0.6 mm long, anthers ovoid, ca 0.8 by 0.4 cm, apex obtuse, base cordate. *Staminodes* none. *Ovary* conoidal, 7—10-ribbed, ca 1.5 by 1 mm, ferruginous-villous, 7—10-celled, ovules inserted in lower half of the cells; style cylindrical, ca 0.4 mm long, glabrous; stigma 7—11-lobed. *Fruits* obovoid-globose, up to 55 by 40 mm, purplish brown, glabrous, pericarp up to 10 mm thick, 4—8-celled;* seeds 4—8, obovate, up to 9 by 4 by 2.5 mm, apex broadly rounded, base rounded, testa chartaceous, purplish black, scar oblanceolate, ca 5.5 by 2.5 cm, hilum apical; albumen membranaceous to none; cotyledons thick, flattened, obovate, radicle basal, suhglobose.

Vern. names: Bantam: Sawoe kadoe; Bogor: Sawo idjo, Sawo hidjo.

Distr.: West Indian Islands and Central America, cultivated throughout the tropics.

CEYLON. ***Herb. v. Boyen s.n. = JI.L.B. 904.8.383*** **(L).**

MALAY PENINSULA. **Singapore Island, Garden of Chia Peng, Mcng, 237 Kampong Teban: *8.F. S8595* (L)»**

SUMATRA. **Mcdan, ca 15 m alt.: *Lõwing 9174* (L); ibidem, fruit-gardens of natives: *Lörzing 13078* (P), raro, tree, crippled, 45—10 m high, fruit ellipsoid, green, 5—6 cm long, "ein Obst von wenig Bedeutung".**

JAVA. **Bantam: Pandeglang, 250 m alt.: *Booker 7500* (BO, L), 7. fl. March, cult., native yard; Batavia: Batavia (now Djakarta), Kampong Lima: *Backer 33886* (BO), cult.; Batavia: *Backer 33887* (BO, L), fl. March, cult.; Meeater Cornelis: *Ochse s.n.* (BO), buds Nov., cult.; ibidem: *Weehuxzen 23* (BO), y. fl., native yard; Buitenzorg (now Bogor) 240 m alt.: *Bakhuizen v. d. Brink fil. 245t**(BO, IT), y. fl. March,**

ono specimen in scrub; ibidem, Tjomas, 250 m alt.: *Backer S6S77* (L), fl. March, cult.; ibidem: *Booker s.n.* (.L), fl. April; Buitenzorg, 250 m alt.: *Ochse s.n.* (L), y. fl. March, cult.; Batavia without locality: *Backer s.n.* (L), fl. March; Prcanger: Tjibadak: *Backer 35219* (BO), cult., curopean yard; Soekaboemi, 600—700 m -alt.: *Backer 15207* (BO, L), fr. Aug., gardens, cult.; between Bandoeng and Prcanger:, Socmedang, Tandjoengsari, 900 m alt.: *Witkamp s.n.* (BO) buds, fr. May, in a garden; Besoeki, Djember, Setadjek, 200 m alt.: *Koorders 21846 &* (BO), cult.; Onderneming Kali Baroe, 400 m alt.: *Backer 36853* (L), fl. March, european yard, cult.

Cultivated at Hort. Bot. Bogor: *sub no. IV — C — 5* (BO, L), fl. Oct.; *sub no. IV—C—7* (BO, L, U), fr. Jan.; *sub no. IV — C — 7a* (BO, L) fl. Jan., March; *sub no XII — B (IX)—35* (BO, L), fl. Dec; *without number* (BO, L); *Beccari s.n.* (BO, Fl, P); *Docters v. Leeuwen & Dakkus s.n.* (L), fl. March.

TIMOR. (Portuguese part). Dili, near or behind seashore: *v. Steenis 18332* (BO), fl. Dec, tree, 15 m high, apparently cult., corolla • yellow green.

Remarks: The description is drawn from the specimens mentioned above. Eyma (PI. of Suriname, 1936, 390) mentions: "corolla 3.5—5.5mm long, lobes 5(—7); ovary subglobosep* 6—11-celled; fruit 5—8 cm long, fleshy, edible pericarp, not all ovules developing into seeds. A rather variable species".

Pierre depicts (ms) two anthers on one bifid filament and two connected anthers on one filament. The drawing belongs to *Beccari s.n.* (P), which is a cultivated specimen.

Nozeran (Ann. Sc. Nat., Bot., 2me sér., 1955, 187) describes irregularities in the number of flowerparts in a specimen of this species, among which even those of coalescence of flowers.

2. C. oliviforme L., Syst. Nat. ed. 10, II, 1759, 937; Lam. Enc. I, 1783, f>52 (excl. var.); Pierre & Urban, Symb. Ant. V, 1904, 156; Cronquist, Bull. Torr. Bot. Cl. 72, 1945, 199; [Plumier, PI. Am., 1756, 57, tig. 69] — *C. monopyrenum* Sw., Prodr., 1788, 49 et PI. Ind. Occ. I, 1797, 480; Curtis, Bot. Mag. 8, 1834, t. 3303; Miquel in Martius, PI. Bras. 7, 1863, 95; Milsum, Fruit Cult, in Malaya, Dept. Agric. P. M. S. Bull. 29, 1919, 87; H. J. Lam, Bull. Jard. Bot. Buitenzorg, s6r. 3, VII, 1925, 189; Burkill, Diet. econ. prod. Malay Peninsula, 1935 — *Sideroxylon derryanum* King & Gamble, Journ. As. Soc. Beng. 74, II, 1905, 163 and 373; Gamble, Kew Bull., 1907, 109; Ridley, PI. Mai. Pen. 2, 1923, 259.

Trees, up to 15 m high. Branchlets terete, 2—4 mm in diam., light brown to brownish grey, appressedly ferruginous-tomentose, quickly glabres- °ent. *Leaves* diffuse, elliptical to oblong, 5—13 by 3—6.5 cm, apex abruptly shortly acuminate, acumen ca 0.2 cm long, base obtuse, often shortly decurrent; ferruginous-sericeous on either side, quickly glabrescent above, becoming nitidulous to nitidous, quickly becoming greyish brown to smoke-S^ey sericeous below, ultimately glabrescent, chartaceous; midrib impressed above, very prominent below, secondary nerves 10—20, ascending at an [a]&£le of 70°—75°, straight or very slightly curved, archingly joined, faint to prominulous above, prominulous below, tertiary nerves laxly longitudinally reticulate, reticulation near margins more or less irregular, faint to very faint above, inconspicuous to very faint 'below, often between every two secondary nerves one tertiary one somewhat more distinct and subparallel to secondary ones; petioles 0.5—1(—1.8) cm long, canaliculate above, founded below, brownish to ferruginous-sericeous. *Inflorescences* 5—10-'IOPOUS, in the axils of leaves or their scars; pedicels 6—9 mm long,

appressedly ferruginous- or brownish tomentose; bracteoles basal, ovate to lanceolate, 0.5—1.5 by, 0.5 mm, apex acute, indumentum as petioles. *Sepals* 5, rotundate to ovate, 2—3 by 2—2.5 mm, apex rounded to obtuse, brownish to ferruginous-subsericeous without, margins laying inside in bud with a glabrous border, with some scattered hairs to thinly sericeous within. *Corolla* 4.7—5.4 mm long, brownly sericeous without, but glabrous at the base of the tube and along margins of the lobes, glabrous within, tube 3—3.5 mm long, lobes 5, ovate, 1.5—2 by 1—1.5 mm, apex rounded to subacute. *Stamens* 5, inserted in corolla-throat, filaments short, deltoid, apex filiform, 0.5—0.7 mm long, anthers ovoid, ca 1 by 0.5 mm, apex obtuse, base cordate. *Staminodes* none. *Ovary* ovoid to conoidal, 5-ribbed, ca 1—1.5 by 1—1.5 mm, ferruginous-villous, 5-celled, ovules inserted in lower half of the cells; style 0.5(—1) mm long, glabrous; stigma 5-lobed. *Fruits* ovoid, 15—21 by 8—11 by 8—10 mm, apex obtuse, crowned with the remains of the style, base obtuse, glabrous, purplish black, exocarp thin; seeds one, ovoid to ellipsoid, 13—19 by 6—9 by 6—9 mm, apex and base rounded, testa light brown, dull, striate, along scar nitidous, ca 1 mm thick, scar basi-lateral, obovate to rotundate, ca 7—8.5 by 6—8 mm, apex rounded to emarginate, base rounded to acute; albumen copious, cotyledons flat, thin to moderately thick, radicle basal, cylindrical, ca 1.5 mm long.

Type figure: Plumier, Pl. Am., 1756, t. 69.

Vern. name: Pulau Penang: buah susu.

Distr.: Tropical America, imported in Malay Peninsula and Hawaii.

MALAY PENINSULA. Pulau Penang, Ayer Etam, Kampong Bharu: *Moh. Haniff s.n.* (BO, K, KEP), fl. & fr. May; ibidem, Thean Tek Road: *Moh. Raniff s.n.* (BO, K, SING), tree, 7.5—10 m high, leaves dark green above, shining, corolla greenish yellow, fr. May; Perak: *Derry-Civrtis 3641* (BO, K, SING) *type specimen of Sideroxylon derryanum* King & Gamble, f l. & fr. Dec. (BO, K, SING); Singapore, Botanical Gardens: Old Jamil Limes: *M. Nur s.n.* (SING), f l. June; Arboretum: *M. Nur s.n.* (SING); ibidem, *Gardens 833, M. Nur s.n.* (SING), fr. June; ibidem, *Gardens 1636 M. Nur. s/n.* (SING), fl. March; Office: *M. Nur s.n.* (SING), fr. June; Economic Gardens: *DesmaTch s.n.* (SING), tree with a milky elliptic fruit, size big, small fruits, fr. Fcbr.; opposite rubber store: *Deshmukh s.n.* (SING), a 12—15 m high tree, fruit small, oval, purple, full of pulp and latex, fl. Sept.; Residency Gardens: *Cubitt K.F. £0154* (KEP), fl. & y. fr. May.

HAWAII. Waianae valley: *D. L. Sopping 3101* (BO) y. fr. April.

3. **0. lanceolatum** (Bl.) DC, Prodr. 8. 1844, 162 — *Nycterisition lanceolatum* Blume, Bijdr. 12, 1826, 676 — *Chrysophyllum roxburghii* G. Don, Gen. Gard. Syst. Diet. 4, 1838, 33; see H. J. Lam, Bull. Jard. Bot. Buitenzorg, s6r. 3, 7, 1925, 187 *except syn. C. curtisii* King & Gamble — *Lucuma lanceolata* Zippel in Macklot, Bijdr. Natuurk. Wet. 5, 1830, 178 — *Chrysophyllum javanicum* Steud,, Nom., ed. 2, 1840, 359.

Trees, 15—55 m high. Branchlets terete, 1—4 mm in diam., greyish to purplish black, ferruginous-tomentose, glabrescent. *Leaves* scattered, oblong to ovate or lanceolate, sometimes obovate, often with parallel sides, 5—12.5 by 1.7—4 cm, apex acute, nearly always acuminate, acumen 0.5—1.8 cm long, base obtuse to cuneate, often slightly asymmetrical, margins undulate; ferruginous-tomentose on either side, quickly glabrescent, indumentum longer persistent along midrib at the lower surface, nitidous above, nitidulous to nitidous below, chartaceous; midrib minutely crested above, prominent below, secondary nerves 12—37, ascending at an angle

of 60°—80°, straight or slightly curved, archingly joined, the archs forming a nearly straight intramarginal nerve, hardly distinguishable from tertiary ones, faint but very distinct on either side, tertiary nerves parallel to secondary ones, near margins becoming reticulate, joined by a very dense* quaterny reticulation, very faint to nearly inconspicuous above, faint to very faint, but nearly always distinct below; petioles 0.3—0.7 cm long, flattened above or terete, ferruginous-tomentose, glabrescent. *Inflorescences* 5—45-florous, in the axils of leaves or their scars; pedicels 3—6 mm long, ferruginous-tomentose, glabrescent; bracteoles basal, ovate, ca 1 by 0.5cm, apex acute, ferruginous-tomentose without, glabrous within. *Svpals* 5, ovate to rotundate, 0.7—1.2 by 0.6—1 mm, apex obtuse to rounded, ferruginous-tomentose without when very young, glabresoent, margins fringed, glabrous within. *Corolla* 1.8—2.1 mm long, glabrous, tube 0.7—1.2 mm long, lobes 5, Ungulate to trapezoid, 1 by 1—1.5 onm, apex obtuse, sometimes very minutely acuminate, margin minutely fimbriate. *Stamens* 5, inserted at or below the middle of the tube, filaments clavellate to cylindrical, 9—15 mm long, anthers ovoid, ca 0.8 by 0.4 mm, apex rectangular to acute, fimbriate, base minutely cordate. *Staminodes* none. *Ovary* subglobose, 5-ribbed, ca 0.6 by 0.9 mm, ferruginous-villous, 5-celled, ovules inserted at or somewhat below the middle of the cells; style cylindrical, 1.5 mm l°ng> glabrous; stigma very minute. *Fruits* globular to 5-winged, 15—40 by 15—40(—60) mm, ferruginous-tomentose when young, glabrescent, brownish to purplish black when dry, pericarp thick to thin; seeds 5—4(—1), obovate, laterally flattened, 13.5—26(—35) by 8—13.5(—15) by 4.5—8 mm, apex and base obtuse, testa 0.8—1 mm thick, brown and nitidous without, scar narrowly oblong to oblanceolate, apex and base rounded to acute, hylum apical; cotyledons thin, flattened, ovate; albumen copious; radicle basal, cylindrical, ca 2 mm long.

Lectotype specimen: *Blume 775* in L.

Vern. names: (between brackets language and/or dialect; °var. *tonceolatum,* *var. *stellatocarpon).*

SIAM. *Korat,* * Ki pûng.

MALACCA. *Pulot pulot.

SUMATRA. *W. Coast,* Kapiunan (Minangkabau); *E. Coast,* Majang tjabak ?; *Palembang,* *Kajac nasi, Pais (Malay), Pcpulut (Malay); *Bangka,* Mempulut; *Bitttfon,* Mempulut.

BORNEO. ° roeloet; *W. Borneo,* Pelai cilin (Dajak, Tajan); *8. and E. Borneo,* Pulut kaju, Meralemubut.

JAVA. *Djakarta,* Kibaijongbong (Sundanese); *Preanger,* ° Kilaketan, Tjilaketan; *Tjilatjap,* ° Kenit; *Besoeki,* Laket, Selaket, Tjelaket, Resip.

CELEBES. *Malili,* ° Dondon gisalakino (Tobela); *Menado,* Sambiring rintek.

NEW GUINEA. *Manokwari,* Inggeris (Noemfoor), Interrika (Sidai), Istofo (Arfak), N'dau, Senarga or Senariga (Manikiong), Sowgwa; *Hydroffrajjhers Range,* Girufu (Orokaiva), Koro (Mumuni).

Distr.: W. Coast of India, Ceylon, Assam, Silhet, Burma, Thailand, Vietnam, Laos, Cambodja, Cochin-China, Hainan, HongKong, Malay-Peninsula, Indonesia except the Smaller Sunda Islands, Philippines, New Guinea, Salomon Islands.

Non-fruiting material:

INDIA. Bombay.# S. Maratha & N. Canara, Palichabuda: *Young s.n. (MaJutn)* (BM); ibidem, Maggaon sai: *Young s.n.* (BM, L); without known locality: *Wallich 4160* (BM).

CEYLON, without known locality: *Pierre 3277* (P), y. fl. March; ibidem: *Thwaites 2689* (BM, P); ibidem: *Walker s.n.* (L).

TotfKEN. prov. Phu-Tho, For. Reserve Chan-Mong: *Fleury SOI 18* (P), old. fl. April.

CociirN-GHiNA. Paulo Condor I si.: *Pierre 1507* (= *Harmand 841 j* (P).

HAINAN. Ch'ang-kiang Distr., Ka Chik Shan and vicinity: *Lav, 1480* (P), y. fl. April.

MALAY PENINSULA. Kedah, Jeniang Road: *S.F. 85988* (BO, BM) — Johore, 14th mile Mawai-Jemaluang Road: *S.F. 84948* (BO) — Singapore, Singapore Bot. Gard.: *S.F. 81199* (BO, L); ibidem: *Fl. of Sing. (coll. Ridley) 5837* (BM, BO).

SUMATRA. Atjeh, Cajo Loeëus, Penosan, (On. Rangoet Galang): *NIFS bb 28402* (L); East Coast, Karolanden, Lau Boeloeh: *NIFS bb 11979* (L); West Coast, Agam, Malalak: *NIFS bb 6676* (BO, L); Battang Barocs: *Teysmann, II. B. 973* (L), *type of C. sumatranum* Miq.; ibidem: *Teysmann 163 = 11. B. 973 $ 976* (BO, L); ibidem: *Teysmann II.B. 978* (L, P); Palembang, Lemating-ilir, near Gn. Megang: *NIFS E1208* (BO, L); Lampongsf: *Teysmann s.n.* (BO); Sumatra, without known locality: *Herb. Var. Bot. s.n.* (L); ibidem: *De Vriese s.n.* (L).

LINCKZA. *Teysmann s.n.* (BO).

BANGKA. Muntok, Aer Limau: *NIFS bb7841* (BO); Djcboes: *Teysmann E.B. 3888 4r 8496* (BO, L»), *type-specimen of C. bancamm* Miq.; Soengailiat: *Teysmann s.n.* (BO); Boekit bcsar, Poeloet toelocng Mij: *Berkhout 210* (BO), fl. Aug.; Lobok bcsar: *Anta (exp. Kostermans) 219* (L) and *1197* (L); ibidem: *NIFS bb 33977 (Kosiermans 39)* (L) and *34017 K.80)* (L); Aer Merah: *NIFS bb23938* (L); without known locality: *Teysmann s.n.* (BO, P), *De Vriese E.B. 3288* (L).

BILLPPON. Mijndistrict Bantan, Tandjong Pandan: *NIFS bb4U3* (BO), fl. Dec; *Teysmann s.n.* (BO).

BORNEO. S. and £. Borneo, W. Koetai, Sei Gitam: *NIFS bb 12746* (BO, L), fl. Sept.; liocloengan, Mensapa: *NIFS bb 26241* (L); E. Koetai, Sg. Soesoeh (Sangkoelirang): *NIFS bb 34720* f= *Kostermans)* (L); Pengadan: *NIFS bb 13012* (*= *Ilaung 63)* (BO); Balikpapan, Pemaloean: *NIFS bb24757* (L); Pleihari, Kintap: *NIFS bb 12885* (L), fl. Sept.; Tanah grogot, P. Boengoer: *NIFS bb 9533* (BO); Tanah Boemboe, Baroe: *NIFS bb 13382 (= Verhoef Z.O.B. I — 221)* (BO); Borneo, without known locality: *Bhtme s.n.* (L); *Beccari 8734* (P).

JAVA. W. Java, Palaboeanratoe: *Koorders 10131* (3 (L, P), *Koorders 12262 0* (L), *Koorders 33086* (3 (L); Depok: *Koorders 31065$* (BO, P) fl. Aug., *Koorders 42768 0* (L); Tjampea: *Koorders 30414$* (L); ondcrneming Nirmala: *Ileyne 102* (BO, L); G. Salak: *Koorders 24410* 0 (L, P) buds Sept., *Blume 775* (L) *lecto-type of Nycterisition lanceolatum* Bl.; G. Gedeh: *Bouts, v. d. Gedeh. 304* (L); Takoka: *Koorders 10132 0* (L), *10138$* (BO, L), fl. July, *10134 $* (BO, L, P) fl. July, *12122$* (L), *12124 $* (L), *32687 $* (BO), *33409$* (BO), *39570 $* (L); M. Java, Noesa Kambangan: *Koorders 10135$* (L); Pringombo: *Koorders 34066$* (L) buds Aug.; E. Java, Tjoeramanis: *Koorders 10186$* (L), *18024 $* (L, P), *20639$* (L, P); Moentjar: *decking 80* (BO); Rogodjampi, Rogodjampi-Balak: *Koorders 1734 $* (BO, L) type specimen of *C. dioicum* K. & V.; Java without locality: *Forbes 546 (BO);Pierre s.n.* (L); *De Vriese s.n.* (L); *Herb. Var. Bot. s.n.* (L); *v/nknown collector s.n.* (L).

Cult, in Hort. Bog.: many collectors (BO, L, P).

PHILIPPINES. Palawan. Puerto Princesa: *Cenabre 29161* (P), Taytay: *Merrill 92161* (P); Palawan without known locality: *Merrill 2098* (BM, BO, P).

CELEBES. Manado, Minahassa, Bivak near Pandok Pingsay, Koejawatoe: *Koorders 18853$* (BO, P) and *18854$* (BO, P).

MOLUCCAS. E. Ceram, G. Kilia, Kiandarat: *Bwvalda 5643* (L), fl. Aug.; ibidem: *NIFS bb25840* (L).

NEW GUINEA. Manokwari, Pami-Koloniaatie: *NIFS bb 15881* (BO, L) and *bb 15885* (L); Warnapi: *NIFS bb 33609* (BO, L); Arifi: *BW 489* (L) buds Febr.; ibidem: *BW 2215* (L), fr. Oct.; Sidai *BW 1802* (L); Oransbari: *BW 2605* (L), *BW. 2617* (L); Momi: *NIFS bb 33529* (L), *bb 33539* (L), *bb 33456 (-= Kostermans 257)*

(L), buds Aug.; Nabire: *Kanehira 4- Uatmima 12875* (A, BO, L), buds MaJ; Hollandia, Berap: *NIFS bh&8999* (L); Hydrographers Range: *Uoogland S854* (L), budB Sept.; without known locality: *Zippel 141* (L), *143* (L).

Field notes: *Altitude:* from sea-level up to 200 m throughout, the area; in Siam, Java and Sumatra records from up to 1600 m. *Habitat:* primary (secondary) forests; rainforests; on loam, clay, sandy clay, sand, "red soil", volcanic tuff; scattered in forest or in small groups. *Trees,* 15—55 m high, first branch 10—40 m high; diameter at 1.75—2.25 m height: 20—80 cm, just below the first branch: 15—45 cm, stem rather straight; bark rough to smooth, not fissured, without lenticels, little peeling, slightly cracked, grey, dirty or purplish grey or black; living bark 10—20 mm, dirty white to pale straw, with a little white latex. Wood white, straw or yellow, with faint sour scent and a little white latex. *Leaves* dark green, with translucent secondary and tertiary nerves. *Flowerbuds* brownish green, green, light green, yellowish or yellow-white, sour. *Pedicels* and outer *calyx* dirty green. *Corolla* and filaments white to milky white, anthers light yellow to dirty straw. *Pistil* light yellowish green, ovary with long white hairs. *Juvenile fruit* light brown tomentose or with green apex and below covered with white hairs, sour, with white latex.. *Ripe fruit* fleshy, light green to butter-coloured without, light yellow to white within; sweet, but sickly and slimy tasting; testa brown to black without, brown within; albumen glossy white.

Remarks: Since the specific epithet *lanceolatum* Blume (1826) is an older valid name than *roxburghii* G. Don (1838) this wellknown species has to be named *Chrysophyllum lanceolatum* (Bl.) DC. (1844) even though the name *C. roxburghii* 6. Don is an older combination.

There may be distinguished three varieties, which are also geographically more or less different, though partly overlapping. The type variety ^ found in Java, Borneo, Philippines, Celebes and New Guinea; var. *stellatocarpon* is found on the continent, BongKong, Hainan, Sumatra, Riouw-archipelago and Billiton, and var. *papuanum* is reported from eastern New Guinea and the Solomon Islands. There are, however, some large fruits known from the continent, which are nearly intermediate between var. *stellatocarpon* and the type variety, but always their lateral sides are concave. I have not seen fruits from India, but some authors describe them as 5-ribbed, which agrees with our concept of the variety. As for the var. **papuanum,* a specimen came to hand from the neighbourhood of one of the localities reported for this variety by White, which showed to be the var. *lanceolatum.*

Key to the varieties

1a- Fruits up to 6 cm in diam., seeds 3.5 cm long, 1.5 cm wide. var. **papuanum White**
b. Fruits up to 4.0 cm diam., seeds 2.5 cm long or less, up to 1.2 cm wide . . 2
2a* The fruit globose or slightly 5-angled, lateral sides convex . . var. **lanceolatum**
b. The fruit distinctly 5-winged, -star-like in transverse section, lateral sides concave **var.** stellatocarpon **v. Boyen**

Var. **lanceolatum**

Fruits globose, sometimes slightly 5-angled in transverse section,

lateral "sides convex, 1.5—4 by 1.5—4 cm. Exocarp hard and dry, thick, especially between the cells.

Distr.: Java, Borneo, Philippines, Celebes, New Guinea.

BORNEO. S. and E. Borneo, E. Koetai, Sg. Susuk Region: *Kostermans 5537* (L); Loa Haur, W. of Samarinda: *Kostermans 6928* (L);' Pcgatan, Pint. Tanah Labang: *Delmaar 60b* (BO); Tanah Boemboe, Baroe: *NIFS bb 13824* (= *Verhoef Z.O.B. 1 — 95)* (BO), fr. Jan.

JAVA. W.-Java, Depok: *BevmSe 6019* (BO, L), fr. April; Tjampea: *Koorders 30413 &* (L), fr. July; G. Salak: *Koorders 24347 &* (L), fr. Sept.; ibidem: *Blume 775* (L), *leoto-type-spedmen of Nycterisition lanoeolatum* Bl.; Tjiandjocr, Takoka: *Koorders 15331$* (BO, P), fr. Febr., *87256$* (L), fr. Oct.; M.-Jffava: Tjilatjap, Noesa Kambangan: *Koorders 80319 $* (BO), fr. June; E. Java: Besoeki, Banjoewangi, Rogodjampi-Balak: *Koorders 22440$* (BO); *without locality, unknown ooll. Jl.L.B. 232* (L).

PHILIPPINES. LUZOn, without known locality, Gurran: *For. Bur. 17803* (P), fr. Jan.

CELEBES. LOCWOO, Malili, Kawata: *NIFS V-192* (L), fr. Oct.; P. Moena: Raha, Wasalangka: *NIFS bb 21333* (L), fr. Aug.

NEW GUINEA. Manokwari, Ransiki: *NIFS bb33270 (= Soehandanda llham 22)* (L), fr. July; Morobe Distr. Yalu, near Lac: *Womersley N.G.F. 3297* (K, LAE), fr. July.

Var. stellatocarpon v. Royen nov. var. — A typo fructibus in sectione transversum asteriforme recidit.

Fruits globose, but in transverse section star-like, with rounded wings, in some cases only 5-angled, but lateral sides always concave, 1.5—3 by 1.5—3 cm, in some cases the seeds showing.

Type specimen: *NIFS T.I.P. 744* in L.

Distr.: on the continent, Ceylon, HongKong, Hainan, Sumatra, Riouw, Singapore, Billiton.

CEYLON, without known locality: *C. V. 2689 IThwaites?)* (BM).

THAILAND. Rachasima Korat: *Kerr 8173* (BM); Rachasima (Korat) Bukanum: *Kerr 9864* (BM); Krabi Kaw, Pipi, 100 m alt.: *Kerr 18883* (BM).

LAOS. Kilo, 20 km on the road from Savanna-tiket to Quang Fri: *Polaine 11798* (P).

ANNAM. Prov. du Kantum, Massif de Ngok Guga, near Dak To: *Polaine 35674* (L, P), fr. May.

CAMBODJA: PI. du Gambodge: *Bejeaud 50* (P).

COCHIN CHINA. Saigon, ad pagum go'vap: *Pierre 1507* (BM, BO, FI, L, P), fr. April; Mont Bavi: *Pierre 1507* (P).

HAINAN, without known locality: *Wang 34505* (P), fr. Oct.

HONG KONG. Wongncichung: *Ford 21612* (BM), fr. Jan.

MALAY PENINSULA. Malacca, Sungei Udang: *Fl. of Sing. 1739 (coll. Goodenouffh)* (BO); Singapore, Bukit Timah For. Res.: *Sinclair 8.F. 40200* (L); ibidem: *Fl. of Sing 2756 (coll. "Ridley)* (BM, BO, L); without known locality: *Maingay 980* (L), *Griffith* s.n. (BM).

SUMATRA. Asahan, Mahisi Fbr. Reserve: *Krukoff 4156* (L), fr. Oct.—Nov.: Palembang, Banjoeasin and Koeboe Region, near Banjoenglintjir: *NIFS T. 1. P. 744* (BO, L), *type-specimen of C. lanoeolatum (Bl.) DC., var. stellatocarpon v. Boy en;* Ramas: *Grashoff 1080* (L).

Riouw. Karimocn, Bockit Djeloentocng: *NIFS bb20765* (L), fr. April.

BILLBPON. Aer Mcrah: *NIFS bb 23987* (L), fr. March; Simpang roosa: *NIFS bb 23939* (L), fr. March.

Remarks: Blume did not describe the fruit, but as lie described the speeies from Java, which is covered by the area of var. *lanceolatum* and falls outside the area of the var. *stellatocarpon,* it seems very likely that his specimen was having the more rounded fruits and not the

winged ones. When drawing up his description of the genus *Nycterisition* he writes "fructus carnosus" which does not agree with the fruit of var. *stellatocarpon.* Moreover Blume labelled the sheet *H.L.B. 232: "**Chrysophyllum lanceolatum Alph. DC; Nycterisition lanceolatum** £/."* and this sheet is bearing a fruit of the more globose type.

Var. **papuanum** White, Journ. Arn. Arb. 31, 1, 1950, 105—106.

Fruits 6 cm in diam., seed 3.5 by 1.5 cm.

Type specimen: ***Dadswell, Smith & White N. G.F. 1545*** **(LAE,** J<0; no fruits seen by me.

Distr.: the E. part of New Guinea and Solomon Islands.

NEW GUINEA. **Buna Hinterland, 7 miles NW of Embi Lakes:** ***Smith N.G.F. 1869*** **(LAE, L); Yalu:** ***Lane Poole 614*** **(BO); Lae:** ***Dadswell, Smith 4- White N.G.F. 1520*** **(LAE).**

SOLOMON ISLANDS. **Beaufort Bay:** ***Walker BSIP 884*** **(K, L),)**

Remarks: No fruit was seen by me. About var. *lanceolatum* in the area of this variety see "Remarks" of that variety.

Lam (Nova Guinea, 14, 1932, 557) described *Niemeyera papuana* provisionally as a new species, but already pointed out that the fruits did not match the description on the label given by Lane-Poole. The leaves belong to *Chrysophyllum lanceolatum* and it is practically certain that the fruits belong to *Dysoxylnm* spec. (Meliaceae). So the fruit and the vegetative parts of the type specimen *(Lane-Poole 614)* do not belong together. White selected the fruit from this specimen as the type of *Niemeyera papuana,* which name falls now in the synonymy of *Dysoxylon* spec.

4. C. novoguineense Vink nov. spec. — *Pag. 67 and fig. 1.*

Branchlet terete, 2.5 mm in diam., dark brown, glabrous. Only 3 *leaves* Present: one young leaf, oblanceolate, 10 by 3.3 cm, apex obtuse; two Mature leaves, one obovate, 18.5 by 7.8 cm, apex slightly acuminate, acumen 5* 0.5 cm long, the other one elliptical, 14 by 6.6 cm, apex broken off; }*i all leaves base cuncate, decurrent; with remains of ferruginous-sericeous ^dumentum on either side, turning grey, longer persistent below, dull on either side, chartaceous; midrib flat above, very prominent below, second-ai 7 nerves, 9, 10 and 11, ascending at an angle of 60°—70°, curved or slightly curved, diminishing near margins, faint to very faint above, pronunulous below, tertiary nerves ca perpendicular to midrib reticulate, near Margins reticulation more or less irregular, very faint to nearly inconspicuous above, very faint below; petiqjes 1.8 and 2.3 cm long, flattened above, funded below, indumentum as lamina. *Inflorescences* 13- and 16-florous, |n the axils of leaves?; pedicels 2.5—2.8 mm long, light brownish to brownish grey sericeous, bracteoles basal. *Sepals* 5, elliptical-ovate, 2.2—2.5 "V 2—2.8 mm, light grey to brownish grey sericeous on either side, inner °nes with a glabrous border along fimbriate margin on either side. *Corolla* shortly exsert, 2.5—3 mm long, glabrous, tube 1—1.3 mm long, lobes 5, elliptical, 1.5 by 1.3—1.4 mm, apex rounded. *Stamens* 5, inserted just below corolla throat, filaments cylindrical, ca 0.5 mm long, anthers ovoid, °a 0.6 by 0.4 mm, apex obtuse; base slightly cordate. *Disk* cupuliform,

ea 0.6 mm high, ca 0.2 mm thick, **oppressed** to ovary, lower half thinly greyish sericeous, upper .hail[1] densely shortly **greyish** villou.s. ***Ovary*** conoidal to ovoid, ea 0.7 by 0.8 mm, glabrous, 5-celled, style tapering, ea 0.5 mm long (apex broken off?), glabrous, stigma (?) flattened, ca 0.3 mm in dimn.

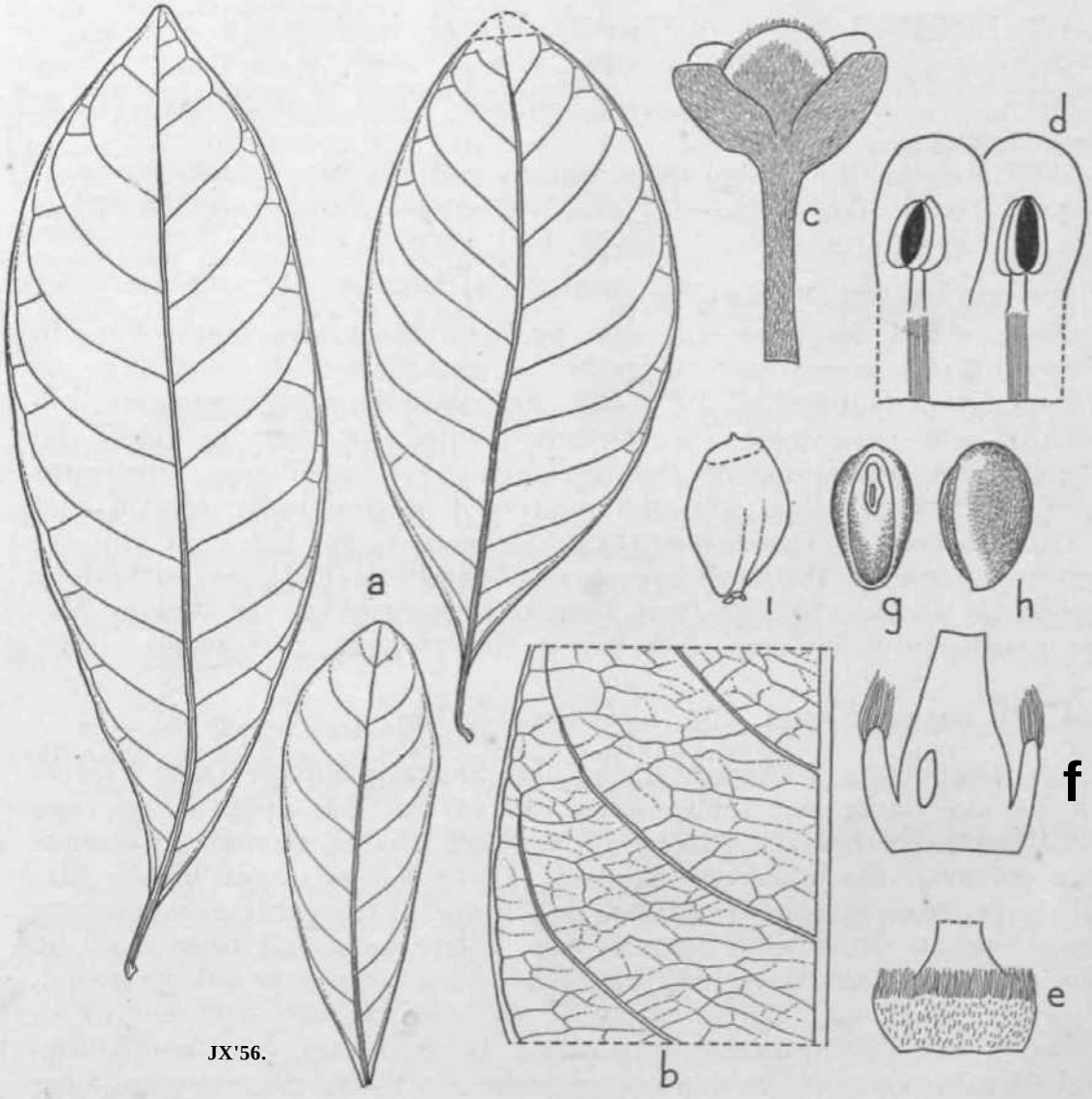


Fig. 1. *C. novoguinmw,* a. Icsivr-s (Mi X), b- leaf-nervation (100? [c]- **pediew** and calyx (5 *X)?* d. part *of* the corolla (10 X), & [1]*k und ovary (10 *X),* *• crosa-soi-t inn **through** o., g. and li. seed from two sides (IX), i. fruit (IX)- (from *Bt'ccari g.*n<|

Fruits ohovoid, **17**—18 by **10**—11 mm. **apes** rounded, crowned with the remains of the style on a 4—6 mm in diam. **lightbrown** circular area, **base** acute **with** minute remains of disk and villi. **glabrous,** brown or yellowish and purplish brown, **pericarp thin,** papyraceous **when** dry, seeds one, obovoid, ea 16 by 10 by 9 mm, apex rounded, base rounded, testa

thick, glabrous and nitidous without, darkbrown, along scar brownish yellow, scar lateral, ca oblanceolate, ca 15 by 5 mm, apex acutish, base rounded, albumen copious, cotyledons thin, flat, obovate to elliptical, radicle cylindrical, ca 1 mm long.

Type specimen: *Beccari* (annot. Pierre: *no 184)* in P; Ply River.

I) istr.: New Guinea.

5. 0. papuanicum, (Pierre) v. Royen, Blumea 8, 2, 1957, 426 — C. *f papuamcum* Pierre Not. Bot. Sap., 1890, 30, *nom. nvd.* — *Planchonella papuanica* Pierre ex Dubard, Ann. Mus. Col. Marseille, 20, 10, 1912, r>9, Not. Syst. 2, 1913, 133; H. J. Lam, Bull. Jard. Bot. Buitenzorg, sér. 3, 7, 1925, 217; H. J. Lam, Nova Guinea 14, Bot. 4, 1932, 561, t. 113 — *ReccarieUa papuanica* Pierre ex Krause, Bot. Jahrb. 58, 1923, 483 — *B. Papuanica* Pierre, 1. c, 30, *nom. nud.* — *Sideroxylon papuamcum* Boerl. Hand. PI. Ned. Ind., 2, 1, 1891, 312, *nom. nud.*

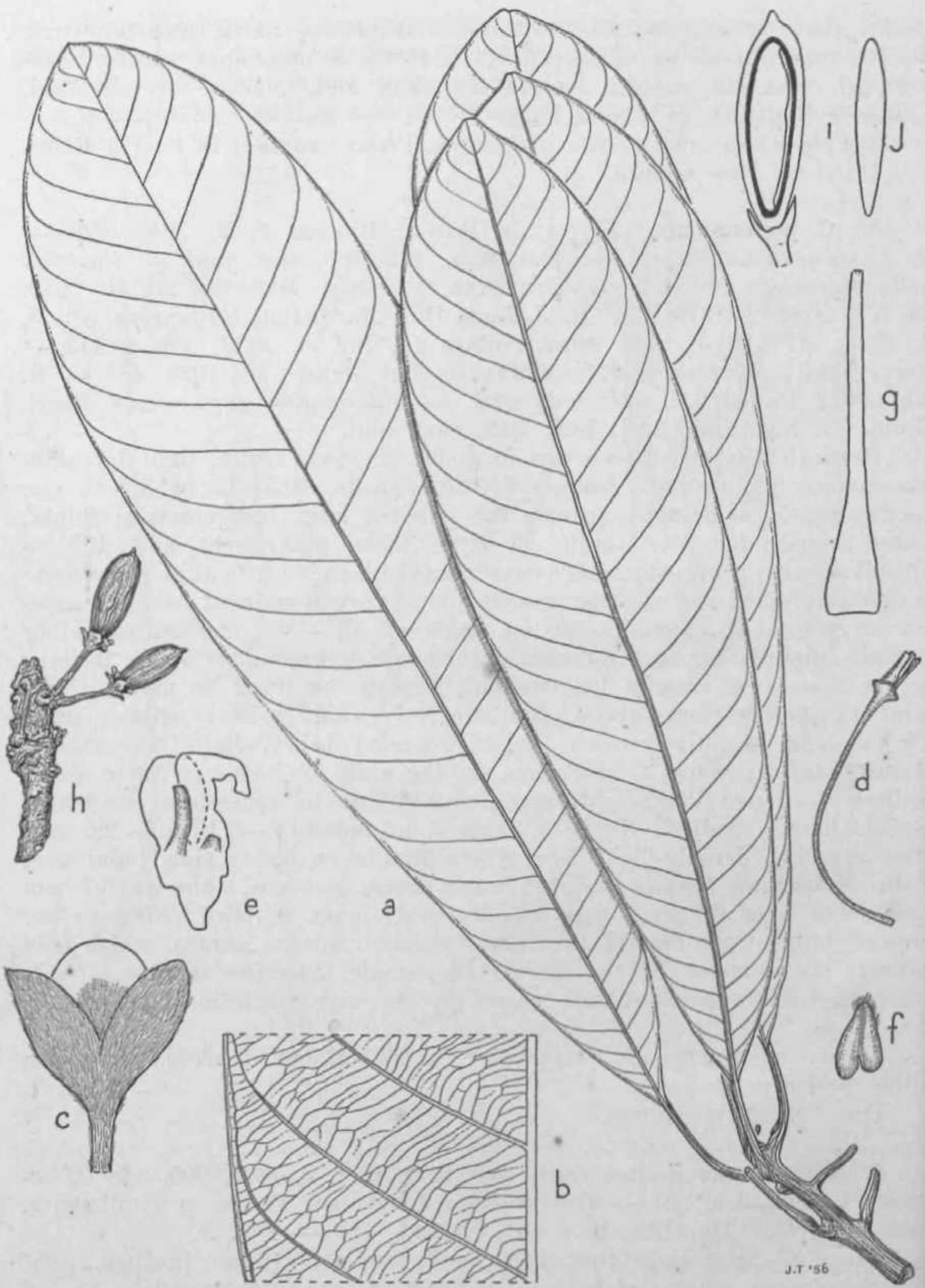
Branchlets terete, 2—1.5 mm in diam., greyisch brown, light ferruginous hirsute, glabrescent. *Leaves* diffuse, obovate, 10.5—15 by 4.5—6 cm, apex abruptly acuminate, acumen 0.5—0.8 cm long, base cuneate; thinly, along midrib densely, hirsute on either side, glabrescent and dull to flitidulous above, indumentum longer persistent on midrib, thin coriaceous; midrib impressed and slightly crested above, very prominent below, secondary nerves 6—9, ascending at an angle of 70°—80°, curved to rather straight, diminishing near margins, faint above, prominulous below, tertiary Carves transverse, nearly longitudinal, slightly recurved to midrib, very faint to inconspicuous above, faint to very faint below; petioles 0.7—1-5 cm long, slightly concave above, rounded below, light ferruginous-hirsute. *Inflorescences* 2—5-florous, in the axils of leaves or their scars; pedicels 1—2 mm long, light ferruginous-hirsute to -tomentose; bracteoles 1—3 at base of pedicel. *Sepals* 5, ovate to rotundate, 2—3 by 1.5—2.5 mm, apex rounded, densely light ferruginous-hirsute on either side, basal part Skbrous within. *Corolla* about 1.5 mm long, glabrous, tube ca 0.7 mm *&> lobes 5, ca 0.7 by 1 mm, broadly ovate, apex rounded. *Stamens* not present, only at the base of the tube 5 epipetal minute organs, which may indicate the stamens. So the flowers are female. *Staminodes* none. *Fruits* unknown; albumen abundant according to an annotation on one of the sheets.

Type specimen: *Beccan350* (A, PI), Ramoi, f 1. Aug., fruit with edible pericarp.

Distr.: New Guinea.

6. C. balansae Baillon, Bull. Soc. Linn. Par. 2, 1891, 900, non *C. balansae* Baillon, I.e. 901 — *Ochrothalkis t balansae* Pierre ex Guillaumin, Ann. Mus. Col. Marseille, 2me s&\, 9, 1911, 185 — *Fig. 2.*

Trees, 8—15 m high. Branchlets stout, terete, 6—12 mm in diam., light brown sericeous, quickly glabrescent. *Leaves* obovate to oblanceolate, 15—48 by 6—18 cm, apex acute and broadly acuminate to obtuse, acumen up till *-5 cm long, base slightly asymmetrical, obtuse to cuneate, shortly de-(-urient, margin often undulate; glabrous above, yellowish to brownish grey sericeous below, firmly chartaceous; midrib near apex minutely, near base



Pig. -. <'. *bohnis.ti,* ;i. **branehlet** with **leaves** (VJX), **b. leaf-nervation** (1 X), c. rulyx (i>X)i d. **pedicel with remainders of** ili<- corolla ('-% X)> e. remainders of **the** only «oroila **knows** (•"'X)> **f« anther,** *g.*]>istil (5 X)» !•• l*ranehlet with fruits I'/iX). 4- **longitudinal section of fruit** (IX). j- **MM (IX)**- **C«-i b., d. and h.** from I « *dhtrd W,* '•., <•., *t* urn! **gf. fawn** JJ«bni.j(O 2801, **i. timl j, from *Bit la MM 18££).***

strongly impressed,; crested, or only minutely crested above, very prominent below, secondary nerves 20—25 (—30), ascending at an angle of 55°—70°, straight, diminishing near margins, faint above, prominent below, tertiary nerves transversely reticulate, very faint; petioles 2—4.5 cm long, canaliculate above, rounded below, ferruginous-sericeous, quickly glabrescent. *Inflorescences* up to 10-florous, in the axils of leaf scars; pedicels 6—12 mm long, thinly light brown sericeous, becoming greyish, glabrescent; bracteoles 1—3 at base of pedicel. *Sepals* 5, ovate, 3—3.5 "by 2—3.5 mm, apex rounded to obtuse, base slightly orbiculate, densely light brown ferruginous-tomentose without, especially the inner ones with a glabrous border along margin, glabrous within. *Corolla* badly known, lobes 5 (?). *Stamens* 5 (?), inserted in corolla-throat, anthers ovoid, ca 2 by 1.3 by 0.8 mm, apex obtuse, shortly fimbriate, base cordate. *Staminodes* none. *Ovary* conoidal, ca 2 by 1 mm, glabrous, 4—5-celled; style tapering, ca 7 mm long, glabrous; stigma minutely dentate. *Fruit* obovoid, 22—31 by 8—11 by 4—9 mm, apex rounded, crowned with the ca 1 mm long remains of the style, base narrowed and often curved, purplish black, apex brown, glabrous, dull, pericarp ca 1 mm thick, brown and dull within, calyx persistent, seeds one, oblong obovoid, 18—26 by 6—9 by 3—7 mm, testa ca 0.2 mm thick, purplish to dark brown without, purplish, light brown longitudinally veined within, scar oblanceolate, 12—20 by 2—6 mm, apex rounded, base narrowly cuneate, yellowish brown, dull, cotyledons flattened, albumen noarly none.

Type specimen: *VieiUard 18* in P.

Distr.: New Caledonia.

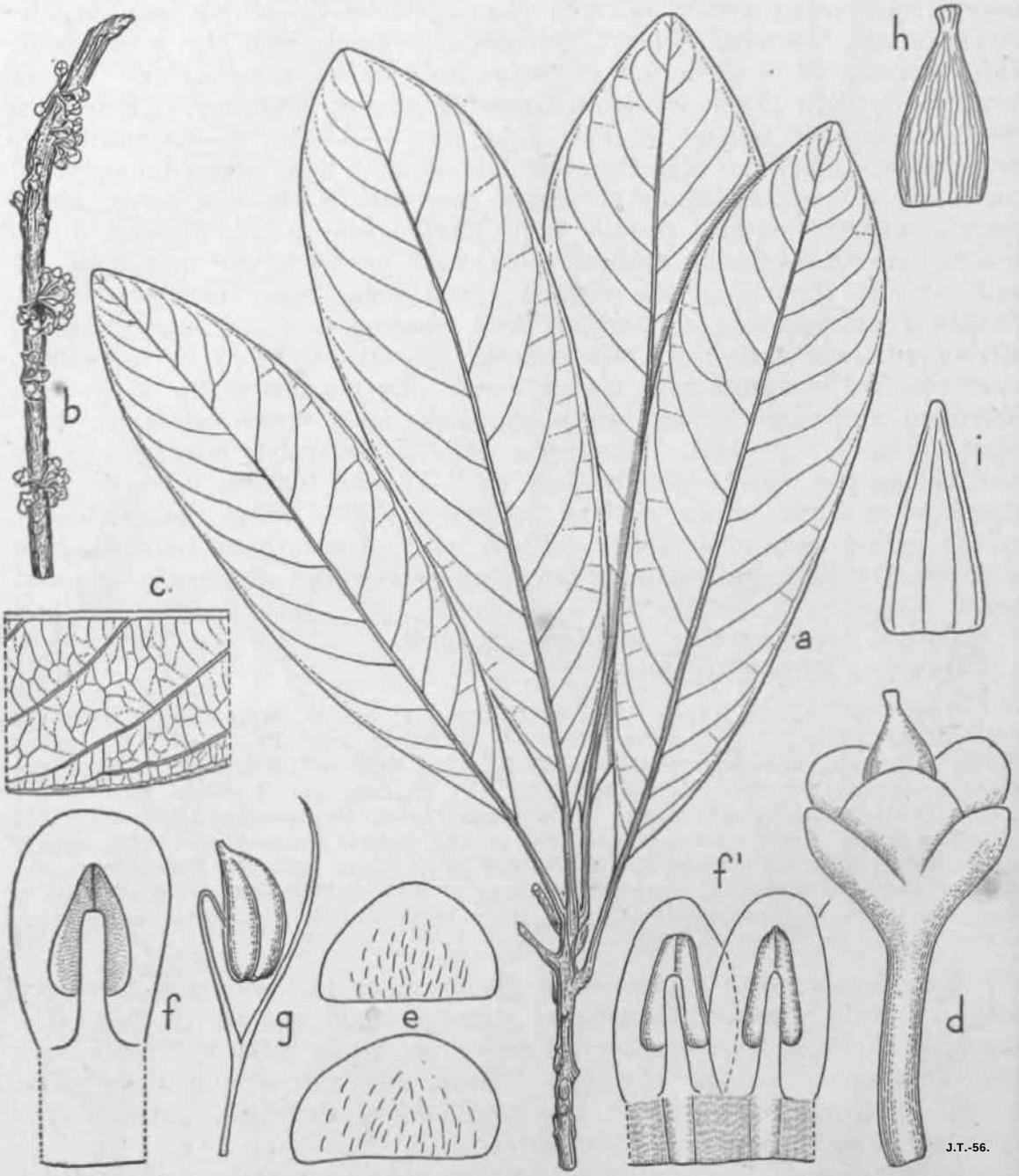
NEW CAUEDONIA: Wagap (ace. to Baillon I.e. on the mountains of Balade): *Vieillard 18* (BM, P), fr.; Farino: *Panoher et Sibert s.n.* (P); Eiv.f Thi, gallary forest, 100 m alt., limestone: *Guillaumin 4r Baumann 719S* (Z), 5 m high; West of the missionary near Port Bouquet: *Balansa 1888* (P) fr. Oct., tree, 1—15 m high, forest; Quinng Quell-mountains, 900 m alt., hydrophilous forest: *Gwllaumin $ Baumann 18968* (2), 6 m high: North of Conception, 550 in alt., forest: *Balansa 8801* (P), *cotype*, »ld fl. Febr.; without locality: *Sarlin S08, S09* (P), *Lecard 1SS* (P), *Lecard s.n.* (P); ibidem: *Baumann 15865* (Z), serpentine, 350 m alt., 10 m high; ibidem: *Gvillanmin 4* Raum 10186* (Z), hygrophiious* forest, 10 m high; ibidem: *Guillawmin #• Baumann 8979* (Z), 700 m alt., » m high.

Remarks: The statement of Baillon that this species is provided with 5 corolla-lobes and 5 episepal stamens could not be verified. The sheets of the type specimen carried only one corolla eaten by insects; the tube contained 5 strands. The sheet *Balansa 2801* carried only the remains °f one destroyed corolla with two corolla-lobes, the basal parts of two °pisepal filaments and one loose anther.

Baillon named two species *C. halansae.* As the species mentioned on P- 901 1. c. is inserted in *Pouteria,* the epithet *balansae* was reserved for the sPecies mentioned on p. 900 1. c. See under *Pouteria calomeris* (Baillon) Baehni, Blumea VIII, 2, 1957, 467—469.

Sarlin 308 and *309* having much smaller, thinly coriaceous loaves (7—17 by 2—7 cm) shorter petioles (1—2 cm) and more slender branchjets probably belong to this species, being identical in nervation and ^dumentum. They were regarded by Guillaumin (I.e.) as *Chryso-Phillum* species.

7. C. gordoniaefolium Moore, **Journ.** Linn. Soe. 45, 1920, 350; Vink, **Nova** (iuiiK'a N. S. 8, 1, 1957, 124 — *Trnpalanthe lamii* (luillaumin, Bull. Soe. Bot. Fr. 91, 1944, 72 — *Fig. 3.*



Yig. 3. *C. gonloirkirfolium,* a. branchk't with **leavae** *(Vi* X). **b*** branclilft **witl** inflorescences *(V>* **X) j c- leaf-awwition** *(%* **X)» i flower,** <-orolla **remored** *(JVJ'*X), **e.** aopiils {!'% X), f. and f. ptirt of **oorolb** (7V& X), g. lateral view of (., ii. **and** L pistil (7'ix).. (<L, f. and h. from buds), (a.—d., f. and i. from ***Vieffiard 988&,*** **el, f., g.** and **h. from tJomyton,** *1S6£).*

Trees, type specimen 9 m high. **Branehleta** terete, 3—6.5 mm in rliam., brown **or igrey,** greyish **brawn** .sericeous, **qaickly glabresoent.** ***Leaves*** *confined* to the tips of the branchlets, **oblong** to oblanceolate, 14—19.5 by

4---6.5 'cm, apex acutish to obtuse, base cuneate, minutely decurrent, margin minutely undulate; with greyish remains of indumentum especially along midrib on either side, glabrescent, nitidulous above, dull below, chartaceous; midrib impressed above, very prominent below, secondary nerves 10—14,. ascending at an angle of 50°—60°, curved to slightly curved, diminishing near margins, faint above, prominulous below, tertiary nerves transversely reticulate, recurved to midrib, very faint to inconspicuous on either side; petioles 1.5—3 cm long, canaliculate to flattened above, rounded below, with greyish brown remains of indumentum to glabrous. *Inflorescences* 2—22-florous, in the axils of leaf scars; pedicels 2.5—6 mm long, thinly whitish sericeous. *Sepals* 5, broadly ovate.to semi-circular, 1.5—2 by 2—3 mm, apex broadly rounded, glabrous or very thinly whitish puberulous without with a wide glabrous border along the margin, glabrous within. *Corolla* ca 6 mm long, glabrous, tube 2—2.5 mm long, lobes 6—8, obovate to elliptical, ca 4 by 2.5 mm, apex broadly rounded. *Stamens* 6—8, inserted in corolla throat, filaments flattened, tapering, tips recurved outwardly, ca 3 mm long, anthers ovoid, ca 2.2 by 1.3 mm, apex acute, base slightly cordate. *Staminodes* none. *Ovary* cylindrical, ca. 1—1.5 by 1.5 mm, glabrous, 5—8-celled, ovules inserted in lower half of the cells; style conoidal, 1.5—2.5 mm long, glabrous; stigma minute. *Fruits* unknown.

Type specimen: *Compton 1862* in BM.

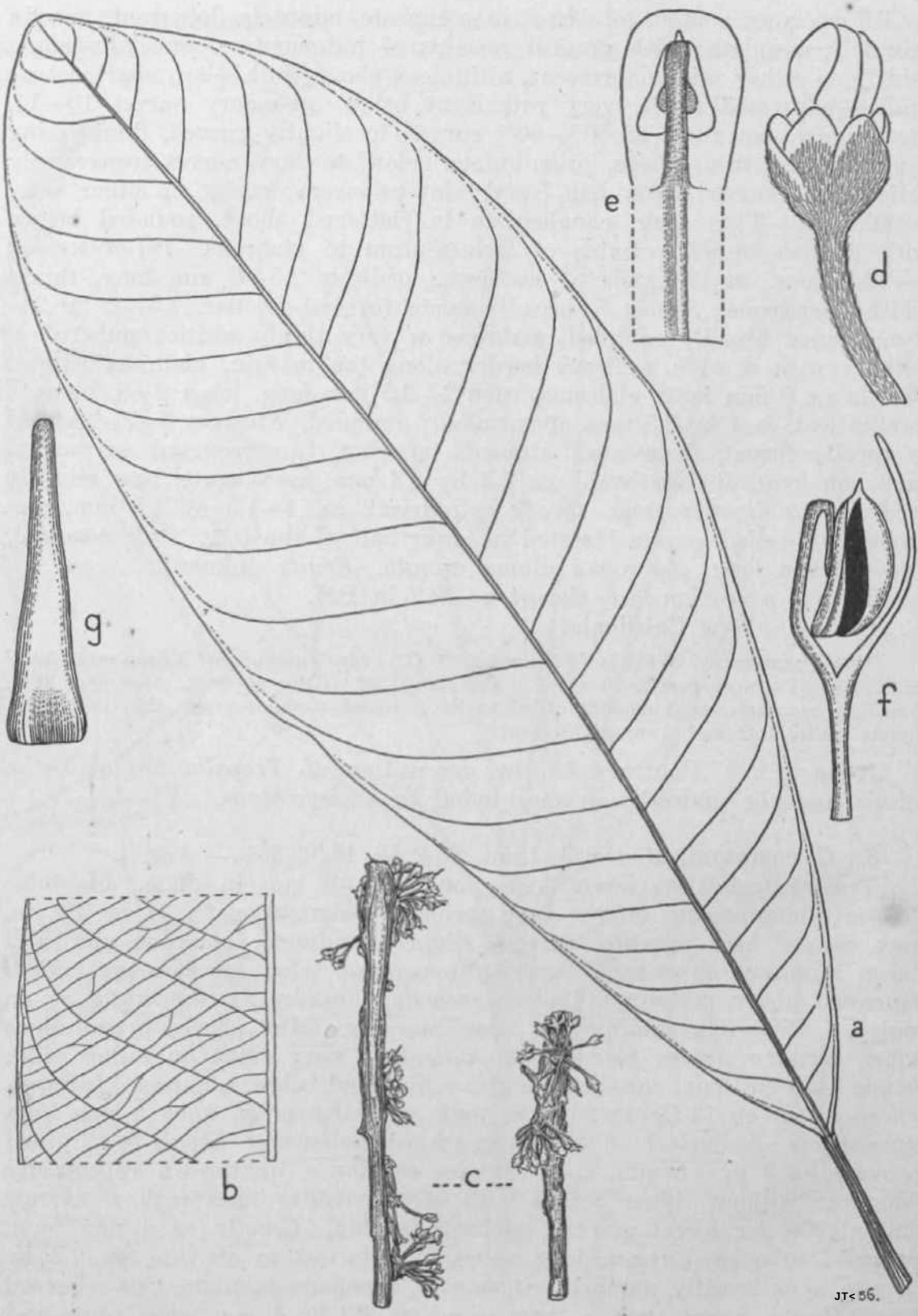
Distr.: New Caledonia.

NEW CAUSDONIA.: **Wagajo: *Vieillard 8885* (P), *type specimen of Tropalanthe lamiii* Guillaumin; Paompei forest, 30 m alt.: *Compton 1868* (BM), fl. Sept., tree 9 m high, sprcading branches, small amount of white latex, leaves medium green-, thin but stiff; lowers white, anthers brown, slight scent.**

Remarks: Contrary to the description of *Tropalanthe lamii* the corolla and the androecium were found to be isomerous.

8. C. comptonii Moore, J. Linn. Soc. 45, 1920, 351 — *Fig. 4.*

Trees. Branchlets terete, older ones 4.5—6 mm in diam., glabrous. The only leaf present on the type specimen oblong-obovate, 34 by 12 cm, apex obtuse, base cuneate, margin slightly undulate, glabrous and dull above, minutely appressedly greyish tomentose below, coriaceous; midrib ^pressed above, prominent below, secondary nerves 21, ascending at an aftffle of 65°—70°, diminishing near margins, faint above, prominulous bolow, tertiary nerves transversely reticulate, very faint on either side; Petiole 4—3 cm long, canaliculate above, rounded below, glabrous. *Inflorescences* up to ca 12-florous, in the axils of leafscars on a ca 5 mm high hemisphaere; pedicels .7—8 mm long, greyish pubescent. *Sepals* 5, elliptical to ovate, ca 2 by 1.5 mm, apex rounded to obtuse, lightbrown appressedly tomentose without, inner sepals with a wide, outer ones with a narrow glabrous border along margin, glabrous within. *Corolla* ca 4 mm long, glabrous, tube ca 1.8 mm long, lobes 5, elliptical to obovate, ca 2.2 by 1-5 mm, apex broadly rounded." *Stamens* 5, filaments subulate, tips recurved outwardly, ca 5 mm long, anthers ovoid, ca 1.3 by 1 mm, apex acute and acuminate, base slightly cordate. *Staminodes* none. *Ovary* prismatical, ribbed, ca 0.7 by 1 mm, glabrous, 5-celled; style tapering, ca 3.2 mm long. glabrous; stigma minute.



Kg. 4. *V. oomplonii,* a, loaf (% X)f b, leaf-nervation (Mb X), *•. branehes wil h infli.rcHcdncea C/JX), **cl. flower** (5X), <?. part of the corolla (10X)t *• **tafcera] vie**w **of CoroD»-pai1** ami **stamen** (10 X), K- I'^til (10 X)- (from *Campion 550,* a.—c. **afb**:r a photograph of this Hpwimen).

Type specimen: *Compton 550* in BM; Mont Mou, 550 m alt., damp stream-gully, limestone, leaves leathery, white flowers on main trunk; tree.

Distr.: New Caledonia.

9. C. sessilifolium Pancher & Sébert in Sébert, Not. Bois Nouv. Cal6d. 1874, 195 — *Ochrothallus sessiUfoUus* Pierre ex Guillaumin, Ann. Mus. Col. Marseille, 2me sér., 9, 1911, 186 — *Fig. 5.*

Smal trees, 8—10 m high. Branchlets terete with prominulous longitudinal ribs, greyish brown, ferruginous-woolly, glabrescent. *Leaves* crowded at the tips of the branchlets, some ones diffuse, oblanceolate, 12—34 by 4—10 cm, thinly coriaceous, apex rounded to obtuse, base rounded; densely brown woolly when very young, when mature glabrous and dull to nitidulous above, tomentum longer persistent on midrib, turning grey, densely brown woolly below, glabrescent; midrib minutely impressed and crested or flat above, very prominent below, secondary nerves 13—28, ascending at an angle of 60°—80°, curved, diminishing near margins, rather faint above, prominent below, tertiary nerves transverse, recurved to midrib, faint to inconspicuous above, prominulous below; petioles 0.5-S-1.5 cm long, densely brown woolly, glabrescent, slightly canaliculate or flat above, rounded below. *Inflorescences* up to multiflorous, in the axils of leaf scars or of leaves; pedicels 5—10 mm long, densely light brown woolly; bracteoles 1—3 at the base of the pedicels, 0(—1) along the pedicels. *Sepals* 5, compressedly ovate to ovate or (the inner ones) elliptical, 4—5 by 4—5 mm, apex broadly rounded, densely light brown woolly without, glabrous within. *Corolla* 6—7 mm long; tube 2.5—3 mm long, glabrous; lobes 8—11, obovate to elliptical, 3.5—**i** by 3—3.5 mm, apex broadly rounded and light brown fimbriate, the central longitudinal part densely light brown tomentose yithout, lateral parts glabrous, glabrous within. *Stamens* 8—10, exsert, inserted in corolla-throat, filaments filiform, tip recurved outwardly, 5—6 mm long, anthers ovoid, 1.5—1.7 by 0.6—1 by 0.4—0.5 mm, apex of ^ach theca minutely acuminate, base of anther slightly cordate, *pvary* ovoid to globose, 1.5—2 by 2 by 2 mm, densely light brown villous, 5-celled, ovules inserted in upper half of the cells; style cylindrical, tapering, 4—6-5 mm long, 1.5—2.5 mm from base as villous as ovary, upper part glabrous; stigma minute. *Fruits* unknown.

Type specimen: *Sebert et Fournier 76* in P.

Distr.: New Caledonia.

NEW CALJEDOXIA: Mont Pénai-i, in the woods, 700 in alt.: *Balansa S465* (P), tree 8—10 m high; Bois des Torrents: *Frame 1835* (P), fl. Dec., shrub; Prony, wooded "mountains: *Franc 1771* (P), young fl. Febr., tree; without locality: *8€bert et Fournier 7,f* (P); ibidem: *Baumann 14941* (Z), primary foifeat, 300 m alt., 8 m high; ibidem: *Baitmann 15*68* (Z), serpentine, 350 m alt., 10 m high.

Remarks: On examining the specimen *Franc 1771 (a)* among normal blowers some were found with more or less abortive stamens or ovary. In the least abnormal flower with 9 stamens, 1 stamen was somewhat, 1 stamen very much decreased in size of all parts. Another flower contained only 10 very abnormal stamens: filaments ca 0.25 mm long, recurved inwardly, anthers deformed, 0.3—0.5 mm long; the style was very short.


c
h
b
a
f
g
d
e
J.T '56.

In the most extreme case (see *fig. 5, f-g)* the corolla-lobes and the stamens varied in size and shape, most of the anthers being deformed or even failing, two filaments being inserted in the middle of the tube. In this flower the pistil seemed normal.

An insufficient number of flowers was examined to state statistically the variability mentioned. As for a variability of the same type in *Nesoluma*, vide H. J. Lam, Occ. Pap. Bishop Mus., XIV, 1938, 133.

10. C. wagapense (Juillaumin, Bull. Soc. Bot. Pr. 91, 1944, 69 — ***Fig. 6.***

Trees. Branchlets terete, 1.5—3.5 mm in diam., grey to darkbrown, glabrous. *Leaves* crowded at the tips of the branchlets, oblanceolate to subspatulate, 8—17 by 3—5.5 cm, apex broadly rounded to obtuse, base founded; glabrous and nitidous, chartaceous; midrib minutely impressed, crested above, prominent below, secondary nerves 8—16, ascending at*%n angle of 60°—70°, curved, diminishing near margins or connected with the next one by thickened tertiary nerves, faint above, prominulous below, tertiary nerves transversely reticulate, recurved to midrib, faint on cither sWe; petioles ca cylindrical, 0.5—0.7 cm long, glabrous. *Flowers* in the axils of leaves; pedicels filiform, 12—14 mm long, greyish brown tomentose, Slabrescent. *Sepals* 5, ovate to deltoid, 1(—2) by 1(—1.5) mm, apex acute, greyish brown tomentose without, lateral margins laying inside in bud with a glabrous border, glabrous within. *Corolla* ca 3 mm long, glabrous, tube ca 1 mm long, lobes (4—)5, elliptical to ovate, ca 2 by 1 mm, apex acute. *Stamens* (4—)5, inserted in corolla-throat, filaments subulate, straight in bpd, ca 1.5 mm long, anthers narrowly ovoid, apex acute and slightly bifide, base cordate. *Staminodes* none. *Ovary* subglobose, 5-lobed, ca 0.5 by 0.5 mm, glabrous, 5?-celled; style subulate, ca 2.5 mm long, glabrous; stigma minute. *Fruits* unknown.

Type specimen: *Vieillard 2901* in P; Wagap, basis of the fountains, tree.

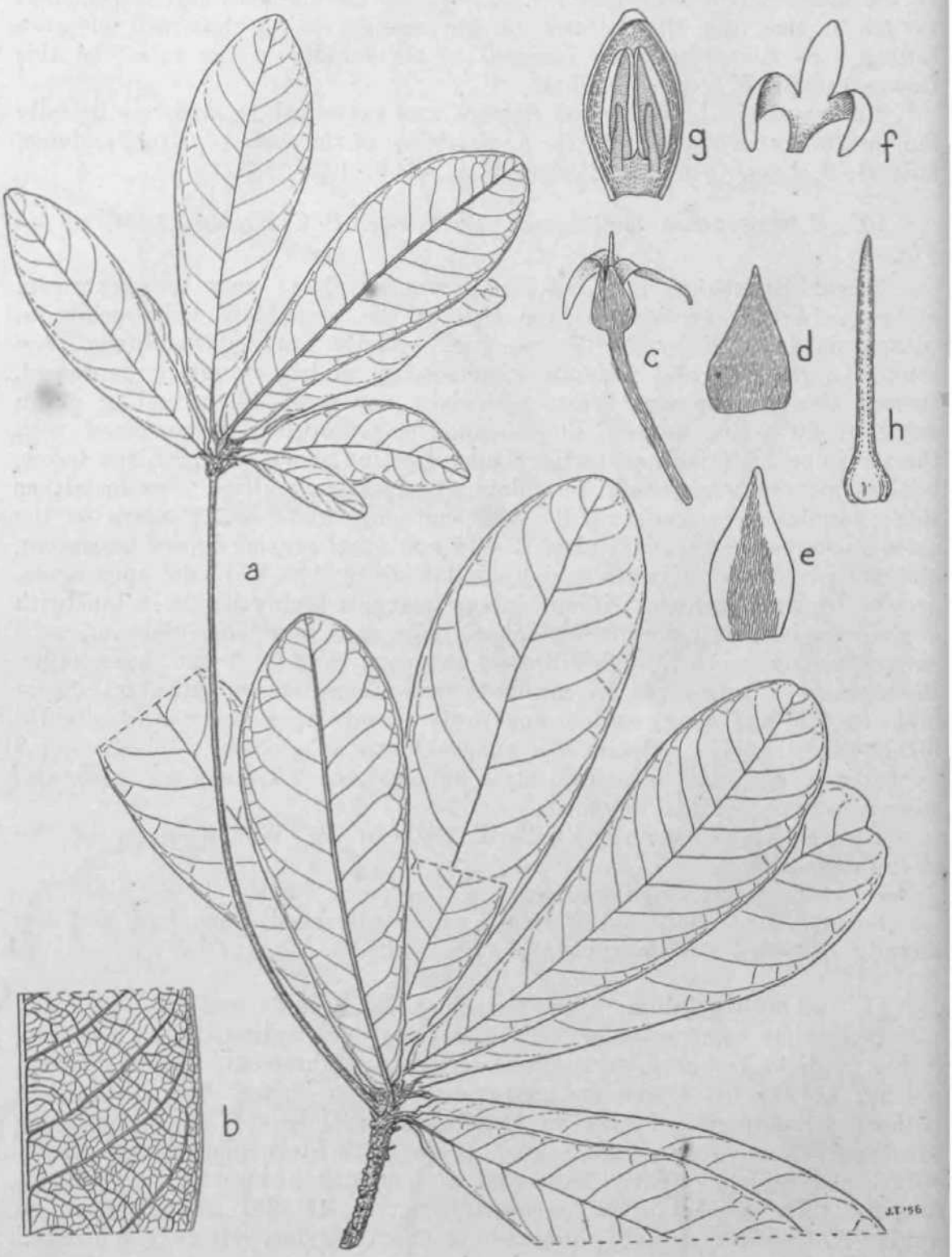
Distr.: New Caledonia.

Remarks: Only old flowers (corolla detached), one bud nnd one already dissected corolla could be examined.

11. C. multipetalum Vink, nov. spec. — *Pag. 68 and fig. 7.*

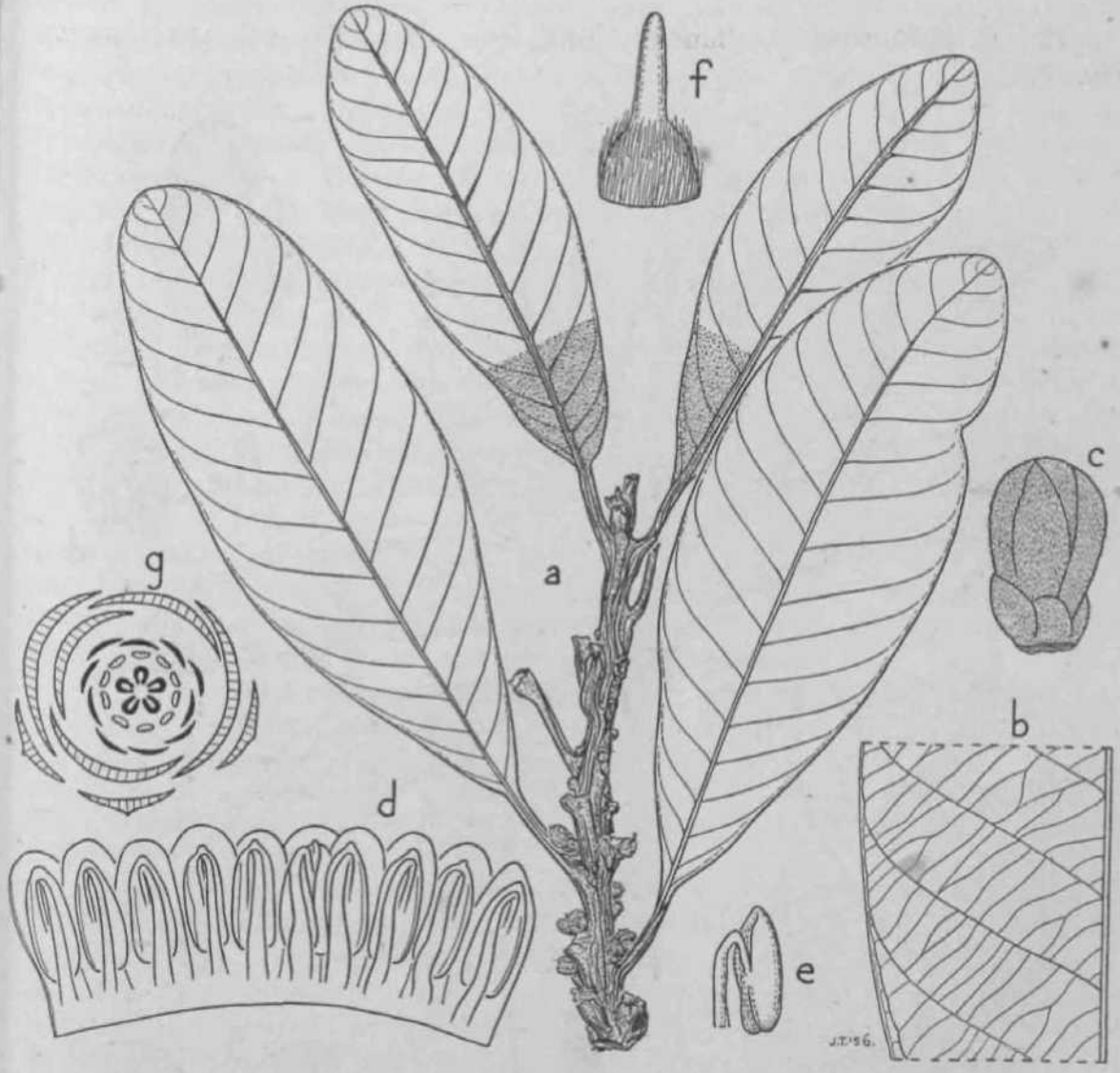
Branchlets subtrinngular by thick ribs, descending from leafbases, ; mm in diam., ashgrcy, ferruginous-sericeous, glabrescent. *Leaves* diffuse, oblong, 11—15 by 4—5.5 cm, apex rounded to obtuse, base cuncate to obtuse; ferruginous-sericeous on either side, glabrescent above, becoming nitidous, indumenturti turning grey below, ultimately glabrescent, firmly coriaceous; midrib slightly impressed and crested above, very prominent, longitudinally ribbed below, secondary nerves 11—18, ascending at an angle of 50°—60°, straight, diminishing near margins, minutely impressed

Fig. 5. *C. sessilifolium,* **a. brauchlct with leaves and flowers (% X)> b- Icaf-n«rvation (% X), <• sepal, indumentum partly figured (5 X), d. part of the corolla, °utsido (5X), e. part of the corolla, inside (5X)> f. irregular corolla** *{see text;* **GX)> ff. diagram of f., h. pistil (5 X). (a.—e. and h. from** *Franc 1835,* **f. and g.** *Franc 1771).*



Pi^-. 8. C. ***wagapenae,*** **a. branc&let** with leaves (%X)- **b- leaf-nervation (l'/j X)i c. flower, oorolla parti; destroyed** {iJX)i <J. oui<r **sepaj (10 X), fl. innei sepal** (10X)i I", **par!** ni' the onrolla, **crateide** (5 X). g- part «*' "1(1 **corolla** from bail (1<) X). U. **piflti** {10 X)- from ***VieiSard*** *£001).*

above, prominulous .below, tertiary **nerves transversely** reticulate, very minutely impressed above, **inconspicuous** below; petioles 1.5—2 em long. Hat trued with crested **midrib above,** rounded and with longitudinal ribs below as midrib. *Inflorescences 2*—-l-flonjus, in the axils of leaves or their **scars.** *Buds* sessile, **bracteoles** 3. *Sepals* 5, ovate **to** elliptical, **ca** 4.8—5.6



Fig, 7. *('.)i>vUipe1ahim,* a. Inan.-Met **with Dowers and bads** (Mt X)> **b.** leaf-nervation (IX), e. bud £2% X)i 3- corolla (5 X), *f.* **stamen** (5 X), f- pistil (o'X), 8- diagram, (from ***8&bi rt 4 Fowaier 77,*** **c,—g. after Pierre** ms from tlip same mei).

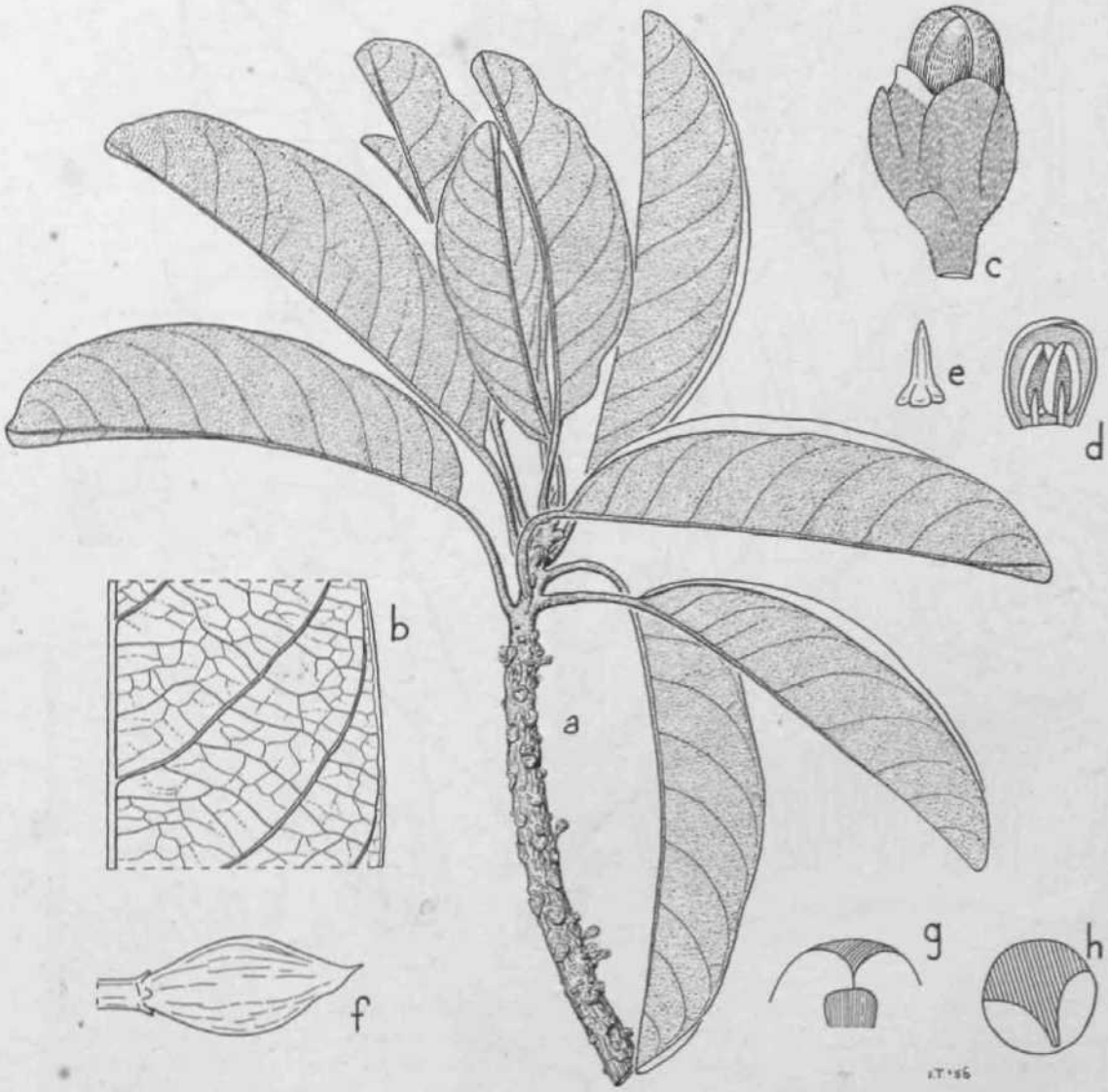
°*y* 2.4—6 mm. **apex** rounded, li^lit **Cerruginous-sericeoua without) glabrous** within. *Carotin* **ca 5.5 mm long, glabrous,** lobes 9—10, obovat<\ **broadly** '•""tided. *Stamens* 9—10, inserted just below **corolla throat, Eilamenta** sub-»te, tips **reeurved outwardly, anthers ellipsoidal to cylindrical, ;i|)(1* <>b-tuse to minutely acuminate, base** eon late. ***Ovary*** **dome-shaped, ferrugkLouB-villba, 5-celled,** ovules inserted in lower **half of the** cells; style **cylindrical,** glabrous**; stigma** minute. *Fruits* **unknown.**

Type specimen: *Sebert et Fournier 77* iu P, without known locality.

Histr,: Now <'tiledonia.

Remarks: The same number, but according to the **description** not the **same Specimen,** is mentioned as *Spermoftpis rutriyiiwsa* (iommier in Panrher & Sebert, Not. Bois Nouv. Caled., **1874,** 257.

12. C. gatopense Cnilluumin, Bull. Soe. Bot. Pr. 91, 1944, 69 — ***Fig.*** *8.*



Fi}*. 8. ***C. ffatopense,*** **a. bnmchlet** witli leaves and buds (\4X)(b« leaf-ncrvatiou (l'/iX)f **8"** *JU(1 (5X)> **d.** r[arl] °f **tfcfl** corolla, **from** bud (3 X)> ©« pistil, from Imrf (5X)j '• friiit (1% X)i)?- [ftri(^] h. sketch of the **apes of** i!u> wt'Oil, lateral and apical **view reap,** (from *l'\iUlard 88gS).*

Shrubs, 2—3 m **high. Branehlets** rather .stout, 5—7 mm in diam., grey, minutely dark ferruginous-sericeous when very young, turning *u;\vy,* **quickly glabiwcent.** ***Leaves*** oblong to oho vote, 7—13 by 3—5.5 cm, rounded, obtuse

to acute, base cuneate to obtuse, minutely decurrent, long smoke-grey sericeous above when very young only, very quickly becoming glabrous and nitidulous, minutely dark ferruginous-sericeous below, turning light-grey, glabresoent, dull, firmly coriaceous; midrib impressed above, very, prominent below, secondary nerves 8—14, ascending at an angle of 55°—70°, slightly curved to straight, diminishing near margins or sometimes connected by short thickened tertiary nerves, minutely impressed to inconspicuous above, prominulous to faint below, tertiary nerves irregularly transversely reticulate, recurved to midrib, very minutely impressed to inconspicuous above, faint to very faint below; petioles 2—3 cm long, ca cylindrical, minutely dark ferruginous-sericeous, very quickly glabrescent. *Inflorescences* 2—4-f lorous, in the axils of leaf scars;. only buds known; pedicels 1—2 mm long, ferruginous-puberulous; bracteoles 3—6 at base and 1—3 along pedicel, 0—1 just below the calyx, ovate, ca 0.5—1 by 0.5—1 mm, ferruginous-tomentose without, glabrous within. *Sepals* 5, rotundate to ovate, ca 2 by 2 mm, apex rounded, ferruginous-puberulous without, margins laying inside in but with a glabrous border, glabrous within. *Corolla* connate at base, glabrous, lobes 5, rotundate. *Stamens* 5, inserted at base of tube, anthers ovoid to ellipsoid, apex rounded, base slightly cordate. *Staminodes* none. *Ovary* conoidal, 5-lobed, glabrous, 5?-celled; style tapering, glabrous; stigma very minute. *Fruits* ellipsoid, ca 15 by 7 by 7 mm, apex acute, minutely mucronate, base acutish, dark greyish brown, minutely ribbed, glabrous, exocarp 1.2—2 mm thick; seeds °ne, obovoid, 9.5 by 7 by 7 mm, apex broadly rounded, base obtuse, testa nearly chartaceous, purplish brown, scar covering a lateral half of the Seed, 9.5 by 7 mm, apex emarginate, base rounded.

Type specimen: *Vieillard 2892* in P.

I) istr.: New Caledonia.

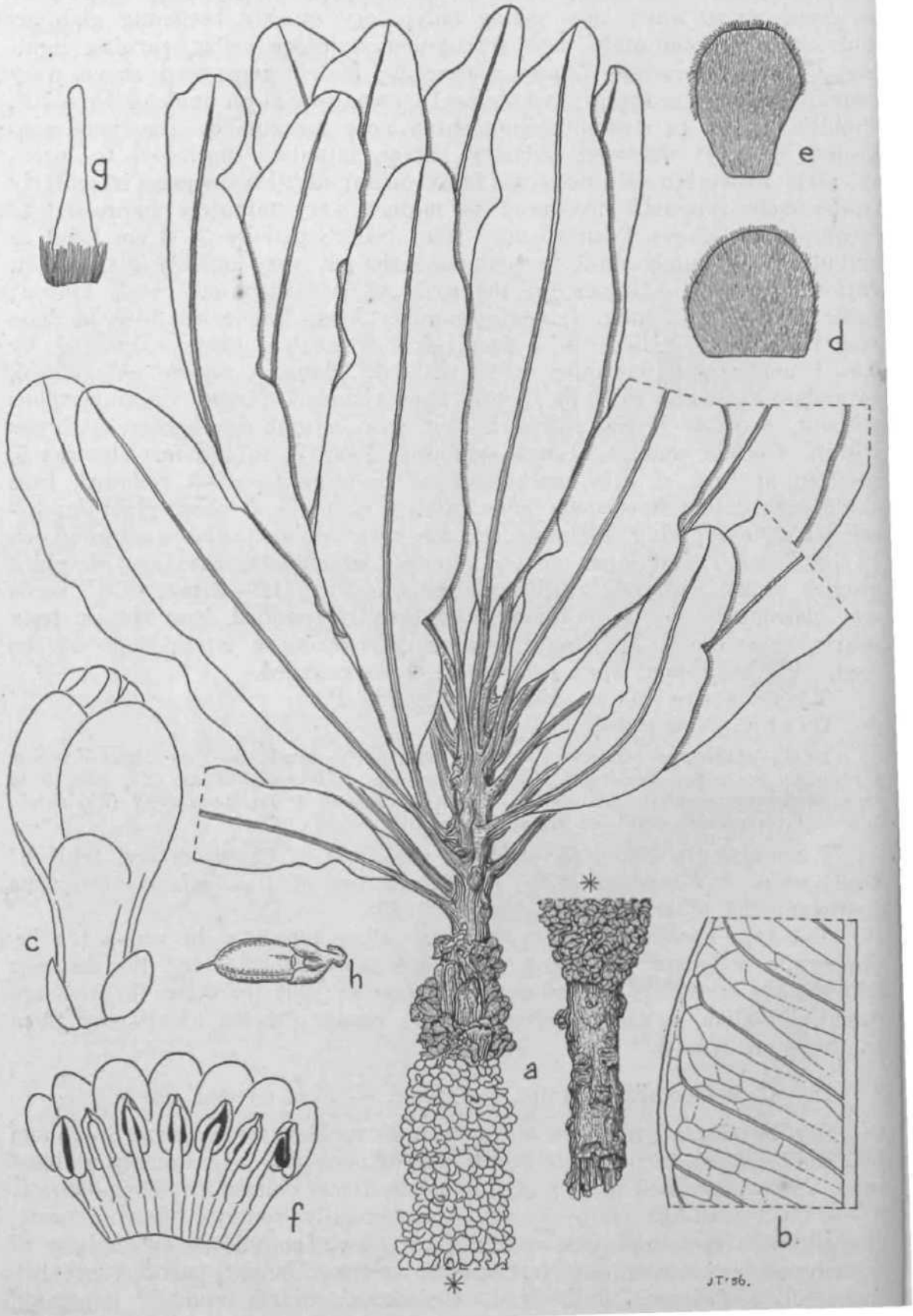
New CAI^DONIA: Gatope: *Vieilllard 2892* (P), slujub, 2—3 m high, branches spreading; S. bridge Rivière d. Lacs: *Guillaumin $ Bawmam, 6732* (Z), tree, 3 m high, serpentine, scrub on riverbank; ibidem *Guillaumin $ Bawtnann 6748* (Z), shrub, ^ m high, serpentine, scrub on riverbank, fr. Oct.

Remarks: The description of the fruit is based on one fruit of *Guillaumin & Bavmann 6748,* the description of the buds on the type specimen, the other specimens being sterile.

The type specimen differs from the other numbers, in which the indumontum is longer persistent, the leaves more obovate, and the distance between the secondary nerves generally smaller; but the other features are essentially alike, so there seems to be no reason for not identifying them af* the same species.

13. C. heteromerum Vink, nov. spec. — *Pag. 68 and fig. 9.*

Shrubs or small trees, 1—10 m high. Branchlets terete, stout 8—15 mm 111 diam., greyish to purplish brown, ferruginous-sericeous, quickly glabres-jterit. *Leaves* confined to tips of branchlets, linear-oblong to oblong-obovate, 8.5—17.5 by (2.5)3—4.5 (—5) cm, apex broadly rounded, base cuneate, slightly decurrent, glabrous and nitidous above, on midrib or on base of fiudrib greyish tomentose, ferruginous-sericeous below, turning greyish, Ultimately glabrescent, dull, firmly coriaceous; midrib minutely impressed


g
e
d
c
h
a
b
f
JT·56.

and slightly to prominently crested above, very prominent below, secondary nerves 21—31, ascending at an angle of 70°—85°, straight, archingly joined, very faint to minutely impressed above, prominulous to faint below, tertiary nerves descending, near margin irregularly, near midrib longitudinally reticulate, between every two secondary nerves a tertiary nerve running subparallel to these and at the middle of the leaf often nearly indistinguishable from- them; petioles 1—3 cm long, canaliculate between two crests above, rounded below, ferruginous-sericeous, quickly glabrescent. *Inflorescences* multiflorous, in the axils of leaf scars; pedicels 2—3 mm long, ferruginous-sericeous; bracteoles 3—8 at base and along pedicel, one bracteole inserted just below calyx. *Sepals* 5(—6), ovate, inner ones often elliptical to obovate, 3—4.2 by 3—4.2 mm, apex broadly rounded, ferruginous-sericeous without, glabrous within. *Corolla* only known from buds, in bud ca 5 mm long, glabrous, tube ca 3 mm long, lobes 5—7, elliptical to obovate, ca 2 by 1.5 mm. *Stamens* 5—7, inserted just below the middle of the tube, filaments subulate, apex recurved outwardly, anthers narrowly ovate, apex acute or minutely bifide, base slightly cordate. *Staminodes* none. *Ovary* conoidal, ca 1.5 by 1.5 mm, tapering into style, ferruginous-villous at base, glabrous, 5-celled, ovules inserted in lower half of the cells; style tapering, ca 4 mm long, glabrous; stigma minute. *Juvenile fruits* obovoid, 10—12 by 6 mm, apex rounded, base acutish, style persistent, greyish to Purplish brown, glabrous, dull, pericarp ca 0.8 mm thick, seeds one, ob-°void, testa papyraceous, scar lateral, albumen none, cotyledons fleshy.

Type specimen: *M. et Mme Le Rat 2952* in P.

Distr.: New Caledonia.

NEW GAUEDONIA. Mont Dzumac: *M. et Mme Le Bat £958* (P), tree of 8—10 in; top-rogion of Mt. Dor6, alt. 750 m, serpentine scrub: *Vvrot 210* (P), exposition NE, shrub, 1.5 m high, candle-formed; latex white, abundant, flowers white, fl. June; ibidem: *Panclier s.n.* (P), (sec remarks); ibidem, "Gipfel-wald", alt. 750 m: *Ouillaumin # Baumam 11398* (Z), shrub, 1 m high; Vulcan, alt. 900 m, serpentine: *Baumann 8071* (Z)» 3 m high, juv. fr.

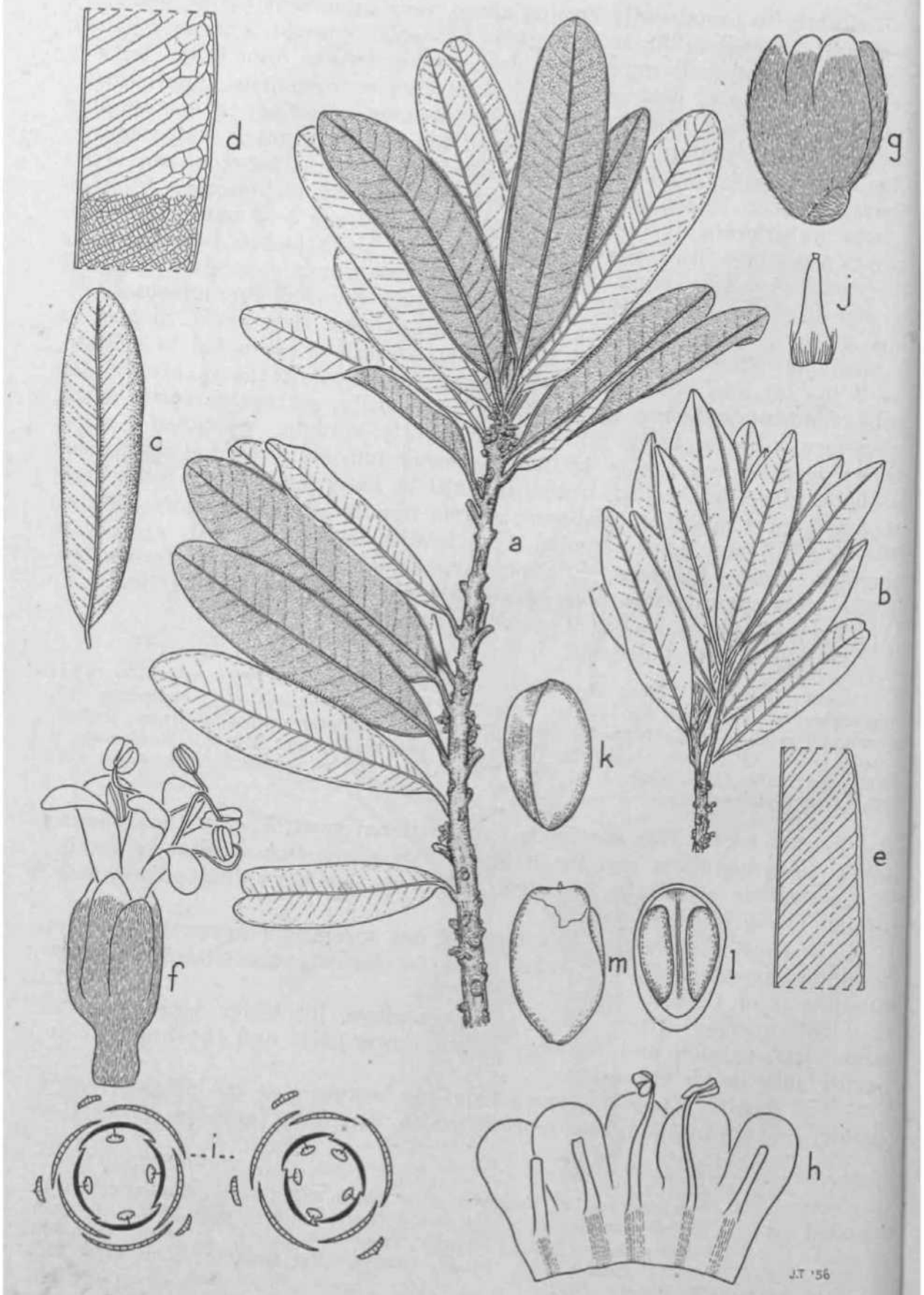
Remarks: This species is a transitional type between the 5-merous genus *Chrysophyllum* and the 6—10-merous genus *Ochrothallus* «by having a *£*>—7-merous corolla in the same specimen, thus providing an argument to the union of these genera.

The sheet *Pancher s.n.* is a mixtum, one specimen representing *Chryso-Phyttum lissophyllum,* the other *C. heteromerum;* the attached flower-analysis is of *C. heteromerum.*

This species differs from *C. lissophyllum* by wider leaves, stouter hranchlets, petioles and pedicels, larger flower-parts and the bracteole inserted just below the calyx.

The specific name is derived from the feature that the parts of calyx, corolla and androecium are represented in inconstant numbers.

Fig. 9. *C. heteromerum,* a. branchlet with leaves and flowers, the latter partly sketched (½ ×), b. leaf-nervation (1 ×), c. bud, indumentum not drawn (5 ×), d. outer sepal (5 ×), e. inner sepal (5 ×), f. corolla, from bud (5 ×), g. pistil, from old flower (5 ×), h. young fruit (1 ×). (a.—f. from *Le Rat 2952,* g. from *Virot 210,* h. from *Baumann-Bodenheim 8071*).


d
g
j
c
a
b
k
e
f
m
l
i
h
J.T. '56

14. C. lissophyllum Pierre ex Baillon, Bull. Soc. Linn. Par. II, 113, 1891, 903 — C. *peninsulare* S. Moore, Journ. Linn. Soc. XLV, 1921, 352 — *Fig. 10.*

Shrubs, up to 3 m high. Branchlets terete, 3—6 mm in diam., light brown, grey or black, ferruginous-tomentose, turning light grey, glabrescent. *Leaves* oblong to linear-oblong (to oblanceolate), 4—15 by 1—3.5 cm, apex rounded to nearly acuminate, base cuneate and slightly decurrent, margin flat to recurved, reddish to brownish sericeous or villous when young, when mature glabrous and nitidous or dull above, below indumentum longer persistent, turning smoke-grey, glabrescent, coriaceous; midrib crested, often impressed above, very prominent below, secondary nerves 15—25, ascending at an angle of 55°—70°, straight near margins archingly joined, minutely impressed to invisible above, faint to very faint below, tertiary nerves near midrib ca parallel to secondary ones, near the margins forming an irregular lax reticulation, minutely impressed to invisible above, very faint to nearly invisible below when leaf glabrous; petioles 0.7—1.2 cm long, canaliculate above, rounded below, ferruginous-, turning ash-greyish sericeous or villous, glabrescent. *Inflorescences* up to 45-florous, flowers sessile or with up to 2 mm long pedicels, ferruginous-sericeous; bracteoles 3—16, only 0—1 along pedicel. *Sepals* 5, elliptical to ovate, 1.4—2.8 by 1—2.2 mm, apex rounded to obtuse, dark brownish to ferruginous-sericeous without and, especially the inner ones, with an up to 1 mm wide glabrous border along margin, glabrous within. *Corolla* 3.5—5 mm long, glabrous, tube 1.7—2.2 mm long, lobes 4—6, elliptical, 1.8—2.3 by 1.3—1.8 mm, apex rounded. *Stamens* 4—6, inserted just below corollarthroat, filaments subulate, 2.1—2.5 mm long, anthers ovoid, ca 1.3 by 0.6 mm, apex minutely acuminate, base cordate. *Staminodes* none. *Ovary* conoidal to ovoid, 0.5—1 by 1—1.3 mm, with some basal ferruginous villi to densely ferruginous-villous all over, 4—5-celled, ovules inserted in the lower half of the cells, style tapering, 1.5—2 mm long, glabrous; stigma very minute. *Fruits* (of type-forma) ellipsoid-obovoid, 15 by 8—10 by 8—9 mm, apex flattened, crowned with the remains of the style, base obtuse, light brown to Purplish black, glabrous and nitidous, pericarp 0.1—0.4 mm thick, light brown and nitidous within; seeds one, ellipsoid-obovoid, ca 14 by 9 by 9 mm, apex flattened, base obtuse, testa ligneous, ca 0.3 mm thick, light brown and nitidous without, brown and nitidous, whitish longitudinally veined within, scar lateral, obovate, ca 12.5 by 8 mm, apex broadly rounded, base obtuse, dark brown and dull, hilum longitudinal, ca 10 by 2 mm, brownish white with central longitudinal dark brown line; albumen none; cotyledons thick, fleshy, radicle minute, double-trapezoid.

Type specimen: *Balansa 1823* in P.

Distr.: New Caledonia.

Fig. 10. *C. lissophyllum* f. *lissophyllum*, f. flower (7% X), j. pistil (7% X) (from *Balansa 1828*), k. and l. seed from two sides (1% X) (from *Balansa 988*) — *C. obsourinerve*, b. branchlet with leaves and buds (% X), e. leaf-nervation (1% X) — *C. longifolium*, a. branchlet with, leaves and buds (% X), c. leaf, upper side (% X), d. leaf-nervation (1% X), g. calyx of sessile flower (7% X), h. corolla (7% X) (from *Franc 1938*), i. two diagrams (from *Bammann-Bodenteim 11859*).

Key to the f ormae

1.a. Secondary nerves nearly to quite invisible above . . . . f. obscurinerve
b. Secondary nerves minutely impressed above; if not, then always distinguishable by a lighter colour 2
2.a. Young leaves reddish ferruginous-sericeous below; leaves 4—8 cm long; pedicels 1—2 mm long . . . . . f. lissophyllum
b. Young leaves brownish fcrriiginous-villous below; leaves 9—*In* cm long; flowers sessile . . . . . f. longifolium

Forma **lissophyllum**

Leaves linear-oblong, margins recurved, reddish ferruginous-sericeous below when young; secondary nerves minutely impressed above, if not, then always distinguishable by a lighter colour; pedicels 1—2 mm long.

Type specimen: *Balansa 1823* in P.

Distr.:, New Caledonia.

Mont Coumboui (Dent de St. Vincent), ca 700 m alt.: *Balansa 2802* (P), old fl. April, shrub, 2—3 m high; Mont Hum-bold, ca 500 m alt., "terrains ferrugiuaux": *Balansa 1823* (P) fl. Sept.; Mont Mi, "terrains ferruginaux": *Balansa 988* (P).

Forma **obscurinerve,** Vink, nov. forma

Folia oblonga, marginc haud vel leviter recurva, juvenilia subtus indumento rubescenti-ferrugineo sericea; nervi secundarii inconspicui vel subinconspicui; flores pedicello 1—2 mm longo suffulti.

Typus: *Balansa 3149* in P.

Gatope: *VieMard 2893* (P); Mont Poume, "terrains e*ruptifs": *Balansa 314!)* (P), fl. May, shrub, 2 m high.

Forma **longifolium,** Vink, nov. forma

Folia lineari-oblonga, margine recurva, juvenilia subtus indumento brunneo-femigineo villosa; nervi secundarii supra leviter impressi, si non a colore pallidiori semper distincti; flores sessiles.

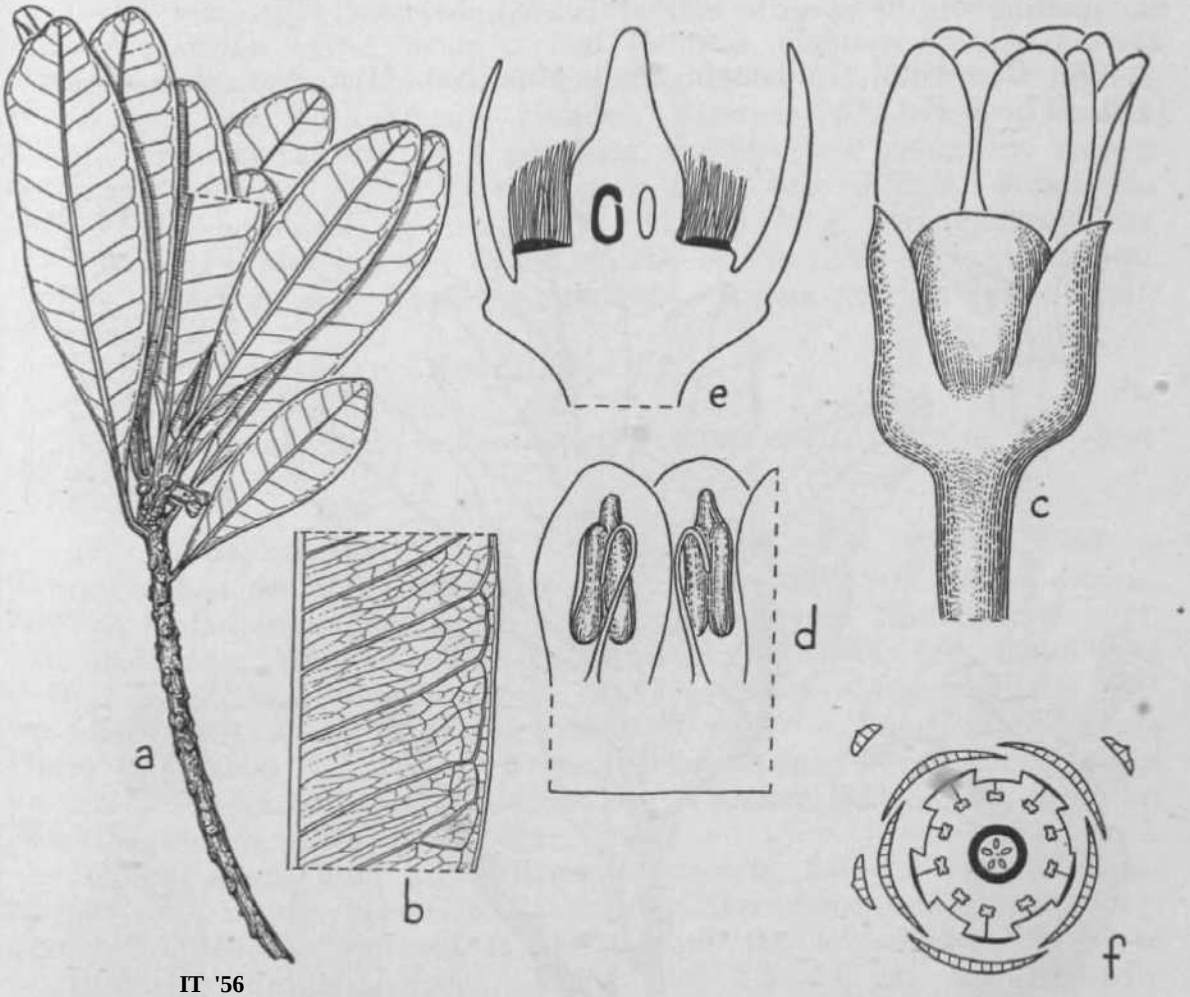
Typus: *Franc 1938* in P.

NEW CALEDONIA. Peninsula of Bogota, ca 500 *m alt.*, occasional in serpentine scrub: *Compton 1340* (BM), *type-specimen of Chrysophyllum peninsulare S. Moore,* fl. June, leaves light green, covered with red-brown pubescence when young, flowers on old wood, corolla white, petals rolled back, anthers exserted; Mont Dore, 500 m alt., forest: *Guillaumin $ Baumann 11359* (Z), buds March, shrub, 1 m high; Route de Yate", 300 m alt., serpentine: *Guillaumin 4" Baumann 10736* (Z), buds F-ebr., shrub 3 m high, Pie des Pins, serpentine: *Gvillaumin & Baumann 12016* (Z), buds April, shrub 1 m high; Prony, Bois des Torrents: *Frame 1938* (P), fl. March, shrub *2*—3 m high; unknown locality: *Guillaumin 8357* (Z), shrub 2 m high; *Guillawmim, $ Bawmann 11593* (Z), buds March, shrub 1 m high; without known locality: *Pancher s.n.* (P); *Baumann 1141* (Z); *Vieillard 28931* (BM); Mt. Dor6, 400 m alt.: *Me Kee 2460 (L,* P), fl. May, shrub 1.5 m high, leaves light green above, grey-green below, flowers white.

15. C. **litseiflorum** ((ruillaumin) Vink nov. comb. — *Ochrothalhis litseaeflorus* Guillaumin, Mém. Mus. Nat. Hist. Nat., nouv. sér., B, IV, I, 1953, 46 — *Fig. 11.*

Shrubs, ca 1.5 m high. Branchlets terete, 4 mm in diam., dark-brown, glabrous. *Leaves* confined to the tips of the branchlets, oblanceolate, 6.5—8.5 by 2—2.5 cm, apex rounded, base acute and decurrent, glabrous, dull

to nitifiuhm.s **above, nitidous** below, **thinly coriaceous; midrib** flat or minutely impressed, sometimes **slightly crested above,** very **prominent** below, secondary' nerves 15—17, **ascending** at an angle of 60°—70°, straight, near margin archingly joined, rather faint on either side, tertiary **nerves descending, ea longitudinally,** near **margin irregularly** reticulate, **faint on either** side; petioles ea 1 em long, flattened above or **with** crested midrib, rounded below, **glabrous.** *Iv florescences* 2—3-florous, in the axils



IT '56

Fig. 11. *C. Ktaeiflorum,* **a. braaefctet with leaves** ami flowers (^ X). ⊱ **Leaf-**nervi Ltion (ii/jX)- **C. flower** (.10 X), d- I[1]*'* **«f** tlic **corolla (10 X), <• tongitndina]** secti **DO through** flower, ***zaxoOa* remored** (10 X), **f-** Jiagrttm (from *Pirot lt&*).

(J I]e;ives; pedieels 4—7 mm long, glabrous; braeteoles 2—3 at **base of Pedicels,** 0-1 **ea** halfway of **them,** *Sepals* 5, broadly elliptical **to** nearly **circular,** 1.6—1.8 **by** 1.7—1.8 mm, apex rounded, **glabrous.** ***CoroUa*** ea **3** mm **""ig, glabrous; tube** ea 1 mm long; lobes 10, biseriate, elliptical, **ea** 2 by 1:5 nun, apex rounded. ***Stamens*** 10, inserted in **corolla-throat; filaments subulate,** ca **1.5** mm long, tips **recurred** outwardly in **young flowers,** anthers Narrowly OYoid, ca **1.4** by 0.5 **by** 0.4 nun, apex **broadly** acuminate, **acuna** en '•i **0.3** mm long, base cordate. *Disk* table-shaped, **hypogynons, ea 0.5** mm nigh and **0.5** mm ^ide, at its flattened top **bearing Long ferruginous** villi.

Ovary cylindrical, ea 1 by 1 by 1 mm, glabrous, 4—5-celled, ovules inserted in the middle of the cells; style conical, 1.5—2 mm'long, glabrous; stigma minute. *Fruit* unknown.

Type specimen: *Virot 1280* in P.

1) istr.: New ('alcdonia.

NEW CALJSDOKIA: Summit of the dome of the Ti&baglie, alt. ca 600 m, serpent im scrub, exposition \\.: *Virot l£80* (P), shrub 1.50 m high, flowers greenish white, fl. Oct.

Remarks: In accordance with the rules of the Code of Stockholm the spelling of the **specific epithet** is changed here.

16. C. sarlinii Cuilhuimin, Bull. Mus. Nat. Hist. Nat., 2me se>., 22, 1950, 117 — *Fig. 13.*

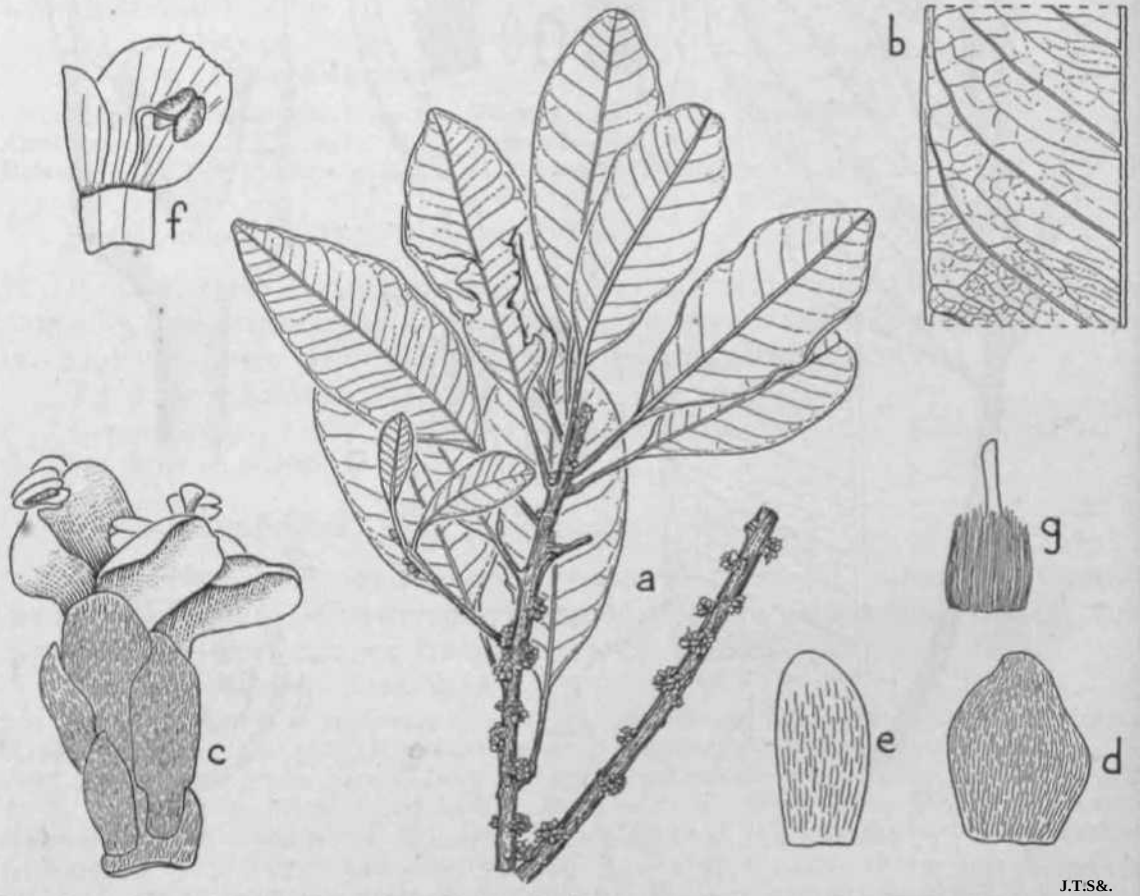


Fig. 12. *C. Hitrlinii,* a. hrauchlet with loaves and flowers (^ X), b. loaf-nervation (I'/iXh 6. flower (10 X), d. -""I e, sepuls, outside (10 X), *t* part of the corolln (10 X), *g*- pistil (10 X)- ([froni] *<'**« *[fi7])-

Branchlets terete, 3.5—6 mm in diam.. purplish brown, **becoming** greyish brown when older, **with** rests of minute brown puberulous **hairs** on tips, glabrescent. *Leaves* confined to the tips of the branehlets, elliptical to **obovate,** 5—8.5 by 2.5—3.5 cm, apex obtuse to rounded, base cuneate, slightly decurrent; glabrous and nitidulous above, minutely liglilbrown sericeous below, thinly coriaceous; midrib impressed above, very prominent below, secondary nerves 10—15, ascending at an angle of 60°—65°, straight

diminishing near margins and connected with next one by thickened tertiary nerves or archingly joined, often both types in the same leaf, rather faint above, faint to prominulous below, tertiary nerves irregularly reticulate, the most prominent ones often more or less parallel to secondary nerves, faint to very faint on either side; petioles 1.1—2.4 cm long, near lamina canaliculate, near base with crest above, as midrib minutely longitudinally ribbed below. *Inflorescences* 2—20-florous, in the axils of leafscars or of leaves, flowers sessile, bracteoles 1—2. *Sepals* 5, ovate to obovate, 1.3—1.8 V 1—1.5 mm, apex rounded, light ferruginous' to light brown sericeous without, margins laying inside in bud glabrous, glabrous within. *Corolla* 2 mm long, glabrous, tube ca 0.5 mm long, lobes 5, circular to elliptical, ca 1.5 by 1 mm, apex broadly rounded. *Stamens* 5, inserted in corolla-throat, filaments filiform, ca 1 mm long, tip recurved outwardly, anthers ovoid, ca 0.7—1 by 0.5 by 0.4 mm, apex acute, base cordate. *Staminodes* none. *Ovary* conoidal to globose, ca 0.7 mm long, ferruginous-villous, (4r—)5-celled, ovules inserted in the middle of the cells; style cylindrical, slightly tapering, ca 1 mm long, glabrous; stigma very minute. *Fruits* unknown.

Type specimen: *SarUn 167* in P.

Distr.: New Caledonia.

NEW CALEDONIA: **Route de Yate": *Sarlin 167* (P), slender high tree, with cobalt-ttue latex.**

17. 0. deplanchei Baillon, Bull. Soc. Linn. Par. 2, 1891, 899 — ***Chrysophyllum parvifolium* Schlechter, Bot. Jahrb. 39, 1907, 225 — *Chrysophyllum*** *leptocladum* (Baillon) Guillaumin in Lecomte, Not. Syst. 2, 1911, 103; ibid. Ann. Mus. Col. Marseille, 2me sér., 9, 1911, 185, Guillaumin et Beauvisage, Ann. Soc. Bot. Lyon 38, 1914, 100 — *Chrysophyllum floribundum* Moore, Journ. Linn. Soc. 45, 1920, 351 — *Trouettia leptoclada* Pierre ex Baillon, 1. c. 945 — *Trouettia parvifolia* Pierre ex Schlechter, 1. c. 225 — *Planchonella leptoclada* (Baillon) Daniker, Beibl. Viert. Jahrschr. Nat. Ges. Zürich, 1933, 354 — *Fig. 13.*

Shrubs, up to 3 m high. Branchlets terete, 2.5—4.5 mm in diam., greyish or purplish brown to dark grey, ferruginous-sericeous, quickly glabrescent. *Leaves* confined to the tips of the branchlets, obovate to elliptical (to elliptical-oblong), 3.2—12 by 1.5—3.9 cm, apex broadly funded to acutish, base cuneate; densely ferruginous-sericeous when young, quickly glabrescent, nitidous above, indumentum longer persistent ?n midrib, turning grey, densely light ferrugineous-sericeous below, turning ash-grey, in.some cases quickly glabrescent, coriaceous; midrib slightly ^pressed, flat or slightly crested at leafbase above, prominent below, secondary nerves 9—15, ascending at an angle of 40°—50°, straight, archingly joined near margin, minutely impressed above, very faint to ^conspicuous below, tertiary nerves descendent, ca parallel to secondary one ll il ' il y d iiibl h i y ones, laxly reticulate, minutely impressed to invisible above, inconspicuous below; petioles 0.3—0.6 cm long, ferruginous- to brownish sericeous, flattened above, rounded below. *Inflorescences* up to many-florous, in the axils °' leafscars or of leaves; pedicels 2—3 mm long, densely ferruginous-sericeous; bracteoles 2—3 at base of pedicel. *Sepals* 5, elliptical, 2—3.3

by 1.3—1.4 mm, apex rounded, ferruginous- to dark brown sericeous without, margins of inner ones with narrow **glabrous border,** minutely **EhnbtaWJ** glabrous **within.** *Corolla* 3—3.5 mm long, tube 0.7—1 mm long, **glabrous** or ferruginous-sericeous along petal-strands without, lubes 5, elliptical, nearly ovate or narrowly **obovate,** 2—2.3 by 1—1.8 mm, apex rounded, ferruginous to dark brownish sericeous with glabrous border along margin without, **glabrous** within. ***Stamens* 5,** inserted in or just below corolla-throat, filaments subulate, when young with a sharp carve inwards between

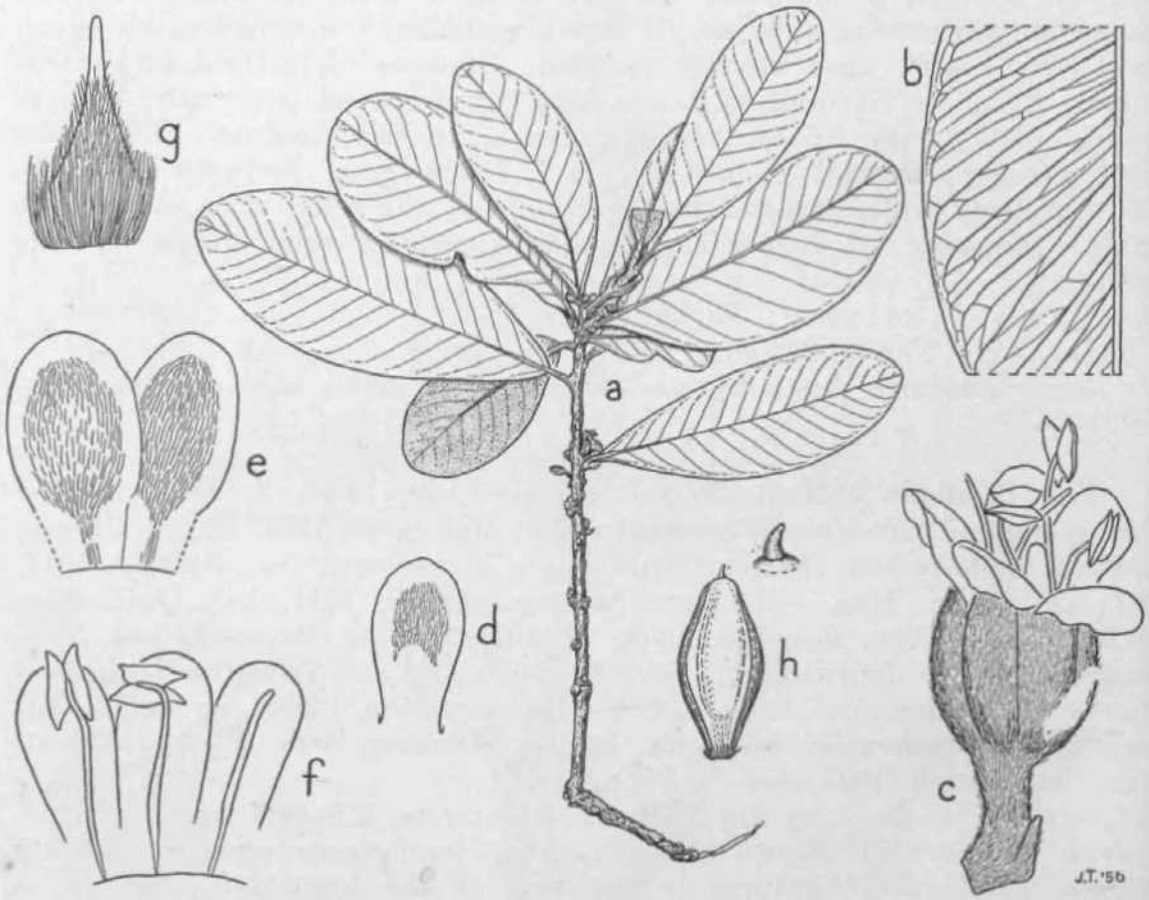


Fig. **13.** ***C.*** *<]<!>l<mc)u:i,* a. braneliU't with leaves and flowers *(%* X), b. leaf-nervation (1 X), e. flower <;<% X), d. corolla lol)e, outside (7% *X),* «. ibidem, f. part of **the** corolla, inside (7%'X), £• pistil (7%X)J h- yomig fruit OViX). (a., b., e. and g. from *Com-pton $.».,* e., d. and f. froni *Balansa S459* mid h. 1'runi ***Depkmche*** *<l$6),*

ilic **thecae,** ea 2 mm long, anthers when young ovoid, apex acute, **bifide,** base cordate, tips of apex diverging ***when*** maturing, the liases **of the theea€ beoomiog** aeutish. *Staminodes* none. *Ovunj* subglobose to colloidal, ca 1 bj **1** mm, **densely** iVrnigimms-villous, 5-celled, ovules inserted in lower halt' of the cells, style narrowly conoidal, **ferruginous-setnligerouB, tip** gabrous; **stigma** niimiU[1]. *Jure nil?,* ***fruit* ellipsoid,** 11—15 by 5—6 mm, apex and base acutish to acute, crowned with the remains **of** the style, glabrous, at base with the villi **of the** ovary, **purplish** brown or purplish black, pericarp thin, seeds one, sear laterally.

Type specimen: *Deplanche 436* in P.

I) i s t r.: New Caledonia.

NEW CALEDONIA: **Between Thio and Houailou, rocky country: *Fetschering s.n.* (P); near the mouth of the Dotio, volcanic hills: *Balansa S4S9* (K, P), *type of Trou'ettia leptoclada* Pierre, shrub, 1—2 m high; on the mountains along the Ngoye, 1000 m alt.: *Schlechter 15189* (BM, P), buds Nov., *type of Chrysophyllum paroifoliwm* Schlechter; Haute Tontouta, ca 200 m alt.: *Bernier US* (T), fl. Oct., shrub, 2—3 m high; Sentier du Drumac, ca 600 m alt., expos. S., serpentine scrub: *Virot 191* (P), fl. (only buds seen, W. V.) Aug., shrub, 1.50 m high, flowers reddish; Upper Tontouta Valley, hillside, alt. 500—600 m: *Me Kee S488* (L, P), fl. Nov., shrub 70 cm, leaves dark green above, pale green below, young leaves brown, flowers white: without locality: *Balansa S049* (P); ibidem: *Compton s.n.* (BM, P), *type of Chrysophyllum floribundum* Moore; ibidem: *Dcplanche 4S6* (P), *type of Chrysophyllum deplamchei* Baillon.**

Remarks: *Schlechter 15189,* described as *C. parvifolium* Schltr., is bearing leaves which are very quickly glabrescent, dull above, with a more prominently crested midrib; the very small buds contain a ca 0.25 mm long; glabrous corolla.

The specimen resembles *C. lissophyllum, f. obscurinerve,* but differs from it by obovate, acute to rounded leaves, fewer secondary nerves, which are more irregular, the archs not forming a nearly straight inframarginal nerve.

18. C. francii (Juillaumin & Dubard, Bull. Mus. Nat. Hist. Nat. 25, 1919, 290, *non C. franchii* Uuillaumin, Bull. Soc. Bot. Pr. 91, 1944, 69 — *Ochrothallus francii* (Guillaumin & Dubard) Guillaumin, **Bull.** Soc. Bot. Fr. 89, **1942,** 223 — *Fig. 14.*

Shrubs, 1—4 m high. Branchlets terete with faint to prominulous irregular ribs, running down from leafscars, 2—4 mm in diam., light brown, greyish brown or dark grey to blackish, brownish tomentose, quickly glabrescent. *Leaves* confined to the tips of the branchlets, oblong-obovate to subspatulate or linear-oblong, 2.8—7.5 by 1.1—3.2 cm, apex rounded (to obtuse), base rounded, densely ferruginous-tomentose on either side, very quickly glabrescent, indumentum longer persistent on midrib and then grey, nitidous on either side, coriaceous; midrib minutely or not impressed and minutely convex above, prominent below, secondary nerves 7—11, ascending at an angle of 60°—75°, slightly curved or straight, archingly joined, very faint above, faint below, tertiary nerves descending, irregularly Miculate, very faint to inconspicuous above, faint to very faint below; Petioles 2—7 mm long; flattened to convex above, rounded below, ferruginous-tomentose, turning grey, ultimately glabrescent. *Inflorescences* 2—6-florous, in the axils of leaves; pedicels 1.5—4 mm long, ferruginous-tomentose; bracteoles 1—3 basal, 0—1 along pedicel. *Sepals* 5, ovate to elliptical or oblong, 2.3—2.S by 1.2—1.7 mm, apex rounded to acutish, densely ferruginous-tomentose without, glabrous within. *Corolla* 3.4—4 mm long, glabrous, tube **1.3—1.6 mm** long, lobes 7—10, elliptical to obovate, 2—2.5 by 1.3—2 mm, apex broadly rounded, fimbriate. *Stamens* 7—10, inserted in corolla-throat, filaments filiform, 2.5—3 mm long, anthers oyoid, 1—1.3 by 0.5—0.7 mm, apex acuminate, acumen often slightly bifid, base cordate. *Staminodes* none(?). *Ovary* ovoid to conoidal, 0.9—1.3 by 0.8—1.2 mm, densely ferruginous-villous, 3—5-celled, ovules inserted in the upper or lower half of the cells; style tapering, 2.3—2.6 mm long,

basal half densely ferruginous-villous, upper half glabrous; stigma minute., *Fruits* ellipsoid, 4—A. 6 by 13—17 nun, apex acuminate, **acumen** 2—5 mm long, base narrowed, acute, narrowed part not embracing the seed, purplish brown and with ninny faint longitudinal ribs, glabrous, pericarp 0.3—0.7mm

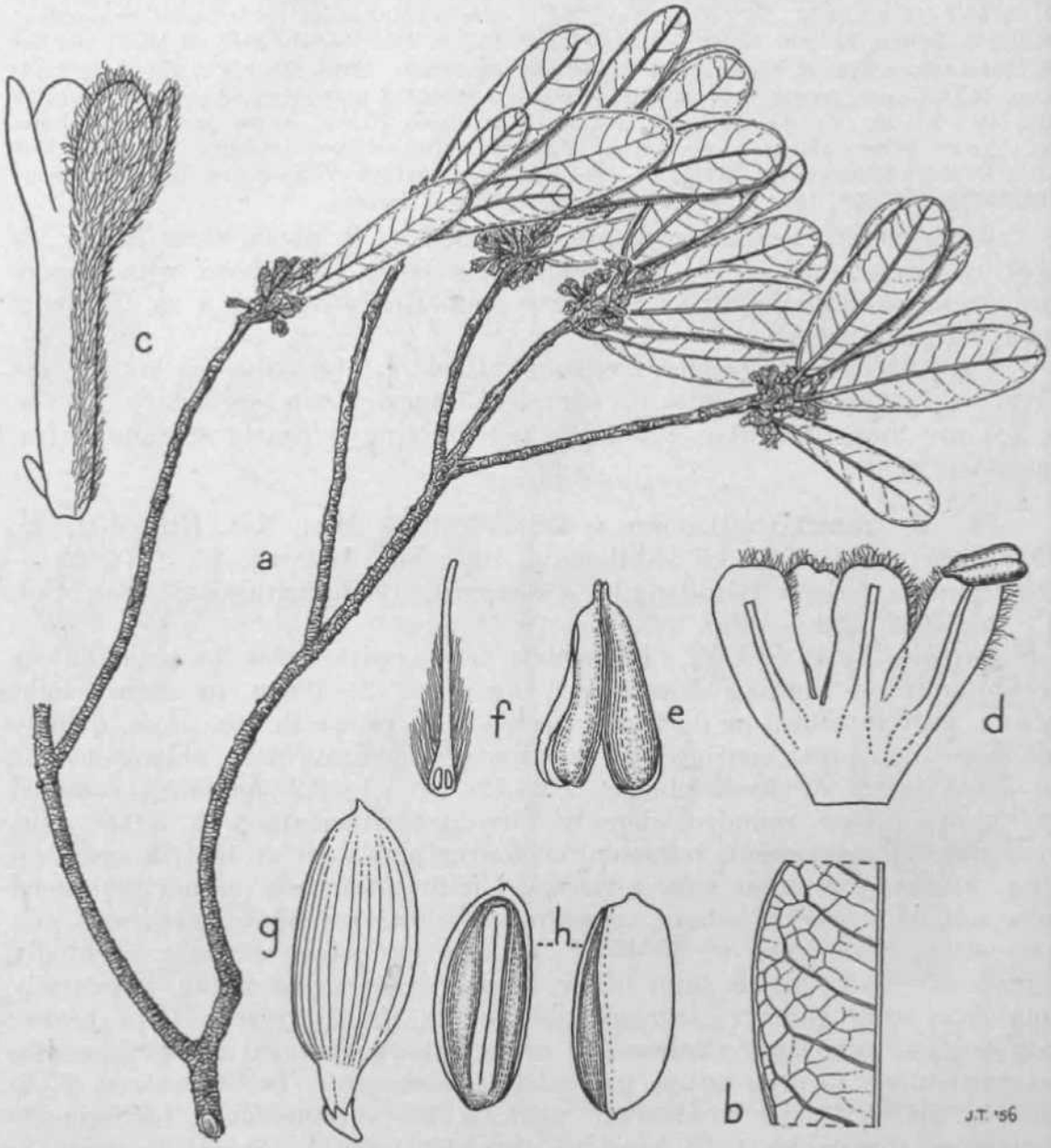


Fig. 14. *C, franolrii,* a. hraudilets with leaves and flowers {% X). b. lesf-nervation (1% X)< <• j»"Hfel and calyx *(7%* X), d. part of the corolla (7Vj X). e. anthiT, f. pistil in longitudinal swtion (7^ X), *g-* fruit *(%* X), h. Beed front two sides (•& X)- (a.—b. from *Cuitl. f Baum.-Bodenh. 1196$, c.*—\\. from *Franc 689),*

thick, greenish and nitidous within; seeds one, ellipsoid, slightly flattened **at** 2 or 3 sides, 28—32 by 14—16 mm, **apex** and base rounded, testa light brown and nitidous without, whitish longitudinally, near the back of the sear transvrrsally veined within, back of sear brown, sear **laterally** ovate to elliptical, 26—29 by 12—15 mm, apex rounded, base acutish, brown

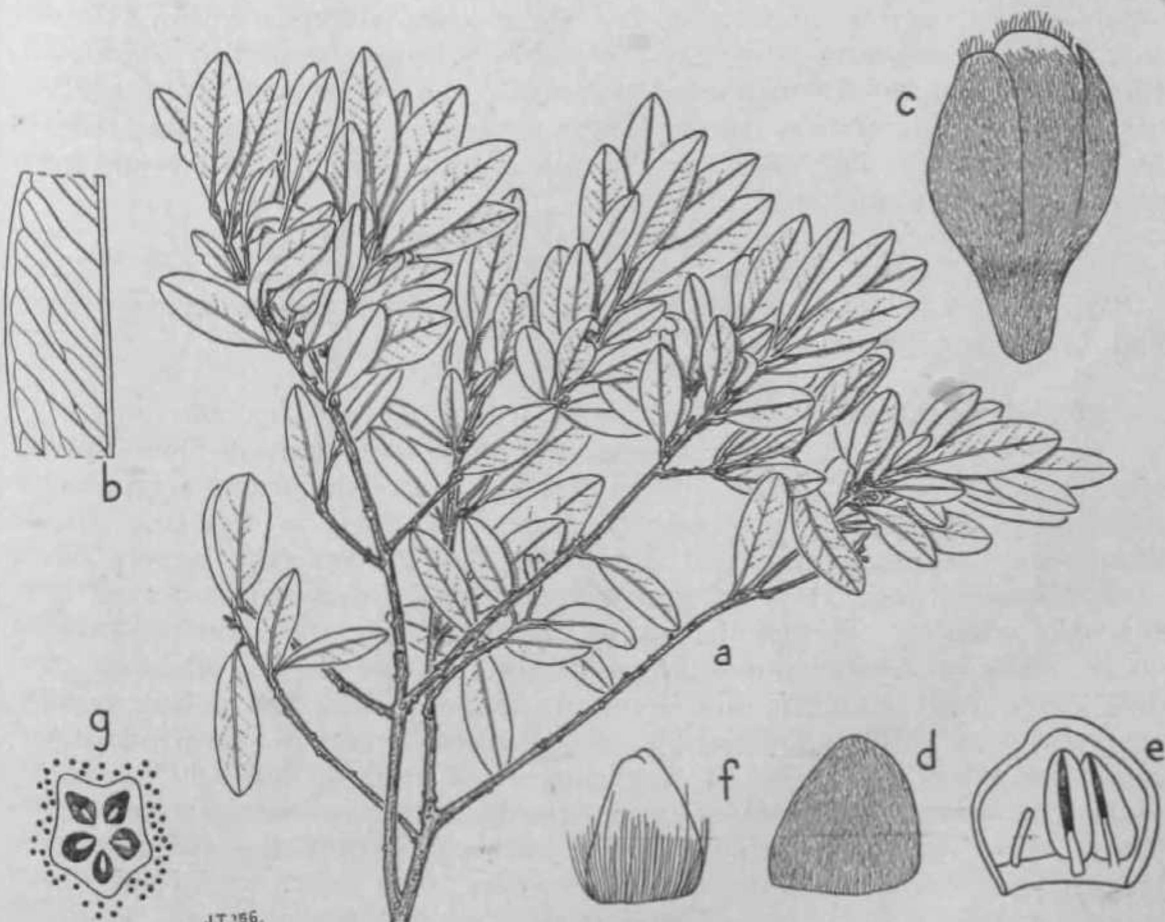
and dull, hilum linear; cotyledons thick, fleshy; albumen none; radicle minute, basal.

Type specimen: Franc *689* in P.

Distr.: New Caledonia.

NEW CAXEDONTA. Western slope of Mt. Koghi, N. of 1'Hermitage, 500 m alt.: *Me Kcc 8416* (L, P), shrub 2.5 m high, leaves light green; **Pifl** de Pe"rctta: *Brouamichr S9g* (pj(fi_ April, 1—3 in high ,leaves darkgreen; "Trockenwalde", Vulcan, serpentine, 90(T in nil.: ***Boumtmn*** *8286* (Z), fr, Nov., 4 m high, fruits violet; Plaino des Lacs, arid places, badly grown scrub: *Franc €89* (BM, NY, P), fl. Febr., rare; Boia du Sud, Spennolepis-woods, serpentine: *Baumann 11654* (Z), fl. March, ii m **high;** without locality: *Pancher s.n.* (P) ; *ll-iirlimann 1018 and 11S0* (Z) ;' *Guillawmim 4' Bauvumn 11957* (Z), fJ- April; ibidem *11958* (Z), buds April; ibidem *1196Z* (Z), fl. April, serpentine, 2 m high.

Remarks: One sheet of *Brousmicke 892* bears an annotation by Baillon: "Sideroxylon *1* Je vois 1, 2 stamuiodes", and another one of the same number carries a drawing and annotations by Pierre: "Staminodia mterna fauce inserta, nana vel punctiforma vel dentii'oi-ma brevissimus vix prospicuo". The drawing shows very minute alternipetal staminodes. I Traa unable to find any staminode, either in flowers of the type specimen, or in those of other ones.



Rig. 15. C. *intermedium,* a. branchlets with leaves* and **bods** (V6X), b. leaf-'^nation (2X), c butl (15X), d. sepal (15 X). «• **part of the corolla (15 X),** • pistil (15 X), g- cross-sect ion **through** the ovary, **the** *<U>t** **representing** the liairs **(15 X)**» u'^g. from buds (from *IhiUima 8045).*

19. O. **intermedium** Baillon, Bull. Soc. Linn. Par. 2, 113, 1891, 898 — *Planchonella intermedia* (Baillon) Däniker, Viertelj. Nat. Ges. Zürich, 78, Beibl. 19, 1933, 353 — *Trouettia intermedia* Pierre mss. ex Guillaumin, Ann. Mus. Colon. Marseille, 2me sér. 9, 1911, 185 — *Pouteria intermedia* (Baillon) Baehni, Candollea 9, 1942, 409 — *Fig. 15.*

Branchlets terete, 1—3 mm in diam., faintly ribbed when young, greyish brown, ferruginous-sericeous, quickly glabrescent. *Leaves* elliptical to obovate, 1.5—3.5 by 0.6—1.3 cm, apex acutish to rounded, base cuneate, when young purplish brown and very thin sericeous above, brown and thin reddish brown sericeous below, when mature grey, glabrous, nitidulous above, dull below, coriaceous; midrib flat above, rather prominent below, secondary nerves 8—12, ascending at an angle of 40°—50°, straight to sinuous, archingly joined, very faint to inconspicuous on either side, tertiary nerves descending, lasiy irregular-longitudinally reticulate, very faintly visible on young leaves only; petioles 0.2—0.5 cm long, flattened above, rounded below, reddish ferruginous-sericeous, quickly glabrescent. *Inflorescences* 4—10-florous, in the axils of leaves or their scars, pedicels ca 1.5 mm long, ferruginous-, ultimately greyish sericeous. *Sepals* 5, ca 1 by 1 mm, ovate, apex rounded, reddish ferruginous-sericeous without, inner sepals with a narrow glabrous border along apex, glabrous within. *Corolla* only known from young buds, glabrous, lobes 5, broadly rounded. *Stamens* 5, filaments subulate, tips recurved outwardly, anthers ovoid, apex acutish, base cordate. *Staminodes* none. *Ovary* ovoid, ca 0.5 by 0.5 mm, reddish ferruginous-villous just above base, 5-celled, style tapering, ca 0.5 mm long, glabrous. *Fruits* unknown.

Type specimen: *Balansa 3045* in P, s. l.

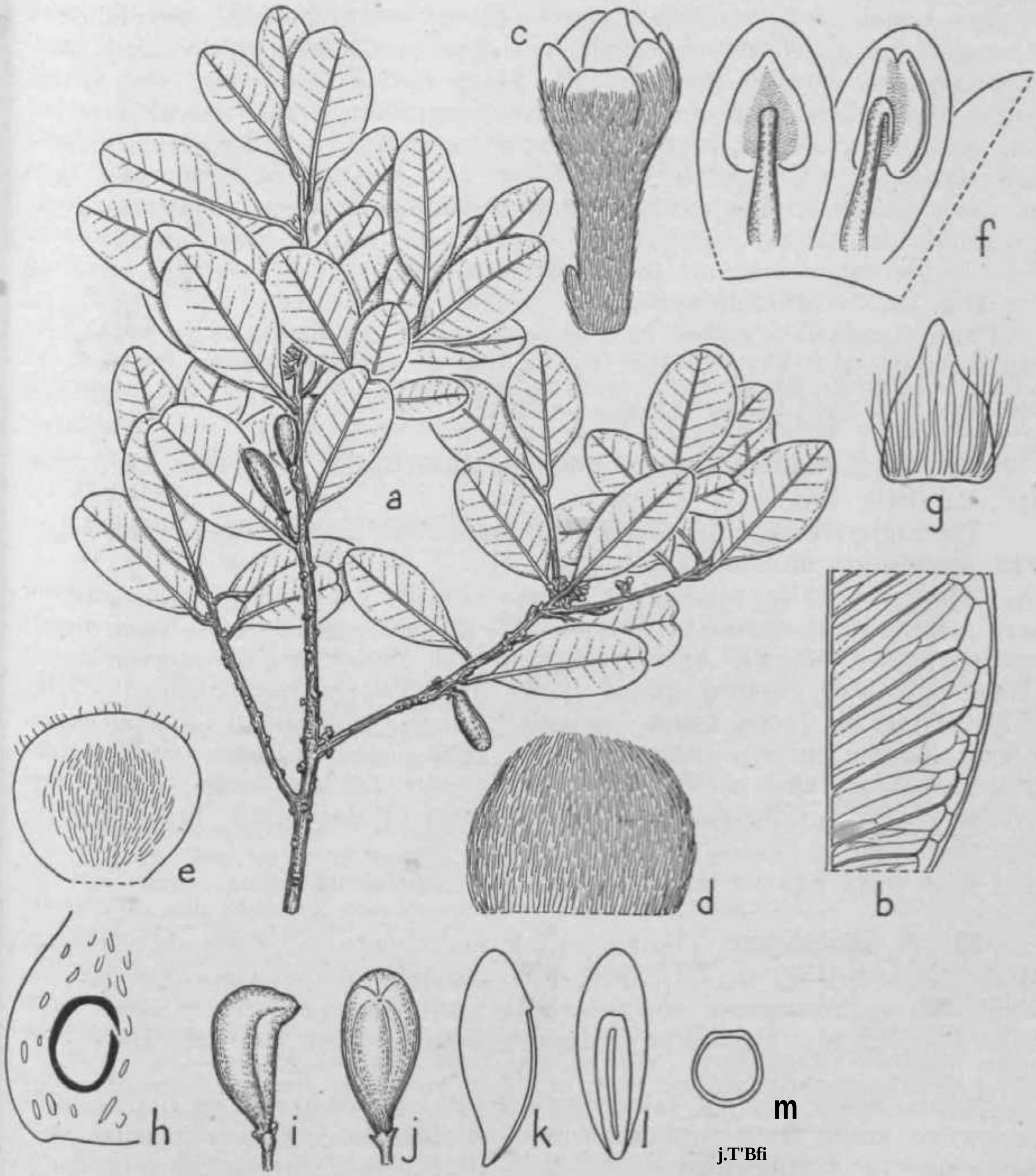
Distr.: New Caledonia.

Remarks: The description of the flower is based on very tiny buds and one old flower.

20. O. cochleare Vink, nov. spec. — *Pag. 69 and fig. 16.*

Shrubs, 0.5—2 m high. Branchlets terete with minute longitudinal ribs, 1.5—4.5 mm in diam., light grey to purplish black, ferruginous-sericeous, very quickly glabrescent. *Leaves* confined to the tips of the branchlets, obovate to elliptical, 1.8—5 by 1.2—2.4 cm (the largest leaves often being the most terminal ones), apex broadly rounded to obtuse, base cuneate, minutely decurrent; young leaves thinly ferruginous-sericeous above, densely ferruginous-sericeous below, mature leaves glabrous and dull above, light ferruginous-sericeous to glabrous and dull below, coriaceous; midrib slightly impressed and near leaf-base crested above, prominent below, secondary nerves 6—13, ascending at an angle of 50°—60°, straight, archingly joined, very faint to nearly inconspicuous or minutely impressed above> faint to inconspicuous below, tertiary nerves descending, laxly longitudinally reticulate, inconspicuous above, very faint to inconspicuous below; petioles 0.3—0.7 cm long, flat with crested midrib above, rounded below, ferruginous-sericeous, glabrescent. *Inflorescences* 4—10-florous, inserted in the axils of leaves or their scars; only buds known, pedicels ca 1.5 mm long, ferruginous-sericeous; bracteoles 1—3, minute. *Sepals* 5, broadly ovate to rotundate, ca 1 by 1 mm, densely ferruginous-sericeous

without, inner ones **with a** wide **glabrous border along margin,** glabrous within. *Corolla* ca 1.5 mm **long, glabrous, lobes** 5, elliptical, ca 1.2 by 1 mm,



Pig. Hi. ***c. ooehteare,*** **a. branchlet** with loaves, Imds and fruits (V<>X).)>. **leaf-** dc;• vjit**ion** (1% X)I **e. bud** (10X). **'I. outer sepsJ (10X)i e. inner** sopal (10 X), ***t.*** part ?f **the** corolla **(^>X)i** %- **pistil** (l'nX). h. **tongitndinn] afiction** tiiroiiyh **the ovary, L and** J- » **fruit** from two **adea (1 X), ^- sad I.** a **Beed from two sidee (IX), m. crosa-aeetion** '"**rouh empty seed, (from** ***liiiniiitnin-Botlcnhfiiii 8180).***

apex — rounded. ***Stamens ?*** **inserted** in corolla-throat, filaments **subulate,** tip IS • **recurved** outwai'dly, anthers ovoid, apex acute **to** slightly hifide, base ^rdate. *Staminodes* none. *Ovary* eonoidal, sparsely **long ferruginous-**

villous, 5-celled, ovules inserted in upper half of the cells, style narrowly conoidal, glabrous, stigma minute. *Fruit* obovoid, dorsally flattened to longitudinally curved, 14—25 by 6—10 by 6—7 mm, apex rounded with minute remains of the style, base tapering, acute, purplish to yellowish brown, glabrous, sepals persistent, pericarp ca 0.3 mm thick; seeds one, with the same form as the fruit, 12—23 by 7—9 by 6—7 mm, testa beige-tinted without, with a reddish brown margin along the lateral sides of the scar, brown inside, longitudinally white veined, ca 0.2 mm thick, scar dorso-laterally, oblanceolate, 10—17 by 2.5—4 mm, apex truncate, base narrowly acute, brown, hilum linear, white; albumen membranaceous; cotyledons thick, fleshy, tapering towards base, radicle very minute.

Type specimen: *Baumann 8130* in Z.

Distr.: New Caledonia.

Ntfw CALEDONIA.: Sentier du Dzumac, banks of the first cascade, 500 m alt., exp. S., serpentine scrub: *Virot 205* (P), fl. Aug., shrub, 0.5—1 m high; South of the Vulcan, serpentine: *Baumann 8130* (Z), *type specimen, 2 m* high; ibidem: *Baiiinann 8061* (Z), 1 m high; ibidem: *Baumann 8196* (Z), 2 m high.

21. C. ? **glabrisepalum** Guillaumin, Bull. Mus. Nat. Hist. Nat. 2me s&\, 21, 1949, 258.

The material used for the description of this species was not available. The description of Guillaumin runs:

Arbor 6 m alta, lactescente, trunco 10—20 cm diam., cortice rugosa, atro griseo. Folia ovata (8—15 cm X 2—4.5 cm), petiolo 1.5—3 cm longo-suffulta, basi cuneata, apice rotundata vel obtusa, rigida, nervis supra immersis subtus prominentibus, 9—11 jugis, venis inconspicuis. Flores valde numerosi, ramis dense fasciculati, parvi, pcdicello 3—4 mm longo, dense appresse piloso, calyx pedicello fere aequante, lobis ovatis, tubo aequilongis, glabris, corolla glaberrima, tubo 2.5 mm longo, lobis 7—8 ovatis, fere 3 mm longis, staminea epipetala, 4 mm longa, fauce inserta, ovario glabro.

Type specimen: *Buchhoh 1304* (not seen).

22. C. **chartaceum** (Bailey) Vink nov. comb. — *Lucuma chartacea* Bailey, Queensl. Flora III, 1900, 955; Bailey, Compr. Cat. Queensl. PI. 1909, 305 — *Niemeyera chartacea* (Bailey) White in Contr. Arn. Arb. IV, 1933, 87 — *Sersalisia baihyana* Domin, Bibl. Bot. 22, Heft 896, 1928, 1062.

Trees, 8—25 m high. Branchlets terete, 1.5—2.5 mm in diam., light brown to grey, ferruginous-tomentose, glabrescent. *Leaves* diffuse, oblanceolate to oblong-oblanceolate, 2.5—19 by 1—7 cm, apex acuminate, acumen 0.2—1 cm long, base cuneate, shortly decurrent, margin undulate; densely ferruginous-tomentose on either side when very young, very quickly glabrescent, indumentum somewhat longer persistent on midrib above, on midrib and secondary nerves below, nitidulous to nitidous on either side, chartaceous; midrib impressed and minutely crested above, prominent below, secondary nerves 6—12, ascending at an angle of 35°—65°, slightly curved, diminishing near margins or joined by tertiary reticulation, faint above, prominulous below, tertiary nerves transverse or longitudinally to irregularly reticulate, faint on either side; petioles 0.5—2 cm long, long ferrugin-

ous-tomentose, glabrescent, flattened above, rounded below. *Inflorescences* &—.20-florous, in the axils of leaves or their scars. Flowers crowded, sessile; bracteoles 2, inserted bel#w the inner sepals. *Sepals* 5, ovate-oblong, 2 *by* 1 mm, apex obtuse, densely ferruginous-Jiirsute without, covered Margins glabrous, glabrous within. *Corolla* ca 3 mm long, glabrous, tube 1—1.5 mm long, lobes 5, oblong, 1.5—2 by 1 mm, apex obtuse, recurved outwardly. *Stamens* 5, exsert, inserted in the upper half of the tube, filaments subulate, ca 2 mm long, anthers oblong, ca 0.5—1 by 0.5—0.8 mm, apex acute or obtusiusculous, base cordate. *Staminodes* none. *Ovary* conoid-&1, 5-ribbed, ca 1.5 by 1 mm, densely ferruginous-villous, 5-celled, ovules inserted in lower half of the cells; style tapering, about 3.5 mm long, glabrous; stigma minute. *Fruits* ovoid-oblong to almost globular, 1.5—3 by 1.5—2.5 cm, brownish to ferruginous-tomentose, turning whitsh, glabrescent, apex with remains of the style; exocarp purple and thin when dry; seeds 1 or 2, ovoid, about 1.5—3 by 1.5—2.5 cm, testa very thin, papyraceous, sear covering almost the whole surface of the seed, leaving a small shining Part only which is 1.5—2 cm long and 0.8—1 cm wide, hilum apical, cotyledons thick, oblong or semiglobose, albumen none, radicle very small, basal, triangular.

Type specimen: *Bailey s.n.* in BBI.

Distr.: Queensland.

AUSTRALIA., QUEENSLAND, Cook District: Daintree River, in rainforest, alt. J? m: *S. F. KajewsU 1440* (BRI, K,, NSW,, SING)) fl. Dec., small tree, about 8 m y&h flowers small, inconspicuous, petals light green, calyx with brown hairs, common; ibidem, in rainforest: *L. J. Brass 2218* (BRI, K, L, P), fl. March, a slender tree, 9—12 m liigh, thin brown bark, milky viscid sap; Bellenden Ker, lowland scimb: *C. T. White 1282* (BRI) fl. March; Topaz, near Malanda, in rainforest, alt. ca. 750 m: *Smith* jj[1] *TV ebb S295* (BRI), fr. Aug., a small tree, 7.5 m high, trunk 12.5 cm diam., outer [ba]*k brownish, inner bark pale reddish brown, 0.3 cm thick, isparingly exuding latex, JJJpwood pale, ca 2—4 cm thick, heart-wood pinkish brown; East Malanda, Atherton [r]a*>leland, in rainforest, alt. 700 m: *S. F. KajewsU 121S* (B, BRI, K, NSW, S), y. fr. [an]d fl. Sept., tree up to 25 m high, fruit purple black when ripe, slightly flattened top and bottom, also small hole or recess at each end, bark dark grey, light pink brown when cut, odourless, common; ibidem: Boonjii, in rainforest, alt. 800 m: *8. F. Kajewslci 1200* (BRI, K, S), fr. Oct., tree 15 m high, leaves dark green, ijruit purple when ripe, flattened at both ends, with a small point at apex, 3.2 by 4 cm, bark dark grey, with small pustules on it; Inisfail: *Canon Michael s.n.* (BRI); Berner Creek, near Inisfail: *N. dimming s.n.* (BRI); near Kairi, road junction between Mt. Edith and Danbulla, in rainforest, alt. 700 m: *Smith # Webb SS62* (BRI) fr. and y. fl. Aug., [tl#]ee 6 m high, trunk 10 cm diam., outer bark brownish, longitudinally lined and some-[v]hat pustular; inner bark, pinkish or reddish to white inwards, sparingly exuding latex, j^pwood cream, 2—2.5 cm thick, heartwood pinkish brown, fruit greenish, brownish [5*][lr]y, tending to become glabrous; Garradunga, in rainforest: *C. T. White 11729* (BRI, [:*)]> fl. Dec, a small tree, in rainforest; Devil Devil Creek Area, ca 6 miles due S. of j^ossman, in rainforest, alt. 360 m: *Smith & Webb S963* (BRI), fl. Sept., tree 12 m [u]gn, bole 22.5 cm diam., outer bark brownish, inner bark reddish, 0.2 cm thick exuding [latex] TP Whcu cut; Mos8man Biver Gorge, ^ rainforest: *L. J. Brass 214S* (B, BRI, K, P), D' KT [illegible], all young parts covered with dense floccose brown Pubescence, old leaves glabrous and shiiiing on both sides, flowers white; ibidem: L" *Tryon s.n.* (NSW) fl. fr. Aug.; S. Kennedy District: Eungella Range. Jjassey Creek, W. of Mackay, in rainforest, alt. ca 900 m: *Smith $ Webb 4672* (BRI)) Oct., tree 18 in high, bole ca. 40 cm diam., exuding latex when cut, flowera [cream]y white, fruit purplish, fleshy^ up to 3.8—5 cm in diam.; W. of Mackay, in rain-forest, alt. ca 900 m: *Smith f Webb 4742* (BRI), tree 13.5 m high, bole 20 cm in diam«i oxuding latex when cut; via Mackay: *W. D. Francis s.n.* (BRI), y. fl. fr. Oct.*,

Wide Bay District: Eumundi: *J. F. Bailey s.n.* (BBI), fl. fr. Oct.; ibidem: *J. F. Bailey s.n.* (BBI), fl. Nov.; ibidem: *J. H. Svinvmonds s.n.* (BBI) fl. March; ibidem: *J. II. Simmonds s.n.* (BBI, K); district unknown: Mt. Glorious: *J. f M. 8. Clemens s.n.* (BBI), fl. Jan.; Bange Sampad*: *C. T. White 8918* (BBI); Tarzali: *C. T. White 1282* (BBI), fl. March; Blackall Bange, Montville: *C. T. White s.n.* (BBI, NSW), fl. fr. Apr., fairly common.

Remarks: See *23. C. pruniferum.*

23. 0. pruniferum P. v. M., Fragm. Phyt. 6, 1867—1868, 26; Bentham, Fl. Austr. 4, 1869, 278; Bailey, Queensl. Fl. 3, 1900, 953; Bailey, Compr. Cat. Queensl. PI. 1909, 305 — *Niemeyera pruniferum* (F[1]. v. M) F. v. M., Fragm. Phyt. 7, 1870, 114 — *Lucuma prunifera* Bentham ex F. v. M., Select. PI. industr. Cult. 1876, 142.

Trees, up to 15 m high. Branchlets terete, 2.5—6 mm in diam., light brown to purplish brown, long ferruginous-tomentose, turning greyish, glabrescent. *Leaves* diffuse, obovate to oblong, 2.5—18 by 1.5—7 cm, apex acute or acuminate, acumen 0.2—0.5 cm long, base cuneate, minutely decurrent, margins undulate to flat; densely long ferruginous- or reddish ferruginous-tomentose on either side when young, glabrous and nitidous above, long ferruginous- to reddish ferruginous-tomentose especially on midrib and secondary nerves below or glabrescent when mature, chartaceous; midrib impressed and minutely crested above, very prominent below, secondary nerves 6—20, ascending at an angle of 50°—70°, straight or slightly curved, diminishing near margins or joined by tertiary reticulation, faint above, prominent below, tertiary nerves transverse, near midrib recurved, faint above, faint to prominent below, if faint mature leaves always with indumentum below; petioles 0.5—1.5 cm long, ferruginous-tomentose, ultimate light grey or glabrescent, flattened above, rounded below. *Inflorescences* 4—15-florous, in the axils of leaves or their scars. Flowers crowded, sessile; bracteoles 2, inserted below the inner sepals. *Sepals* 5, ovate, 2 by 0.5—1 mm, obtuse, densely brownish to ferruginous-tomentose without, covered margins glabrous, glabrous within. *Corolla* ca 3.5 mm long, glabrous, margin shortly fimbriate; tube ca 1.5 cm long, lobes 5, elliptic-ovate, ca 2 by 1 mm, apex rounded to obtuse. *Stamens* 5, filaments subulate, ca 2 mm long, anthers ovoid, ca 0.8—1.2 by 0.8—1 mm, apex shortly acuminate, base cordate. *Staminodes* none. *Ovary* subglobose, 5-lobed, densely ferruginous-villous, 5-celled, ovules inserted in the lower half of the cells; style ca 3.5 mm long, glabrous, tapering; stigma very minute. *Fruits* almost globular, 3—5 by 2.5—5 cm, purplish black, densely ferruginous-tomentose, glabrescent, apex with remains of the style, exocarp thin; seeds 1, testa ca 0.5 mm thick, hard, scar covering almost the whole surface of the seed leaving a small dorsal shining part, ca 2.5 by 15 cm, cotyledons thick, fleshy, albumen none.

Lectotype specimen: *Dallachy s.n.*, collected 2nd March 1864 (MELB'.).

Distr.: Queensland, New South Wales.

AUSTRALIA, QUEENSLAND, Rockingham Bay: *Dallachy s.n.* (K, NSW, P), fl., y. fr., 1868; ibidem: *Dallachy s.n.*, collected 2nd March 1864, (MELB.), small tree, flowers yellow, *lectotype-specvmen;* ibidem, *unknown collector* (BO, L) — NEW SoiTOi WA£ES> South Graf ton: *B. Blacket s.n.* (NSW), fr. Febr.; Woolgoolga District; *W. A. W. de*

Seuzeville 748 (NSW), fl., fr. Oct.,. a small to large tree to 0.60 in in diam., hark yields a copious milky exudation when cut, leaves dark glossy green above, paler beneath, fruit reddish when unripe, ripe ones very glossy black, mostly globular, with a diam. UP to 7.5 cm, occasionally a little ^Jointed at apex, seed marked with a variable sized shining scar, generally 1.3—2 cm long, elliptical to clubshaped, tree common in brushes; ibidem, Wedding Bells, State Forest: *B. Clarke s.n.* (NSW), fl. Oct.; Coff's Harbour: s- *L. Allman s.n.* (NSW), fr. Febr.; ibidem: *A. II. Lawrence s.n.* (BBI, NSW), fr. ^Pr.; ibidem: *J. L. Boorman s.n.* (NSW), fr. May; Dorrigo: *C. E. Carter 35* (NSW), y-Sept.j Bellingen River: *C. Moore s.n.* (K, NSW); ibidem: *E. E. L. Swain £08* (NSW), y. fl. Aug., tree 9 m high, 0.30 m girth at 1.20 m, smooth bole, 6-ribbed *t base with long narrow ribs, bark whitish grey, corky, wrinkled, in brashes on moist Waek soil; Port Macquarie District: *G. B. Brown 509* (NSW), fl. Aug., ver. name: ^ut-Apple or "Plum-Moonboys"; Whian Whian: *C. T. White 13043* (BRI), fr. May, *rpc 15 m high, leaves dark green above, paler and brownish beneath, young shoots; very brown hairy, fr. borne in great abundance but only odd ones beneath the tree available, ^ern. name: Black Plum; Upper Tallebudgera: *C. T. White s.n.* (BRI, NSW); Repton: J- *C. Campbell 199* (LAE) in rainforest.

Remarks: It is very difficult to delimitate *C. pruniferum* and ^f. *chartaceum* against each other by vegetative or flower characters. Some Material is mentioned here with some doubt.

In *C. pruniferum* there are two types: 1. with glabrous mature leaves jvith prominent tertiary nerves below; the seeds in this type have a thick hard testa; 2. with mature leaves with a thin to dense indumentum and faintly prominent tertiary nerves below; the lectotype specimen belongs to this group, but no fruits in this type could be traced, which makes it Uncertain if the fruit-characters are different from those in *C. chartaceum.* As there are transitions between these two types of leaves, both are included in the same species.

In *C. chartaceum* the venation is often very similar to that in the second type of *C. pruniferum,* but in mature leaves the indumentum is always lacking and the tertiary nerves are often strongly recurved to the midrib. In this species the testa is papyraceous.

Extensive collections of both species should be made and collectors ^puld remember that fruit-bearing specimens only are useful for delimitation-questions, since the flowers are much alike. Prom those new collections tt may be learned if the fruits in both types of *C. pruniferum* are identical or if there are transitions to *C. chartaceum.* In the latter case both species are to be united.

24. C. antilogum (P. v. M.) Vink nov. comb. — *Amorphospermum antilogum* P. v. M. Pragm. Phyt. VII, 1870, 113; Engler in Engler & Pr*ntl. NatiPflanz. fam. IV-1, ·1897, 150; Baillon, Hist. PI. XI, 1892, 2^K— *IjUCum*<^ *amorphosperma* (P. v. M.) Bailey, Queensl. Flora III, 1900, 9s55 ibidem, Compr. Cat. Queensl. PI. 1909, 305.

Trees, up to 18 m high. Branchlets terete, 1.5—1 mm in diam., yellowish brown or brown to light brownish grey, ferruginous-tomentose, glabrescent. *Leaves* diffuse, rotundate-ovate or oblong to obovate-oblanceolate, rarely oblanceolate, (1.5—) 6—16 by (0.8—)2—6.5 cm, apex emarginate or rounded to obtuse or acute to shortly and obtusely acuminate, acumen 0.3—0.5 cm long, base cuneate, slightly to minutely decurrcnt, glabrous atta nitidous above, at first ferruginous-, later on yellowish brown to greyish shortly sericeous below, ultimately glabrescent, thinly coriaceous to corince-

ous; midrib impressed and minutely crested above, prominent below, secondary nerves 6—20, ascending at an angle of 55°—65°, straight, sometimes slightly curved, more or less distinctly archingly joined or diminishing near margins, faint on either side, tertiary nerves more or less longitudinally reticulate (angle with midrib 60°—90°), very faint to inconspicuous on either side; petioles 0.3—1.5 cm long, canaliculate above, rounded below, ferruginous- to brownish tomentose, glabrescent. *Inflorescences* up to 15-florous, flowers sessile; bracteoles 2—3. *Sepals* 5—6, ovate, 1.8—2.3 by 1—1.3 mm, apex obtuse, ferruginous- to brownish sericeous without, margins laying inside in bud with a glabrous border, fimbriate, glabrous within. *Corolla* 3—1 mm long, tube 1—2 mm long, with some scattered approssed hairs without, glabrous within, lobes 5—6(—8), obovate to elliptical, 2—2.5 by 1—1.5 mm, apex rounded or obtuse, glabrous. *Stamens* 5—6(—8),i inserted halfway the tube or in the corolla-throat, filaments subulate, 3—4 mm long, tip recurved outwardly, anthers ovoid to cylindrical, 1.2—1.5 by 0.3—0.5 mm, apex acuminate and minutely fimbriate, glabrescent, base slightly cordate. *Staminodes* none(see Remarks). *Ovary* ovoid to conoidal, 1(—1.5) by 1(—1.5) mm, densely ferruginous-villous, 1—3-celled, ovules inserted a little above the middle of the cells; style tapering, 3.5—4 mm long, glabrous but ferruginous-villous at base; stigma minute. *Fruit almost* globular, 25—40 by 25—40 by 25—40 mm, abruptly narrowed at base, narrowing stalk-like, 5—20 mm long, solid, exocarp ca 0.5 mm thick, purplish to light brown and glabrous without,, purplish to light reddish brown within, seeds one, almost globular, 25—40 by 25—40 by 25—40 mm, testa hard, woody, ca 1 mm thick, light yellowish without, light reddish brown, nitidous, with reddish brown reticulate veins within, scar almost covering the whole seed, dull, leaving a small, sometimes long and narrow lateral nitidous part, which is 7—15 by 1—3 mm, hilum apico-lateral, albumen none, embryo globose, cotyledons thick, radicle basal, prominent, triangular. Taproot emerging from the stalk of the seed, fleshy, milky, tapering to the lower end, sulcate, breaking off from stalk and apically giving rise to the young plant.

Lectotype specimen: *Thozet s.n.* (MEL).

Distr.: Queensland.

QUEENSLAND. **North Kennedy District:** near (riru, alt. below 30 m: *Blake 14016* (BRI), fl. Apr., slender tree, 12 m high, slightly flanged at base, bark grey when old, creamy when, young, tessellately scaly, brown beneath surface and reddish brown deeper down, this region with flow of white latex, also in shoots, leaven dark green above, shining coppery or somewhat silvery beneath, fruit up from ground, in light rain forest, on rocky hillside; Abbot Bay, in duno scrub, ca 1 m altTf *Blake 18680* (BRI, L), fl. Oct., tree 5 m high, with grey scaly-looking bark, leaves dull lightgreen above, silvery or coppery beneath, fruit lightgreen to reddish; Mt. Elliott: *von Muellef s.n.* (L); ibidem: *FiUalan s.n.* (P); **Port Curtis District:** Rockhampton, Lands Mill: *Me Dowell s.n.* (BRI), fr. Dec, grows in the serpentine country; ibidem: *Those* s.n.* (K, P); near the circle of Capricorn: *Bowman s.n.* (P); Byf ield near Keppel Bay: *C. T. White 8034* (B, BRI, S, SING), medium sized tree, very common in rainforest, leaves glossy green above, at first rusty, afterwards silvery beneath, fl. £r. Sept.; Marlborough: *C. T. White 1210!)* (BRI), fl.fr. Oct., small tree, fl. cream, aldng creek* and in gullies in dry rocky country; Mt. Dryandcr: *FiUalan s.n.* (NSW); **Wide Bay District:** Imbil: *F. Wratherhcad WOO* (BRI, NSW) y. fl. Apr.; ibidem: *W. A. Wde Beuzevillc 814* (NSW), fl. Febr.; ibidem: *W. B. Petn· s.n.* (BRI); ibidem: *W. BPrtri 05a* (BRI), y. fl. Aug.; ibidem, rainforest: *K. Gray 100* (LAE), tree; ibidem*

in rainforest, alt. 150 m: *L. S. Smith f L. J. Webb 31&7* (HRI), tree 18 m high, trunk 0.25 in in diam., outer bark brownish, often faintly marked in patches by a pinkish lichen?, inner bark pink to white inwards, ca 0.3 cm thick, exuding latex, .sapwood pale straw, 2 cm thick, heartwood pale pinkish; Gympie Scrubs: *E. II. F. Swain* [4n] (BRI) fr. Jan., medium sized tree, pale, straight, grained wood; Peechey's Scrub: *•7. tihirly s.n.* (HRI); Mt. Bauple, in rainforest, alt. 0—300 m: *8. F. KajewsM 76* (RHI), medium sized tree, fairly common, fr. bluish black; Moret6n- District: Brisbane, Kelvin Grove: *White $ Francis s.n.* (BEI); ibidem, Bancroft Park: *S. F. Everest s.n.* (BRI), fl. Oct.; District unknown: Daybo.ro: *C. T. White s.n.* (BRI) j without locality: *Thozet s.n.* (NSW); ibidem: *Fitealan s.n.* (BRI); cultivated: Muellerville: *Thozet SIS* (NSW, P).

Remarks: The leaf-shape varies considerably.

The flowers of the specimen *Fitzalan s.n.* (Mt. Dryandcr) contained: [a]) stamens with normal anthers; b) stamens with anthers bearing apically [a] subulate prolonged connective; c) petaloid staminodes instead of stamens. In none of the other specimens such features could be found.

Latin diagnosis of the new species

4. Chrysophyllum novoguineense Vink, now spec. — *Cf. p. 33 et fig. 1.*

Ramuli tcretes, glabri; tria folia solum cognita, elliptica vel obovata [v]el oblanceolata, (10—) 14—18.5 cm longa, (3.3—)6.6—7.8 cm lata, apice obtusa vel acuminata, basi cuneata decurrentia, utrinque indumenti ferrugineo-sericei rudimento ornata, demum canescentia chartacea; costa media [^]pra plana, subtus valde prominens; nervi secundarii 9—11, sub angulo 60°—70° ascendentes, curvati vel paulo curvati, prope marginem diminuti, [Sl]ipra obscuri, subtus prominuli; nervi tertiarii cum reticulatione fere sub [an]gulo recto in costam mediam posita, prope marginem plusminusve irregulariter reticulati, supra obscuri vel inconspicui, subtus obscuri; petioli 1.8—2.3 cm longi, supra plani, eodem indumento ornati ut in lamina; inflorescentiae 13—16-florae; pedicelli 2.5—2.8 mm longi, sericei pilis pallide [J^]unneis vel brunneo-canescentibus; sepala 5, elliptico-ovata, 2.2—2.5 mm [J^]ga, 2—2.8 mm lata, utrinque pilis brunneo-canescentibus sericea; corolla [*]o—3 mm longa, glabra, tubo 1—1.3 mm longo, lobis 5, ellipticis, 1.5 mm [Jo]ngis, 1.3—14 mm latis; stamina 5, infra corollac faucem ipsam inserta; discus cupuliformis, ca 0.6 mm altus, ca «0.2 mm crassus, ad ovarium appressus, in parte inferiori indumento sericeo canescenti sparse ornatus, in parte superiori canescenti-villosus; ovarium conoideum vel obovoideum, ca 0.7 mm loHgum, ca 0.8 mm latum, glabrum, 5-loculare; stylus 0.5? mm longus, glaber; stigma truncatum; f met us obovoideus, 17—18 mm longus, 10—11 mm latus, apice rotundatus stylo persistenti coronatus, basi acutus disco persistenti munitus, glaber, monospermus; pericarpium papyraceum; [lSe]men obovoideum, ca 16 mm lbngum, 10 mm latum, 9 mm crassum, apice [^]tundatum, e basi subacuta rotundatum; testa crassa, cxtus nitida; cicatrix * |[a]terc affixa, plusminusve oblanceolata, ca 15 mm longa, ca 5 mm lata, [a]Pice acutiuscula, basi rotundata; albumen copiosum; cotyledones tenues, [I)la]nae, obovatae vel ellipticae; radicula cylindrica, ca 1 mm longa.

Typus: *Beccari* (annot. P^prrc no. *184)* (P).

11. Chrysophyllum multipetalum Vink nov. spec. — *Cf. pag. 43 et fig. 7.*

Ramuli propter eostas robustas subtriangulares, ferrugineo-sericei, glabrescentes; folia pro maxima parte in ramulis distributa, non ad apicem conferta, oblonga, 11—15 cm longa, 4—5.5 cm lata, apice rotundata vel obtusa, basi cuneata vel obtusa, utrinque ferrugineo-sericea, supra glabrescentia, subtus deinde eanescentia, ultimo glabrescentia; costa media supra leviter impressa et carinata, subtus valde prominens; nervi secundarii 11—18, sub angulo 50°—60° ascendentes, recti, prope marginem diminuti, supra leviter impressi, subtus prominuli; nervi tertiarii transverse reticulati, supra valde leviter impressi, subtus inconspicui; petioli 1.5—2 cm longi, supra plani idemque carinati; inflorescentiae 2—4-florae, in foliorum persitentium vel delapsorum axillis positae; alabastra sessilia; sepala 5, ovata vel elliptica, 4.8—5.6 mm longa, 2.4—6 mm lata, apice rotundata, extus pallide ferrugineo-sericea, intus glabra; corolla in alabastro ca 5.5 mm longa, glabra, lobis 9—10 obovatis; stamina 9—10, infra corollae faucem ipsam inserta; ovarium semi-ovoideum, ferrugineo-villosum, 5-loculare; stylus glaber; stigma minutum; fructus ignotus.

Typus: ***Sébert et Fowrnier 77*** **(P).**

13. Chrysophyllum heteromerum Vink nov. spec. — *Cf. pag. 47 et fig. 9.*

Prutex vel arbor parva, 1—10 m alta; ramuli teretes, ferrugineo-sericei, mox glabrescentes; folia ad ramulorum apices conferta, lineari-oblonga vel oblongo-obovata, 8.5—17.5 cm longa, (2.5—)3—4.5 (—5) cm lata, apice rotundata, basi cuneata, paullum decurrentia, supra glabra et nitida, in tota costa media vel in ei parte basali solum canescenti-tomentosa, subtus demum ferrugineo-sericea, deinde eanescentia, denique glabrescentia, valde coriacea; costa media supra leviter impressa idemque carinata, subtus valde prominens; nervi secundarii 21—31, sub angulo 70°—85° aseendentes, recti, prope marginem arcuatim conjuncti, supra obscuri vel leviter impressi, subtus prominuli vel obscuri; nervi tertiarii prope marginem irregulariter reticulati, sed prope costam in reticulatione longitudinali abeuntes; inter nervos secundarios binos nervus tertiarius unus interjectus, eis subparallelus et in folii parte media saepe ab eis haud distinctus; petioli 1—3 cm longi, supra canaliculati, ferrugineo-sericei, mox glabrescentes; inflorescentiae pauciflorae vel multiflorae, in foliorum delapsorum axillis positae; pedicelli 2—3 mm longi, ferrugineo-sericei; bracteoli 3—8, unus infra calycem insertus late ovatus, 1.5—2.8 mm longus, 2.2—3.3 mm latus; sepala 5(—6), ovata (interiora saepe elliptica vel obovata), 3—4.2 mm longa, 3—4.2 mm lata, apice rotundata, extus ferrugineo-sericea, intus glabra; corolla in alabastro ca 5 mm longa, glabra, tubo ca 3 mm longo, lobis 5—7, ellipticis vel obovatis, ca 2 mm longis, ca 1.5 mm latis, stamina 5—7, paullum infra tubi partem mediam inserta; staminodia nulla; ovarium conoideum, ca 1.5 mm longum, ca 1.5 mm latum, ad basin ferrugineo-sericeum, 5-loculare; stylus ca 4 mm longus, glaber; stigma minutum; fructus valde immaturi obovoidei, 10—12 mm longi, 6 mm lati, apice rotundati stylo persistente coronati, basi subacuti, canescenti- vel purpureo-brunnei, glabri, monospermi; pericarpium

<a 0.8 mm crassum; semen obovoideum; testa papyracea; cicatrix lateralis, albumen nullum; cotyledons crassae.

Typus: *M. et Mme he Rat 2952* (P).

20. Chxysophyllum cochleare Vink nov. spec. — *Cf. pag. 60 et fig. 16.*

Frutex, 0.5—2 m altus; ramuli teretes, striati, ferrugineo-sericei, mox Slabrescentes; folia ad ramulorum apices conferta, obovata vel elliptica, 1.8—5 cm longa, 1.2—2.4 cm lata, apice rotundata vel obtusa, basi cuneata, niinute decurrentia, juvenilia supra sparse .ferrugineo-sericea, subtus dense ferrugineo-sericea, adulta supra glabra, subtus pallide ferrugineo-sericea vel glabra, coriacea; costa media supra leviter impressa et ad folii basin carinata, subtus prominens; nervi secundarii 6—13, sub angulo 50°—60° ascendentes, prope marginem arcuatim conjuncti, utrinque obscuri vel fere mconspicui vel supra leviter impressi; nervi tertiarii laxe reticulati, reticulatione ea nervorum secundariorum parallela, supra inconspicui, subtus obscuri vel inconspicui; petioli 0.3—0.7 cm longi, supra plani idemque carinati, ferrugineo-sericei, glabrescentes; inflorescentiae 4—10-florae, in toliorum persistentium vel eorum cicatricum axillis positae; pedicelli nondum evoluti ca 1.5 mm longi, ferrugineo-sericei; sepala 5, in alabastro late °vata vel rotundata, ca 1 mm longa, 1 mm lata, extus dense ferrugineo-sericea, intus glabra; corolla in alabastro ca 1.5 mm longa, lobis 5, ellipticis, stamina 5, fauce inserta; staminodia nulla; ovarium conoideum, sparse et lonnge ferrugineo-villosum, 5-loculare; stylus glaber; stigma minutum; fructus obovoideus, rectus et dorso applanatus vel curvatus, 14—25 mm longus, 6--10 mm latus, 6—7 mm diametiens, apice rotundatus stylo persistente eoronatus, basi acutus, glaber, monospermus; pericarpium ca 0.3 mm crassum; semen obovoideum, 12—23 mm longum, 7—9 mm latum, 6—7 mm diametiens; testa ca 0.2 mm crassa; cicatrix dorso-lateraliter affixa, circuitu ^blanceolata, 10—17 mm longa, 2.5—1 mm lata, apice truncata, basi angusta acuta; hilus linearis, albus; albumen membranaceum; cotyl«.-ilones crassae; radicula minutissima.

Typus: *Bawniann-Bodenheim 8130* (Z).

Excluded species

- *Chrysophyllum t amieiuinum* (Juill. — Pouteria ?amieuanum (Guill.) van Boyen, Blumea VIII, 2, 1957, 497.
- ———— *balansae* Baillon, Bull. Soc. Linn. Par. II, 1891, 901 (non C. balansae Baillon 1. c. 900) = Pouteria calomeris (Baillon) Baehni, Candollea IX, 1942, 323.
- ———— *beccarii* Pierre = Planchonella torricellensis (Schumann) H. J. Lam, Nova Guinea XIV, Bot. 4, 1932, 562.
- ———— *brevicaule* Krause = Myrsinacea, H. J. Lam 1. c. 568.
- ———— *calomeris* Baillon ex (Uuill. = Pouteria ealomeris (Baillon) Baehni, I.e. 323.
- ———— *castanospennum* White = Pouteria castanosperma (White) • Baehni, 1. c. 295.
- ———— *curtisii* King & Gamble = Planchonella linggensis (Burck) Pierre, Not. Bot. Sap. 1890, 35.

8. *Chrysophyllum dubium* Pancher & Sébert — Planchonella dubia (Pancher & Sébert) van Royen, Blumea VIII, 2, 1957, 304.
9. ——— *firmum* Miquel = Planchonella firma (Miquel) Dubard, Ann. Mus. Col. Marseille XX, 1912, 59.
10. ——— *francii* Guill. = Pycnandra chartacca Vink, Nova (liiinea, NS. 8, 1, 1957, p. 113.
11. ——— *hdermannii* Krause = Planchonella chrysophylloides H. J. Lam, I.e. 566.
12. ——— *longipes* Baillon = Pouteria *i* lon&ipes (Baillon) Bachni, l.c. 330.
13. ——— *macrocarpum* (Pancher & Sébert) Baillon = Pouteria endlicheri (Montr.) Baehni, 1. c. 305.
14. ——— *philippense* Perrottet = Palaquium i)hilippense (Perrottet) Robinson, Phil. J. Sc. Ill, 1908, 304.
15. ——— *polynesicum* Hill. = Nesoluma polynesicum (Hill.) Baillon, Bull. Soc. Linn. Par. II, 1891, 964.
16. ——— *fpyriforme* Baillon = Pouteria balansana (Pierre) Baehni, l.c. 317.
17. ——— *rhodoneurum* Hassk. = Planchonella nitida (Bl.) Dnbard, vide H. J. Lara, Bull. Jard. Bot. Buitenzorg ser. Ill, 7, 1925, 205.
18. ——— *sebertii* Pancher = Planchonella sebertii (Pancher) Dubard, Ann. Mus. Col. Marseille XX, 1912, 58,
19. ——— *torulosum* Krause = Myrsinacea, H. J. Lam, Nova (Suinea XIV, Bot. 4, 1932, 568.
20. ——— *wakere* Pancher & Sébert = Pouteria wakere (Pancher & Sébert) Baehni, l.c. 335.
21. ——— *spec.* Baehni, 1. c. 427 = Pouteria unmackiana (Bailey) Brlee, Blumea VIII, 2, 1957, 470.

Index of collectors' numbers

The numbers between brackets indicate the number of the species; * indicates a type specimen not seen by me.

Fetschcrin s.n. (17) — Fitzalan s.n. (24) — Fleury 30118 (3) — PI. f»* Sing. 1739 (3) ; 2756 (3-); 5837 (3) — Forbes 546 (3) — Ford 21612 (3) — Forestry Bureau 17803 (3) — Franc 689 *(18);* 1835 (9); 1771 (9) — Francis s.n. (22).

Gardens 833 (2); 1636 (2) — Goodenough 1739 (3) — Grashoff 1080 (3)' — Gray 199 (24) — Griffith s.n. (3) — Guillaumin & Baumann-Bodenheim 6732 (12); 6748 (12); 7193 (6); 8979 (6); 10186 (6); 11398 (13); 11957 (18); 11958.'* (18); H»62 (18); 12968 (6).

Hàniff s.n. (2) — Harmand 841 (3) — Haung 63 (3) — Herb. v. Royen s.n. 0) — Herb. Var. Bot. s.n. (3) — Heyne 102 (3) — H. L. B. -232 (3) — Hooglaml .1854 (3) — Houteoorten v. d. Gecleh 304 (3) — Hiiilimann 1018 (18); 1130 (18). Kajpwski 76 (24); 1200 *(22);* 1213 *(22);* 1440 *(22)* — Kauelura & Hatusinia *12873* (3) — Kerr 8.173 (3); 9864 (3); 18883 (3) — K.F. 20154 (2) — Koorden (all "umbers: 3) 1734(3; 2184/3; 10131(3; 10132(9; 101330; 101340; 101350; 101360;]212ap; 121240; 12262 0; 130240; 153310; 188530; 188540; 206390; 224400; 24347 0; 24410 0 ; 30319 0 ; 3041 3 0; 30414 0; 31065 0; *S2687 0;* 33086 0; 33409 0; •HO660; 37256 0; S9570 0; 42763 0 — Kostermans 39 (3); 219 (3); 257 (3); lW (3); 5537 (3); 6923 (3) — Krukoff 4156 (3).

Lane-Poole 614 (3) — Lau 1480 (3) — Lawrence s.n. (23) — Lfaurd 135 (6); 811. (<JJ _ Lörzing 9»174 (1); 13078 (1).

Mahan e.n. (3) — Maingay 980 (3) — Me Dowell s.n. (24) — Me Kee 2416 0*0; 2460 (14); 3488 (17) — Merrill 2098 (3); 92161 (3) — Moore s.n. (23) — v. Mueller s.n. (24).

N.I.F.S. (all numbers: 3) V — 192; bb4113; bb6676; bb7841; bb9533; ⋙ 11979; bb 12746; bb 12885; bb 13012; bb 13-324; bb 13382; bb 15881; bb 15885; h 20765; bb 21333; bb 22402; bb 23937; bb 23938; bb 23939; bb 24757; bb 25840; »26241; bb 28999; bb 33270; bb 33456; bb 33529; bb 33539"; bb 33609; bb 33977; »b 34017; bb 34720; E1208; T. 1. P. 744 — N. G. F. 12-89 (3); 1520 (3); 3297 (3) — *Mir 833 (2); 1636 (2); s.n. (2).

Ochse s.n. (1).

Pancher s.n. (18); s.n. (13) — Pancher & Sebert s.n. (6) — Petri 95a (24); s.n. (24) — pfcrje 1507 (3); 9277 (3); s.n. (3) — Poilaine 11798 (3); 35674 (3). Le Bat 2952 (13) — Ridley 2756 (3); 5837 (3).

Sarlin 167 (16); 308 (6); 309 (6) — Schlechter 15189 (17) — Sebert & Fournier I? (9); 77 (11) — S.F. 31199 (3); 34943 (3); 35983 (3); 38595 (1); 40200 (3) — »niriOy s.11. (24); s.n. (22) — Simmonds s.n. (22) — Sinclair 40200 (3) — Smith 1269 (3.) — Smith & Webb 3137 (24) ; S295 (22); 3362 (22) ; 3963 (22) ; 4672 (22); 4742 (22) — Sodiadanda Ilham 22 (3) — v. Steenis 18332 (1) — 8wain 40 (24); (23).

Teysmann H. B. 973 (3); H. B. 973 & 976 (3); H. B. 978 (3); H. B. 3288 & 3496 (3); 163 (3); s.n. (3) — Thozet 298 (24); 315 (24); s.n. (24) — Thwaites 2689 (3) — Tryon s.n. (22).

Verhoef Z. O. B. I — 95 (3); Z. O. B. I — 221 (3) — Vieillard 18 (6); 2892 (12); 2901 (10) — Virot 191 (17); 205 (20); 210 (13); 1280 (15) — de Vriese H. B. 3288 (3); s.n. (3).

Walker 234 (3); s.n. (3) — Wallich 4160 (3) — Wang 34505 (3) — Weatherhead 90 (24) — Weehuizen 23 (1) — White 1282 (22); 8034 (24); 8918 (22); 11729 W?) J 12109 (24); 13043 (23); s.n. (22); s.11. (23) — White & Francis s.n. (24) — »tkamp s.n. (1) — Woomersley 3297 (3).

Young s.n. (3).

Zippel 141 (3); 143 (3).

Index

Accepted species are printed in roman, synonyms in *italics;* new species and new combinations are printed in **bold** characters. The numbers refer to those of the species in the text. The prefix E refers to the deluded species.

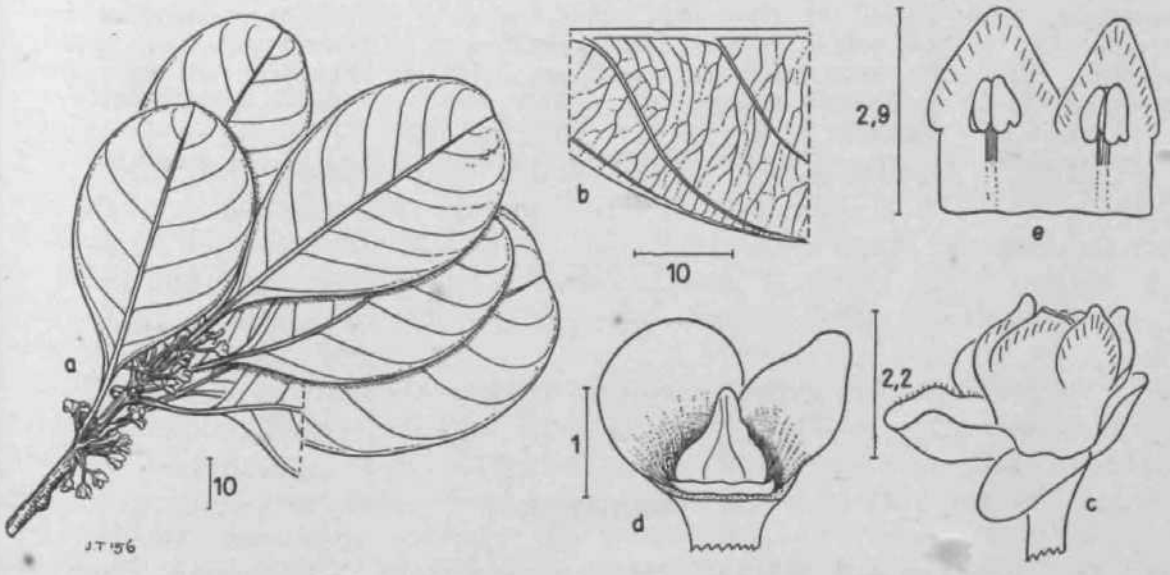
ADDENDA

After this publication, had **been made read;** for press some new material came to our disposal. By **abstention** of Mr \\\ Vink, wlm has been called upon to fulfill liis national service in **the** Dutch Army, a description of a new species has to be drawn up by us. We have named it *CUrysophyUum baUntizt iiii* vim Ri>yen in honour of l>r E, C. Bakhuizen van den Brink who pointed **oat** that *Cnrr lilxf** belongs to the **Sapotaceiue,**

Th<' ricsciiptiun of this species runs as follows:

25. C. bakhuizenii van Royen, nov. sp. — ***Fiff.*** *17.*

Tall tree, c, 25 m. Hranehlets terete, 1'—,') mm in diam., blackish, rugulose, glabrous. *Leaves* broadly obovntc-spatulate, 6.5—&,5 by 3—4.5 cm, rounded at aptex', narrowly emirate ;it base, decurreut; **enbooxiaoeaus, glabroaa** abovo hut **whitish** tonieiii[1] **along midrib** *mul* **oerveB,** pule ***tetragiBoaAy*** toincntosc-sericcou.s brlow; jniilrili **grooved** a'>ove, angular below, aecondary nerves stout, 5—*1,* **ascending** at an an^le **of** <•. 60°, jUnd, diminishing until ineonspieuous or aifhiugly joined, but sometimes **connected** by some thiclwMii'd nerves unly, **prominent** on **either** side, **tertiary** nerves transverae,



l'"iji. 17, C. *b<il!uii~i-iti-i,* ii, **flowering brauehiet,** b, part of leaf enlarged, **c** flower, 1 • "vary and part of valyx, o. part of corolla, inside, (from *Corr 1415*9).

prominem on r'ithcr side but more distinct **above;** petioles 1.1—*2 cm* long, slightly grooved above, subangiihir or rounded below, **glalxrous.** *Flowers* in 8—14-flowered axillary <'lustiTs; **pediffili Bubengular,** 5—7 mm long, sparsely whitish tomentose. *S(ptils* »ieular or suborbicular, t-. 2.5 by 2 imu, rounded at apex, glabrous without, sparsely ferniginously tomentost[1] within, **inner** sepals **with** sparsely pale ferrugiiiously iicntoso outside, ami tnenibranous and fimbriate margin. *Corolla 2.5*—3.5 mm long, »i-"iis, lobes **orate, 1.5—*2* hy **1.2—1.5** mm, **obtuse,** tube 1—1.5 mm long. ***Stamens*** 5, stertod in the Ijaaal third, e. *13* mm long, filaments subulate, e. 0.7 mm long, **anthers** L™*J "• **0.6** mm lout;, **rounded** and emarginate at apex, dehiscing introrsely. »Sf;it]ii[]otlea '^'"t. *Ovary* **conoid,** 5-lobed, o-celled, c. 0.5 by 1 **mm,** at base densely **terruginously** ut<>; style c, 0.5 mm long, **not** distinctly marked against the ovary. *Fruits* unknown.

Type specimen: ***Cart*** *N15!)* in L,

J^istr.: New **Quinea.** *.

XKW (irixtiA.. **Southeastern** New **(Jtiinea,** Alola, alt. 2Ouo m, fore^i: (L^, tnx* c. 2> m, fl. greenish, January; Lala river: *Caw 160l£* '{BM, L,), tree e.]« m, fl. March,

fm ^enia rks; This **speeaea** is **elosely related** to **C.** *t/onloniarfolwm* Moore but differs th species iti **the smaller** number of secondary nerves (5—7 against 10__14) ma I In leaves **(8.5—8.5** by **9—4,5** against 14—**19.5 by** 4—6.5 cm), and in the *pukes'.*

cent ovary, which is glabrous in C. *gordoniaefoUum.* Moreover, the new species is found in New Guinea and C. *gordoniaefolium* in New Caledonia.

In the key to the species of the genus *Chrysophylhm* (see p. 24) C. *hakimisniii* has to 1)0 inserted under nr 11, which now reads:

lla. Secondary nerves 5—14 . . . . . 11'
b. Secondary nerves 20—30 etc. etc 12
ll'a. Secondary nerves 5—7, leaves 6.5—8.5 by 3—4.5 cm, ovary densely ferruginously hirsute at base. *New Guinea* . . . . . 26. 0. **baUffllzenii** van Boyen
1). Secondary nerves 10—14, leaves 14—19.5 by *A*—6.5 cm, ovary glabrous. *New Caledonia* . . . . . 7. C. **gordoniaefolium** Moore

Latin diagnosis of the new species:

Chrysophyllum bakhulzenli van Boyon — Arbor magna. Folia late obovata-spatulata, 6.5—8.5 X 3—4*5 <?m> apice rotundata, basi attenuata, supra glabra, subtus dense et pallid? ferrugineo-sericea; nervi secundarii in utroque latere 5—7 e costa orti; petiolus supra subcanaliculatus. Floi^es axillares fasciculati. Sepala 5, intus pallidc ferrugineo-tomentosa, extus glabra vel (interiora) extus sparse et pallido feri*ugineo-tomentosa. Corollae lobi 5, basi tubum connati, ovati. Stamina 5, filamentis subulatis, antheris ovoideis. Staminodia nulla. Ovarium conoideum, 5-lobatuin, 5-loculare, ad basin dense ferrugineo-hirsutum. Fructus ignotus.

Typus: *Can 14159* in L.

Chrysophyllo gordoniaefolio Moore affinis, sed ab eo differt nervis secundariis 5—7 et foliis minoribus.

ESEATUM

In Nova Guinea N.S. 8, 1, 1957, 123 the specific epithet should be read: *Pycnandm* ***griseosepala*** **Vink instead of P.** ***griseopala*** **Vink.**

REVISION OF THE SAFOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

XIV[1]). Diploknema Pierre

by

P. VAN ROYEN

(Rjjksherbarium, Leiden)

(Issued 1. VII. 1958)

Diploknema Pierre, Arch, néerl. sc. exact, et nat. 19, 1884, 103; Burck, Med. Lands PI. Bzg 3, 1886, 43; Boerlage, Handl. Fl. Ned.-Ind. 2> 1, 1891, 301; Baillon, Hist. PI. 11, 1891, 302; Engler $ Prantl, Nat. Pfl. Pam. 4, 1, 1897, 134; Heyne, Nutt. PI. Ned.-Ind. 3, 1917, 292; Lam, Bull. Jard. Bot. Bzg, sér. 3, 7, 1925, 183; Lam, Bull. Jard. bot. Bzg, sér. 3, 8> 1927, 463; Heyne, Nutt PI. Ned.-Ind., ed. 2, 1927, 1231, and ed. 3, ^SO, 1231 — *Mixandra* Pierre, Not. Bot. Sapot., 1890, 2; Dubard, Rev. ({*n. Bot. 20, 1908, 316.

Trees. *Leaves* alternate, usually crowded at apex of branchlets, stipules °xtant, petioles often thickened in basal part. *Inflorescences* fascicled in axils of leaf-scars on older branches, those of the present year in most eases bearing leaves only. *Sepals* (4—)5(—6), spirally arranged, ovate, the two exterior ones valvate, the inner ones imbricate. *Corolla* 7—16-lobed. *Stamens* 16—80, in 2—4 rows inserted in the throat of the °orolla, sometimes androecium reduced and consisting of as many petaloid staminodes. *Ovary* without or with a small disk, conoid, glabrous or Pubescent, 5—14-celled; style stout, truncate, cells with one ovule which j8 centrally or apically attached. *Fruit* a 1—3 (—5)-seeded berry, seeds lar ge, scar broad, testa thin to thick, woody to crustaceous., albumen none to extant, cotyledons thick, curved towards margins, radicle short, inferior.

Type species: *D. sebifera* Pierre.

IHstr.: 6 species; 2 in India, Tibet, Bhotan, Nepal, Burma, and the Andamans, 1 in Siam, 1 in Borneo, 1 in the Philippines, and 1 in Amboina. ***(Fig. 1).***

Remarks: The number of secondary nerves is that at one side of the midrib. The scales added to the drawings are given in millimeters.

---

[1]) I—III in Blumca VI, 3, 1952, 547—595; IV—V in Blumea VII, 2, 1953, 364—412; IVa in Blumea VII, 3, 1954, 481—483; Ha, IVb, Va, VI—IX in Blumea VIII, 2, 1957, 201—513; X—XII in Nova Guinea N.S. 8, 1, 1957, 87—128; XIII—XVI in tho present isauo.

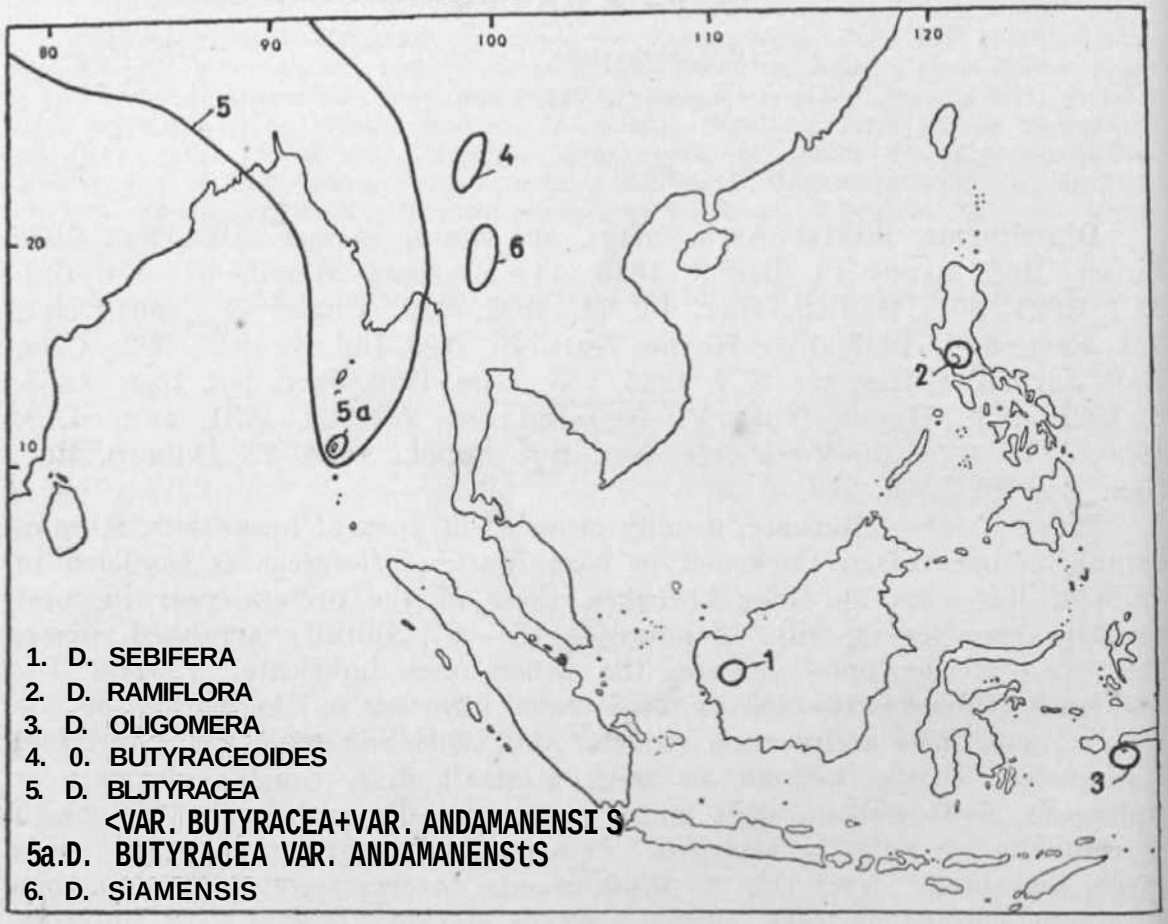
Key to the taxa

J.a. Base of leaves **abruptly narrowed,** rounded, or **euneate** and **shortly decurrentj** cin-olla-lobes 5—10, stamens ID—SO, flowers up to 1 em large, pedicel*] 0.2—US cm long. 2

b. BaM of leaves tapering, short or rather long decurrentj but if rounded then stamens 22—40, flowers larger thun 1 cm and pedicels '2.*n*—3.5 cm long . . 3

g.a. Corolla BmaHer than 8 mm, corolla-lobes spatulato, apex obtuse, rtamena 1(5—2(H pedicels 0.2—0.15 cm long; socondarj' nerves of leaves 8—14, ascending tit an angle, of $4S^{8}$-^55^{8}. *Borneo*. . . . . .1. D. sebifera Pierrl

DISTRIBUTION OF THE SPECIES OF DIPLOKNEMA



Fi^. l. Distribntion of the species of ZKpIofcnema.

h. Corolla 6—8 mm large, corolla-lobes lanceolate, apex acute, stamens e. 20, pedicels c. l.o cm long; secondary nerve* of loaves 6—8, ascending at an anglfl Of 35°—50°. *Philippines* . , . . *2.* D. ramiflora (Merrill) H. -T, Lam

,'i.a. Corolla smaller than 4 in in, pedicels 0,7—l.S cm; leaves 4—M by 2~5.5 cm, loiigly acutely acuminate, secondary nerves 8—14, petioles 1.5—3 cm long. *AmboinO.* 3. D. oligomera *H.* .1. Lam

b. Corolla larger than 1 em, pedicels L5—3.5 era long; leaves 15—*ir>* hy (i—18 cm, short otitusely acuminate or rounded, secondary nerves 15—*20,* petioles *2—Yl* oil long. 4

4.a. Stamens 70—SO, pedio'ls 1.6—2*5 em long, petioles 2—4 rm limj;. glabrous- *India and Bur nut*. . . . . 4. D. butyraceoides (Scott) H. ,T. Lain

b. Startn'iis *18*—10, petioles 4—1^ ctn long and glabrous or petioles 1.8—4.4 cm long :ind yellowish puberulous. . . . . .S

5 •a. Corolla 7—10-lobed; petioles 1.8—4.4 cm long, flat or shallow anrl hroadlv **grooved** above . . . . . .(>

b. Corolla 14-lo.bcd; petioles 4—12 cm long, narrow and deeply grooved above, ***Siam*** 6. **I>.** siamensis **Plet'chor**

6 •a. Co roll a-lobes broadly sjiatuliUc., calyx glabrous **within, except** for a few scattered brown woolly Imir.s lubes obtuse to **Sttbobtuse,** stunu'iis L[11]— K), **filaments** 5—7 miti **long,** glabrous, anthers **glabrous.** *India, Bliotan,* ***Nepal*** *cud* ***Tibet.***
5. **D,** butyracea (Koxb.) II. J. L:uu var. butyracea

b. Corolla-lobes narrowly ovate, calyx ferruginously sericeous within, lobt's acute stamens c, IS, filaments c. *2* mm long, densely brownish woolly, **anthers** *with* long brown hairs on **either** side. *Andamans* 5. D. fcutyracea **fRoxb.) H.** .1. Lam vur. andamanensis **?aa Boyen**

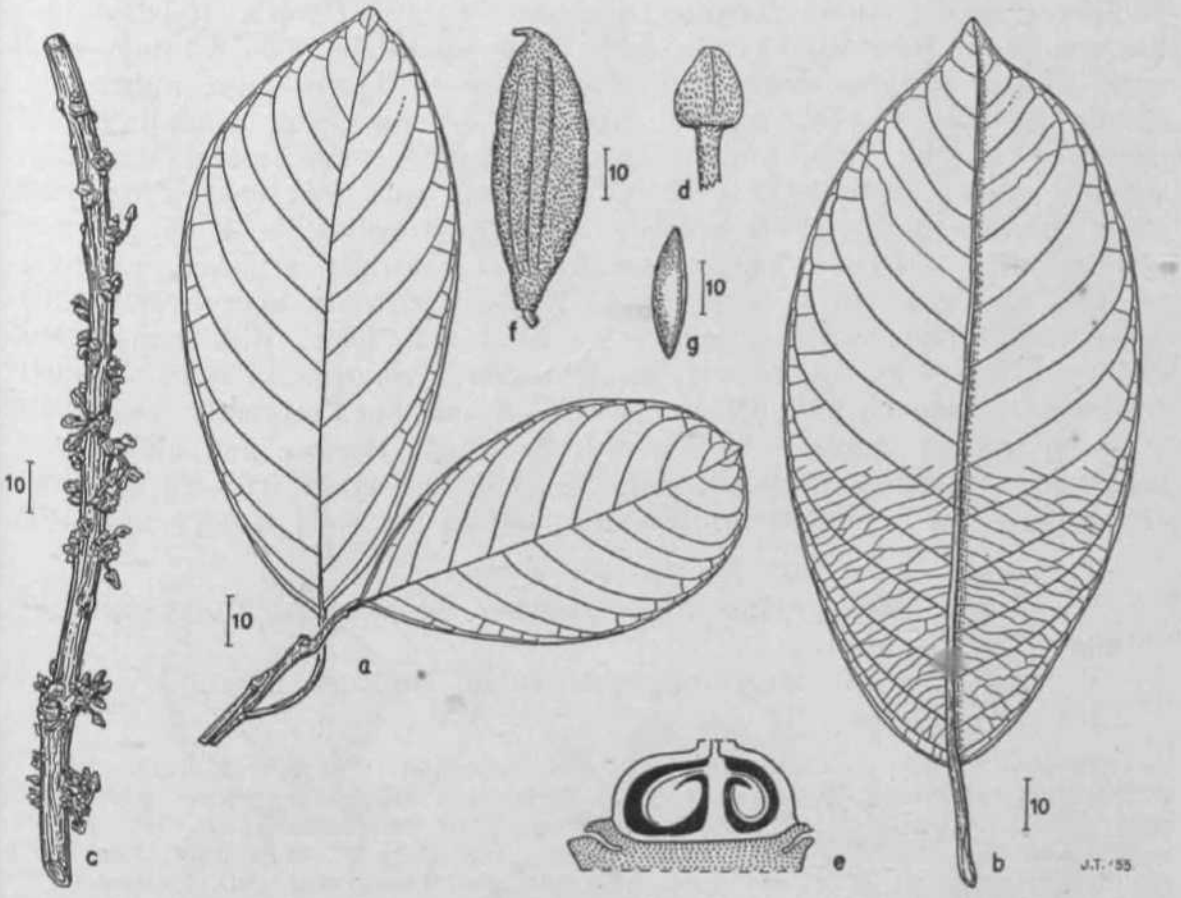


Fig. **2.** ***Diploknema*** *xebifera,* a. top of branchlet **with** leaves, b. leaf, underside, ^•flowering **bianchiet, dL flowerbud, e.** longitudinal section of ovary, f, fruit, g. sped. 1from *Kmppcrt s.n.).*

1. D, sebifera Pierre. Arch, neerl. se. exact, et nat. 19, 1884, 103, }• [4]; Burek, **Med** Lands. Pl.t. Bzg 3, 1886, 43; Hoyne, Nutt. PI. Ned.-Ind. $ 1917, 292; Lam, I.e. 1925, isi; **Lam,** I.e. 1927, 463; Heyne, Nutt. PI. ^ 1 , Ind., ed. 2, 1927, 1231, and ed. 3, 1950, 1231 — *Fig. 2.*

Trees. Branchlets angular, e. 4 mm thirk. **glabrous,** greyish. *Leaves* f'onferted at apex of bra ncli lets, **spatulate** or obovate, 10—24 by 3—7.5 cm, I^x obtuse or shortly acuminate, **base** rounded, shortly decurrent alonj; 'Pper surface of petiole; **glabrous** on either side, nitidous above, dull below,

coriaceous; midrib grooved above, prominent below, secondary nerves 8—14, ascending at an angle of 45°—55°, slightly curved, diminishing until inconspicuous, rarely archingly joined, subimpressed above, prominent below, tertiary nerves transverse, few, inconspicuous above, prominent below; petioles 2—4 cm long, with a very narrow shallow groove above, basal part thickened, glabrous. *Flowers* unisexual, in 3—7-flowered fascicles on distinctly prominent warts, in the axils of up to 2 mm large, lanceolate bracts, which are ferruginously puberulous without and glabrous within; pedicels 2—5 mm long, ferruginously tomentose. *Sepals* 5, ovate or elliptic, 2.5—4 by 1—3 mm, apex subacute or obtuse, ferruginously tomentose without, glabrous within, margin cili-ate, the two innermost sepals carinate and pubescent except along margins, glabrous within. *Corolla* 10-lobed, 3—4.5 mm long, tube 0.5—1 mm long, lobes spatulate., 2.5—3.5 mm long, auex obtuse, margins denticulate, (according to Pierre apex pubescent). *Sterile stamens* 16—20, in two rows, 2—3.5 mm long, lanceolate, but narrowed at the base, apex obtuse, irregularly denticulate, sometimes sparsely pilose, glabrous, except in the basal part for some white hairs along margins and outside. *Ovary* (6—)7(—8)-celled, c. 1 by 1.5 mm, ferruginously sericeous, ovules apically and centrally attached, campylotropous, the ovules in a subhorizontal position with the micropyle slightly below the hilum; style angular, up to 4 mm long; disk cup-shaped; c. 1.5 mm in diam., irregularly 16—20-toothed, glabrous. *Fruits* obliquely fusiform or subobovate, 3.5—6 by 1.4—2 cm, apex obtusely acuminate (acumen up to 3 mm), 1—3-seeded, brownish floccose but glabrescent, pericarp subligneous, seeds obovoid, 2.5—3 by 0.8—1 by 0.6—0.8 cm, apex obtuse, base acute, scar covering almost half of the seed, embryo unknown.

Type specimen: *Knappert s. n.* in L.

Use: The seeds produce after pressing the so-called Tangkawang oil (Minjak Tangkawang).

Vern. names: merading, njato kalan, lfankang, putat.

Distr.: Borneo.

BORNEO. **Indonesian Borneo, distr. Amuntai: *Knappert s. ?i.* (K, L), fl. & fr.; E. Kutai, Sungei Menubar region, alt. 20 in, loam soil with limestone: *Kostermans 5028* (BO, L), tree 32 m, fr. June; Mt Sekrat, S. of Sangkulirang, alt. 100—200 m, coral limestone rocks: *Kostermans 59g8* (BO, L), tree 40 m, fl. buds, July; Loa Haur, W. of Samarinda, alt. 40 m, sandstone, loam soil: *Kostermcms 6794* (BO, L), tree 40 m, fr. May; ibidem: *Kostermans 6949* (BO, L), tree 48 m, fr. May; Tdg Bangko region near mouth of Mahakam river, low ridge, sandy soil: *Kostermans 7168* (BO, L), tree 45 m, fr.; Berau Domaring, alt. 300 m: *NIFS bb 18901* (BO, L), May — Sandakan, Elopura: *A game AS1SS* (SING), Sept.; West Gajah: *Lakursing ASS54* (SING), Sept.**

Remarks: In Pierre's description the number of secondary rierves of the leaf is stated as being 28—30, but this certainly is a typographic error as in the type specimen this number is 8—10 pairs only. By this error, Lam, 1927, who did not see the type specimen, unintentionally, placed Z). *sebifera* in the wrong part of his key.

2. D. ramiflora (Merrill) H. J. Lam, I.e. 1925, 184, f. 52; Lam, I.e. 1927, 463 — *Illipe ramiflora* Merrill, Bur. (lov. Lab. Bull 17, 1904, 42 — *Bassia ramiflora* (Merrill) Merrill, Phil. Journ. Sc. Bot. 10, 1915,

§6 — *Mttdhuw mmiflora* (Merrill) Merrill, Eiium. Phil. PI PI 3, 3, 1923, 278 - *Fig. 3.*

Trees, up to 35 m. Branchlets terete, 3—9 mm in diam., **striate,** greyish-brown, brownish sericeous when young; stipules lanceolate, up to :> mm long, apex acute, brownish sericeous, caducous. *Leaves* scattered **o* Bubconferted at apex of branehlets, oblong or subobovate,** 8—13 **by** 2.5—° em, apex obtuse or subaeuminate, **acumen** tip to 5 mm long, obtuse, base

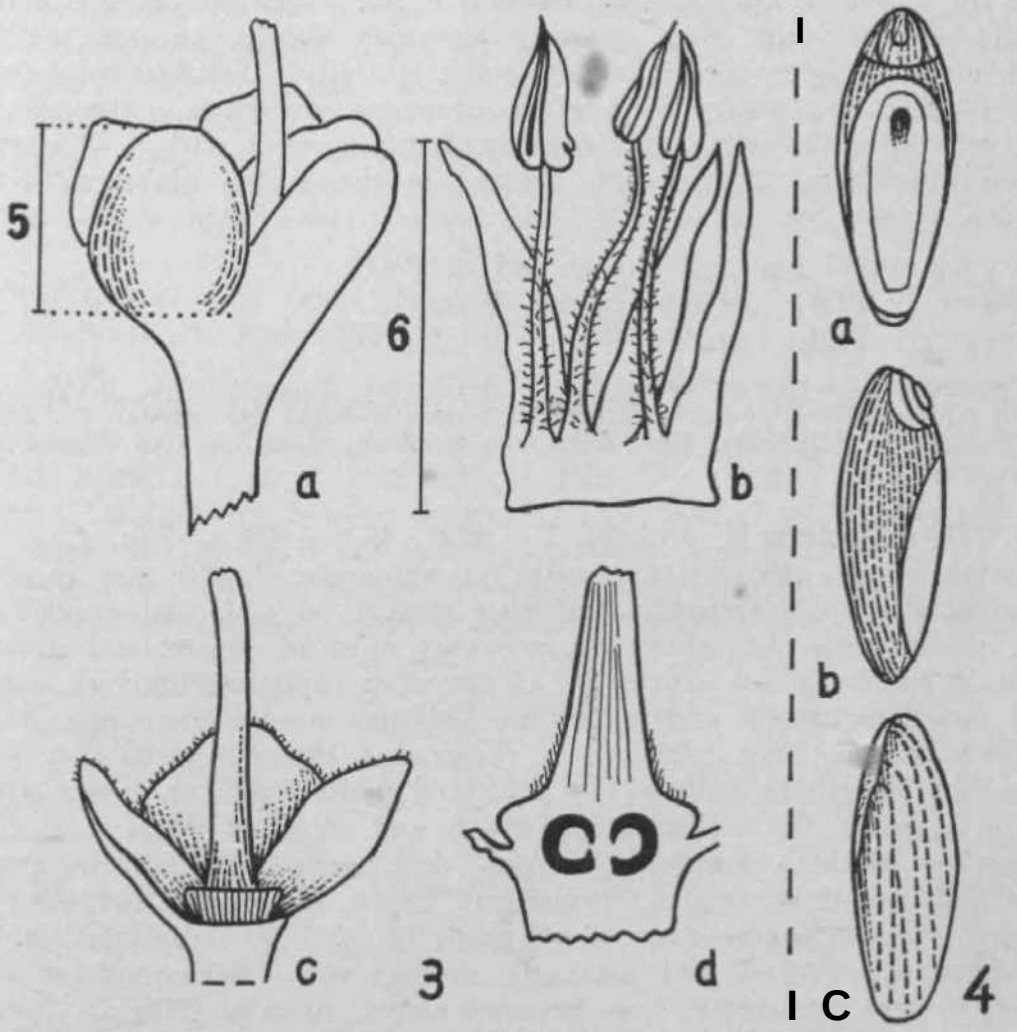


Fig. 3. *Diplohwma ramiflora,* JI. flower, outside, b. dissected flower, inside, a. ovary^ with a few scjial!*, d. longitudinal section of gynaocium. **(from *type speohnm)'.***

Fig. 4. ***Diptoknema aUffootara,*** **a.** seed, view **of the** scai, li. **seed, Been** from aside, c. inside **of tiMta.** {from *Butvalda €100).*

IT|unded or acute, abruptly narrowed; juvenile leaves sparsely whitish seri-"•'"ls M3 **eithoc side,** mature ones glabrous on either side or with a few u'mte ***hairs*** **below,** nitklulrms **above,** dull below, coriaceous; midrib grooved ab ove and minutely crested, **prominent** below, **secondary nerves** 6—8, ?seending at an angle of 35°—50°, slightly curved, diminishing until n<'t;iispicuous, impressed above, prominenl below, tertiary nerves few, trans-v(,lN|e, invisible above, inconspicuous below; **petioles** 1.5—4 cm lonjr, **grooved**

above, rounded below, basal part thickened, rugose and flaking off with marcescent flakes. *Flowers* in 1—5-flowered fascicles on distinctly prominent warts, in the axils of up to 2 mm large., lanceolate, acute bracts which are ferruginously sericeous on either side; pedicels angular, c. 1.5 cm long, brownish sericeous, thickened at apex. *Sepals* 5, broadly ovate, 5—7.5 by 5—6 mm, apex obtuse, or short obtusely or acutely acuminate, ferruginously tomentose or sericeous on either side, but woolly along the margins. *Corolla* white, 10-lobed, 6—8 mm long, lobes lanceolate, 5—6.5 by c. 2 mm, apex acute. *Stamens* c. 20, 7—10 mm long, filaments subulate, 4.5—6.5 mm long, sparsely brownish woolly, anthers sagittate, 2.5—4 mm long, apex acuminate^ dehiscing laterally. *Pistillum* long-conoid, up to 14 mm long; ovary 6—8-celled, brownish sericeous, ovules attached in the middle of the cells; style angular, glabrous, apex with 6—8 stigmas; disk cupuliform, c. 2 mm high, adnate to the ovary, glabrous. *Fruits* unknown.

Type specimen: *Barnes 189* in PNH.
Vernacular name: baniti (Luzon).
Distr.: Philippines.

PHILIPPINES. **Luzon, Bataan prow, Lamao river: *Barnes 189* (K, PNH, SING), fl. Jan.; ibidem: *Barnes 58S* (PNH), March; Bataan, *Williams 554* (SING), fl.; Zayabas prov.: *Curran 10S94* (SING), May; Laguna prov.: Santa Maria, Maritae: *Curran 10086* (SING), Febr.**

3. D. oligomera H. J. Lam, l. c. 1927, 463, f. 26 — *Fig. 4.*

Large trees. Branchlets angular or subterete, 2—3.5 mm in diam., ferruginous-brownish sericeous, the more mature ones blackish-greyish sericeous, glabrescent. *Leaves* subconferted at apex of branchlets, subovate, elliptic or subobovate., 4—16 by 2—5.5 cm, apex caudate-acuminate, acumen 5—35 mm long, acute and sometimes oblique, margin crenulate, with a distinct marginal nerve; glabrous on either side, except for the very young leaves, but sometimes with a few scattered white hairs on lower surface to leaf, blackish to black-greenish above and nitidous when dry, cinnamomous or blackish brown below and dull, coriaceous; midrib grooved above and minutely crested, prominent below, secondary nerves 8—14, straight or curved, ascending at an angle of 55°—70°, diminishing until inconspicuous, grooved and minutely crested above., prominulous below, tertiary nerves transverse, few, grooved above, prominent below; petioles 1.5—3 cm long, slender, shallowly grooved above and minutely crested, basal part slightly thickened, grey-blackish velutinous, glabrescent except for the thickened part. *Flowers* in 5—12-flowered fascicles, in the axil of up to 1 mm large, deltoid, acute bracts which are ferruginously blackish sericeous without, glabrous within; pedicels angular, 7—12 mm long, slightly thickened at apex, ferruginously velutinous. *Sepals* broadly ovate, 1—2 by 1.5—2.5 mm, apex obtuse or subacute, brownish sericeous without, glabrous within, margin fimbriate. *Corolla* 3—3.5 mm long, 10-lobed, outer 5 lobes spatulate or ovate, acute., inner 5 lobes ovate, obtuse, both types 2—2.5 by c. 1.5 mm and whitish-ferruginously sericeous without. *Stamens* 10 or 11, in 2 rows, inserted near base of corolla., filaments subulate, curved outwards at apex, 0.5—1 mm long, anthers sagittate, 0.2—

0.7 mm long, apex **mucronate, dehiscing extrorsely, base** of iliecae obtuse ***Ovary*** conoid, p. 1 by 0.5 mm, 5-cclled, **ferruginoiisly** sericeous, **at** apex **contracted** in 5 **stigmas,** cells one-ovuled, ovules inserted **slightly above the** middle of the placentas, sulieampylotropous. *Fruits* obliquely ovoid or [illegible]soid, up **to** [illegible] **by** 1.5 cm, apex obtusely **acuminate, brownish** sericeous, Slahreseent, one-seeded, **pericarp** thin, **woody**; seeds fusiform, **slightly** shorter than **the** fruit, aeute at either end, testa thin, crustaeeous, nitidous. **Bear** covering **slightly** less than half of the seed, **embryo exalbuminous,** up *o 25 by **12** mm, radicle, terete, **up** to 6 mm lon«:.

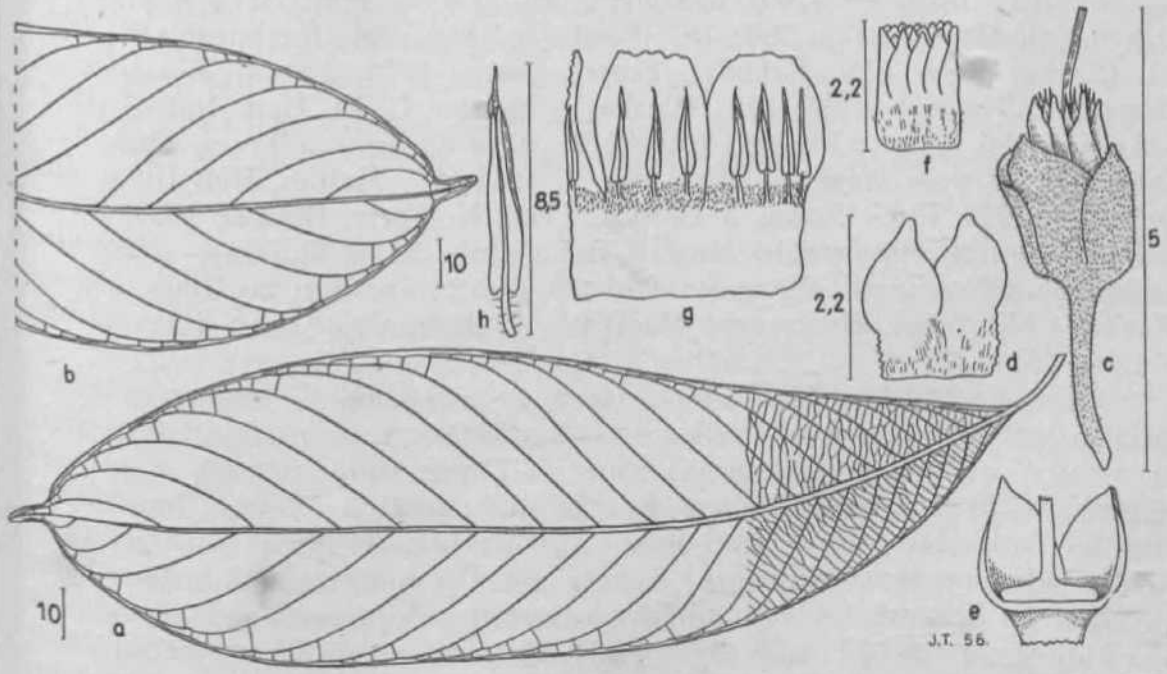
Type **specimen:** *NIFS bb lOJOS^ln* BO.
Vernacular name: tetali.
Dis1 r.: Amboina.

^MIHII:\A. Waal, alt. c 40 m: *NIFS' bb 10106* (BO, L), fl. .luno; ibidem, alt. "JO m: *NIF8 hi, SS966* (BO, L, SING), *be.* Sept.; ibidem, alt. e. 100 ni: *NIFS 25074* {BO, L, -SING), Sept.} ibidem, alt. <\ 100 m: *liitvuiliht H7OO {HO),* tree, fr. Sept,

Remarks: The fruit has **been described Orom** *NIFS bb **25965*** in **Rgfeaherbarram,** and ***BuwcUda** 6100* in BO.

4. D. butyraceoides **(Scott)** If. -I. **Lam,** I.e. 1927, 465 — *Bassia butyr**aceoides*** **Scott, Kew Bull.** Misc. Inf. 1916, 36; Burkill, Bot. **Abor** Exp., Rec. **Bot.** Sun. Ind. 10, 2, 1925, 316 — ***Fig.** 5.*

Trees. Branehlets densely brownish tomontose. *Leaves* **scattered,** ob-ovate-**>blong,** If)—25 by **6—11** cm, apex acutely **acuminate,** acumen up to 1 cm long, base **euneate, margin** undulate; **glabrous**| nitidous above, niti-dulous lielow, membranousj **midrib** shallowly grooved above and minutely



Fi ^' '• *Diploknema butyraoeoides,* a. teaf, b. apes of leaf, c flowerj d. *atari* ^'"11| H;i, outside, o. ovary, f. rorolhi. outside, *g.* part of corolht, iusiile,]i. Btamen. om *tyre specimen).*

crested, prominent below, secondary nerves 16—23, ascending at an angle of c. 45°, straight and curved at tip, apical nerves curved, diminishing until inconspicuous, prominulous above, prominent below, tertiary nerves transverse, inconspicuous above, slightly more distinct below; petioles terete, 2—4 cm long, grooved above, basal part subincrassate, glabrous. *Flowers* in 12- (or more?) flowered, axillary clusters conferted near apex of branchlets; pedicels angular, 1.5—2.5 cm long, brownish woolly, subincrassate at apex. *Sepals* broadly ovate, 1.5—2 by 1.2—1.8 cm, apex obtuse or acute, subacuminate or acuminate, light brownish woolly without, margins of inner sepals ciliate in the basal par^ glabrous within. *Corolla* 2—2.6 cm long, lobes 16, obovate, 10—15 by W—io mm, subacute, outside ferruginously hirsute at the base, inside ferruginously woolly in the throat between the stamens. *Stamens* 70—80, 7—9 mm long., filaments subulate, 1.5—3 mm long, sparsely brownish woolly, anthers sagittate, 5.5—6 mm long, apex caudate. *Ovary* disciform, c. 1.5 by 7 mm, 14-celled, glabrous, ovules anatropous; style 1.8—2.5 cm long, glabrous, truncate, with 14 stigmas. *Fruits* unknown.

Type specimen: *Kanjilal 3137* in K.
Distr.: India and Burma.

INDIA. Assam, NE frontier, Nizamghat, alt. 160 m, Upendranath: *Kanjilal 3137* (K, CAL); Rengging: *Burl-ill 86605* (CAL), fl. Febr.; hill over the Jammc mouth: *Burkill 3616$* (CAL), fl. Jan.; Dihong river, alt. 250 m: *Burkill 37609* (CAL), fl. Dec

BURMA. According to Scott also reported from this country.

5. D. **butyracea*** (Roxburgh) H. J. Lam, I.e. 1925, 186; Lam, I.e. 1927, 465 — *Bassia butyracea* Roxburgh, Asiatic Res. (Transact. Soc. Inst. Bengal etc.) 8, 1808, 499, fig.; D. Don, Prodr. PI. Nep., 1825, 146; Wallich, List of, etc., 1828, nr 4164; Roxburgh, .Fl. Ind. 2, 1832, 527; Royle, Bot. Himalayan Mts. 1, 1839, 263; DC, Prodr. 8, 1844, 198; Roxburgh, Fl. Ind., ed. Clarke., 1874, 411; Brandis, Forest Flora, 1874, 290, t. 35; (iamble, Man. Ind. Timbers, 1881, 448; Clarke in Hooker f., Fl. Brit. Ind. 3, 1882, 546; Kanjilal, Forest Fl. etc., 1901, 219; Brandis, Indian Trees, 1906, 427; Duthie, Fl. Upper Gangetic Plain etc. 2, 1911, 12; Haines, Bot. Bihar and Orissai 4., 1922, 512; Cowan & Cowan, Trees Northern Bengal, 1929, 86 -* *IlUpe butyracea* (Roxburgh) Engler, Bot. Jahrb. 12, 1890, 509 — *MixandrO butyracea* (Roxburgh) Pierre ex Dubard, Rev. Gen. Bot. 20, 1908, 196 -< *Madhuca butyracea* (Roxburgh) MacBride, Contrib. Gray Herb. Harv. Univ., NS 53, 1918, 18.

Trees, up to 25 m. Branchlets terete or subtcrete, 4—10 mm in diam» striate, lenticellate, rugose., yellowish, cinnamomous or brownish tomentosG or woolly, glabrescent; terminal cone 4—7 mm long, densely woolly *ot* tomentose, in the same colour as the indumentum of the branchlets; stipules lanceolate, c. 5 mm long, apex acute, brownish or yellowish woolly or tomentose, caducous. *Leaves* usually conferted or subconferted at apex of branchlets, sometimes scattered, elliptic-oblong, obovate *ot* obovate-oblong (6—)17—35 by (3—)8—17 cm, apex obtuse or obtusely acuminate, acumen 2—9 mm long, margin crenulate, with a narrow ma** ginal nerve, base cuneate, not or shortly decurrent; yellowish) cinnamomous or brownish tomentose or woolly on one or either side, glabrescent abov

and then nitidous, sometimes glabrescent below also, coriaceous; midrib broadly and shallowly grooved above and sometimes either with one or with 2 crests, prominent below, secondary nerves 14—21, ascending at an angle of 40°—65°, straight or curved but sometimes only so at the tip, diminishing until inconspicuous and joined by some thickened tertiary nerves, prominulous above, prominent below, tertiary nervation transverse with interjacent reticulate nerves, inconspicuous above, more distinct below; Petioles 1.8—4.4 cm long, grooved above, yellowish, cinnamomous or brownkh tomentose or woolly. *Flowers* solitary or in up to 6-flowered, axillary clusters, conferted near apex of branchlets; pedicels 2—1.5 cm long, in fruit up to 5 cm, yellowish, cinnamomous or brownish tomentose or woolly, in fruit glabrous or almost completely so. *Sepals* (4—)5(—6), ovate, 9—15 hV 6—10 mm, apex obtuse or subobtuse or acute, brownish or yellowish woolly without, glabrous within, but with scattered brownish woolly hairs in the apical part., or entirely ferruginously sericeous (var. *andamanensis).* *Corolla* p$_a$i$_e$ yellow, 1.5—2 cm long, lobes 8—10, oblong, ovate, or narrowly °bovate or broadly spatulate, (7—)8—10 by (4—)5—8 mm long, apex obtuse or subacute., often irregularly crenulate. *Stamens* (18—) 20—40, inserted at the base of the lobes, 9—12 mm long, filaments subulate, c. 2 mm 0I> 5—7 mm long, glabrous or brownish woolly, anthers sagittate, c. 5 mm long, apex aristate, dehiscing laterally, glabrous or with long brownish hairs. *Ovary* conoid, c. 2 by 5 mm, ferruginously sericeous, tapering into ^e style., 7—12-celled, each cell continuing into the style as a hollow vessel, base surrounded by an adnate, ferruginously tomentose disk; style terete or subangular, 1.5—5 cm long, glabrous, with 7—12 hollow vessels. *Fruits* ovoid or oblong, 2—2.5 by 1—1.5 cm, 1—3 (—5)-seeded, generally Pointed by a remaining portion of the style, smooth, pericarp fleshy, seeds °Mong-obovoid, differing in shape according to the number in each fruit, UP to 1.3 by 1 by 0.6 cm, glossy, light brown, scar lanceolate, 2—3 mm w*de, pale yellow, testa crustaceous, embryo unknown.

Type specimen: *Roxburgh s.n.* in BR.

IMstr.: India, Tibet, Bhotan, Nepal, Assam, Andamans.

Var. butyracea.

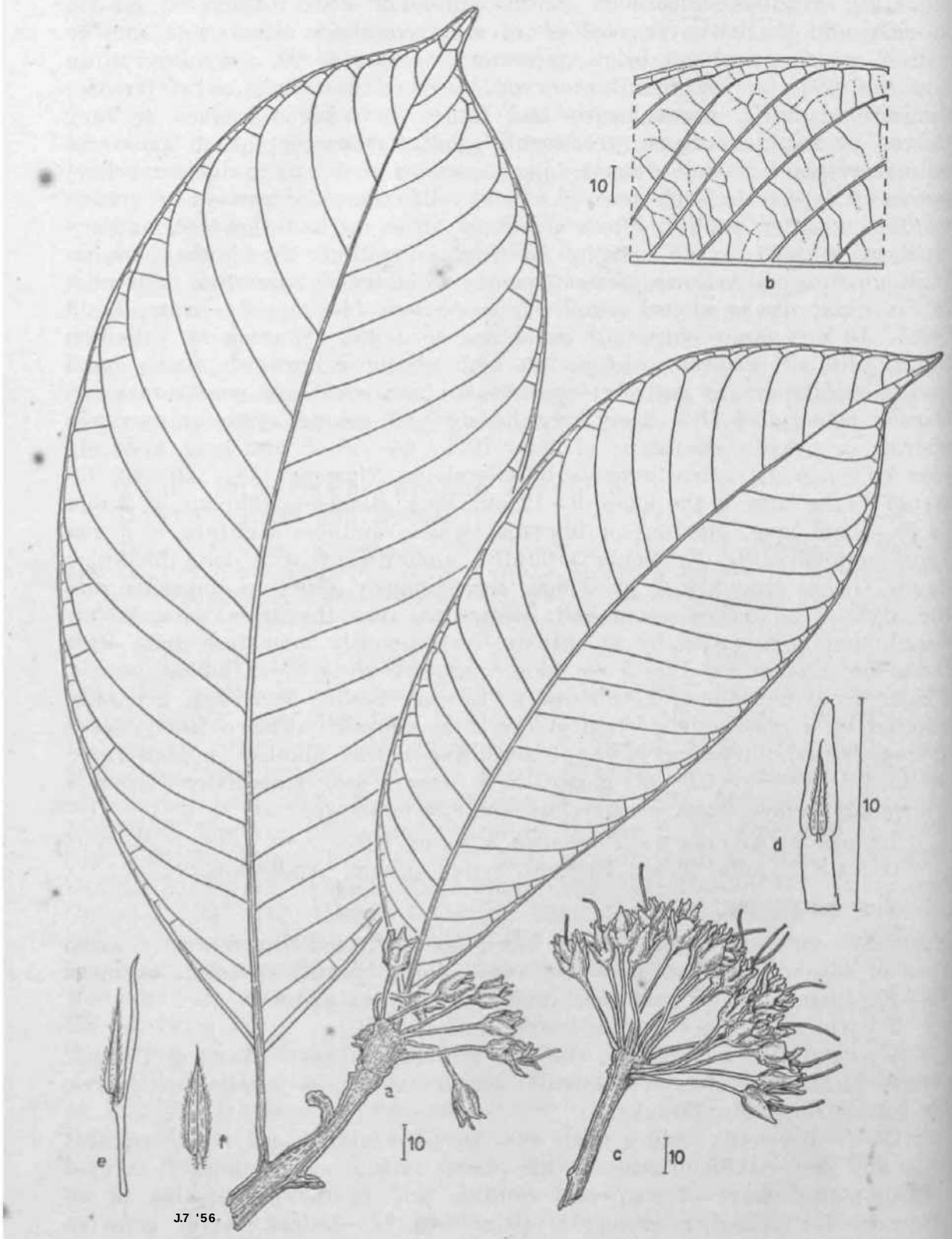
Calyx glabrous within except for a few scattered brown woolly hairs, *Pex of sepals obtuse or subobtuse, corolla-lobes broadly spatulate, stamens 20--40, filaments 5—7 mm long, glabrous., anthers glabrous.

Type specimen: *Roxburgh s.n.* in BR.

Vern. names: ehiura, chaiura, frelwa, phulwara (Kamaon); cheuli (Oudh); chiwari, yel-kung (Bengal); buttery bassia, east india butter.tree, blS-leaved Gordonia (English).

Use: The seeds yield a white substance resembling lard, which remains ?oJid and does not deteriorate in the plains during hot weather. It is used 1h} the manufacture of soap and candles, and in the preparation of an Olntment for relieving rheumatic pains. In the latter case it is offen ^fumed with cloves or attar of roses. The pulp of the fruit and the Oll-oakc are eaten.

Ecology: This species is found in the sub-Himalayan tract and °Uter Himalayan ranges at 500—1000 m alt. It is sparsely found as a small



Fig, ii. ***THploknema bttty faaea,*** var. ***andamanensia,*** ». t'tnuvniifj **branclilot** wit[1] **leaves, b.** j>avt of loaf **with secondary** suul tertiary **oervation,** t. tt»p of flowering **tjranchlet,** <\. part **of corolla, with stamen, <• idflm, seen from aside,** *f.* anther. *(fro& type ximen).*

tree in the hill forests of the Gonda division of the Oudh forests. It flowers from November to January and the seeds are ripe in August.

Wistp.: Tibet, India, Bhotan and Nepal.

TIBET, prov. Samling, Nyam Jang Shu, alt. 1800 m, hillside: *Ludlow c.s. '088* (BM), tree, fr.. Nov.

INDIA. Sikkim, without loc: *Hooker s. n.* (BM, K), fl.; ibidem: *Clarice £7566* (BM), fl. April; Choori P., Ycalkung La: *Gamble 8801A f 2302A* (K), large tree; ihujceling, Mongho, alt. 600 m: *Clarice 11902* (BM), fr. June; Darjeeling, Pomong, alt. 1000 m: *Clarice 13629* (BM), tree 13 m, fr. Oct.; Goromara river, Terai: *Gamble JO1 DA* (K),-April; Great Eangit: *Gamble 7495* (K), fl. Dec.; Mayanghi Khola, alt. 1000 m: *Stainton c.s. 9191* (BM), large spreading tree, fl. white, Oct. — Kumaon, joiests of Ramnagar State: *llaines 3982* (K) — Behar, in cultiv.: *Hooker s.n.* (K), — without known province, Balasim valley, alt. 600 m: *Treutler 1054* £.£), f 1. Nov.; below Bheemtal, alt. 1300 m: *Madden s.n.* (K) — without locality: *Lace y s.n.* **(K), fl.; ibidem:** ***Falconer s.n.*** **(K), juv. fr.;** ***Jlavnilbangh 564*** **(K).**

NEPAL. Sikar, Karnali valley, alt. 1600 m: *Polunin* o. s. *3975* (BM), tree 16—20 m, fr. green, Sept.; Sarju river, alt. 1000 m: *Strachey $ Winterbottom 1* (BM, K) & (K), fl. & juv. fr.; Phewa Tal, alt. 800m: *Stainton c.s. 5294* (BM), tree 16—20m, fr. green, May; Baglung, Kali Gandahi river, alt. 800 m: *Stainton c.s. 7005* (BM), tree 10 m, fl. creamy, Sept. — without locality: *Wallioh HP 4164* (BM, K), fr.

BHOTAN. Khoma, Khoma Chu, alt. 1500 m: *Liidlow c.s. 21244* (BM), tree 10 m, fl. white, Sept.; Mirichoma Dimpu, alt. 1100 m: *Cooper 1066 $ 8664* (BM), tree 10 m, juv. fr. July & fl. Nov., white, scented; Baolcin: *Griffith 2279* (BM, K), juv. fr. Without locality: *Griffith 2280* (BM) & *3604 (3607?)* (BM, K, S), fr.; ***Roxburgh s.n.*** **(BB, K), fl.**

Remarks: The fruits are described from *Oamble 2302 A* in K.

Var. andamanensis van Royen, **nov.** var.[a]) — *Fig. 6.*

Calyx ferruginously sericeous within, lobes acute at apex, corolla-lobes Narrowly ovate., stamens c. 18, filaments c. 2 mm long, densely brownish Coll**y,** anthers with long brownish hairs.

Type specimen: *Parkinson 376* in K.

Ver. name: hill-mohwa.

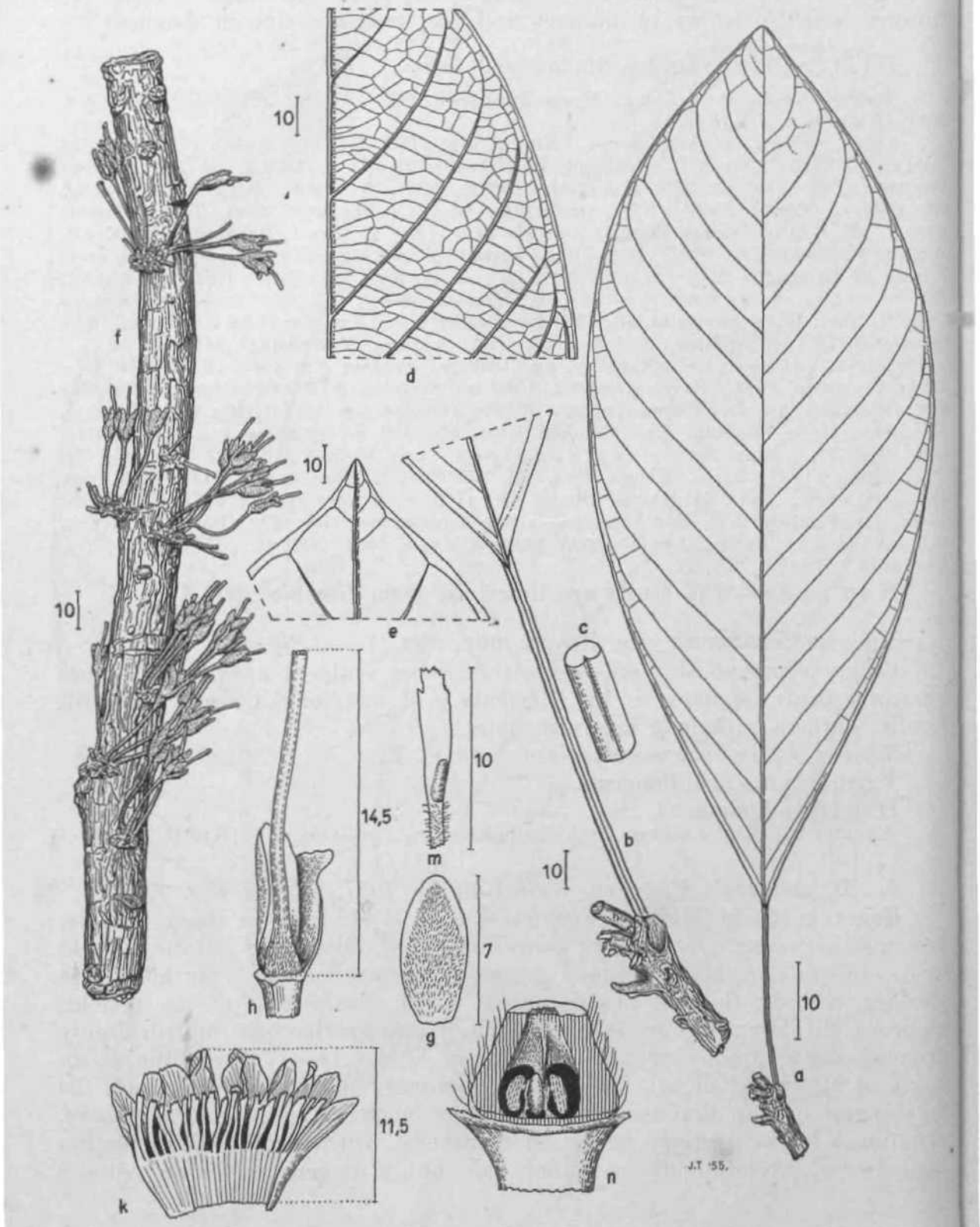
bistr.: Andamans.

ANDAMANS. Mid Andaman, Ali-Masjid-Reserve: *Parkinson* 376 (K), fl. March.

6. D. **siamensis** Fletcher, Kew Bulletin 1937, 379 — *Fig. 7.*

Trees, c. 10 m high. Branchlets terete, 8—15 mm in diam., striate, brownish sericeous, glabrescent. *Leaves* scattered, obovate or elliptic, 20—45 by 7—18 cm, apex short dstusely acuminate, acumen up to 1 cm long, base cuneate, oblique, the margins decurrent along adaxial side of the petiole; scabrous, nitidulous above, dull below., chartaceous-coriaceous; midrib deeply grooved above, prominent below, secondary nerves 14—17, ascending at an angle of 40°—50°, slightly curved and archingly joined, but sometimes the more basal nerves diminishing until inconspicuous, slightly grooved above, prominent below, tertiary nervation transverse, with a minute reticulation between, prominulous on either side but stronger so below; petioles

[a]) **Diploknema butyracea** (Roxburgh) H. J. Lam, var. **andamanensis** van Royen, nov. var. — Oalycis lobi apice acuti, intus ferrugineo-sericei. Gorollae laciniae anguste ovatae. Stamina c. 18, filamentis c. 2 mm longis, pilis fuscis dense lanatis, antheris glabris. Discus longe setosis.



Fifr. *7- Dtptoknema aiavumsie,* a. top »f bxaaehlet with teaf, I>. petiole, (•: pai of petiole, enlarged, il part *at* leaf with Beeoadoxy mul tertiary nervation, e. apox <** leaf, T. parl of flowering branchlet, g. Bepal, outside, li. gynaecium, k, part of enroll** [nside. m. etaminbde, a. longitudinal section of ovaiy< (from *type specimen).*

terete, 4—12 cm long, deeply grooved above, brownish puberulous, glabrescent. *Flowers $* or unisexual, in 4—10-flowered clusters on distinct prominent warts below the leaves in the axil of lanceolate-triangular, 2—3 by 1—2 mm large, acute bracts, which are ferruginously sericeous on either side; Pedicels angular, c. 2 cm long, apex incrassate, ferruginously sericeous. *Sepals* ovate or lanceolate, 6—7.5 by 4—5 mm, apex subacute or obtuse, ferruginously sericeous without, margins woolly, glabrous within except in the apical part. *Corolla* 10—12 mm long, tube 3—4 mm long, lobes 14, obovate or oblong, 7—8 by 1.5—2.5 mm, apex obtuse, irregularly crenulate. *Stamens* not seen. *Staminoctes* 26—28, irregularly spatulate or oblong, 4.5—6.5 by 0.5—1.5 mm, apex rounded, entire or irregularly dentate, basal part brownish woolly. *Ovary* conoid, c. 2.5 by 2.5 mm, (tensely ferruginously velutinous, 9-celled, with anatropous ovules; styles angular, 10—15 mm long, sparsely velutinous in the most basal part, apex with 9 distinct stigmas *Fruits* unknown.

Type specimen: *Kerr 16260* in K.

Distr.: Siam.

SUM. Surat, Chumpawa, Siepyuan, alt. c. 20 m, evergreen forests: *Kerr 168C0* (K), tree c. 20 m, fl. creamy white, Dec.

Excluded species

1. *D.* *grandiflora* (Ridley) H. J. Lam, I.e. 1925, 185; Lam, I.e. 1927, 463; Wyatt-Smith, Man. Mai. Timber Trees 1954, 47 = *Payena grandiflora* Ridley, Journ. As. Soc. Straits 61, 1912, 28; Ridley, Fl. Mai. Penins. s 1923, 262 = Payena maingayi Clarke in Hooker, see van Bruggen, filumea 9, 1, 1958, 104.

2. *D. butyracea* Blanco, Fl. Fil. 4, 1880, 125 = Palaquium sp.?

As the material is sterile, it cannot be decided whether this species is a *Palaquium* or not. It certainly does not represent *Diploknema butyracea* (Roxb.) H. J. Lam.

List of collectors' numbers

The numbers between brackets indicate the number of the species in the text.

Barnes 189 (2), 583 (2); Burkill 36605 (4), 36162 (4), 37509 (4); Buwalda 6100 g); Casey s.n. (5); Clarke 11902 (5), 13629 (5), 10394 (2); Falconer s.n. (5); jftaible 1019A (5), 2301A (5), 2302 A (5), 7495 (5); Griffith 2279 (5), 2280 (5), 2604 (3 o 7t) (5); Haines 3982 (5); Hawulbangh 564 (5); Hooker s.n. (5); Kanjilal 2 J, (4); Kerr 16260 (6); Knappert s. n. (1); Ludlow c. s. 7088 (5), 21244 (5); Ion s.n. (5); NIPS bb 10166 (3), bb 25965 (3), bb 259,4 (3); Parkinson 376 A?)! Polunin c.s. 3975 (5); Roxburgh s.n. (5); Stainton c.s. 5294 (5); 7005 (5), (5); Strachey & Winterbottom 1 (5), 2 (5); Treutler 1054 (5); Wallich HP 4164 ! Williams 554 2).

Index

The numbers indicate the number of the species in the text. Synonyms are printed in *italics*. The prefix E. indicates an excluded species.

REVISION OF THE SAPOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

XV.') Payena A. De Candolle

by

A. C. VAN BRUGGEN

(Division of Entomology, Pretoria)

(Issued 1. VII. 1958)

"Une monographic compete ne sera jamais qu'une utopie"
Alphonse De Candolle

GENERAL PART

1. Introduction

Payena as a genus was created by Alphonse De Candolle in his Prodromus Systematis Naturalis Regfli Vegetabilis in 1844. He commemorated it the French chemist A. Payen (1795—1871) in Paris. De Candolle placed in it the species *Mimmdps hicida*, first described by 0. Don; the latter employed this nomen nudum used by Wallich in his List of specimens in the East India Company's Museum (1858). The famous Swiss botanist characterized the new genus by the following diagnosis on page 196:

"Calyx 4-partitus (nee 8-partitua, ut dixit el. G. Don), lobis ovatis, obtusis extus marginem puberulis, 2 exterioribua latioribus. Corolla 8-fida, basi tubulosa, superne campanulata, calyce vix longior; lobis 2 ante lobum quemque calycis, ovato-acutis, glabria.

') I—III in Blumea VI, 3, 1952, 547—595; IV—V in Blumea VII, 2, 1953, 364—412; IVa in Blumoa VII, 3, 1954, 481—483; IIa, IVb, Va, VI—IX in Blumea VIII, 2, 1957, 201—513; X—XII in Nova Guinea N.S. 8, 1, 1957, 87—128; XIII—XVI in the present issue.

Stamina 8, tubo corolla? propc fauccm inserta, lobis opposita, denticulis interjectis. Filamenta brevissima. Antherae lanceolatae, angulosae, inclusae, filamento multo longiores, connoctivo in acumen obtusiusculum carnosuin producto, loculis subextrorsis, longitudinalitor dehiscentibus. Ovarium hirsutum, 8-loculare. Stylus rectus, glaber, calyee duplo longior, apice obscure dentatus. Ovula 8, ovoideo-angulosa, acuta, deinde ovoidea, ox angula superior? cujusve loculi pendentia. Fructus ign. — Frutexf aut arbusculaf foliis eiliptieis, basi subacutis, apice obtuse acuminatis, glaberrimis, superne nitidis, subtus pallidioribus; pedicellis 1—ft ex axillis folioium superiorum, petiolo duplo longioribus, Ipris , pilis miiiimis adpressis subpubescentibus. —"

He placed it between *Isonandra* and *Bassia* and "perhaps near *Azaola"* ("forsanque Azaolae proximum"). Today *Isonandra* is to be considered a genus in the neighbourhood of *Palaquium* (a group with the parts of calyx and corolla isomerous), and *Bassia* and *Azaola* are considered synonymous to *Madhuca.* De Candolle, while correcting the evident mistake of Don concerning the number of parts of the calyx, makes himself another by saying "Stamina 8..." (see under *P. lucida).*

The second species, considered to be a member of the newly created genus "was *P. sericea* Miquel (PI. Ind. Bat. 2, 1859, 1039), now *Madhuca sericea* (Miquel) H. J. Lam; the third, described by the same author, *P. sumatrana* (Miquel loc. cit, Suppl. 1860, 582) now *P. acuminata* var. *ptdchra.* After the occasional description of some species, a large extension of the genus under discussion was given by L. Pierre (1885), who, however, added a number of species, which appeared to represent for the greater part already known taxa. The first monographer, viz Lam (1925), recognized 26 species, a number which was decreased by 3 by the said botanist in 1927.

The present author holds the opinion that it is unwise to distinguish a large number of taxa in the Madhuceae; the only way to get a fairly good impression of this tribe, characterized by their reticulate interrelationships, is to assume a rather wide species concept. Therefore the author has to apologize for the description of two additional new species, viz, *P. gigas* and *P. lamii.* There can be no doubt, however, as to the validity of these new taxa, as they are among the species most easily recognizable. Already in 1936 they were found to represent hitherto undescribed species by Lam and his then collaborator K. Griffioen, now Professor of Technical Botany in the Technical Institute at Delft. For various reasons they refrained from publishing descriptions of the above-mentioned species, though the specimens examined by them were distributed to various herbaria under the names *P. gigantea* (now *gigas)* and *P. truncata* (now *lamii),* respectively. In accordance with the senior reviewer of 1936 we decided to give new names to these taxa, among others for nomenclatural reasons.

For the student of *Payena* the following literature is indispensable:

Burck, W. — Sur les Sapotacées des Indes Néerlandaises et les origines botanique* de la gutta-percha, Ann. Jard. Bot. Buitenz. 5, 1886, 47—60.

King, G. & J. S. Gamble — Materials for a flora of the Malay Peninsula 1?< J.-As. Soc. Bengal 74, 2, Extra Nr., 1906, 167—175.

Lam, H. J. — The Sapotaceae, Sarcospermaceae and Boerlagellaceae of the Dutch East Indies and surrounding countries, Bull. Jard. Bot. Buitenz., sér. 3, 7, 1925, 130—15J» 260—263, *abbreviated* Lam 1925.

Lam, H. J. — Further studies on Malayan Sapotaceae I, Bull. Jard. Bot. Buitens» sè>. 3, 8, 1927, 430—443, *abbreviated* Lam 1927.

L. — Plantes à gutta-percha, Bull. Mens. Soc. Linn. Paris, 1885, 523—531.
H. N. — The flora of the Malay Peninsula 2, 1923, 529—531.
-Smith, J. — Manual of Malayan timber trees, Sapotaceae, Res. Pamphl. 4, 1954, 47—54.

The last-mentioned publication is particularly interesting since it contains field description[illegible] [illegible]27) the basic monographies

We consider the [illegible] are recorded only if published after 1927 or if [illegible] on *Payena*. Therefore [illegible] 1. In all cases concerning the above-quoted papers or by other authors [illegible] applied, we choose a lectotype from the material originally cited oy tne * r, not designating syntypes or paratypes. No types were designated tor nam ^ that have fallen into synonymy.

After the description^oftiie species the specimens reviewed are enumerated, geographically arranged. The foll wing [illegible] ons are ^d in this enumeration: diam. tor diameter, [illegible] for Forest Department,^, for flowers, fr. for f [illegible] rest Research Institute Bogor.

The combina[illegible] especially the albuminous seed and branching of the tertiary nerv[illegible] in the leaf, which t[illegible] [illegible]her mark S. genus *Payena* as recognized by us, makes in general the distinguishable from other Madhuceae. For full generic descr[illegible]on *Payena*, [illegible]

PayZ ^ to j e fai * constant in the number of its sepals (4), petals (8), stamens (W) - »d »rfb^ the ovary e. q. ovules [illegible]. Although numerous cases [illegible] flower characters to[illegible] genus are reported in the [illegible] several species in Lam 1925) I never fo[illegible] [illegible] nts originating from Indo-China. It is a we [illegible] es of Phanerogams show a more pronounced veriation at the borders of their areas. *P. lanceolata* var. *annamensis* shows a variation in the number [illegible] obes (7—8) and the cells of the ovary e. q. ovules (6—8); a [illegible] w some other characters gives it the rank of a variety. [illegible]ou recorded cases of variation in the flower of Paj/ena were apparently rare exceptions which are now drowned in the more numerous material. The shape of the leaves and [illegible] n the fruits, however, are not verv [illegible] me, but frequently two see[illegible] [illegible] same siz[illegible] e found tog[illegible] rare [illegible] less viable [illegible] normal ones. is r[illegible]

It is comparatively difficult to discuss the [illegible] matic position of the «enus Paj/ena. It is obvious that it belongs to the Madhuceae (sensu W, Rec. Trav. Bot. Neerl. 36, 1939, 525). In the ^ o-inion ^ ^ ^inly has to be placed near *Aesandra* (ct· Van Bruggen, BlumeJ JX, i, 1958, 139) and ^ C o . K might be possibh to consider these three gen[illegible] forming ^series, beginning with *Payem* W varying in [illegible]loral characte[illegible] through *Madhuca* (large ^m01int of variation). Of [illegible] decide which genus shows the most prim[illegible] [illegible] t the genera mentioned are [illegible] cters, [illegible] remaining genera, viz. *Ganua*, [illegible] rela[illegible] and [illegible]*ella*; Van den Assem (Blumea *, 2, 1953, 365—366) recorded *Ganua* to be related closely to *Madhuca*.

2, Distribution of the genus *(Fig. 1)*

Pttiftita is known lo he **represented** in t.lic **following** areas: Burma, **Sunn,** Andamnns, Malay Peninsula, **Simalur,** Sumatra, Riau, Bankn, -lava. Borneo, Palawan, Tawi Tawi, and Mindanao. It is not known **beyond** the "line of Wallace" in the original sense, a boundary famous **among** ⋈ geograpliers **in** earlier days.

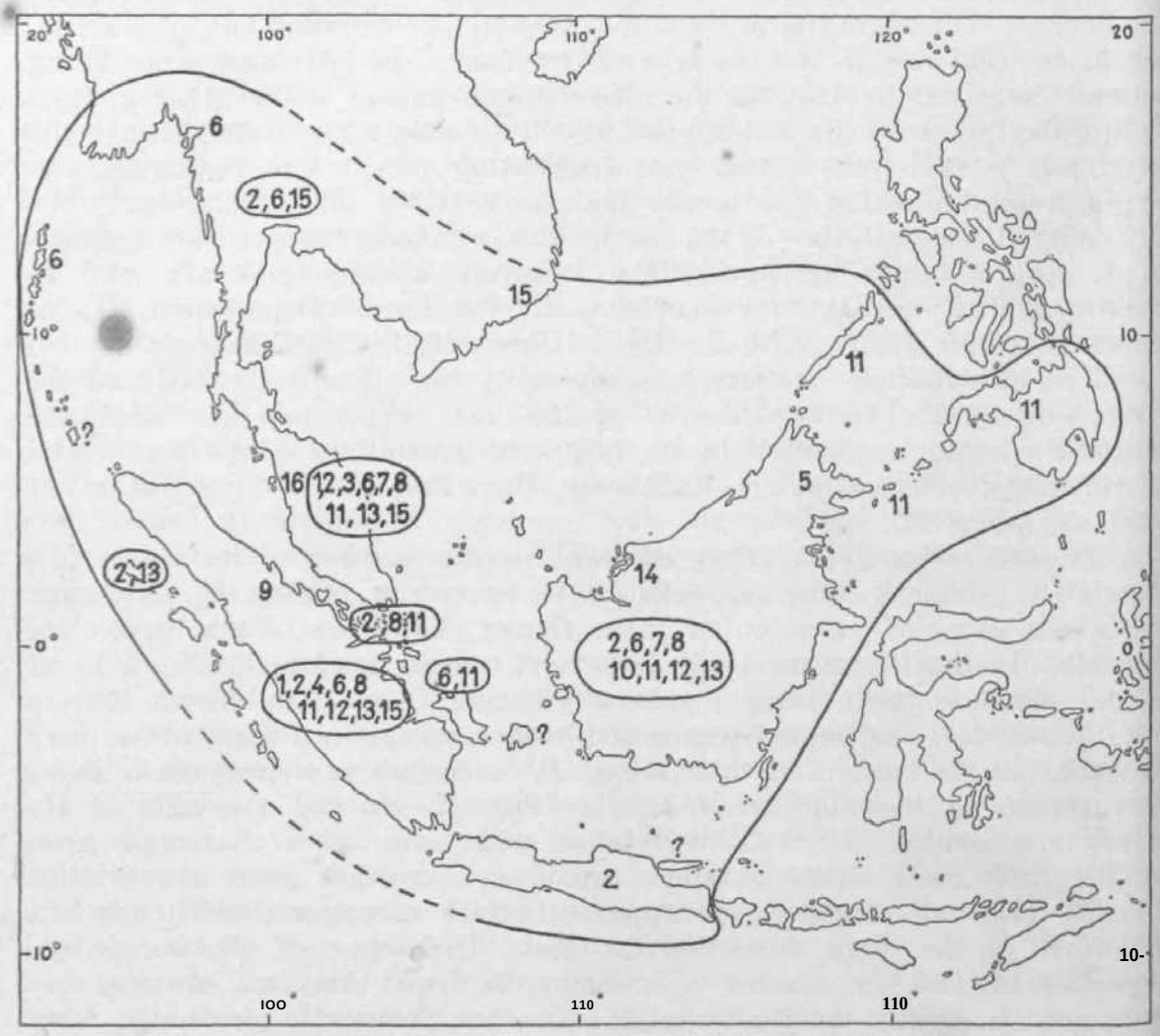


Fig. 1, Area? of *Paytua* speeios. 1. *dasij]iltt)lU>\ ~1. acuminuUi;* 3. *mairtgayi]* **4,** *dantung;* **5, *gigas;*** (i. *lucida; 7.* ***longipedioellata', H. obsowa;*** **9. *pseudoterminalial*** 10. *microphylla;* 11. *lnii\\ Vl. uirfrrtii;* 13. ***tovfiema]*** **1 i. Eamti; 15. *lanceolate]*** 16. *xtl<iiu)oricti.* **Solitary uisabera indicate endemk &peciee oi i&lated Loealitiea of** nthcr-**wise** widt'sjirrini species; **fflurireled oomobexs refer to species occoniag in a** certain region **or island.**

Apparently tlie *)XVUHH* is *u(* West-AIalaysian **origin, having** its greatest **diversity** in the **western** parts oi' **the** Alalay **Archipelago,** notably in the Ala lay **Peninsula** and Sumatra. Borneo shows also **a** fairly **targe** number of **species,** while **one species** only (/\ ***aowninata)*** reaches **Java,** ami **aw** other i /'. *If'f.rii)* the **Philippines.**

Th'e u'i'ims is evidently centered in the Sum la-shell', and may have reached **the Philippines through** Borneo, ami the **Andamans through**

Burma. The extension westward goes rather far into the continent of Asia. It is plausible to suppose that *Payena* has spread west- and eastward from a centre in the Malay Peninsula,, or rather the now' immerged Sunda-shelf.

Some species are widespread, viz., *P. acuminata* (Siam, Malay Peninsula, Sumatra, Simalur, Java, Borneo), *P. lucida* (Burma, Siam, Malay Peninsula, Andamans, Sumatra, Banka, Borneo), *P. leerii* (Malay Peninsula, Riau, Banka, Sumatra, Borneo, Palawan, Tawi Tawi, Mindanao), while others occupy a remarkably restricted area, e.g. *P. maingayi* (Malay Peninsula). The "endemism" of other species, e.g. *P. gigas, P- lamii, P. selangorica,* may be due to insufficient collecting in the regions concerned.

Up to the present no records are known from Madura, Bawean, Karimundjawa Islands, Billiton and the range of islands West of Sumatra, except Simalur. It is likely that in some of these islands at least *Payena* will ultimately be found to be represented.

3. Delimitations and interrelationships of the species

Only one attempt was made to subdivide the genus *Payena,* viz by Lam (1925); he created the sections *Eupayena,* characterized by the tertiary nerves descending from the marginal connections and *Ganuopsis,* distinguishable by the tertiary nerves ascending from the midrib as is the °ase in *Ganua.* However, in his additional paper of 1927 he dropped this classification. We can completely agree with that opinion. At present we Propose to distinguish two sections, viz *Paxjena* and *Purpureopayena* of which *Purpureopayena* comprises only *P. dasyphylla* with its purplish red lowers and its woolly red ferruginous indumentum, and *Payena* the bulk °f the known species, characterized by the whitish flowers and the missing ?f the above-mentioned indumentum. This group of specif*, apart from its very close relation to the section *Purpureopayena,* shows a pattern of r°°ticulate interrelationships, very difficult to unravel.

The wide-spread species *P. acuminata* forms, together with three endemic species, *P. maingayi* (Malay Peninsula), *P. dantung* (Sumatra), and *P- Oigas* (Mount Kinabalu, North Borneo), a group of species with comparatively large leaves and flowers.

Through *P. acuminata* s. s. this group is related to a second one, **comprising *P. lucida* (with the closely allied *P. longipedicellata), obscura, Pseudoterminalis, microphylla, leerii,* and *endertii.* These species form together** a complete series with all possible transitions mutually both in sterile ?nd fertile parts. It possibly represents a taxon which in modern zoology Ls called a "superspecies".

P. lowiana should be considered a relative of the just mentioned group of species, though it shows also characters, e. g. the conspicuous secondary nerves, which bring it close to *P. acuminata* var. *pulclyra.*

. Another somewhat obscure species, *P. lamii,* holds a rather isolated Position among the numbers of *Payena s.s.* The leaf recalls strongly that of p_m *obscura,* except for the comparatively high number of secondary ne*ves. Besides, the hairy corolla throat in the flower is unique in the

genus under discussion, while moreover the pedicels are very short (0.2—0.3 cm long).

Through P. *lucida*, especially the forms with smaller leaves, the *lucida*-group is allied to P. *lanceolata* and P. *selangorica*.

Thus, besides the somewhat isolated species P. *lowiana* and P. *lamii*, the species belonging to the section *Payena* show reticulate relationships. Such characters as used by Lam in **1927** for directing his scheme of relationships (Lam 1927, 430, fig. 12), as pubescence of the lower surface of the leaves, are in our opinion not essential. The young leaves of all species show some pubescence, while no adult leaf is completely free of hairs below; therefore, it is not advisable to base a classification on these characters only.

From a phylogenetical point of view the differentiation within the Madhuceae may be considered a comparatively young one. In this tribe *Payemi* seems still younger than the related genera, since the delimitations between the species are mostly weak. It is therefore not surprising that 107 names (including valid names, synonyms., MS-names, names belonging to other genera and to other families) exist for only 16 species and some others belonging to different genera. In accordance with these ideas we have to consider the more clearly delimited species the older ones: P. *dasyphylla*, the P. ocwmirwtfa^group, P. *lowiana*, and P. *lamii*. As some of these species are geographically isolated, this only strengthens our opinion. In this respect we can not agree with Van Steenis (Fl. Mai. (I), 4^2, 1949, LVIII), who considers the origin and age of groups showing reticulate affinities doubtful.

4. Material and acknowledgements

For the present revision we had the material of the following herbaria at our disposal: Berlin, London, Bogor, Brussels, Calcutta, Florence., Geneva, Kew, Kepong, Leiden, New York, Manila, Paris, Stockholm, Sandakan, Kuching, Singapore., Canton, Utrecht and Washington.

The abbreviations used to indicate these herbaria are those pro* posed by Lanjouw and Stafleu in the third edition of the "Index Herbariorum", 1956.

It is our pleasant duty to tender our sincerest thanks to the directors of the above-mentioned institues for their most valuable cooperation.

Moreover we are very much obliged to the following botanists. Prof. Dr. H. J. Lam (for putting his notes at our disposal and for his invaluable help and criticism), the members of the staff of the Rjjks-herbarium and the Flora Malesiana (Leiden), Mr. M. Jacobs (Bogor)» Dr. J. Leandri **and Prof. Dr. H.** Humbert (Paris), Dr. G. Taylor and Mr. J. F. M. Cannon (London), Sir Edward Salisbury, Dr. W. B. Turrill and Mr. L. L. Forman (Kew).

The Board of Curators of the Leiden University were so kind as to enable us to pay a visit to London and Kew by means of a donation from the "Fonds Vollenhoven". We are very much indebted to the directors and the staff members of the herbaria at Paris, London, and

Kew for the hospitality enjoyed during our stay at their respective institutes.

My sincere thanks are also due to Mr. H. J. T. Tammel, who' has drawn the figures, or adapted already existing drawings.

The scales added to the drawings is in millimeters.

SPECIAL FAST

5. Generic diagnosis

Payena A. De Candolle, Prodr. 8, 1844, 196; Lam 1925, 130; Lam 1927, 430; Lam in Backer, PI. Java Nooduitg. 7, 1948, 166—8; Wyatt Smith, Jtes. Pamphl. 4, 1954, 47 — *Keratophorus* Hasskarl, Flora Bot. Zeit., 1855, 5?9, and Retzia 1, .1855, 100 (errpre *Keratephorus) — Ceratophorus* De vriese, PI. Reinw., 1856, 60, and Tuinb.fl. 3, 1856, 266 *{Ceratophorus) — Hapaloceras* Hasskarl, Flora Bot. Zeit., 1859, 639.

Several species were originally described under the generic names of ***Azaola* Blanco, *Bassia* Koenig, *Isonandra* Wight, and *Mimusops* L.**

Middle-sized to large *trees* with latex; stipules always caducous, rarely still found at the base of young leaves. *Leaves* mostly acuminate, glabrous above, often more or less pubescent below, sometimes nearly or wholly glabrous, young leaves always slightly pubescent above, densely pubescent below; midrib generally prominent above and below, though more so below; secondary nerves straight, near margin of leaf archingly joined, curving towards apex near margin; tertiary nerves much more slender than secondly ones, generally not very conspicuous, mostly descending from marginal ^junctions of secondary nerves and ramifying towards the midrib, sometimes ascending from midrib, more or less parallel to secondary nerves, never distinctly transverse. *Inflorescences* axillary or pseudoterminal, fascicled and 1—pluriflorous; flowers mostly comparatively small, long pedi-^elled, pedicels incrassate in fruits, flowers bisexual. *SepaU* four, more or !ess triangular, biseriate, outer ones valvate, thick and fleshy, inner ones ^bricate, thinner than outer ones, frequently pubescent outside, glabrous inside, tube very short, sepals persistent and incrassate in fruit. *Corolla* Jvith eight lobes in two whorls, tube short and more or less cylindrical, fobes glabrous. *Stamens* 16, uni- or biseriate, outer ones opposite the petals, *nner ones between the petals, filaments comparatively short., anthers with Vfuous and rounded or glabrous and acuminate apex, apex of connective generally rather long, and acuminate; *pistillum* long, subulate, glabrous, ovary generally globose or conoidal, gradually merging into style, tomentose, cells eight, never imperfect, rarely six or seven, with one ovulum ?a<*, attached a little above the middle of the central axis. *Fruits* a dryish ^y9 with persistent and enlarged style and calyx, glabrous or pubescent, Pericarp fleshy; seeds one or two., with thin crustaceous testa and oblong £r. linear scar, hilum above the middle; albumen thick, cotyledons flat, -oliaceous, radicle inferior, exsert, usually cylindrical.

Type species: *Payena lucida* (Don) DC.

Vern. names: guttah, mayang, nyatoh (Malay). Mostly the vernacular names have been copied from the labels, a uniform transcription))01nS impossible.

Uses: Mostly guttah (latex), sometimes timber and firewood, and occasionally edible fruits.

Ecology: Trees of *Payena* are generally found in primary forest, where they belong to the middle or the uppermost story, and sometimes to the emergent trees. Some species occur also in secondary vegetations or at the edge of the forest, e. g. along rivers. Many species are found up to considerable altitudes, occasionally up to nearly 2000 m (Mount Kinabalu). Most species can stand a variety of soils.

There is no definite time for flowering and fruiting. Flowers and fruits are reported from every month, moreover, it is not uncommon to find a branchlet bearing flowers and fruits at the same time.

Distr.: About 16 species from Eastern Burma to Java, Borneo and the Philippines *(Fig. 1).*

6. **Key** to **the taxa**

It is not always easy to identify herbarium specimens of *Payena,* even to the genus, and this is particularly so in sterile specimens. The same or a very similar shape and nervation of the leaves can be found also in other genera (e. g. *Palaquiwni),* and sometimes even in other families.

There are a few species only that can be recognized at once, viz, ***P. dasyphylla, P. gig as, P. maingayi, P. lowiana;*** **this applies especially** to sterile branches. The key is prepared for identification of flowering, and generally also fruiting, specimens; it appeared to be impossible to give a key for sterile specimens only.

The word "glabrous" is to be understood as "completely glabrous, practically glabrous, or glabrous with traces of pubescence along the midrib".

1.a. Branchlcts, petioles, pedicels, calyces, fruits and lower surface of leaves densely woolly red ferruginous pubescent; secondary nerves 12—18, angles with midrib about 60°; flowers purplish red *(Malay Peninsula, Sumatra)* Section PURFUREOPAYENA. . . . . **1. P. dasypnylla** (Miq.) Pierre

b. Branchlets, petioles, pedicels, calyces, fruits and lower surface of leaves glabrous or pubescent, but never **all** these parts together pubescent; flowers withish. Section PAYENA. 2

2.a. Leaves large, 17—37 by 8—17.5 cm. 3

b. Leaves middle-sized or small. 6

3.a. Lower surface of leaves glabrous, flowers and fruits large, fruits 3.7—5 by 2.9—3.7 cm, pedicels of flowers and fruits long, 1.5—6 cm; secondary nerves 27—32, angles with midrib about 70—80°. *Borneo CMount Kinabalu region)* **5. P. gigas** Van Bruggen

1). Lower surface of leaves pubescent, flowers and fruits middle-sized, pedicel* middle-sized. 4

4.a. Leaves comparatively broad, 7—15 cm broad, 14—22 very prominent secondary nerves, angles with midrib about 70—80°, stipules caducous, pcdicols 0.7—1.3 cm **long.** ***Sumatra, Java, Borneo*** **2. P. acuminata** (Bhimc) Pierre var. **pulchra** (Burck) H. J. Lam

b. Leaves more lanceolate, 20—32 secondary nerves, angles with midrib about 60—75°. 5

5.a. Leaves up to 37 cm long, 26—32 secondary nerves, angles with midrib about 70—75°, stipules caducous, pedicels short, 0.4—0.7 cm long, flowers small, sepals 0.5—0.6 by 0.5 cm. *Sumatra.* . . . . . **4. P. dantung** H. J. Lam

b. Leaves up to 32 cm long, 20—25 secondary nerves, angles with midrib about 60—75°, stipules caducous, but generally much less than in other species, pedicels longer, 1.2—3.5 cm long, flowers larger, sepals 0.75—1.1 by 0.4—0.6 cm. *Malay Peninsula* . . . . . 3. P. maingayi Clarke in Hooker

6.a. Loaves with 29—32 secondary nerves and comparatively long apex, up to 2 cm long, lower surface of leaves glabrous; flowers with very short pedicels (0.2—0.3 cm) and hairy corolla throat; angles of secondary nerves with midrib 60—80°. *Borneo (Sarawak)* . . . . . 14. P. **lamii** Van Bruggcn

b. Leaves with 9—25 secondary nerves, apex long or short, lower surface of leaves glabrous or pubescent, flowers with pedicels longer than 0.3 cm and never with hairy corolla throat 7

?.a. Leaves more or less lanceolate, up to 14 can long, 1.8—4.5 cm wide, apex not very distinct, secondary nerves 10—17 8

b. Leaves not lanceolate, apex distinct, secondary nerves 9—25 10

8.a. Lower surface of leaves glabrous, apex of leaf gradually merging into blade, 10—16 secondary nerves, angles with midrib about 60—75°, sepals 0.75 by 0.5 cm; fruits small, 2.5 by 1.2 cm, acuminate. *Malay Peninsula (Selangor)* 16. P. **selangorlca** K. *& G.*

b. Lower surface of leaves pubescent, apex of leaf discern able, but not very distinct, 15—17 secondary nerves, angles with midrib about 80°, sepals 0.45 by 0.3—0.4 cm; fruits middle sized, 3—4.5 by 1—2.2 cm, frequently beaked . 9

9.a. Leaves with 10—16 secondary nerves; sepals as long as wide, corolla with *S* lobes, filaments of stamens short and rather thick, ovary with 8 cells; fruits bluntly acuminate to beaked, thick. *8iam, Malay Peninsula, Sumatra* **15. P. lanceolate** var. **lanceolata**

b. Leaves with 13—«16 secondary nerves; sepals longer than wide, corolla with 7—8 lobes, filaments of stamens rather long and slender, ovary with 6—8 cells; fruits acuminate to beaked, thin. *Indo-China* **15. P. lanceolata** var. **annamensis** (Lee.) van Bruggen

10-a. Pedicels long, 2—4.5 cm, flowers comparatively large, sepals 0.8—1.5 by 0.8—1 cm, style stout, corolla long exsert; lower surface of leaves glabrous, 12—16 secondary nerves, angles with midrib about 60—70°. *Malay Peninsula, Borneo* 7. P. **longipedlcellata** Brace ex K. & G.

b. Pedicels long (up to 3.5 cm), middle-sized or short, flowers generally smaller, style thin, corolla slightly exsert; lower surface of leaves glabrous or pubescent 11

• Inflorescences together pseudoracemose and conferted pseudotormiially at tips of short branchlets above region of adult leaves; leaves midiile-sizcd, lower surface pubescent, 9—12 secondary nerves, angles with midrib about 55—60°. *Eastern Sumatra* . . . . . 9. P. **pseudotenninalis H. J. Lam

b. Inflorescences together not pseudoracemose, frequently almost pseudotcrminal, usually in upper leaf axils, leaves middle-sized to rather large, lower surface glabrous, 10—15 secondary nerves, angles with midrib about 60—70°. *Malay Peninsula, Sumatra, Biau, Borneo* . . . . . 8. P. **obscura** Burck

* Inflorescences together not pseudoracemose, generally dispersed along branchlets, sometimes conferted below leaves near tips of banchtets 12

***• Leaves small, 5—7 by 2—3 cm, lower surface glabrous, 10—13 secondary nerves, angles with midrib about 50—70*; flowers small, with comparatively long style, L&--1I.6 cm long, pedicels 0.6—1.5 cm long. *Borneo* 10. P. **microphylla** (De Vr.) Picnv

b. Leaves middle-sized, rarely small 13

•• Leaves middle-sized to rather large, with 20—25 secondary nerves, lower surface pubescent 14

°- Leaves middle-sized with 9—17 secondary nerves, lower surface glabrous or Pubescent 15

•a« Leaves comparatively broad, 7—15 cm broad, 14—22 very prominent secondary nerves, angles with midrib about 70—80°, stipules caducous, pedicels 0.7—1.3 cm l°ng. *Sumatra, Java, Borneo* 2. **P. acuminata** (Blume) Pierre var. pulchra (Burck) H. J. Lam

D« Leaves more lanceolate, 20—25 secondary nerves, angles with midrib about

60^-75°; stipules caducous, but generally remaining longer than in other species, pedicels 1.2—3.5 cm long. *Malay Peninsula* 3. P. maingayl Clarke in Hooker

15.a. Leaves glabrous to subglabrous below, or with traces of pubescence along midrib 16

b. Leaves pubescent below 19

16.a. Leaves comparatively small, 6—12 by 2—4.5 cm, 9—12 secondary nerves, leaves generally shortly appressedly pubescent; apex of connective in stamens longer than anthers; fruits rpunded ovoid to spherical. *Sumatra, Borneo* **12. P. endertli** H. J. Lam

b. Leaves middle-sized, 5—23 by 1.5—8 cm, 10—18 secondary nerves; apex of connective in stamens shorter than or rarely as long as anthers; fruits rounded ovoid, sometimes conical, never spherical 17

17.a. Leaves with comparatively robust secondary nerves, style in flowers and fruits Tathcr long, 1.8—2.2 cm long, pedicels of flowers 1.5—2.1 cm long. *Malay Peninsula, Sumatra, Simalur, Borneo* . . . . . 13. **P. lowiana** Picrro

b. Leaves with slender secondary nerves, forking practically at edge of leaf, style in flowers and fruits middle sized or short * 18

c. Leaves with slender secondary nerves, forking at a comparatively large distance from edge of leaf, style in flowers and fruits middle-sized, pedicels of flowers 0.7—3.5 cm long. *Burma, Siam, Malay Peninsula, Andamans, Sumatra, Banka, Borneo*. . . . . **.6. P. lucida** (Don) DO

18.a. Flowers small, calyx 0.2—0.4 by 0.25—0.3 cm, pedicels of flowers 0.8—1.7 cm lomg; fruits conical or ovoid, glabrous to subglabrous, apex truncate, persistent style short, frequently broken off; tertiary nerves of leaves faint or hardly visible below. *Malay peninsula, Biau, Banka, Sumatra, Borneo, Palawan, Tawi Tawi, Mindanao* . . . . . **.11. P. leezil** (T. & B.) Kurz

b. Flowers comparatively large, sepals 0.4—0.7 by 0.4—0.6 cm, pedicels of flowers 1.2—2.5 cm long; fruits never conical, generally ovoid, pubescent to subgla* brous, apex acute, persistent style medium-sized; tertiary nerves of leaves prominent and conspicuous below. *Malay Peninsula, Sumatra, Biau, Borneo* 8. P. **obscura** Burck

19.a. Leaves with 9—16 secondary nerves, angles with midrib about 60—70°, petioles 0.7—1.6 cm long 20

b. Leaves with 14—22 secondary nerves, angles with midrib about 70—80°, petioles 1—3 cm long; fruits 2.9—3.6 by 1.2—1.8 cm, persistent style 0.8—1 cm long; leaves 6.5—24 by 4—7 cm. *Siam, Malay Peninsula, Sumatra, Simalur, Java Borneo* 2. P. **acuminata** (Blunic) Pierre var. **acuminata**

20A. Leaves small, 6—12 by 2—4.5 cm, 9—12 secondary nerves, forking of secondary nerves practically at edge of leaf; pedicels of flowers middle-sized to short, apex of connective in stamens longer than anthers; fruits glabrous, ovoid to spherical, 2.2—2.3 by 1—1.3 cm, persistent style 1.3 cm long, pistillum in flower 1.1 cm long. *Sumatra, Borneo* . . . . . 12. P. **endertii** H. J. Lam

b. Leaves middle-sized, 8—23 by 3—8 cm, 10—16 secondary nerves,, forking of secondary nerves at a comparatively large distance from edge of leaf; pedicels of flowers middle-sized to long, apex of connective in stamens shorter than anthers; fruits pubescent, ovoid, never spherical, 1.5—3.7 by 1.1—2 cm, persistent style 0.7—0.8 em long, pistillum in flower 0.7—1 cm long. *Burmdt Siam, Malay Peninsula, Andamxans, Sumatra, Banka, Borneo* 6. P. lucida (Don) DO

7. Taxonomic part

Section PURPURKOPAYEXA sect. nov. — floribus rubropurpureis, indu* mento lanato rubroferrugineo in ramulis, petiolis, pedicellis, calycibus, fructibus, foliisque subtus.

Flowers purplish red, branchlets, petioles, pedicels of flowers and fruits, calyces and lower surfaces of leaves with woolly red ferruginous indumentum.

Type species of section: *Payena dasyphylla* (Miq.) Pierre.

1. **Payena** dasyphylla (Miquel) Pierre, Bull. Mens. Soc. Linn. Paris, 1885, f,27; Lam 1925, 143; Lam 1927, 431, *fig. 13;* Wyatt-Smith, Res. ^amphl. 4, 1954, 50 — *Isonandra dasyphylla* Miquel, PL Jungh., 1852, 20* — *Bassia cawdata* Ridley, PI. Mai. Pen. 2, 1923, 267 — *Madhuca c«udata* (Ridley) H. J. Lam, Lam 1925, 161.

Trees up to 35 m, diameter up to 1 m, girth up to 2 m. Branchlets, Petioles, pedicels of flowers and fruits, calyces and lower surfaces of leaves ^th a dense covering of a red ferruginous woolly pubescence. *Branchlets* not very thin, terete, stipules caducous, small, narrowly triangular, acute, iong pubescent. *Leaves* dispersed along branchlets., chartaceo-membrana-ceous, apex long,^ibruptly acuminate, base cuneate, petioles 1—2.5 cm long; blade 15—25 by 5—11 cm, elliptical or ovate-oblong, glabrous above, e*cept some traces of the pubescence on the midrib, lower surface with "*e above mentioned indumentum; midrib sunken above, prominent below, father conspicuous, a little darker than the blade; secondary nerves idem, 12—18, rather straight, archingly joined near margin., starting from mid-*& at angles of about 60°, curving towards apex near margin; tertiary *jei>ves much less conspicuous, more or less forming a *Ganua-like* pattern, ^escending. *Inflorescences* in axils of leaves and below leaf region, 2—8-Norous, pedicels 1.5—3 cm long. *Sepals* 0.5—0.9 by. 0.45—0.8 cm, thick triangular or broadly ovate-rotundate, acute, inner sepals thinner. *Corolla* generally exsert, 0.7—1.7 cm long, tube 0.2—0.5 cm long, lobes 8, ovate oblong, acute, glabrous. *Stamens* 16, 0.5—0.6 cm long, filaments short, Jtth comparatively long hairs, apex of connective acuminate, generally bifid, thecae oblong. *Pistillum* 0.8—1.6 cm long, glabrous, base villous; ovary conical, villous, cells 8, ovules rounded, small. *Fruits* 1.8—2.5 by 1.5 cm, obovoid-ovoid, with short red ferruginous indumentum; seed 1, 1.7—A-8 by 0.8 cm, oblong, scar linear., narrow, cotyledons flat, narrow, ovate °blong, radicle thick and short; incrassate pedicels 1.6—2 cm long, per-cent sepals 0.6—0.8 cm long, persistent style 0.6—0.8 cm long.

Lectotype specimen: *Junghuhn s.n.*, HLB 908225-141, in L.

Vern. names: nyatoh ekor., n. ekur, n. tembaga (Malay Penin-*i/a)> balam kerang, b. selendit, kaju balam, madang bungo, njatuh kerah Sumatra).

Uses: Guttah.

£>istr.: Malay Peninsula, Sumatra.

ho" u *4AIJAY PENINSUUL. Kelantan, Temangan, old forest: *Mai. FD 68769* (KEP), (Ir?ut 19,,30 m» S""*11 1-20 m — Peak, Larut, 1100—1200 m: *King's Collector 2611* L » height 25—30 m, fl. Dec. — Pahang, Kuantan, Baloh Forest Reserve: *Yeop* ea^i *FD S650* (K» KEP» SING), height 28 m, girth 2 m, fl. Mar. *(type* of *Bassia Hò^ta* Ri<lley); Fraser Hfill, upon the Selangor border, 1200—1300 m: *Bnrkill $* (K S *SF 7766* (SING), fl. Sept.; Fraser Hill, 1200 m: *Symington Mai. FD 45468***

f0 *^IATRA. Atjeh and Dep., Gajo countries, from Gadjah to Blang Kedjeron, Ank 1 8lope> 1300~1400 m: *Van Steenis 9405* (BO, L), fl. Feb. — Tapanuli, Upper Jung 1 , forest region, 3—900 m: *Junghuhn s.n.* (L, *leototype);* Upper Ankola, Tobing: *Junghuhn* 8,n- (U)5 uPPer Ankola, 900 m: *Junghuhn s.n.* (P), fr.; Tapanuli without locality: *Junghuhn s.n.* (L), 1 sterile, 2 fr.; idem: *Anonymous s.n.* (BO, L), fr. (the specimen with the evidently incorrect locality "Java") — East Coast, Bandar Pulu », Asahan: *Yates 20&7* (B, BO, L), fl.; Masihi, Asahan: *Yates 2641* (BO), fl.; ^jundjung: *Stadtmiller 79* (BO); Unggan: *Stadtmiller 105* (BO); Tapus, Kuantan

river, **100** U: *Koorderx 10488 fi* **(BO), height** appr. 85 in, **ili:ini.** 1 m. **fir. Feb.;** Siluka. **Eoaatau** river, 100 m: ***Koordera 10469*** *ji* (BO), height appr. 7 m — West Coast. L Kota: *Anomyv\oit$ s.n.* (BO), fl.

Remarks: This species is characterized by the dense woolly pubescence of branchlets, **petioles,** pedicels, calyces., fruits, and lower surface of leaves. The colour of this indumentum is red **ferruginous when** dry. P. ***dasyphyUa*** is a tree of hills and lower mountains, up to 1400 m (WyaU Smith, **toe.** cit.: "lowland forest").

The flowers are generally reported to be purplish red, the fruits pale yellowish brown.

Section PAYENA — floribus albidis, **deficiente indumento** in omnibus partibus simul.

Flowers whitish, indumentum never on all parts of the plant together.

Type species of section: *Payena lucida* (Don) UC.

Fig. 2. *P.* **sou-** *minata* vur. ***aowmi-*** jotfo, bifuicJdet **with** fruitfl From Jno- *nymom s.n.,* Cult, Hort. Bot. Bog. (L).

2. Payena acuminata (Blume) Pierre, Bull. M:i:s. Soc, Linn. Paris, 1885, 528; Merrill, PI. Elm. Born., Univ. Calif. Publ. Bot. 15, 1929, 238; Lam in Backer. PI. Java, Nooduitg. 7, 1948, 166—8 — *Mimusops acuminata* Blume, Bydr. Fl. Ned. Ind., 1825, 672 — *P. sericea* (Blume) II. J. Lam, Lam 1925, 139, 261; Lam 1927, 439; Fletcher in Craib, Fl. Siam. Enum. 2, 4, 1938, 361; Heyne, Nutt. PI. Indon. 1, 1950, 1229 — *P. sericea* {Blume) H. J. Lam var. *typica* H. J. Lam, Lam 1925, 140, *fig. 38A;* Lam 1927, 441 —*P. sericea* (Blume) II. .1 Lam var. *pulchra* (Burck) II. J. Lam, Lam 1925, 142, *fig. 38B* ; Lam 1927, 441 — *Isonandra pulchra* Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 21 — *Bassia sericea* Blume, Bijdr. Fl. Ned. Ind., 1825, 674 — *P. sumatrana* Miquel, Fl. Ind. Bat. Suppl. Sum., 1860, 582 — *Isonandra sumatrana* (Miguel) Burck, Ann. Jard. Bot. Bnitenz. 5, 1886. 21 — *P. teysmanniana* **Pierre,** Bull. Mens. Soc. Linn. Paris, 1885, 527; Lam 1925, 151, 263 — *P. suringariana* Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 49 — *P. omata* Moore, J. Bot. 63, Suppl., 1925, 61. — *Fig. 2.*

Trees up to 42 m, diameter up to 0.92 m, girth up to 1.12 m. *Branchlets* slender, terete, with rough bark, appressed ferruginous pubescent, stipules caduecous, narrowly triangular, acute, long red ferruginous pubescent, 0.2—0.35 cm long. *Leaves* dispersed along branchlets, sometimes to a small degree crowded at **tips** of branchlets, chartaceous to coriaceous, apex acuminate, acute or obtuse acute, base cuneate to rounded, petioles 1—3 em long, ferruginous **pii**bescent to sub«:labrous, **rough;** blade 6.5—24 bj ^—^ cm, broadly elliptic to more narrow long ovate, in young leaves sometimes lanceolate, glairons above, (pale) **ferruginous** pubescent below«

sometimes pubescence sparingly only in basic part ef leaf and along midrib and secondary nerves; midrib sunken above, prominent below; secondary nerves to some degree prominent above, inconspicuous to hardly visible below, 14—22, straight, archingly joined near margin, starting from midrib at angles of about 70—80°, curving towards apex near margin; tertiary nerves conspicuous above, inconspicuous below, some more or less parallel to secondary ones, others stretchedly reticulate, generally one of the parallel ones somewhat more conspicuous and placed in the middle between two secondary nerves, descending. *Inflorescences* in axils of leaves or of scars of leaves, 2—13-florous, pedicels 0.7—1.3 cm long, minutely pubescent. *Sepals* 0.4—0.5 by 0.4—0.5 cm, deltoid or long deltoid, obtuse acute, outside appressedly pubescent, inside glabrous, inter ones ciliated along edges. *Corolla* frequently cxsert, 0.7—0.9 cm long, tube 0.3—0.4 cm long, lobes 8, Jong elliptic,:acute, glabrous. *Stamens* 16, 0.4—0.5 cm long, filaments long and thin, glabrous, apex of connective long acute to obtuse acute, thecae long elliptic, comparatively thick. *Pistillum* 1.2—1.5 cm long, subglabrous to glabrous, base pubescent; ovary conical, small, villous, cells 8, ovules ovate rounded. *Fruits* 2.9—3.6 by 1.2—1.8 cm, long ovoid to obovate, acuminate, base narrow, subglabrous to glabrous (young ones pubescent); seeds 1 or 2, 2.3—3 by 1.1—1.4 by 0.5—0.7 cm, laterally compressed, scar 0.2—0.4 cm wide, cotyledons flat and foliaceous, radicle cylindrical, 0.2—0.4 cm long, inferior, exsert; incrassate pedicels 1—2 cm long, glabrous, incrassate persistent sepals 0.4—0.5 by 0.4—0.5 cm, subglabrous to glabrous, persistent style 0.8—1 cm long.

Lectotype specimen: *Blume 239* in L.

Uses: Timber, gutta of inferior quality, fruits edible.

Distr.: Siam, Malay Peninsula, Sumatra, Riau, Simalur, Java, Borneo.

Var. **acuminate** — Synonymy as in species, except for the names cited sub var. *pulchra.*

Base of *leaves* attenuate, leaves comparatively narrow, 4—7 cm wide, secondary nerves thin, hardly prominent below, petioles 1—3 cm long.

Vern. names: chakhun, pi kul pa (Siam); balam, b. durian, h. suntek, b. timah, geneng, genong, kaju kentan, kontan, majang bulan, n. damanik, m. lisak, njatuh balam, punti, simartarutung (Sumatra); balam tembaga, b. turian, suri manuk (Simalur); djenggot, djenkot, getta, kellau, ki, k. kepel, kituwah, matak rasberassan, santenan, tandjungan, taun, tundjang (Java); baitis, manatu, matu, monongan najah, natu, nyatoh, n. merah, n. laka, sendi, tinkawang lilin (Borneo).

Distr.: Siam, Malay Peninsula, Sumatra, Simalur, Java, Borneo.

SIAM. **Pattani, Bukit Nasi, Toh Moh, evergreen forest, 200 m:** ***Kerr 648*** **(K, BM), fl. Apr. — Surat, dipterocarp forest of Bangbao:** ***Llewelyn Williams 17113*** **(L), height 15—26 m, fl. Feb.**

MALAY PENINSULA. **Trengganu, Ulu Brang, 200 m:** ***Moysey $ Kiah SFS3747*** **(BM, SING), fr. July; ibidem:** ***Moysvy # Kiah SF33749*** **(BM, BO, SING), fr. July.**

SUMATRA. **Atjeh and Dep., Pedie Tjot Ludas, 450 m:** ***FBI bb 8497*** **(L) — Baet Coast, Bandar Pulu, Asahan:** ***Yates 1687*** **(L, S, SING), fl.; ibidem:** ***Yates 275*** **(BO); Hutan Padang Estate near Kisaran:** ***Krukoff 229*** **(SING, US), fr. Dec; Labuan Batu, Gunting Sago:** ***FBI bb 7733*** **(BO), height 26 m, diam. 0.45 m; Simelungun:** ***FBI bb 30177*** **(L, SING), fr. Dsc; ibidem, Marikat Hoita, 700 m:** ***FBI bb 4869***

(SING), fl. Oct.; ibtfem, Pcrbutaran, old forest, 140 m: *FBI bb 5353* (L), height 27 m, diam. 0.45 m; ibidem, Badja Hombang, 150 m: *FBI bb 8550* (BO), height 29 m, diam. 0.40 m — Tapanuli, Mandailing, 1000 in: *FBI bb 6181* (L), fr. Oct. — West Coast, Ophir, Lub Gadang, Parit, old primary forest, 90 m: *FBI bb 187S1* (L), height 42 m, diam. 0.60 m; Painan, Burung Balantai: *FBI SWK 1—10* (L, SING), fl. fr. Oct.; Painan, Lubuk Gangger, 600 m: *FBI bb 5468* (L); Pajakumbuh, 1000 m: *FBI bb 2898* (L) — Paleonbang, Banjuasin and Kubus countries: *FBI 35 TIP 39* (L, SING, U), fl. Aug., fr. Feb.; Lematang Ilir: *FBH T 570* (L, SING, U), fl. Sep., fr. Nov. Dec; ibidem: *FBI 136 ESP 819* (L, SING, U), fl. fr. Jan.; ibidem, near dusun Megang: *FBI T3P 408* (L, SING, U), fl. Nov., fr. Febr.; Oganhulu: *Teysmann s.n.* (BO); ibidem: *Anonymous s.n.* (L, U); Rawas, 150 *m: Grashoff 1152* (L) — Benkulen, Redjang, 600 m: *FBI bb 2999* (L, SING); Talang Benal, 250 m: *FBI bb 8788* (L), fr. June — Lampong Districts, *Anonymous s. n.* (BO), fl.; Sumatra without locality: *Forbes s.n.* (L), fl.; *Korthals* *.tt. (L), fr., sterile; *De Vriese s.n.* (L); *Anonymous s.n.* (L), fl.

RIAU. without known loc.: *Bhodine s.n.* (SING), height 21 m, diam. 0.45 m.

SIMALUR. Tapah district, Defajan: *Achmad 1498* (L); only Simalur: *Achmad 61* (L), fr. Nov.; *AcJmad 273* (L); *Aohmad 1244* (G, L, SING, U), fl. July; *Aohmad 1306* (G, L, U), fl. Aug.

JAVA. West Java, Bogor: *Heyne s.n.* (L), fl.; Bogor, Handjere, Janglappa, primary forest: *FBI Ja 6220* (L), height 14 m, diam. 0.40 m, fr.; Bogor, Nature Reserve Dungua Iwul near Djasinga, old forest, 220 m: *FBI Ja 1964* (BO), diam. 0.84 m; Oheribon: *Router s.n.* (BO); Djakarta: *Junghuhn s.n.* (BM), fl.; Djakarta, Depok, 1000 m: *Beumde 6020* (L), fr. Nov.; ibidem, 95 m: *Bcumée 5672* (L); Djakarta, Tjampea: *Baoiborski 324* (BO); ibidem: *Koorders 30412 $* (L), Gunung Besar, near Tjidadap, S. of Tjibeber, 1000 m: *Winded 248$* (BO), fl. Aug.; ibidem: *Wvnckel 268* (L, SING, U), fl. Aug.; Gunung Gedeh: *Junghuhn 247* (L), fl.; Gunung Salak, near Bogor, 700 m: *Koorders 24402 $* (BO, L, U), height 24 m, diam. 0.56 m, fl. fr. Sep.; Krawang: *Anonymous s.n.* (L); Plabuan Ratu, 400 m: *Koorders 10164$* (L); Sanggrawa, Sukabumi, 400 m: *Koorders 10165* £(BO), height 20—25 m, diam. 0.40—0.60 m; Takoka, Tjantjur, 1100 m: *Koorders 10166$* (BO), fl. July; ibidem: *Koorders 10167 f* (L), fl. July; ibidem: *Koorders 12120$* (L); ibidem: *Koorders 12121 $* (L); ibidem: *Koorders 15230 $* (L); ibidem: *Koorders 25603$* (L); ibidem: *Koorders 32672$* (BO): ibidem: *Koorders 37284 $* (BO, L), fl., fr. Oct.; ibidem: *Koorders 39600 &* (BO) ;Udpung Kulon, Tjimara, Menen Bantam: *Koorders 10168* (3(BO), height 15—25 m, diam. 0.30—0.35 m — Central Java, Gunung Wruia, Tjolle, E. of Kudus, 700 m: *Kostermans 6266* (L), height 35 m, diam. 0.50 m, fl. Nov.; Japara, Sumanding, old forest, 800 m: *FBI Ja 1877* (L), height 21 m, diam. 0.51 m, fl. May; ibidem: *FBI Ja. 3824* (BO, L), height 23 m, diam. 0.50 m, fl. May; S. of Margasari, Pekalongan, 100 m: *NolUe 4018* (BO); Ngarengan, Taju, Djuwana, Japara: *Koorders 85052 &* (BO), height 25 m, diam. 0645 m, fl. May; Pringombo, Singomerto, Bandjarnegara, Banjumas: *Koorders 10162 $* (BO); ibidem, 800 m: *Koorders 33811 $* (BO); Prupuk, Pekalongan, mixed forests: *Wind 4018* (BO), fl. July; Semarang, Unggarang, N. slope: *Junghuhn s.n.* (L), fl. May, June — East Java, Besuki, Pradjekan, Situbondo, Pantjur Idjen, primary forest: *Koorders 14703 $* (BO), height 35 m, diam. 0.92 m; ibidem, 1000 m: *Koorders 10169* 0(BO), height 20 m, diam. 0.62 m; ibidem: *Koorders 14702$* (BO); Besuki, Tjuramanis: *Koorders 10170$* (L), fl. fr. Nov.; ibidem: *Koorders 10172$* (BO); ibidem: *Koorders 10173 $* (L) ; ibidem: *Koorders 10174 $* (L); ibidem: *Koorders 10175 $* (BO), height 22 m, diam. 0.90 m; ibidem: *Koorders 10176 $* (BO), height 18 m, diam. 0.45 m; ibidem: *Koorders 10177$* (L); ibidem: *Koorders 10178 $* (BO); ibidem: *Koorders 20799 $* (L); ibidem: *Koorders 20948 $* (L); ibidem: *Koorders 20974 $* (L, SING), fr. Nov.; ibidem: *Koorders 21841 $* (BO); ibidem: *Koorders 21844 $* (L) ; ibidem: *Koorders 25603$* (L); ibidem: *Koorders 29084 $* (L); ibidem: *Koorders 38505$* (BO); ibidem: *Koorders 38567$* (BO); ibidem: *Koorders 39991$* (L), fl. June; ibidem: *Koorders 40007$* (L), fl. June* ibidem: *Koorders 400150* (L), fl. June; ibidem: *Koorders 40064$* (BO), fl. June; Besuki, Rogodjampi: *Koorders 29085 $* (L), fr. Sep.; Bondowoso, Kembang, old forest, 750 m: *FBI Ja 2865* (L), height 23 m, diam. 0.35 m; Gunung Parang, Tjantjur: *Blume 1258* (L), fl. July *(type* of *Bassia sericea* Blume); Pasuruan, Tangkil, Southern Mountains, 400—500 m: *Koorders 23926* (9 (BO, L); Java without locality: *Blume 230* (L), fl. *(type)*; *Blume s.n.* (BO, L, IT), fl. fr. sterile; *De Vriese 23* (L), fl.; *De Vriese s.n.* (L), fl.

BORNQO. West Borneo, Melawi Tjatit, Bukit Tenkujung, 450 m: *FBI bb 26458* (Lr) — South and East Borneo, Balikpapau, Mentawir, primary forest: *FBI bb 34909* (L), height 10 m, diam. 0.20 m, fl. Sept.; Berau, Domaring, old forest: *FXI bb 18825* (BO, L, SING), height 22 m, diam. 0.75 m; Madjamut, Pulu Laut: *Delniaar 2001* (SING), fl. Sep.; Biam Kanan: *Anonymous 2007* (L, U), fl. Sep.; Wqst Kutai, Longbleh: *Fffl bb 16040* (L); ibidem: *FBI bb 16041* (L) — Sandakan, Belaching Reserve: *Castro N. Born. FD 3793* (SING), height 5 m, diam. 0.075 m, fl. Apr.; Bettotan, river bank: *N. Born. FD 4537* (K), height 10 m, girth 0.50 m, fl. Mar.; Elopura, Kabili-Sepilok Forest Reserve: *Encliai Mai. FD 48783* (KEP), height 17 m, girth 0.60 m, fl. June; ibidem: *Enggoh Mai. FD 55118* (KEP), height 13 m, girth 1.12 m, fr. Sep.; ibidem: *Otilc N. Bom. FD 4353* (K, SING), height 10 m, girth 0.25 m, fl. Mar.; ibidem: *Enggoh N. Born. FD 4608* (K, L), height 6.50 m, fl. Aug.; ibidem: *Keith N. Born. FD 4608* (K, SING), height 5 m, girth 0.25 m, fl. May; ibidem: *Enohai N. Born FD 9996* (K, L), height 15 m, girth 0.60 m, fl. June; ibidem: *Kadir N. Born. FD A 42* (K, KEP, SING), height 8 m, girth 1 m, fl. Sep.; Ibidem: *Kadir N. Born. FD A 659* (KEP, SING), height 20 m, girth 0.80 m, fr. Dec; ibidem: *Muliadi N. Born FD A 809* (KEP, SING), height 6 m, girth 0.10 m, fl. June; ibidem: *Kadir bin Abdul N. Born. FD A 2881* (KEP, L, SING), height 13 m, girth 0.30 m, fl. July; ibidem flat land near river: *N. Bor. FD 10634* (K), height 13 m, girth 1.12 m, 1. Sep.; Elopura, Supu Forest Reserve, Kinabatangan: *N. Born. FD 10076* (K), height 6.50 m, girth 0.25 m, fl. Oct.; Kinabatangan, Batuh Puteh, flat land: *N. Born. FD 1750* (K), height *9* m, diam. 0.20 m, fl. Apr.; Kinabatangan, Bukit Garam: *Wood' #. Born. FD A 4720* (L), height 27 m, fl. June; Kinabatangan Besar, Kori: *Cuadra X. Born, FD A 2163* (KEP, SING), height 7.50 m, girth 0.45 m, fl. Oct.; Sekong River Valley: *Sales N. Born. FD 4311* (SING), fl. Mar.; Tawao, Elphinstone Province: *Elmer 21236* (BO, K, L, S, SING, U), fl. fr.; ibidem: *Elmer 21441* (BO, G, K, L, 8, SING, U), fl. fr.

MALAY ARCHIPELAGO, without known loc: *Korthals* «.n. (L); *Anonymous s.n.* (BO), fr.

Cur/rrvATED. Botanical Gardens Bogor: *Becoari s.n.* (Fl), fl.; *Ilochreutiner 36* (G); *Teysmann s.n.* (L, U), fl. fr. sterile; *Anonymous s.n.* (BO, L, NY, SING), fl. f*. sterile.

Var. **pulchra** (Burek) H. J. Lam, Lam 1925, 142; Lam 1927, 441 — *honandra pulchra* Burck, Ann. Jard. Bot. Buitenz. 5, 18&6, 21 — *P. swma-*[tr]*nnn* Miquel, PI. Ind. Bat. Suppl. Sum., 1860, 582 — *Isonandra swniatrana* Uliquel) Burek, Ann. Jard. Bot. Buitenz. 5, 1886, 21 — *P. teysmanniana* Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 527; Lam 1925, 151, 263 — [/J]. *ornata* Moore, J. Bot. 63, Suppl., 1925, 61.

Base of leaves broad, leaves comparatively broad, 7—15 cm wide, secondary nerves rather thick, prominent below, petioles 1.5—2 cm long.

Type specimen: *Burck s.n.* in BO, Herbarium Bogoriense **151357–151368.**

Vern. names: balam, b. beringin, b. durian, b. kelemangung, b. [kp]tiau: b. ketjil, b. pinang, b. sasak, b. tembaga, b. timah, getah balam, kaju balam, k. tamem, mayang bulan, m. damanik (Sumatra); matu besi (Borneo); djenkot (Java).

Distr.: Sumatra, Java, Borneo.

— SUMATRA East Coast, Simelungun, Marihat Hoita: *FBI bb 4869* (L), fl. Oct. And Tapanuii' Amjkola and Sepirok, 1300 m: *FBI bb 6161* (L) - West Coast, (Bkurimr *Burok s.n.* (BO, L); Kerintji, Indrapura, Air Lebo, 1400 m: *FBI bb 18760* >, L), heiffht 22 m, diam. 0.60 m; Muara Lahuh, Timulun, 1000 m: *FBI bb 6103* (L); Padanff Pandrang, Tambangan: *FBI bb 5506* (L); Supajang, Ajer Busu: *Burck* */*. (BO, type)' fr. — Benkulcn, Redjang, Karanganjar, 900 m: *FBI bb 8837* (L); ibidem *FBI bb 8838* (L, U), fr. Feb. — Palembang, Muara Dua: *Anonymous* ?;n- (L, U)- ibidem, 150 m: *Grashoff 504* (BO), height 28—30 m, diam. 0.60 m; ibi<*em, Kisaii' old forest, 800 m: *FBI bb 9221* (BO), height 23 m, diam. 0.24 m;

ibidem: ***FBI bb 9225*** **(BO), height 16 m, diam. 0.23 m; ibidem, Sungei Pagu:** ***Teysmann s.n.*** **(BO); Palembang:** ***Teysmann 3730*** **(U), fr.; Rawas, 200 m;** ***Dumas 1636*** **(L, SING, U), fl.. July; Sumatra without loc:** ***Burdk s.n.*** **(BO, CAL, P, U, SING);** ***Forbes s. n.*** **(BM);** ***Korthals s. n.*** **(L);** ***Teysmann s. n.*** **(L, P);** ***Teysmann # Be Vriese*** **(L);** ***Be Vriese 81*** **(P);** ***Be Vriese s.n.*** **(L), fl. fr.;** ***Be Vriese f Teysmann s.n.*** **(L);** ***Anonymous s.n**** **(L);** ***Anonymous s.n.*** **(P).**

JAVA. **West Java, Gunung Gedeh:** ***Jloutsoorten Gedeh 87*** **(L) — Central Java, Pringombo, Banjumas, 700—900 m:** ***Koorders 11103 0*** **(L) — East Java Pasuruan, Tangkik, Southern Mountains, 400—500 m;** ***Koorders 23989 0*** **(L).**

BOKNBO. **West Borneo, Gunung Damar Putih, Tcwingan:** ***FBI 2131*** **(L), fl.; Sanggau:** ***Ilallier 863*** **(L, SING, U), fl. — South and East Borneo, Berau, Karai:** ***FBI bb 19151*** **(BO, L), height 26 m, diam. 0.45 m; Pasir Lebaran:** ***FBI bb 2666*** **(L), fl. -Sep.; Sandakan, Elopura, Kabili-Sepilok Forest' Reserve:** ***Puasa N. Born. FB 4887*** **(K, L), height 12 m, girth 0.60 m, fr. June.**

Cm/rrvATED. Botanical Gardens Bogor: ***Anonymous s.n.*** **(L).**

WEniauT LOCALITY — ***Biedel s.n.*** **(BO, P), labelled Celebes, Minahassa, according to Lam (Lam 1927, 441) and Van Steenis—Kruseman (Fl. Mai. (I), 1, 1950, 438) there is a probability that this specimen originates from Banka or Billiton;** ***Anonymous s.n.*** **(L).**

Remarks: Generally it is rather easy to distinguish the two varieties of the present species; there are, however, specimens that form a transition between the two, notably from Sumatra. The most reliable character is the nervation of the leaf, especially the secondary nerves below.

Frequently one finds plants with fruits showing different shapes (cf. *Fig. 2)*; the smaller fruits invariably have one seed only, which does not look very apt to germinate.

Probably duplicates of the types were distributed at least to Leiden and Utrecht; it is, however, practically impossible to find out what specimens are really duplicates of the type, since the plants in question bear labels with "Burck, Sumatra" in the handwriting of Burck himself only. Some of the synonyms mentioned seem to be based on watershoots, e. g. *P. sumatrana* Miq. and *teysmanniana* Pierre. The types belonging to these names are mostly sterile and have unusually large leaves.

Pierre and Miquel both obviously'referred to the same species; therefore a *P. sumatrana* Pierre does not exist. The only difference is that Miquel was in doubt about the genus, i.e. he added a question mark **to *Payena.***

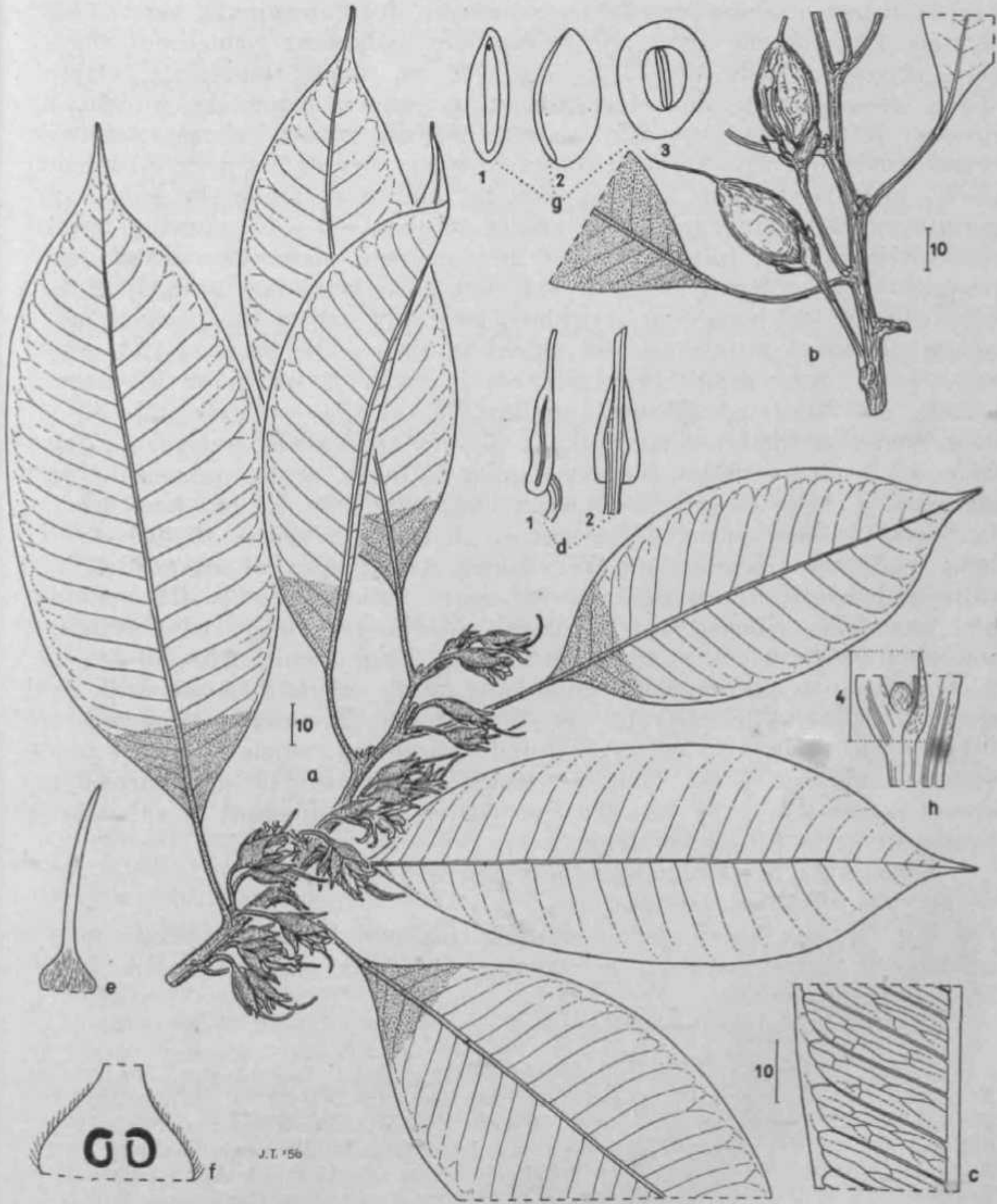
Lam (Lam 1927, 442) quoted *P. ornata* as a synonym to *P. dantung;* the type of Moore, which was at our disposal, shows that it rather belongs **to *P. acuminata* var. *pvlchra.***

In one specimen, viz, *Anonymous s.n.* (L), Cult. Hort. Bot. Bog. sub num. IV D 93, Lampong Districts, Sumatra, I found a fruit of 2.6 by 1.4 cm with 4 small seeds of 1.5 by 0.5 cm, scar 0.1 cm wide. This case should be considered an abnormality, moreover the seeds do not look viable; generally *P. acuminata* has one seed in the fruit, and occasionally two.

The flowers and latex are white, the fruits greenish.

3. Payena maingayi Clarke in Hooker. Fl. Brit. Ind. 3, 1882, 547; Lam 1925, 133; Lam 1927, 442; Heyne, Nutt. PL Indon. 1, 1950, 1228; Wyatt-Smith, Res. Pamphl. 4, 1954, 53 — P. *grandiflora* Ridley, J. As.

Soo. Straits **61, 1912,** 28 — *Diploknenut* ***grandiflora*** (Ridley) **H. J. Lam,** Um 1925, 185; Lam **1927, 363 —** ***Fig. 3.***



Hlg. 3. *P. mouuunii,* ft. **bnuiehlet** with **leavaa** and **flowers; b,** hranchlet **with** 'nii^; <•. HIT vat ion of loaf; d. 1. stamen, **lateral** view; **d.2. stamen,** frontal view; vjttv ;itul **styte;** f. ovary, longiiu-': nal se **etiottj** g. 1. **seed,** ventral view; g. 2. seed, ***4«ml View;** g. 3. seed, cross-section; h. stipule, a., o, from *SF 21116,* b- from *CF 596, g~-^'* from *Cantley* *.»., g. from A'itt^ *Collector 7ttS.* h. from *SFS77S4.* Figiiros • —K- adapted after an alrcadv **eodatSng** piate in the lcones **collection** in the Rijks-llOl"l»anmi,, **Leidefi,** li. n'iapted after a sketch of the author.

Trees up to 33 m, girth up to 2.31 m. *Branchlets* slender, terete, rusty tomentose, stipules caducous, though generally longer persistent than in other species, 0.4—0.6 cm long, narrow and acute, long rusty pubescent. *Leaves* dispersed along branchlets, coriaceous, apex acuminate, base cuneate, petioles 1.5—4.5 cm long, red ferruginous pubescent, sometimes slightly alate at apex; blade 10—32 by 3.7—9.5 cm, oblong lanceolate, glabrous above, sometimes a short ferruginous pubescence along the midrib, appressed ferruginous pubescent below; midrib sunken above, prominent below, sometimes with faint grooves; secondary nerves not very conspicuous above, prominent below, 20—25, straight and thin, archingly joined near margin, starting from midrib at angles of about 60—75°, curving towards apex near margin; tertiary nerves inconspicuous above to a small degree prominent below, mostly more or less parallel to secondary ones, frequently near edge of leaf somewhat reticulate, generally one of the parallel nerves somewhat more conspicuous and placed in the middle between two secondary nerves, descending. *Inflorescences* in axils of leaves or in scars of leaves, 2—12-florous, flowers comparatively large, pedicels 1.2—3.5 cm long, somewhat thickened towards the flowers, appressedly pubescent. *Sepals* 0.75—1.1 by 0.4—0.6 cm, long triangular to ovate, acute, pubescent, inside glabrous. *Corolla* exsert, 0.9—1.6 cm long, tube 0.3—0.4 cm long, lobes 8, lanceolate to long ovate, obtuse acute, glabrous. *Stamens* 16, 0.6—0.7 cm long, glabrous, filaments not very short, thick, apex of connective long, thin and acute, thecae elliptic to ovate. *Pistillum* 1.8—2.2 cm long, glabrous, base villous; ovary conical to rounded, long red ferruginous pubescent, cells 8, ovules rounded, 0.05 cm long. *Fruits* 2.5—3.5 by 1.5—2 cm, oblong to elliptic, short pubescent, rarely subglabrous; seeds 1, sometimes 2, 2.5—2.8 by 0.9—1.2 by 0.7—0.8 cm, laterally compressed, scar O.4-€0.6 cm wide, cotyledons flat and foliaceous, radicle inferior; incrassate pedicels 1.5—4 cm long, appressedly pubescent to subglabrous, persistent sepals 0.7—1 by 0.4—0.6 cm, appressedly pubescent to subglabrous, persistent style 0.9—2 cm long.

Neotype specimen: *Maingay 990* in K.

Uses: Timber, firewood.

Vern. names: getah sundik, maiang taban, mayang, mentua nyatoh, m. taban, nyatoh, n. paya, n. tembaga, sawoh, sundik burong (Malay Peninsula).

Distr.: Malay Peninsula.

MALAY PENINSULA. **Kedah**, Kuala Nerang, Bukit Batu Jajam, 300 m: *Mai FD 67874* (KEP), height 30 m, girth 1.75 m; Sik: *Mai FD 73798* (K), height 28 *m*, girth 1.56 m, fl. Apr. — **Penang**, Reserve line W. hill, 650 m: *Curtis 1565* (K, SING), fl. Apr. — **Perak**, Kedah-Perak boundary, Bukit Kuala Ketang, Gunong Bintang: *Moh. Jlaniff SF 81116* (BO, SING), height 12—15 m, fl. Apr.; Chikus Forest Reserve: *Mai FD 30118* (KEP), fr. Feb.; Upper Perak, Ulu Kenderong, Grik: *Mai FD 11604 (K,* SING), fl. Apr.; Upper Perak, 100 m: *Wray 3423* (SING), height 18 m. fl. May; Gunong Malacca, open jungle clearing, 100—260 m: *King's Collector 7&t&* (BM, K, BO) ,height 20—26 m, diam. 0.50—0.66 m, fr. Jan.; Perak, open jungle: *King's Collector 9918* (BO), height 15—23 m, diam. 0.37—0.5 m, fr. July; Perak: *Scortechini 346b* (BM, L, P, SING), fr. — **Kelantan**, Mengkebang: *Mai FD 6881** (KEP), height 1.25 m, girth 0.10 m — **Selangor**: Bukit Endong Reserve, Ulu Langat: *Mai FD 50440* (KEP), height 2.90 m, girth 0.17 m, fl. Aug.; Kuala Lumpur Ulu Langat Forest Reserve, 200 m: *Mai FD 71387* (K, KEP), height 33 m, girtU

2.31 in. II. Aug.; Kii;il;i Limipur, Sungci Puluh Reserve: *Dt Zylva Mai FD :>•593* (KKP, SING), fl. Sep.; Kajang, Bukit Tunggal **Reserve,** Ulu **Tangots** ***MitdieU Mai.*** *i-'t) 309* (Ki;i>, si.VG), **heigW 26 m, ft Mar.; K&jang:** ***Watson Mai. FD 596*** (KKI\ SING), ***tt.*** July == *Burlil! Mai. FD 596;* hill slope, **plantation, Kepong!** *Mai. FDS75S8* (Ki;['). li(.i$ht' 10 m, girth 0.45 m — Pahnng, Belingo, Tei....**loh:** *Awang Lvla* ***Mai.*** *FD 2688* **(KEP, SING),** fl. Sep.: **ibidem:** ***Pawanget Mai*** *FD 13774* **(TTF.P), height** 26 m, girth l.:-i2 it), fl. SI>J».; Komaiisul **Reserve, Temerloh:** *Humid Mai. Fl) maiS* (K), fl. **Sep.; Bumpiu:** *Lambah Mai. FD 8713* (K, SING), II. Apr.; Sang, Lunar Reutong: ***BaUh*** *Mill. Fl) $986* (K), fl. **Sep.;** Pahans: *Fwcwortbtt* ***1156*** **(KEP),** fr. — **Negri** Semhilan, Duriaii **Ta^rax, State land:** *Tahir Mai. FD* ***QGm*** (K), tl. **Oct.** — Malii.-- '*:i. Avcv Panas: *Curtis SiSS* <K), **height** 23—27 **m, girth 0.45—0.«0** m; linkii **Senggeh Beserre, 864** ***m: MaL FD 9067*** **(KEP), height 30 m, girth 0.95 m, fl. May; MaScca** Towu; *Goodoiotuiit* ***td$7*** (S1X«), fr. Sep.; PHHCIIUTC: *<',»<HI> uoiuih UH8* [SIXOij, fr. July; Sungci Urlang- Forest Reserve, forest by **roadside:** *Sun-Son SF 40588* (L), **heighi**]0 m; Malacca: *Canttey s.n.* (BO), fl. — Jolioro, Gunoiig Palai: *Mai. FD 7785* (BO, SING), fr. Apr.;' Kota Tinggi, **Uawai** Boar), swam.py forest: *Comer SF $1318* **(BOj** K, KEP, SING), fl. Fell. — **Singapore,** Kruiug Path, Rukit Timah **Powal Beserre:** *SjF* ***89663*** (K, **L)j** Hukit **Timah:** ***Bidley 6£S9*** (BM, K, SING), fl. May; Choa **Cha gang:** ***Ridley*** *6696* **(SING), fr,;** Sungei Morai: WW/,//. fi^ft? (K). fr.; Mandai **Road:** ***Corner 8F 37734*** (BM, BO, K, SING); mi!y Mnlava: ***Uaangay 990 {type,*** **RM, K, L, P).**

<'i i.rrvATED. Botanic Gardens Singapore: **Eidkj** *11371* **(K), il.** Apr., ti.**;** ***Ano-*** *nV»iouti s.n.* (K).

Remarks: A very characteristic species with **large** leaves and flowers, named in honour of A. C. Maingay, a British colonial officer.

On account of Ridley's **erroneous** remark {Ridley **loc.** cit., 29): **"Sepals** ovate **subobtuse** nearly half an inch **bug** 5, ..." l^am transferred *P-* ***Qrandiflora*** to the genus *Diploknnna.* In **our** opinion it is **evident** that this species is quite identical **with P.** ***mtmgayi*** Only once did **I** find a **fruit** with **three** seeds, *ciz, Scoriechini* ***346b*** in **SING.**

The flowers are white, sometimes yellowish pink: the latex is white.

4. Payena dantung H, .1. Lam, Lam *925, 134, ***fig.*** *37;* Lam 192734'2; **Seyne,** Nutt. PL Indon. 1, 1950, 1227 — ***Fig.*** *4.*

Trees up to 15 m. *linmchli !.<* tl<lvt<'. u-ith short **ferruginous** Pubescence, stipules caducous, **acu-** ^ nate, pithrsccnt, 0.4 cm **long.** ~~aves dispersed at tips **of** branchlets, ehartaceo-niemiirana- (>eous? apex obtuse-acuminate, nar- 1<;lu, , base cuneate, petioles *2—'A* p ld. '''''' with long, somewhat channeled, cene a short **ferraginotw pobes-** ej blade 20—37 by 8—11 em, ob «mg **elliptic , glabrous** above, sericeous ferruginous **pubescent** below, **especially** along the ner\'es; midrib sunken above, sometimes sulcate, very **prominent** below, same colour'as the blade or **somewhat** darker; secondary norvos comparat- [Vel y faint, **espeeiaUy** above, **26—32, arehingly joined aear** margin. **Btarting** ro)m **midrib at angles** of about 70—75°, straight, curving towards apex

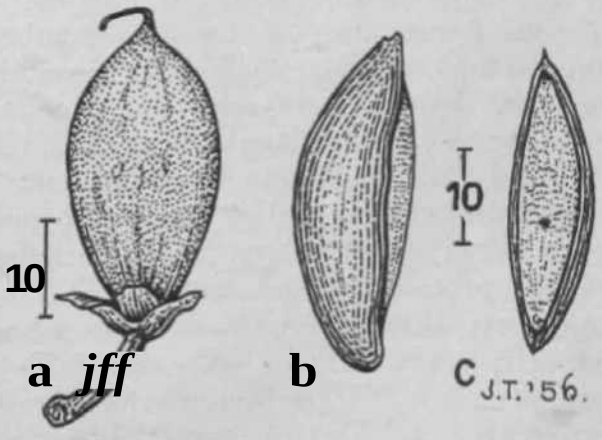


Fig. 4. P. *dantniiff,* a. fruit; b. seed, latoral view; c. sct'il, vt'iitra] view. Prom *r,ni. Humbvr()h .s.n.*

near margin; tertiary nerves faint, near margin forming a reticulate pattern and near midrib more or less parallel to secondary ones, generally one of the parallel nerves somewhat more conspicuous and placed in the middle between two secondary ones, starting from marginal edges. *Inflorescences* mostly in axils of leaves, 1—3-florous, pedicels 0.4—0.7 cm long, comparatively thick, pubescent. *Sepals* 0.5—0.6 by 0.5 cm, ovate to triangular, acute, outside pubescent, inside glabrous. *Corolla* 0.7 cm long, tube 0.3 cm long, lobes 8, obtuse-rounded to acute, glabrous, mostly at the outside with some pubescence in the middle of each lobe. *Stamens* 16, 0.2—0.3 cm long, filaments thick and short, glabrous, apex of connective very short to invisible, thecae oblong-acute. *PistiUum* 0.9—1 cm long, subulate, glabrous, base pubescent; ovary conoidal, pubescent, cells 8. *Fruits* 3—4.5 by 1.6—2 cm, oblong-ovoid, minutely appressed pubescent; seeds 1—2, 3.7—4 by 1.4 by 1—1.1 cm, oblong, scar 0.7—0.9 cm wide, cotyledons foliaceous, radicle cylindrical, 0.4—0.5 cm long; thickened pedicels 1.2—1.5 cm long, persistent sepals 0.6—0.7 by 0.6 cm, persistent style 0.8—0.9 cm long.

Lectotype specimen: *Van Romburgh s. n.* in BO.

Vern. names: balam kèdjèl, b. kedjil, dantung (Sumatra).

Uses: Guttah of inferior quality.

Distr.: Sumatra.

SUMATRA. West Coast, Oganhulu: *Ten Brummeler 43* (BO); Lubuk Gedang: *Van Romburgh s.n. (type,* BO, L), fl. fr. Oct. — Palembang, **Bawas:** *Grashoff 1109* (BO, K, L).

Remarks: This rare species seems to be confined to a rather restricted part of Sumatra. Although the leaves are large, it is a very moderate-sized tree with comparatively small flowers. Its nearest relatives, P. *acuminata, P. gigas,* and P. *maingayi,* are larger trees with longer pedicels ancMarger fruits.

6. Payena gigas Van Bruggen, nov. sp. — P. *gigantea* K. Griffioen & H. J. Lam, MS ined. — *Fig.* 5.

Arbores altae, altitudine maxima 30 m, diametro usque ad 0.50 m. *Kamuli* tenues, teretes, ferrugineo-pubescentes, stipulis caducis, longis triangularibus, acutis, dense pubescentibus, 0.8—1 cm longis. *Folia* praeter ramulos dispersa, coriacea, apice acuminata, basi cuneata ad rotundata, petiolis 2.5—5.5 cm longis, teretibus, aliquando canaliculatis, rare pubescentibus ad glabris; lamina 17—36.5 X 9—17.5 cm, ovata, supra glabra, subtus rare, pubescens ad glabra, praecipue praeter costam nervosque secundarios; costa supra plana, subtus prominentissima nervi secundarii plani ad domersi supra, prominentissimi subtus, 27—32, recti, marginem versus arcuatifli conjuncti, angulo 70—80° de costa adscendentes, prope marginem in apicem curvati; nervi tertiarii vix conspicui supra, plus minusve conspicui subtus, prope costam nervis secundariis paralleli, prope marginem plus minusve reticulati adscendentes descendenjesque mixti, generatim unus inter nervos parallelos evidentior in media duoruni nervorum secundariorum. *Inflorescentiae* axillares, 5—7-florae, pedicelli 1.5—5 cm longi, graciles, pubes'centes. *Sepala* 0.5 X 0.7—0.8 cm, crassa, late deltoidea, latiores quam longa, apice rotundata ad acuminata, extus pubescentes fasci notato pubescentiae in apicibus suffulta, intus glabra; *corolla* juveniles tantum nota, petala 8, longe ovata, apicibus rotundatis-acuminatis, glabra; *stamina* 16, 0.2—

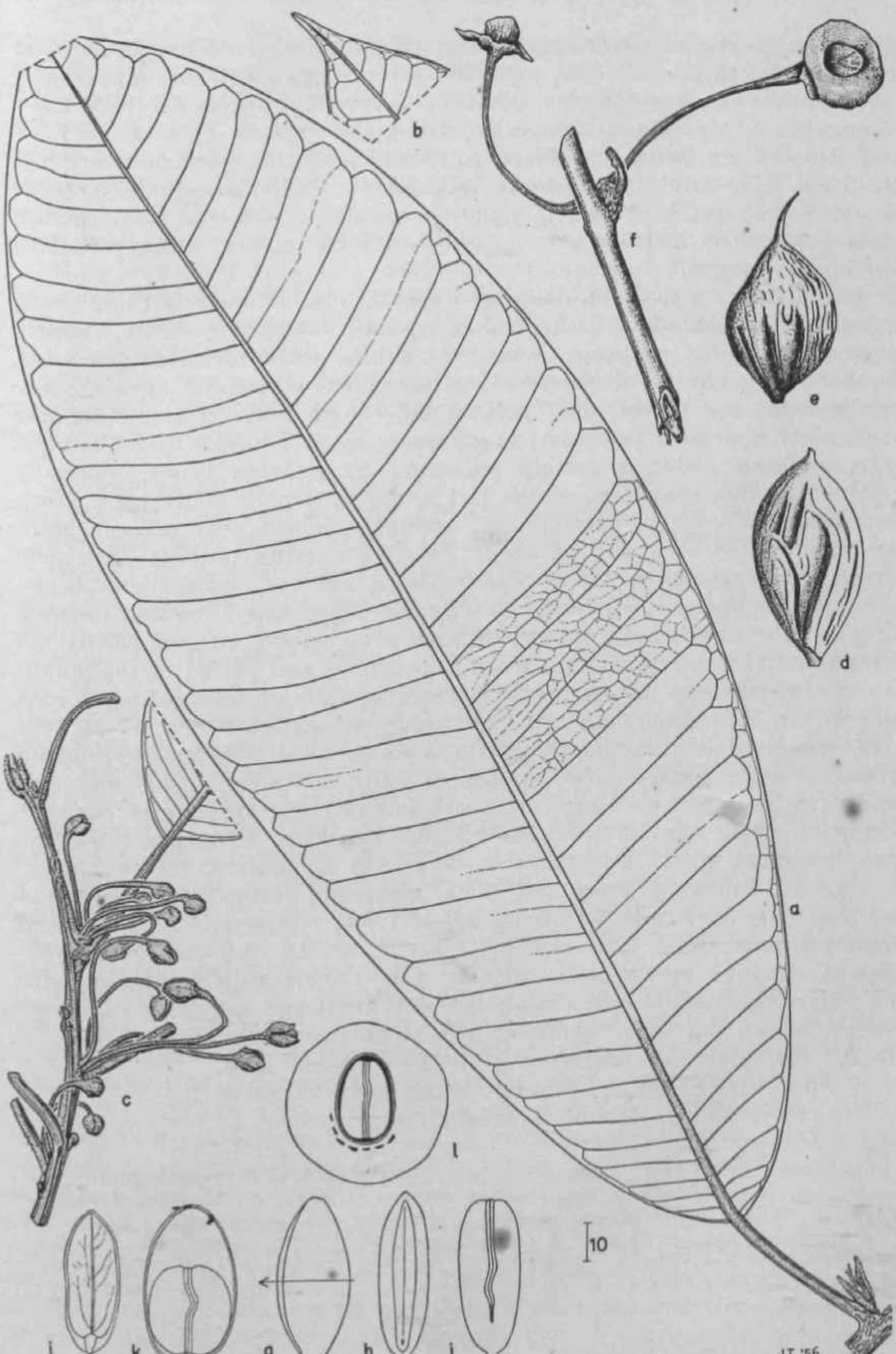


Fig. 5 **P.** ***ffigas,*** a. leaf, **b. apex** of leaf. **e. part** of **flowering branch,** d. fruit, e- fruit, f, part of a **btsnch** with the basal parts of two fruits, g. seed, hitom) view, h- seed,'scar in the midd!<>t i- embryo with one cotyledon **removed,** inner **view,** j. embryo, s**bowing in the middle** the **two** r-oryietfous, k. transversf **section** of the **embiyo** in the seedi **I.** transverse section of a fruit showing the single fertile seed and some reduced ""•••>. a. froii Clemer. ·· >r ***Clemens*** *HS16,* c. from ***Clement*** <f *Clemens* ***51322,*** the **rest** rom *Clemens & Clemens 27452.*

0.3 cm longa, filamentis crassis brevisque, glabra, apice connectivi obtusa ad acuminata, thecis oblongis; *pistiUum* 0.3 cm longum, breve crassumque, glabrum; ovarium late conicum, glabrum, loculis 8. *Fructus* 3.7—5 X 2.9—3.7 cm, pro genere magni, longe ovoidei, glabri; semen 1, 3—4.7 X 1.3—2.3 X 0.9—1.6 cm, longe ovoideum, nitidum, spadiceum, cicatrice variabili, 0.3—3 cm lata, cotyledones planae foliaceaeque, radicula cylindrica, 0.3—0.4 cm longa; pedicelli aliquo modo incrassati, 3.5—6 cm longi, glabri, scpala persistentia incrassata 0.8—1 X 0.7—0.8 cm, glabra, stylus persistens 1.4—1.5 cm longus.

Large *trees* up to 30 m, diameter up to 0.50 m. *Branchlets* thin, terete, ferruginous pubescent, stipules caducous, long triangular, acute, densely pubescent, stipules caducous, long triangular, acute, densely pubescent, 0.8—1 cm long. *Leaves* dispersed along branchlets, coriaceous, apex acuminate, base cuneate to rounded, petioles 2.5—5 cm long, terete, sometimes canaliculate, sparingly pubescent to glabrous; blade 17—36.5 by 9—17.5 cm, ovate, glabrous above, sparingly pubescent to glabrous below, especially prominent below; secondary nerves flat to deeply sunken above, very prominent below, 27—32, rather straight, archingly joined near margin, starting from midrib at angles of about 70—80°, curving towards apex near margin; tertiary nerves hardly visible above, not very conspicuous below, near midrib more or less parallel to secondary ones, ascending and descending ones intermixed, near margin forming a reticulate pattern, mostly one of the parallel nerves somewhat more conspicuous and placed in the middle between two secondy nerves. *Inflorescences* in axils of leaves, 5—7-florous, pedicels 1.5—5 cm long, thin and long, pubescent. *Sepals* 0.5 by 0.7—0.8 cm, thick, broadly deltoid, wider than long,, apex rounded to acuminate, outside pubescent with characteristic bundles of hairs at apices, inside glabrous; *coroVfi* (in bud) 0.23 cm long, tube short, lobes 8, long ovate, apex rounded-acuminate, glabrous; *stamens* 16, 0.2—O.3 cm long, filaments thick and short, glabrous, apex of connective obtuse to acuminate, thecae oblong; *pistillum* 0.3 cm long, short and thick, glabrous; ovary broadly oonoidal, glabrous, cells 8. *Fruits* 3.7—5 by 2.9—3.7 cm, comparatively large, long ovoid, glabrous; seed 1, 3—4.7 by 1.3—2.3 by 0.9—1.6 cm, long ovoid, nitidous chestnut brown, scar variable, 0.3—1.3 cm wide, cotyledons flat and foliaceous, radicle cylindrical, 0.3—0.4 cm long; somewhat thickened pedicels 3.5—6 cm long, glabrous, persistent incrassate sepals 0.8—1 by 0.7—0.8 cm, glabrous, persistent style 1.4—1.5 cm long.

Type specimen: *Clemens & Clemens 27452* **in L.**

Distr.: Borneo, Mount Kinabalu region.

BORNEO. **Sandakan**, Mount Kinabalu, Dallas: *Clemens 4' Clemens 26830* (BM), height 23 in, diam. 0.20 m, fr. Sep.; ibidem, 1000 m: *Clemens $ Clemens 26830—27SI6* (B, BO, G, K, L), height 26—30 m, diam. 0.45 m, fr. Sep. Nov.; ibidtem, Forest Hill, E. of Resthouse, 900 m: *Clemens $ Cljkens 27316* (BM, BO), height 26—30 m, diam. 0.45—0.50 m, fr. Nov.; ibidem, Mount Ridges, 1000 m: *Qlemens $ Clemens 27452 (type,* in L, dupl. in B, BM, BO, G, K, L), fr. Dec.; ibidem, near bridle trail, 1100—1300 m: *Clemens f Clemens 51322* (BM, G, K, L), height 25—27 m, fl. Dec.

Remarks: Large tree of the lower hills, very probably endemic in this region of Borneo. Easily to be distinguished from *P. dantung* by its

practically glabrous leaves, its very prominent nervation below, its long Pedicels of flowers and fruits, the sepals with hairtufts and its large fruits. The characters mentioned, distinguish it also from *P. acuminata* Var. *Pulchra,* to which it is closely allied. Moreover *P. gigas* is a large tree up to 30 m, while *P. dantung* does not exceed 15 m in height. The general shape of the leaves in *P. gigas* is ovate and that of *P. dantung* more oblong. The lower surface of the leaves in sicco shows a chestnut brown colour; those of *P. dantung* are of a characteristic yellowish brown.

It is surprising that this species, the stoutest of the genus, was not discovered until 1931 and not recognized before 1936 by Lam and Griffioen. Perhaps *P. gigas* is one of those cases suspected of polyploidy as are quoted by Van Steenis (PL Mai. (I), 4^2, 1949, LI).

The flowers are yet insufficiently known since we had buds only at °ur disposal. According to the labels the fruits *in vivo* are green and reach the size of a lemon.

6. Payena lucida ((J. Don) De Candolle, Prodr. 8, 1844, 197; Lam 1925, 145, 262; Lam 1927, 431, *fig. 14;* Fletcher in Craib, PL Siam. Bnum. 2, 4, 1938, 360; var. *nigra* King & Gamble, Mat. PL Mai. Pen. 17, J. As. Soc. Bengal 74, 2, 1906, Extra Nr., 173; Lam 1925, 146; var. *typica* H. J. Lam, Lam 1925, 145; var. *wightii* (Hasskarl) Clarke in Hooker, PL Brit. !ndia 3, 1882, 548; Lam 1925, 146; Fletcher in Craib, 1. c, 361 — *Kerato-Phorus wightii* Hasskarl, Retzia 1, 1855, 101 — *Mimusops lucida* Wallich, Cat, 1828, 4147 (p.p., fide Dubard, Ann. Mus. Col. Marseille (3), 23, !915, 49, *nomen nudum);* G. Don, Gard. Diet. 4, 1838, 35 — *P. parallelo-neura* Kurz, J. As. Soc. Bengal 40, 2, 1871, 70; Lam 1925, 151; Lam 1927, 443; Fletcher in Craib, I.e., 361 — *P. griffithii* Pierre, Bull. Mens. Soc. Linn-. Paris, 1885, 525; Lam 1925, 151, 263; Lam 1927, 443 — *P. glutinosa* Pierre, I.e., 529; Lam 1925, 151; Lam 1927, 443 — *P. pubemla* (Miquel) Pierre, I.e., 529; *Isonandra puberula* Miquel, PL Jungh., 1852, 201 — *P- dasyphylla* var. *glabrata* King & Gamble, 1. c, 184; Lam 1925, 144; ^.vatt Smith, Res. Pamphl. 4, 1954, 50 — *P. punctata* Fletcher, Kew Bull., 1937, 379; Fletcher in Craib, I.e., 361; *Bassia braceana* King & Gamble, '•e., 184, p.p., quoad *King's Collector* 3275.

Trees up to 30 m, diameter up to 0.90 m, girth up to 3.30 m. *branchlets* slender, terete, densely ferruginous pubescent to subglabrous; stipules caducous. *Leaves* dispersed along branchlets, rarely to some degree c**owded near tips of branchlets, chartaceous, apex acuminate, base cuneate, Petioles 0.7—1.5 cm long, ferruginous pubescent to subglabrous; blade **^23 by 3—8 cm, elliptic lanceolate to ovate, glabrous above, ferruginous Pubescent to glabrous below, especially along the midrib and the second-. £ry nerves, sometimes slightly villous; midrib sunken above, prominent below; secondary nerves inconspicuous ^jove, prominent below, 10—16, •straight, archingly joined near margin, Girting from midrib at angles of a|>out 50—70°, curving towards apex near margin; tertiary nerves hardly vij*ible above, not very conspicuous below, some more or less parallel to Se<?cndary ones, others reticulate, generally one of the parallel ones somewhat more conspicuous and placed in the middle between two secondary riei*ves, descending. *Inflorescences* in axils of upper leaves, 2—8-florous,

pedicels 0.7—3.5 cm long, minutely pubescent to subglabrous. *Sepals* 0.4—0.5 by 0.5—0.7 cm, long deltoid to triangular, obtuse acute to acute, sometimes rounded, short sparingly pubescent to subglabrous. *Corolla* generally, exsert, 0.&—0.8 cm long, tube very short, 0.1—0.2 cm long, lobes 8, oblong anceolate, obtuse acute, glabrous. *Stamens* 16, 0.3 cm long, filaments short and comparatively thick, glabrous, apex of connective broadly obtuse to bifid acuminate, thecae long ovate. *PistiUwn* 0.7—1 cm long, glabrous, base villous or short pubescent; ovary rounded, ovoid to depressed conoidal, short apprcssedly ferruginous pubescent, cells 8, ovules rounded, comparatively small, 0.02 cm long. *Fruits* 1.1—2 by 1.5—3.7 cm, generally ovoid, sometimes oblong, ferruginous pubescent to subglabrous; seed 1, 1.8—2.9 by 0.8—1.2 by 0.5—0.8 cm, generally thick ovoid, sometimes laterally compressed and oblong, scar 0.3—0.4 cm wide, cotyledons flat and foliaceous, radicle) comparatively large, inferior; incrassate pedicels 1.5—3 cm long, exceptionally longer (once 5.5 cm, *Clemens & Clemens 26329),* sparingly pubescent to subglabrous, incrassate persistent sepals 0.4—0.5 by 0.4—0.6 cm, persistent style 0.7—0.8 cm long.

Type specimen: *Wallich 4147* in K.

Vern. names: pi kun tuan (Siam); bidara, bidoru, ekor, getah ekor, kaya tanjong hutan, maiang bukit, medang tanjong, mitis, nyatoh, n. balem, n. balam, n. bunga, n. burong, n. hitam, n. metis, n. paya, n. pipit, n. tembaga, pako nyatoh, poko medang puravas, p. niato puteh, p. n. temaga, p. tuboh, purut plandok, sondek, taban, tampang (Malay Peninsula); kalimangong, meang tjingge (Sumatra); baringin djiput, ketiau, niantu, nyatoh, n. hitam, nyatu, n. lilin, n. merah, puntik merah (Borneo).

Uses: Timber.

Distr.: Burma, Siam, Malay Peninsula, Andamans, Sumatra, Banka, Borneo.

BURMA. TJiaungyin, *Maung Ba Pe 13046* (K), height 13 m, fl. Jan. — Amherst, Menyaw Chaung Yunzalin Valley: *Parkinson 5299* (K), fl. Mar. — Tenasserim, *Heifer 3611* (BM, P, S, U), fl. — Mergui, forest at sea shore: *Heifer 3611* (K, P), fl. Jan.; without known loc: *Griffith 3605* (Fl, G, P, U), fl.

SIAM. Payap, Me Ping, Chieng Dao, evergreen forest, 400 m: *Kerr 5245* (Btf> K), height 10 m. fl. Apr. — Raehaburi, Buw Tai, Petchaburi, evergreen forest: *Kerr 20375* (BM), height 1.80 m, fr. Mar. — Surat, Kaw Samui, evergreen forest, 300 m: *Kerr 12576* (BM, K), height 20 m, fl. Apr. — Puket, Kraburi Ranawnfr evergreen forest: *Kerr 16363* (BM, K), height 25 m, fl. Dec.; Satul, Adang, evergreen forest: *Kerr 14027* (BM, K), height 35 m, fl. Jan. (type of P. *punctata* Fletcher) -^ Naikawn Sritamarat, Ban Pien, Songkla, evergreen forest, 100 m: *Kerr 1484$* (BM, K), height 15 m, fl. Mar. — Pattani, Ban Pari, Toh Moh, 170 m: *LakshnakaW 669* (K), hei^it 15 m, fl. Apr.; Kao Kalakiri, on hill: *Lakshnakara 394* (K), fl. Mar*

MALAY PENINSULA. Kedah, Ounung Bongsu: *Hal. FD 66373* (KEP), height 16 m, girth 0.90 m; Pcrangin Forest Reserve: *Awang Lela Mai. FD 42391* (KEP)> height 20 m, girth 1.20 m; Nur Kuah, Langkawi Island: *Curtis 3687* (SING); Pulu Tuba Forest Reserve, Langkawi Isladfc *Mai. FD 66450* (KEP), height 20 m, girth 1.30 m — Perak, Bukit Kuala Ketan^J Gunung Bintang, Kcdah-Perak boundary: *Moh-Haniff 8F 21095* (BM, BO, SING), fl. Apr.; Bujang Malacca: *Bidley 9701* (S1NG)» fl. Sep.; Goping: *ScortediiM 1989* (K, SING), fl. Apr.; Gunung Pateh, Lower Camp: *Wray 1170* (SING); Larut, open jungle, 100 m: *King's Collector 3275* (BO), heigh* 13.50 m, diam. 0.10—O.20 m, fl. Aug. (type of *Bassia σraceana* K. & G.); Larut: *King's Collector 3734* (K), height 4.50—6.50 m, diam. 0.075—0.10 m, fr. Jan. (typ[c] of P. *costatd* King MS ex K. & G.); Larut, dense jungle, 165—265 m: *King's Collector*

4081 (K), height 6.50-10 m, diam. 0.15—0.30 m, fl.; Larut, open junrie, 150—300 m-
-*fy's Collector 6636* (BO, SING), height 10—13 m, diam. 0.25~-0,37 m, fl SeD •
£lus Forest Reserve: *Moh, Yassin Mai FD S9051* (SING), fl. Feb.; Sumpitau," Upper
Perak: *Uamid Mai FD 10415* (SING); Sungai Sah, Kinta: *Jaamat Mai FD 28075*
y*J!*P)f fl. Mar.; Ulu Kenderong, Grik, near swamp: *Ilamid Mai FD 110M* (KEP)
ir. Mar.; near Ulu Keriing, dense bamboo forest, 150—260 m: *King's Collector 8705*
J«O, SING), height 10—13 m, diam. 0.20—0.30 m, fl. Mar.; dense jungle, 100--200 m-
ftog's Collector 7842 (BM, L), height 13—20 m, diam. 0.25—0.37 m, fr. July open
jungle, 100—200 m: *King's Collector 7957* (L), height 13—20 m, diam. 0.25—0.37 m
to"9^Uff; dense jungle» hIUs J 15<>"-200 m: *King's Collector 10466* (SING), shrub up'
hi. fr* J^ljr; dense jungle on mount, 250—330 m: *King's Collector 10496* (SING) -
jjjgnt 10—13 m, diam. 0.20—0.30 m, fr. July; dense jungle en mountains, 500—700 m,'
ng's Collector 10978 (BM, BO, SING), height 3.50—4.50 m, diam. 0.05—0.07 m, fr.
nF"; only Perak: *wTMy s.n.* (SING)> fl- — Penang, Batu Terenggi: *Curtis 3660*
^ SING), fr. July; ibidem: *Curtis s.n.* (BO, SING), fr. Aug.; Chitty Temple
^ ery: *Moh. Uaniff SF S661* (BO, K, SING), height 3—4 m, fl. Apr.; Waterfall:
J51? *15U* <K SING)» *kristo* 6.50-10 m, fl. Mar.; only Pulu Penang: *Curtis s.n.*
£3iJSTG), fl. May; *Moh. Haniff 88* (SYS), fl. Jan.; *Wallich 4147* (type, BM, G, K,
Ar ... Selangor, Bukit Lagong Forest Reserve, Kl. Kuala Lumpur: *Wyatt Smith*
(, K *G4880* <KEP)> height 13 m» girth o.45 m» fr- Mfty; ibidem: *Sinclair SF 40099*
Klang , L); Kauching Forest Reserve: *Ahmad Mai FD 5790* (SING), fr. Jan.,
FD Gates: *Uashim s.n.* (SING), fl. Sep.; Pahang Road, Klang Gates: *Watson Mai.*
(Rx4 (KEP> SING), fl- Apr.; Kuala Lumpur, Circular Road: *Omar Mai FD 15**0*
W ^ fl, Oct,J Bantau Pan Jang Forest Reserve: *Strugnell Mai FD 12491* (KEP)
\WA U m, fl- *Be&'i* ibidem: *Walton Mai FD 22085* (KEP, SING), fl. Mar. May;
ibidem: *Ngah Mai FD S2SS2* (KEP), height 10 m, girth 0.75 m, fr. Feb.; Selam-
118 ? *Mal FD 1874* (KEP)» fl- Apr-5 Sungai Buloh Forest Reserve: *Moh. Nur SF*
(SING (BO, K, SING), height 7—9 m, fr. Dec; ibidem: *Strugnell Mai FD 12492*
10545 ^ fl, Oct<; Ulu Gombak: *Hvme* *7M* (SING), fl. Oct.; Ulu Selangor: *Goodenough*
(KEP (lSIN!G)> fl- Apr.; Weld's Hill Reserve, Kuala Lumpur: *Rahman Mai FD 823*
ibidem SING), fl. fr. July; ibidem: *Moh. UasUm Mai FD 9562* (SING), fr. Jan.;
j ^ : *Moh. Haslmn, Mai FD 10840* (K, KEP, SING), height 10—13 m, girth 1—
5 ?Ir fl Mar*»' ibidem: *Bum Murdoch 11* (SING), fl. Sep.; ibidem: *Burn Murdoch*
8o#)f ^' Mar< — Trenggatou, Bukit Kajang, Kemaman, 150 m: *Corner SF*
HO ^BM, *BOf Kff* SING)», height 12 m> fl- Nov-; ibidem: *Corner SF 30276* (BM,
Tre* "^^G)> fr. Nov.; Bukit Lah off Sungai Nerus near Kampong Merjor, Kuala
tt,,"8ganu, lowland forest: *Sinclair # Kiah bin Salleh SF 40905* (L, SING), fr. Sep.;
LeU Brang, 200 in: *SF 33749* (K), fr. July — Pahang, Belingo Temeloh: *Awang*
SjJ?*Mai FD 2682* (KEP, SING), fl. Sep.; ibidem: *llamid Mai FD 5449* (KEP,
(fcf".*)i height 20 m, girth 1 m, fr. Dec.; ibidem: *Idris Mai FD 6319* (SING), fl.
£*» 7th mile Barak road, Bentang: *Ahmad Mai FD 5061* (K, SING), fr. Dec;
&Pillondon& ^to Tawar: *Anonymous 2672* (SING), fr. Aug.; Klau Forest Reserve,
(K £&' 8mith Mah FD S940 (K, SING), fl. Sep.; ibidem: *Ahmad Mai FD 5080*
koh SING), height 10 m, girth 0.66 m, fr. Jan.; Gali near Raub: *Burkill #*
Cameron *nmiff SF 16229* (.SING); Raub: *Ahmad Mai FD 5097* (SING), fr. Jan.;
Kuala L Highlands, Sungai Parang: *Symington Mai. FD 36230* (SING), fl. Apr.;
& Lipis: *Fomvorthy Mai FD 0652* (KEP), fr; 8 miles S. of Kuala Lipis: *Burkill*
& Moh. Haniff SF 17195 (BO, SING), fl. Nov.; Kuala Pilah, 100 m: *Mal. FD 62880*
(KEP), height 15 m, girth 1.10 m; Kuantan, Tandjong Pasir: *Mahamud Mal. FD 3713*
(SING)» fl. Sep.; Rotan Tunggeh Reserve: *Osman Mai FD 29302* (KEP), height 10 in,
girth 0.23 m — Negri Sembilan, Bukit Dusun Raya: *Alvins 1167* (SING), height •
IW n m> fl, Mar-J Gunung Angai Forest Reserve: *Sham Mai. FD 23746* (SING), fl.
Af^' Gunung Talan: *Alvins 886* (SING), height 20—23 m, fl. Fel).; Tampiu: *Moh.*
(Sl\rm *1310* (SING), fr. July; Tampiu Hill: *JttZ. FD 1853* (BM); *Goodenough 1853*
*ort lv f fl- Ma.vJ Gunung Tampiu, 500 m: *Burkill SF 3240* (BO, K, SING), fl. May
<W ckson» Sungai M. Forest Reserve: *Mai FD 66509* (KEP), height 13 m, girth
*kd?\tr, Dec-5 Seftru: *Mai FD 1874* (SING), fl. Apr.; Senawang Reserve: *Moh.*
S*Nff *Mal, FD 197g* (K» SING)» fl- ^ SeP- — Malacca, Brisu: *Derry 654* (K,
^ser fl, June J Bukit Bruftng: *Curtis 3644* (K, SING), fl. Apr.; Bukit Panchor,
(§IjJp.G: *Molt. Isa Mai FD 10495* (KEP), girth 3.30 m; Bukit Sedanan: *Holmberg 794*
TM)y fl. Mar.; Bukit Sedanan Forest Reserve, edge of forest: *Holttum SF 9660*

(BO, SING), height 13 m, fl. Nov.; Chunana Puteh: *Alvins 894* (SING); Kesang Tua: *Goodenough 1278* (BM, SING), fr. July; Merlimau: *Berry 54* (K, SING), fr. July; ibidem: *Alvins 2150* (SING), height 21—25 m, fr. Aug.; ibidem: *Alvins s.n.* (SING), fl. Apr.; Sungai Udang: *Alvim 47* (SING); ibidem: *Ilolmberg 804* (BM), fl. May? ibidem: *Goodenough 1977* (SING), fr. July; 14—14% miles Sungai Udang Forest Reserve: *Sinclair SF 40595* (L), fl. Apr.; only Malacca: *Alvins 248* (SING), fl.; *Alvins 569* (SING), fl.; *Alvins s.n.* (SING), height 33 m, fl. Apr.; *Alvins s.n.* (SING), fl.; *Cantley s.n.* (BO), fl.; *Berry 461* (SING), fl.; *Griffith s.n.* (BM, G, L, P, U), fl. sterile; *Kurz s.n.* (BO), fl.; *Anonymous 16S6* (SING), fr. July; *Anonymous s.n** (BO), fl. — Johore, Gunung Palai: *Moh. Nur 4- Kiah SF 7764* (BO, SING) — Singapore, Bmandi: *Goodenough 3658* (SING), fl. Mar.; Bukit Tiiriah: *Corner SF 64961 = Ngadiman SF 34961* (BO, K, SING), fl. Apr.; ibidem: *Cantley 2633* (SING); ibidem: *Langlassi 300* (P), height 10—15 m, fr. Sep.; ibidem: *Ngadvman SF 36421* (SING), height 10 m, fl. May; ibidem: *Bidley 6213* (BO), fl.; ibidem: *Bidley 6508* (SING), fr.; ibidem, near bungalow: *Fox 11305* (K, SING), fr. Aug.; Gardens Jungle: *Ahmed s.n.* (SING), fl. Oct.; ibidem: *Bidley s.n.*, fr.; Reservoir Jungle: *Bidley 5070* (SING), fl.; Selitar: *Bidley 5644* (SING), fl. Apr.; ibidem: *Bidley 6135* (SING), fl.; ibidem: *Bidley s.n.* (BM), fl.; Singapore without locality: *Cantlty 74* (SING), fl.; *Anonymous s.n.* (SING), fl.; *Anonymous s.n.* (BO), fl.; Malay Peninsula without locality: *Griffith 3605* (Fl, G, P, U).

ANDAMANS. Labyrinth Island, forest at sea shore: *Heifer 424* (K), fl.; Andamans without locality: *Eelfer 3611* (K, S).

SUMATRA. Atjeh and Dep., Muara Pea: *FBI bb 10257* (U), fl. July — Tapanuli, Upper Ankola, 1000 *m: Junghuhn s.n.* (L), fl.; Ankola: *Teysmann s.n.* (P); ibidem: *Anonymous s.n.* (L), fl.; forests near Tobing: *Junghuhn s.n.* (L, P, U), height 20—26 m, fr. Oct. — West Coast, Priaman: *Be Vriese s.n.* (L); near Priaman: *Teysmann s.n.* (P) — Lampong Districts, Kebang: *Teysmann «.n** (L); unlocalized: Topang Dalam, Pulu Lavau: *Baud 10857* (SING); Sumatra without locality: *Junghuhn 25* (BO), fl.; *Junghuhn s.n.* (BO, L), fl. fr. sterile; *Be Vriese XVI* (L); *Be Vriese s.n.* (L); *Anonymous s.n.* (L), height 20—27 m.

BANKA. without known loc.: *IIorsfield 191* (BM).

BOKNBO. Sarawak, Mount Salak: *Beccari 2991* (Fl, P), fr. Dec. (type of P. *glutinosa* Pierre); Sibu: *Sar. FB S0528* (SAH), height 15 m, girth 0.47 m; iibdem: *Sar. FB 80534* (SAR), height 11 m, girth 0.35 m; ibidem: *Sar. FB 80684* (SAR)i height 20 m, girth 0.90 m; ibidem, swamps: *Anderson 1835 = Sar. FB 2683* (SAR) — West Borneo, Melawi Tjatit, Bukit Gantuk: *FBI bb 31800* (L); Melawi Tjatit, Bukit Tengkujung, 450 m: *FBI bb 26030* (L) ; Sekadau, Tamang, old forest: *FBI bb 8022* (L), height 21 m, diam. 0.48 m, fl. Mar. — South and East Borneo; Balikpapan, Sungai Wain, primary forest: *FBI bb 34373* (L), height 17 m, diam- 0.13 m; ibidem: *FBI bb 34445* (L), height 20 m, diam. 0.19 m; Balikpapan, Gunung Sapinggan: *FBI 2017* (BO), fl. Sep.; ibidem, Pembuang: *FBI 2130* (BO), fl. Sep.; Loa Haur, W. of Samarinda, low ridges: *Kostermans 6941* (L), height 30 m, diam. 0.40 m, fl. May; Martapura, Djungun, 350 m: *FBI bb 10408* (BO), height 26 m, diam. 0.35 m; Muara Teweh, Marampan, old forest, 100 m: *FBI bb 11434* (BO), height 26 m, diam. 0.40 m; Nunukan, Bengaris Putih: *FBI bb 33008* (BO), height 25 m, diam. 0.90 m; Nunukan, Bulungan: *FBI bb 29333* (L); ibidem: *FBI bb 26158* (L, SING), fr. July; Nunukan, primary forest, 150 m: *FBI bb 84505* (L), height 30 m* diam. 0.39 m, fl. Mar.; E. Kutai, Sangkulirang island, ridge: *Kostermcms 4947* (L)f height 30 m, diam. 0.80 m, fr. June; W. Kutai, Sabintulung, forest: *FBI bb 1586** (BO, L), height 18 m, diam. 0.52 m, fl. Nov.; W. Kutai, Sebulu: *FBI bb 15786* (L)f ibidem: *FBI bb 15791* (BO), height 17 m, diam. 0.40 m — Sandakan, Bukit Ten'om, 1% miles W. of Tenom, 330 m: *Wood $ Wyatt Smith N. Born. FB A 4390* (L), height 36 m, fl. Sep.; Mount Kinabalu, Tuaran: *Clemens f Clemens 11258* (BO, K), fl. Dec; Mount Kinabalu, Kiau,0>allas, jungle hills, 1000 m: *Clemens & Clemen** *26329* (BM, BO, K, L), height 20 m, fl. fr. Sep.; Mount Kinabalu, Dallas, E. ravine, forest hill, 1000 m: *Clemens & Clemens 27405* (BM); Mount Kinabalu, Dallas, Tenompok, 1600 m: *Clemens # Clemens 27405, 27974* (BO, K, L, SING), fl.; Mount Kinabalu Tenompok, jungle, 1700 m: *Clemens $ Clemens 27974* (BM), fl. Jan.; ibidem: *Clemens 4- Clemens 28688* (BM, BO, K, L), height 8 m, diam. 0.45 m, fl. May; Mount Kinabalu, Penibukan, W. ridge, jungle, 1300 m: *Clemens f Clemens 40778* (BM), height 27 m» diam. 0.66 m, fl. Oct.

CULTIVATED. **Botanic Gardens Penang:** ***Henderson s.n.*** **(SING); Botanic Gardens Singapore:** ***Flippance s.n.*** **(SING), fl. Feb.;** ***Isaac s.n.*** **(SING), fl. Aug.;** ***Moh. Nw $F 405*** **(SING);** ***Moh. Nur 8F M47*** **(SING);** ***Moh. Nur s.n.*** **(KEP, SING), fl. Oct., •terile;** ***Eidley 3995*** **(SING);** ***Eidlcy 650S*** **(SING), fr.;** ***JRidley s.n.*** **(SING), fr. sterile;** ***Anonymous s.n.*** **(KEP, SING), height 4 m, fl. Mar., sterile.**

WITHOUT LOCALITY — ***Anonymous s.n.*** **(L), fl.**

Remarks: Wallich's unvalidly published name was first employed by (J. Don in his Gardener's Dictionnary; therefore Don is to be considered, the author of *Mimusops hicida* in stead of Wallich. Don (loc. cit., 35) notes that the calyx has "... 4 outer segments..." and "... 4 inner ones..."; De Candolle (loc. -cit., 196) corrects this evident mistake but himself makes another, viz, by saying "Stamina 8...". In the type specimen however, as in all other specimens, we found 16 stamens.

This common and wide-spread species shows a considerable range of Variation. Lam already in 1927 (Lam 1927, 433) dropped the subdivisions and the present author also holds the opinion, according to the large material at hand, that it is impossible to distinguish any well delimited variety or form. In general this species is characterized by the rather large leaves (up to 23 cm long), the forking of secondary nerves at a considerable distance from the edge of the leaf (which occurs also in *P. dasyphylla* and *P. acuminata*, and some other species, but which serves as a suitable character to separate *P. lucida* from its near allies), the comparatively long pedicels and medium-sized flowers, and the ovoid or oblong acute fruits. These fruits can grow rather large as we found a field note on *King's Collector 10978* (in BM), stating that the fruit measured 31 by *9 mm (i. s. 20 by 12 mm).

P. punctata very probably belongs to the present species. Fletcher U-c, 1937, 379—380) attaches importance to the "glandular punctate Wer surface of the leaves." In our opinion, however, ac ·«>rding to the °riginal material collected by Kerr, the punctation is a consequence of the desiccation of the plant. Looking through material of various herbarium specimens one finds frequently different stages of punctation.

The flowers are whitish, the latex white, and the fruits greenish.

7. Payena longipedicellata Brace ex King & Gamble, Mat. Fl.]tal. J.en17, J. As. Soc. Bengal 74, 2, 1906, Extra Nr., 169; Lam 1925, 148 — ** *longipedunculata* Brace, errore in indice King & Gamble, 1. c, 1909, 900 — ***Fig. 6.***

Trees up to 40 m, diameter up to 0.25 m. *Branchlets* thin, terete, Pubescent to subglabrous, stipules caducous, small, long triangular to ovate, ^°ute, long pubescent. *Leaves* dispersed along branchlets, chartaceo-coria-^ous, apex acuminate, base cuneate, petioles 1.7—2.5 cm long, subglabrous to glabrous*; blade 5—13 by 2.5—5 cm, oblong to elliptic, glabrous at both su*faces, generally some traces of pubegcence along the midrib below; J^drib sunken above, prominent below; secondary nerves conspicuous and *° a very small degree prominent above, somewhat prominent below, 12—16, j}rchingly joined near margin, starting from midrib at angles of about 50 R—^°' curv^n& towards apex near margin; tertiary nerves hardly visible a&ove, conspicuous below, generally one only between two secondary ones, Ramifying towards midrib, near edge of leaf more or less parallel to

secondary nerves, descending. *Inflorescences* **dispersed** along bra noli lets below leaf region, axillary or in sears of leaves, 1—4-i'lorous, flowers comparatively large, pedicels 2—1.5 cm long, slender, pubescent to subgabrous.

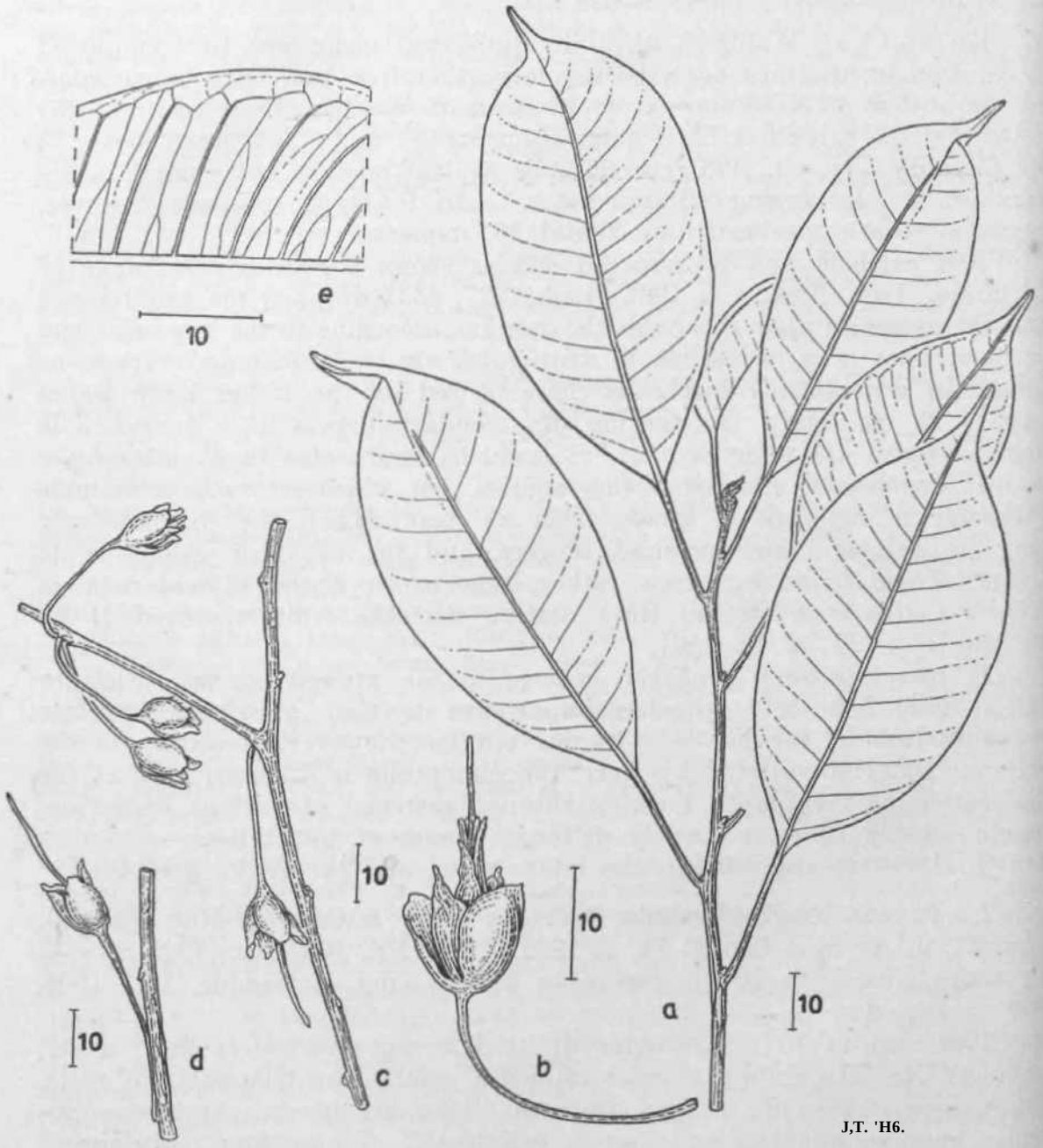


Fig. 6. *P. longipedirrUaUt,* a. **bianchlet** witli **[eaves;** b. flower; c./ il. branchlet with older **flowers;** e. nervation of leaf. From *Ilnviland 8085.*

8epah **0.8—1.5 by 0.8—1** em, thick and stjuamiform, ovate, **apex** rounded to obtuse acute, **pubescent,** inside **glabrous.** *Corolla* **exsert,** 1.2—2 em **long** tube 0.45—0.75 cm long, lobes 8, long ovate, acute, glabrous. *Stamens* 16. 0.3—0.4 em long, glabrous, filaments short and **thick,** apex of connective bifid, rarely laciniate, thecae long ovate to elliptic, *Pistillum* 0.9—2.5 cf*

long, comparatively thick, base yillous; ovary oblong conical, long pubescent, cells 8, ovules rounded. *Fruits* unknown.

Lectotype specimen: *King's Collector 2940* in K.

Vern. names: impulut, njantu (Borneo).

Distr.: Malay Peninsula, Borneo.

MALAY PENDNSULA. **Perak, Larut: *King's Collector 2940 (type,* K), fl. Apr.** BORNEO. **Sarawak, near Kuching: *Haviland S0S5* (BO, K, SING), fl. Mar. — North and East Borneo, Nunukan, primary forest: *FBI ŏb 84648* (L), height 28 m, diam. 0.25 m, fl. Feb.; ibidem: *Paymans 9* (L), height-20 m, diam. 0.20 m, fl. Jan.**

Remarks: This species, closely related to *P. lucida,* is easily recognized by the combination of the following characters: large flowers with largely exsert corolla and very long pedicels, and moderate-sized leaves.

.Lam 1927, 443, cites the present species under *P. ghitinosa;* the last-mentioned name, however, is a synonyfti to *P. lucida.*

The flowers are white.

8. Payena obscura Burck. Ann. Jard. Bot. Buitenz. 5, 1886, 60; Um 1925,150; Lam 1927, 435, *fig. 15;* Heyne, Nutt. PL Indon. 1, 1950, 1229; Wyatt-Smith, Res. Pamphl. 4, 1954, 51 — *P. havilandii* King & (Jamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Beng. 74, 2, 1906, Extra Nr., 169; Lam 1925, **136;** Fletcher in Craib, Fl. Siam. Enum. 2, 4, 1938, 360; Heine, Pfl. Samml. Clemens Mt. Kinab., thesis, 1953, 85.

Trees up to 42.50 m, diameter up to 0.66 m, girth up to 2.80 m. *ftrancklets* slender, terete, short sparingly pubescent, sometimes subglabrous, stipules caducous, small. *Leaves* dispersed along branchlets, eharta<»eo-coriaceous, apex acute, sometimes comparatively long, base cuneae, petioles 0.5—2.5 cm long, subglabrous to glabrous, sometimes sparingly Pubescent; blade 5—17 by 2.5—5 cm, ovate to ovate-rotunrtate, sometimes fiiore or less oblong, glabrous at both surfaces, sometimes sparingly pubes-^nt below, especially along midrib; midrib sunken above, prominent below, secondary nerves faint above, prominent below, 10—15, straight and thin, archingly joined near margin, starting from midrib at angles of about 60—70°,* curving towards apex near margin; tertiary nerves hardly visible above, conspicuous and prominent below, more or less parallel to secondary °aes, generally one more conspicuous and placed in the middle between t*o secondary nerves, descending. *Inflorescences* usually in upper leaf axils, frequently almost pseudoterminal, 1—5-florous, pedicels 1.2—3 cm long, thin, rusty pubescent. *Sepals* 0.4—0.7 by 0.4—0.6 cm, oblong rounded to broadly triangular rounded, apex very obtuse acute to rounded, appressedly pubescent to subglabrous, inside glabrous, inner sepals ciliated at edges. *Corolla* to some degree' exsert, 0.75—1 cm long, tube 0.2—0.4 cm long, lobes 8, ovate, apex obtuse acute or rounded, glabrous. *Stamens* 16, 0.3—0.5 cm long, glabrous, filaments short and not very thick, apex of °°nnective long and acute or obtuse acute, thecae long ovate to triangular, jfPex acute, sometimes to some degree adnate to apex of connective. *Pistil-* '*•* **0.9—1.6** cm long, glabrous, base pubescent; ovary conical or rounded, *ort pubescent, cells 8, ovules comparatively large, 0.08—0.1 cm long, rounded triangular. *Fruits* 2—4 by 1—2.3 cm, obpyriform, acuminate, base narrow or broad, slightly pubescent to subglabrous; seed 1, 2.3—2.5 by 0.6—1.4 by 0.5—0.7 cm, laterally compressed, scar 0.3—0.4 cm wide,

cotyledons flat and foliaceous, radicle comparatively large, 0.3—0.4 cm long; incrassate pedicels 1.9—3 cm long, subglabrous, persistent incrassate sepals 0.5—0.7 by 0.5—0.6 cm, sparingly pubescent to subglabrous, persistent style 1—1.3 cm long.

Type specimen: *Burck s.*ft. in BO, Herbarium Bogoriense no. 151344 (see under Remarks of P. *acuminata).*

Vern. names: getah sundik, suryau (Malay Peninsula), balam kadidie, njatuh balam simeney (Sumatra), ketiau, nyatoh enkelit, n. riau, ubah (Borneo).

Uses: Timber, gutta of a fairly good quality.

Distr.: Malay Peninsula, Riau, Sumatra, Borneo.

MALAY PENINSULA. Penang, Government Hill: *Main gay 2259* (K), fr. Feb.; Grace Dieu, 330 m: *Moh. Ilaniff 16S37* (SING), height 10—13 m, fl. Apr.; The Spout, Moniot's Road, 650 m: *Curtis 777* (BO, K, SING), height 16—20 m, fl. Apr. — Perak, Segari Melintang, Bindings: *Strugnell Mai. FD 16570* (K, SING), fr. July; Suriau, Dindings: *Burn-Murdoch 250* (SING), fl.; Kinta Ipoh Forest Reserve, 300 m: *Mai. FD 65927* (KEP), height 41 m, girth 1.85 m, fr. Apr. — Selangor, Subang, Bukit Chivaha, Sungai Plampas basin: *Mai. FD 53689* (KEP), height 21 m, girth 1.75 m — Pahang, Tandjong Tuan Ulu: *Awang Mai. FD 29639* (SING), fr. Dec. — Johore, Gunung Arong Forest Reserve: *Mai FD 35954* (KEP), girth 2.50 m, fl. June; ibidem, Merging: *Mai. FD 70077* (KEP), height 39 m, girth 2.15 m, fr. Jan.; Mersing: *Mai FD 74151* (KEP), height 42.50 m, girth 2.80 m; Kluang Forest Reserve: *Mai. FD 69915* (KEP), height 40 m, girth 2.20 in, fl. Sep.; South Pontian: *Mai. FD 70256* (KEP), height 31 m, girth 1.20 m — Singapore, Bajan: *Ridley 4959* (K, SING), fl.; Bukit Timah Reserve: *Bidley 9203* (K, SING), fl. May; ibidem: *SF 35800* (BO, K, SING), height 13 m, fl. Jan.; ibidem: *SF 35908* (SING), height 15 m; ibidem: *SF 36431* (BO, K, SING), height 20 m, fl. June; ibidem: *SF 86456* (SING).

RIAU. Lingga, near Binek: *FBI Bi/I-40* (BO).

SUMATRA. Riau and Bep., Indragiri Highlands, Danau Menkuang, primary forest: *Buwalda 6608* (BO, L), fl. Apr.; ibidem: *FBI bb 27500* (L, SING), fl. Apr.; Indragiri Highlands, Muara Padjanki: *FBI bb 27452* (L, SING), fl. Apr. — West Coast, Pankalan, Kota Baliru: *Burck s.n.* (BO), *type;* Sidjungdjung, Pilawas, old forest, 300 m: *FBI bb 6065* (L), height 20 m, diam. 0.35; Sumatra without locality: *Burck s.n.* (L, U); *De Vriese s.n.* (L).

BORNEO. Sarawak, Kuching: *Hewitt 8.5.1* (BM), fl. Mar.; ibidem: *Hewitt 8.5.2* (BM), fl. May; ibidem: *Anonymous s.n.* (BO), fl. Apr.; Kuching, Sungfti. Semengoh Forest Reserve: *Mvas 1745 = Sar. FD 8235* (SAR), height 8 m, girth 0.30 m, fl. Dec; near Kuching: *Ilaviland 2098* (BM, K, L, SING), fl. fr. Jan.; ibidem: *Haviland 2320* (BM, BO, K, L, SING), fl. Mar.; Sibu: *Sar. FD 80671* (SAR), fr. Jan.; ibidem: *Sar. FD S2768* (SAR); ibidem, swamps: *Ahmady 1736 = Sar. FD 82722* (SAR) — Sandakan, Mount Kinabalu, Dallas, 1000 m: *Clemens 4r Clemen* 26715* (B, BO, G, K, L, SING), height 13 m, fl. Sep.; Mount Kinabalu, Penibukatfi 1300 m: *Clemens $ Clemens 32127* (BO, L), height 26 m, diam. 0.45 m, f 1. Mar.; ibidem, near camp, 1300—1700 m: *Clemens 4' Clemens 31329* (BM, BO, K, L), height 20 m, diam. 0.66 m, fl. Jan., sterile; ibidem: *Clemens $ Clemens 31220* (BM, BO, L), height 25 m, diam. 0.35 m, fl. Jan.; Mount Kinabalu, Penibukan, jungle hilliside near camp: *Clemens $ Clemens 40623* (BM, K, L), height 25 m, diam. 0.33 m, fl. Oct.; ibidem: *Clemens f Clemens 40761* (B, K, L), fl. fr. Oct.; Mount Kinabalu, Penibukan, jungle ridge near camp, 1300 m: *Clemens 4* Clemens 32050* (BM, BO, K, L), fl. Feb.; Maun* Kinabalu, Penibukan, forest W. of camp noar ravine, 1300 m: *Clemens 4' Clemens S21&* (BM, BO, L), fl. Mar.; Mount Kinabalu, Penibukan, on ridge beyond Dahobang, 1300-" 1700 m: *Clemens 4' Clemens 30701* (BM, BO, K, L), fl. fr. Jan.; Mount Kinabalo» Tenompok, near lodge above trail, 1700 m: *Clemens 4" Clemens 29351* (BO, L), fl. Mar., Apr.; Mount Kinabalu, Tenompok 1700 m: *Clemens 4" Clemens 28678, 29351* (K)» fl. Mar., Apr.

MALAY AKCHTPELACJO. *Anonymous s.n.* (SING).

Remarks: Although some authors (i. c. Lam 1925, 1. c, and Wyatt Smith, I.e.) state the branchlets being glabrous, we nearly always found them to be pubescent, sometimes only subglabrous.

It is difficult to see why Fletcher and Heine *(vide supra)* still mention this species under P. *havilandii*, a name which is a synonym to P. *obscura*, as was shown already in 1927 by Lam (Lam 1927, 435).

The flowers and latex are white, the fruits green.

9. Payena pseudoterminalis H. J. Lam, Lam 1925, 260; Lam 1927, 439, *fig. 17* — P. *ew^eniaefolia* King ex Moore, J. Bot. 63, Suppl., 1925, 61!

Trees up to 23 m, diameter up to 0.32 m, girth up to 1.50 m. *Branchlets* not very slender, terete, appressedly pubescent to subglabrous, ^ipules caducous, 0.2—0.3 cm long, narrow triangular, long pubescent. *Leaves* dispersed along branchlets, sometimes with tendency for crowding at tips of branchlets, chartaceo-coriaceous, apex acuminate, base narrowly £uneate, petioles 1.0—1.8 cm long, appressedly pubescent to subglabrous; blade 5—9 by 1.5—4 cm, narrow lanceolate to broadly lanceolate-ovate, glabrous above, minutely appressedly pubescent below; midrib sunken above, more or less prominent below;.secondary nerves hardly visible above, not very conspicuous below, 9-^12, slender and straight, archingly joined near Margin, starting from midrib at angles of about 55—60°, curving towards apex near margin; tertiary nerves very faint to completely invisible, more or less parallel to secondary ones, descending. *Inflorescences* together Pseudo-racemose, conferted pseudoterminally at tips of branchlets above adult leaves, 1—3-florous, pedicels 1.2—1.8 cm long, appressedly pubescent. *Sepals* 0.6—0.8 by 0.4—0.5 cm, deltoid, apex acute or obtuse acute, outside pubescent, inside glabrous. *Corolla* not or to a small degree exsert, 0.5—5.6 cm long, tube 0.4 cm long, lobes 8, narrow and long ovate, apex obtuse acute, glabrous. *Stamens* 16, 0.4—0.5 cm long, glabrous, filaments short, apex of connective comparatively long, broad and flat, obtuse bounded. *Pistillum* 1—1.6 cm long, glabrous, base pubescent; ovary conoid, appressedly pubescent, cells 8, ovules ovate-rounded, small. *Fruits* unknown.

Type specimen: *FBI bb 7190* in L.

Vern. names: endreket (Sumatra).

Distr.: Eastern Sumatra.

SUMATRA. East Coast, Karo countries, near Petjeran, young forest, 1500 m: *FBI bb 7190 (type,* B, K, L, SING), height 23 m, diam. 0.17—0.32 m, fl. Aug. — Palau and Dep., Indragiri, highlands, Muara Padjanki, primary forest: *Bmualda* (BO, L, PNH, SING), fl. Apr. — Palembang, Mount Dempo, 1900 m: Forbes 2667 (BM, K, L, types of P. *eugeniaefolia* King ex Moore), girth 1.50 in, fl.

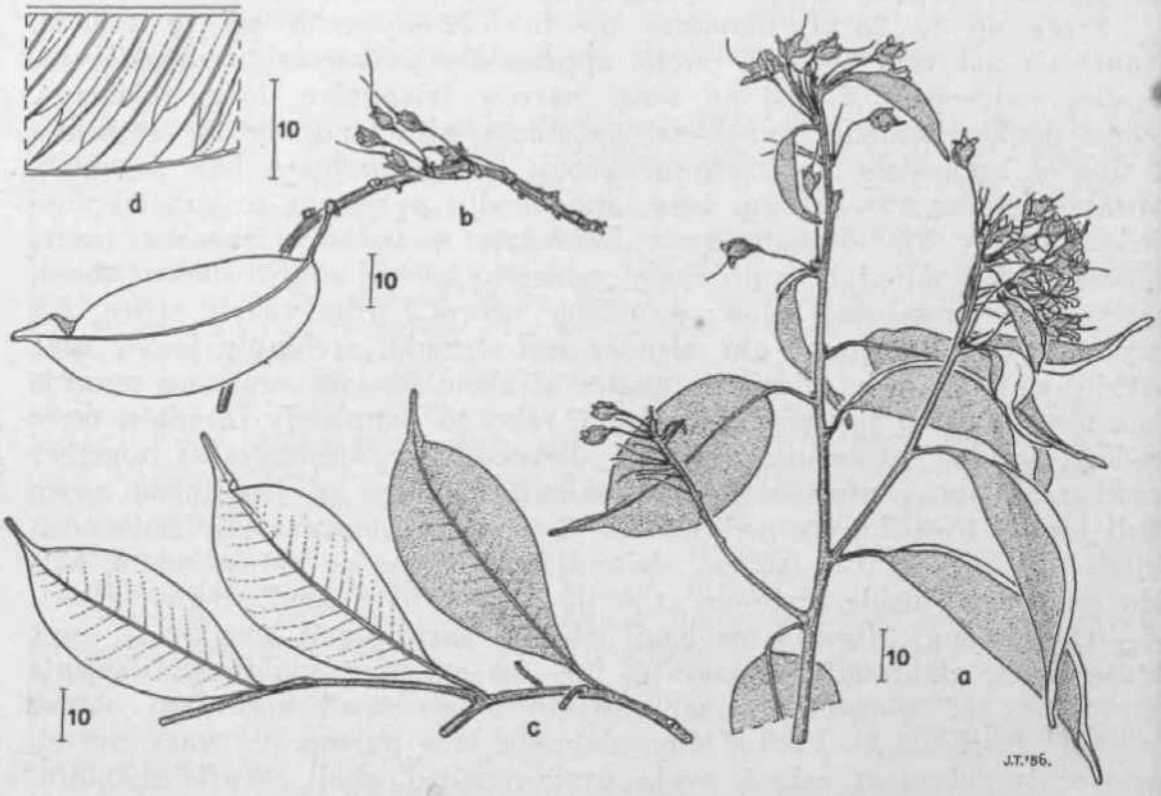
Remarks: *P. pseudoterminalis* is a close relative of *P. leerii*, a species which shows almost the same type of inflorescences; generally the tertiary nerves of the loaf are much more faint or completely invisible in the first-mentioned species.

Lam (Lam 1927, 438) considered P. *eugeniaefolia* a synonym to P. *endertu* «e descr.". The Leiden specimens collected by Forbes, however, were identified by Lam in 1936 as P. *pseudoterminalis*, with which identification I can agree. Accordingly P. *eugeniaefolia* falls into the synonymy of the present species.

As both mimes were 'published in February 1925, Lam's specific epithet *psevdotenninalis* has been selected as the valid one.

10. Payena microphylla (Ue Vriese) Pierre, Bull. Mens. Soe. Linn. Paris, 1885, 531; Lam 1925, 136; Lam 1927, 437 — *Isonandra micropkylM* De Vriese, Nat. Tgdsehr. Nod. Ind. 21, 1860, 312 — *Fig. 7.*

Trees up to 27 m, diameter up to 0.42 m. *Bmnchlets* thin and slender, terete, short-ferruginous pubescent, stipules caducous, small. *Leu res* dispersed along branchlets, subcoriaeeous, apex acuminate, base cuneate,



Fit*. .'• P« *mieraphylla,* a. branchlet with leaves and flowers; b. bmnehh't wit)i **leaf** and flowers; c. branchlot with **teaves;** d. nervation of leaf. a. from *Fill bb 28096,* b. from type specimen ***Motley*** *VIII (SOS),* c. from *Beccari 1848,* cL idem.

petioles 0.8—1.5 em long, short sparingly pubescent to (sub)-glabrous; blade 5—7 by 2—3 em, elliptical or ovate, glabrous at both surfaces, sometimes subglabrous below; midrib sunken or slightly prominent above, prominent below; secondary nerves not very conspicuous above, not *very* prominent to very faint he low, 10—13, straight, slender and thin, archinglj joined near margin, starting from midrib at angles of about 50—70°, curving towards apex near margin; tertiary nerves faint, more or less parallel to secondary ones, descending. *Inflorescences* crowded at tips of branch lets or axillary, 1—7-florous, pedicels 0.6—1.5 em Long, short pubescent to Bubglabrous. *Sepals* 0.4—0,6 by 0.3—0.4 cm, long triangular, obtase*acute, sericeous pubescent, inside glabrous. *Corolla* exsert, 0.6—0.7 cin long, tube 0.2—0.3 cm long, lobes 8, lanceolate to elliptical, obtuse acuti to laeiniate, glabrous. *Stamens* 16, 0.3—0.4 cm Long, glabrous, filament

long, not very slender, apex of connective broad, laciniate to obtuse acute, thecae elliptic or ovate. *PistitkLm* 1.2—1.6 cm long, glabrous, base villous; ovary rounded to conical, long pubescent, cells 8, ovules rounded to ovate, •small. *Fruits* unknown.

Type specimen: *Motley VIII (203)* in L.

Vern. names: baringiri, ngiatu wanjie (Borneo).

Distr.: Borneo.

BORNEO. **Sarawak, Mattang, 900 m: *Beccari 1848 *)* (Fl, G, K, L, P, S, types of P. *beccarii* Pierre and P. *parvifolia* Engler), fl. June — South and East Borneo, Bandjcrmasin: *Motley IV (1S64)* (L, P); neighbourhood of Bandjcrmasin: *Motley VIII (90S) {type,* BO, K, L, P), fl.; Muara-Tewch, Pepas, primary forest: *FRI bb 28095* (BO), height 27 m, diam. 0.42 m, fl. May; ibidem: *FBI bb £8096* (BO, . SING), height 27 m, diam. 0.40 m, fl. May.**

Remarks: A species with small leaves, nearly related to *P. leerii.* The flowers and the latex are white.

11. Payena leerii (Teysmann & Binnendjjk) Kurz, J. As. Soc. Bengal •±0, 2, 1871, 69; Lam 1925, 137, 261; Lam 1927, 437; Lam in Backer, PI. Java Nooduitg. 7, 1948, 166—8; Heyne, Nutt. PL Indon. 1, 1950, 1227 — *Azoala leerii* Teysmann & Binnendjjk, Nat. Tjjdschr. Ned. Ind. 6, 1854, 116 — *P.-croixiana* Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 524; Lam 1925, 136 — *Fig. 8.*

Trees up to 38 m, diameter up to 0.80 m, girth up to 1.10 m. *Branchlets* thin, terete, subglabrous to short appressed ferruginous pubes-[ee]nt, stipules caducous, narrowly long ovate, acute, 0.3—0.4 cm long. *Leaves* dispersed along branchlets, thin coriaceous to chartaceo-membrana-[c]eous, apex (obtuse) acuminate, base cuneate to rounded, petioles 0.5—1-5 cm long, sulcate above, glabrous, with rough epidermis; blade 5—16 by 1.5—8 cm, narrow ovate-lanceolate to ovate-ovoid, even sometimes nearly circular, glabrous above, glabrous, rarely subglabrous, below; midrib sunken above, prominent below; secondary nerves not very conspicuous above, [s]omewhat more conspicuous and prominent below, 11—18, thin and straight, a^chingly joined near margin, starting from midrib at angles of about 65—750^ curving towards apex near margin; tertiary nerves hardly visible, specially above, more or less parallel to secondary ones, descending. *Inflorescences* generally in axils of leaves, or in scars of leaves in top region of branchlets, sometimes subterminal, 1—8-florous, pedicels 0.8—1.7 cm long, sparingly pubescent to (sub)glabrous. *Sepals* 0.2—0.4 by 0.25—0.3 cm, triangular to ovoid, apex rounded, short pubescent to subglabrous, inside glabrous. *Corolla* generally exsert, 0.4—0.5 cm long, tube 0.1—0.2 cm long, [lo]bes 8, long ovate, apex rounded. *Stamens* 16, 0.2 cm long, filaments short, IHibescent, apex of connective long ciliated, thecae long elliptic. *Pistillvm* 0.6—0.8 cm long, glabrous, base villous; ovary long conoidal, long pubes-[cn]t, cells 8, ovules small, 0.015 cm long. *Fruits* 2.5—5 by 1—2.5 cm, [ov]oid, frequently to some degree conoidal, apex truncate, glabrous to ^Mabrous; seed 1, 2—2.5 by 0.8—1 cm, long ovate, scar 0.1—0.2 cm [w]i<le, cotyledons flat and foliaceous, radicle short; thickened pedicels 1—

[j]') Errore *Becoari 1818.* See also Van Steenia & Van Steenis-Ki useman, Number-[K]t8 of Beccari, Sumatra, Borneo, New Guinea, Flora Malesiana Foundation, 1951—1953.

3 cm long, persistent **incrassate sepals** 0.4 by 0.4 cm, glabrous, persistent style sbort, frequently broken off.

Neotype specimen: ***Tey$mmm*** *a. n.* in BM. Herbariuin Hance 13935.

Vern. names: getab sundek, gutta sundé (Malay Peninsula); kulan (Riau); getah kulan, kaju kulan, kulan, k. itani, k. ketjil, k. puti, k. **tembaga,** lating, **leting** (Banka); balam baringin, 1). **biingiz^ b. btingj** tandjung, b. aont6, b. sonteh, b. sundek, 1). suntei, b. tandjonjr, b. tandul,

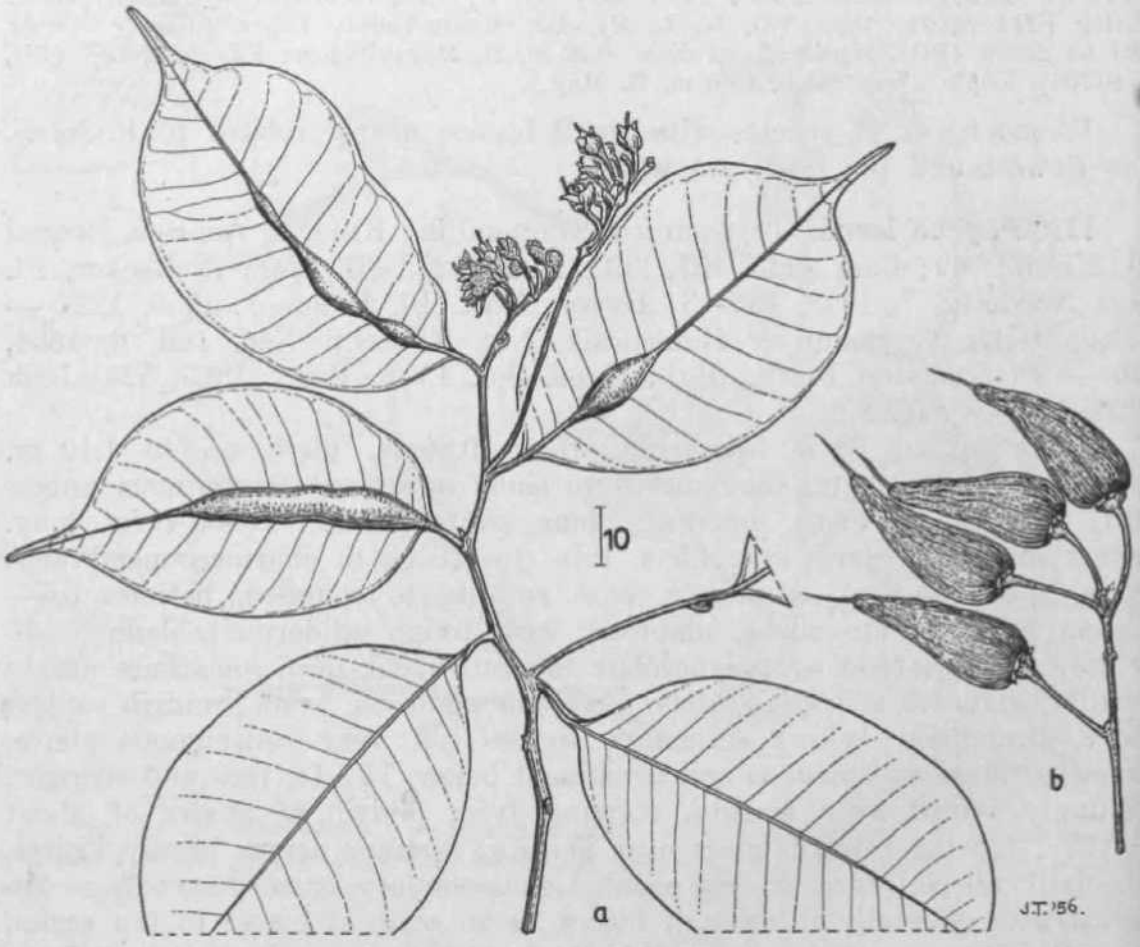


Fig. 8. *P. lecrii,* a. flowering branch with galls along iow^r side of some lea*es, b. fruiting branch, *a,* fvom *Haviland S03S, b.* from *Anonymous s. n.*

IJ. **tjabie, b. tjobee,** get a sundi, kalemanggong, kalimanggung, majang bat a, m. sondek, njatu btingin, n. sundi tua, sundai, sunde, sundei, s. bakaU (Sumatra); balam bariujfin, b. bringin, b. tembaga, beitis, bringin. b. djiput, kolan, mergatahan, nyatob **bukong, n. burang,** n. pepit, selangan l>atu, **BOPodb** bukong (Borneo).

I'ses: Timber, important **prodticent of** guttah of comparatively good quality, fruits stated to be edible.

I>istr.: **Malay** Peninsula, Riau, Banka, Sumatra, Borneo, Palawan, Tawi Tawi, Mindanao. Cultivated in tropical Asia (e.g. Java), Africa, and South America.

MALAY PENINSULA. **Penang, Pulu Penang, 100 m: *Aniff 16SS7* (BM), fl. fr. Apr. — Perak, Dindings: *Bryant s.n.* (SING), fl. Mar.; Bindings, Bruas at Tanjong Aru: *Ouftis 3640* (SING), height 13—17 m, girth 0.25—0.30 m, fr. June; Lahat: *Errington de la Croix 68, -69, -70, -71, -79* (P), fl.; Larut: *St. Pol Lias 4- De la Croix &17* (P)$_f$ heigh£ 26—33 m, fr., types of *P. oroixiana* Pierre; Larut, Kuala Kangsar: *St. Pol Lias 4- De la Croix s.n.* (L), fr.; Sapetang: *Low 523* (K), fl. fr. Aug.; ibidem: *Wray 523* (SING), fl. fr.; ibidem: *Wray s.n.* (SING), fr.; Taiping: *Barnard Mai. &D 1* (SING), fr. Jan. — Singapore, Bukit Timah Reserve: *Ngadiman SF S5800* (BM, BO, SING), height 13 in; ibidem: *Ridley 11331* (SING); Singapore without locality: *Smith s.n.* (SING), fr.**

BIAU. **Pulu Djangkang: *Teysmann s.n.* (BO); Karimun, Simpang: *FBI bb 17ISO* (L); ibidem: *FBI bb 31665* (L, SING), fl. Apr.; Lingga, Ngina: *FBI Bi/I-15* (BO); Pulu Singkep, Gunung Gambang, old forest, 100 m: *FBI bb 4041* (BO), height 26 m, diam. 0.40 m; Pulu Singkep, near Todak: *FBI bb 17347* (L).**

BANKA. **Blin ju: *Grashoff 78* (L) ; Blinju, Djebus, Sungai Liat: *Berkhout s.* n. IW)), fl. fr. Aug.; Djebus: *Teysmann 3214* (BO), fl.; Lobok Bcsar: *Andang 19* (BO, L, SING), fl. Sep.; ibidem: *Anta 554* (BO, L, SING), height 8 in, diam. 0.10 m, *!• Sep.; ibidem, primary forest: *Kostermans 118 = FBI bb 34050* (BO, L, SING), height 25 m, fl. Sep.; ibidem, 200 m: *Anta 218* (L), height 20 m, diam. 0.30 m, *1- Oct.; ibidem: *Anta 1083 = Anta 2083* (BO, L, PNH, SING), height 18 m, diam. °30 m, fr. Oct.; ibidem: *Anta 1218* (BO, PNH, SING), height 22 m, diam. 0.30 m., ^{f}l- Oct.; ibidem, Gunung Pading: *Kostermans 903 = Anta 903* (BO, L), height 25 m, diam. 0.25 m, fl. Sep.; S. Banka, Bakung, primary forest: *Kostermans 215 = FBI &6 34149* (BO, L), height 16.60 m, diam. 0.32 m, fl. fr. Oct.; S. Banka, Perlang, primary forest: *FBI bb 11642* (BO), height 25 m, diam. 0.35 m; ibidem: *Kostermans V?0 = FBI bb S4104* (BO, L), height 22.40 m, diam. 0.55 m, fl. Sep.; S. Banka, Rindik: *FftI bb 11566* (L), fl. May; without locality: *Teysmann s.n.* (BO, Fl), fl.; *Anonymous ^{11}* (BO, L); *Anonymous s.n.* (BO).**

SUMATRA. **East Coast, Asahan, Bandar Pulu: *Stadtmiller s.n.* (BO), height ^ m; Bengkalis: *Brainier s.n.* (BO), fl. Apr.; ibidem, Tamberan: *Beguin 235* (BO, J;i U), height 17 m, diam. 0.8O m, fr. Aug.; ibidem, Tandjung: *FBI bb 17552* (L); Gunung: *Stadtmiller 47* (BO); Labuan Batu, Masihi, 300 m: *FBI hb 5299* (L), height ™ m, diam. 0.30 m; Langkat: *Heyne s.n.* (BO); Mangsang: *Stadtmiller 118* (BO); ^{8}enawar: *Stadtmiller 119* (BO); Siak River: *Seligmann s.n.* (P); Unggan: *Stadtmiller ^{10}2* (BO) — Riau and Dep., Indragiri: *Curtis 3631* (SING); iti.iem: *Curtis s.n.* (SING) — Djambi, Muara Pindjuan: *FBI bb 12824* (BO), height 25 m, diam. 0.45 m — West Coast, Balai Selasa: *Anonymous s.n.* (BO); Air Bangis: *Anonymous* * (L); Halaban, L Kota: *Bwrok s.n.* (BO); Pankalan, L Kota: *Burck s.n.* (BO), fl. Oct.; Lubuk Gedang: *Van Bomburgh s.n.* (BO); Supajang: *Anonymous s.n.* (BO), *^{r}-; ibidem, Air Busuk: *Burok s.n.* (BO); only West Coast: *Anonymous s.n.* (P) — ^{p}alembang, Banjuasin and Kubus countries: *Grashoff 736* (L), fr.; Kubus countries, Primary forest: *Endert 227* (BO); Batu Radjah: *Teysmann 3912* (BO); ibidem: *De Friese s.n.* (L, P, U); ibidem: *Anonymous 3912* (L) ; Lematang Ilir: *FBI T 1007* (G, L, SING, U), fl. fr. July; ibidem, Semangus, 100 m: *FBI bb 31976* (L); Lematang Ulu, 150 m: *Lambaoh 1853* (L), fr. Dec; Penduduan forest: *Bunrman van Vreeden 218* (BO), height 16 m, diam. 0.20 m; ibidem: *Buurman van Vreeden 246* (BO); Pulu Rimau: £!*<* *s.n.* (SING); ibidem: *Anonymous s.n.* (SING); Rawas: *Dumas 1581* (G, L, 3?*G), height 20 m, girth 1.10 m, fl. Mar. Apr.; ibidem: *Dumas 1558* (L), fl. May; {todem, 150 m: *Grashoff 1083* (L) ; only Palembang: *Buurman van Vreeden 177* (BO), ^^{l}Rht 18 m, diam. 0.20 m; *Buurman van Vreeden 179* (BO), height 18 m, diam. "•20 m., *FBI T 484* (L> SING); *Teysmann s.n.* (BM), fl., *neotype; Anonymous s.n.* (BO), *fi* __ Lampong Districts, Balainbagan: *Van Bomburgh s.n.* (BO), fl. ^{Au}R.; Kebang: *Teysmann s.n.* (U); Lampong Districts without locality: <*Teysmann* *•*. (BO); *Anonymous 2* (BO), fl.; Sumatra without locality: *Burok s.n.* (BO, SING, V> fl., fr., sterile; *Forbes 2947* (PI), fl.; *Teysmann s.n.* (L, P); *De Vriese s.n.* (P); *^{An}°nymous s.n.* (BO, L), fl.**

BORNEO. **Sarawak, Kuching: *Bartlett s.n.* (BM), fl.; near Kuching: *Haviland 5038* (BO, L, SING), fl. May; ibidem: *Haviland s.n.* (BM), fl. May; Setapoh Fbrest Reserve near Kuching: *Egon 1020 = Sar. FD A 0809* (SAR), fr. Dec; ibidem, swamps: Omar *tSl = Sar. FD 00077* (SAR, SING), fl. May — West Borneo, Gunung Klam*: Ilallier 2310* (L) ; Kophiang: Van Romburgh 31 (BO); ibidem: *Vhn Bomburgh***

37 (BO); Melawi Tjatit, Bukit Tcnkujung, 400 m: *FBI bb £6547* (L, SING), fl. Nov.; Pamangkat, Kamak Bekumpai: *Van Bomburgh 5* (BO); Pangkala Lohan Paloh: *Van Bomburgh 3* (BO) ; *Wight s. n.* Sambas (SING); Sungai Lohanmendjawa: *Van Bomburgh 17* (BO); Tclukkemaning: *Van Bomburgh 66* (BO) — South and East Borneo, Buntok, Sungai Ajoh: *FBI 8181* (BO), fr. Jan.; Loa Djanan, W. of Samarinda: *Kostermans 6747* (L), height 40 m, diam. 0.70 m, fl. Apr.; Lower Dajak, Danan Rawah, old forest: *FBI bb 13474* (BO), height 24 m, diam. 0.15 m, fl. Oct.; Lower Dajak, central basin Little Dajak River near Pedah Ketapi, swamps: *Meegan IV* (BO), fl. Febr.; Lower Dajak, Little Dajak River, Pedah Ketapi, in swamps and forest: *Meegan X* (BO); Kutai: *Tromp s.n.* (BO); Medara: *Van Bomburgh 19* (BO), fr. Mar.; Muara Teweh, Pepas: *FBI bb 28093* (BO), height 22 m, diam. 0.23 m, fl. May; ibidem: *FBI bb 88094* (BO, L, SING, U), height 18 m, diam. 0.14 m, fl. May; Muara Teweh, Kali Prarawen: *Van Bomburgh 68* (BO); Muka Hadji: *Van Bomburgh 38* (BO) J Peak of Balikpapan, Beoul, 600 m: *Kostermans 7331* (L), height 30 m, diam. 0.80 m, fl. July; Pulu Laut, Madjamut: *Delmaar 8001 = FBI 8001* (BO), fl. July; Puruk Tjahu, Tahudjan, primary forest, 500 m: *FBI bb 81158* (BO, L); Sudarane, Aju River? *Van Bomburgh 87* (BO); Sungai Kapuas: *Laboinn 68b* (BO), fl. — Sandakan, 3% miles SSW of Sipitang, Sibutu River, Mengalong Forest Reserve: *Wood N. Born. FD 15145* (L), height 28 m, fl. May; St. Lucia, Sawau, Tinagat Forest Reserve: *Cuadra N. Born. FD A 8463* (L).

PALAWAN. *Cenabre, Gellidon #• Paras For. Bur. 87877* (K, P), fr. Jan. Feb. .

TAWI TAWI. f. Brown, Min. Prod. Phil. For. 2, 1921, 82; Merrill, Enum. Phil. PI. 3, 1923, 277.

MINDANAO. *Ahern 5674* (BO), fl.

MALAY AACKHPELAGO. without known loc: *Teysmann s.n.* (BO), fl. fr.; *Anonymous s.n.* (BO).

CULTIVATED. Botanical Gardens Bogor: *Becoari s.n.* (BM, Fl), fl., sterile; *Van Ilarreveld HT 6353* (L), fl. fr. Sep.; *Hochreutvner 35* (G), fr. Dec.; *Teysmann 14610* (BO), fl.; *Anonymous s.n.* (B, BO, L, U), fl., fr., sterile; Tjipetir Estate, Java: *Boerlage s.n.* (L), fl.; *Van Bomburgh s.n.* (BO), fl. Dec.; Belgian Congo, Botanical Gardens Eala: *Vermoesen 8151* (<S), fl. May; East Africa, East African Agricultural Research Station, Amani: *Anonymous s.n.* (BM, K), fl. Feb.

WITHOUT LOCALITY. *Anonymous s.n.* (BO), fl., labelled "Ambon", cultivatedf

Remarks: This species shows a wide range of variation, especially in the shape of the leaves; these vary from long, narrow and sublanceolate (up to 14 cm long) to nearly circular or ovoid (up to 5 cm long). The truncate apex of the fruit is very characteristic and is present in nearly every fruit we had at our disposal. The conical fruits, unique among the members of *Payena*, are specific for *P. leerii*.

The flowers are white or yellowish white, the latex white, the fruits are green.

Mr M. Jacobs, botanist at the Bogor Herbarium, at our request communicated that the type specimen of this species could not be traced. As no other material also could be found a neotype specimen has been chosen from material evidently seen by Teysmann at least and corresponding as much as possible with the original description.

12. Payena endertii II. J. Lam, Lam 1925, 144; Lam 1927, 438 -*~ ***Fig. 9.***

Trees up to 38 m. *Branchiets* thin, terete, mostly with short ferruginous pubescence, stipules caducous, very small. *Leaves* dispersed along branchlets, chartaceous, apex long, obtuse acute, base cuneate, petioles 1.2—1.6 cm long, somewhat sulcate above, with dense ferruginous pubescence, those of older leaves sparingly pubescent; blade 6—12 by 2—i.5 cm, ovate-oblong, glabrous above, appressed short ferruginous sericeous pubes-

cent below, sometimes subglabrous; midrib sunken above, prominent **below; secondary** nerves idem, comparatively thin, 9—12, archingly joined near **margin,** starting from **midrib** at angles of about 60—65°, **straight,** curving towards apex near margin; tertiary nerves comparative If taint, **both** above and below, descending from marginal conjunctions **of Secondary** nerves, ramifying towards midrib. *Inflorescences* in axils of leaves, in scars nf **leaves** or sometimes scattered along branches, **1—4-florons,** pedicels 1.5—1.6 cm **long,** appressedly pubescent. *Sepals* 0.55—0.6 **by** 0.5 em, deltoid to triangular, acute, outside **Pubescent,** inside glabrous. *Corolla* exsert, [1]—1.2 cm long, tube 0.-1—0.5 cm long, lobes *K* acute lanceolate, glabrous. *Stamens* 16, °-3 cm long, filaments rather short, **tho**:ae °void, apex of connective longer than anthers, truncate, acute, bifid or lacerate. ***PistiUum*** [J]-l cm long, **subulate,** glabrous, base **pttbes**-[ee]nt; **ovary** small, globose, pubeseem, cells N. [F]*ruits* 2.2—2.3 by 1—1.3 cm, generally round-[e]d, sometimes ovoid, glabrous; **seed 1,** 1.9 by °-8 **by** 0.65 em, oblong, scar **0.2—0.22 cm Mde,** cotyledons foliaceous, radicle inferior, **small; incraasate** pedicels 1.3—1.4 cm long, glabrous, persistent sepals 0.5 **by** 0.5 em, Pubescent to subglabrous, **persistent** style [u c m T] teig. ,

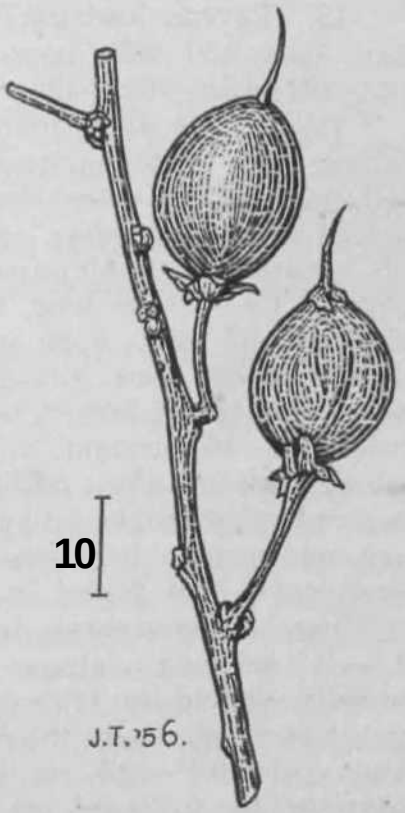


Fig. 9. P. *endartii,* tiranehlet with fruits. Prom *Ftlt bb 14197.*

L e c t o t y p e S **p** e c i m e n: *rn I [E] 1031* in BO.

V e r n. n a m e s: balam terung {Sumatra). **[a]iato** hnniiiir. njatu. repuk rawns (Borneo).

Dist r.: Sumatra, Borneo.

SUMATRA. B e m k u l e n, Redjang, Tjurup, northern slope **of I ^ t K«Jm , , M)I n**: *FRI E 1051 (type,* BO, K, L), height 30 m, diam. 0.80 m, fl P a e m b a n g, Pasemah countries, 1000—1500 m: *FRI TB 452* (L, SING), fl. .., **BOBSSO. So** u t h a n d E a s t B o r n e o, Berau near ın: *FRI bb 12118* **TO i»eighi S3** m; diam. 0.50 m, fr. Oct.; West Kutei, Mount Antjalung: *FRI bb* **J*99 (L)**; ibidem: *Fill hb 16522* ibidem: *FBI bb 16838 [1*);* vvost I\UIM. near tu Bong: *Ewl-cri SSSS5* (L, U), **fr. July: *We**** Kutei, **aeaar L. Petah: Bndert** *3453* fr. Sep.; Gunung Bulu Lembok near Pleihari: *Delmaer 1150* (L), fr.; Katapang, 450 m: *FRI bb 13779* (L), fl. Sep.; Pleihari, S. Alang: *FRI bb 14197* SIN3), fr. Feb.

R em a r k s: The most important **character of P. *enderfU*** is **the babitus of** the stamina' 'in **which the apes of** the connective is longer than the anthers. In our opinion, however, the value oi **this** character is **rather** doubtful, as most **of** the species of *Poyena* **show** a considerable range **of** variation in the form of their stamens. **Perhaps,** it combined **with** the typical **rounded fruit, these** are suitable characteristics **Cor** /'. *e>ui,rhi.*

Lam (Lam 1927, 438, fig. 16) figured ovoid fruits; the present author generally found rounded fruits, once only ovoid ones.

The flowers and latex are wihte, the fruits green.

13. Payena lowiana Pierre, Bull. Mens. Soc. Linn. Parif, 1885, 525; Lam 1925, 150, 263; Lam 1927, 436 — *P. glabra* H. J. Lam, Lam 1925, 148, 262; Lam 1927, 438; Heyne, Nutt. PL Indon. 1, 1950, 1227.

Trees up to 42 m, diameter up to 0.40 m, girth up to 2 m. *Branchlets* rather thin, terete, appressed sericeous pubescent to subglabrous, stipules caducous, deltoid, narrowly acute, pubescent, 0.2—0!3 cm long. *Leaves* dispersed along branchlets, sometimes to some degree concentrated near tips of branchlets, membranaceo-chartaceous, apex acuminate, base cuneate, petioles 1.5—2.5 cm long, terete, short sericeous pubescent to subglabrous* blade 10—17 by 3—5 cm, ovate to ovate-lanceolate, glabrous above, glabrous to subglabrous below, young leaves sericeous pubescent below; midrib sunken above, prominent below; secondary nerves inconspicuous above, prominent below, 11—16, straight, archingly joined near margin, starting from midrib at angles of about 50—60°, curving towards apex near margin; tertiary nerves hardly visible, reticulate near margin, more or less parallel to secondary ones near midrib, sometimes one of the parallel nerves somewhat more conspicuous and placed in the middle between two secondary nerves, descending. *Inflorescences* dispersed along branchlets, 2—5-florous, pedicels 1.5—2.1 cm long, glabrous to subglabrous. *Sepals* 0.4—0.5 by 0.4—0.5 cm, broadly deltoid to triangular, tips rounded, with very short appressed pubescence, especially the outer ones. *Corolla* frequently exsert, 0.7—0.8 cm long, tube 0.45—0.5 cm long, lobes 8, acute ovate lanceolate, glabrous. *Stamens* 16, 0.35—0.4 cm long, filaments thin and very short, glabrous, apex of connective rather long, broadly obtuse to obtuse acute, laterally compressed, thecae long ovate. *Pistillum* 1.8—2.2 cm long, glabrous, base pubescent; ovary long conoidal, with rather long appressed chryso-brownish pubescence, cells 8, ovules long ovate to rounded. *Fruits* 2.8—3.5 by 0.9—2 cm, ovoid acuminate, short appressed pubescent to (sub)glabrous; seeds 1, rarely 2, 2.5—2.8 by 1.1 by 0.6—0.7 cm, long ovate ovoid, nitidous fulvous, scar 0.45—0.5 cm wide, cotyledons flat and foliaceous, radicle inferior, cylindrical, 0.3 cm long; incrassate pedicels 1.5—2.4 em long, glabrous, persistent sepals 0.4—0.5 by 0.4—0.5 cm, subglabrous to glabrous, persistent style long, up to 2 cm long.

Type specimen: *St. Pol Lias & De la Croix 292* in P (errore *272,* Pierre l.c).

Vern. names: balam, b. puntie kaju, majang rata (Sumatra); awa sau-uding, balam tembaga, b. tundjang, balem sito bulling, sau pajo (Simalur); simpur, taipalat karing = natu djalet (Borneo).

Uses: Timber, fruits edible.

Distr.: Malay Peninsula, Sumatra, Simalur, Borneo.

MAUIY PENINSULA. **Perak, Bukit Berapi:** ***St. Pol. Lias 4' De la Croix 2f>£ (type,*** **P), fr.**

SUMATRA. **Atjeh and D« p., Gajo Loeëus, Penosan, Gunung Gerupal, 1900 m:** ***FBI*** **66.** ***2837$*** **(L, SING); ibidem, 2000 m:** ***FBI*** **66** ***22372*** **(U); island Bras, near Laping, 130 m:** ***Koorders 10567 8*** **(BO), height 25 m, diam. 0.40 m — TapanuH, Angkola and Sopirok:** ***FBI hh 3143*** **(L) — West Coast, Air Baṇgis:** ***Anonymous 8***

(L); ibidem: *Anonymous s.n.* (P); Ophir, Simpang Parit, 90 m: *FBI bb 19624* (L). SIMAIAJR. **marshy forest: *Achmad 544* (BO, L, U), height 24 m, girth 0.86 *m*, fr. July; ibidem: *Achmad 1887* (K, L, SING), height 26 in, girth 0.86 m, fl. Aug.; ibidem, forest: *Achmad 1079* (G, L, SING, height 31 m, girth 2 m, very young fr. Apr.; ibidem: *Achmad 11*9* (L, SING, U), height 25 m, girth 0.80 m, fr. May; North Sinialur, forest! *Van Jlerwaarden 19* (BO), height 30-^50 m, fl. July.**

BORNEO. **South and East Borneo, West Kutei, Mount Antjalung: *FBI && 16674* (L), fr. Mar.; ibidem: *FBI bb 16580* (L), fr. Mar.; Puruktjahu, Kalapeh, old forest, 200 m: *FBI bb 11106* (BO), height 19 m, diam. 0.25 m; Puruktjahu, Puru, °ld forest, 100 m: *FBI bb 11119* (L), height 25 m, diam. 0.16 m; Sungei* Wain region j N. of Balikpapan: *Kostermans 415S* (L), height 10 in, diam. 0.10 *m*, fl. Oct.; ibidem: *Kostermans 4408* (BO), height 12 m, fl. Oct.; Borneo without locality: *De Viiese-s.n.* (U).**

Remarks: The fruit is not always glabrous as Lam mentions in his description of *P. glabra* (Lam 1925, 149); sometimes clearly shows a short Pubescence.

The abundant latex and the flowers are white, the fruits are green.

14. Payena lamii Van Bruggen, nov. sp. — *P. truncata* K. Griffioen & H. J. Lam MS ined. — *Fig. 10.*

Arbores. Ramuli graciles, teretes, gltfbri. *Folia* in regione terminali ttimulorum dispersa, crasse coriacea, apice longe obtuse acuminata, basi cuneata, petiolis 3—4.5 cm longis, sulcatis vel teretibus, glabris; lamina 15—19 x 5—7 cm, ovata, fere glabra, indiciis pubescentiae brevis raraeque praeter costam; costa supra plana, subtus prominens; nervi secundarii sub-STaciles, maxima supra, 29—32, recti, marginem versus obscuri sed arcuatim conjuncti, angulo 60—80° de costa adscendentes, apicem versus prope marginem curvati; nervi tertiarii vix conspicui, prope marginem plus minusve reticulati, prope costam nervis secundariis paralleli, descendentes, Plerumque unus inter nervos parallelos evidentior in medio duorum nervorum secunda riorum. *Inflorescentiae* axillares vel in ramulis dispersae, 7—10-florae, pedicelli breves, 0.2—0.3 cm longi, pubescentes, apice dilatati. *Sepala* 0.4—0.45 X 0.2—0.35 cm, ovata, apice rotundata vel acuta, extus adpresse fulvo-pubescentes, intus glabra vel subglabra, interiora praeter Marginem valde ciliata; *corolla* 0.4 cm longa, tubus 0.15 cm longus, petalis 7—8, ovatis-oblongis, apicibus rotundatis, utrimque glabris medio linea pubescentiae apice dilatata munitis, fauce pubescens; *stamina* 16, 0.2—0.25 cm longae, filamentis crassis brevibusque, plerumque longe pubescentibus, ^axime in floribus juvenilibus, apice connectivi acuta, thecis longis triangularibus; *pistillum* 1 cm longum, subulatum, glaber, basi pubescente; Ovarium conicum, pubescens, loculis 8. *Fructus* ignoti.

Trees. Branchlets thin, terete, glabrous. *Leaves* dispersed in terminal region of branchlets, thick coriaceous, apex long, obtuse acuminate, base pneate, petioles 3—4.5 cm long, sulcate or terete, glabrous; blade 15—19 by 5_7 cm> ovate, practically glabrous, with traces of a short sparingly Pubescence along the midrib; midrib sunken above, prominent below; ^eondary nerves comparatively faint, especially above, 29—32, straight, near margin faint and archingly joined, starting from midrib at angles of about 60—80°, curving towards apex near margin; tertiary nerves hardly conspicuous, near margin to some degree forming a reticulate pattern, near midrib parallel to secondary ones, starting from marginal edges, generally one of the parallel nerves somewhat more conspicuous and placed

i nthe middle between two secondary nerves. *Inflorescences* in axils of leaves or scattered along branchlets, 7—10-florous, pedicels short, 0.2—0.3 cm long, pubescent, thickened towards flower. *Sepals* 0.4—0.45 by 0.2—0.35 cm, ovoid, apex rounded or acute, outside appressed yellowish brown pubescent especially long ciliated along margin at inner ones, inside glabrous to subglabrous. *Corolla* 0.4 cm long, tube 0.15 cm long, lobes 7—8, ovate-oblong, obtuse rounded at tips, glabrous with at both surfaces a towards the apex widening line of pubescence in the middle of each lobe, throat very pubescent. *Stamens* 16, 0.2—0.25 cm long, filaments thick and short, mostly long pubescent, especially in immature flowers, apex of connective acute, thecae long triangular. *Pistillum* 1 cm long, subulate, glabrous, base pubescent; ovary conoidal, pubescent, cells 8. *Fruits* unknown.

Type specimen: *H. H. Everett s.n.* in SAR.
Vern. names: njato berlali (Borneo).
Distr.: Borneo, Sarawak.

BORNEO. **Sarawak, Bintulu: #. *H. Everett s.n. (type,* L, SAB), fl. May.**

Remarks: Although we have at present one specimen only at our disposal we do not hesitate to attribute it to an as yet unknown species, which is characterized by the pubescent throat, the very short pedicels, the large number of secondary nerves in a comparatively small leaf, and the very long apex of the leaf. It is named in honour of Prof. Dr. H. J. Lam, director of the Rijksherbarium at Leiden.

15. Payena lanceolata Ridley, J. As. Soc. Straits 79, 1918, 93; Lam 1925, 147; Lam 1927, 438 — Fletcher in Craib, Fl. Siam. Enum. 2, 4, 1938, 360; *P. lancifolia* H. J. Lam, Lam 1925, 147; Lam 1927, 438; Wyatt Smith, Res. Pamphl. 4, 1954, 52 — *P. annamensis* Lecomte, Fl. Gén. Indoch. 3, 7, 1930, 909 — *P. leerii* Fletcher nee (Teysmann & Binnendfik) Kurz, Fletcher in Craib, 1. c, 360.

Trees up to 35 m, diameter up to 0.40 m, girth up to 2.50 m. *Branchlets* thin, terete, ferruginous pubescent to (sub) glabrous, stipules caducous, long acute, ferruginous pubescent, 0.4—0.5 cm long. *Leaves* dispersed along branchlets, chartaceous to (sub)coriaceous, apex more or less acuminate, base cuneate, petioles 1—2 cm long, terete to sulcate above, glabrous to ferruginous pubescent; blade 5.5—12 by 1.8—4 cm, lanceolate to ovate-lanceolate, glabrous above, glabrous to sparingly tomentose along the basic part of the midrib below; midrib sunken above, prominent below; secondary nerves inconspicuous above, not prominent below, 10—16, straight, archingly joined near margin, starting from midrib at angles of about 60—75°, curving towards apex near margin; tertiary nerves hardly visible, especially above, more or less parallel to secondary ones, descending. *Inflorescences* in axils of leaves, 2—7-florous, pedicels 0.7—1.2 cm long, sparingly pubescent. *Sepals* 0.45 by 0.3—0.4 cm, triangular, as Ion? as wide or longer than wide, apex acute to rounded, pubescent to subglabrous, to some degree ciliated at margins, especially inner ones. *Corolla* sometimes exsert, 0.5—0.7 cm long, tube 0.2—0.3 cm long, lobes 7—8, oblong, apex obtuse acute to rounded. *Stamens* 16, 0.2—0.3 cm long, filaments short or longer and slender, pubescent, apex of connective acute to

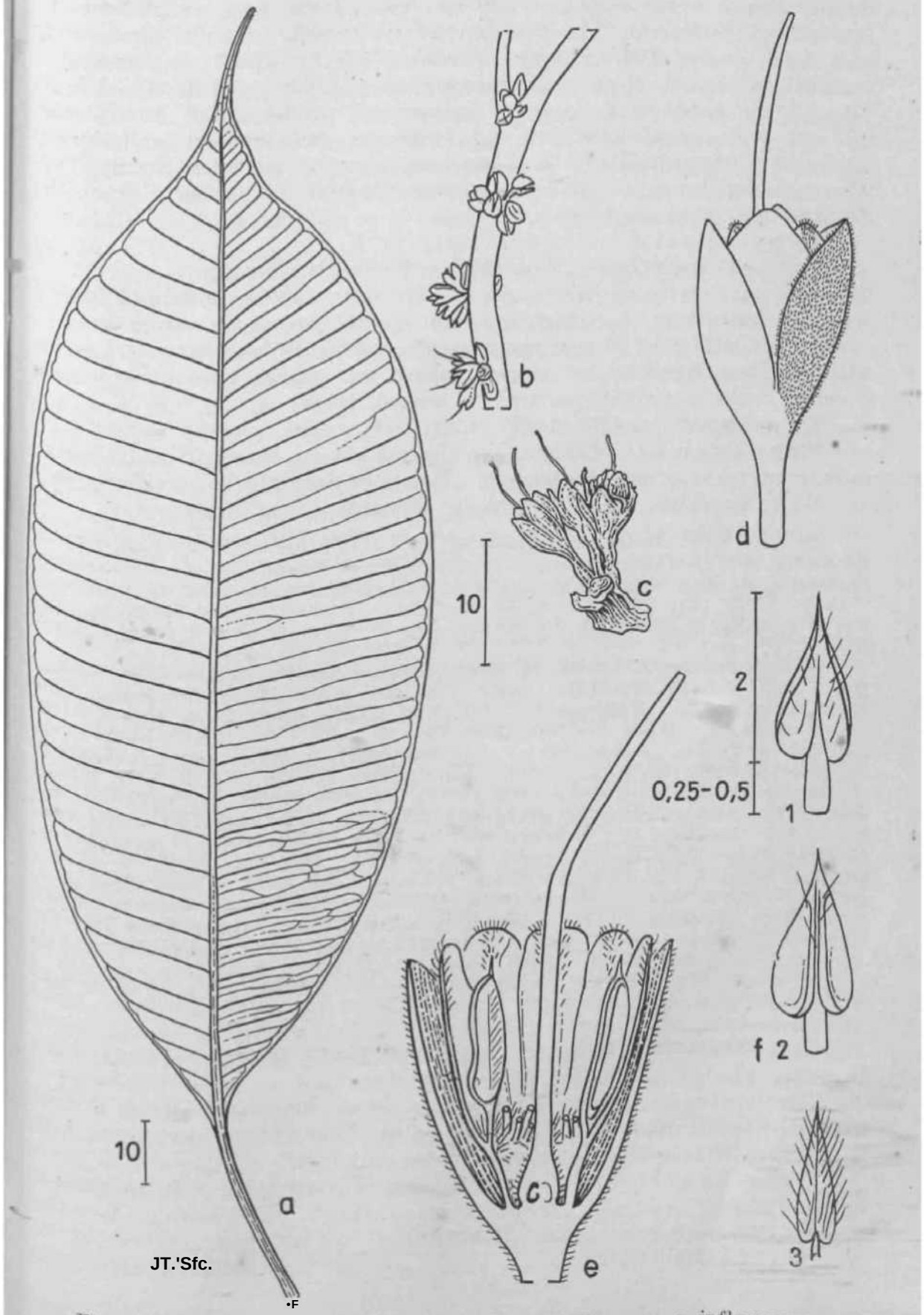


Fig. ID *p lam*, »•* **tea*J b. bmnchlel with inftorescenees; •.** inflorescnee with four olfwe»•, **iflower: e. tongitudina] leetion through flowers C. BtameiiB, 1.** vpntml, 2. dorsal **view,** 3. stamen fvom immature flower. From *Everett s. n.,* b., d.—f. from drawi"|« bj **Gbiffioen.**

obtuse, thecae ovate oblong. *PistMum* 0.7—1.2 cm long, subglabrous to ferruginous pubescent, base villous; ovary broadly conoidal, pubescent, cells 6—8, ovules .0.04 cm' long. *Fruits* 3—4.5 by 1—2.2 cm, acuminate rounded to beaked, appressed pubescent to glabrous; seed 1, 2.2—2.7 by 0.9—1.3 cm, long ovoid, laterally compressed, nitidous dark brown, scar 0.75 cm wide, cotyledons flat and foliaceous, radicle short, cylindrical; somewhat thickened pedicels 1—2 cm long, glabrous, persistent sepals 0.3—0.5 cm., subglabrous to glabrous, persistent style very short, gradually merging into apex of fruit.

Type specimen: *Aniff 15541* in K.

Distr.: Indo-China, Siam, Malay Peninsula, Sumatra,

the basic part of the midrib below; midrib sunken above, prominent below;

Var. **lanceolata** — Synonymy as in species, except *P. annamensis.*

Leaves with 10—16 secondary nerves; *sepals* as long as wide, *corolla* with 8 lobes, filaments of *stamens* short and rather thick, *ovary* with 8 cells; *fruits* acuminate-rounded to beaked, thick

Type specimen: *Aniff 15541* in K.

• Vern. names: chakhun, koon, pikul nok, p. thuan (Siam); beliau, ekor, ikor, mayang, nyatoh tanjong (Malay Peninsula); balam (Sumatra)-

Distr.: Siam, Malay Peninsula, Sumatra.

SUM. Suret, Bangbao: *Llewelyn Williams 17110* (L), height 30 m, fl. Feb. -" Nakawn Sritainarat, Trang, Chawng, evergreen jungle, 120 m: *Smitinand 4' Williams 17037* (L), height 20 m, fl. Jan.; Trang, Kachong, edge of forest: *Llewely* Williams 170S7* (L), height 35 m, fl. fr. Feb. — Puket, Kopah Bạngsack: *Moh Ilaniff 4- Moh. Nwr 2940* (BM, BO, KEP), height 17—20 m, fr. Dec. (types of *P. landfolia* H. J. Lam).

MALAY PENINSULA. Kedah, Bukit Dendong Reserve, Langkawi Isl.: *BakW Mai. FD 12486* (K, KEP, SING), height 20 m, girth 1.80 m, fl. fr. Apr. Sept.; Butf* Malut, Langkawi Isl.: *Wilkinson Mai. FD 17732* (KEP), height 21 m, girth 2 m, fl-Oct.; Gunong Raya Forest Reserve: *Abdul Ghani Mai. FD 47380* (KEP), height 13 m« girth 1.20 m, fr. Dec; ibidem, 300 m: *Aniff 15541* (K), fl. Feb.; ibidem: *Dolman Mcb FD 6780* (K, KEP, SING), fl. fr. Dec; ibidem: *Ishdk Mai. FD 7686* (K, KEP, SING)> fl. Jan.; ibidem, 170 m: *Mai. FD 71190* (KEP), height 40 m, girth 2.50 m, fl. fr. Feb.; ibidem: *Moh. Ynssoff Mai. FD 47674* (KEP), height 20 in, girth 1.20 m, fl. Feb.; Kolam Ayer, Langkawi Isl.: *Mohamed Mai. FD 42523* (KEP), height 10 m, girth 2 0* fl. Dec; Pulau Tuba Forest Reserve, Langkawi Isl.: *Dris Mai. FD 32909* (KEP)> height 13 m, girth 1 m, fr. Aug.; ibidem: *Jlaron Mai. FD 59650* (KEP), height 22 * girth 1.15 m, fl. Apr. — Kelantan, Kemahang North Forest Reserve, primary forest: *Mai. FD 65185* (KEP), height 25 m, girth 1.15 m; Panyik: *Bahty Mai. F0 68763* (KEP), height 20 m, girth 1.10 m; Pahang: Frasor Hill, 1300 m: *Mob Nur SF 11327* (BM, BO, K, SING), height 13—17 m, fr. Sep.**

SUMATRA. West Coast, Ophir, Watas Panti, Tjubadak, 930 m: *FBI bb 655S* (BO), height 31 m, diam. 0.40 in.

Var. **annamensis** (Lecomte) Van Bruggen, nov. comb. — *P. annamensis* Lecomte, Fl. Gén. Indo-Ch. 3, 7, 1930, 909.-

Leaves with 13—16 secondary nerves; *sepals* longer than wide. *Corolla* with 7—8 lobes, filaments of *stamens* rather long and slender, *ovary* with 6—8 cells. *Fruits* long acuminate to beaked, thin.

Type specimen: *Poilane 10170* in P (lectotype of *P. annamensis* Lecomte).

Vern. names: ca ta (Annamite).

Distr.: Indo-China.

IXDO-CIIINA. Nha-1rang, road from Nha-trang to Ninh-hoa, km 26: *Foilanc* (P)$_7$ f$_{r\#}$ Oct. — Phan rang, Baran: *Poilane 10170* (P), fl. Mar.

Remarks: We do not hesitate to unite as one species what has been considered to represent three different ones, viz, *P. annamensis, P. lanceolata,* and P. *lancifolia.* The present species has a rather wide range of variation, sometimes coming very near *P. lucida.* However, it can be distinguished immediately from that species-by the forking of the secondly nerves, which occurs comparatively near the edge of the leaf (in contrast with P. *lucida,* whore it occurs at some distance of the edge of the leaf).

In our opinion, according to the material at hand, we can subdivide into two varieties, one of which represents a taxon that is the most variable in the genus *Payena.* At the boundaries of their areas the taxa of many plants show a higher grade of variation. P. *laneeolata* var. *annwensis* is the only member of *Payena* that has 7—8 lobes in the corolla and 6—8 cells in the ovary.

Ridley's remark (Ridley 1. c, 93) "style and ovary glabrous" is not correct since I found these parts of the f lower to be pubescent in his type specimen. Wyatt Smith (I.e., 52) attaches importance to the pubescence of branchlets and leaves; we consider these characters in this case of less value, since older parts of the tree do no longer show this pubescence, which in young leaves only covers the basal part of the blade at the lower surface near the midrib and sometimes also near the secondary nerves.

In the Bogor Herbarium a specimen, *Bosch 4584,* labeled Java, Banjuwangi certainly belongs to the species under discussion, but I doubt very much whether the locality is correct.

The flowers and latex are white, the fruits green.

16. Payena selangorica King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, 2, Extra Nr., 1906, 175; idem, Addenda-Corrigenda, 1908, 873; Ridley, Fl. Mai. Pen. 2, 1923, 264; Lam 1925, 132; Lam 1927, 439 — *Fig. 11.*

Trees up to 7 m. *Branchlets* slender, terete, light brown, rough, sparingly pubescent, stipules caducous. *Leaves* dispersed along branchlets, chartaceo-coriaceous, apex acuminate, base cuneate, narrowly attenuate, petioles 1.5—2 cm long, channeled, short sparingly pubescent; blade 11—14 by 2.5—4 cm, oblong-lanceolate, glabrous above, red ferruginous pubescent below, especially along the midrib; midrib impressed and to some degree keeled above, prominent below; secondary nerves indistinct, especially below, 15—20 archingly joined near margin, starting from midrib at angles of about 80°, more or less straight, curving towards apex near margin; tertiary nerves visible but not prominent, near margin forming a *Ganua*-type Pattern, near midrib more or less parallel to secondary ones, descending etc. *Inflorescences* in axils of leaves, 2—3-florous, pedicels 0.5—2 cm long, reddish, short sparingly pubescent. *Sepals* 0.75 by 0.5 cm, ovate-acute, rather thick, pubescent. Other parts of flower unknown. *Fruits* 2.5 by 1.2 cm, ellipsoid, pedicels 1.6—1.9 cm long, persistent sepals 0.6—0.7 cm long, style persistent.

Type specimen: *Ridley 7387* in **SING.**
Distr.: Malay Peninsula, Selangor.

MAIJVY PENINSULA.. 9clangor, Bukit Kutu **woods:** *Bidlcy 7887 (type,* SING), height 7 m, fr. May, annot.: "In fruit no gutta".

Remarks: Only the type specimen of this evidently very rare

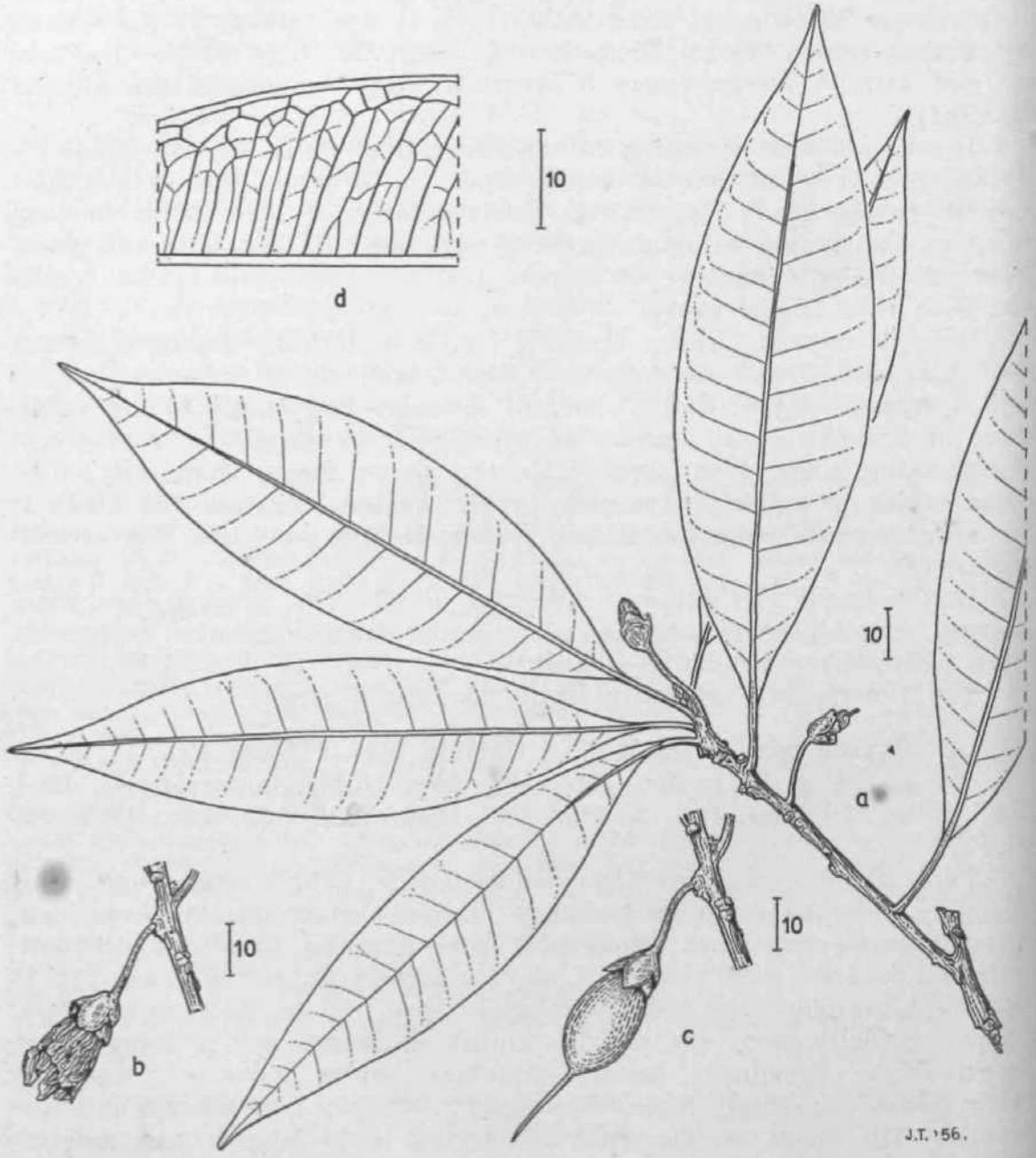


Fig. 11. *P. selrtngorioa,* a,]>randilct ivith leaves **and** very young fruits; **b. mato*"** fmit; <•. reconstruction of mature fruit; *6,* nervation of leaf. From type specimen, *Bidlcy 7S87,*

species is known. Unfortunately it contains, besides some leaves, only tin[1]" fruits (two immature, one mature) in very bad condition. Therefore t!i[f] **description** had to **be** extracted **partly** from the above-cited literature.

The species was described as a *Payena*. However, the status is still doubtful. According to the present material it could belong to *Madhtica* P[r] *Ganua* as well. If it is a species of *Payena* at all it should be placed [lr]i the neighbourhood of *P. lanceolata*, differing from that species by its larger leaves with no conspicuous acumen and the smaller fruits.

Doubtful species

P. ridleyi ftandoger, Bull. Soc. Bot. Prance 65, 1918, 56.

The original description runs as follows:

"*Payena Bidleyi* Gdgr. — A P. *costata* distineta foliis duplo majoribus non acuftunatis sed breviter acutis basi truncatis subtus glaucis, floribus 3—5-fasciculatis, pedi[po]llis glabris duplo brcvioribus, calycc non dentato styloquo longiorc.

HAB.: Asia merid., ad Singapore *(Eidley* n. 6698!).

Ex eodem cl. collectore, qui ingentem copiam plantanun peninsulac Malacca, Malaisia, [ta]< benevole mihi transmisit, specimina a praccedcntibus notis diversis typum ipsum [lo]forcntia."

Not having seen the type specimen we can not refer it to one of the known species; moreover, the description is quite insufficient. There is [a] possibility that it is identical with *P. maingayi* (1882), according to toe remark that the leaves are twice as long as those of *P. costata* = **> *lucida.***

8. New combinations

***Payena cambodiana* Lccomte = *Madhuca cambodiana* (Lecomte) Van Bruggen.**

9. Index of collectors numbers

Species have been indicated by their number between brackets.

„ Abdul Ghani Mai. FD 47380 (15); Achmad 61 (2), 273 (2), 544 · 13), 1079 (13), 1*29 (i3)> 1244 (2), 1306 (2), 1327 (13), 1498 (2); Ahera 5674 (11); Ahmad Mai. FD *[J6]1 (6), 5080 (6), 5097 (6), 5790 (6); Ahmady 1736 = Sar. FID S2722 (8); Ahmed *[m]- W; Alvins 47 (6), 248 (6), 569 (6), 886 (6), 894 (6), 1167 (6), 2150 (6), s.n. (6); person 1835 = Sar. FD 2683 (6); Andang 19 (11); Aniff 15541 (15), 16337 (11); Anonymous 2 (11), 3 (13), 5 (11), 11 (11), 1636 (6), 2007 (2), 2672 (6), 3912 (11), s.n. (!> 2, 6, 8, 11); Anta 554 (11), 903 = Kostcrmans 903 (11), 1083 = 2083 (11), 1218 W), 2083 = 1083 (11); Awang Mai. FD 29639 (8), 42391 (6); Awang Lela Mal. FD 2682 (6), 2688 (3).

k Bahty MaL FD 68763 (15); Barnard Mai. FD 1 (11); Barttett s.n. (11); J*cari 1818, vide Beccari 1848, 1848 (10), 2991 (6), s.n. (2, 11); Beguin 235 (11); JSrkhout s.n. (11); Beum6o 5672 (2), 6020 (2); Blume 239 (2), 1258 (2), s.n. (2); J*rlage s.n. (nj., Bosch 4584 (15). Brainier s. n. (11); ten Brummelcr 43 (4); 5»7[ant s.n.- (n)> •Burck s_n- (2» 8» n)> BurkiU Mai. FD 596 = Wlatson Mai. FD b* (3); BurkiU SiF 3240 (6); BurkiU & Holttum SF 7766 (1); Burkill & Haniff 2*- 17195 (6); Burkill & Moh. Haniff SF 16229 (6); Burn-Murdoch 11 (6), 29 (6), fil[J]" (8); Buurman van Vrceden 177 (11), 179 (11), 218 (11), 246 (11); Buwalda *[ii(J] O), 6608 (8).

Gelli 2filo Oantley 74 (6), 2633 (6), s. n. (3, 6); Oastro N. Born. FD 3793 (2); Cenabre, don & Paras For- Bar. 27877 (11); Clemens & Clemens 11258 (6), 26329 (6), 274-0 (5), 26330—27316 (5), 26715 (8), 27316 (5), 27405 (6), 27405—27974 (6), 3212 <5)» ^7974 (6), 28688 (6), 29351 (8), 30701 (8), 31220 (8), 31329 (8), 32050 (8), 3017 (8), 32187 (8), 40623 (8), 40761 (8), 40778 (6), 51322 (5); Corner SF 21318 (3), 302.4 (6), 30276 (6), 34961 = Ngadiman SF 34961 (6), 37734 (3); Cuadra N. Born. FD A 2163 (2)» A2436 (n)5 Curtis 777 (8)» 1516 (6)» 1565 (6)» 3483 (3)> 3631 (11), 3640 O1), 3644 (6), 3660 (6), 3687 6), s. n. (6, 11).

Bald 10857 (6); Delmaar 1150 (12), 2001 (11); Derry 54 (6), 461 (6), 654 (6);

Dolman Mai. FD 6780 (15); Dris Mai. FD 32909 (15); Dumas 1531 (11), 1558 (11), 1636 (2);

Eggn 1020 = Sar. FD A 0809 (11); Elmor 21236 (2), 21441 (2); Enchai MaL FD 48783 (2); Endert 227 (11), 2335 (12), 3453 (12); Enggoh Mai. FD 55118 (2); Enggoh N. Bom. FD 4608 (2); Errington dc la Croix 68 (11), 69 (11), 70 (11), 71 (11), 72 (11); Everett s. n. (14).

Flippancc s. n. (6); Forbes 2567 (9), 2947 (11), s. n. (2); For. Bur. 27877 (11); Fox 11.50.1 (6); Foxworthy 1155 (3), Mai. FD 652 (6); FRI 35 T 1 P 39 (2), 136 E3 P819 (2), 2001 (11), 2017 (6), 2121 (11), 2130 (6), 2131 (2), 11642 (11), bb-numbers 2666 (2), 2999 (2), 3143 (13), 4041 (11), 4869 (2)., 5299 (11), 5353 (2), 5468 (2), 5506 (2), 6065 (8), 6103 (2), 6161 (2), 6181 (2), 6558 (15), 7190 (9), 7733 (2), 8022 (6), 849.7 (2), 8550 (2), 8788 (2), 8837 (2), 8838 (2), 9221 (2), 9225 (2), 10257 (6), 10408 (6), 11106 (13), 11119 (13); 11434 (6), 11566 (11), 12118 (12), 12824 (11), 13474 (11), 13481 (11), 13779 (12), 14197 (12), 15786 (6), 15791 (6), 15864 (6), 16040 (2), 16041 (2), 16499 (12), 16522 (12), 16538 (12), 16574 (13), 16580 (13), 17150 (11), 17347 (11), 17552 (11), 18731 (2), 18760 (2), 18825 (2), 19151 (2), 19624 (13), 21152 (11), 22372 (13>, 22373 (13), 26030 (6), 26154 (6), 26158 (6), 26347 (11), 27452 (8), 27500 (8), 28093 (11), 28094 (11), 28095 (10), 28096 (10), 29333 (6), 30177 (2), 31665 (11), 31800 (6), 31976 (11), 33008 (6), 34050 = Kostennans 113 (11), 34104 = Kostcrmans 170 (11), 34149 = KostcrmanS 215 (11), 34373 (6), 34445 (6), 34505 (6), 34642 (7), 34909 (2), E1051 (12), Ja 1877 (2), Ja 1964 (2), Ja 2865 (2), Ja 3824 (2), Ja 6220 (2), Bi/I-15 (11), Ri/I-40 (8), SWK/I-10 (2), T3 P408 (2), T484 (11), T 570 (2), T1007 (11); TB 452 (12),

Goodenough 1268 (3), 1278 (6), 1427 (3), 1853 (6), 1977 (6), 3658 (6), 10545 (6)J Grashoff 78 (11), 504 (2), 736 (11), 1109 (4), 1152 (2); Griffith 3605 (6), s. n. (6).

Hallier 863 (2), 2310 (11); Hamid MaL FD 1591 (6), 5449 (6), 10615 (3), 11045 (6); Haron Mai. FD 59650.(15); van Harrcvcld HT 6353 (11); Hashim s. n. (6); Haviland 2098 (8), 3220 (8), 3032 (11), 3035 (7); Heifer 424 (6), 3611 (6); Henderson s. n. (6); van Hervraarden 19 (13); Hewitt 8. 5.1 (8); S. 5.2 (8); Heyne s. n. (2, 11)J Hochrcutiner 35 (11), 36 (2); Holmberg 794 (6), 804 (6); Holttum SF 9660 (6)1 Horsficld 191 (6); Houtcr s. n. (2); Houtsoorten Gedeh 87 (2); Hume 8766 (6)-

Idris Mai. FD 6319 (6); Isaac s. n. (6); Ishak Mai. FD 76*86 (15).

Jaamat MaL FD 28057 (6); Junghuhn 25 (6), 87 (2), 247 (2), s. n. (1, 2, 6)» Kadir N. Born. FD A 42 (2), A 659 (2); Kadir bin Abdul N. Born. FD A 2881 (2); Keith N. Bom FD 4608 (2); Kerr 648 (2), 5245 (6), 12576 (6), 14027 (6), 14845 (6), 16363 (6), 20375 (6); King's Collector 2611 (1), 2940 (7), 3275 (6), 3734 (6), 4081 (6)» 6630 (6), 7223 (3), 7842 (6), 7957 (6), 8705 (6), 9918 (3), 10466 (6), 10496 (6), 10978 (6); Koorders 10162 0 (2), 10164 0(2), 10165 0 (2), 10166 0 (2), 10167 0 *(2),* 1016S 0 *{2),* 10169 0 (2), 10170 0 (2), 10172 0 (2), 10173 0 (2), 10174 0 (2), 10175 0 (*)• 10176 0 (2), 10177 0 (2), 10178 0 (2, 10423 *0* (1), 10429 *0* (1), 10567 0 (13), 11103 *Q* (2> 121200 (2), 12121 0 (2), 14702 0(2), 14703 0 (2), 15230 *0* (2), 20779 0 (2), 20948 0 (2). 20974 *0* (2), 21841 *0* (2), 21844 *0* (2), 23926 0 (2), 23989 *0* (2), 24402 *0* (2), 25603 *0 (2),* 29084 *0* (2), 29085 *0* (2), 30412 *fi* (2), 30878 *0* (2), 32672 0 (2), 33811 *0* (2), 35052 *0* (2)' 37284 *0* (2), 38505 *0* (2), 38567 *0* (2), 39600 *0* (2), 39991 *0* (2), 40007 *0* (2), 40015 *0* (2> 400640 (2), Korthals H. n. (2); Kostcrmans 113 = FRI bb 34050 (11), 170 = FRI b* 34104 (11), 215 = FRI bb 34149 (11), 903 = Anta 903 (11), 4153 (13), 4408 (13)» 4947 (6), 6266 (2), 6747 (11), 6941 (6), 7331 (11); Krukoff 229 (2); Kura s. n. (6)'

Labohm 68b (11); Lakshnakara 394 (6), 648 (2), 669 (6); Lambach 1353 (11)5 Lambah Mai. FD 2713 (3); Langlassc* 3D0 (6); Low 523 (11).

Mahamud MaL FD 3713 (6); Maingay 990 (3), 2259 (8); MaL FD 1 (U)» 309 (3), 530 (6), 596 (3), 627 (3), 652 (6), 823 (6), 1591 (6), 1853 (6), 1874 (6> 1972 (6), 2067 (3), 2682 (6), 2688 (3), 2713 (3), 3650 (1), 3713 (6), 3926 (3> 3940 (6), 5061 (6), 5080 (6), 5097 (6),. 5449 (6), 5790 (6), 6319 (6), 6780 (lV» 7686 (15), 7785 (3), 9562 (6), 9593 (3), 10495 (6), 10615 (3), 10840 (6), 11045 (6)' 11604 (3), 12426 (15), 12491 (6), 12492 (6), 13774 (3), 15220 (6), 16570 (8), 17732 (15)' 22085 (6), 23746 (6), 23057 (6), 29302 (6), 29639 (8), 30118 (3), 32332 (6), 32909 (15)' 35954 (8), 36230 (6), 37558 (3), 39051 (6), 42391 (6), 42523 (15), 45468 (1), 47380 (lWi 47674 (15), 48783 (2), 50440 (3), 53689 (8), 55118 (2), 59650 (15), 62880 (6), 64880 *(ph^* 65185 (15), 65927 (8), 66373 (6), 66450 (6), 66509 (6), 67874 (3)," 68314 (3), 68763 (15)' 68769 (1), 69915 (8), 70077 (8), 70256 (8)', 71190 (15), 71387 (3), 73798 (3), 74151 (8)'

Haung Ba Pe 13046 (6); Meegan IV (11), X (11); Mejjcr 2565 (2); Mitchell MaL TO 309 (3); Mohamcd Mai. FD 42623 (15); Moh. Haniff 88 (6), 16337 (8), SF 3661 (6), SF 21095 (6), SF 21116 (3); Moh. Haniff & Moh. Nur 2940 (15); Moh. Hashim Mai. FD 10840 (6); Moh. Isa Mai. FD 10495 (6); Moh. Nur SF 405 (6), 1310 (6), 247 (6), 11327 (15), 11858 (6), s.n. (6); Moh. Nur & Kiah SF 7764 (6); Moh. Yakim Mai. FD 1972 (6); Moh. Yassin Mai. FD 39051 (6); Moh. Yussoff MaL FD 47674 (15); Motley IV (1364) (10), VIII (203) (10); Moysey & Kiah SF 33747 (2), 33749 (2); Muas 1745 = Sar. FD S 235 (8); Muliadi N. Born. FD A 809 (2); N. Born. FD 1750 (2), 3793 (2), 4311 (2'), 4353 (2), 4537 (2), 4608 .(2), 4887 (2), 2996 (2), 10076 (2), *0634 (2), 15145 (11), A 42 (2), A 659 (2), A 809 (2), A 2163 (2), A 2436 (11), A 2881 (2), A 4392 (6), A 4720 (2); Ngadiman SF 34961 = Corner SF 34961 (6), 35800 (11), *6421 (6); Ngah MaL FD 32332 (6); NoltSe 4018 (2).

Omar 131 = Sar. FD 00077 (11); Omar MaL FD 15220 (6); Osman Mai. FD 29302 (6); Otik N. Born. FD 4353 (2).

Parkinson 5299 (6); Paymans 9 (7); Pawangec Mai. FD 13774 (3); Poilane 3319 (15), 10170 (15); Price s. n. (11); Puasa N. Born. FD 4887 (2).

Baciborski 324 (2); Bahim MaL FD 12426 (15); Rahman MaL FD 823 (6); Jhodine s.n. (2); Ridley 3995 (6), 4959 (8), 5070 (6), 5644 (6), 6135 (6), 6213 (6), 6239 ((3), 6497 (3), 6503 (6), 6508 (6), 6696 (3), 7387 (16), 9203 (8), 9701 (6), J1331 (11), H371 (3), s.n. (6); Biedel 8.n. (2); van Bomburgh 3 (11), 5 (11), 17 (11), 19 (11), *27* (11), 31 (11), 32 (11), 37 (11), 62 (11), 66 (11), ». n. (4, 11).

Saleh MaL FD 3926 (3); Sales N. Born. FD 4311 (2); Sar. FD 00077 = Omar 131 (11), 2683 .= Anderson 1835 (6), A 0809 = Egon 1020 (11), S235 = Muas 1745 (8), £0528 (6), S0534 (6), 0671 (8), S 0684 (6), S2722 = Ahrnady 1736 (8), S2768 (8); ^cortechini 346b (3), 1989 (6); Seligmann s. n. (11); SF 405 (6); 1310 (6), 2247 (6), *240 (6), 3661 (6), 7764 (6), 77<56 (1), 6990 (6), 11327 (15), 11858 (6), 16229 (6), 17195 (6), 21095 (6), 21116 (3), 21318 (3), 29663 (3), 30274 (6), 30276 (6), 33747 (2), 3749 (2), 34961 (6), 35800 (11), 35908 (8), 36421 (6), 35431 (8), 36456 (8), 37734 (3), 663 (3), 40099 (6), 40588 (3), 40595 (6), 40905 (6); Sham MaL FD 23746 (6); ^nclair SF 40099 (6), 40588 (3), 40595 (6); Sinclair & Kiah bin SaUeh SF 40905 (6); Smith MaL FD 3940 (6), s.n- (11); Smitinand & Williams 17037 (15); St. Pol Lias & 2e la Croix 272 vide St. Pol Lias & de la Croix 292, 292 (13), 317 (11), s.n. (11); ^tadtmiUer 47 (11), 79 (1), 102 (11), 105 (1), 113 (11), 119 (11), s. n. (11); van »toenis 9405 (1); Strugncll MaL FD 12491 (6), 12492 (6), 16570 (8); Symington Mai. *V* 36230 (6), 45468 (1).

Tahir MaL FD 627 (3); Teysmann 3214 (11), 3730 (2), 3912 ^11), 14610 (11), s.n- (2, 6, 11); Teysmann & de Vriese s.n. (2); Tromp s.n. (11).

Vermoesen 2151 (11); de Vriesc XVI (6), 81 (2), s.n. (2, 6, 11, 13); de Vriese * Teysimann s. n. (2).

Wallich 4147 (6); Walton MaL FD 22085 (6); Watson MaL FD 530 (6), 596 = e^rkill MaL FD 596 (3); Wight s.n. (11); Wilkinson MaL FD 17732 (15); Llewelyn y^Uiams 17037 (15), 17110 (15), 17113 (3); Winckel 248 *0* (2), 268 (2); Wind 4018 W; Wood N. Born. FD 15145 (11), A 4720 (2); Wood & Wyatt Smith N. Born. FD 5 23 (11), 1170 (6), 3423 (3), s.n. (6, 11); Wyatt Smith MaL FD D-«80 (6,) ©4880 (6).

Yates 1687 (2), 2027 (1), 2575 (2), 2641 (1); Yeop MaL FD 3650 (1).

De Zylva MaL FD 9593 (3).

10. Index of species described under Payena

a(J*uminata* (Blume) Pierre, Bull. Mons. Soc. Linn. • Paris, 1885, 528, this publication species no. 2.

amensi8 Lecomte, Fl. *G6n.* Indo-Ch. 3, 7, 1930, 909 = P. lanceolata Bidley var. annajnsnsis (Lecomte) Van Bruggen, sp. 15.

&tte Lecomte, MS-name in Paris Herbarium, no corresponding specimen.

(Miquel) Pierre, Bull. Mcns. Soc. Linn. Paris, 1«85, 530 = P. acuminata, fide Lttm 1925> SP- 2-

siit Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 54 = *Ganua motleyana* (de Vriese) Pierre ex Dubard, fide Lam 1925.

n Scheffer, Ann. Jard. Bot. Buitenz. 1, 1876, 33 = *Burckella obovata* (Forster) Pierre, vide Lam & Van Boyen, Blumea 6, 1952, 588.

beccarii Engler, Bot. Jahrb. 12, 1890, 508 = *Madhuca beccarii* (Engler) H. J. Lam, fide Lam 1925.
beccarii Lecomte, MS-namc in Paris Herbarium, typo of *Gonna beccarii* Pierre (label by Lam).
beccarii Pierre, Bull. Mcns. Soc. Linn. Paris, 1885, 525 = P. microphylla (Dc Vriese) Pierre, sp. 10.
benjamina (De Vriese) Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 524 = P. lecrii (Teysmann & Binnendijk) Kurz, sp. 11.
betis (Blanco) Villar, Nov. App., 1880, 125 = *Madhuca betis* (Blanco) Macbride, fide Lam 1925.
boerlageana Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 54 = *Ganua boerlageana* (Burck) Pierre ex Dubard, fide Van den Assem, Blumea 7, 1953, 385.
cambodiana Lecomte, Fl. G6n. Indo-Ch. 3, 7, 1930, 912 = *Madhuca cambodiana* (Lecomte) Van Bruggen, comb. nov.
chrysocarpa Lecomte, MS-name in Paris Herbarium, no corresponding specimen.
clarlcii Pierre, MS-namc in British Museum (Natural History) = *Madhuca sericea* (Miquel) H. J. Lam, fide label.
cochinchinensis Pierre, MS-name in Paris Herbarium = *Madhuca cochinchinensis* (Pierre ex Dubard) H. J. Lam.
costata King MS ex King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, 2, Extra Nr., 1906, 172 = P. lucida (Don) DC, sp. 6.
croixiana Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 5254 = P. lcerii (Teysmann & Binnendijk) Kurz, sp. 11.
dantung H. J. Lam, Bull. Jard. Bot. Buitenz., se*r. 3, 7, 1925, 134, sp. 4.
dasyphylla (Miquel) Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 527, sp. 1.
dongnaiensis (Pierre) Engler, Nat. Pfl. Fam. 4, 1, Nachtr., 1897, 272 = *Aesandra dongnaiensis* Pierre.
elliptica (Pierre ex Dubard) Lecomte, Fl. Ge''n. Indo-Ch. 3, 7, 1930, 913 = *Madhuca elliptica* (Pierre ex Dubard) H. J. Lam.
endcrtii H. J. Lam, Bull. Jard. Bot. Buitenz., scr. 3, 7, 1925, 144, sp. 12.
engleri Merrill, J. As. Soc. Straits, Spec. Nr., 1921, 477 = *Madhuca beocarii* (Engler) H. J. Lam, fide Lam 1925.
cugeniifolia (eugeniaefolia) King ex Moore, J. Bot. 63, Suppl., 1925, 61 = P. pseudo-terminal is H. J. Lam, sp. 9.
firma (Picrro ex Dubard) Lecomte, Fl. Gén. Indo-Ch. 3, 7, 1930, 913 = *Madhuca firma* (Pierre ex Dubard) H. J. Lam.
flonbunda (Pierre ex Dubard) Lecomte, Fl. Gén. Indo-Ch. 3, 7, 1930, 910 = *Madhuca floribunda* (Pierre ex Dubard) H. J. Lam.
fusicarpa Elmer, Leafl. Phil. Bot. 8, 1915, 2820 = *Madhuca burdkiana* (Koorders) H. J. Lam, fide Lam 1925.
gigantea K. Griffiocn & H. J. Lam MS = P. gigas Van Bruggen, sp. 5.
gigas Van Bruggen, sp. 5.
glabra H. J. Lam, Bull. Jard. Bot. Buitenz., se*r. 3, 7, 1925, 148 = P. lowiana Pierre, sp. 13.
glabrata King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, 2, Extra Nr., 1906, 174 = P. lucida (Don) DC, sp. 6.
glutinosa Pierre, Bull. Mcns. Soc. Linn. Paris, 1885, 529 = P. lucida (Don) DC, sp. 6.
grandiflora Ridley, J. As. Soc. Straits 61, 1912, 28 = P. maingayi Clarke in Hooker, sp. 3.
griffithii Kurz, For. Fl. Brit. Bui-ma 2, 1877, 121 = *Talaquium hexandrum* (Griffith) Engler.
griffithii Pierre, Bull. Mcns. Soc. Linn. Paris, 1885, 525 = P. lucida (Don) DC, sp. 6.
havilandU (havilandi) King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, 2, Extra Nr., 1906, 169 = P. obscura Burck, sp. &
hillU (hilli) J. G. Baker, J. Linn. Soc. London, 20, 1883, 368 = *Burckella hillii* (J. & Baker) H. J. Lam, vide Lam & Van Boyen, Blumea 6, 1952, 583.
insignis Badlkofer, MS-name in Geneva Herbarium = *Madhuca. insignis* (Radlkofer) H. J. Lam.
junghuhniana (De Vriese) Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 530 = P. acuminat* (Blume) Pierre var. acuminata, sp. 2.
lorlaa Pierre, MS-namo in Paris Herbarium = P. cf. lucida (Don) DC, sp. 6.

korthalmi Pierre, MS-name in Kcw Herbarium, orrorc *Tcorthalsiana* = *Madhuca Tcorthalsii* (Pierre) H. J. Lam.

lamii Van Bruggen, sp. 14.

hmponga (Miquel) Burek, Ann. Jard. Bot. Buitcnz. 5, 1886, 59 = P. leerii (Teysmann & Binnendijk) Kurz, sp. 11.

lanceolata H. J. Lam, Bull. Jard. Bot. Buitenz., sér. 3, 7, 1925, 146, forma of P. lucida (Don) DC var. *wightU* (Hasskarl) Clarke in Hooker = P. lucida (Don) DO, sp. 6.

lanceolata Merrill, Bur. Gov. Lab. Bull. 17, 1904, 42 = *Madhuca lanceolata* (Merrill) Merrill, Knum. Phil. Plow. PI. 3, 3, 1923, 276.

lanceolata Ridley, J. As. Soc. Straits, 79, 1918, 93, sp. 15.

lancifolia Burck, Med. Lands PI. tuin Buitenz. 3, 1886, 41 = *Madhuca landfolia* (Burck) H. J. Lam, fide Lam 1925.

lanoifolia H. J. Lam, Bull. Jard. Bot. Buitenz., sér. 3, 7, 1925, 147 = P. lanceolata Ridley, sp. 15.

kWfolia Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 58 = *Gamia motleyana* (De Vriese) Pierre ex Dubard, fide Lam 1925.

leerii (Teysmann & Binnendÿk) Kurz, J. As. Soc. Bengal 40, 2, 1871, 69, sp. 11.

l°ngipcdicellata *(longipedwwulata* Brace, in indice 1909, 900), Brace ex King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, 2, Extra Nr., 1906, 169, sp. 7.

hngipetiolata Kurz, J. As. Soc. Bengal 40, 2, 1871, 69 = *Ganua motleyana* (De Vriese) Pierre, fide Lam 1925.

Jowiana Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 525, sp. 13.

lucida (Don) DC, Prodr. 8, 1844, 197, sp. 6.

lucida Herb. Traj. ex Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 526 = P. lucida (Don) DC, sp. 6.

lucida Herb. Paris ex Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 525 = P. lowiana Pierre, sp. 13.

macrophytta (Hasskarl) Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 51 = *Madlmica macrophylla* (Hasskarl) H. J. Lam, fide Lam 1925.

maingayi Clarke in Hooker, Fl. Brit. India 3, 1882, 547, sp. 3.

Qlabarica (Beddome) Pierre ex Dubard, Rev. Gen. Bot. 20, 1908, 200 = *Madhuca neriifolia* (Moon) H. J. Lam, fide Lam 1925.

laooensis Clarke in Hooker, Fl. Brit. India 3, 1882, 547 = *Madhuca malaccensis* (Clarke in Hooker) H. J. Lam, fide Lam 1925.

menteelU K. Schumann, Notizbl. Berl. Bot. Gart. 1, 1895, 102 = *Burokella obovata* (Forster) Pierre, fide Lam & Van Royen, Blumea 6, 1952, 588.

'nicrophylla (De Vriese) Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 531, sp. 10.

inollis Pierre ex Dubard, Rev. Gen. Bot. 20, 1908, 204 = P. maingayi Clarke in Hooker, fide Lam 1925, sp. 3.

moonii sine auctore, MS-name in Paris Herbarium, sheet with damaged fruit only; cf. *Madhuca moonii* (Thwaitcs) H. J. Lam.

multiUneata Burck, Med. Lands. PI. tuin Buitenz. 3, 1886, 42 = I *Tristania* spec. (Myrtaceae), fide Lam 1925. Non Sapotaceae.

nanil Pierre, MS-name in British Museum (Natural History) = *Madhuca insignia* (Radlkofer) H. J. Lam.

*ner**/oKa* Radlkofer, MS-name in Geneva Herbarium = *Madhiwa nertifolia* (Moon) H. J. Lam.

ffra King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, 2, Extra Nr., 1906, 173, var. of P. lucida (Don) DC = P. lucida (Don) DC, sp. 6.

0ropunctata Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 53 = *Neesia altissima* Blume (Bombaeaceae), fide Lam 1925.

Jfccura Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 60, sp. 8.

vxifolia King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, 2, Extra Nr., 1906, 175 = *Madhuca spec.*

**fera* Prain & Watt, MS-name in Kew Herbarium = *Ganua motleyana* (De Vriese) Pierre ex Dubard, det. Lam & Van Bruggen.

nata Moore, J. Bot. 63, Suppl. 1925, 61 = P. acuminata (Blume) Pierre var. pulchra ((Burck) H. J. Lam, sp. 2.

vata H. J. Lam, Bull. Jard. Bot. Buitenz., sér. 3, 7, 1925, 146, forma of P. lucida (Don) DC var. *wightii* (Hasskarl) Clarke in Hooker = P. lucida (Don) DC, sp. 6.

ttteloneura Kurz, J. As. Soc. Bengal 40, 2, 1871, 70 = P. lucida (Don) DC, sp. 6.

parvifolia Engler, Bot. Jahrb. 12, 1890, 508 = P. microphylla (De Vriese} Pierre, sp. 10.
polyandra (Wight) Bentham & Hooker, Gen. Plant. 2, 1876, 659 = F. lucida (Don) DC, sp. 6.
poutie Pierre, MS-name in Paris Herbarium = P. lowiana Pierre sp. 13.
prolixa (Pierre ex Duhard), MS-name in Paris Herbarium = *Gawua prolixa* Pierre ex Dubard.
pseudoterminalis H. J. Lam, Bull. Jard. Bot. Buitenz., s£r. 3, 7, *1925, 260,* sp. 9.
puberula (Miquel) Pierre Bull. Mens. Soc. Linn. Paris, 1885, 529 = P. lucida (Don) DC, ap. 6.
pulchra (Burck) auctores, MS-name in Leiden Herbarium = P. acuminata (Blume) Pierre var. pulchra (Burck) H. J. Lam, sp. 2.
punctata Fletcher, Kew Bull., 1937, 379 = P. lucida (Don) DC, sp. 6.
ridleyi Gandoger, Bull. Soc. Bot. France 65, 1918, 56 = f
rigoso punctata sine auctore, MS-name in Bogor Herbarium = *Neesia of. altissvmv* Blumo (Bombacaceae), fide B. C. Bakhuizen van den Brink Jr.
rubropedieellata Burck, Aim. Jard. Bot. Buitenz. 5, 1886, 55 = *Ganua mvtleyana* (De Vriese) Pierre, fide Lam 1925.
solangorica King & Gamble, Mat. Fl. Mai. Pen. 17, J. As. Soc. Bengal 74, *2,* Extra Nr., 1906, 175, sp. 16.
sericea De Vriese errore in Indice Kewense, fide Lam 1925.
sericea Bentham & Hooker, errore quoad auctores, fide Lam 1925.
serioea (Blume) H. J. Lam, Bull. Jard. Bot. Buitenz., s£r. 3, 7, 1925, 139 = P. acuminata (Blume) Pierre var. acuminata, sp. 2.
serioea Miquel, Fl. Ind. Bat. *2,* 1859, 1039 = *Madhuea serioea* fMiquel) H. J. Lam, fide Lam 1925.
sessilis King & Gamble, Mat. Fl. Mai. Pen., 17, J. As. Soc. Bengal 74, *2,* Extra Nr., 1906, 174 = *Ganua sessilis* (King & Gamble) H. J. Lam, vide Van den Assem, Blumea 7, 1953, 387.
stipularis Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 48 = P. acuminata (Blume) Pierre var. pulchra (Burck) H. J. Lam, sp. 2.
.*sumatrana* Miquel, Fl. Ind. Bat. Suppl., 1860, 582 = P. acuminata (Blume) Pierre var. pulchra (Burck) H. J. Lam, sp. 2.
miring ariana Burck, Ann. Jard. Bot. Buitenz. 5, 1886, 49 = P. acuminata (Blume) Pierre var. acuminata, sp. 2.
teysmanniana Pierre, Bull. Mens. Soc. Linn. Paris, 1885, 527 = P. acuminata (Blume) Pierrre var. pulchra (Burck) H. J. Lam. sp. 2.
thorellii (Pierre ex Dubard) Lecomte, Fl. Gen. Indo-Ch. 3, 7, 1930, 910 = *Madhuea thorellU* (Pierre ex Dubard) H. J. Lam.
truncata K. Griffioen & H. J. Lam MS — P. lamii Van Bruggen, sp. 14.
utilis Ridley, J. As. Soc. Straits 79, 1918, 94 = *Madhuea utilis* (Ridley) II. J. Lam, fide Lam 1925, 1927.
vulcanica Ridley, J. As. Soc. Mai. Br. 1, 1923, 77 = *Madhuoa* spec.
wightii (Hasskarl) Clarke in Hooker, Fl. Brit. India 3, 1882, 548, var. of P. lucida (Don) DC = P. luoida (Don) DC, sp. 6.

11. Synonyms described under genera other than Payena

Azaola LeerU Teysmann & Binnendijk = P. leerii (T. & B.) Kurz.
Bassia braoeana King & Gamble = (partim) *P. luoida* (Don) DC.
Bassia caudata Ridley = P. dasyphylla (Miq.) Pierre.
Bassia sericea Blume = P. acuminata (Bl.) Pierre var. acuminata.
Diploknema grandiflora (Ridley) H. J. Lam = P. maingayi Clarke in Hook.
Isonandra dasyphylla Miquel = P. dasyphylla (Miq.) Pierre.
Isonandra microphylla De Vriese = P. microphylla (De Vr.) Pierre.
Isonandra puberula Miquel = P. lucida (Dn) DC.
Isonandra pulchra Burck = P. acuminata (Bl.) Pierre var. pulchra (Burck) H. J. Lam.
Isonandra smmatrana (Miq.) Burck = P. acuminata (Bl.) Pierre var. *pulchra* (Burck) H. J. Lam.
***Keratophorus wightii* Hasskarl = P. *lucida* (Don) DC.**
Madhuea caudata (Ridley) H. J. Lam = P. dasyphylla (Miq.) Pierre.
Mimusops acuminata Blume = P. acuminata (Bl.) Pierre var. acuminata.
Mimusops huida Don = P. lucida (Don) DC.

REVISION OF THE 8APOTACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

XVI[1]). Aesandra Pierre

by

A. C. VAN BKUGQEN

(Division of Entomology, Pretoria)

(Issued 1. VII. 1958)

For many years the monotypical genus *Aesandra* was incorporated in *Paxjena* (vide Lam 1925, 1927) or *Madhuca (Bassia* sensu Lecomte, 1930). Revising the genus *Payena* we came across specimens, that did not fit in the diagnosis of either genus; it appeared that the specimens in question showed a mixture of the characters of both *Payena* and *Madhuca*, and also some characters of their own. These we found to belong to what has been described as *Aesandra.* The only species is *A. dongnaiensis* Pierre, 1890. It is our impression that *Aesandra* is to be maintained as a separate genus of the Madhuceae (cf. Lam, Rec. Trav, Bot. Neerl. 36, 1939, 525).

We examined material from the following herbaria: British Museum (Natural History) at London (BM), Rjjksherbarium at Leiden (L) and Muséum National d'Histoire Naturelle, Ehanérogamie, at Paris (P) and are very much obliged to the authorities of these institutes for the loan of specimens and the hospitality enjoyed during our stay in 1955 at Paris and London.

In the taxonomical part the following abbreviations are used:

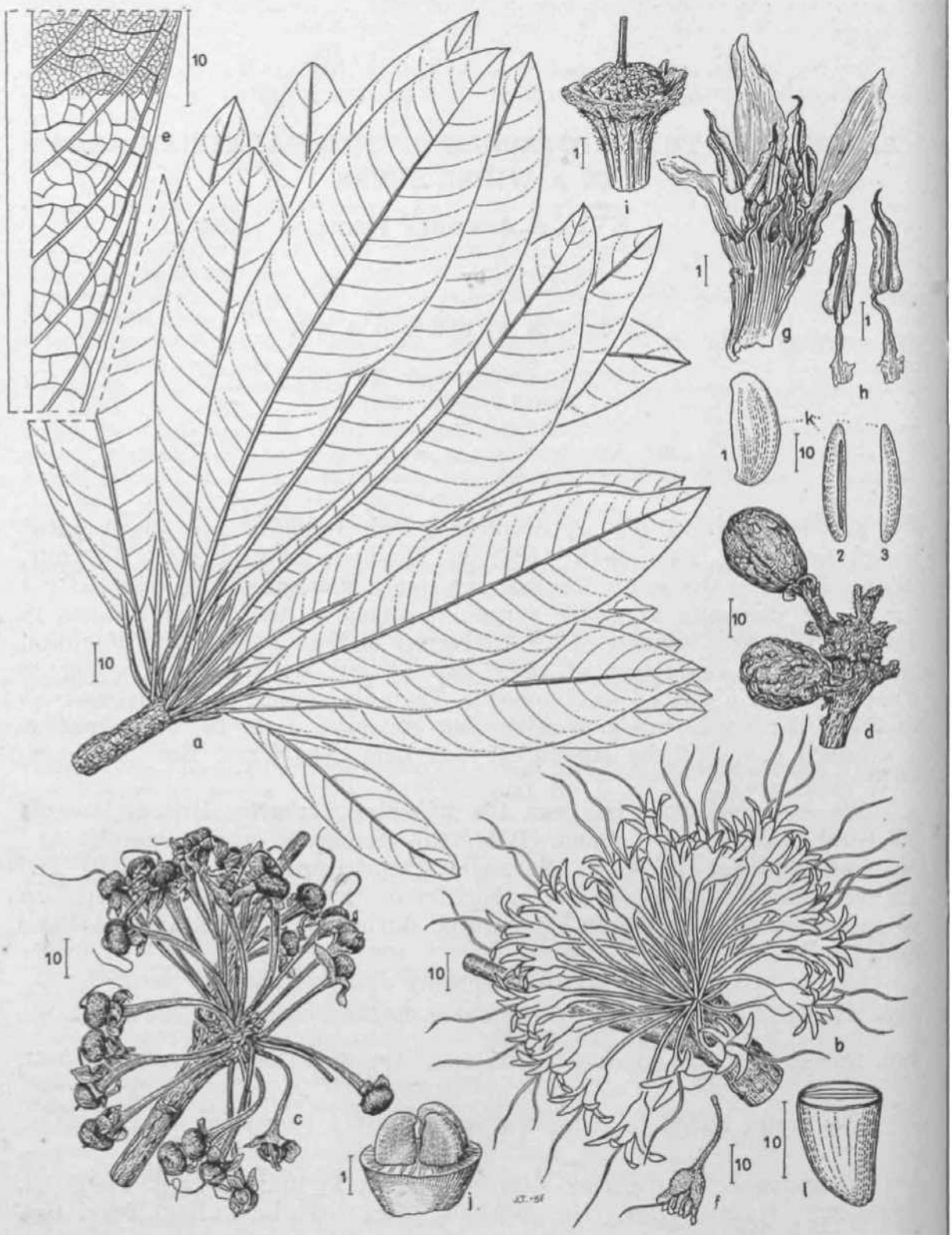
Lam 1925 = H. J. Lam, The Sapotaceae etc. of the Dutch East Indies, Bull. JaTd. bot. Bzfc, sè>. 3, 7, 1925, 1—*289.*

Lam 1927 = H. J. Lam, Further studies etc., Bull. Jard. bot. Bzg, sir. 3,[f] 8, 1927, 3^1—493.

The scales added to the drawings are given in millimeters.

Aesandra L. Pierre, Not. Bot. Sap., 1890, 1; Baillon, Hist. Plant. 11, 1891, 302; Dubard, Rev. Gén. Bot. 20, 1908, 204; Lam, Rec. Trav. Bot. Neerl. 36, 1939, 520; sub *Payena:* Bugler, Pflanzenfam. 4, 1, Nachtr.,

[1]) I—III in Blumea VI, 3, 1952, 547—595; IV—V in Blumea VII, 2, 1953, 364—412; IVa in Blumea VII, 3, 1954, 481—483; IIa, IVb, Va, VI—IX in Blumea VIII, 2, 1957, 201—513; X—XII in Nova Guinea N. S. 8, 1, 1957, 87—128; XIII—XVI in the present issue.



Fig, 1. *Arttandra* ***dongnaiensis, a.,*** **branehlet** with loaves, h. **branchlet** with **flowers, <•. bnmchlet** with yotiuy fruits, <1, **hmnchtel with mature** finits, e. nervation of leaf, f, **flower, g.** part **of corolla, Inside, *h.* stamens^** i. ovary, **j.** fruit **with three** seeds, **k. 1. MP(11, lateral** view, k. *2.* **seed, ventral view, k.3.** seed, **dorsal** view, 1. s«?od, **cross* Etedoon. (sch^a. a, f,-i.** from ***Chevalier*** *$6X74,* **b, <, \.<-\. adapted after a drawing of E, Detpy in the Pwis herbariom, e.-i** from **Ketre** *s%£8).*

1897, 272; Lam 1925, 130; sub *Bassia:* Lecomte, Flore Gén. Indo-Ch. 3, 7, 1930, 904; sub *Madhuca:* Baehni, Candollea 7, 1938, 416.

Corresponding with *Payena* in the abundant albumen and the thin flat cotyledons in the seed and with *Madhuca* in the nervation of the leaves and the number of sepals, petals, stamens and cells of the ovary. Differing from both genera by the number of seeds (3—6) in the fruit[1]). Monotypical.

Type species: *Aesandra dongnoiensis* Pierre.

Distr.: One species in Indo-China.

1. **Aesandra dongnaiensis** Pierre, 1. c, 2; Dubard, 1. c, 204 — *Payena dongnaiensis* (Pierre) Bngler, Engler, I.e., 272; Lam 1925, 151; Lam 1927, 443 — *Bassia dongnaiensis* (Pierre) Lecomte, Lecomte, 1. c, 904 — *Madhuca dongnaiensis* (Pierre) Baehni, Baehni, I.e., 416. On several labels were found the names *Mixandra* Pierre (= *Dipkknema* Pierre), *Centrorhxza* Pierre MS and *Centrorizia* Pierre MS. — *Fig. 1.*

Trees up to 25 m, with reddish wood. *Branchlets* terete, thick, diameter 0.7—1 cm, with rough bark. Stipules absent or caducous; scars of leaves and flowers crowded at regular distances, thick and tuberculate. *Leaves* crowded at tips of branchlets, obovate-lanceolate, widest somewhat above the middle, subcoriaceous, more or less acuminate, base cuneate; Petioles 2—3.5 cm long, winged towards blade, canaliculate, glabrous, in young leaves densely ferruginous pubescent at base; blade 12—20 by 2.5—5.5 cm, glabrous except traces of a short pubescence near the midrib both above and below; midrib somewhat sunken above, prominent below, conspicuous; secondary nerves less conspicuous above, prominent below, Id—lb, starting from midrib at angles of about 60°, rather straight, curving towards apex near margin, ultimately thin and more or less parallel to edge of leaf; tertiary nerves comparatively faint, starting from midrib, forming a reticulate pattern. *Inflorescences* axillary, just below the leaves of the same season, multiflorous; pedicels 1.5-2.5 cm long, with short ±erruginous Pubescence, thickened towards flower. *Calyx* with very short tube, sepals 4 or 5»), 0.9—1.1 by 0.4—0.5 cm, ovate-lanceolate, apex bluntly acute, Pubescent at both surfaces. *Corolla* exsert, 0.6-1.3 cm long, with short tube, which is 0.2-0.4 cm long, glabrous, lobes 11 or 12, long ovate, blunt at tips. *Stamens* 18-.24, pluriseriate, glabrous, 0.35-0.6 cm long, filaments not very short, thin, apex of connective acute or bifid, thecae oblong-tnangula? *Ovary* hemispheroid, glabrous, cells 12, rarely 11, with one ovulum each, attached somewhat above the middle of the centra 1 axis; *style* 1-8-2.2 cm long, subulate, glabrous. *Frmts* [illegible] funded or ovate, never acuminate, young fruits more hemispheroid, glatwous; seeds 3-6, 2-2.6 by 1-1.2 cm, oblong, laterally compressed, scar linear, narrow, 0.1 cm wide, not reaching as far as tips of seed; cotyledons flat and foliaceous, narrow, ovate-oblong, radicle comparatively long, some-

[illegible] *Pauena* 1—2 *Madhuca* 1—3 seeds in the fruit.

[illegible] *TZL* [illegible] *Cavalier S6174* (P). I found the annotation "sur un autre specimen 7 l o W ; if correct, an unusual observation indeed.

what exsert, inferior, thick; albumen abundant; thickened pedicels with traces of pubescence, 1.5—4 cm long, persistent incrassate sepals 0.5 by 0.6—1 cm, style persistent in young fruits, generally broken off in mature fruits (herbarium specimens).

Lectotype specimen: ***Pierre 3228*** **in P.**

Vern. names: Mo-cua, Mu-cua, Xung dao (Annamite).

Uses: Wood used by natives.

Distr.: Indo-China.

INDO-CHINA. **Bien-hoa, near cataracts of Tri huyen, Dong nai river, forest:** ***Pierre S228*** **(BM, L, P), fl. fr. Jan., height 20^-25 m; Bien-hoa only:** ***Chevalier 36X74*** **(P), fl. Jan.; Chuachan:** ***Chevalier 36739*** **(P), fr. March.**

PRECURSORY STUDIES ON MALAYSIAN MOSSES
II. A PRELIMINARY KEY TO THE MOSS GENERA')

by

R. VAN DEE WIJK

(Botanical Laboratory, University of GroningenJ

(Issued 1. VII. 1958)

1. Introduction

For identifying the mosses collected in different localities of the Malaysian region, the need was felt for a key to the genera. In the l^eliminary one that I constructed to this end the genera were taken in I;[1]? delimitation accepted in the second edition of Brotherus, Natiirl. f-flanzf. In addition to the latter the genera published after 1925 and therefore not included in Brotherus I.e. arc taken into account. In ^vising the families for *Flora Malesiana* I will doubtless be compelled **alter the position of some of the species and the delimitation of some the genera, and at the end of series III of *Flora Malesiana,* which will** Contain the Mosses, I therefore intend to give a final key. I sincerely *|?pe that the preliminary key will in the meantime have been tested by (afferent bryologists, and that they will let me profit by their remarks. *or this reason it is published here.

The analytical key is based as far as possible on vegetative eharacters, specially on the shape of the leaf cells. The principal features of the JjPorophyte are noted, but are not, as a rule, made use of as alternatives, 'his applies particularly to those alternatives that lead to the main ^oups. Only when no reliable vegetative characters could be found, have Jjljaracters of the sporophyte, especially those of the peristome, been used. *he habitat of each genus, not its distribution in the Malaysian region, Is indicated in the key.

A survey of the botanical terms used in this key will be published in the first instalment of *Flora Malesiana.*

The main key is long, too long for quick use. Therefore an introductory Ke.V has been added which is confined to the main alternatives. The end umbers of this key (in italics) correspond to the numbers of the general -e.y with which one should continue. The general key can of course be used without reference to the introductory one. In the general key one will find between brackets the number before which the same number with

[1]) I in Rev. Biyol. Lieh. 2(i: S—19. 1957.

the alternative appears, e.g. 19.(25) means that the second number 19 is to be found above the (first) number 25 of the key.

Bryologists using this key, are requested to send their remarks to the author.

2. Introductory Key

1. Stem*and leaves absent 2,
1. Distinctly leafy plants.
2. Leaves distichous 4
2. Leaves polystichous.
3. Branches in fascicles *(Sphagnum)* 9
3. Branches if present not in fascicles.
4. Greater part of the leaf composed of the broad rib, in cross section with three or more layers of dimorphic cells . . . H
4. Leaf cells one layered or seldom two-layered.
5. Leaves ventrally with longitudinal lamellae 20
5. Leaves ventrally without lamellae.
6. Inner basal leaf cells hyaline, large, sharply differentiated from the small laminal cells 26
6. Inner basal leaf cells not sharply differentiated from the laminal cells.
7. Amphigastria present 30
7. Amphigastria absent.
8. Smaller dorsal leaves present" 34
8. Dorsal leaves not differently developed.
9. Rib dividing the leaf into two unequal parts. *(Mniomdlia)* 36
9. Leaves equilateral.
10. Leaf cells strongly sinuose or nodulose 38
10. Leaf cells not sinuose.
11. Acrocarpous mosses.
12. Leaf cells prosenchymatous.
13. Leaf cells elongated rhombic 46
13. Leaf cells narrowly linear.
14. Alar cells differentiated 64
14. Alar cells not differentiated 75
12. Leaf cells parenchymatous.
15. Leaf cells wide, hexagonal or rectangular.
16. Leaf cells hexagonal 92
16. Leaf cells rectangular 94
15. Leaf cells small, quadrate, rounded, hexagonal or rectangular.
17. Primary stem creeping 112
17. Primary stem erect.
18. Alar cells differentiated 116
18. Alar cells not differentiated.
19. Leaf cells smooth 121
19. Leaf cells more or less papillate or mamillate . 140
11. Pleurocarpous mosses.

11. Pleurocarpous mosses.
20. Alar cells absent or indistinctly developed.
21. Leaf cells prosenchymatous.
22. Leaf cells linear.
23. Leaf rib absent.
24. Leaf cells smooth 181
24. Leaf cells more or less papillate to mamillate . . . 193
23. Leaf rib single or double 197
22. Leaf cells elongated rhombic.
25. Rib absent 222
25. Rib single or double.
26. Leaf cells smooth 233
26. Leaf cells more or less papillate 238
21. Leaf cells parenchymatous.
27. Leaf cells small 245
27. Leaf cells wider 269
20. Alar cells distinctly developed.
28. Leaf cells prosenchymatous.
29. Leaf cells linear.
30. Rib absent.
31. Apical branch leaves rolled up into an acute point . . 281
31. Apical branch leaves not uprolled into an acute point.
32. Leaf cells smooth.
33. Leaves tristichous *(Tristichella)* 283
33. Leaves several-ranked.
34. Leaf cells thin-walled 284
34. Leaf cells thick-walled 304
32. Leaf cells papillate to mamillate.
35. Leaf cells thin-walled 320
35. Leaf cells thick-walled 328
30. Rib present.
36. Rib double 333
36. Rib single.
37. Leaf cells smooth 336
37. Leaf cells more or less papillate to mamillate . . . 349
29. Leaf cells elongate rhombic.
38. Leaf rib absent.
39. Leaf cells thin-walled 356
39. Leaf cells thick-walled 370
38. Leaf rib single or double.
40. Leaf cells thin-walled 377
40. Leaf cells thick-walled 381
28. Leaf cells parenchymatous 390

3. General Key

tem and leaves absent or very short, scarcely visible to the naked
re. Protonema well-developed, persistent.
Trowing on leaves. Protonema brownish, strongly dichotomously

branched, often with gemmae on special stalks. Capsule rarely present, small, ellipsoid, suberect. Seta about 2 mm long, smooth.
Ephemeropsis (ioeb.

2. Growing on rotten wood or on humus soil. Protonenia brownish-green, gemmae absent. Capsule large, obliquely ovoid, flattened on the upper surface, inclined. Seta 20 **ram.** papillose. Male plants minute.
Buxbaumia Iledw.

1. Distinctly leafy plants of various shapes and sizes. Protonema occasionally persistent, usually absent.
3. (9) Leaves distichous (= alternately two-ranked).
4. Leaves equitant (= transversely inserted with stem-clasping leaf base and usually complanate).
5. Dorsal surface of leaf in the median line with a winglike expansion (= dorsal lamina).
6. Dorsal lamina long, extending beyond the sheathing basal portion (= duplicate lamina) for Ve or more of its length. Peristome teeth 16, divided to one half into two or three subulate segments. Ground-, rock- and tree-mosses, sometimes aquatic.
Fissidens Iledw.

6. Dorsal lamina short, not extending beyond the duplicate lamina. The latter broadly bordered with elongate, rhombic, hyaline cells. Peristome teeth entire, narrowly subulate. **Sorapilla** Sprue, et Mitt.

5. Leaves without a dorsal lamina.
7. Leaf rib present, single. Leaves from a broadened base more or less subulate. Lid conical, obtuse or acute. Peristome teeth 16, divided to their base into two filiform segments. Calyptra cucullate. Ground- and rock-mosses. . . . **Ditrichum** Br. et Schimp*

7. Leaf rib very short or absent. Leaves cymbiform, obtuse or shortly acute. Lid conical, rostrate. Peristome teeth entire. Calyptra mitriform. On bark and on branches. **Orthorrhynchium** Reicbdt.

4. Leaves not equitant.
8. Leaf cells small, rounded or 4—6-sided (10—20 /i), incrassate. At least the branch leaves distichous. On trees, and on the ground, rarely on rocks. . . . . **Rhizogonium** Brid.

8. Leaf cells larger and wider (15—40 /*), rounded-hexagonal. Only the leaves of the flagellae distichous. On the ground, on rocks and on trees. . . . . **Mnium** Hedw.

3. Leaves polystichous (= inserted in three, five or more rows), sometimes complanate and then looking more or less distichous.
9. Branches grouped together in fascicles, usually hanging, but at tips of stems crowded and erect. Leaf rib absent. Leaf cells in one layer, but dimorphous: large, hyaline, usually fibrillose cells filling up the meshes of the network formed by the long, much narrower chlorophyllose cells. In peat bogs, on heaths and in wet or damp places. . . . . **Sphagnum** Ehrh.

9. Branches, if present, not in fascicles. Leaf cells usually chlorophyllose, if hyaline then not fibrillose.
10. (19) Greater part of the leaf composed of the broad rib,, which

in cross section shows three or more, layers of dimorphous cells.: small, angular, ehlorophyllose cells in one or in three layers (= ehloroeysts), covered by large, porous, hyaline cells in two or more layers (= leueocysts). Leaf lamina narrow, one-layered, hyaline, resembling a narrow leaf border.

11. Leaf rib with a narrow median band of stereids, ressembling a secondary midrib. Chlorocysts 4-sided, one-layered, each situated at the junction of 4 leueocysts. Tree-mosses. Leucophanes I lamp.
11. Leaf rib without a median band of stereids.
12. Chlorocysts, at least in the upper part of the rib forming three layers, irregularly 3—7-sided.
13. Leaves distinctly in three, spirally arranged rows, from a sheathing 'base gradually attenuated into a linear apical part, obtuse, «ntire, smooth, very fragile, usually broken off halfway down. Dorsal and ventral layer of chlorocysts covered by a single layer of large leueocysts. On trees and on tree-ferns. Arthxocormus Doz. et Molk
13. Leaves several-ranked, from an obovate sheathing base attenuated into a lanceolate apical part, usually very papillose. Dorsal and ventral layer of chlorocysts free on both surfaces. Bark-mosses. . . . . • • « * « * • Card.
12. Chlorocysts forming a single layer, covered by one or more layers of leueocysts on both surfaces.
14. Chlorocysts in a median layer regularly arranged between the leucocysts. Hyaline lamina forming a very narrow border (at most 6 rows of cells) or lamina absent.
15. Chlorocysts in cross section triangular, arranged in azigzag manner and each situated at the junction of fc..ee, leucocysts. Leaves linear, thick and broad, dorsally convex ventrally plane. Capsule cylindrical, erect. Peratome teeth 8, some-

15. Chlorocysts in cross section quadrangular, each s.tuated at the junction of 4 leucocysts. Peristome teeth 16, entire or divided, or peristome absent.
16. Leaves imbricate, appressed, broad-linear, hairpointed or apSate. Stem creeping, branched like a pleurocarpous mosT Capsule lateral on short branches. Calyptra conical-mitrifnrm entire at base. Bark-mosses.
mitntorm, enure at u» oiadopodanthus Doz. et Molk.
16. Leaves erect-spreading or squarrose.
17. Leaves small, erect-spreading, lower part oblong' upper part narrowly lanceolate. Capsule terminal, hemisphaerical, fmmersed. Lid conical, longly and stmghtly rostrate. Calyptra narrowly conical, densely fimbriate at base. Pm-y..e absent. . . . . . Ochrobryum Mitt.
17. Leases larger and broader. Capsule emerged on an elongated seta. Peristome teeth 16.

18. Leaves usually shortly acuminate. Calyptra turgid, cucullate, entire at base. Capsule ovoid, dorsiventral, inclined, 8-furrowed when dry. Peristome teeth divided to about the middle into two segments, longitudinally striate or papillose. On bark and on shady ground. . . . . **Leucobryum** Brid.

18. Leaves sharply acuminate, often cucullate at apex. Calyptra conical-mitriform, longly fimbriate at base. Capsule cylindrical, radial, erect. Peristome teeth entire, finely papillose. Oi* bark or on ground. . . . . **Schistomitrium** Doz. et Molk.

14. Chlorocysts irregularly arranged, not always in a median layer. Hyaline lamina distinct, V_4—V_3 the width of the leaf base. Leaves lanceolate, auriculate. Terminal leaflets often with clusters of gemmae. Calyptra mitriform, ciliate at base. On rotten trunks. **Brothera** C. Muell.

10. Leaf cells one-layered, or seldom two-layered, except in the rib, if present. Lamina cells all similar, or the cells of the leaf base, in the leaf corners (alars cells) or along the margin differently developed.

19.(25) Ventral surface of leaves with longitudinal lamellae on the more or less broadened rib.

20. Leaves usually long. 1—4 cm, longly sheathing. Lamellae numerous, 40—80. Capsule ovoid, dorsiventral. Peristome a bushlike tuft of numerous, filiform, somewhat twisted bristles. Calyptra longhaired. Usually very robust ground-mosses. **Dawsonia** R. Brown

20. Leaves of different size, but usually not so extremely long. Peristome, if present, composed of 32—64 teeth, connected above with a membrane, covering the mouth of the deoperculated capsule (epiphragm). Capsule cylindrical or prismatic.

21. Leaves with a distinctly sheating base. Calyptra usually hairy. Lamellae numerous, straight.

22. Peristome teeth 32. Capsule rounded or two-sided complanate.

23. Bib on dorsal side toward apex dentate. Capsule cilindrical or spherical. Neck without stomata. Calyptra densely long-haired. Ground-mosses. . . . . **Pogonatum** Beauv.

23. Bib dorsally smooth. Capsule two-angled, in cross section seniilunulate. Neck short, with stomata. Calyptra smooth or short-haired. Old setae laterally placed as a result of innovations. On stones in wet places. **Polytrichadelphus** (C. Muell.) Mitt.

22. Capsule prismatic, mostly quadrangular. Neck hemispherical or discoid, with large stomata. Peristome teeth 64. Ground-mosses or growing in swamps and peat . . . **Polytrichum** Hedw.

21. Leaves without a sheathing base or indistinctly sheathing. Lamellae 2—12. Calyptra naked or with a few scattered hairs.

24. Leaves with a thickened border, marginal teeth usually two-ranked. Bib near apex dorsally dentate. Lamellae 2—3, straight. Ground-mosses. . . . . **Atrichum** Beauv-

24. Leaves not bordered. Lamellae 2—12, sinuose. Bib dorsally with a few rudimentary, serrate lamellae. Ground-mosses. **Oligotrichwn** Lam. et Cand.

19. Leaves ventrally without longitudinal lamellae.
25.(29) Inner basal leaf cells hyaline, large, sharply differentiated from the small, chlorophyllose, more or less papillose lamina cells.
26. Primary stem creeping, secondary stems erect or procumbent. Leaf margin with a broad, hyaline border. Seta terminal on secondary stems. On bark. . . . . **Thyridium** Mitt.
26. Primary stem erect, usually simple. Leaf border narrow or absent. Seta terminal *on* primary stem, seldom pseudo-lateral.
27. Abnormal leaves with a rib excurrent in a thick point, bearing clusters of filiform gemmae.
28. Clusters of gemmae inserted midways between base and apex of the elongated rib. Leaf margin narrowly bordered. Peristome single. Calyptra cucullate, deeply lobed. On bark. Calymperopsis (C. Muell.) Fleisch.
28. Clusters of gemmae terminal on the elongated rib. Leaf margin not bordered. Peristome absent. Calyptra campanulate, plicate and twisted, reaching down to below the neck of the capsule. On bark in forests . . **Calymperes** Swartz
27. Abnormal gemmiferous leaves absent. Peristome single. Leaf margin usually narrowly bordered. Capsule erect, cylindrical. Calyptra mitriform. On bark, seldom on rocks. **Syrrhopodon** Schwaegr.
25. Inner basal leaf cells not sharply differentiated from the lamina cells; if different in shape or colour then changing gradually.
29.(33) Amphigastria (= smaller leaves on the ventral surface of the stem) present.
30. Secondary stems simple or rarely dichotomously branched. Amphigastria in one row. Seta very short, luieral.
31. Secondary stems caudate at the apex, with numerous filiform gemmae. Peristome teeth with a zigzag median line, finely papillose. On tree-trunks. **Cyathophorella** (Broth.) Pleisch.
31. Secondary stems not caudate and without gemmae. Peristome teeth perforated in the median line, transversely striate. On bark. . . . . **Cyathophoruxn** Beauv.
30. Secondary stems pinnate, fanlike or dendroid. Amphigastria usually in two rows. Seta at least 5 mm. Peristome teeth with a zigzag median line. Leaf margin bordered with linear cells.
32. Primary stem growing in a horizontal direction, secondary stems dendroid. Rib ending about two thirds up the leaf lamina. Seta usually elongate. Basal membrane distinct. Cilia well-developed. On rotten trunks, on bark or seldom on rocks. . . . . **Hypopterygium** Brid.
32. Primary stem vertically creeping, secondary stems pinnate or fanlike. Rib percurrent or excurrent. Seta short. Basal membrane low. Cilia absent. On bark. **Lopidium** Hook. f. et Wils.
29. Amphigastria absent.

33. Dorsal leaves, at least on sterile branches, much smaller than lateral leaves, mostly in two longitudinally rows.
34. Leaf margin bordered.
35. Leaf border yellowish. Lateral leaves elliptic. Rib percurrent. Leaf cells uni-papillate. Capsule folded near the mouth when dry, erect. Peristome teeth densely papillose. Cilia absent. On bark and on forest ground. . . . . **Powellia** Mitt.
35. Leaf border reddish. Lateral leaves oblong, acute. Rib reddish, ending halfway. Leaf cells smooth. Capsule smooth, inclined. Peristome teeth densely lamellaté, papillose. Cilia 2. Ground-mosses. . . . . **Epipterygiiun** Lindb.
34. Leaf margin not bordered. Rib longly excurrent. Capsule deeply furrowed when dry. Peristome teeth transversely striate. Cilia 3. Tree- and rock-mosses. . . . . **Rhacopilum** Beauv.
33. Dorsal leaves, if developed, not different in size or shape from the lateral leaves.
36. Rib excurrent, dividing the leaf lamina into two unequal parts. Leaves complanate, in 8 rows and obliquely inserted but apparently distichous. Upper leaf margin convex, bordered, lower margin not bordered. On bark and on damp rocks.
Mniomalia C. Muell.
36. Rib, if present, dividing the leaf lamina into two nearly equal parts.
37.(43) Leaf cells strongly sinuose or nodulose *(i.e.* inner surface of the longitudinal walls corrugated or undulate), at least the basal ones.
38.(42) Only the basal cells sinuose or nodulose.
39. Leaves tristichous. Leaf cells smooth. Capsule pseudolateral. Lid longly and obliquely rostrate. On rocks. **Reimersia** Chen.
39. Leaves in several rows.
40. Capsule opening by 4 vertical slits. Stem very fragile when dry. Darkbrown mosses growing on siliceous rocks.
Andreaea Hedw.
40. Capsule opening by a lid. Plant not blackish.
41. Leaves with a hyaline border of elongated cells, in 3—5 rows, ending halfway up the lamina. Leaf cells finely papillose, basal leaf cells narrowly linear, yellowish-red. Capsule unknown. On calcareous rocks. **Ghionoloma** Dix*
41. Leaves completely bordered with several rows of narrowed, not elongated cells. Leaf cells mammillose. Lid longly and obliquely rostrate, shed with the columella attached. Peristome absent. On rocks . . **Hymenostyliella** Bartr.
38. Leaf cells usually all sinuose.
42. Branches equal in length. Rib convex. Peristome teeth entire or slightly divided or peristome absent. On calcareous and siliceous rocks and stones. . . . . **Grimmia** Iledw*
42. Primary stem with many short branches. Rib broad and flat. Peristome teeth divided to their base into two filiform segments. Mostly on siliceous soil and rocks. **Rhacomitrium** Brid.

37. Leaf cells not sinuose.
43.(176) Stems erect, usually simple or with a few erect short branches. Seta terminal on stem and branches *(acrocarpous **mosses).***
44.(80) Leaf cells in the upper half of the leaf prosenchymatoiw *(*= elongated with *acute* ends): elongated rhombic, elongated rectangular or narrowly linear.
45.(63) Leaf cells elongated rhombic or elongated rectangular in the upper half of the leaf.
46. Small plants, branching sparingly by innovations below the perigamium. Capsule spherical, sessile, capsule wall bursting open irregularly or decaying gradually. Capsule long enveloped by the delicate calyptra, which at maturity is irregularly split and whose remnants remain behind at the base of the capsule. Spores few, about 16 per capsule, and very large (100—200 /i). Ground-mosses . . **Archidium** Brid.
46. Not all of the above characters present. Spores usually much smaller.
47. Upper leaf cells narrow and incrassate, lower cells widely rectangular and thin-walled. Branches julaceous. Leaves ovate, obtuse or acute, not bordered. Rib ending below apex. Ground- and rock-mosses . . **Anomobryum** Schimp.
47. Leaf cells all thin-walled or all incrassate.
48. Upper leaves horizontally spreading, forming a conspicuous rosette.
49. Mosses extending by underground stolons or by prostrate old stems from which upright stems arise. Capsule cylindrical, horizontal to inclined, two or mce in the same perigamium. Ground-mosses.
Bhodobryum (Schimp.) ITamp.
49. Stem not stoloniferous. Capsule ellipsoid, obovoid, pyriform or clavate, usually single in a perigamium. Ground- and rock-mosses, rarely on tree-trunks.
Bryum (Hedw.) Schimp.
48. Upper leaves suberect or erect-spreading, not forming rosettes, but sometimes in comal tufts.
50. Leaves narrowly lingulate, blunt or subacute. Seta long, erect. Capsule cylindrical. Peristome teeth divided to their base into two filiform, papillose segments. Pale-coloured or bluish-green. On walls and on rocks.
Wilsoniella C. Mueil.
50. Leaves oblong, lanceolate or broadly spathulate, but never narrowly lingulate.
51.(57) Peristome usually single.
52. Exostome absent. Endostome a low basal membrane with 16 appendiculate processes. Lid small, mammillate. Ground- en rock-mosses . . **Mielichhoferia** Hornsch.
52. Endostome absent. Exostome teeth 16.

53. Alar cells differentiated.
54. Leaf rib broad, about V_3 the width of the leaf base. Peristome teeth divided to one half into longitudinally striate segments. Capsule ellipsoid. On ground, on rocks, on rotting tree-trunks and in peat . . . . . **CampylQpus** Brid.
54. Leaf rib narrow. Peristome teeth almost entire, smooth. Capsule shortly pyriform with a thick, brown neck. On wet, non-calcareous rocks and stones . . . **Blindia** Br. et Schimp.
53. Alar cells not differentiated.
55. Seta short or absent, capsule immersed. Segments of the papillose, nearly to their base forked peristome teeth, united at tips. Ground-mosses. . . . . **Garckea** C. Muell.
55. Seta distinctly developed, capsule elevated.
56. Stem simple or bearing short julaceous branches, arising from the terminal tuft. Leaves shortly ovate-lanceolate to subulate. Capsule ovoid to cylindrical, radial, erect. Lid conical, acute or rostrate. Ground- and rock-mosses.
Aongstroemia Br. et Schimp.
56. Stem usually simple, small. Leaves ovate-spathulate, apex rounded or blunt. Capsule spheroidal to cylindric. Lid conical, mammillate. On ground and on rocks.
Splachnobryum C. Muell.

5.1. Peristome double.
57. Capsule erect or somewhat inclined.
58. Leaves lanceolate.
59. Leaf cells narrow. Lid gently arched. Peristome teeth papillose, united in pairs. Endostome processes narrow, as long as the exostome teeth, cilia well-developed. Ground- and rock-mosses.
Pseudopohlia Williams
59. Leaf cells widened. Capsule furrowed. Lid obliquely rostrate. Peristome teeth not paired, smooth or papillose. Endostome processes longer than the exostome teeth. On rotten tree-trunks.
Orthodontium Schwaegr.
58. Leaves oblong-elliptic to spathulate. Leaf cells widened. Lid conical or arched with an acumen. Peristome teeth not paired. Endostome processes often, cilia always rudimentary. Ground* and tree-mosses. . . . . **Brachymenium** Schwaegr.
57. Capsule distinctly inclined to pendulous.
60. Leaf cells narrowly rhombic to linear. Upper leaves forming & terminal tuft. Endostome short, often rudimentary. Lid mammillate or shortly acute. On ground and on rocks.
Pohlia (Hedw.) Lindb.
60. Leaf cells widely rhombic to hexagonal.
61. Capsule pyriform, dorsiventral. Lid flat or arched. Calyptra turgid, cucullate, entire. Stem short, leaves budlike, broadly spathulate. Ground-mosses. . . . . **Funaria** Hedw.
61. Capsule ovoid, shortly cylindric, pendulous. Calyptra small* cucullate, fugacious.

62. Leaves longly lanceolate. Upper leaves not forming a tuft. Ring absent. Stomata cryptoporous. Cilia nodose. Ground-mosses.
Mniobiyum (Schimp:) Limpr.

62. Leaves oblong-elliptic or spathulate or lanceolate.* Upper leaves often forming a tuft. Ring present. Stomata phaneroporous. Cilia appendiculate, but often rudimentary or absent. Ground- and rock-mosses, rarely growing.on trees.
Bryum (Hedw.) Schimp.

45. Leaf cells narrowly linear in the upper half of the leaf.

63. (75) Alar cells differentiated.

64. (68) Leaves bordered.

65. Leaves longly subulate, erect or falcate. Perichaetial leaves not sheathing.

•66. Rib broad (V_8—7. the width of the leaf base) and plane. Seta cyeneous or undulate. Peristome teeth divided to their base into two filiform segments. On forest ground, rotting tree-trunks and non-calcareous rocks.
Dicranodontium Ur. et Schimp.

66. Rib narrow, convex. Seta straight. Peristome teeth divided to or beyond the middle into two segments. On forest ground and on trees, sometimes in swamps . **Dicraaioloma** Ren.

65. Leaves ovate, shortly acute. Rib slender. Perichaetial leaves **highly thing.**

67 Alar cX yellow to yellow4>rown. Leaf border, indistinctly, 1—2 rows of cells. Leaf margin plane, except near apex. Snores large (225 a), many-celled, conical. Tree-mosses, spores large \e*«> /v, * **Dienemon** Schwaegr.

fi7 All,- PPIIS hvaline Leaf border distinct, 4r— rows of cells.

64 ä ^ p i S d i S S K L i **very highly sheathing, reaching the base**

69 **sternly-celled. Primary stem creeping. Rib very short or**

70. **telfcells narrow, incrassate, pitted.** » ^ £**£+ W cells narrow, Mcrassa, p

S £ * f t least to'the middle, segments umted ^ tips ^ trees.

70. Leaf cells narrow and incrassate, but not phtecL Pcmtome teeth usually highly papillose, red or V ^ ^ ^ ^ entire. Mostly on trees . • • •

69. Spores one-celled. Primary stem erect ib very

71. **Leaves broadly lanceolate,** n arM w f *V 0 Tire2 **seldom. slender or absent. Peristome absent. Usually** TM £ 3 £ n £ **Bra**

on d

71 Lea^ovate-lanceolate. Mb vaUd, excurrent, hairpointed.

>X- **Some teeth short, papillose, not** J g ^ **B**ryum Fleisch.

68. Perichaetial leaves subulate, not highly sheathing.

72. Leaves plicate, at least at base. Stems irregularly or subpinnately branched. Leaf cells papillate. Capsule ovoid to subspherical. Peristome double. Peristome teeth papillose. On wet rocks, on moist ground, in swamps. . . . . **Breutelia** Schimp.
72. Leaves concave, not plicate. Leaf cells smooth or rough.
73. Capsule ovoid, radial, erect. Peristome double. Exostome teeth paired. Endostome processes as long as the exostome teeth. Cilia appendiculate. Lid gently arched, not mamillate. Ground- and rock-mosses. . . . . **Pseudopohlia** Williams
73. Capsule cylindrical or pyriform. Peristome single. Peristome teeth longitudinally striate or seldom papillose or smooth.
74. Peristome teeth entire, perforated, or slightly divided, smooth or finely papillose. Capsule shortly pyriform with a thick brown neck. On wet calcareous rocks and stones. **Blindia** Br. et Schimp.
74. Peristome teeth divided at least to the middle. Seta absent, capsule immersed. Peristome teeth smooth. Spores ellipsoid, 50 /A. **Cryptodicranum** Bartr.

63. Alar cells not differentiated.
75. Leaf cells thick-walled, at least the upper cells.
76. Leaves ovate, closely appressed, branches julaceous. Upper leaf cells narrow, incrassate, lower cells widely rectangular and thin-walled, always smooth. Bib ending far below apex. Capsule usually pendulous. Ground- and rock-mosses. **Anomobrytim** Schimp.
76. Leaves lanceolate, plicate, at least at base. Leaf cells papillate. Rib percurrent or excurrent. Capsule inclined. On wet ibcks, on moist ground, in swamps. . . . . **Breutelia** Schimp.
75. Leaf cells thin-walled.
77. Peristome single.
78. Leaves from a half-sheathing base first spreading, then ascending. Capsule often furrowed when dry. Peristome teeth broad, longitudinally striate at base, divided to about the middle. Ground-mosses. . . . . **Dicranella** Schimp-
78. Leaves erect-spreading. Capsule not furrowed when dry. Peristome teeth entire, papillose. Ground-mosses. **Microdus** Schimp.
77. Peristome double.
79. Leaf cells with papillosely projecting upper ends. Seta short, 1 mm. Capsule immersed, erect, spherical. On trees and on rocks. **Leiomela** (Mitt.) Broth.
79. Leaf cells smooth. Seta elongate, up to 7 cm. Leaves on stem and branches gradually increasing in size towards the terminal tuft. Capsule ovoid, inclined to pendulous. Endostome processes shorter than the exostome teeth. Cilia nodulose. Lid archedly conical, mammillate or apiculate. On ground and on rocks. **Pohlia** Iledw.

44. Leaf cells in the upper half of the leaf lamina parenchymatous: quadrate, hexagonal, rectangular, rounded, sometimes more or less elongated, but never distinctly prosenchymatous.

80. (111) Leaf cells wide hexagonal or rectangular.
81. (94) Leaf cells hexagonal, regular or shortly elongate.
82. (89) Leaf cells regularly hexagonal.
83. Leaf rib absent. Leaves hyaline, minute. Leaf margin lobed. Stem very short, almost invisible to the naked eye. Protonema persistent, brown-green. Capsule large. Peristome double. On rotten wood or on humus soil. . . . . **Buxbaumia** Hedw.
83. Leaf rib single, well-developed.
84. Leaf cells papillate or mammillate. Basal leaf cells elongate, hyaline. Leaves shortly spathulate, apex rounded. Leaf margin entire. Peristome absent. On limestone rocks.
Gymnostomiella Fleisch.
84. Leaf cells smooth.
85. Leaf margin bordered. Capsule short-necked.
86. Primary stem long creeping, branches erect.
87. Leaf rib ending far below apex. Seta *very* short. Calyptra naked. Tree-mosses . . . . **Orthomniopsis** Broth.
87. Leaf rib percurrent or excurrent. Seta elongate. Calyptra densely and longly pilose. Tree-mosses.
Orthomnium Williams
86. Primary stem erect, the upper leaves forming a rosette, unbranched or sometimes with differently leaved stolons. Border cells incrassate. Lid conical. Ground-, rock- and tree-mosses, also growing in swamps . . **Mnium** Iledw.
85. Leaf margin not bordered.
88. Capsule with a well-developed hypophysis (i. e. with a swollen neck, when ripened much broader than the theca and of a different colour). Peristome Veth when dry doubled back on to the theca. On excrements of carnivores, on humus. . . . . **Splachnum** Iledw.
88. Capsule with a larger or shorter neck but without a hypophysis. Peristome teeth when dry not bent back on the theca. On excrements of carnivores and on humus.
Tayloria Hook.
82. Leaf cells elongately hexagonal.
89. Exostome absent. Endostome a low basal membrane with 16 appendiculate processes. Lid small, mammillate. Oround- and jock-mosses. . . . . **Mielichhoferia** Hornsch.
89. Endostome absent or peristome absent.
90. Peristome teeth 32, not trabeculate, pale with yellow-red axis.
91. Leaf margin dentate or serrate. Rib homogenous, consisting of two layers of equal cells with a wide lumen, (iround-mosses. . . . . **Rhacelopodopsis** Ther.
91. Leaf margin nearly entire. Rib heterogenous. (Jroimd- and rock-mosses, also on decaying wood.
Rhacelopus Doz. et Molk.
90. Peristome teeth 16, articulated, or peristome absent.

92. Capsule with an obovate or obconical hypophysis. Rib ending below apex. Growing on excrements. **Tetraplodon** Br. et Schimp.
92. Capsule without hypophysis, short-necked. Ground- and rock-mosses.
93. Stem simple or with julaceous branches below the perigamium. Leaves shortly ovate-lanceolate to subulate. Leaf cells with numerous or lage chloroplasts. Capsule ovoid to cilindric, radial, erect. Lid conical, acute or rostrate. Calyptra cucullate. Ground- and rock-mosses. . . . . **Aongstroemia** Br. et Schimp.
93. Stem short, leaves budlike, broadly spathulate. Leaf cells with scanty chloroplasts. Capsule pyriform, dorsiventral, inclined. Lid flat or arched, not rostrate. Calyptra turgid cucullate, entire. Ground-mosses. . . . . **Funaria** lledw.

81. Leaf cells rectangular.
94. Alar cells differentiated.
95. Leaf cells papillate. Leaves plicate, at least at base. On wet rocks, on moist ground, in swamps . . . **Breutelia** Schimp.
95. Leaf cells usually smooth.
96. Leaves broadly bordered with narrow linear cells. Rib very broad, occupying one-third to two-thirds the width of the leaf base. Seta cygneous. Peristome teeth divided to their base. On forest ground, on tree-trunks and on non-calcareous rocks. **Dicranodontium** Br. et Schimp.
96. Leaves not bordered. Peristome teeth divided to their base into two filiform segments, longitudinally striate at base. ^Capsule ellipsoid. Growing on wet clay . . . **Atractylocarpus** Dix.

94. Alar cells not differentiated.
97. Leaves with a thickened double-toothed border. Rib denticulate on back. Capsule nearly spherical, longitudinally furcate, inclined to horizontal. Ground- and rock-mosses, mostly in swamps or soaking wet places near springs . . . . **Philonotis** Brid.
97. Leaves not bordered.
98.(108) Leaf cells smooth.
99. Lid absent. Leaves oval-oblong, imbricate. Perichaetial leaves lanceolate-subulate, forming a terminal tuft. Seta short, capsule immersed. Calyptra cucullate, covering only the upper part of the capsule. Ground-mosses. . . . . **Pleuridium** Brid.
99. Lid present, dehiscent.
100. Leaves broad, oblong to spathulate.
101. Leaf apex acute. Rib broad, $^{x}/_{4}$ the width of the leaf base, excurrent with rounded apex. Leaves oblong. Branches julaceous. Peristome absent. On meadows in high mountainous regions. . . . . **Aongstroemiopsis** Fleisch.
101. Leaves lingulate-spathulate with rounded apex or blunt. Rib narrow, ending below apex. Peristome single. On ground and on rocks. . . . . **Splachnobryum** C. Muell-
100. Leaves lanceolate-subulate.

102. Capsule with a tapering neck about twice as'long as. the theca, with numerous stomata in the spongy neck-tissue. Seta mostly erect. Calyptra turgid, cucullate. Ground-mosses.

Trematodon Michx.

102. Capsule short-necked. Stomata sparse in neck-portion or totally absent.

103. (108) Leaf margin entire.

104. Peristome single.

103 Upper leaves forming a tuft. Seta elongate, cygiieous y curved. Leaves from a broader sheathing base abruptly subulately acuminate. Leaf rib biconvex with stereids on both sides. Peristome teeth divided to the middle, segments not united. Ground-mosses . **Microcampylopus C. Muell.**

105. Upper leaves not forming a conspicuous tuft: .

106. Seta cygneously curved. Leaf rib biconvex with stere.ds on both sides. Leaves from a sheathing base elonsately sub-ulate. Peristome teeth divided to the middle, longitudinally striate at base. Ground-mosses.

Campylopodium (C. Muell.) Reach.

106. Seta long, erect, straight. Leaf rib broad and flat. Leaves From a non-sheathing base longly subulate-canieulate. Peri-stome teeth papillose, divided to their l » e mtotwo:filiform segments. Ground- and rock-mosses . . **Ditrichum 1 imm.**

ble.

?07 ^ r n a ^ w l y lanceolate. Leaf cells essentially smooth, the cuticula only somewhat striate-papillose. Stem triangular lYth a wide-celLl hyalodermis. Seta 1 0 - l ^ O n Jj-J- us ri .

stone ck

107. Wes^obLg-'lonceolate. ' Hyalodermis absent^Seta v*ry

103. sTmeTeUveloped. On ground and o^rooks i n ^ places. ischerob Loesk.

98. Leaf

108. Hy S3f5S#S3SrS3

109. L

cells naDUlate over the lumen. Stem covered by a dense teltot S o i r ^ s u l e subspherical. Peristome usuaf^double. ch On ks s Br lin Sch

109 nvrnotl'lmtr^^apillae confined to the ends of the leaf ceUs On?y the basal part of the stem with rhizoids. Capsule spherical Peristome absent . . **Bartramidula Br. et Schnnp.**

108 Hvalodermis of stem small-celled or absent.

110 Seta elongate. Capsule erect or inclined, furrowed when dry.

110. with papillosely projecting upper ends. Endostome rudimentary. On trees and on rocks . . . . **Leiomela (Mitt.) Broth.**

80. Leaf cells small; quadrate, rounded, hexagonal or rectangular, seldom elongately hexagonal or rectangular.
111. Primary stem creeping with erect branches.
112. Leaves bordered with hyaline, elongate or quadrate cells. Central basal leaf cells quadrate, incrassate, different from the elongated marginal cells. Capsule cylindric. Calyptra mitriform, small, smooth. Bark-mosses, seldom on rocks.
Micromitrium Schimp.
112. Leaves not bordered.
113. Capsule emergent on an elongated seta.
114. Calyptra campanulate, longitudinally pluri-plicate, entire or rarely split open on one side, smooth or hairy. Capsule erect, spherical to oblong-ovoid. Peristome double, sometimes single or absent. Predominately tree-mosses.
Macromitrium Brid.
114. Calyptra conical-campanulate, never plicate, lower margin lobed. Capsule erect, ovoid to cilindric. Tree- and rock-mosses. . . . . **Schlotheimia** Brid.
113. Capsule immersed. Leaves dimorphous: leaves of primary stem and of sterile branches lanceolate, acute, spirally arranged, on fertile branches ovate and 5-ranked. Tree-mosses.
Desmotheca Lindb.
111. Primary stem erect, seldom branched.
115. (120) Alar cells differentiated, forming a distinct group, hyaline or brownish.
116. Leaves with a hyaline border of elongated cells. Capsule cilindric, radial, erect or somewhat inclined.
117. Leaf cells densely papillate. Basal leaf cells linear, almost hyaline, the insertion cells often coloured. Tree-mosses.
Leucoloma Brid.
117. Leaf cells smooth. Alar cells incrassate, hyaline basal cells absent. On forest ground, on trees, sometimes in swamps.
Dicranoloma Ben.
116. Leaves not bordered.
118. Rib very broad, occupying one third to two thirds the width of the leaf base. Lid longly and obliquely rostrate.
119. Leaves from a lanceolate lower part attenuated into a subulate apical part. Capsule deeply furrowed. Peristome teeth divided to the middle. On dry ground, on rotting trunks, in peat. . . . . **Campylojms** Brid.
] 19. Leaves oblong, passing into a lanceolate upper part. Capsule rough at base. Peristome teeth divided to their base. Ground- and rock-mosses . **Thysanomitrium** Schwaegr.
118. Rib narrow. Lid straightly or obliquely rostrate. Leaves from a sheathing base abruptly narrowed. Perichaetial leaves very long pointed. On trees and rocks.
Holomitrium Brid.
115. Alar cells not or scarcely differentiated.

120. (140) Leaf cells smooth.
121. (135) Leaf margin entire or finely crenulate.
122. (126) Leaf margin completely incurved or recurved.
123. Leaves lingulate-spathulate.
124. Leaves hairpointed. Capsule ovoid. Lid arched. Peristome teeth short on a basal membrane. On bark, seldom on rocks. **Leptostomum** R. Brown.
124. Leaves not hairpointed. Basal leaf cells rectangular. Capsule cilindric. Lid longly rostrate. Peristome absent. Ground- and rock-mosses. **Hyophila** Brid.
123. Leaves ovate-lanceolate, acute or obtuse.
125. Darkbrown, non-radiculose mosses with yery fragile stems when dry. Capsule erect. Lid and peristome absent. Growing on siliceous rocks. **Andreaea** Iledw.
125. Dull green mosses, radiculose below. Capsule inclined, opening with a lid. Peristome teeth divided nearly to their base, papillose, bordered. On various substrata. **Ceratodon** Brid.
122. Leaf margin plane.
126. Basal leaf cells elongate with acute ends, hyaline or opaque.
127. (133) Basal leaf cells hyaline.
128. Leaves from a sheathing base elongate-subulate, strongly recurved when dry. Peristome teeth more or less paired, divided to the middle. On bark and on branches. **Symblepharis** Mont.
128. Leaves without a sheathing base. Peristome teeth not paired.
129. (132)- Leaves Ungulate. Leaf apex obtuse or nearly acute.
130. Leaf cells collenchymatously thickened. Peristome teeth 32, solid, not trabeculate. Ground-mosses. **Pseudorhacelopus** Broth.
130. Leaf cells not collenchymatous. Peristome teeth 16, trabeculate or peristome absent.
131. Leaves strongly crisped when dry. Capsule ovoid, smooth. Peristome absent. On rocks, rarely trees.
131. Leaves not crisped when dry. Leaf apex obtuse. Peristome teeth 32, filiform, twisted to the left from a high tesselated basal membrane. On walls, rocks, and roadsides, seldom on bark. **Tortula** Hedw.
129. Leaves ovate-lanceolate to linear-subulate. Leaf rib percurrent.
132. Leaves strongly crisped when dry. Rib smooth on back. Peristome single. Peristome teeth smooth or obliquely striate. Capsule small, ovoid, with 8 rib-like prominent dark-coloured streaks, whose cells differ from the cells of the intervening areas. Growing in cracks of siliceous rocks. **Rhabdoweisia** Br. et Schimp.
132. Leaves not crisped when dry. Rib papillose on back. Capsule obovoid, on laterally placed short branches. Growing on volcanic rocks. **Anoectangium** (Hedw.) Br. et Schirnp.

127. Basal leaf cells not hyaline.
133. Peristome usually double, peristome teeth 8 and more or less divided or 16 and paired. Leaf border one row of cells, only present on the lower margin. Central basal cells narrow linear, incrassate, different from the quadrate, hyaline, thin-walled marginal cells. Capsule 8-ribbed. Calyptra long-haired. Bark-mosses, rarely on rocks. . . . . **Ulota** Mohr.
133. Peristome single. Peristome teeth 16, not paired, divided into three segments, papillose. Seta erect, straight. Capsule spherical, wide-mouthed, sihooth. On calcareous rocks in water. **Tridontium** Hook.
126. Basal leaf cells rectangular, hyaline.
134. Leaves oblong, obtuse. Marginal cells yellowish, in several rows, strongly incrassate. Capsule ovoid. Peristome absent. Lid rostrate. Rock-mosses. . . . . **Merceya** Stfiimp.
134. Leaves elliptic-oblong. Marginal cells not differently developed. Capsule ellipsoid or cylindrical with 8 deep longitudinal folds, small-mouthed, puckered. Peristome double or absent. Tree-mosses, seldom on rocks . . . . **Zygodon** Hook, et Tayl.
121. Leaf margin serrate or dentate in one or in two rows.
135. Basal leaf cells elongate or rectangular.
136. Basal leaf cells hyaline or yellow.
137. Peristome teeth 32, solid, not trabeculate. Capsule spherical or cylindrical. Calyptra densely hairy. Epiphragm developed. . . Ground-mosses. . . . . **Pogonatum** Br. et Schimp.
137. Peristome teeth 16, trabeculate or peristome absent. Calyptra naked, seldom few-haired. Epiphragm none. On bark, seldom on rocks. . . . . **Zygodon** Hook, et Tayl
136. Basal leaf cells never hyaline, usually incrassate.
138. Leaves lanceolate from a sheathing base. Basal leaf cells linear. Peristome teeth 16, divided to their base into two filiform segments, papillose. Tree-mosses. **Khamphidium** Mitt.
138. Leaves lanceolate-subulate from a narrowed base. Leaf margin sharply double-toothed. Peristome teeth 32, solid, formed by U-shaped cells. Ground-mosses . . . . **Atrichum** Beauv.
135. Basal leaf cells not differently devedoped.
139. Cells of leaf margin several-layered, incrassate, darkened, double-toothed. Peristome teeth with distinct lamellae and with a zigzag median line. Seta long. On trees and on ground, rarely on rocks. . . . . **Rhizogonipm** ftrid.
139. Leaf margin one-layered, recurved. Exostome absent. Endostome with filiform processes, irregularly united, hyaline. **Hymenodontopsis** Ilerz-
120. Leaf cells more or less papillate or mammillate.
140. Leaves bordened with elongated or shortened cells.
141. Leaf border ending halfway up the margin, hyaline. Leaf cells seriately papillate over the lumen. Leaves extremely long-acicular, very fragile. Capsule unknown. **Stephanodictyon** Dix.

141. Leaf border complete. Leaves linear from a short, hyaline, clasping base, flexuose. Rib broadened, 150 *p.* below, excurrent in a short cuspidate point. Capsule unknown.
Pachyneurum Bartr.

140. Leaves not bordered.
142. Leaves tristichous. Perichaetial leaves highly sheathing. Leaf cells densely and highly papillose. Ground- and rock-mosses.
Triquetrella C. Muell.

142. Leaves arranged in several rows.
143. Capsule opening by 4 vertical slits. Stem very fragile when dry. Darkbrown mosses, growing on siliceous rocks.
Andreaea Hedw.

143. Capsule opening by a lid or fracturing irregularly or capsule unknown.
144. Leaf lamina 2—3-layered.
145. Leaves spirally curved and hooked when dry. Perichaetial leaves not differently developed. Seta elongate. Peristome teeth erect or steeply inclined to the left. On calcareous soil and rocks. . . . . Timxniella De Not.
145. Leaves crisped when dry. Perichaetial leaves long-linear-subulate, the apex usually long-hairpointed and fimbriate. Capsule immersed. Peristome double. Ground- and rock-mosses.
Diphyscium Mohr.

144. Leaf lamina one-layered.
146. (169) Leaf margin entire or scarcely and finely crenulate.
147. (152) Leaves oblong-spathulate to Ungulate. Leaf apex usually obtuse or somewhat acute.
148. Calyptra cylindrical-campanulate, enveloping the whole capsule. Leaves densely and strongly papillose. Spores large, verrucose. Ground- and rock-mosses.
Encalypta Iledw.

148. Calyptra usually cucullate, if campanulate then not enveloping the whole capsule.
149. Seta long, very slender. Capsule smooth.
150. Leaves crisped when dry. Ring persistent. On rocks.
Merceyopsis Broth, et Dix.

150. Leaf margin strongly incurved when dry. Ring unrolling. On walls, on rocks and on ground. **Hyophila** Brid.

149. Seta shorter. Capsule with 8 or 16 prominent coloured streaks.
151. Mouth of capsule small, strongly puckered. Calyptra small, cucullate, usually smooth. On bark or on rocks.
Zygodon Hook, et Tayl.

151. Mouth of capsule not puckered. Calyptra campanulate, more or less pilose, longitudinally sharply plicate. Tree- and rock-mosses. . . . . **Orthotrichum** Hedw.

147. Leaves lanceolate or linear-subulate. Leaf apex usually acute or acuminate.

152 (167) Basal leaf cells rectangular or elongate.
153. (162) Basal leaf cells rectangular.
154. Green protonema persistent. Leaf cells papillate. Basal cells hyaline. Capsule densely covered with large pustules. Lid absent. Spores 35—40 /i, brown, papillose. In open places between grasses. . . . . **Trachycarpidium** Broth.
154. Green protonema fugacious. Lid present.
155. Capsule cylindrical or pyriform.
156. Capsule distinctly with 8 or 16 deep folds when dry.
157. Capsule pyriform, wide-mouthed. Peristome absent. Leaf margin recurved at base. On rocks. **Amphidium** (Nees) Schimp.
157. Capsule cylindrical, mouth of capsule small, strongly puckered. Peristome single, double or absent. On bark and on rocks. . . . . **Zygodon** Hook, et Tayl.
156. Capsule not folded. Peristome teeth entire or divided to base, papillose. Red to reddish-brown ground- and rock-mosses. **Didymodon** Hedw.
155. Capsule ovoid, obovoid or slightly cylindrical, not folding when dry.
158. Capsule on laterally places short branches. Bib percurrent, papillose on back. On volcanic rocks. **Anoectangium** (Hedw.) Br. et Schimp.
158. Capsule terminal on the primary stem.
159. Perichaetial leaves highly sheathing. Leaf cells finely papillate. Calyptra plicate. On trees and on rocks. **Glyphomitrium** Brid.
159. Perichaetial leaves not differently developed.
160. Basal leaf cells hyaline.
161. Leaves crisped when dry. Peristome teeth short, undivided or peristome absent. Ground-mosses and growing in cracks of rocks. . . . . **Weisia** Hedw.
161. Leaves not crisped when dry. Peristome teeth 16, usually long lanceolate, sometimes divided. On calcareous rocks. **Gyroweisia** Schimp-
160. Basal cells not hyaline. Capsule ovoid to spheroidal. Peristome absent. On limestone rocks. **Gymnostomum** Hedw.
153. Basal leaf cells elongate with acute ends.
162. Peristome absent.
163. Leaf margin plane. Capsule oblong-cylindrical, narrowly mouthed. On bark. . . . . **Leptodontopsis** Broth-
163. Leaf margin incurved or recurved.
164. Seta distinctly developed. Mouth of capsule after the removal of the lid closed for a long time with a membrane (hymenium). On the ground and in clefts of walls and rocks. **Hymenostomum** R. Brow#
164. Seta very short, capsule immersed. Lid persistent or absent. Hymenium none. Ground-mosses . . . **Astomum Hp[e]***

162. Peristome present.
165. Leaves from a broader sheathing base longly and slenderly acuminate. Peristome teeth perforated or divided into 2—4 segments, short, densely papillose. Rib exeurrent. Ground-, ruck- and tree-mosses . . . Pseudosymblepharis Broth.
165. Leaves without a .sheathing base. leaf apex obtuse, mucronate. 9 Peristome teeth cut ire or divided to their base.
Hid. Leaves fragile. Peristome teeth entire, spirally papillosely striate. Basal membrane none. On wet rocks.
Oxystegus (Lindb.) Hi!p.
166. Leaves not fragile. Peristome teetli divided to their base, remotely papillose. Ground-, wall- and rock-mosses.
Trichostomum Hedw.
152. Basal leaf cells not or scarcely different from the upper laminal "cells.
167. Leaves narrow-Hnpulate. Leaf cells transparent. On rocks, roots and on branches in streams . . . . Hydropogon Bnd.
167. Leaves lanceolate. Leaf cells not transparent.
168. Leaf rib dorsally rough, very scabrous. On walls and on stones. Semibarbula liitp.
168. Rib dorsally smooth or slightly papillose. Ground- and rock-musses . . . . . Baxbula Hedw.
U6. Leaf margin serrate or dentate or strongly erenate, at least at apex.
169. Leaf margin plane.
170. Basal leaf cells elongate or rectangular.
171. Leaves longly decurrent. Capsule narrowly cylindne Worm, plicate . . . . . Pleurozygodontopsis Dix.
171. Leaves not deeurrent. Peristome teeth usually present, entire Capsule eylindric, small-mouthed, strongly puckered, folded when dry. On bark and on rocks . . Zygodon Hook et layl.
170-Basal leaf cells usually not different from the laminal cells. Leaves ovate-lanceolate, kmg-hairpointed. Exostome absent. Endostome without cilia. Mostly on treefcrns. Hymenodon Hook t. et Wils.
169. Leaf margin partly or completely recurred or incurved.
172. Leaves oblong-lingulate, mostly obtuse.
173. Leaf margin recurved. Basal leaf cells elongate, hyaline or llow.
174. Perichaetial leaves highly sheathing. Peristome teeth 16, divided to their base, smooth or finely papillose. Ground-, rock- and tree-mosses . . . . . Leptodontium Hamp.
174. Perichaetial leaves not differently developed. Peristome teeth 32 twisted to the left from a high tesselated basal membrane, papillose or t r _ e l y stnat, On walls, « £ j j * * £ sides, rarely on baric .
173. Leaf margin incurved. Basal leaf cells rectangular.
175 Leaves broad-lanceolate to spathulate. Peristome absent. On walls, rocks and on ground . . . - • . Hyophila Bnd.
175. Leaves from a spathulate base oblong-lanceolate. Peristome teeth 16 lanceolate, paired, smooth. On rocks. Ebabdoweisiella Williams

172. Leaves linear-lanceolate, obtuse, mucronate, crisped when dry. Basal leaf cells elongate, hyaline. Peristome teeth divided to their base. Ground- and rock-mosses . . . . **Trichostomum** Hedw.

43. Primary stem often creeping, usually copiously pinnately or irregularly branched. Capsules at the apices of short lateral branches of **limited growth** ***{plewocarpous mosses).***

176. (277) Alar cells absent or indistinctly developed.

177. (245) Leaf cells prosenchymatous, linear or elongated rhombic.

178. (221) Leaf cells linear.

179. (197) Leaf rib absent or very short and double.

180. (193) Leaf cells smooth.

181. (188) Leaf cells thin-walled.

182. Seta very short, capsule immersed. Peristome teeth smooth. Lower basal leaf cells forming a transversal band of subisodiametric, brown-reddish cells. Tree-mosses.
Symphysodon Doz. et Molk.

182. Seta distinctly developed, capsule elevated. Peristome teeth papillose or transversely striate.

183. Paraphyllia present, subulate. Secondary stems woody, more or less arborescent, pinnately or bipinnately branched. Capsule elongate, cylindrical. Peristome teeth densely papillose. Leaves apt to turn white papery in spots, giving the plant a characteristic look. On trunks and on branches.
Trachyloma Brid.

183. Paraphyllia absent.

184. Perichaetial leaves highly sheathing. Branch leaves elliptic-lanceolate, complanate. Gemmae on tips of branches. Capsule 8-ribbed. Peristome teeth transversely striate. Calyptra mitriform, deeply lobed. On bark and OIL leaves.
Hampeella C. Muell.

184. Perichaetial leaves erect, abruptly or gradually subulate, never sheathing.

185. Marginal leaf cells in one row elongate, forming an indistinct border. Primary stem almost regularly pinnate. Branch leaves more or less complanate, not homotropous. Ground- and rock- and tree-mosses.
Vesicularia (C. Muell.) C. Muell.

185. Marginal leaf cells not differently developed.

186. Secondary stems long, pendulous. Leaves concave, oblong-lanceolate, longly acuminate, obliquely spreading, soro*'what complanate. Peristome double. Very slender tree* mosses. . . . . **Barbella** (C. Muell.) Fleisch.

186. Secondary stems creeping or procumbent.

187. Secondary stems usually pinnately branched. Branch leaves radially arranged, not complanate falcate a** homotropous near apex. On forest ground, tree-trunk[s] and rocks. . . . . **Ectropothecium** Mit[t§]

187. Secondary stems usually irregularly branched. Branch leaves spreading, complanate, not homotropous. Mostly on rotten tree-trunks,, sometimes on stones or on rocks. **Isopterygium** Mitt.

181. Leaf cells thick-walled.

188. Leaves longitudinally plicate or undulate.

189. Peristome teeth papillose. Endostom^with low basal membrane and filiform processes.

190. Inner perichaetial leaves highly sheathing. Capsule totally immersed. Calyptra mitriform. Bark-mosses. **Qarovaglia** Endl.

190. Inner perichaetial leaves small. Capsule shortly elevated. Calyptra cucullate. Tree-mosses . **Endotrichella** C. Muell.

189. Peristome teeth transversely striate Endostome with highly developed basal membrane and broad, keeled processes. Calyptra conical. Spores 35 X 45 /1. Bark-mosses. **Euptychium** Schimp.

188. Leaves concave or plane, not plicate.

191. Secondary stems long, pendulous. Leaves oblong-lanceolate, longly acuminate, obliquely spreading, somewhat complanate. Peristome double. Very slender tree-mosses. **Barbella** (C. Muell.) Fleisch.

191. Secondary stems erect, suberect or creeping.

192. Secondary stems disposed in one plane, pinnate or bipinnate. Leaves oblong-lanceolate, shortly acuminate. Leaf base with a band of isodiametric, reddish-brown cells. Peristome teeth smooth. Endostome rudimentary, only a short basal membrane without processes. Tree-mosses. **Symphysodontella** Fleisch.

192. Secondary stems simple or irregularly branched. Leaves ovate-lanceolate, subulate acuminate. Peristome teeth papillose. Endostome with 16 filiform processes. Tree-mosses. **Endotrichella** C. Muell.

180. Leaf cells more or less papillate or mammillate.

193. Leaf cells thin-walled with papillately projecting upper ends. Leaves elliptic, complanate. Capsule smooth. Lid conical, acute. Peristome double. On decaying wood, rarely on rocks or on humus soil. . . . . **Isopterygium** Mitt.

193. Leaf cells thick-walled. Branch leaves oblong-lanceolate to Ungulate, squarrose or spreading, seldom complanate.

194. Seta short-or absent. Leaves longitudinally plicate or undulate.

195. Leaf margin entire. Marginal cells shortened. Capsule nearly immersed, furrowed when dry. Peristome absent. Rock-mosses. **Hedwigidium** Br. et Schimp.

195. Leaf margin dentate or serrate, at least in part, either near base or near apex. Capsule totally immersed in the perichaetium. Calyptra mitriform, several-lobed, naked, covering only the lid. Bark-mosses. . . . . **Gaxovaglia** Endl.

194. Seta longer than 1 cm (up to 3 cm). Leaves concave, not plicate.

196. Primary stem more or less regularly pinnate. Branches short, more or less complanate. Leaves Ungulate, rounded or short-pointed. Seta smooth or somewhat rough. Calyptra cucullate, naked. On wet rocks and stones . . **Olossadelphus** Fleisch.

196. Primary stem densely tomentose, richly pinnately branched. Branches elongate, radially arranged or complanately foliate. Leaves oval-oblong or lanceolate, short-pointed or abruptly long-pointed. Seta papillose or spinose. Calyptra conical-mitriform, spinose and ciliate. On trunks, on branches and on leaves.
Chaetomitrium Doz. et Molk.

179. Leaf rib single or flbuble, at least longer than one fourth the length of the leaf.

197. Leaf base auriculate. Peristome teeth smooth. Endostome brown-yellow with well-developed processes. Tree-mosses.
Calyptothecium Mitt.

197. Leaf base not auriculate.

198. (211) Leaf cells smooth.

199. Leaf margin entire.

200. Leaf cells thin-walled,, basal leaf cells forming a band of isodiametric coloured cells. Peristome teeth united in pairs, smooth. Bndostome very thin, hyaline, without processes. Tree-mosses. . . . . **Symphysodon** Doz. et Molk.

200. Leaf cells thick-walled. Rib ending halfway up or higher.

201. Secondary stems simple, obtuse. Leaf lamina plicate, when dry. Leaves cordate, oval. Peristome single. Seta 5 mm. On bark.
Jaegerinopsis Broth.

201. Secondary stems pinnately branched. Leaf lamina never plicate, concave. Leaves oblong-lanceolate, acuminate. Peristome teeth smooth. Endostome rudimentary. Seta short or absent. Tree-mosses . . . . **Symphysodontella** Fleisch.

199. Leaf margin dentate or serrate.

202. (210) Leaf cells thin-walled.

203. Rib double, ending below apex. Peristome teeth transversely striate. Seta elongate, smooth. Tree- and rock-mosses.
Hookeriopsis (Besch.) Jaeg-

203. Rib single.

204. Secondary stems long, pendulous.

205. Leaves horizontally spreading, oblong-lanceolate, gradually narrowed into a long capillary point. Seta short, smooth or papillose. Tree-mosses. **Barbella** (C. Muell.) Fleisch.

205. Leaves squarrosely spreading.

206. Leaves stem-clasping. Leaf tip often recurved. Calyptra conical, hairy or seldom cucullate and naked. Basal membrane low, without cilia. Tree-mosses.
Meteoriopsis Fleisch.

206. Leaves half-stem-clasping. Leaf tip twisted. Calyptra unknown. Basal membrane as high as length of processes, with 2—3 cilia. Tree-mosses.
Aerobryum Doz. et Molk-

204. Secondary stems erect or prostrate.

207. Primary stem creeping, secondary stems erect, arborescently branched.

208. Leaves strongly longitudinally plicate, ovate-lanceolate. **Capsule** immersed. Peristome teeth smooth. On bark.
Pterobryum Hornsch.
208. Leaves not or indistinctly plicate. Capsule longly exserted.- Peristome teeth papillose or striate.
209. Paraphyllia subulate. Rib dorsally smooth, ending halfway. On trunks and on branches. . . . . **Trachyloma** Brid.
209. Paraphyllia absent. Bib percurrent or shortly excurrent, dorsally strongly toothed. Bark-, rock- and ground-mosses.
Hypnodendron (C. Muell.) Lindb.
207. Primary and secondary stems creeping, irregularly branched. Seta elongate, usually sinuose. Peristome teeth transversely striate. Ground- and stone-mosses. **Shynchostegium** Br. et Schimp.
202. Leaf cells thick-walled.
210. Secondary stems very long, 20—30 cm, arborescently branched. Paraphyllia subulate. Leaf rib percurrent, dorsally dentate. Seta 5—15 mm, capsule elevated. Bark-mosses.
Pterobryella (C. Muell.) C. **Muell.**
210. Secondary stems usually simple, elongate, undulate, not densely crowded, often with lateral flagellae. Paraphyllia absent. Seta very short, capsule immersed. Tree-mosses. **Jaegerina** C. **Muell.**
198. Leaf cells more or less papillate or mammillate.
211. (219) Rib single.
212. Secondary stems erect, arborescently branched.
213. Capsule smooth. Lid conical or shortly rostrate. On forest ground.
Sciadocladus Lindb.
213. Capsule more or less distinctly ribbed. Lid longly rostrate. On bark, on rocks and on forest ground.
Hypnodendron (C. Muell.) Lindb.
212. Secondary stems erect or pendulous, simple or pinnately branched.
214. Secondary steins simple, elongate, undulate, not densely crowded, often with lateral flagellae. Leaves longitudinally plicate. Seta very short, capsule immersed. Tree-mosses. **Jaegerina** C. Muell.
214. Secondary stems more or less pinnately branched. Flagellae absent.
215. Branch leaves upwards transversely undulate. Branches somewhat complanately foliate. Periohaetial leaves hairpointed.
216. Leaves gradually narrowed. Peristome teeth papillose. On bark and on leaves, seldom on rocks. **Aerobryopsis** Pleisch.
216. Leaves oblong-lanceolate, abruptly narrowed into a long narrow point. Bib exceeding the middle of the leaf lamina. Peristome teeth yellow, densely transversely striate. On bark.
Aerobryidium Fleisch.
215. Branch leaves not undulate. Perichaetial leaves shortly acuminate.
217. Leaves squarrosely spreading. Branchlets never complanate. Tree-mosses. . . . . **Meteoriopsis** Pleisch.
217. Leaves erect-spreading, never squarrose. Branchlets often somewhat complanate.

218. Leaves lanceolate, gradually narrowed into a long capillar point. Glossy plants. Leaf cells smooth or faintly papillate. Calyptra usually mitriform and naked, seldom cucullate and hairy. Tree-mosses. . . . . **Barbella** (C. Muell.) Fleisch.

218. Leaves ovate-lanceolate, acuminate. Dull plants. Leaf cells seriately papillat?. Calyptra cucullate, sparingly pilose. On bark, on branches and on leaves, rarely on dead twigs or on humus soil. **Floribundaria** C. Muell.

211. Rib double.

219. Branches dimorphous: complanate branches with double-toothed leaves and narrowed branches with indistinctly dentate leaves and with gemmae. Calyptra stifly haired. On bark. **Dimorphocladon** Dix.

219. Branches similar. Marginal row of leaf cells once dentate.

220. Leaves several-rowed. Leaves oblong-lanceolate. Leaf cells with papillosely projecting ends. Leaf ribs short. Seta papillose or spinose. Lid longly rostrate. Calyptra conical-mitriform, spinulose, often ciliate. On trunks, branches and on leaves. **Chaetomitrium** Doz. et Molk.

220. Leaves in several rows, pseudodistichous. Leaves oval, ribbed to about the middle. Leaf cells strongly papillate, papillae in series. Seta smooth. Calyptra cucullate, smooth. Peristome teeth transversely striate. On bark and decaying wood. **Pseudohypnella** (Broth.) Fleisch.

178. Leaf cells elongated rhombic.

221. (231) Bib absent or very short and double.

222. (227) Leaf cells smooth.

223. Leaf cells thin-walled.

224. Basal leaf cells or basal marginal cells differently developed as the laminal cells. Seta rough with convex cells. Lid longly and finely rostrate. On decaying bark and on the base of tree-trunks. . . . . **Leucomium** Mitt.

224. All laminal cells similar to each other.

225. Branches complanately leaved. Leaves ovate-lanceolate, shortly or longly acuminate. Seta smooth. Lid convex or conical, shortly acute. Ground-, rock- and tree-mosses. **Vesicularia** (C. Muell.) C. Muell.

225. Branches not complanately leaved.

226. Leaves lanceolate, acuminate. Capsule ovoid. Seta smooth. On decaying trunks, seldom on rocks. **Sauloma** (Hook. f. et Wils.) Mitt.

226. Leaves ovate-triangular. Capsule unknown. One large alar cell, hidden in the stem . . . . **Crepidophyllum** Herz.

223. Leaf cells thick-walled. Leaves octostichous, appearing tetrastichous, Ungulate or spathulate, obtuse. On roots, on base of trees, on rocks, rarely on ground. **Homalia** (Brid.) Br. et Schimp-

222. Leaf cells papillate or mamillate.

227. Leaf cells thin-walled, papillate at the upper end.

228. Leaf margin entire. Leaves lanceolate, concave, subulate. Capsule small, ovoid or spherical, verruculose. On calcareous substrata, more rarely on bark . . . . Trachythecium Fleisch.
228. Leaf margin finely dfentate.
229. Leaf cells papillate at the upper end. Leaves oblong, shortly or longly acuminate, spreading. Branches strongly complanate. Ground- and bark-mosses . . . . **Taxiphyllum** Fleisch.
229. Leaf cells with mamillately projecting ends. Leaves lanceolate, falcate, homotropous near apex. Branches ail-roundly foliate. On forest ground, tree-trunks and on rocks. **Ectropotheciuxn** Mitt.
227. Leaf cells thick-walled. Leaf margin dentate.
230. Branches pinnately disposed. Branch leaves undulately, finely acute. Seta smooth. Endostome absent. Bark-mosses. **Microctenidum** Fleisch.
230. Branches uni-laterally arranged. Branch leaves distichous, spreading. Seta upwards papillose. Peristome double. Bark-mosses. **Ctenidiadelphus** Fleisch.
22J. Rib single or double, at least longer than y_4 the length of the leaf.
231. (241) Bib single.
232. (238) Leaf cells smooth.
233. Very robust, scarcely brandfed plants. Leaves densely and sharply serrate, with a sheathing nerveless base. Capsule on a very short seta. On trees and rotting wood. **Spiridens** Nees.
233. Slender plants or more or less robust. Leaf margin entire. Seta 4 mm or longer, capsule always emergent.
234. Leaf cells thin-walled. Leaves ovate or linear-lanceolate, serrate near apex. Leaves of stem and branches radially arranged. Exostome absent. Endostome a low basal membrane with 16 appendiculate processes. Lid small, mammillate. flround- and rock-mosses. . . . . **Mielichhoferia** Hornsch.
234. Leaf cells thick-walled.
235. Secondary stems very complanate.
236. Leaves broadly lingulate with truncate or rounded apex, sometimes with a small acumen, usually undulate. Secondary stems elongate, irregularly pinnate. Peristome teeth papillose. Tree- and rock-mosses . . . **Neckeropsis** Beichdt.
236. Leaves lingulate-spathulate, obtuse. Secondary stems usually dichotomously branched, seldom pinnate. Peristome teeth transversely striate. Tree- and rock-mosses. **Homalia** (Brid.) Br. et Schimp.
235. Leaves of secondary stems several-ranked, not complanate.
237. Leaf margin recurved towards apex. Lid conical, blunt. Exostome teeth shorter than the endostome processes. Endostome processes perforated, smooth. Tree-mosses. **Rhegmatodon** Brid.
237. Leaf margin wholly recurved. Lid conical, acute or shortly rostrate. Endostome absent or rudimentary. On trees, rarely on rocks. . . . . **Porstroemia** Lindb.

232. Leaf cells more or less papillate.
238. Branchlets somewhat complanately leaved. Primary stem pendulous, irregularly branched. Rib ending about halfway. Leaf cells unipapillate over thtf lumen. On bark and leaves, sometimes on rocks. . . . . **Aerobryopsis** Fleisch.
238. Leaves of branchlets radially arranged.
239. Primary stem pendulous, irregularly pinnate. Leaves appressed.
240. Leaf cells pluri-papillate on the cell wall and over the lumen. Branches imbricately foliate. Plants dull. Seta smooth. Tree-mosses. . . . . **Papillaria** (C. Muell.) C. Muell.
240. Leaf cells uni- or bi-papillate over the lumen. Branches densely leaved and turgid. Plants more or less shining. Seta papillose. Tree-mosses . . . **Meteorium** Doz. et MolK
239. Primary stem adscending, more or less regularly pinnate. Leaves laxly imbricate, contorted when dry. Paraphyllia sparingly developed. Ground- and tree-mosses.
Claopodium (Lesq. et Jam.) Ben. et Card.
231. Leaf rib double.
241. Leaf cells smooth.
242. Leaf margin indistincUy bordered with one row of narrowed cells. Branches radially leaved. Peristome teeth papillose with a zigzag median line. Calyptra mitriform, lobed, smooth. Tree-mosses. . . . . **Actinodontium** Schwaegr-
242. Leaves not bordered. Branches complanately foliate. Peristome teeth transversely striate. Calyptra conical, mitriform, small smooth. Tree- and rock-mosses. **Hookeriopsis** (Besch.) Jaeg-
241. Leaf cells more or less papillate to mammillate.
243. Leaf cells finely unipapillate at the upper end.
244. Primary stem creeping, pinnate or irregularly bipinnate. Leaves with recurved apex. Creeping along branches of trees. **Chaetomitriopsis** Fleisch.
244. Primary stem creeping with procumbent, nearly dendroid secondary stems. Leaf apex straight, leaves often narrowed below apex. On forest floor . . **Macrothamnium** Fleiscb*
243. Leaf cells unipapillate over the lumen. Leaves oblong, shortly acuminate. Bib ending near apex. On tree-trunks and decaying wood, rarely on rocks . . . **Callicostella** (C. Muell.) Mitt*
177. Leaf cells parenchymatous: small and narrow or wider qua* drangular to hexagonal.
245. (269) Leaf cells small: quadrate, hexagonal or rounded.
246. Leaf rib double, ending below the apex. Leaf cells usually unipapillate over the lumen. Branches complanately foliate. Capsule horizontal to pendulous. Calyptra conical-mitriform. On tree-trunks .and decaying wood, rarely on rocks.
Callicostella (C. Muell.) Mitt-
246. Leaf rib single or absent.
247. Leaf cells thin-walled.

248. Leaf cells densely and finely papillate. Secondary stems simply or bi-pinnately branched. Leaf margin dentate or seldom entire. Bib percurrent, smooth at back. On shady ground.
O/1O T , „ , **Thuidiopsis** (Broth.) Fleisch.

*4o. Leaf cells smooth.
249. Leaf margin bordered. Primary stem creeping, branches erect.
250. Leaf rib ending far below apex. Seta very short. Calyptra naked. Tree-mosses. . . . . **Orthomniopsis** Broth.
250. Leaf rib percurrent or excurrent. Seta elongate. Calyptra densely and longly pilose. Tree-mosses. **Orthomnium** Williams
249. Leaves not bordered. Leaves ovate-lanceolate, leaf apex rounded or acute. Leaf margin toward apex finely to coarsely dentate. Usually on wet ground, near springs and waterfalls, rarely aquatic. . . . . **Thamnium** Br. et Schimp.

247. Leaf cells! thick-walled.
251 (252) Leaf cells smooth.
252. Leaf rib strongly undulate above. Secondary stems snaillikely inrolled when dry. Leaves lanceolate, shortly acuminate, upwards widely serrate. On tree-trunks and on rocks.
Herpetineurum (C. Muell.) Card.

252. Leaf rib not undulate.
253. Leaf margin bordered.
254. Leaf border consisting of a few rows of cells extending up to about one third the length of the lamina. Peristome absent or consisting of two narrow membranes. Calyptra mitriform, small, smooth. Chiefly bark-mosses, rarely on rocks.
Micromitrium Schimp.

254. Leaf border reaching the apex.
255. Leaf border two-layered, widely dentate. Very robust, scarcely branched mosses. Leaves of branches radially arranged. Seta short. On trees and on rotting wood.
Spiridens Nees.

255. Leaf border one-layered, nearly entire. Slender, simple or sparingly branched mosses. Branches complanately leaved. Seta elongate, thin, undulate. Tree-mosses. **Leskeodon** Broth.

253. Leaves not bordered.
256. Branches complanately leaved. Leaves in 8 rows, pseudotetrastichous.
257. Leaves broadly Ungulate, with truncate or rounded apex, sometimes with a small acumen, usually undulate. Secondary steins elongatej irregularly pinnate. Peristome teeth papillose. Tree- and rock-mosses . . . **Neckeropsis** Beichdt.
257. Leaves lingulate-spathulate, obtuse. Secondary stems usually dichotomously branched, seldom pinnate. Peristome teeth transversely striate. Tree- and rock-mosses.
Homalia (Brid.) Br. et Schimp.

256. Leaves of branches in several rows, radially arranged.
258. Primary stem short.

259. Basal leaf cells elongate. Secondary stems sparely irregularly branched. Seta 1—3 cm. Endostome absent. Tree-mosses. **Bescherellea** Dub.

259. Basal leaf cells short. Secondary stems irregularly branched. Leaf cells smooth. Seta short. Lid conical, obtuse. Exostome teeth shorter than endostome processes. Tree-mosses. **Rhegmatodon** Brid.

258. Primary stem elongate.

260. Secondary stems single.

261. Calyptra campanulate, longitudinally plicate, entire or rarely split open on one side, smooth or hairy. Capsule erect, spherical or oblong-ovoid. Peristome double, sometimes single or absent. Predominately tree-mosses . . . . **Macromitrium** Brid.

261. Calyptra conical-campanulate, never plicate, lower margin lobed. Capsule erect, ovoid to cylindric. Peristome double. Tree- and rock-mosses. . . . . **Schlotheimia** Brid.

260. Secondary stems pinnate, bipinnate or branched like a fan. Leaves more or less distinctly in 8 rows, Ungulate, leaf apex obtuse but usually with acumen. Tree-mosses. **Himantocladium** (Mitt.) Fleisch.

251. Leaf cells more or less papillate or mammillate.

262. Paraphyllia absent.

263. Capsule immersed. Leaves dimorphous: leaves of primary stem and of sterile branches lanceolate, acute, arranged in several rows; leaves of fertile branches ovate and 5-ranked. Tree-mosses. **Desmotheca** Lindb.

263. Capsule emerged on a shorter or longer seta.

264. Leaves in 5 rows. Leaf margin entire, only finely serrulate, with projecting papillae. Bib ending in or just below ape*. Seta smooth. Tree- and rock-mosses. **Anomodon** Hook, et Tayl-

264. Leaves in several rows.

265. Primary stem erect, sparingly branched. Rib percurrent, papil' lose on back. Lid longly rostrate. On volcanic rocks. **Anoectangium** (Hedw.) Br. et Schiinp-

265. Primary stem creeping, branches erect or procumbent.

266. Basal leaf cells elongate, very incrassate with a semilunul»r lumen, sometimes with large papillae. Calyptra campanula^* plicate. Tree-mosses. . . . . **Macromitrium** Brid-

266. Basal leaf cells not differentiated. Sometimes an intralaminaJ band of elongated cells in several rows extending for soft& distance from the base upwards. Seta papillose. Calyptr* unknown. Tree-, rarely ground- and rock-mosses. **Pinnatella** (C. Muell.) Fleisch.

262. Paraphyllia present, usually numerous.

267. Calyptra conical-campanulate, deeply lobed, spinose. Rib branch leaves being placed more to one side of the leaf lamina*. On rotten wood, on roots and on bark . . . **Pelekium** Mitt.

267. Calyptra cucullate, smooth. Rib in branch leaves dividing the lamina into two equal parts.

268. Paraphyllia few, squarrose, lanceolate, not branched. Branches regularly or irregularly simply pinnate. Leaves spreading and curved when dry. (ifround- and rock- and tree-mosses.
Claopodium (Lesq. et Jam.) Ren. et Card.

268. Paraphyllia numerous, simple or variously branched. Branches densely bi- or tri-pinnate, very short ones only simply pinnate. Leaves appressed or incurved when dry. On forest ground, on bark and on roots. . . . . **Thuidium** Br. et Schimp.

24.1. Leaf cells wider: regularly hexagonal or more or less elongate hexagonal without acute ends.

269. Leaf cells regularly hexagonal, smooth, thin-walled. Leaves bordered, usually complanate.

270. Leaf rib when present, single, forked or unforked.

271. Leaf rib unforked or absent. Leaf margin entire.

272. Leaf rib ending about halfway or nearer to the apex. Leaf apex acute or rounded. Peristome teeth transversely striate with furrowed median line. Seta smooth. On moist ground, rocks- and tree-trunks . . Distichophyllum Doz. et Molk.

272. Leaf rib short or absent. Leaves usually hairpointed.

273. Seta papillose. Peristome teeth papillose with zigzag median line. Lid shortly rostrate. Bndostome processes weakly keeled. Leaf rib absent. Growing among other mosses.
Distichophyllidium Fleisch.

273. Seta smooth. Peristome teeth pale, smooth. Lid longly rostrate. Leaf rib absent. Endostome processes strongly keeled. On decaying wood . . . **Archboldiella** Bartr.

271. Leaf rib single at base, forked above, forks unequal. Leaf margin dentate. Peristome teeth furrowed in the median line. Seta densely spinose. On rotting tree-trunks, wet rocks, humus soil. . . . . **Eriopus** (Brid.) C. Muell.

270. Leaf rib double, ending below the apex. Leaf margin bordered, slightly dentate. Peristome teeth transversely striate with furrowed median line and with many lamellae. Seta smooth. Ground-, rock- and tree-mosses . . . . **Cyclodictyon** Mitt.

269. Leaf cells hexagonal, elongate.

274. Leaf rib absent or very short and double.

275. Leaves 5-ranked, complanate. Leaf margin entire, with an indistinct border in one row. Leaf cells smooth. In shining oily looking tufts on moist and shady forest ground.
Hookeria Sin.

275. Leaves several-ranked, complanate. Leaf margin dentate, not bordered. Leaf cells papillate; papillae in series on the cell wall. On bark, rarely on ground. **EctropothecieUa** Fleisch.

274. Leaf rib distinct, at least one fourth the length of the lamina single or double.

276. Leaf rib single, ending far below apex. Leaf margin bordered. Peristome teeth densely papillose, with longitudinal zigzag line, unforked. On bark and on branches. **Daltoma** Hook, et Tayl.

276. Leaf rib double, ending about the middle of the lamina. Leaf margin not bordered. Peristome teeth transversely striate, perforated in the median line. Tree- and rock-mosses.
Hookeriopsis (Besch.) Jaeg.

176. Alar cells distinctly developed, different in size or in shape to the laminal cells.

277 (390) Leaf cells prosenchymatous: linear or elongated rhombic.

278. (354) Leaf cells linear.

279 (332) Rib absent in branch leaves.

280. Leaves spreading or imbricate, at the straight or hooked tips of stem and branches rolled up into an acute point.

281. Leaves lanceolate, acuminate. Leaf cells usually incrassate, smooth or somewhat scabrous. Peristome double. Peristome teeth not paired, transversely striate. Capsule small, inclined or suberect. On trunks and on branches, more rarely on rocks and on forest ground . . . . **Acroporium** Mitt.

281. Leaves oblong-elliptic, acuminate. Leaf cells thin-walled, smooth. Endostome absent. Peristome teeth in pairs, bordered, smooth. Capsule erect. On bark.
Schraderella C. Muell.

280. Apical branch leaves not uprolled into an acute point.

282. (319) Leaf cells smooth.

283. Leaves tristichous. Leaf apex with two rows of spines on back. On branches . . . . . Tristichella Dix.

283. Leaves several-ranked.

284. (304) Leaf cells thin-walled.

285. (294) Alar cells large, usually hyaline, in one horizontal row, seldom with a few small cells in a second row above.

286. Leaf margin entire, seldom finely dentate near apex.

287. Leaves falcate, homotropous. Branches irregularly disposed. Lid longly rostrate. On tree-trunks, less frequently on rocks or humus ground.
Rhaphidorrhynchium Besch.

287. Leaves erect-spreading, oblong-elliptic.

288. Leaf apex blunt or with a short or subulate point. Capsule inclined to horizontal. Neck of capsule smooth. Exothecial cells collenchymatous. Seta smooth. On trees, rarely on rocks . . . **Sematophyllum** Mitt.

288. Leaf apex more or less abruptly narrowed into a short or long lanceolate to aristate point. Capsule pendulous. Neck of capsule verrucose. Exothcial cells thin-walled or collenchymatous. Seta papillose. Tree-mosses.
Rhaphidostichum Fleisch.

286. Leaf margin distinctly dentate, at least near apex.

289. Leaves falcate, homotropous.

290. Branch leaves oblong to lanceolate, abruptly passing into a rather long, nearly filiform subulate point. Alar cells undivided. Peristome teeth perforated in the

median line. Exothecial cells more or less collenchymatous. Neck of capsule verrucose. On bark and on tree-trunks.

y **Warburgiella C. Muell.**

290\. Branch leaves elliptic, gradually attenuated into a narrowly subulate point. Alar cells sometimes with transverse walls. Peristome teeth with a zigzag median line. Bxothecial cells parenchymatous. Neck of capsule smooth. T r ^ m o s ^ the Loesk.

289\. Leaves spreading, erect or squarrose.

291\. Leaves longitudinally plicate.

292\. Leaves squarrose, sharply dentate. Gold-green, shiny, densely pinnate plants. Capsule unknown. On shrub^and « £ « tajnta; Pt hophy um B oth

292 Leaves erect spreading, finely dentate near apex. Seta strongly ^ S o s H o ·U Capsule tuberculate at b^O^rotte^trunks. o] oecii Bartr.

2ll*. L ^ S e s T a n c P e S gradually apiculat. Basal margin above the alar cells with a few hyaline cells. Seta smooth. On tree-trunks. **Acanthocladium Mitt.**

293\. Leaves elliptic, abruptly narrowed into ^ S d o S ^ F I e S Seta upwards papillose. Tree-mosses. **Rhaptadostichum** Meiscn.

285\. Alar S S a group of equally developed larger or smaller cells in several horizontal rows.

294\. Alar cells incrassate.

295\. Filiform gemmae present.

296\. Small, slender plants. Primary stem creeping, secondary ascending, often with caudate tips, bearing smooth gemmae. as? small, ovoid. Lid shortly rostrate. Peristome teeth papillose with circular perforations in the median line. Endostome processes linear. On bark and decaying wood. **Aptychella Herz.**

296\. ary stem longly creeping, secondary stems Branches with clusters of papillose brood-filam'enf near tips. Cpsul. oblong-ovoid. Lid rostrate. On **Clastobryella Fleisch.**

2,5. concave. Capsule ovoid smooth Lid finely and thinly rostrate. Peristome teeth rane without pro-cesses. Tree-mosses. **Myurium Schimp.**

294\. Alar cells thin-walled. nblioue rows

297\. Alar cells t a m i n g ..verylarge group . |^ g ^ S about halfway on e t k J. » J « larly pinnatJ. Peristome Branches i n h W ' t T b e C ^ ^ v e S a l l y striate upwards. On teeth transversely striate below, verxi ^ ^ ^ ^ ^ flamp

297\. S C J f i f o m t g a much smaller group, sometimes nearly absent. on ks

298\. Leaves complanate.

299. Peristome teeth cribrosely perforated. Leaves ovate-oblong. Capsule erect, narrowly cylindrical. Lid obliquely rostrate. On trees.

299. Peristome teeth usually not perforated, papillose or striate. **Cribrodontium** Herz.

300. Leaves ovate-lanceolate, obtuse or short-pointed, seldom longer acuminate. Capsule ellipsoid, erect. Basal membrane low. Peristome teeth differently striate. On tree-trunks and calcareous rocks. . . . . **Entodon** C. Muell.

300. Leaves ovate, longly acuminate. Secondary stems procumbent, simple or irregularly branched. Peristome teeth transversely striate. Basal membrane high. On rocks, on trees and trunks, and on forest floor . . . . **Plagiothecium** Br. et Schimp.

298. Leaves erectly or squarrosely spreading, not complanate.

301. Leaves longitudinally plicate, narrowly ovate-lanceolate, acuminate. Peristome teeth transversely striate at base, higher up obliquely to longitudinally striate and papillose at tip. Endostome without processes. On trees. **Oampylodontium** Doz. et Molk.

301. Leaves not or finely plicate.

302. Paraphyllia numerous, polymorphous. Alar cells yellow or brownish, incrassate, sharply limited. Leaves coarsely serrate above. On decaying wood. **Heterophyllium** (Schimp.) Kindb.

302. Paraphyllia absent.

303. Primary stem creeping, densely regularly pinnate, seldom irregularly branched. Capsule small, ovoid to ellipsoid, smooth, inclined. On forest ground, tree-trunks and on rocks. **Ectropothecium** Mitt.

303. Primary stem creeping, densely pinnate. Capsule oblong' ovoid, wide-mouthed, horizontal to inclined. With tumid, obtuse branches. On rocks . . . **Foreauella** Dix et Vard-

284. Leaf cells thick-walled.

304. Alar cells large, hyaline or brown, in one row with or without smaller cells in a second horizontal row.

305. Leaf margin entire, more or less recurved.

306. Alar cells incrassate. reddish brown and yellow. Capsule erect, ovoid. Peristome teeth yellow. Endostome pale, basal membrane high with short processes. Lid cupulate, shortly rostrate. *O&* bark. . . . . **Glastobryophilum** Fleisch-

306. Alar cells either thin-walled or thick-walled. Capsule erect, ovoid to oblong-cylindrical. Peristome teeth pale, papillose or smooth. Endostome absent. Mostly tree-, rarely rock-mosses. **Meiothecium** Mitt-

30.''). Leaf margin more or less dentate.

307. Leaves more or less distinctly bordered, upwards widely and sharply dentate. Alar cells often divided. Capsule very large, ellipsoidal, horizontal. On forest ground, on roots, decaying trunks and on bark . . . Trismegistia (C. Muell.) Broth-

307. Leaves not" bordered, subhomotropous to falcate. Seta smooth or upwards verrucose. Alar cells undivided. Capsule small, ovoid inclined. On tree-trunks. . . . . **Mastopoma** Card!

304. Alar cells forming a group of equally developed, larger or smaller cells in several horizontal rows.

308. Perichaetial leaves highly sheathing, ending at the base of the capsule.

309. Leaf cells incrassate and pitted. Peristome teeth striate, divided at least to the middle, segments united at tips. On trees. **Synodontia** Dub.

309. Leaf cells narrow, incrassate but not pitted. Peristome teeth usually highly papillose, red or pale, broadly lanceolate, entire. Mostly on trees. . . . . **Eucamptodon** Mont.

308. Perichaetial leaves short, not highly sheathing.

310. (314) Leaf margin entire.

311. Leaves falcate, homotropous at least at apex of branch.

312. Capsule long-cylindric, inclined to pendulous. Alar cells t>arenchymatous, coloured, not chlorophyllose, forming a distinctly limited group. Leaves oval-oblong, shortly or longer acuminate. Branches almost regularly pinnate. On various substrata. . . . . **Hypnum** Hedw.

312. Capsule ovoid to cylindric, erect. Alar cells chlorophyllose.

313. Leaves ovate-lanceolate, not plicate. Branches irregularly pinnate. Peristome teeth transversely striate. Bndostome well-developed. On bark, seldom on siliceous rocks. Pylaisia Br. et Schimp.

313. Leaves lanceolate, distinctly plicate. Branches nearly regularly pinnate. Peristome teeth finely papillose. Endostome absent. On stones in rivulets . . **Stereodontopsis** Williams

311. Leaves erect-spreading or imbricate, oval, abruptly shortly acuminate. Alar cells forming a small, concave group, hyaline. Capsule ellipsoid, inclined to horizontal. Lid convex, verrucose. On rocks. . . . . **Elmeriobryum** Broth.

310. Leaf margin more or less serrate or dentate.

314. Alar cells incrassate.

315. Leaves falcate, homotropous. Capsule inclined to pendulous, long-cylindric. Leaves oval-oblong, shortly or longly acuminate. On various substrata . . . . **Hypnum** Hedw.

315. Leaves erect-spreading, deeply plicate. Capsule ovoid, erect. Secondary stems with filiform papillose gemmae. Peristome teeth transversely striate. Tree-mosses. **Piloecium** C. Muell.

314. Alar cells thin-walled or very small.

316. Leaves dimorphous: stem leaves with fragile, decurrent auricles, abruptly lanceolate, branch leaves narrower, lanceolate, not auriculate. Capsule ovoid, inclined to pendulous, doiiiventral. Tree- and rock-mosses in dense, plumose mats. **Ctenidium** (Schimp.) Mitt.

316. Stem and branch leaves equally developed.

317. Leaves longitudinally plicate.
318. Leaves oblong. Peristome teeth papillose. Endostome absent. Seta 15 mm, papillose. On stones in streams.
Stereodontopsis Williams
318. Leaves ovate-lanceolate. Peristome double. Seta absent or very short. Leaves ovate, obtuse or shortly acute. Peristome teeth transversely striate. Basal membrane distinct, with broad, keeled processes. Spores 35—45 /i. Tree-mosses.
Euptychium Sehimp.
317. Leaves concave or flat, not plicate, falcate, homotropous. Paraphyllia numerous, often branched. Peristome teeth papillose. Capsule longly cylindrical. On tree-trunks . **Stereodon** Mitt.
282. Leaf cells more or less papillate to mammillate.
319. (328) Leaf cells thin-walled.
320. (326) Alar cells few and large, in one horizontal row with or without smaller cells above.
321. Leaves usually falcate. Lid longly and finely rostrate.
322. Leaf cells with papillately projecting upper ends. Seta smooth. On tree-trunks, less frequently on rocks and humus ground.
Rhaphidorrhynchium Besch.
322. Leaf cells uni-papillate or seriate over the lumen.
323. Primary stem creeping, secondary stems erect. Filiform papillose gemmae at the tip of branches. Leaves ovate-lanceolate, shortly or longer acuminate. Peristome teeth smooth or papillose. Bark- and leaf-mosses.
Clastobryella Fleisch.
323. Primary and secondary stems creeping. Exothecial cells collenchymatous.
324. Leaf cells uni- or seriate-papillose over the lumen. Seta strongly scabrous above. Neck more or less verrucose. O# bark and rocks, rarely on decaying wood.
Trichosteleum (Mitt.) Jaeg*
324. Leaf cells unipapillate over the lumen. Seta smooth. Neck verrucose. Branch leaves oblong or lanceolate, abruptly passing into a rather long, nearly filiform subulate point- Alar cells undivided. On bark and on tree-trunks.
Warburgiella C. Muell-
321. Leaves spreading.
325. Leaves complanate. Leaf cells uni- or pluri-papillate over the lumen, or with protuding upper ends. Lid shortly rostrate Exothecial cells not collenchymatous. On decaying wood, seldom on rocks. . . . . **Taxithelium** Sprue,
325. Branches radially leaved. Leaf cells sparingly papillate. &** obtuse, verrucose or more or less rostrate. Leaves lanceolate abruptly narrowly acuminate. Basal margin above the alar cells with a few hyaline cells. On tree-trunks.
Acanthocladium Mitt.
320. Alar cells usually small, equally developed.

326. Leaves yellowish bordered, oblong, acute or hairpointed, entire or dentate at apex. Alar cells incrassate. Leaf cells densely and finely papillate. On rocks in wet. places and in peat.

wa T * • * u J j **Rhacocarpus** Lindb.

ozo. Leai margin not bordered.

327. Leaf cells papillate, papillae in a single series on the cell walls. Capsule unknown. Tree-mosses..

Ectropotheciopsis (Broth.) Fleisch.

327. Leaf cells minutely papillate by the projecting ends or nearly smooth. Capsule inclined to pendulous, small, ovoid. On tree-trunks, rarely *on* rocks or forest ground, growing in flat mats.

Ectropothecium Mitt.

319. Leaf cells thick-walled.

328. Alar cells few, very large, in one horizontal row, incrassate. Secondary stems erect, densely pinnate, often flagelliform. Filiform, papillose gemmae at tip of branches. Peristome teeth smooth. On bark and humus ground. **Clastobryum** Doz. et Molk.

328. A1# cells in several horizontal rows, equally developed, usually thin-walled or scarcely developed.

329. Leaves more or ess longitudinally plicate. Branch leaves squar-rosely spreading or falcate. Peristome teeth transversely striate. Tree- and rock-mosses in dense, plumose mats.

Ctenidium (Schimp.)' Mitt.

329. Leaves not plicate. Secondary stems creeping.

330. Leaves lingulate, rounded or short-pointed. Leaf cells with papillately projecting upper ends. Usually complanate. Mostly in wet places on rocks and on stones.

Glossadelphus Broth.

330. Leaves shortly or longly acuminate.

331. Leaf cells papillate, papillae in series over the lumen or occasionally on the cell walls. Leaves ovate or lanceolate. Lid shortly rostrate. On bark, decaying wood, seldom on rocks.

Taxithelium Sprue.

331. Leaf cells only with papillate projecting upper ends. Leaves oval. Lid conical, acute. On forest ground and in meadows.

Oollania Broth.

279. L$_{ca}$f $_{p}$jjj $_{we}$ll-developed, to y_4 or more of the length of the lamina, single or double.

332. Bib double. Leaf (Tells smooth or more or less papillate at the upper ends.

333. Primary stem elongate, pendulous, more or less complanately leaved, densely or remotely pinnate. Leaf ribs short, y_4—y_a. Capsule .erect, ellipsoid, spinose. On branches. **Symphyodon** Mont.

333. Primary stem creeping, secondary stems creeping or procumbent, pinnately or irregularly branched. Capsule smooth.

334. Leaves cordate, longly acuminate, finely serrate. Capsule ovoid to cylindrical, inclined to pendulous. On bark and on rocks.

Microthamnium Mitt.

334. Leaves cordate, shortly acuminate, upwards sharply serrate. Capsule cylindrical, erect. On bark. **Leptohymenium** Schwaegr.
332. Rib single.
335. (349) Leaf cells smooth.
336. Leaf cells thin-walled.
337. Leaves longitudinally plicate.
338. Secondary stems irregularly branched, rigid when dry. Leaves erect spreading, cordate, longly acuminate. Capsule erect, cylindrical. Lid longly rostrate. Peristome teeth transversely striate or papillose. Endostome processes on a high basal membrane. Tree-mosses. . . . . **Pleuropus** Griff.
338. Secondary stems more or less pinnately branched. Leaves broadly lanceolate, erect-spreading or imbricate. Capsule inclined to horizontal, ellipsoid, curved, gibbose. Lid convex, obtuse or acute. Peristome teeth transversely striate. Ground-, stone- and rock-mosses . . **Brachythecium** Br. et Schimp.
337. Leaves not plicate.
339. Lid longly rostrate. Seta rough.
340. Leaf rib dorsally ending in a spine. Leaves ovate-oblong, shortly acuminate. Branches usually complanately leaved. On rocks, on ground and on bark.
Oxyrrhynchium (Br. et Schimp.) Warnst.
340. Leaf rib dorsally smooth. Leaves narrowly lanceolate, longly acuminate. Leaves of branches radially arranged. On damp walls, on rocks, trunks and branches.
Rhynchostegiella Br. et Schimp.
339. Lid acute or shortly rostrate. Leaves ovate-lanceolate, obtuse or shortly pointed. Capsule ovoid, mostly inclined to horizontal. On tree-trunks and on rocks. **Stereophyllum** Mitt.
336. Leaf cells thick-walled.
341. Secondary stems erect, dendroid, arborescently or pinnately branched. Lid longly rostrate.
342. Leaf rib on dorsal side distinctly serrate, percurrent or excurrent. Leaves lanceolate, subulately acuminate. Secondary stems brown-tomentose. Capsule horizontal to pendulous, longly cylindrical, ribbed. On forest ground, rotting trunks rarely on moist rocks. . . . . **Mniodendron** Lindb.
342. Leaf rib on dorsal side smooth. Leaves oval-oblong, obtuse. Secondary stems julaceous. Leaf rib ending halfway up the lamina. Capsule inclined, ovoid, smooth.
Porotrichodendron Fleischb.
341. Secondary stems not dendroid: simple or regularly or irregularly pinnately branched.
343. Secondary stems horizontally spreading or hanging, simple or scarcely branched. Leaves ovate, short-pointed, very concave appressed. Endostome rudimentary. Tree-mosses.
Pterobryopsis Fleisch.
343. Secondary stems creeping or procumbent.

344. Alar cells thin-walled.
345. Leaves longitudinally plicate. Leaves ovate-lanceolate, longly subulate. Secondary stems richly pinnately branched, incurved when dry. Peristome teeth papillose. Bndostome processes on a low basal membrane, very short. Tree- and rock-mosses. **Homalothecium** Br. et Schimp.
345. Leaves not plicate. Leaves lanceolate, falcate, longly subulate. Growing in water, in wet places on various substrata. Drepanocladus (C. Muell.) Broth.
344. Alar cells thick-walled.
346. Leaf margin entire or indistinctly dentate near apex.
347. Alar cells chlorophyllose. Leaves oblong, longly acuminate, not bordered. On forest ground, grassy places, on base of tree-trunks and on rocks . . . . **Cirriphyllum** Grout.
347. Alar cells yellow to yellow-brown. Leaves oval. Leaf border in 1—2 rows, indistinct. Spores many-celled, conical, 225 /*. ©round- and bark-mosses . . . . **Dicnemon** Schwaegr.
346. Leaf margin distinctly dentate or serrulate.
348. Leaves erect-spreading to imbricate, ovate, shortly acuminate. Tree- and rock-mosses. . . . . **Isothedum** Brid.
348. Leaves spreading, broadly ovate, blunt or acute. In running water or on wet rocks . . . . **Platyhypnidium** Fleisch.

335. Leaf cells more or less papillate to mammillate.
349. Secondary stems more or less pendulous.
350. Leaves longitudinally plicate. Secondary stems simple *DT* irregularly pinnate. Leaf cells papillate, papillae in series on the cell walls. Seta papillose. Peristome teeth papillose. Tree-, rarely rock-mosses . . . . . **Trachypus** Rw. et Hornsch.
350. Leaves not plicate.
351. Secondary stems simply or bi-pinnate. Leaf cells uni-papillate over the lumen. Seta papillose. Peristome teeth smooth. Tree-mosses. . . . . **Diaphanodon** Ren. et Card.
351. Secondary stems irregularly pinnate. Seta short, smooth. Leaf cells seriately papillate over the lumen. Peristome teeth transversely striate at base. On bark, on branches and leaves or on humus ground. . . . . **Floribundana** C. Muell.
349. Secondary stems creeping or erect.
352. Leaves longitudinally plicate. Secondary stems richly irregularly branched. Seta papillose. Tree- and rock-mosses. **Homalothecium** Br. et Schimp.
352. Leaves not plicate.
353. Secondary stems erect, scarcely branched. Leaf rib slender, percurrent. Leaf cells uni-papillate over the lumen. Seta smooth. Peristome teeth normally developed. Tree-mosses. **Pseudospindentopsis** (Broth.) Fleisch.
353. Secondary stems ascending. Leaf rib ending slightly above midleaf. Leaf cells minutely papillate at apical angles. Seta

minutely scabrous. Peristome teeth short, rudimentary. Endostome processes linear. On bark . . **Schwetschkea** C. Muell.

278. Leaf cells elongate rhombic.

354. (376) Rib absent or very short and double.

355. (370) Leaf cells thin-walled:

356. (366) Leaf cells smooth.

357. (360)[1] Leaf margin entire.

358. Alar cells thin-walled. Leaves, of branches radially arranged.

359. Leaves oval, short-pointed, spreading. Secondary stems irregularly branched. Peristome teeth papillose. Endostome absent. On trees, rarely on rocks. **Meiothecium** Mitt.

359. Leaves longly elliptic, erect-spreading. Secondary stems regularly pinnate. Peristome teeth obtuse, smooth, bordered. Endostome processes filiform on a low basal membrane, cilia absent. On trees and on branches. **Chionostomum** C. Muell.

358. Alar cells thick-walled. Clusters of filiform gqmmae at the end of branches. On bark and branches or on leaves. **Clastobryella** Fleisch.

357. * Leaf margin more or less dentate to serrate.

360. Alar cells large, in one horizontal row with or without horizontal rows of somewhat smaller cells above. Leaves toward apices finely serrate. Basal membrane high. Tree-mosses. . . . . **Brotherella** Loesk-

360. Alar cells equal in size, forming a distinct group.

361. Branches complanately leaved.

362. Secondary stems irregularly branched. Leaves oblong-Seta yellowish. Peristome teeth paired, papillose. Endostome absent. On bark and branches. **Pterogonidium** C. Muell-

362. Branches regularly pinnate. Leaves ovate-oblong. Sets red. Peristome teeth transversely striate, yellow, bordered. Endostome with low basal membrane and narrow processes, cilia absent. On trees. **Plagiotheciopsis** Broth-

361. Leaves of branches radially arranged.

363. Primary stem creeping, secondary stems horizontal or pendulous, usually irregularly branched. Endostome rudimentary, filiform or totally absent. Spores 40—50 /*. Tree-mosses. . . . . **Pterobryopsis** Fleisch-

363. Primary and secondary stems creeping.

364. Secondary stems regularly pinnate. Leaves oblong' lanceolate, acuminate, spreading. Rib ending halfway or nearly reaching the apex. Tree-mosses. **Schwetschkea** C. Muell.

364. Secondary stems simple.

365. Leaves ovate, abruptly acuminate, squarrose. Seta red. Peristome double. Peristome teeth papillosely s[illegible] On bark. . . . . **RhizQhypnella** Fleiscb-

365. Leaves ovate-lanceolate, erect-spreading. Seta pale-yellow. Peristome single. Peristome teeth papillose. Tree-mosses. **Fabronia fiadd.**

356. Leaf cells more or less papillate to mammillate.

366. Leaves oblong, acute or hairpointed, yellowish bordered, entire or dentate near apex. Alar cells of equal size, incrassate. Leaf cells densely and finely papillate. On rocks in wet places and in peat. **Rhacocarpus** Lindb.

366. Leaves not bordered. Alar cells few but large, in one horizontal row with or without horizontal rows of smaller cells above.

367. Leaf cells uni- or pluri-papillate over the lumen.

368. Branch leaves 5-ranked, complanate. Leaf cells papillate, papillae in series. Capsule on a short seta. Lid longly rostrate. On rotten logs. . . . . **Taxitheliella** Dix.

368. Branch leaves several-ranked, branches not complanate.

369. Leaf cells seriately papillate or uni-papillate. Capsule small, ovoid, pendulous. Seta usually strongly scabrous above. Exothecial cells collenchymatous. Lid finely and longly rostrate. On bark and decaying wood. Trichosteleum (Mitt.) Jaeg.

369. Leaf cells unipapillate over the lumen or at the upper end. Capsule ellipsoidal, erect. Seta smooth or remotely papillose. Exothecial cells not or indistinctly collenchymatous. Lid shortly rostrate. Alar cells incrassate. On bark, on branches and on leaves. . . . . **Clastobryella** Fleisch.

367. Leaf cells only with papillately projecting upper ends. Peristome single. Leaves oval, short-pointed. Peristome teeth papillose. On trees, rarely on rocks. . . . . **Meiothecium** Mitt.

355. Leaf cells thick-walled.

370. Leaf cells smooth.

371. Alar cells incrassate, hyaline or coloured.

372. Leaves more or less distinctly bordered, toward apex widely and sharply dentate. Alar cells often divided. Seta long sinuous. Capsule very large, ellipsoidal, horizontal. On forest ground and on bark. . . . . **Trismegistia** (C. Muell.) Broth.

372. Leaves not bordered.

373. Paraphyllia numerous on the secondary stems. Leaves erect-spreading, longitudinally plicate. On bark. **Glyphothecium** Hamp.

373. Paraphyllia absent or scarcely developed. Peristome teeth transversely striate. Lid rostrate from a conical base. Tree-mosses. **Macrohymenium** C. Muell.

371. Alar cells more or less incrassate, chlorophyllose, gradually changing into the laminal cells. Leaves ovate-lanceolate. Capsule ovoid-cylindric, erect. Peristome teeth transversely striate. On bark, seldom on siliceous rocks . . **Pylaisia** Br. et Schimp.

3a. Leaf cells papillate or mammillate.

4. Secondary stems erect, arborescently branched. Leaves ovate-oblong, shortly or longly pointed. Perichaetial leaves highly sheating. Alar cells incrassate. Tree-mosses. **Camptochaete** Reichdt.

374. Secondary stems ascending, irregularly branched or regularly pinnate.
375. Leaves imbricate, branches julaceous. Leaf cells with papillately projecting upper ends. Alar cells chlorophyllose. Peristome teeth papillose. On bUrk and on rocks.
Trachyphyllum Gepp.
375. Leaves subcomplanate. Leaf cells uni-papillate over the lumen. Alar cells hyaline. Peristome teeth transversely striate. On forest ground, on trees and on exposed roots.
Acanthorrhynchium Fleisch.
354. Bib single or double to V_3 or more of the length of the leaf lamina.
376. (381) Leaf celss thin-walled.
377. Leaf cells smooth.
378. Leaves longitudinally plicate, narrowly lanceolate with broad cordate base. Primary stem and secondary stems creeping or procumbent, irregularly branched. Paraphyllia developed. Ground-, rock- and tree-mosses. **Brachythecium** Br. et Schimp.
378. Leaves not plicate.
379. Leaf margin entire. Secondary stems erect or procumbent. Alar cells rectangular, hyaline. Peristome teeth paired, papillose. Endostome processes filiform, smooth, basal membrane none. Tree-mosses. . . . . **Anacamptodon** Brid.
379. Leaf margin more or less dentate to serrate. Leaves lanceolate, narrowed into a long, undulate hairpoint. Peristome teeth transversely striate. Endostome processes short on a high basal membrane. On bark . . . . **Merrilliobryum** Broth.
377. Leaf cells more or less papillate to mammillate. Leaf margin usually distinctly dentate to serrate.
380. Bib single, more or less elongate. Leaves oblong, lingulate, obtuse or acute. Secondary stems creeping, branches usually complanate and obtuse. Capsule inclined to horizontal. Peristome teeth transversely striate. Endostome processes keeled and perforated. On tree-trunks and on rocks.
Stereophyllum Mitt.
380. Bib double, short or ending about the middle of the leaf blade. Leaves ovate-cordate, shortly acute. Secondary stems bipinnate, usually treelike with ascending branches. On forest ground.
Macrothamnium. Fleisch.
376. Leaf cells thick-walled.
381. (388) Leaf cells smooth.
382. Secondary stems hanging to horizontal.
383. Secondary stems irregularly branched, not complanate. Leaf rib ending below apex. Capsule immersed. On bark.
Pilotrichopsis Besch.
383. Secondary stems simply or bi-pinnate, very complanately foliate. Leaves 8-ranked, mostly transversely undulate. Leaf rib of different length. Capsule immersed or somewhat emerged. Tree- and rock-mosses . . . . **Neckera** Hedw.

382. Secondary stems creeping, or procumbent or erect.
384. Branches complanately foliate. Leaves oblong-spathulate, toward apex coarsely sen-ate. On bark . . **Homaliodendron** Fleisch.
384. Leaves of branches radially arranged.
385. Secondary stems erect,' simple or scarcely branched. Seta short, straight. Peristome teeth papillose. On bark. Forstroemia Lindb.
385. Secondary stems irregularly to arborescently branched.
386. Leaves longly acuminate. Seta elongate. Peristome teeth united in pairs, smooth, without lamellae. Calyptra cucullate, hairy. On bark. . . . . **Pireella** Card.
386. Leaves shortly and usually narrowly acuminate.
387. Endostome rudimentary or absent. Spores 40—50 *p.* Tree-mosses. . . . . **Pterobryopsis** Fleisch.
387. Endostome hyaline, with a high basal membrane and with lanceolate, subulate processes. Spores small. On bark and on rocks. . . . . **Isothecium** Brid.
381. Leaf cells more or less papillate to mammillate.
388. Leaf rib double, short or ending about the middle of the leaf lamina. Leaves ovate-cordate, shortly acute. Secondary stems irregularly bipinnate, nearly tree-like with ascending branches. On forest ground. . . . . **Macrothamnium** Fleisch.
388. Leaf rib single.
389. Leaves strongly transversely undulate. Secondary stems simple or scarcely branched. Capsule ovoid. Seta papillose. Ground- and rock-mosses. . . . . **Neolindbergia** Fleisch.
389. Leaves not undulate, longitudinally plicate. Leaf base with large, incurved auricles. Secondary stems irregularly pinnate. Capsule ellipsoid. Seta tuberculate. Tree-mosses.
Trachypodopsis Fleisch.
277. Leaf cells parenchymatous: rectangular, quadrate, rounded or hexagonal.
390. (397) Leaf cells small: rounded, quadrate or angular.
391. Leaf cells thin-walled.
392. Leaf margin hyaline-bordered, more or less dentate. Leaf cells unipapillate. Leaf rib percurrent. Endostome processes papillose, keeled, cilia 3, nodulose. Ground- and tree-mosses.
Duthiella C. Muell.
392. Leaf margin not bordered. Leaf cells smooth. Leaf rib ending halfway or nearly reaching the apex. Leaves oblong-lanceolate, acuminate. Cilia absent. Tree-mosses. **Schwctschkea** C. Muell.
391. Leaf cells thick-walled.
393. Secondary stems hanging, irregularly branched. Leaf nb ending below apex. Capsule immersed. On bark.
Pilotrichopsis Besch.
393. Secondary stems creeping, procumbent or erect.
394. Leaf rib valid, percurrent. Leaves ovate, shortly acuminate with rounded apex. Secondary stems erect, simple. Bark- and rock-mosses. . . . . **Pseudoleskeopsis** Broth.

394. Leaf rib narrow.
395. Branch leaves complanate. Secondary stems simply, bi- or tri-pinnate. Leaves octostiehous (apparently tetrastichous), oblong-spathulate with rounded apex. Leaf rib ending halfway. Bark-mosses. . . . . **Homaliodendron** Fleisch.
395. Branch leaves several-ranked, not complanate.
396. Capsule ovoid or ellipsoid, terminal on elongated branches. Calyptra conical. Peristome teeth densely papillose. Endostome absent. Spores 20—25 *p*.. Tree-mosses. **Acrocryphaea** Br. et Schimp.
396. Capsule short-cylindric, on short branches. Calyptra conical campanulate. Peristome double. Spores 25—30 *p*.. On bark, seldom on rocks or on stones . . . . **Cryphaea** Mohr.
390. Leaf cells wide: hexagonal, usually regularly hexagonal.
397. Branches complanate with dimorphous leaves. Peristome absent. Leaf apex rounded, obtuse. Calyptra covering only the upper part of the theca. On bark . . . . **Solmsiella** C. Muell.
397. Leaves of branches radially arranged. Exostome absent, endostome pale, papillose, with medianly perforated processes. Bib short or absent. On roots and on bark . . Austinia C. Muell.

OBSERVATIONS ON THE ALGAL VEGETATION OF THE NORTHERN *IER AT HOEK VAN HOLLAND, MADE PROM OCTOBER 1953 TILL AUGUST 1954

by

C. VAN DEN HOEK

(Rijkaherbarium, Leiden)

I. Introduction

The Netherlands' coast being sandy and muddy is not suitable for ^ost algal growth. Dikes, piers and harbour-works replace the rocks els-i-nhere. The pier at Hoek van Holland is one of these artificial rocky coasts. It has been constructed with basalt blocks and other hard stones, viz. the so called "Nilvoordste steen" and "Doornikse steen", both from Belgium.

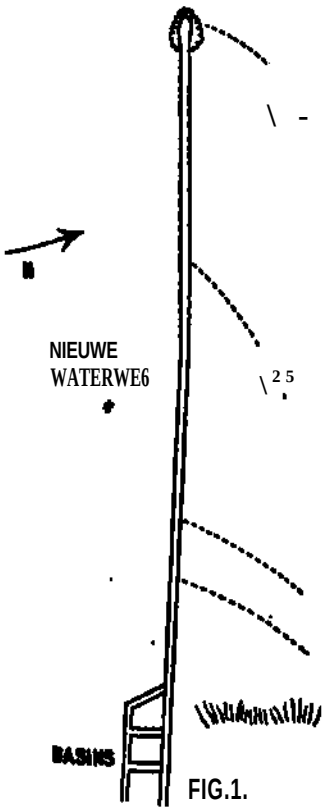


FIG.1.

Depths in dm

The pier projects into the sea about 1350 m. On the southern side it is washed by the mouth of the Nieuwe Waterweg, on the northern side by the North Sea. A little more (fig. 1) up the Nieuwe Waterweg there are several basins enclosed by a dam parallel to the pier and a number of dams at right angles to it, thus replacing the rockpools of natural rocky shores.

The upper side of the pier is covered by big concrete slabs since 1948; before that time it was bearing a rail, under which a number of small artificial roekpools. Although the vegetation of these rockpools is not described they are sometimes referred to in the checklist.

The tide.

The medium high water level is situated 88 cm above N.A.P., and the medium low water level 70 cm below N.A.P., so that the mean difference between high and low tide amounts to 158 cm. See also table 1. The extreme low water during spring tide is as low as 103 cm below N.A.P.

TABLE 1

M.H.W.S. = 1.04 m + N.A.P.
H.H.W.N. = 0.76 m + N.A.P.
M.L.W.S. = 0.66 m — N.A.P.

During strong W. winds and especially N.W. winds, the tidal levels are raised considerably, during strong B. winds, especially S.B. winds they are lowered. The lowest level was reached on January 25th, when it was as low as 1.65 m below N.A.P.

The wind arid the humidity of the air.[1])

The wind is blowing mostly from western directions and more especially from the S.W. (see table 2). The N. side of the pier is most exposed to the surf, also during S.W. winds. In that case the waves are coming from about N.W. because they change their direction on the shallows on the N. side of the pier (a phenomenon identical with light refraction, see P. Groen, p. 220—229).

The water of the Nieuwe Waterweg on the S. side of the pier is mostly quiet, it being sheltered by the N. and S. piers. Only when the winds are blowing from S. to S.S.W. the S. side too can be washed by a relatively strong surf.

TABLE 2

Percentage of hours, during which the winds blew from different directions during the years 1953 and 1954 (data furnished by the K.N.M.I.).

Year	S.	S.W.	W.	N.W.	N.	N.E.	E.	S.E.	no wind
1953	**13**	**22**	**17**	**9**	**11**	13	7	4	3
1954	15	**23**	**16**	9	**9**	10	10	7	2

Periods of strong E. winds are unfavourable for the algal vegetation as the latter dries up: 1. by the lowering of the tide, 2. while the relative humidity of the air is rather low during E. winds. The lowest Relative Humidity in winter was reached in the last decade of January; the mean R.H. amounted to 71 %, the minimum R.H. on January 27th amounted to 55 %. The lowest R.H. of the year was reached in May, when ftie mean R.H. for the second decade amounted to 59 %, the minimum R.H. on May 14th to 34%. The maximum R.H. for the time of observation was reached in the first decade of December, when the mean R.H. amounted to 94 %, the maximum R.H. on December 5th and 6th amounted to 100 *fo*- Also in the last decade of February the R.H. was very high; the mean R.H. was 92 %., the maximum R.H. 97 %. Moreover, in winter it mostly freezes during E. winds.

*Temperature. *)*

An important factor for the littoral algae is not only the temperature of the water, but also that of the air. The minimum temperature of th[c] air was reached in the first week of February 1954; the mean temperature of the first decade amounted to — 4.1° C, the minimum temperature i* the night of February 2nd to —12.7° C. The minimum temperature ot

***) The .meteorological data were furnished by the Royal Meteorological Institute (K.N.M.I.) and were collected at Naaldwjjk, about 7 km E.N.E. wards. The data concerning the temperature of the seawater were collected on the light ship Goeree.**

the water was reached a decade later; the mean temperature of the seawater during the second decade amounted to 1.4° C.

These two weeks of frost had a destructive influence on the algal vegetation. Most species did not survive, except several species of the lower littoral belt, like Pylaiella littoralis (midlittoral), Polysiphonia urceolata, P. nigrescens and Ceramium deslongchampsii. After this destructive period most of the littoral belt had to be recolonized.

The maximum temperature of the air and the water was reached in August, when the mean temperature of the air for the first decade amounted to 17.9° C; the maximum temperature of the seawater was 16.5° C. at that time.

Light.

The vegetation on the N. side of the wooden poles on the pier differs remarkably from that on the S. side. Most probably this difference is connected with the difference in insolation on both sides, and therefore with the difference in humidity.

The difference'in vegetation of the N. and S. side of the pier itself is perhaps also connected with a difference in insolation, although probably here other factors like surf, salinity and turbidity are more important.

Salinity.

The salinity on the S. side of the pier, in the mouth of the Nieuwe ^aterweg, varies considerably. The concentration of Cl'-ions m the surface layer amounts to about 3000 mg C1V1 at low water, and lowers to 2000 mg C171 at high water.

The salinity of the seawater on the N. side of the pier may be more instant. No data from exactly that place are available; the chlonnity of the sea about 4 kilometers from the mouth of the Nieuwe Waterweg amounts, to 17000 till 18000 mg Cl'/l (data furnished by the Riks-^aterstaat").

Turbidity.

The turbiditv of the water in the Nieuwe Waterweg is considerable; the algae on the*S. side are often covered with mud or muddy sand.

Sand.

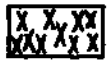
Sand is an unfavourable factor for algal g^ro^> P ^ J ^ J * to during action, especially on coasts strongly exposed to the surf, and *^h»e it, often Covering the stones, may prevent spores to get fixed. This 1? Perhaps the SIson why the vegetation is preponderantly characterized \ a vegetation of Enteromorpha compressa often accompanied by Pm-^ph>^ra umbilicalis.

II. The algal vegetation

The littoral belt is not characterized here by the phaeophycean ****** so characteristic of the most European westcoasts, as only Fucus ^Mrali_s occurred on the places observed. Also on numerous other

FI6.2.


Blidingia minima


Enteromorpha compressa


Fucus spiralis


Cyanophyta


Pylaiella littoralis


Callithamnion polyspermum


Bangia fuscopurpurea


Rhizoclonium sp.


Ceramium deslongschampsii

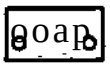

Polysiphonia sp.


Ulothrix sp.


Urospora sp.

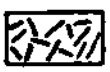

Sphacelaria britannica


Ralfsia verrucosa


Porphyra umbilicalis


Acrosiphonia centralis


Diatomeae (epilithic)


mussels


barnacles

places exposed to the surf and the scouring action of the sand, like the "Delflandse hoof den" and other piers projecting into the sea, the big Phaeophyta are practically not found growing. Nevertheless several girdles can be recognized, chiefly of Chlorophyta, but also of Phaeophyta and Bhodophyta.

The vegetations on .the N. side and the S. side of the pier differ considerably, and are treated separately. Also the vegetation on the wooden poles on the N. side as well as on the S. side of the pier have a different character. Therefore the poles are treated separately too.

The following ,scale was used to give an impression of the abundance of the species in the girdles: cc very abundant, c abundant, 4- moderate, r rare, rr very rare. The vegetation of several places, especially that of the wooden poles was mapped. For this purpose the symbols were used given in fig. 2.

1. The southside of the pier

A. *The vegetation on the stones.*

The following belts were distinguished, from the top downward:

1. A girdle consisting of a crust-like vegetation of Cyanophyta, chiefly Entophysalis deusta (Gloeocapsa crepidinum). This girdle is supralittoral-(moistened by splash and spray), but the participating species occur as far as in the lower littoral belt under those species characteristic for that place.

This girdle can be seen during the whole year. During periods of calm and dry weather (no rain, little splash and spray) the crust dries out and peels off. When the moistening increases again, the vegetation spreads rapidly. On January 23rd the crust had disappeared almost entirely by the extreme and long low water (E. wind) and the calm dry weather during the frost. Also after a dry period in May 1954 the crust had disappeared.

The girdle occurred everywhere in the supralittoral belt, on the N· as well af onthe S side, on stones as well as on poles. It consisted of th\Tlwing speci: Entophysalis deusta ^ ^ ^ ^ ^ ^ Calothrix scopulorum (+), Phonnidium fragile (+), Ulothnx subflaccida (+), uispormirabilis (r), Bangia fuscopurpurea (r), Blidmgia minima (r) (samples from 8-11-1953).

2. A gife characterized by Blidingia minima. This girdle fills up the upper found during the whole year. Most plants appeared t the frost of January/February 1954. In April 1954 the species had not yet returned. Under Blidingia the following species were found growing: Entophysalis deusta (cc), Calothrix scopulorum (+), Phormidium fragile (r), Ulothrix flacca (r), Ulothrix subflaccida (rr), Porphyra umbilicalis (+) (samples from 8-11-1953).

spiralis Entero-

(see table 3). In many places ™ » ^ ™ r a Neither Enteromorpha compressa nor Fucus spiralis survived ti«stroj of January/February 1954: morpha compressa domwating the vegetation^ m ot o ly the low temperature on January 23rd ««*. P ^ ^ ^ T t t a vegetation had entirely dried but also the low humidity of the air - the ™f £ been a destructive JP and was very brittle at low tab - ^ - have ^ ^ April ^ factor. The area was ^colonised bydi atoms and Ulot oun- plants Entero— 't was covered by a dense vegetation ot very y ·s 1954 b-- fu u grown «iorpha compressa, only a few mm high, in August y Plants of the same species.

TABLE 3

Sample	8-11 -'53	24-1 -'54	28-3 -'54	10-4 -'54	2-8 -'54
j^ucus spiralis	cc	c[1])	rr		r
j^teromorpha compressa	cc	c[1])	rr	cc[2])	cc
£opPhyra umbilicalis	+	c ·	-T"		+
Jjlothrix flacca		r	c	c	+
•j'lothrix pseudoflacca			r	r	
diatoms		c	cc	c	

1) Plants almost all dead,
2) very young plants.

4. A girdle, characterized by Cladophora glaueescens and Lallithamnion roseum (see table 4). IMB girdle fills up the lowest part of the littoral belt and extends till into the sublittoral belt. Both species had disappeared on January 26T<X together with the young mussels (Mytilus edulis) on which they were attached. At that time the stones were entirely bare with the exception of hyaua threads and barnacles here and there. The area was recolonized by diatoms and Ulothrix. In August 1954 the original vegetation app returned.

TABLE 4

Sample	8-11 -'53	24-1 -'54	28-3 -'54	10-4 -'54	2-8 -'54
Cladophora glaucescens	cc[1])				cc
Callithamnion roseum	c[1])				c
diatoms		byssus	cc	+	
Enteromorpha compressa	4-		r		+
Ulothrix flacca			c	+	
Ulothrix pseudoflacca			-+•	cc	
Ulothrix subflaccida			c	+	
Urospora mirabilis			•+-	r	
Porphyra umbilicalis				rr	

[a]) overgrown by epiphytic diatoms.

B. *The vegetation on the poles.*

The vegetation on the S. side and that on the N. side of the poles show remarkable differences. On the S. side of the poles as well as on the stones of the S. side of the pier about the same girdles were seen on corresponding levels. Rhizoclonium riparium and Rhizoclonium implexum were abundant in the Blidingia minima and Enteromorpha compressa girdles, but they were not found on the stones. The following girdles were distinguished from the top downward:

1. A supralittoral girdle of Cyanophyta, composed of Entophysalis deusta (Gloeocapsa crepidinum) (cc), Calothrix scopulorum (+), Phormidium fragile (r), Plectonema battersii (r)., Porphyra umbilicalis (+) (samples of 8-11-1953). What is said about this belt on page 175 is also valid here. However, here the crust survives during dry periods in little fissures.

2. A girdle, characterized by Blidingia minima (see table 5). See also what is mentioned about this belt on page 176.

TABLE 5

Sample	18-10 -'53	25-10 -'53	8-11 '•53	24-1 -'54	2-8 -'54
Blidingia minima	cc	cc	cc	cc[1])	cc
Rhizoclonium implcxum			c		
Rhizoclonium riparium	cc	cc	c	cc[1])	+
Urospora mirabilis					r
Entophysalis deusta	+	+	+		cc
Phormidium fragile	+	+			c
Plectonema battersii					r
Ulothrix pseudoflacca		+			rr

*) plants practically all dead.

3. A girdle, characterized by Enteromorpha compressa (see table 6). See also what is said about this belt on page 176.

TABLE 6

Sample	18-10-'53	25-10-'53	8-11-'53	24-1-'54	2-8-'54
Enteromorpha compressa	cc	cc	cc	cc[1])	c
Blidingia minima	r	r	r		
Rhizoclonium riparium	cc	c	+	cc[1])	
Urospora mirabilis					cc
Entophysalis deusta					[illegible]
Plectonema battersii					r
Phormidium fragile					r

[1]) plants practically all dead.

In August 1954 on many places Urospora mirabilis appeared to be very abundant in the Enteromor[pha] [illegible] species,

The N. side of the poles was [illegible] species namely Pylaiella littoralis and Callithamni[on] [illegible] Calli- form two distinct girdles mostly, of which [illegible] less luxuriant on the lower one. The area they [illegible] with the Ent[ero]mor[pha] [illegible] and on the S. side of the po[le]s. Callithamnion had disappeared in January 1954, and was not seen again in August 1954. Pylaiella was found growing during the whole year (see pl. I, and table 7, A [illegible] corresponds with A in the table, etc.).

PL. I.

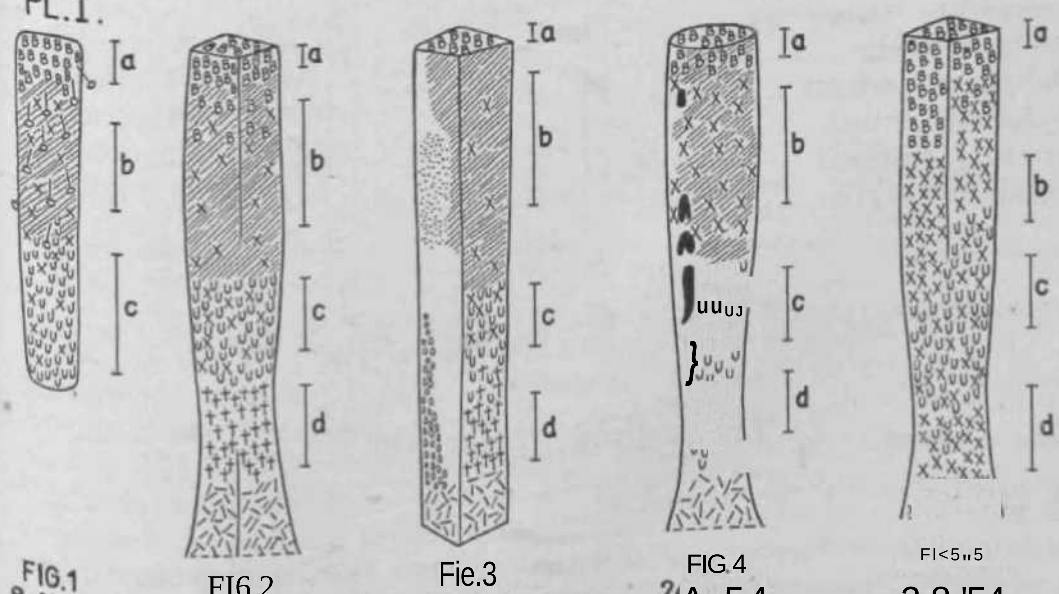


FIG. 1 8-11-'53 FIG. 2 18-10-'53 FIG. 3 25-10-'53 FIG. 4 24-1-'54 FIG. 5 2-8-'54

VEGETATION OF THE N. SIDE OF THE POLES ON THE S. SIDE OF THE PIER (SEE TABLE 7).

TABLE 7

	Saiiple	18-10 -'53	25-10 -'53	8-11 -'53	24-1 -'54	2-8 -'54
A	Blidingia minima	cc	cc	co	cc[1])	cc
	Bhiziclonium riparium				cc[1])	
B	Enteromorpha compressa	4-	r	c	c[1])	cc
	Bhizoclonium riparium	cc	cc	cc	cc[1])	+
	Pucus spiralis			c		
	Blidingia minima	+	r	c		rr
	Porphyra umbilicalis			r		
	Entophysalis deusta		c			
	Balfsia verrucosa				c	
	Urospora mirabilis					r
C	Pylaiella littoralis	cc	cc	cc	cc	cc
	Enteromorpha compressa	+	c	4-		c
	Bhizoclonium implexum			+		
	Callithamnion polyspermum	r	r			
	Callithamnion roseum			rr		
	Cladophora glaucescens			rr		
	Ceramium deslongschampsii			rr		
	Acrochaetium virgatulum			+		
	Entophysalis conferta	+	+	+	+	+
	Phormidium molle			r		
	Entophysalis deusta					r
	Balfsia verrucosa				c	
	Phormidium fragile					r
	Plectonema battersii					r
D	Callithamnion polyspermum	cc	cc			
	Enteromorpha compressa		+	Base of pole not low enough in littoral belt	+	cc
	Pylaiella littoralis				cc	4-
	Entophysalis conferta				+	
	Entophysalis deusta					r
	Plectonema battersii					r
	Phormidium fragile					r

[a]) most plants dead.

Vegetation on the N. side of the poles on the S. side of the pier (see pi. I).

2. The northside of the pier

A. *The vegetation on the stones.*

The following girdles were distinguished from the top downward (see pi. II), of which the upper three are identical with the upper three on the S. side:

1. A belt of Cyanophyta, mainly Entophysalis deusta (cc), further Calothrix scopulorum (+), Fhormidium fragile (+), Plectonema batteraii (+) (sample from 8-11-1953). See also what is mentioned about this girdle on pag. 175.

2. A "irdle, characterized by Bhdingia minima. Under Blidmgia the following species were found: Entophysalis deusta (c)' Calothrix scopulorum (c), Phormidium fragile (r), Ulothrix flacca (r) (samples of 8-11-1953). See also page 176, Blidingia girdle.

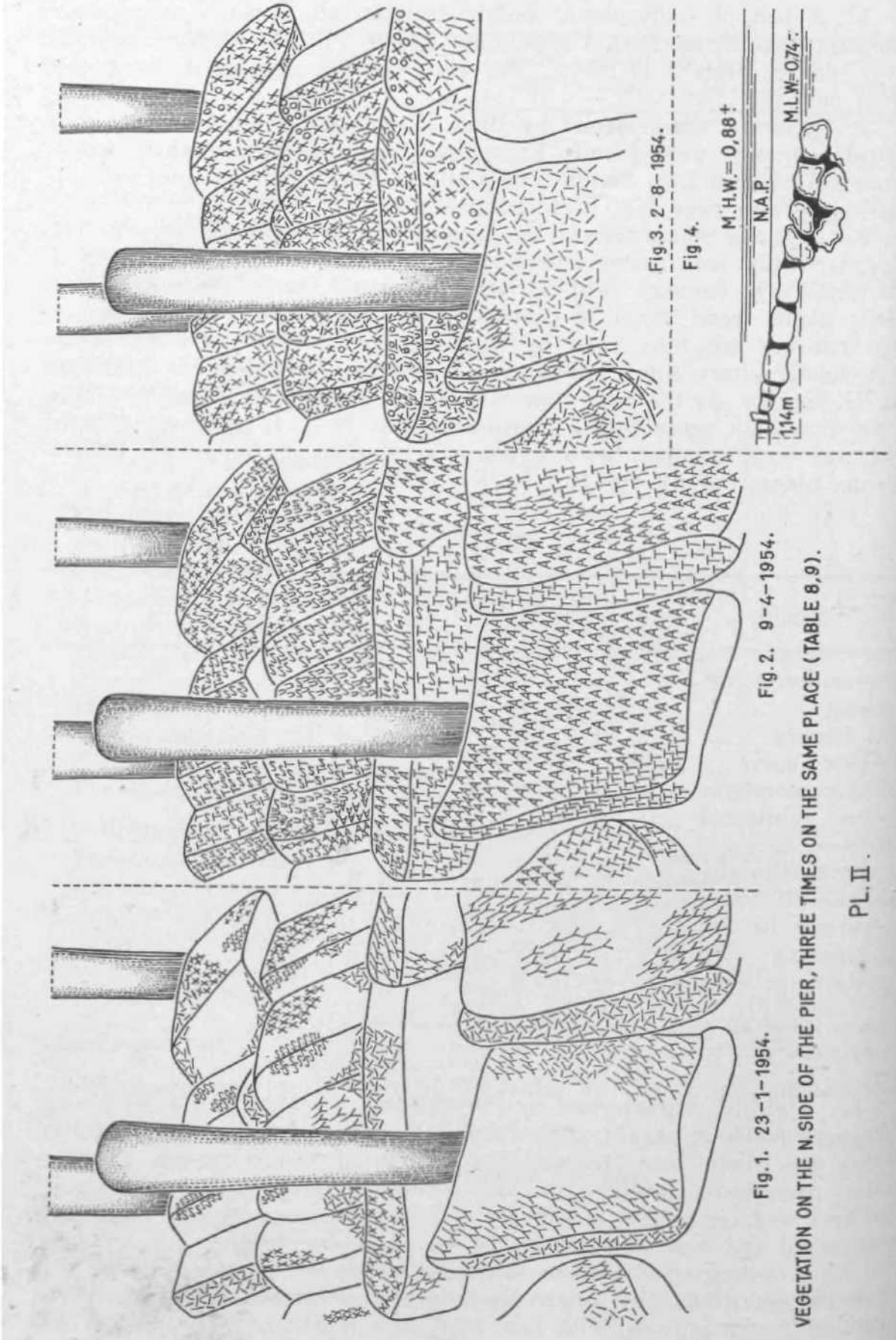
3· A eirdle characterized by Enteromorpha compressa (sec pi. HI, tableS). Only very sparse Fucus spiralis plants were found growing m this girdle. oE January 23rd the greater part· of the Enteromorpha compressa plants were frozen to death or had disappeared (pi. II, fig. 1). The area was not recolonized by Ulothrix and diatoms ^ly, but partly by Pylaiella littoralis too, which species was very abundant on April 9th, (Pi. IMig· 2)· At the sime time many very, young Entermorpha]^ants a few mm high, were found growing in this· belt. * » J ^ 1 ^ 1 ^ ^ area was covered again with a dense vegetation ot full-grown Enteromorpha plants (pi. II, fig. 3).

TABLE 8

Sample	11-10 -'53	25-10 -'53	18-11 -'53	23-1 -'54	28-3 -'54	9-4 -'54	2-8 -'64
^nteromorpha compressa	cc	cc	cc	+[1]	r[1]	c[2]	cc
plva lactuca	cc	c	c	+[1]	r[1]		c
Uothrix flacca	r	r	r	c[2]	cc	c	r
plothrix pseudoflacca.		r		r	c	c	r
Ulothrix subflaccida...					c	c	
djatoms				+	cc	c	
^rospora mirabilis	r	r				cc	c
SVlaiella littoralis			r			+	
j-ucus spiralis					r		c
£ro#siphonia centralis.							
Orphyra umbilicalis	+	r					

[1] Plants almost all dead.
[2] very young plants.

4. A girdle, characterized by Polysiphonia urceolata and Polysiphonia nigrescens (table 9, pL II). Polysiphonia appea^ to maintain its position during the whole year. In winter a growth of young mussels (^ytilus edulis) disappear previously occupied a large part of the girdle. The area was rec mainly by epilithic diatoms turn disappeared and were replaced by the spring-species Ac ralis, which was accompanied by two other spring-species, Petalonia fascia and Petalonia zosterifolia. In August the stones were covered again by a dense carpet of young mussels, with here and there a mat of Polysiphonia.



VEGETATION ON THE N. SIDE OF THE PIER, THREE TIMES ON THE SAME PLACE (TABLE 8,9).

PL. II.

TABLE 9

Sample	11-10 -'53	18-10 -'53	25-10 -'53	23-1 -'64	28-3 -'54	9-4 -'54	2-8 -'54
Polysiphonia urceolata	cc	cc	cc	cc	cc	c	cc
l*olysiphonia nigrescens	c	c	c	c	c	"I"	Is
Enteromorpha compressa	-h	•+•	-r	~n			
Oeramium rubrum	c						
Ceramium deslongschampsii		r	rr		r		
Chaetomorpha aerea x)			+				
diatoms				CC	œ	c	
tlothrix flacca.........				H-	C	-h	
Hothrix pseudoflacca.						-i-	
Ulothrix subflaccida ...						•	
Acrosiphonia centralis.						r	
iJrospora mirabilis ...						r	
Petalonia fascia........						r	
Petalonia zosterifolia .							
Ep: Lyngbya infixa...			•+-	IT			
Ep: Acrochaetium secundatum			-r	JL.			r
^orphyra umbilicalis...	r	r	r	r			

') *in* the summer of 1,53 i c h Oha^on.o.pha acxea was found in the Polysiphonia belt.

B. *The vegetation on the poles.*

The aspect of the N.side» and thr t:£*»B. £ g ^ fc much A 41o4 nf thp S side is different here too. Apart from the tact that tne vege - n important disparity. "Parser, the composition.ot the species shorn^ also he ier much re^bles that of the poles on the S. side. The most ""P? ^ N. side of the S. side

The vegetation on the poles on the N side^otant d. £ferences &re:

1. The vegetation on the S. side of Ae P ^ e0 ^ ^ the ^ 1 ^ water of the pier, probably while t h / J j t ^ which is not the case on Pier, is much sparser than that on the S.; stened by ^e N. side.

2. The lowest part of the .N. side of the p ^ ^ the N. side of the Pier is characterized by a girdle ot Polysiphon and Ceramium deslongschampsii. This belt was not found an the N. side of the poles on the S. side of the pier.

On the S. side of the poles on the N. side of the pier the following girdles were distinguished (see pi. III «JJ^« 'nım ; This species was

1. A girdle characterized by g g g j , lis deusta. Usually Bangia often accompanied or replaced. by Entopnysa ^ s of the poles. tuscopurpurea was found growing on the

TABLE 10

Sample	11-10 -'53	11-10 -'53	11-10 -'53	25-10 -'53	23-1 -'54	10-4 -'54	2-8 -'54
PL, fig.	II, 1	II, 2	11, 3	n, 4	II, 5	II, 6	II, 7
A							
Blidingia minima		cc		C	c[1])		cc
Entophysalis deusta			cc	CC	c	c	cc
Calothrix scopulorum			r	r		cc	
Bangia fuscopurpurea			c		c		c
Phormidium fragile			r		r		cc
Spirulina major					rr		
Enteromcrpha compressa						r	
Plectonema battersii			r				-h
Ulothrix flacca							r
Ralfsia verrucosa						c	
B							
Enteromorpha compressa		e		e	r[1])		ee
Ealfsia verrucosa	cc	cc			c	c	
Phormidium fragile	r				r		c
Pucus spiralis		r					
diatoms					cc		
Lyngbya semiplena					+		
Pylaiella littoralis						+	
Urospora mirabilis							cc
Plectonema battersii							+
Entophysalis deusta							c
Ulothrix flacca							c
Bangia fuscopurpurea							c
Calothrix scopulorum							+
Bhizoclonium riparium							+
Blidingia minima							rr

[a]) most plants dead.

Vegetation on the S. side of the poles on the N. side of the pier.

2. A girdle characterized by Enteromorpha compressa. This specie* was often accompanied or replaced by Balfsia verrucosa. In August 19^4 much Urospora mirabilis grew in this belt.

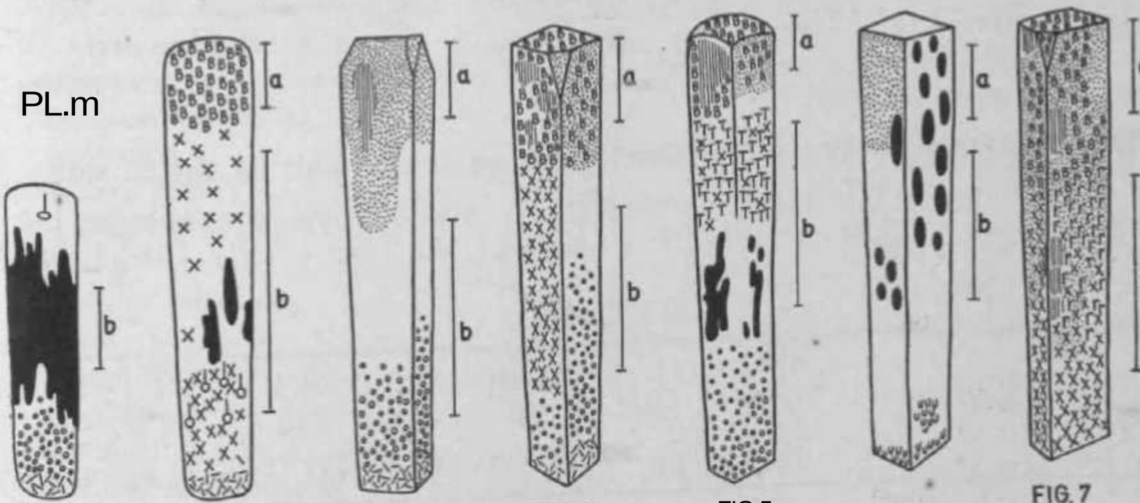
Also here Blidingia and Enteromorpha appeared to be frozen to death for the greater part on January 23rd.

On the N. side of the poles, on the N. side of the pier (see pi. 1^* table 11), a number of sciophilous species were found growing, viz. Pylaiella littoralis, Sphaeelaria britannica, Callithamnion polyspermum, Polysiphonia

urceolata, Ceramium deslongschampsii. The following girdles were disting-uish

f: A girdle characterized by Blidingia minima. This species was often accompanied orsLetimes replaced by Cyanophyta, of which Bntophysahs deu7aPwat the most abundant one. Rhizoelonium nparum often occurred

PL.m



FIS.1 18-10-53 FIG.2 11-10-53 FtG.3 FHM FIG.5 J J J ^ ^ ' S ^ FIG. 7 2-8-'54

1Vi0-S«nN ZTu?NLE0FTHEP^R(SEETABLE10). VEGETATION ON THE S.S10E OF THE POLES ON THE N.SIDE OF intnt«

PLE

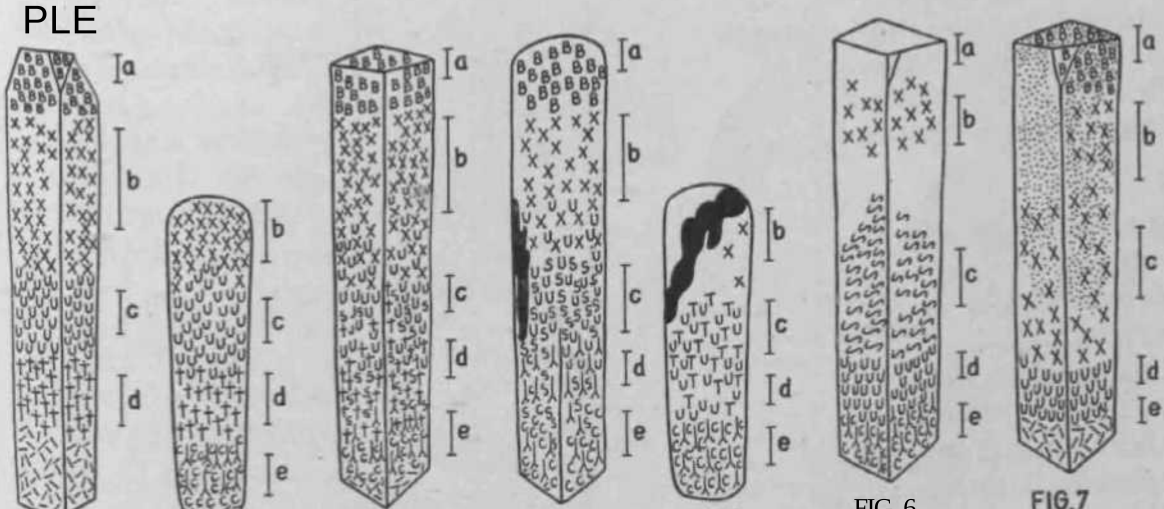


FIG.1 8:1 W-1O-53 FIG.2 iMO-'53 FK 25-1O-'53 - Z T i i 23"1" « FIG5 78-3-'5 » 3 i FIG. 6 iO-4-'54. FIG.7 2-8-'54

VESETATIONONTHEN.SIDEOFTHEPOLESONTHEN.SIDEOFTHEP.ER PIER (SEE TABLE 11).

in the **Blidingia belt Blidingia** and Rh««ioni ^ Bhi7iielonium were killed by the Host for the **greater** part on January OT. ^ eompressa. Also in this

2. A girdle characterized by fanteio, J Both e,ieH did not girdto Rhizoclonium riparium was « ^a ^nive the frost of J«nuary/I'^n-'"l)> ;]jnm·alis. This speeie.s was

3. A girdle charactered by• J > ;ind ^ winter Spliace· lr»und growing during the whole **year-** Iai'**ia britannica** was very abundant.

4. A girdle characterized by Callithamnion polyspermnm. This species was found in autumn only. During winter and later this area appeared to be occupied by Pylaiella littoralis, Ceramium deslongschampsii and Polysiphonia urceolata or by the two last mentioned species only. In August 1954 Callithamnion polyspermum had not reappeared.

5. A girdle characterized by Ceramium deslongschampsii and Polysiphonia urceolata. This girdle was seen during the whole year. In August 1954 the vegetation appeared to be pushed away by a new settlement of young mussels.

The differences between the vegetations on the N. and on the S. side

Most important is the difference in the combination of species in the lower littoral belt. There, on the S. side of the pier chiefly Cladophora

TABLE 11

Sample	18-10 -'53	11-10 -'53	25-10 -'53	23-1 -'54	28-3 -'54	10-4 -'54	2-8 -'54
pl-, fig	IV, 1	IV, 2	IV, 3	IV, 4	IV, 5	IV, 6	IV, 7
A	**pole**				**pole**		
Blidingia minima	**not**	cc	c	cc[1])	**not**		cc
Rhizoclonium riparium	**high**	c	cc	cc[1])	**high**		
Enteromorpha compressa			+		**enough**		+
Entophysalis deusta							cc
Phormidium fragile							cc
Calothrix scopulorum	**enough**		r				c
B							
Enteromorpha compressa		cc	+	c[1])	+[1])	+[2])	cc
Enteromorpha ahlneriana			cc				
Rhizoclonium riparium	cc	c		c[1])			-4-
Ralfsia verrucosa							
Blidingia minima							-+-
Pylaiella littoralis			+				
Rhizoclonium implexum							
Phormidium fragile							cc
Entophysalis deusta				+	c		cc
Calothrix scopulorum							c
Ulothrix flacca							r
Urospora mirabilis							**r**
C							
Pylaiella littoralis	cc	cc	cc				
Enteromorpha ahlneriana			c	cc			

cc

TABLE 11 (continued)

Sample	18-10 -'53	11-10 -'53	25-10 -'53	23-1 •'54	28-3 -'50	10-4 -'54	2-8 -'55
PL fig.	IV, 1	IV, 2	IV, 3	IV, 4	IV, 5)	IV, 6	IV, 7
Enteromorpha compressa			H-	+			cc
Callithamnion polyspermum			+		c	cc	+
tlothrix flacca			⊥	CC			
Sphacelaria britannica.						c	c
diatoms					cc		
Blidingia minima				IT			
Ralfsia verrucosa				c			
Cladophora utriculosa.				rr			
Entophysalis deusta...							cc
Phormidium fragile ...							cc
Calothrix scopulorum .							c
Urospora mirabilis							r
h							
Callithamnion polyspermum	cc	cc	cc				
Pylaiella littoralis				r	cc	cc	cc
Enteromorpha compressa							+
Sphacelaria britannica.			c	+			
^olysiphonia iirceolata			+	cc			
ᵕeramium deslongschampsii				c			
diatoms					cc	c	c
Entophysalis deusta...					+		4-
Wothrix flacca							r
^alothrix scopulorum .							
Ectocarpus confervoides							rr
13							
Ceramium deslongschampsii	cc	not	CC	cc	c	c	
*Hvsiphonia iirceolata	cc.	low	CC	cc	c	c	
ussels	cc	enough	cc	cc	c		cc
Mlaiella littoralis			r	r		r	
^adophora utriculosa.				rr			
^Phacelaria britannica.				r			
^othrix flacca					+		

.) Plants almost all dead.
} Very young plants, a few mm high.

, Vegetation on the N. side of the poles on the N. side of the pier (see <* pi. IV).

glaucescens and Callithamnion roseum are growing, species, which disappear in winter and are replaced by epilithic diatoms and Ulothrix. The lowest girdle on the N. side consists of Polysiphonia urceolata and Polysiphonia nigrescens, in spring accompanied by Acrosiphonia centralis. Also in the occurrence of the more rare species the N. and S. side show considerable differences. Generally speaking several species which were found growing on the N. side do not occur on the S. side (see table 12).

TABLE 12

On the N. side, but not on the S. side

In the Enteromorpha compressa and Pylaiella belt on the N. side of a pole:

Enteromorpha ahlneriana

In the Pylaiella belt on the N. side of a pole:

Sphacelaria britannica

In the Ceramium deslongschampsii-Polysiphonia urceolata belt on the N. side of a pole:

Polysiphonia urceolata
Ceramium deslongschampsii[1])
Sphacelaria britannica
Cladophora utriculosa

In the Polysiphonia belt on stones:

Polysiphonia urceolata
Polysiphonia nigrescens
Ceramium rubrum
Chaetomorpha aerea
Acrosiphonia centralis
Petalonia fascia
Petalonia zosterifolia

On the 8. side, but not on the N. side

In basins and on the more eastward banks more up the Nieuwe Waterweg:

Fucus ceranoides

In the Cladophora glaucescens* Callithamnion roseum belt on the stones:

Cladophora glaucescens
Callithamnion roseum

***) This species was found growing once on the N. side of a pole on the S. side of the pier. It was seen also several times on the N. side of the pier on stones.**

Further, Fucus spiralis was much more abundant on the S. side than on the N. side, probably because the N. side is much more exposed to the surf, so to the scouring action of the sand too.

List of algae, collected in Hoek van Holland

The following abbreviations are used to design the localities where the species were found growing: S.s. = south side of pier, N.s. = north side of pier, S.s.po = south side of poles, N.s.po = north side of poles, l.l. == lower littoral belt, m.l. = midlittoral belt, u.l. = upper littoral belt, ba = basin, ro = "rockpool" on top of pier.

Cyanophyta

Calothrix scopulorum (Web. et Mohr) Ag. ex Bornet et Flahault. N.s., S.s., N.s.po, S.s.po; in a supralittoral girdle of Cyanophyta, also lower.

Entophysalis deusta (Menegh.) Drouet & Daily (Gloeocapsa crepidium Thuret). N.s., S.s., N.s.po, S.s.po; in a supralittoral girdle of Cyanophyta and also lower down.

Entophysalis conferta (Kiitz.) Drouet & Daily. Epiphytic on several species: Pylaiella littoralis, Enteromorpha compressa, Chaetomorpha aerea, Polysiphonia urceolata. N.s. and S.s.

Lyngbya infixa Frémy. Epiphytic on several species in the 1.1.; Ceramium rubrum, Polysiphonia.

Lyngbya semiplena (Ag.) J. Ag. ex Gom. Forms blue-green slippery patches on the bitumen on the top of the pier, about in the Enteromorpha compressa girdle, where the pier is relatively low.

Phormidium fragile (Menegh.) ex Gom. In a supralittoral girdle of Cyanophyta and also lower down.

Plectonema battersii Gom. In a supralittoral girdle of Cyanophyta ard also lower down.

Spirulina major Kutz. ex Gom. S.s.po on N.s. (Van d«n Hoek, 23-1-1954).

Chlorophyta

Acrosiphonia centralis (Lyngb.) Kjellm. N.s., 1.1., abundant in Polysiphonia girdle; spring-species.

Blidingia minima (Nasg. in Kiitz.) Kylin. S.s., N.s., S.s.po, N.s.po, abundant during the whole year, but nearly all killed by the frost.

Chaetomorpha aerea (Dillw.) Kiitz. N.s., 1.1., in Polysiphonia girdle. Also on pol

CladophOTa^'lbida (Huds.) Kiitz. var. refracta Thur. S.s. (Schlittler, 24-6-1947).

Cladophora flexuosa (Griff.) Harv. ba .(Lucas, Koster 1-6-1948).

Uadophora glaucescens (Griff.) Harv. S.s., 1.1. and subhttoral, in a girdle of Cladophora glaucescens and Callithamnion roseum (Van den Hook, Oct. 1953 and Aug. 1954).

Cladophora refracta (Roth) Kiitz. ba (Koster, 4-7-1947).

Cladophora rupestris (L.) Kiitz. ba (Koster, 4-7-1947).

Cladophora utriculosa Kiitz* N.s.po on N.s., in thf ^ ^ m o r p h a compressa and Pylaiella girdle. Rare. (Van den Hoek, 25-10-1953).

Enteromorpha ahlneriana Bliding N.s.po on N.s., in the Enteromorpha to compressa and Pylaiella girdle (Van den Hoek, a " ™ * * -

Enteromorpha compressa (L.) Grev. N.s., Ss., Nspo, Ss.po. Forms a girdle in the upper littoral belt. Also m.l. and 1.1. Also m ba abundant.

Bnteromorpha intestinalis (L.) Link. S.s., H.I. (Van den Hoek, 9-11-1952,

En :8).

On pole (Lucas 12-2-1950). Epiphytic on Fucus (Vervoort, Jan. 1938).

Gomontia polyrhiza (Lagerheim) Bornet et Plahault. Abundant in barnacles (Van den Hoek).

Rhizoclonium implexum (Dillw.) Kiitz. S.s.po on S.s. Abundant in Bli-

dingia girdle, rare in Pylaiella girdle (Van den Hoek, 8-11-1928).
Rhizoclonium riparium (Both) Harv. S.s. and N.s., on poles, abundant in the Enteromorpha compressa and Blidingia minima girdles.
Ulothrix flacca (Dillw.) Thur. S.s., N.s., H.I., 1.1. Abundant after the frost of January 1954, recolonizing the area previously occupied by Enteromorpha.
Ulothrix pseudoflacca Wille. S.s., N.s., on poles and stones. Often in little quantities between other algae., together with the more abundant U. flacca.
Ulothrix subflaccida Wille. Often together with Ulothrix flacca and U. pseudoflacca, but in much smaller quantities. One time it was found growing in the supralittoral girdle of Cyanophyta (Van den Hoek, 8-11-1953).
Ulva lactuca L. S.s., N.s., abundant in the lower part of the Enteromorpha compressa girdle. Also 1.1., ba, ro.
Urospora penicilliformis (Both) Aresch. N.s., S.s., 1.1., h.l., on poles and stones.

Phaeophyta

Ectocarpus confervoides (Both) le Jolis. N.s.po on N.s., among Pylaiella littoralis (Van den H^ek, 2-8-1954) ba, abundant. S.s., on dam of ba.
Elachista fucicola (Velley) Aresch. S.s., on Fucus (Koster, 1-6-1948, Lucas, 18-10-1949).
Fucus ceranoides L. On dams of ba and still more up the Nieuwe Waterweg. Dioecious as well as monoecious plants. Also in ba.
Fucus spiralis L. Forms a girdle on the S.s., together with Enteromorpha compressa. Had disappeared entirely after the frost of January 1954. Also on the N.s., but very sparse. Also in ba.
Fucus vesiculosus L. Was found here and there in the littoral belt by several collectors. Forms never a distinct, closed belt (Lucas, 30-12-1947, Koster, 4-7-1947, Van den Hoek, 15-3-1953).
Petalonia fascia (Miiller) 0. Kuntze. N.s., 1.1., common in Polysiphonia girdle. Spring-species. Also in ro on top of pier (Lucas, Koster, 1-6-1948).
Petalonia zosterifolia (Beinke) 0. Kuntze. N.s., 1.1., common in Polysiphonia girdle. Spring-species.
Pylaiella littoralis (L.*) Kjellm. N.s.po, h.l.; forms a distinct girdle. Also on the N.s., on stones, in Enteromorpha compressa girdle. Abundant in ba.
Balfsia verrucosa (Aresch.) J.Ag. Abundant on S.s.po and N.s.po on the N.s. Less common on poles on the S.s., scarce on the stones.
Sphacelaria britannica Sauv. N.s.po on N.s., in Pylaiella and Callitham* nion polyspermum girdles in autumn and January (Van den Hoek> 1953/1954).

Khodophyta

Acrochaetium secundatum (Lyngb.) NBg. Epiphytic on Porphyra umbili[c]" alis (Den Hartog, 10-4-1954).

Acrochaetium virgatulum (Harv.) J. Ag. Epiphytic on Ceramium rubrum, Polysiphonia, Chaetomorpha aerea (Van den Hoek, 1-3-1953, 15-3-1953).

Bangia fuscopurpurea (Dillw.) Lyngb. On poles on N.s., in Blidingia girdle. Always on S.W. sides. Once very scarce in the supralittoral Cyanophyta girdle on the S.s. (Van den Hoek, 8-11-1953).

Callithamnion polyspermum Ag. N.s.po., on N.s. and S.s. Forms a distinct belt. Only seen in autumn; not found back in August 1954 (det. R. Boddeke).

Callithamnion roseum Harv. S.s., l.l. and sublittoral. Forms a girdle together with Cladophora glaucescens. Had disappeared in January 1954. Found again in August 1954. Also epiphytic on Fucus ceranoides; abundant in ba; in ro.

Ceramium deslongschampsii Chauvin. N.s.po on N.s. Forms a girdle together with Polysiphonia urceolata. N.s. on stones, in Polysiphonia girdle. Also in ba (Koster, 1-6-1948). S.s. on stones (Schlittler, 24-7-1947, Koster, 10-6-1948).

Ceramium rubrum (Huds.) Ag. N.s., l.l. in Polysiphonia girdle. Ba (Lucas, 10-10-1949, Van den Hoek, 16-11-1952).

Polysiphonia nigrescens (Dillw.) Grev. N.s., l.l.; in a girdle of P. urceolata and P. nigrescens. Ro (Koster, 4-7-1947).

Polysiphonia urceolata (Dillw.) Grev. N.s., l.l., on stones in a girdle of P. urceolata and P. nigrescens. N.s.po on N.s., in a girdle of Ceramium deslongschampsii and Polysiphonia urceolata. Ro on top of pier (Koster, 1-6-1948). Ba (Lucas, 1-6-1948). On the dam of a basin, sublittoral (Koster, 1-6-1948).

Porphyra leucosticta Thur. Ba (Den Hartog, 10-9-1954).

Porphyra umbilicalis (L.) Kützt. N.s., S.s., hi, l.l., ba. Very common on all places, most abundant in Enteromorpha compressa girdle.

Rhodochorton purpureum (Lightf.) Rosenv. On the dam of a basin (Den Hartog, 10-4-1954).

References

DROUET, F. & DAILY, W. A. Revision of the coecoid Myxophyceae. Butler Un. Bot. Stud.

FELDMA[illegible] of marine algae, in G. M. Smith, Manual of Phycology. Waltham, 1954.

FELDM[illegible]iiventaife de la FJore Marine de Roscoff, [illegible] 1923.

VAN GOOR, A. C. J. Die Holländischen Meeresalgen. [illegible]

GROEN, P. De Wateren der Wereldzee. Amsterdam [illegible]

DEN HARTOG, C. Porphyra leucosticta along the Dutch coast. Acta bot. neerl. 2, [illegible] 3[illegible] 6.

DEN HA[illegible] C. A classification system for the epilithic algal communities of the Netherlands' coast. Id. 4, 1955, 126--[illegible]

KO[illegible] A review of the taxonomical and ecological studies on [illegible] studies on Netherlands' [illegible] VII, 1954, 55

KOSTER, [illegible] The genus Rhizoclonium Kütz. [illegible] the Netherlands. Publ. Stas. N.poli 27, 19[illegible] 357.

MULDER, [illegible] en Oosterschelde, tegenstelling tussen rivier[illegible] en binnen-zee.

PARKE, [illegible] Mar. Biol. Ass. U. K. 32, [illegible] 497—520.

THE ALGAL MICRO VEGETATION IN AND ON BARNACLE-SHELLS, COLLECTED ALONG THE DUTCH AND FRENCH COASTS

by

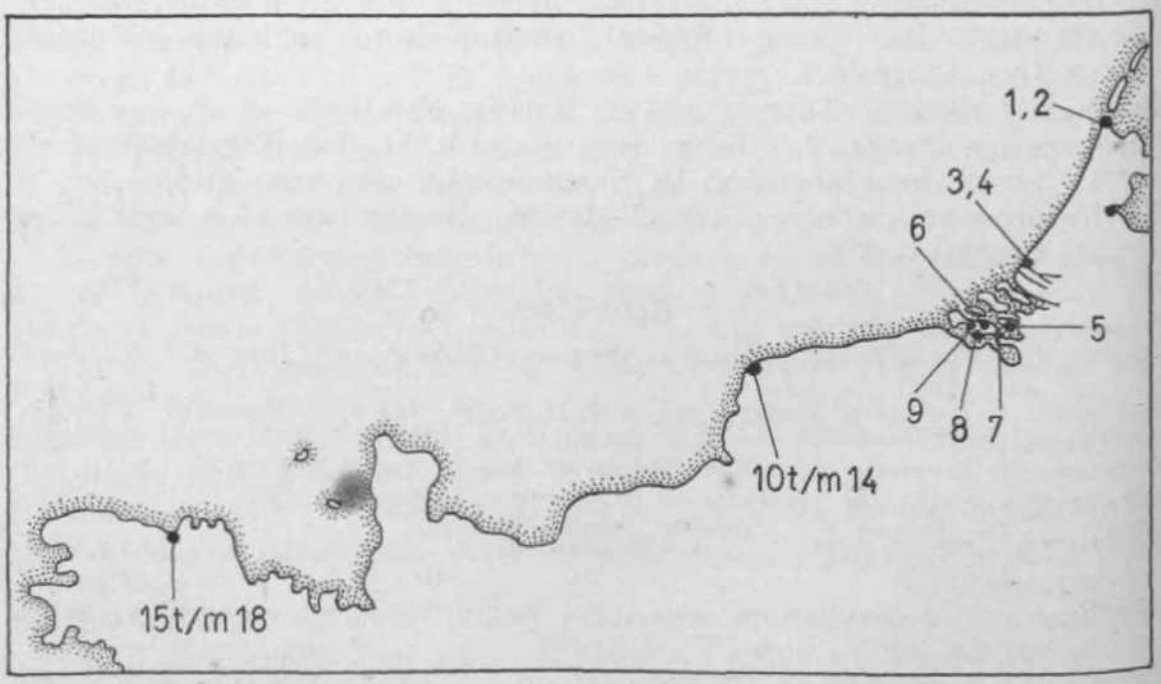
C. VAN DEN HOBK

(Rijksherbarium, Leiden)

During some trips to several points on the Dutch and French **coasts** barnacles were collected ***in*** order to get an **impression** of the algal *micro-***regetation perforating** into the shells and growing on them.

The barnacles were dried or conserved in 1'ormalde.hyd-solution; they were decalcified in diaphanol. By treating slides with chloriodide of zinc the chlorophyceae could be distinguished from the remaining algae by their cell-walls and starch-grains stained violet and blue.

Description of the localities, where barnacles were collected (see map)



1. **DEN** IIELDER, 6-9-1956. On the sea-dike in the ***PorphyrorEnteromorpK***[6] **girdle,** high in the **littoral** belt.
2. DKN HKLDKR, 6-9-1956. On the'sea-dike in the *Finns* ***serratw*** **girdle** low in **the** littoral belt.
3. HOKK **VAS** HoLLiST), 24-11-1956. On the north-side of the north-pie** of the **Nfieuwe** Waterweg, in the *Enteroniorpha compressa*-girdle, *ndd*-littoral.

4. HOEK VAN HOLLAND, 24-11-1956. On the south-side of the north-pier of the Nieuwe Waterweg, in the *Fucus spiralis-Enteromorpha compressor* girdle.
5. SEA-DIKE NEAR STRUENHAM (THOLEN, south coast), 27-10-1956. In the *Ascophyllum nodosum-Fucus vesicidosus-girdle.*
6. KATTENDWKE (ZUID-BEVELAND), 15-5-1956. On the sea-dike, in the *Fucus vesiculosus-girdle.*
7. ICANAAT^DOOR-ZUID-BEVBLAND, NEAR POSTBRUG, 14-5-1956. On the east-side. Inner side of a *Mytilus-sheW.*
8. DIKE OF THE WEOTERSCHELDE BETWEEN BORSSELE AND ELUEWOUTSDIJK (ZUID-BEVELAND, south coast), 14-5-1956. In the *Ascophyllum nodosum-*girdle.
9. DIKE OF THE WESTERSCHELDE, NOORDNOL, (ZUID-BEVELAND, south coast), 14-5-1956. In *Ascophyllum nodosum-girdle.*
10. AUDRHSSELLES, August 1955. High in the littoral belt, in the *Fucus* spirafts-girdle! On the shadowy, steep north-side of a rock, in a vegetation of *Gelidium pusittwn.*
11. AUDRESSELLES, August 1955. High in the littoral belt, in the *Fucus* spirafts-girdle! In the shade on the steep north-side of a rock, in a vegetation of maiftly *Ceramium flabelUgerum* and *Rhodochorton* pwr-*pureum.*
12. AUDRE33ELLES, August 1955. High in the littoral belt, in the *Fucus spiralis-girdle.*
13. POECTE AUX OIES, August 1955. Midlittoral. In a vegetation of *Ulothrix flacca* and *Enteromorpha compressa.*
14. CAP GRIZ NEZ, August 1955. Midlittoral. On the north-side of a rock, in a vegetation of *Laurencia pinnatifida, Enteromorpha compressa* and *Callithamnion polyspermum.*
15. BOSCOFF NORTH-BIDE OF ILE DE BecLEM, October 1955. Very much ex-, posed, low in the littoral belt, in the *Balanus perforatus-girdle.* Vegetation characterized by *Ralfsia verrucosa, IAthophyUum* and *Coral-Una officinatis.*
16. BOSOOFF NORTH-SIDE OF ILE DE BdoLEM, October 1955. Very much exposed, very low in the littoral belt, in the *Bifurcana rotunda-girdle;* on the steep east-side of a rock. In a vegetation characterized by *Halopteris scop. arm., IAthophyUum incrustans, Corallina officinalis* and *Laurencia pinnatifida.*
17. ROSCOFF, NORTH-SIDE OF ILE DE BECLEM, October 1955. Very much exposed, high in the littoral belt, in the *Chthamalus stellatus-*girdle.
18. ROQOOFF, NORTH-SIDE OF ILE DE CALOT, October 1955. In the *Fucus serratus-girdle* on a steep north-side of a rock *Balanus perforates.* In a vegetation of mainly *Rhodymenia palmata, Lomentaria artxculata, Laurencia pinnatifida, Pylaiella Uttoralis, Lithophyllum incrustans.*

Composition of the microvegetation

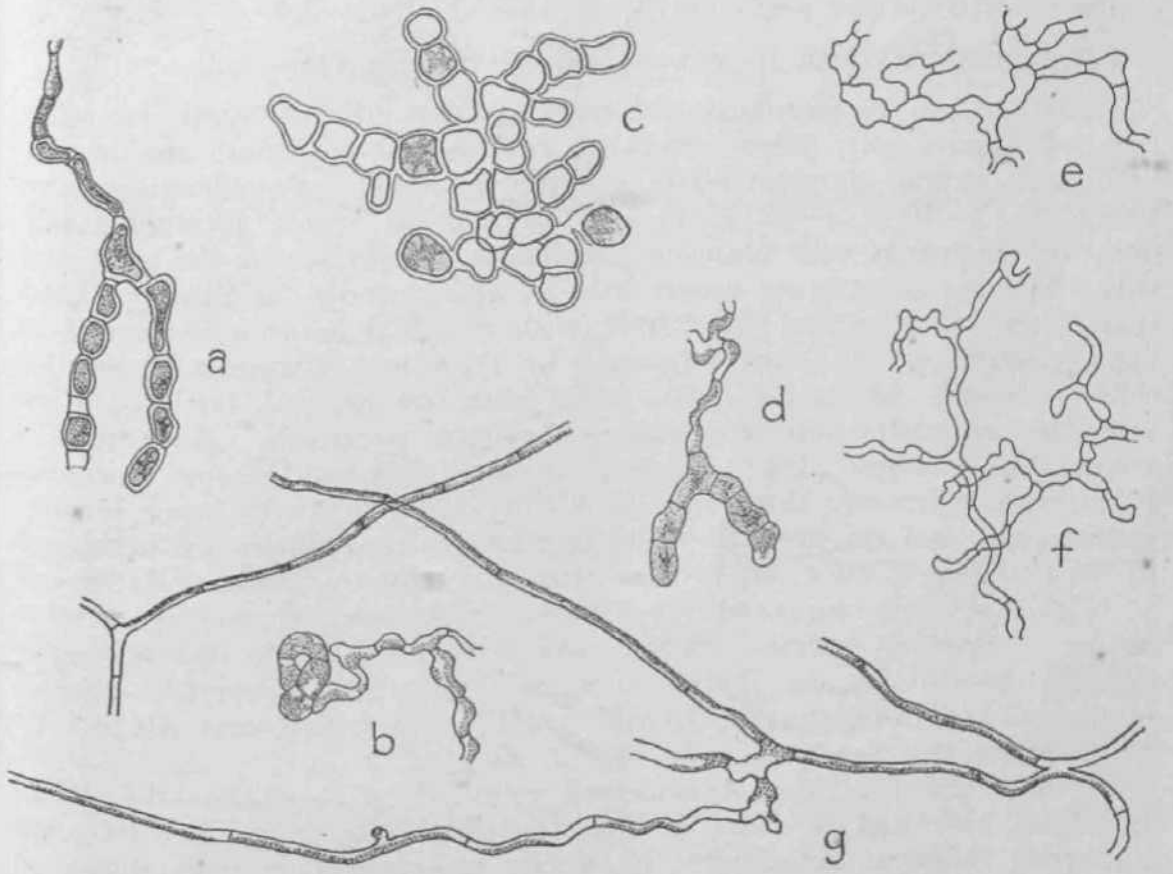
In order to form an idea of the relative abundance of the spftsies, the following symbols are used: *c* = common, + = fairly common, r = rare.

Locality-number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Perforating species.																		
Entophy salts deusta (Meneghini) Drouet & Daily	c	c	c	c	c	c	+	c	r	r	r	c	+	r	r		c	r
Conchocehs phase of *Porphyra*		c		+	+	c		c	c	c	c	c	+	c	c	c		+
Entocladia sp.	+			r	+	+		r	+	r		+	c	+		+	+	
Oomontia polyrhiza (Lagerheim) Bornet et Flahault ...	r			r	r	c	c	r?		r	r	c		+			+?	
Plectonema terebrans Bornet et Flahault		c	+	+		c		c		r		c			c	r	r	+
Mastigocoleus testarum Lagerheim ex Bornet et Flahault	+														c		c	c
Phaeophila dendroides (Crouan) Batters															+	+		
Ostreobium queketti Bornet et Flahault															+	r		
Species growing on the shells.																		
Entophy salts deusta (Meneghini) Drouet & Daily	c	c	c	c	c	c	+	c	r	r	r	c		r	r			
Phormidium fragile (Meneghini) ex Gomont	+	c	c	c	c	c		c	r			r	r				c	
PseudulveUa-like plantlets	c	c	c	+	r	c		+	c	+			c				r	
Plectonema battersii Gomont	c	c	r	+	c			+	r				+					+
Young *Enteromorpha*	r		c			+				r	+	+	c	+	r			
Ralfsia verrucosa (Areschoug) J. Agardh			c	r	r	c		r	r	c		r			c	c		
Oscillatoria nigro-viridis Thwaites ex Gomont	r	+	r	r	r	r												
Ulothrix pseudoflacca Wille		+			r	c			c				+					
Young *Fucus*					r	+				+								
Rhodochorton pxvrpureum (Lightfoot) Rosenvingc								+	+		+							
Spirulina subtilissima Kiitzing ex Gomont	r	r	r															
Polysiphonia urceolata (Dillwyn) Greville								+			+							
Ulothrix flacca (Dillwyn) Thuret													+					
Erythrocladia subintegra Rosenvinge							c											
Lithophyllum incrustans Philippi															c	c		c
Calofhrilx scopulorum (Weber et Mohr) Agarii ex Bornet et Flahault																	r	
Phormidium corium (Agardh) Gomont ex Gomont...*.	c											c						

Morphological, systematic and ecological notes

Porphyra Agardh *(fig. I),*

The Conchoeelis* phase of Porphyra **growing** in **barnaeie-shellB appears to** lie widely **distributed. In this way Porphyra** can probably stand unfavourable **environmental conditions.** Few records could be found about Conehncelis growing in barnacle-shells*: Dr. Drew observed **Conehocelis growing** in the **chalky** plates *of.* the **Lepadidfl Pollycipes** eormicopittc, **collected** at **Roseoff** (Drew *1953,* p. *84*—87). Barnacles **covering great areas of** the coasis **practically everywhere,** sewn **to be** more suitable for a rapid **return** of the adult Porphyry-phase **than** shells from the **sublittoral region. My** determination of the Conchoeelis-plia.se **growing** in **bamaele-shells**



Pig 1 *CanckoeettB^hase of Porpfyra,* **a. "Fertile ceH-TOw" Croni U (diam,** *4~ru.)* b d Vounir **fertile-leeell-Hwwa** from **IS, cc. "Hertik cell-row" wwn 15 (diwa,** 9—l), **e Klamentfl** close **to the** *snrhux* **rf the** shell from **14** ((1.5—V), ***• Mlamenti** los(. ^ **the surface of She ri»n Croaa 15 (l.o-4^)t g. FHamattta deeper in the shell** ''om & (diam. 1.5—3(*).

Collected in the North of **Prance was** confirmed **by Dr.** Drew, **who also** 'bvw **my attention to** the **presence of ^plantlets" (Drew 1954) in this Qiaterial, growing on** the surface of the shells. The diameter **of the** cells °* these plantlets amounts to 19—30^- I **a^e tried** in vain to **find eonchospore-formation** as described by **Tseng and Chang** (1955). In the **•ftaterial from Boscoff, collected in October 1955 "fertile** cell-rows'[1] **were observed.** The filaments close to the **surface** of the shells are **heavily**

coiled, richly branched and forming a dense growth; the filaments deeper in the shells are straight and sparingly branched, thus forming a sparse growth.

Erythrocladia subintegra Bosenvinge 1909, p. 73—75.

A prostrate disc-like Rhodophycea, most probably Erythrocladia subintegra, was found growing on the inner side of a Mytilus-shell, collected in the Kanaal-door-Zuid-Beveland. The thallus is composed of radiately branched creeping filaments, united to a pseudo-parenchymatous disc with often bifid marginal cells. Sometimes the threads are free from each other on the margin of the disc. Each cell contains a stellate chromatophore. Monospores were not observed. Central cells isodiametric, 5—9/x in diam., cells of the periphery 3—5 X 5—13/i *(fig. 2a).*

Gomontia polyrhiza Bornet et Flahault 1889, p. 158—159.

The thallus of Gomontia polyrhiza consists of two types of cells: first, of smaller cells, often somewhat swollen and irregular, uninucleate, with one parietal chromatophore containing usually one, sometimes two pyrenoids, 3—10 X 4—21 /&, 1—4 X as long as broad, forming freely branched filaments with branches parallel to the surface of the shell and with filaments penetrating deeper into it; and secondly, of larger inflated cells, often more or less clubshaped, with rhizoidal outgrowths turned to the shell-surface, and often connected by them with filaments of smaller cells, (13—) 20—60/i X (30—) 90—200 JA, with one parietal, laminate often reticulate chromatophore containing numerous pyrenoids. According to Bornet and Flahault (1889) the large inflated cells may become sporangia filled with zoöspores. According to Kylin (1935, p. 193) Gomontia only consists of the large inflated cells, because in his cultures the zoöspores 6f Gomontia only grew out to such cells, one zoöspore to one inflated cell with rhizoids. He supposed the filaments composed of smaller cells t° belong to another species. Bornet and Flahault (1889), however, gave detailed descriptions and figures in which they present intermediate fortf[18] of normal and inflated cells. I could sometimes clearly observe connection between the two forms of cells *(fig. 3, a—d).*

Plants growing in a Mytilus-shell collected in the Kanaal-door-Zuid' Beveland, consisted of more or less flattened cells only, provided with numerous rhizoidal outgrowths, by a few of which they were connected with each other. These cells, however., were very variable in diameter ***(fig. 2,* 6, c).**

In the barnacles from 8 and 17, only filaments of smaller cells coitf[0] be detected; so it is not absolutely certain whether they belong [t0] Gomontia polyrhiza or not.

Entocladia sp.

Kylin (1935, p. 197—204; 1949, p. 38—41) described two species *oi* Entocladia, perforating into the shells of molluscs, viz. E. testarum [a.no] E. tenuis. The diameter of the cells of E. testarum amounts to 5— 10 JL, that of E. tenuis to 3—8 jut The diameter of the cells in my materials is 2.5—5 (—7) p; the length of the cells is 1—6 X their dia-

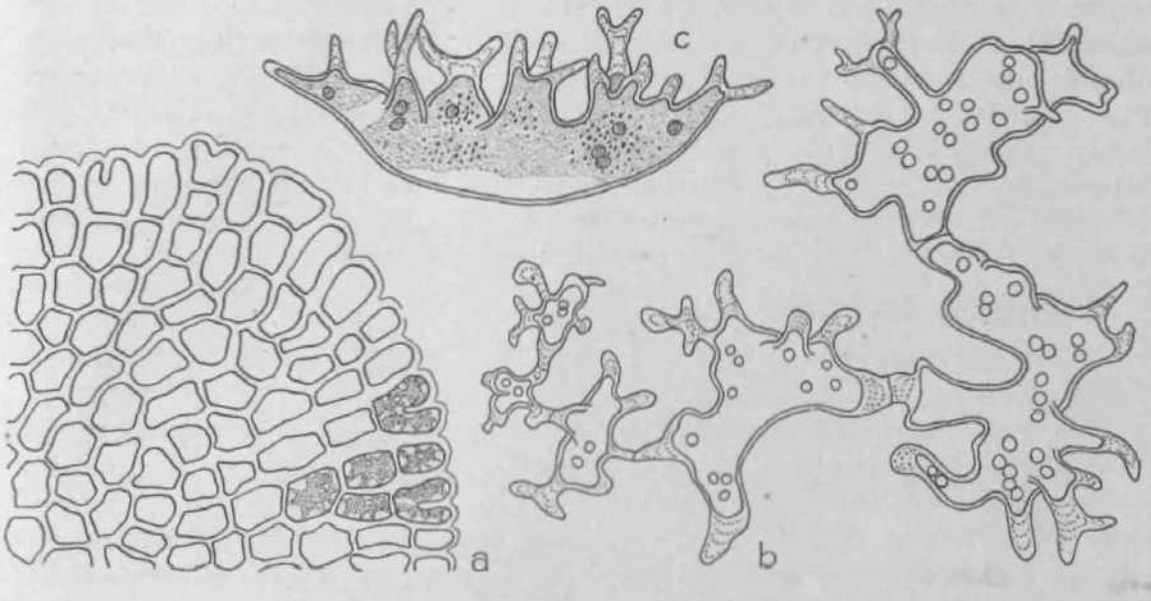


Fig. 2 a. *Eryihrocladiii .tubintcgm* from 7, b, c. ***Gomontkt*** *polyrhisa* in Myiiht:-shell from 7.

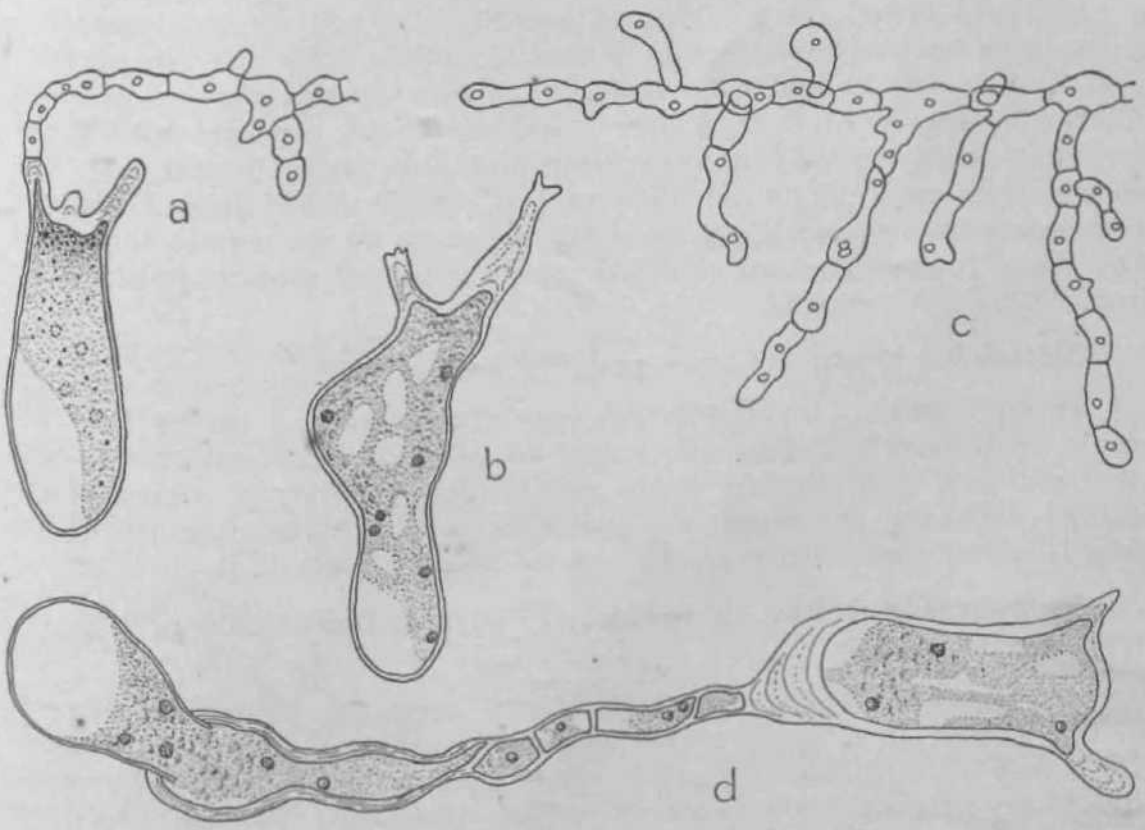


Fig. 3. *Gamontia polyrhtea* in barnacles frmn 6·

meter; it is, therefore, impossible to attribute my specimens to one of the two species. Furthermore, I am not certain that chalk-boring always is valuable as a taxonomic characteristic. In one case I found branches of a plantlet perforating into a shell growing among the upright and closely packed filaments of Ralfsia *{fig. 5 b).* In this respect it resembles Entocladia viridis. Phaeophila dendroides .has been found growing in the cell-walls of several algae, but also among the cells of Lithothamnion and Melobesia (Hamel 1930, p. 27) and in barnacle-shells.

Phaeophila dendroides (Crouan) Batters.

P. floridearum Hauck 1885, p. 464, Hamel 1930, p. 27 — *P. engleri* Rcinke 1889, p. 86, Kylin 1935.

No real morphological differences exist between P. dendroides and P. engleri. According to Reinkc (1889, p. 86) P. engleri differs from P. dendroides by the fact that it bores into chalk. According to Hamel, however, (1930, p. 27) P. dendroides has been found growing among the cells of Lithothamnion and Melobesia. P. engleri, therefore, most probably is a synonym of P. dendroides *(see fig. 6, d—/).*

Fseudulvella-like plantlets *(fig. 4c, d).*

On many barnacles a disc-like Chlorophycea was found growing, the margin one cell-layer, the centre several cell-layers thick. In many specimens, however, tubular Enteromorpha-like outgrowths arose from such discs, indicating that they are Blidingia minima. Bliding (1938, p. 85—87), in his cultures of Blidingia, observed that Blidingia zoöspores gave rise to disc-like plantlets, from which afterwards the tubular Bnteromorpha-likc outgrowths characteristic for Blidingia minima arose. In the samples from 3, 4, 9, 10, 14 and "Pseudulvella" plantlets were observed without tubular outgrowths, in 1„ 2, 5 and 6 they were seen provided with them. The first series of samples were taken from the lower littoral belt, the second series from the higher littoral belt, except 2. Perhaps Blidingia, under unfavourable conditions does not grow out to its normal form and size. Very young "Pseudulvella"-like plantlets do not show any difference from Protoderma marina.

Ostreobium queketti Bornet and Flahault *(fig. 6a—c).*

In one sample (15) Ostreobium was found growing among the fH[a]" ments of Conchocelis. Ostreobium can be distinguished from that species by their lack of transverse walls and by the presence of starch grains stained dark-blue by means of chloriodide of zinc. The diameter of the thin filaments amounted to 2—6/x, of the swollen parts to 6—15/A.

Entophysalis deusta (Meneghini) Drouet & Daily 1956, p. 103—U° ***(fig. 4 a, b).***

In many shells the dominant species appeared to be Entopliysali** deusta, mainly in a form resembling Hyella eaespitosa Bornet et Plahau^ (1889, p. CLXV—CXXI); also Gloeocapsa crepidinum-like and Dermocarpa-like forms were frequently observed. Often Hyella-like filaments were seen radiating from a central group of Gloeocapsa-like cells. Aphanocapsa-like

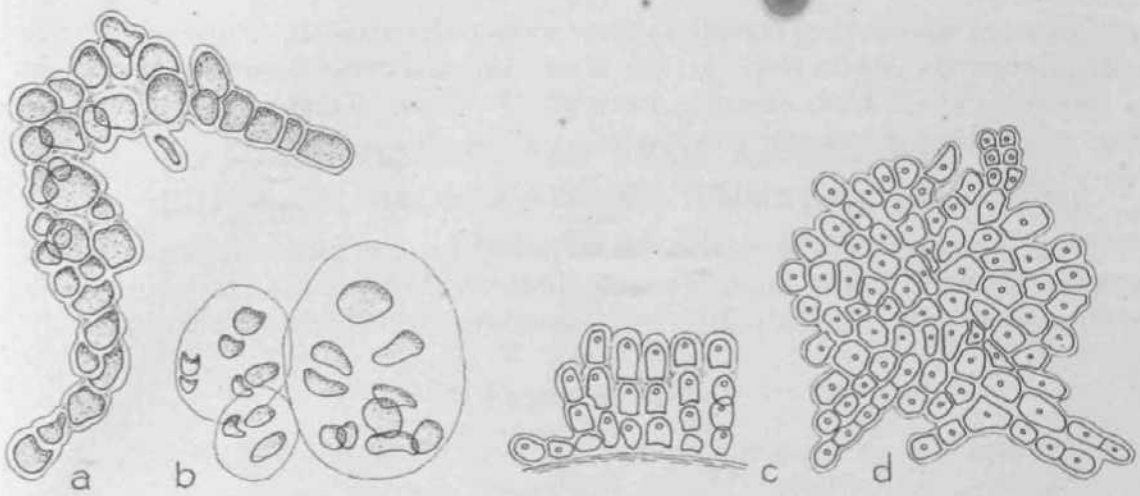


Fig. 4. a, b, ***EnthophsfsdUi cteusta,*** **c,** ***i. "Pa»tdnh>eUa" tram 8,***

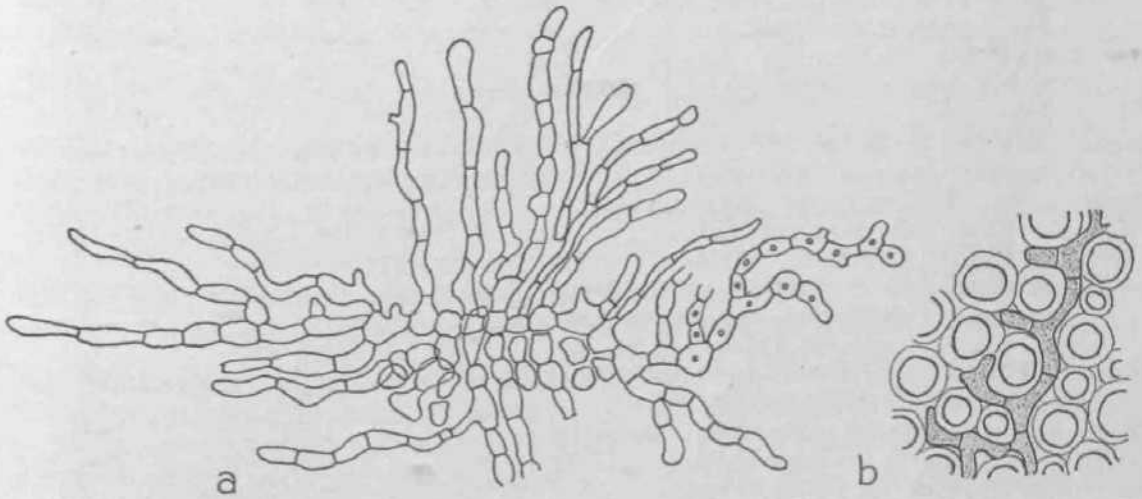
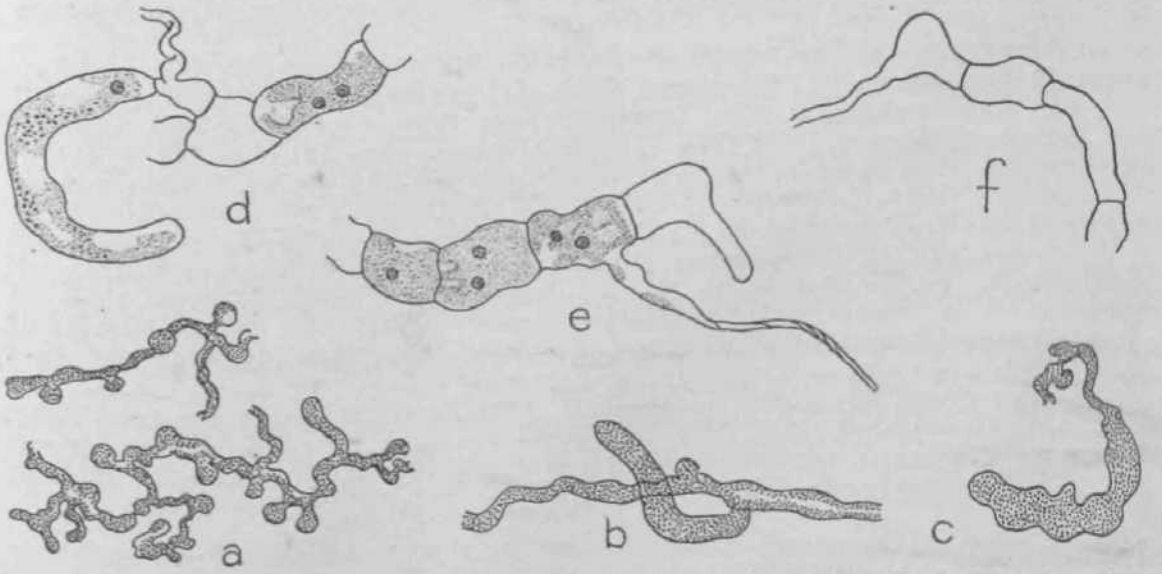


Fig. ~>. ***Bftioetodia *p.*** *from* 6, *n.* Growing in **the** shell, b. Growing **between** the upright filaments **of** Ralfsia.



[?i& (i. ;i, **!„ ,.** *thh,.,!»,<>„* ***gwketti*** **from 15, d, e, f.** ***FhaeopMle dendroides*** from **15**

colonies were also rather common; they were parasitised by Fungus threads, especially on the shells from 17. In most cases all these forms were present on the same shell, with clearly intermediate forms. This species penetrates into, as well as grows on the shells.

Oscillatoria nigro-viridis Thwaites ex Gomont.

The diameter of the specimens growing on the barnacle-shells varied between 5 and 8 ft, the most common diameter being 6 /i. The ends of the triehomes usually were slightly but sometimes considerably attenuate.

References

ANAND, PYARE TAT. A taxonomic study of the algae of the british chalk-cliffs. Journ. Bot. vol. LXXV, suppl. (1937), p. 1—51.

BLIDING, C. Studien ïibcr Entwicklung und Systematik in der Gattung Enteromorpha I. Botaniska Notiser (1938), p. 83—90.

BORKET, E. & FLATIATTI/T, On. Sur quclques plantes vivant dans le test calcaire des Mollusques. Bull. Soc. Bot. Fr., torn. 36 (2o série, torn. Xle) (1889), p. CXLVII—CLXXVII.

——Note sur deux nouveaux genres d'alguos perforantea. Journ. Bot. torn. II (1888), p. 161—165.

CHODAT, B. Etudes de biologie lacustrc C. Bechcrches sur les algues littorales; sur les algu.es .perforantes d'eau douce. Bull. Herb. Boissier, torn. VI (1898), p. 434—450.

DREW, K. M. Studies in the Bangioideae III. The life-history of Porphyra umbilicalis (L.) Kiitz. var. laciniata (Lightf.) J. Ag. A. The Conchocelis-phase in culture. Ann. Bot. N. S. vol. XVIII, no. 70 (1954), p. 1«8—211.

——& RICHARDS, K. S. Studies in the Bangioideae I. The Conchocelis phase of Porphyra sp. in Pollicipes coraucopiae Leach at Boscoff. Journ. Linn. Soc. Lond., Bot., vol. LV, no. 356 (1953), p. 84—87.

DROUET, F. & DAILY, W. A. Revision of the coccoid Mykophyceae. Butler Univ. Bot. Stud., vol. XII (1956), p. 1—218.

FR6MY, P. Les Cyanophyce*ea des Côtes d'Europe. Saint-Lo, 1934.

HAMEL, G. Floridées dc France, Bangiales. Rev. Alg. vol. I (1924), 278—292; 427—457.

——Chlorophycées des C6tes Françaises. Rev. Alg., vol. V (1930), 1—55, 383—430.

HAUCK, F. Die Meeresalgen Deutschlands und Oesterreichs. Leipzig 1885.

KYLIN, H. Ueber einige Kalkbohrendc Ghlorophyceen. Kungl. Fys. SiLllsk. i. Lund Fôrh. Ba. 5 (1935), p. 186—204.

——Ueber die Chlorophyceengattungen Entocladia, Epicladia und Ectochaete. Botaniska Not. (1938), p. 67—76.

——Die Chlorophyceen der Schwedischen Westkiiste. Lund 1949.

KOUDERU? ROSENVINGE, L. The marine algae of Denmark, Rhodophyceae I (Bangiales and Ncmalionalcs). D. Kgl. Danskc Vidensk. Selsk. Skrifter, 7 Raekke, Naturvidensk. og Mathem. Afd. VIII, 1, (1909); Rhodophyceae IV, Idem VII, 4, (1931).

LENDSTEDT, A. Die Flora der marinen Gyanophyceen der Schwedischen Westkiiste. Lund 1943.

SETCHPLL, W. A. & GARDNER, N. L. The marine algae of the pacific coast of North America, part II, Chlorophyceae. Univ. Calif. Publ. Bot. 8 (1920), 139—374.

SMHH, G. M. Marine algae of the Montery Peninsula. Stanford Univ. Press, 1944.

TslENti, C. K. & CHANG, T. J. Studies on Porphyra II. On the Conchocelis-phase of Porphyra tcnera Kjellm., and its conchospores. Act. Bot. Sin., vol. IV, no. 1> (1955), p. 45—62.

WEBER—VAN BOSSE, A. Algues in: Résultats scientifiques du Voyage aux Indes Orientales Ncerlandaises. Mé'm. Mus. Roy. Hist. Nat. Bclg., hors série, vol. VI, fasc. I*

WILLE, N. Conjugatae und Chlorophyceae in Engler & Prantl. Die natiirlichen Pflanaenfamilien, Nachr. zum I Teil, 2e Abt., 1910, p. 90.

FLORAE MALESIANAE PRECURSORES XVII
NOTES ON MALAYSIAN AND SOME S. E. ASIAN CYPERACEAE V)

by

J. H. KEEN
(Ryk^lu'iliuriuLii. **Leiden)**

(Issued **1.** VII. 1958)

I MAPANIA HOLTTUMII

Mapania holttumii Kern, nom. nov. — *Mapania insignis* Holttum, Gard. Bull. Sing. 11, 1947, 293, non Sandwith, Kew Bull. 1933, 496.

When publishing the name *Mapania insignis* for a species occurring in Malay Peninsula, Holttum overlooked the existence of the earlier homonym *Mapania insignis* Sandw. for a different species from British Guiana. I therefore propose to replace the illegitimate binomial by that of *Mapania hoUtumn,*

II SOME NOTES ON PARAMAPANIA

No doubt it is one of the groat merits of Uitticn to have recognize,] the close relation to Mop**., I ^ - r ^ ^ C v rttea'32 193^ **184—192,** certainly a coherent group, **though** f '^ J" ^"xtra-Hahnsian **members or** the **As I can not claim** l « h W ^ * ^ ^ ^ **to Po^mopw** of all be created solution **will be unattainable by** The **rule** smaller than the upp may be a **stamen in its** axil, nsua **11>** in *Mapania* and *Thoracostachyum* and *Mapania* sect. *Cephaloscirpus* the species of *Parama-*

sen«s, *P.nmnapam,,* satisfactory way. *apanieae* will first e numerous genera definite time can be maintained. Very likely a herbarium study only. are in structure very similar **to those of** but generally somewhat more hypogynous scale is usually lacking and stamens. When the third scale is present it as a er ones and sterile. However, occasional there less developed **tl ian the other two•** es on the keel of the two outermost *Paramapania,* the correspond les eing softly ciliate on the ba om

[1]) Part I in Reinwardtia 2, **1962, 97-180;** II in Reinwardtia 3, 1954, 27—66; III in Blumea 8, 1955, 110—1**69; IV in R**einwardtia 4, 1956, 89—97.

pania may readily be distinguished by the lateral leafless scapes. However, it is practically impossible to distinguish between *Paramapania* and the scapigerous species of *Hypolytrum* and *Mapania* by their habit alone. Especially some African *Hypolytra* (e. g. *H. nudicaule* Cherm. from Madagascar) are very similar in habit to *Paramapania parvibractea* (Clarke) U.itt., but the number of hypogynous scales is that of *Hypolytrum,* i.e. reduced to two. As a rule the spikelets and flowers in *Mapania* are much larger than in *Paramapania,* and the fruits more drupaceous by the fleshy or spongy thick exocarp. *Mapania monostachya* Uitt. is very similar to *Paramapania gracillima* (Kiik. & Merr.) Uitt. by its very narrow leaves and spikelets only 6—10 mm long, but the flower-structure and the drupaceous fruit are distinctly those of *Mapania.*

1. *Paramapania attenuata* S. T. Blake, J. Am. Arb. 28, 1947, 210, is said to be most nearly allied to *P. longirostris* (Kiik.) Uitt., but to differ from it by the glumes twice as long, the flowers slightly smaller than the glumes, and the indistinctly 3-angled (not 6-angled) nut passing gradually (not abruptly) into the relatively shorter beak. However, "glumae ... 1.5 mm longae" in Uittien\s description of *Paramapania rostrata* (Elm.) Uitt. [= *P. longirostris* (Kiik.) Uitt.] in Rec. Trav. Bot. Néerl. 32, 1935, 189, is obviously a printer's error for 2.5 mm. In the specimens examined I found the glumes *2y2*—3 mm long, *iy2—1%* mm wide. To me the rather young nuts in the type of *Paramapania attenuata (Brass 12930)* do not differ from those of *P. longirostris.* I therefore refer *Paramapania attenuata* to the synonymy of *P. longirostris.*

2. *Paramapania lucbanensis* (Elm.) Uitt. was based on *Mapania hicbanensis* Elm., the type collection of which is Elmer 9116 from Lucban, prov. of Tayabas, Luzon. Uittien did not see this collection, to which his binomial nomenclaturally belongs. I saw a specimen of it in the Edinburgh Herbarium and have no doubt that it belongs to *Paramapania parvibractea* (Clarke) Uitt., as could already be presumed from Elmer's description (inflorescence 3 by 5 cm, lower peduncles divaricate, nut nearly 2 min long, 1 mm thick). The name *Mapania lucbanensis* Elm. and the binomials based on it must therefore be referred to the synonymy of *Paramapania parvibractea.*

However, Uittien intended the name *Paramapania lucbanensis* for Ramos BS 23642, from Lake Polog, prov. of Sorsogon, Luzon, distributed by the Bureau of Science as *Thoracostachyum lucbanense* (Elm.) RHk-t apparently a different plant. Uittien distinguished it from the other species of *Paramapania* by the nut 3 mm long and suddenly contracted into * stipe. I find the nuts only 2—2[1]/, mm long (stipe and beak included)* and the plants with their dense stellate inflorescences and long conical rostrum of the fruit .hardly different from the Bornean collections *of Paramapania radians* (Clarke) Uitt. . The nuts are slightly different & shape, but I doubt whether they are well developed. Besides, P. *pcf*0*'' *bractea* and P. *radians* are very closely related and possibly only raciaW distinct. To me it seems undesirable to distinguish a third «ntity, for which moreover a new name would be required.

3. Some *Paramapania* collections from the Malay Peninsula (Johore) were described by Uittien as P. *johorensis.* This was done mainly on *c''

count of the 6 hypogynous scalés and the simple inflorescence. Uittien distinguished them from *P. radians* by the peduncled spikelets, the shorter acumen of the leaves, and the subglobose fruit. In 1936 he referred also Teysmann 6280 from P. Lingga to *P. johorensis* with the remark that it differs from the Johore specimens in having only 5 hypogynous scales and a more compound inflorescence. Then he distinguished *P. johorensis* from *P. parvibractea* solely by the terete, globose, stipitate nut of the former. Recently some *Paramapania* specimens were collected in Central Sumatra, but I am unable at present to decide whether they belong to P. *johorensis* or not.

4. In Brass 27935 from Papua the flowers are about 3 mm long, distinctly longer than is usually the case in *Paramapania parvibractea.* There are 6 hypogynous scales, 3 stamens with anthers about 1 mm long, and in some flowers 4 stigmas. Also in Nielsen 221 from Fiji (the only extra-Malaysian *Paramapania* I have seen) the flowers are almost 3 mm long, but here I found only 5 scales and 2 stamens. It seems advisable to consider both collections forms of the widely distributed polymorphic *Paramapania parvibractea.*

The synonymy of *Paramapania radians* and P. *parvibractea* and a survey of the specimens examined are given below.

5. Paramapania radians (Clarke) Uitt., Rcc. Trav. Bot. N6erl. 32, 1935, 188 & 200 — *Mapania radians* Clarke in Ridl., J. Str. Br. R. As. Soc. 46, 1906, 226; Kew Bull. add. ser. 8, 1908, 53; Merr., En. Born. 1921, 65 — *Hypolytrum radians* (Clarke) Ridl., PI. Mai. Pen. 5, 1925, 170, cxcl. pl. malacc. — *Paramapania lucbanensis* Uitt., Rec. Trav. Bot. Néerl. 32, 1935, 190, quoad specim. cit., non *Mapania lucbanensis* Elm.

BORNEO. Br. N. Borneo, dist. Temburong, Sungei Belalong, % mile above Kuala Belalong. 200 ft: *Smythies, Wood # Ashton San 17066* (L). — Sarawak, Matang: *Bidley 1*34** (K, *type;* BM, PNH, SING); Dulit, near Long Kapa, 500—600 m, on rock in primary forest on spur of mountain: *Richards 1475* (K, U); Puak: *Ridley 1*8*9* (SING); Siul: *Ridley s.n.* (SING). — NK. Borneo, Nunukan, N of Tarakan, brookvalley near old forest-garden, primary Dipterocarpaceae forest: *W. Mc%vr 1886* (BO, L, PNH). - BT. N. Borneo, Sandakan, Bongaya R.: *Bidley s.n.* (SING); Kandakan and vicinity, in damp forest: *Ramos 139** (K, US), *U97 (US).*

PHILIPPINES. Luzon, Lake Polog, prov. of Soraogon: *Ramos BS 2864** (BM, HO, BBI, GH, K, L, SING, US). — Mindanao, Zamboanga Dist., Mt Tubuan: *Ramos 4- Edafio BS 366*5* (K).

6. Paramapajiia parvibractea (Clarke) Uitt., Rec. Trav. Bot. Néerl. 33, 1936, 143- S. T. Blako, J. Arn. Arb. 28, 1947, 209 — *Hypolytrum Parvibractea* Clarke, Kew Bull. 1899, 114 — *Mapania montana* Laut. & K. Sch. in K. Sch. & Laut., PI. Schutzgeb. 1900, 189 — *Hypolytrum Parvibracteatum* Clarke, Kew Bull. add. ser. 8, 1908, 51; Valck. Sur., Nova Guinea 8 1912, 709; Ridl., Trans. Linn. Soc. II, 9, 1916, 243 — *Mapania lucbanensis* EIHL, Leafl. Philip. Bot. 2, 1909, 573 — *Hypolytrum parvi-*^{hr}*<tcteatum* var. *quadriglumatum* Valck. Sur., Nova Guinea 8, 1912, 709, t. 116 — *Hypolytrum quadriglumatum* Valck. Sur., l.c, nom. inval. — *Thonicostachyum' montanum* (Laut. & K. Sch.) Valck. Sur., op. cit., 710; Kfifc, Bot Jahrb., 59, 1924, 54; Ohwi, Bot. Mag. Tokyo 56, 1942, 209 — ^{T}*horacostachyum lucbanense* (Elm.) Kük. ex Merr., Philip. J. Sc. 11, 1916, ^{fi}ot. 258-, En Philip. 1, 1923, 132, p.p. — *Hypolytrum radians* Ridl., FI.

Mai. Pen. 5, 1925, 170, quoad specim. malacc, non *Mapania radians* Clarke — *Paramapania johorensis* Uitt., Rec. Trav. Bot. NSerl. 32, 1935, 191; ibid. 33, 1936, 141 — *Paramapania lucbanensis* (Elm.) Uitt., Bee. Trav. Bot. Néerl. 32, 1935, 190, haud quoad specim. cit. — *Paramapania amboinensis* Uitt., op. cit., 191, f. 4 — *Paramapania montana* (Laut. & K. Sch.) Uitt., op. cit., 200, nom. inval. — *Thoracostachywm parvibractea* (Clarke) Kiik., Bot. Jahrb. 69, 1938, 261,. nom. vix valid.

SUMATRA. Central Sumatra, Air Putih, E of Pajokumbuh, on steep wet bank: *Alston 14383* (BM); Tandjong Pauh, along road to Pakan Baru, 400 m, forest on poor sandy soil: *W. Meijer 4611* (L). — P. Lingga, Sungei Tan da: *Teysmann 6280* (BO); 700 m, forest: *Biinnemcijer 6915* (BO).

MALAY PENINSULA. Kelantan, ridge above Sungai Tekal, near Gua Ninik, 1500 ft, in a pool: *Henderson SF 19431* (SING, US). — Jo ho re, Gunong Belumut, S. slope, 2500 ft, in valley: *Holttim 8F 10989* (K, *type* of P. *johorensis* Uitt.; SING); Gunong Panti, 2000 ft: *Ridley 4144* (BM, SING).

PHILIPPINES. Luzon, prov. of Tayabas, Infanta-fiiniloan trail: *"Ramos 4' Edaño* ***BS £9177*** **(US); Mt Binuang:** ***Ramos # Edaño BS £8469*** **(UTS); Luoban:** ***Elmer 9116*** **(E,** ***type coll.*** **of** ***Mapania luobanensis*** **Elm.); Laguna prov., Cagayalan;** ***Edaño PNH*** *6480* (PNH). — Samar, Bagacay, Concord: *Sulit PNJI 6308* (L, PNH, SING). — Mindanao, Zamboanga dist., Malangas: *Ramos $ Edaño BS 37414* (US).

MOLUCCAS. Talaud Islands, Pulu Karakelong, 170 m: *Lam 2757* (BO). — Morotai, G. Sangowo, 50 in: *Kostermans 7808* (BO, L). — Ceram, Central Ceram, northern plain, common: *Stresemann £18* (L); East Ceram, Kp. Kiandarat, G. Kilia, 60 m: *Buwalda 5630* (BO, K, L, PNH, SING); between Warn and Masiwang, 0—100 m, primary forest: *Kornassi 982* (BO). — Ambon: *Brooks 17748* (BO), *Forsten s.n.* (L), *Robinson 1889* (K, L, US); Latua: *Boerlage 464* (BO, L); Way Jua, 200—300 m: ***Komassi (exp. Butt en) 1164*** **(BO, L); G. Saluhutu, 400 m, foijest:** ***van der Pyl 70S*** (BO); *Rant 650* (BO); Hutumuri: *Teysmann* s.n. (L909. 18—241).

NEW GUHNEA. Western New Guinea, Sorong, Kp. Baru, scattered in forest: *Djamhari 353* (BO, K, L); 20 m: *Mann 377* (BO); Ramoi, *Becoari PP346* (FI); Patema, Nabire, 300 m, in rain-forests fringing Bumi R.: *Kanehira $ Hatusima 12363* (BO); Mambcramo B., Albatros bivouac, 75 m: *Dooters van Leeuwen 9652* (BO, K, L, SING); Rouffaer R., 250 m, on steep slopes in the forest: *Docters van Leeuwen 10452* (BO, GH, K, L, U); Idenburg R., Bernhard Camp, 150 m, frequent in rain-forests of lower mountain slopes: *Brass 13842* (BO, BRI, L); near Prauwen-bivouac: *Lam 792 # 802* (BO); 120 m, very common in the forest on the hills: *Lain 830* (BO, K, L); 200 m: *Lam 959* (BO, K, L); N of Depapre, 100 m: *Lam 7818* (L); east slopes of Cycloop Mts, 575 m, occasional floor plant in tall forest: *Brass 8944* (BRI); Cycloop Mts, pass to Netar, 400—600 m, roadside: *Meijer Drees 45* (BO); Mt Carstensz: *Kloss s.n.* (BM, K). — Northeastern New Guinea, Sepik, Yellow R.: *Womersley 3938* (BO); Morobe Dist., Sattelberg to Quembung mission, 3200 ft, forest trail: *Clemens 984* (L); Quembung mission, 2500 ft, forested hills: *Clemens 1210* (L); Wareo, 2000ft, forest trail: *Clemens 1367* (G, L). — Southeastern New Guinea, Fly *B.*, 523 mile Camp, 80 m, common forest floor plant, sporadic on ridges: *Brass 6706* (U)-; **Ply R.:** ***d'Albertis in 1877*** **(PI); Mt Scratchley:** ***Giulianetti s.n.*** **(K,** ***type)*** **see Fl.** Mai. I, 1, 1950, XXI); Kokoda, forest: *Cheesman 103* (K); Kubuna, Centr. Division, 100 m, uncommon forest floor plant: *Brass 5669* (L); Dieni, Ononge Road, Centr. Division, 500 m, sporadic on rain-forest floor: *Brass 3931* (BRI); Koitaki, 1500 ft, forest: *Carr 12553* (L). — P. Gebeh: *Teysmann s.n.* (BO). — Japen-Biak, Sarurai near Serui: *Aet $ Idjan 18* (BO, K, L). — Islands near the S. E. coast: *Armit in 1884* (MEL); Normanby Island, Waikaiuna, 30 m, in a ravine in rain-forest: *Brass 25623* (L); Sudest Island, Mt Riu, W. slopes, 300 m, locally common in rain-forest undergrowth: *Brass 27935* (L).

FIJL Viti Levu: Waidoi: *Nielsen 221* (C).

III. HYPOLYTRUM NEMORUM

Hypolytrum nemorum (Vahl) Spreng., Syst. 1, 1825, 233 — *Scirpus anomahis* Retz., Obs. 5, 1789, 15, non *Hypolytrumt anomalum* Steud., 1855

— *Schoenus nemorum* Vahl, Symb. Bot. 3, 1794, 8; En. 2, 1806, 227 — *Hypolytrum latifolium* L. C. Rich, in Pers., Syn. 1, 1805, 70 — *Hypaelyptum nemorum* (Vahl) Beauv., Fl. Owar. 2, 1810, 13.

The synonymy of this species up to 1825 is given above.

In the Copenhagen Herbarium there are two sheets marked by Vahl respectively *"Schoenus nemorum-Beera* Kaida Rheed. 12 f. 58" and *"Schoenus nemorum-Beem* Kaida Hort. Jlal. p. 12, pag. 109 Tab. 58". Vahl's descriptions of *Schoenus nemorum* in Symbolae Botanicae and Enumeratio Plantarum were certainly based on these specimens, which originate from India and belong to what is generally known ac *Hypolytrum latifolium* L. C. Rich. Sprengel transferred Vahl's name to *Hypolytrum*. The correct name of the species in *Hypolytrum* therefore is *H. nemorum* (Vahl) Spreng. Clarke and others referred this binomial — wrongly with the authority "(Vahl) Beauv." — to an African *Hypolytrum,* the correct name of which is *II. purpurascens* Cherm. (see Nelmes, Kew Bull., 1955, 69—71). Probably because Clarke in the Flora of British India 6, 1894, 678 cites "Rheede Hort. Malab. xii. t. 58" in the synonymy of *H. wightianum* Boeck., Nelmes I.e. supposed *Schoenus nemorum* Vahl might be the earliest binomial for *Hypolytrum wightianum* Boeck. This is certainly not the case, as the specimens in Vahl's herbarium do not belong **to *H. wightianum.***

IV. SCIRPUS SIAMENSIS

Scirpus siamensis (Clarke) Kern, stat. nov. — *Scirpus squarrosus* L. *var. siamensis* Clarke in Hosseus, Beitr. Fl. Siams, Beih. Bot. Centralbl. 27, 1910, 460; Camus in Lecomte, PL Gén. I.-C. 7, 1912, 134 — *Lipocarpha tenera* (non Boeck.) Camus, op. cit, 143, quoad specim. cit. — *Scirpus chinensis* Osb. *var. siamensis* (Clarke) Raymond, Nat. Canad. 84, 1957, 124.

I have no hesitation in crediting specific rank to this taxon. The plant is stouter than *Scirpus squarrosus* L. and differs moreover by the following characters: involucral bracts usually 3, patent to reflexed, the longest one up to 15 cm; spikelets larger, 4r-5 mm wide, stramineous; glumes oblong, the body slightly longer than 1 mm, conduplicate, keeled, with a hyaline auricle on both sides at the top, and 2—3 fine nerves on both sides of the midrib, the awn I1/.—17i mm lonS> slightly longer than the body; style longer, about 2/3 mm (stigmas included); nut somewhat krger, about 7_3 X 2/5 mm; leaves I1/.,—lV_2 mm wide, the upper side with a conspicuous spongy tissue.

Scirpus squarrosus L. is characterized by: involucral bracts usually 2, the lower one erect as though continuing the stem; spikelets very small, 2—3 mm wide, glumes obovate-cuneate, the body slightly shorter than 1 mm, somewhat concave, almost flat, not keeled, not auncled, with almost nerveless sides, the awn about V, mm long, shorter than the body; style very short, about V„ mm long (stigmas included); nut about V_2 X 7, mm; leaves up to 1 mm wide, not spongy.

SUM. Wang Djao, 100 m, savannah forest, frequent but not dominant: ***Ilosscus* 101 P coll.**

(ll^€ Pris^de Sala de la Se-Bàng-ffai, prov. de Savannakhet: ***Poilane 28198*** **(sec. Raym non vidi).**

T o r a'^ ^'v l rao Hai ,"pris le grand lac: ***d'Alleisette in 1908*** **(L).**

COCHIN CHINA. Gnia torn: ***Thorel s.n.*** **(P).**

V. ELEOCHARIS SUNDAICA

Eleocharis sundaica Kern, spec. nov. — *Fig. 1.*

Herba perennis, rhizomate brevi longe stolonifero, stolonibus ad 4 mm diametro, (haud semper?) apice tuberiferis. *Culnti* validi, dense fasciculati, erecti, teretes, laeves, septis propriis magnis nullis, sed cellulis tenuissimis numerosissimis modo medullae gpmpleti, in sicco rugulosi, obsolete striati 65—85 cm alti, 3—6 mm crassi. *Vaginae* 2, laxiusculae, membranaceae, pallide virides vel stramineae, basi saepe fuscescentes, ore oblique sectae ohtusae muticae, vagina summa 10—15 cm longa. *Spicula* cylindrica, apice subacuta, derusiflora, 1—$2^1/_2$ cm longa, 4—6 mm crassa. *Glumae* late ovatae vel suborbiculares, apice late attenuatae vel rotundatae, concavac, ecarinatae, tenuiter pluristriatae, stramineae, marginibus latis hyalinis brunneo-punctatis, intus marginibus brunneo-zonatae, c. 4 mm longae, (3—)4 mm latae; gluma infima caulem amplectens, sterilis, glumae reliquae fertiles. *Setae hypogynae* 5—6, firmae, retrorse scabrae, 2(—3) nuce distincte longiores stylopodium aequantes, ceterae nuce paullo breviores vel paullo longiores. Stamina 3; antherae non visae. Stigmata 2; *stylopodium* persistens triangulare, complanatum, cellulosum, c. $^3/_4$ long, nucis aequans, basi annulo subtoroso nuce subaequilato instructum, $I^1/_2$—$1^3/_4$ mm longum, basi $1V_2$ mm latum. *Nux* late elliptica vel late obovata, apice subtruncata, bieonvexa, marginibus leviter costata, nitida, maturitate castanea, c. 2 mm longa, $l^2/_3$—$1^3/_A$ mm lata, utroque latere cellulis extimis transverse oblongis c. 30-seriatis leviter reticulata.

LESSER SUNDA ISLANDS. **Alor, "Merjak", S of Naumang, 450 m, lining the lake, abundant, May 16, 1938: *Jaag 1190* (L, *type;* ZT); vein, name: m<5luta.**

This new species belongs to ser. *Mutatae* Svens., which comprises about twenty very closely related taxa usually treated on specific level. Up to the present the following *Mutatae* have been recorded for the Malaysian area: *Eleocharvi dulcis* (Burm. f.) Hcnschel, s. 1., *E. acutangula* (Roxb.) Schult., *E. spiralis* (Rottb.) R. & S., *E. philippinensis* Svens., and *E. ochrostachys* Steud. Of these the species described above is most nearly related to *E. spiralis,* differing in the terete (not triquetrous) stems, the larger, not almost truncate glumes, the larger nuts crowned by a much stouter style-base and with the external cells transversely oblong (not linear), and the longer and firmer hypogynous bristles. The simplest differentiating character is offered by the shape of the stems, but as in *Scirpus,* the taxonomic value of this shape (terete or triquetrous), is sometimes illusory. Of greater value is the type of cellular reticulation of the nut, generally considered most important for specific delimitation in *Eleocharis.*

Apparently still closer is the affinity to two extra-Malaysian species, both with terete stems and the same type of nut and style-base, but with the epidermal cells of the nut isodiametric and in about 20 rows on each face. *Eleocharis cellulosa* Torr. from the West Indies, Central America, and the Southern United States is much more slender and has smooth bristles about reaching the top of the style-base. *Eleocharis brassi S. T. Blake from Queensland has longer spikelets, ovate glumes about 5 by $2V_2$ mm, and the longest bristles about as long as the nut proper***

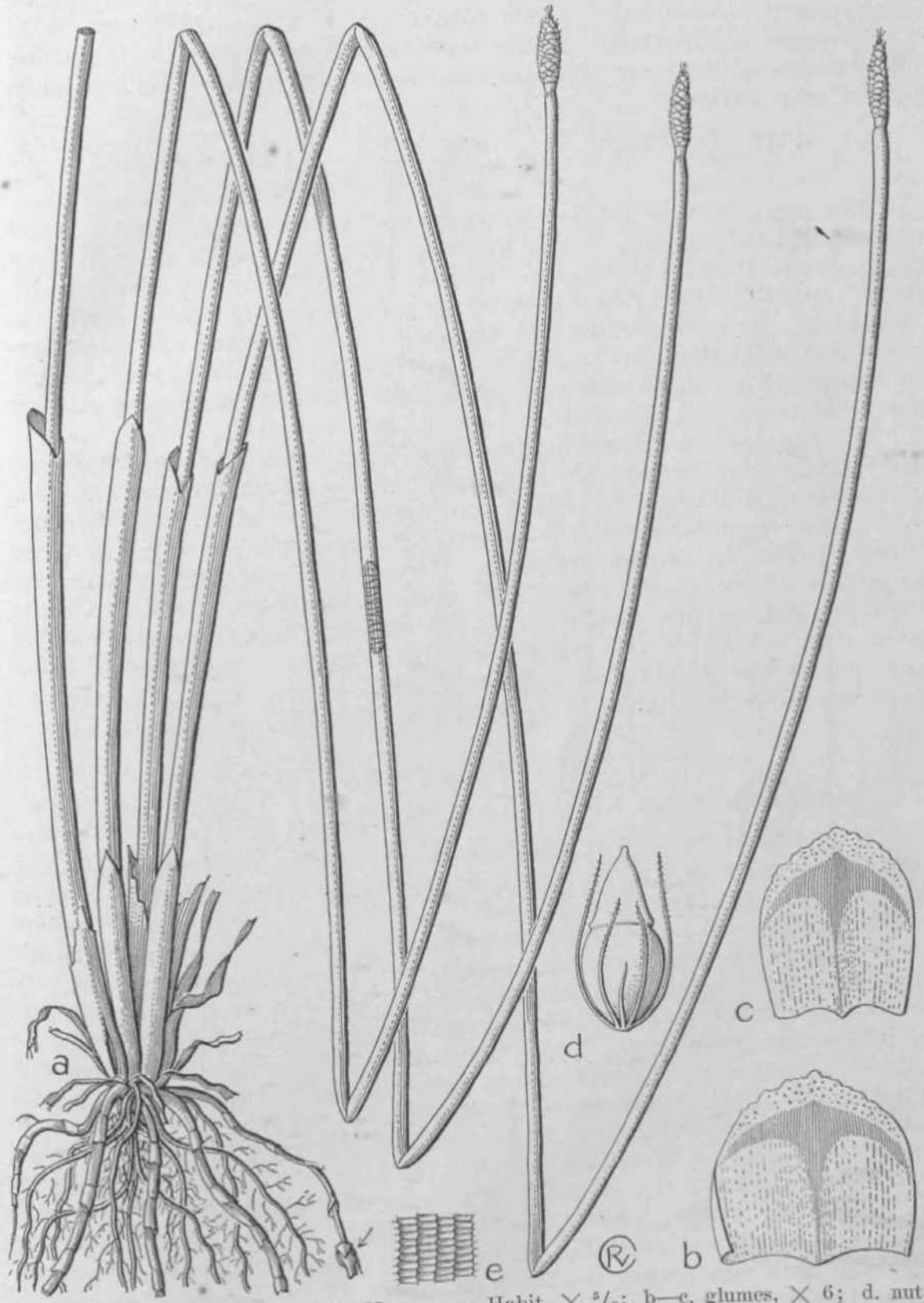


Fig. 1. *Eleocharis sundaica* Kern — a. Habit, × 5/8; b—c. glumes, × 6; d. nut, × 6; e. surface of nut, strongly enlarged. — From *Jaag 1190*.

For the related species no tubers have been recorded, except for *E. dulcis,* which produces conspicuous edible tubers.

Throughout *Eleocharis* specific delimitation presents great difficulties. The question whether the taxa discussed above all represent linneons must be left open here.

VI. THE IDENTITY OP PICINIA FOLIAUEO-BRACTEATA PFEIFP.

The name *Ficinia foliaceo-bracteata* was published in ".Revision der Uattung Ficinia Schrad." by H. Pfeiffer, 1921, 35. *Ficinia* is an African genus, hence Pfeiffer's remarks "Habitat, incognit., ?Java (herb. Lugd. Bat.)" and (p. 10) "Das Indigenat von *F. foliaceo-bracteata* Pfeiff. in Java ist sehr verdächtig. Ob dies isolierte Vorkommen auf Einschleppung aus Siidafrika beruht oder, was mir die grössere Wahrscheinlichkeit zu haben scheint, nicht eher auf einem Irrtum bci der Zusammenstellung des herb. Lugd. Bat., ist nicht zu sagen."

The type in the Rjjksherbarium (labelled "*Ficinia longebracteata* spec, nov." by Pfeiffer) is certainly from Java. It was collected in the lake near Tjilankahan (Banten) by Kuhl & van Hasselt, and undoubtedly belongs to *Cyperns cephalotes* Vahl, a species not uncommon in Western Java. Obviously Pfeiffer mistook the corky tissue at the base of the nut for the gynophore occurring in *Ficinia,* with which it has nothing to do. Already Bentham, J. Linn. Soc, Bot. 15, 1877, 509, stated that this tissue is "nothing more than a cellular and rather hard thickening of the pericarp, below and more or less round the seed-bearing cavity." A very accurate description of it was given by Clarke, in J. Linn. Soc., Bot. 21, 1884, 25—28.

VII. TETRABIA IN MALAYSIA

Tetraria borneensis Kern, sp. nov. — *Fig. 2.*

Hierba perennis, valida, glabra, 1V_2—2 m alta. *Rhizoma* lignosum, breve, crassum. *Citlmi* erecti, rigidi, obtuse trigoni, striati, laeves, per totam longitudinem distanter foliigeri, basi 5—6, medio 2—4 mm crassi, basi incrassata vaginis castaneis plus minusve nitentibus demum in fibras dissolutis obtecti. *Folia* basalia numerosa, coriacea, culmo multo breviora, basi conduplicata, ceterum canaliculata vel plana, 4—10 mm lata, apicem versus longc gradatimque in acumen triquetrum angustata, marginibus saepiusque et in costa antrorse sabra; folia caulina 3—5, laminis brevioribus, vaginis tubulosis castaneis vel atrobrunneis, ore oblique sectis, 4—8 cm longis, apice liberis, partibusque liberis inferne paullo imbricatis. *Inflorescentia* paniculata, angusta, laxa, 40—90 cm longa, e ramorum fasciculis 4—8 distantibus constructa. Bracteae inferiores foliis caulinis similes sed breviores* 5—10 cm longae, longe vaginantes, superiores gradatim breviores. Rami inflorescentiae 2—1-ni, erecti, inaequales, ancipites, scaberuli. *Spiculae* numerosae, solitariae, breviter pedunculatae, anguste lanceolatae, acutae, biflorae, 7—8 mm longae, 1—1V_2 nun l&tae. *RhachiUa* recta, brevissima, baud super florem terminalem producta. *Glumae* 7, obsolete distichae, castaneae, inferiores 4 vacuae, ovatae, e carina breviter (1—2.mm) aristatae, superiores 2 floriferae, oblongae, c. 6 mm longae, apicem versus

Fig. 9. Tetraria borneensis Kern. a. Habit × 2/3; b. spikelet × 8; c. glume, × 8; f. nut (stigmas not yet fallen off), × 4; d. upper flower, × 8; e. lower flower, × 8; g. anther, × [illegible]. — a–f from Purseglove P 5072; g. from [illegible].

asperae; gluma terminalis tenuiter membranacea, sterilis. *Flos* inferior masculinus, antheris ovarioque rudimentario, vel antheris tantum instructus; setae perigonii 2—3(—5), capillares, albidae, apicem versus minute antrorse scaberulae, c. 3 mm longae; stamina 6, filamentis ligulatis post anthesin 5—6 mm longis, antheris linearibus rufescentibus basi inconspicue auriculatis, connectivo in appcndicem conico-subulatam sparse antrorse scabram c. $1V_2$ mm longam producto. Plos superior flori inferiori similis, sed hermaphroditus, ovario fertili instructus; stigmata 3; styli basis persistens, elongato-pyramidalis, triquetra, antrorse scabra, straminea, c. 2 mm longa. *Nux* trigona, obovata, basi attenuata, laevis, castanea, $2V_2$—3 mm longa, 1—$1V_2$ mm lata.

BORNEO. E. Borneo, Kelindjau River region, 100 m, "padang" on sandy soil, marshy, very common, a dominant in this type of vegetation, June 15, 1954: *Kostermans 107 SI* (L, *type).* — W. Borneo, bank of Scndabai Lakes near Taj an, Sept. 24, 1949T *Main (exp. Polak) 1716* (L). — Sarawak, Tclok Assam, Bako National Park, 350 ft, heath woodland, damp hollows. May 21, 1953: *Purscglove P507fS* (L, SING), largo tufted sedge to 6 ft, spikclets [very young!] golden brown; same locality, Feb. 6, 1957: *Purse glove P55S9* (L), abundant sedge to 6 ft, on padang, inflorescence brown.

The occurrence of a *Tetraria* species in the equatorial* lowland of Borneo is very surprising as the genus is almost exclusively African, with its greatest development in extra-tropical South Africa. A few species occur in Australia, but up to the present none was known from Malaysia.

Unfortunately *Tetraria* belongs to an exceedingly difficult group oi" genera, our present knowledge of which is very imperfect. The assignment of the Bornean specimens to one of the ill-circumscribed genera has given me much trouble. There are important differences in the circumscription of *Tetraria* as given by J. M. Black (Trans. & Proc. R. Soc. S. Austr. 58, 1934, 168—169), Kükenthal (in Pedde, Rep. 48, 1940, 195—246), and Mrs Levyns (J. S. Afr. Bot. 13, 1947, 73—93). Especially the delimitation against *Costularia* Clarke is far from being well established. *Costularia* was originally based on some African species differing from *Tetraria* by the lower flower being strictly male (i.e. without a reduced pistil). Later on it was variously extended or reduced. Kiikenthal, op. cit., 199, although admitting that *Costularia* and *Tetraria* are difficult to separate from each other, thinks *Costularia* can be distinguished by the longer and firmer bristles, the anthers not auricled at the base, the style-base separated from the nut by a constriction, the nut softer in texture, and the glumes exactly distichously arranged. As to the species described above, the subdistichous glumes, the short straight rhachilla, the hexandrous flowers of which the lower one is male or functionally male, the persistent conical style-base, and moreover the very delicate hypogynous bristles and the somewhat auricled base of the anthers point to a close relationship with the already known species of *Tetraria.* There are, however, strong affinities with *Costularia pilisepala* (Steud.) Kern from Borneo and New Guinea (see § XVI).

Kiikenthal 1. c. gives a subdivision of the genus *Tetraria* into subgenera and sections, the nomenclature of which must be corrected, as no account has been taken of Clarke's earlier subdivision in Thiselton-Dyer, Flora Capensis, 1898. Of Kükenthars subgeneric names (Subgen. *Epi-*

schoenus, Subgen. *Elynanthus,* and Subgen. *Eu-Tetraria),* the second can pot be maintained as it is bastd on *Elynanthus* Nees in Linnaea 7 1832 «>20. By monotypy the type species of *Elynanthus* is *E. compar* (L.) Nees *i r m, Scho u s com P ar h -)>* a species belonging to Kiikenthal's submenus *UU'letrana.* A new name will be required. Subgenus *Tetraria* (= *Eu-Tetraria* Kuk.) is subdivided by Kiikenthal into three sections. Sect *CapiUaceae* Kuk. [op. cit. 215, type: *T. capillacea* (Thunb) Clarkel" comprises *T. crinifoUa* (Nees) Clarke, the type of sect. *Aulacorhynchus* (Nees) Clarke. Likewise sect. *Aristosquamosae* Kiik., op. cit. 227 (no type indicated) comprises *T. ustulata* (L.) Clarke, the type of *seet>Lepisia* (Presl) Clarke. Consequently the correct names of Kukenthaps sections arc: sect. *Aulacorhynchus* (Nees) Clarke, sect. *Lepma* (Presl) Clarke, and sect. *Tetraria,* the last one comprising *T. thuarii* Beauv., the type species of the genus (for the identity of this species see Levyns, op. cit.).

VIII. THE IDENTITY OF CLADIUM ARFAKENSE RENDLE

Cladium arfakense Rendle in Gibbs, Dutch NW. New Guinea, 1917 90, was based on two collections from NW. New Guinea, Arfak Mts, Angi Lakes, viz. Gibbs 5901 and Gibbs 5561. Both collections are preserved in the Herbarium of the British Museum, a duplicate of the latter one in the Kew Herbarium. Unfortunately the description turns out to be very inaccurate: stem with panicle 5.5 cm, spikelet 5 cm, upper 5 glumes each Subtending a hermaphrodite flower, etc. Rendle did not describe the nuts, although there are many ripe ones in Gibbs 5901. These nuts show the niuch raised irregular ridges and the smooth basal part characteristic of *Cladium jteretifolium* R. Br., to which species in my opinion Gibbs 5901 (and a part of Gibbs 5561 in BM) must be referred. Although the original description does not match any of the specimens on which it was based, it seems best to select Gibbs 5901 (BM) as the lectotype of *Cladium trfakense* Rendle, for Gibbs 5561 in the Kew Herbarium and a part of this collection in the British Museum do not at all belong to *Cladium,* Hit to *Lepidosperma.* Most proibably they represent *Lepidosperma striatum* R. Br., which species is recorded for the same locality by Ohwi, Bot. Mag. Tokyo, 56, 1942, 207. The Gibbs specimens are very young and in this state the Australian *Lepidosperma striatum* is hardly distinguishable from the closely related *L. chinense* Nees. The latter species is only known from the coastal regions of S. China and the western parts of Malaysia[1]).

Hitherto *Cladium teretifolium* was unknown from Malaysia.

IX. CLADIUM DISTICHUM CLARKE, C. MICRANTHES CLARKE, AND C. PHILIPPINENSE MERR.

In "Vorarbeiten zu einer Monographic der Rhynehosporoideae XIII" in. Fedde, Rep. 51, 1942, Kiikenthal describes three Malaysian *Cladia,* which undoubtedly all represent the same species. They are: *Cladium micranthes* Clarke (p. 153), *C. philippinense* Merr. (p. 163), and *C. disti-*

[1]) Brass 4644 from. New Guinea, cited in Bull. Jard. Bot. Btzg III, 16, 1940, 106 and in Fedde, Rep. 50, 1941, 123' under *Lepidosperma chinense,* belongs to *Cladium frevipaniculatum* (Kiik.) Kiik.

chum Clarke (p. 164). Of *C. mieranthes* and *C. distichum* only two collections each are cited, none of them seen* by Kükenthal. Already from the descriptions the conspecific status of the three taxa could be presumed, which presumption was confirmed by the examination of the specimens in the Kew Herbarium.

There is some difficulty as to the correct name resulting from the union of the three taxa. The earliest specific epithet is *distichum.* Unfortunately . the type of *Cladium distichum* is a specimen with badly deformed spikelets: besides the normal lower glumes each spikelet bears a great number of exactly distichous empty upper glumes. The same abnormality can sometimes be observed in *Rhynchospora rubra* (Lour.) Makino. Such deformed specimens of this species are sometimes mistaken for a *Cyperus* species. Although in the Code no definition of a monstrosity is given, it seems advisable to reject the, name *Cladium distichum*^ as "it is based on a monstrosity" (art. 67), and to accept *C. mieranthes* as the correct name of the species.

As far as is known *Cladium mieranthes* is restricted to Malaysia. The specimen from New Zealand cited by Kükenthal (Kirk 834) is very incomplete. It was tentatively referred to *C. mieranthes* by Clarke, but in my opinion certainly does not belong there.

The synonymy and a list of the specimens examined are given below.

Cladium mieranthes Clarke, Kew Bull. add. ser. 8, 1908, 46; Merr., En. Born. 1921, 62; Kiik. in Pedde, Rep. 51, 1942, 153 — *Cladium distichum* Clarke, Philip. J. Sc. 2, 1907, Bot. 102 (specim. monstr.); Merr., En. Philip. 1, 1923, 129; Kiik. in Pedde, Rep. 51, 1942, 164 — *Cladium philippinense* Merr., Philip. J. Sc. 5, 1910, Bot. 171; En. Philip! 1, 1923, 129; Kiik., Bull. Jard. Bot. Btzg III, 16, 1940, 311; in Pedde, Rep. 51, 1942, 163 — *Mariscus distichus* (Clarke) Pern., Rhodora 25, 1923, 53 — *Mariscus geniculatus* Pern., 1. c. — *Mariscus mieranthes* (Clarke) Pern., op. cit., 54 — *Maehaerina disticha* (Clarke) Koyama, Bot. Mag. Tokyo 69, 1956, 63 — *Maehaerina mieranthes* (Clarke) Koyama, op. cit., 64 — *Maehaerina philippinensis* (Merr.) Koyama, op. cit., 65.

ARCH. IND. Without precise locality: *Waitz s.n.* (L).

BORNEO. Banjennasin: *Motley 574* (K, *type* of *C. miorantlies* Clarke); Mt Kinabalu, Penataran R., 3000 ft, open scrub: *Clemens 34128* (BM); id., Penibukan, 4000-^ 5000 ft, at edge of steep landslide, seeping ground: *Clemens 30752* (K, L, SING;.

PHILIPPINES. Palawan, prov. of Palawan, Puerta Prineesa (Mt Pulgar): *Elmer 12832* (BM, K, L, P); Malasgao B., Aborlan, 100 m, along stream in forest: *Eda&o PNH 14094* (L); Victoria Peak, 600 m, rocks at base of waterfall: *Foxworthy BS 7l&* (K); Mt Gantung: *Edano BS 77609* (SING). — Island of Piaragua, E-wi-ig &» in river bed: *Merrill 758* (K, SING). — Mindoro: *Merritt FB 6724* (K, *type coll-* of *C. philippinense* Merr.). — Luzon, prow of Tayabas, Quinataoutan: *Foxworthy f Ramos BS 13161* (K); Guinayangan: *Escritor BS 20678* (BM, K, L, P); Camarfi** prov., Paracale: *Ramos $ Edano BS 33476* (BM, L, SING); prov* Principe, Baler: *Merrill 1124* (K, *type* of *C. distichum* Clarke). — Sibuyan, prov. of Capiz, Magel* lanes (Mt Giting-Giting): *Elmer 12401* (BM, K, L). — Panay, Capiz prov., Libaeao: *Martelino $ Edano BS 35429* (K). — Mindanao, Surigao prov.: *Ramos $ Pasoa**0 BS 34619* (BM, K, L, P); Davao prov., Mt. Galintan: *"Ramos $ Edano BS 48867* (P)'

CELEBES. Talaud Islands, P. Karakelang, 400 in: *Lam 3248* (L).

NEW GUINEA. P. Waigoo, Kambele hills ESE of Kabare[1], 100 m, on border *ot* periodically flooded riverine forest with xerophytic vegetation on leached lateritic liill[9]: *van Royen 5421* (L).

X. IS GAHNIA CASTANEA RIDL. DISTINCT PROM G. JAVANICA MOR.?

Originally Ridley distinguished clearly between two often confused species of *Gahnia* occurring in the Malay Peninsula. In his "Grasses and Sedges of the Malay Peninsula" (J. Str. Br. R. As. Soc. No 23, 1891, 17) he recorded *G. javanica* from Perak, Sunong Batu Puteh, Wray [887], besides an unidentified species from Perak, Maxwell's Hill, Curtis. The former actually belongs to *G. javanica,* the latter to *G. baniensis* Benl (= *G. javanica* var. *penangensis* Clarke). In his "Materials forSa Flora of the Malayan Peninsula III", 1907, however, we find all collections of both species represented in the Singapore Herbarium referred to *G. javanica* var. *penangensis.* This is probably due to an error of Clarke's, who wrongly determined the Wray specimen as var. *penangensis* (see the duplicate in the Kew Herbarium). Later on Ridley realized again that conspicuous differences existed, for in 1915 he published a new species, *G. castanea* ftidl. in J. Fed. Mai. St. Mus. 6, 1915, 60, and his remark in "The dispersal of plants throughout the world" (1930, 117): "In ... *Gahnia javanica* ... the stamens apparently increase in length in some plants, but not in others" obviously refers to one of the differences between *G. javanica* Jmd 6f. *baniensis.* As to *G. castanea,* based on a collection from Perak, (Junong Kerbau, Robinson, Ridley mainly stressed the chestnut-red colour of the spikelet, the accrescence of the filaments after anthesis, and the few glumes.

It is on this *Gahnia castanea* that the opinions of cyperologists are still divided. Kükenthal treats it as a variety of *G. .javamca,* whereas Benl thinks it is a good species. Benl's reasons for specific separation seem very sound, as he ascribes to *G. castanea* filaments interwoven after anthesis ("Flecht-Mechanismus", braiding mechanism). *Gahnia javanica* belongs to a quite different group characterized by the infixation of the filaments into one or more of the sterile glumes (Klemm-Mechanismus, fixing mechanism). According to Benl *G. castanea* occurs in S. China' (Yunnan), the Malay Peninsula, and Sumatra (Atjeh).

It is generally accepted that Benl's various mechanisms for fruit dispersal in *Gahnia* furnish also first-class taxonomic characters. Kukenthal (in Fedde Rep. 52, 1943, 91) objects, that in the type collection of °- *castanea* the filaments are really included by the inrolled apex of a sterile glume, in other words that it can not belong to the group with ^aiding mechanism. In Bot. Jahrb. 75, 1950, 88, Benl returns to the ^estion. Although admitting that occasionally one of the anthers is m-?'uded *Ofr* the outer sterile glume, he sticks to his opinion that *G. castanea* [18] distinct from *G. javanica,* as the anther can easily be detached from the enveloping glume.

After having examined numerous spikelets ot the type collection of G- *castanea* and of the other collections cited by Benl, I am convinced thf*t Kükenthal is right. In several spikelets I frequently found 1, 2 or 3 filaments included by one of the sterile glumes. The process of infixation after anthesis by hardening and inrolling of the glumes takes some time. ^* long as this process goes on, the filaments can easily be detached and

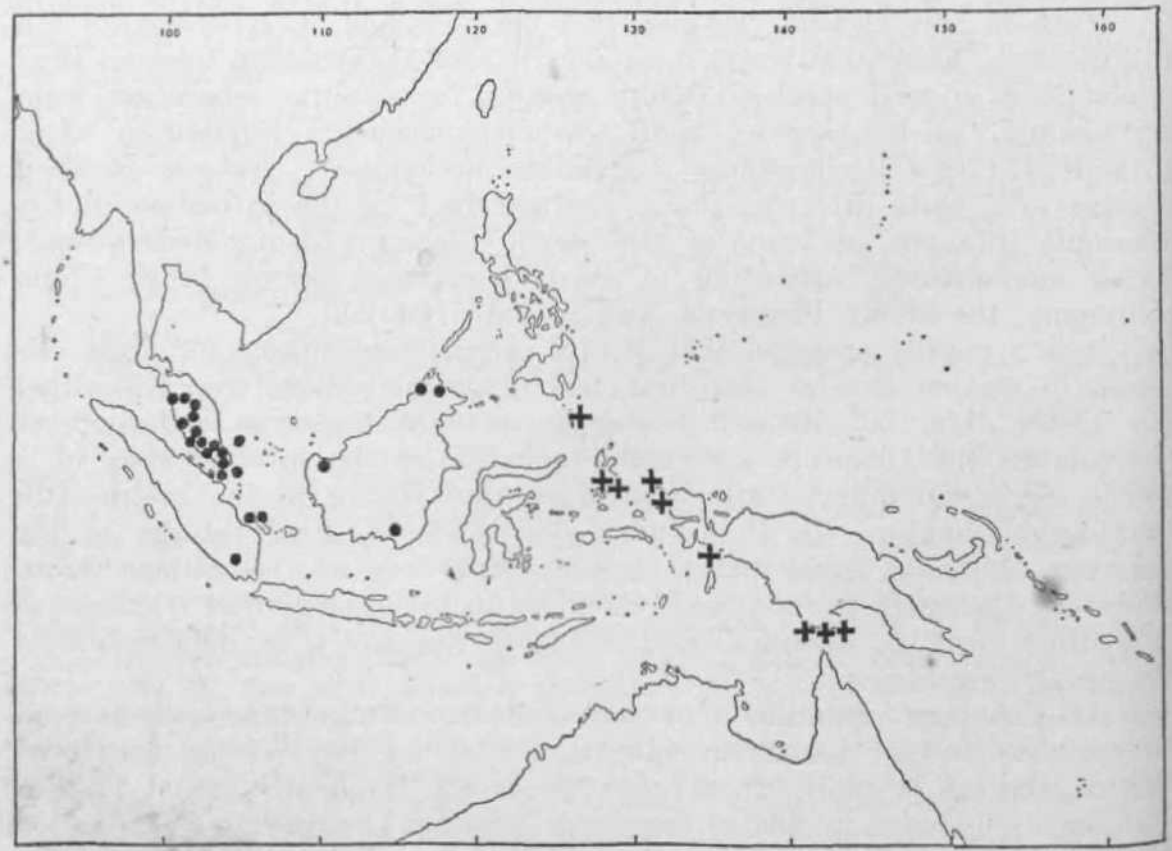
will detach themselves in dried specimens. This can be observed in every young specimen of *G. javanica.* Only in quite mature specimens is it almost impossible to free the filaments from the enveloping glume.

In the mature specimen of Henry 9168 from Yunnan I also find a fixing mechanism. It certainly belongs to *G. javanica,* under which species it is cited by Bonl (p. 173). The same collection is cited under *G, castanea* (p. 185). The latter citation apparently refers to a young specimen in the Kew Herbarium, which in my opinion also belongs to *G. javanint.*

The widely distributed *Gahnia javanica,* growing under various ecological circumstances, is highly polymorphic. To me the numerous varieties and forms distinguished by Benl and Kukmilml are Of little or DO systematic value, as I am unable to find any reliable characters by which their separate treatment would be justified. As to *G. castanea* (= *G. javanica* var. *castanea* Kiik.), I think it merely represents a young state of *G. javanica* not deserving nomenclature! recognition at all. The brownish colour of the inflorescence I have observed in several young specimens collected in Java, Borneo, etc.

XL FURTHER NOTES ON MALAYSIAN (iAHNIAE

Gahnia psittaconm (non La bill.} **Rendle** in **Gibbs,** Dutch NW. New **Guinea,** 1917, 91, cited by Kiikenthal in the synonymy of *G. cUtrkei* Benl, comprises several collections partly belonging to *G. jovaniat.* (iibhs 5585



Fiy. :;. {JiBtribution of *Qaknia a*pora* (R. Br.) Spreag, (+) and *G. tristis* **Nees (•) in Malaysia.**

in the Kew Herbarium is cited by Benl (Bot. Arch. 40, 1940, 221) under *G. clarkei,* the same number in the Leiden Herbarium under (7. *tetragonocarpa* Boeck. (p. 222). The two specimens are not separable, and both belong to *G. sieberiana* Kunth (= *0. tetragonocarpa* Boeok.). Up to now I have not seen *G. clarkei* from Malaysia.

G. trifida LabilL, "Malayischer Archipel (fide J. D. Hooker)", cited by Benl op. cit., p. 231, apparently does not occur in Malaysia. The statement was based on Hooker's Flora Tasmaniae, 1859, lxxxii, sub no 228. The occurrence in Malaysia is very unlikely, and*as far as I know no material is extant.

The closely related *G. aspera* (R. Br.) Spreng. and *G. tristis* Nees arc often confused in herbaria. In the former the nut is glbbose to ovoid, not or hardly angular, distinctly mucronate, and 3—4 mm wide, the filaments ciliate on the margins, the anthers only *V/2*—2 mm long with a very short appendage of the connective ($^1/_4$ mm); in the latter the nut is elliptic, distinctly trigonous, not or hardly mucronate, $1^3/_4$—2(—$2^1/_2$) mm wide, the filaments glabrous, the anthers 3—4 mm long with a subulate 7_2—$^3/_4$ mm long appendage of the connective. In Malaysia *G. aspera* is apparently restricted *to* the Eastern part (New Guinea, Moluccas), *G. tristis* to the Western part (Malay Peninsula and adjacent islands, S. Sumatra, Banka, Borneo). #See map. The record *"G. tristis,* Moluccas: *Gavdichaud* (P)", Benl, Bot.# Arch. 40, 1940, 183, refers to a specimen of *G. aspera* in which all flowers are deformed by attack of a fungus.

XII. THE SUBGENERIC AND SECTIONAL NAMES FOR THE MALAYSIAN RHYNCHOSPORAE

As far as we know the genus *Rhynchospora* is represented in Malaysia by 12 species, viz 1. *R. corymbosa* (L.) Britt.; 2. *R. triflora* Vahl; 3. *R. hookeri* Boeck.; 4. *R. malasica* Clarke; 5. *R. rubra* (Lour.) Mafcino; 6. *R. longisetis* R. Br.; 7. *R. heterochaeta* S. T. Blake; 8. *R. wightinna* (Nees) Steud.; 9. *R. submarginata* Kiik.; 10. *R. subtenuifolia* Kfik.; 11. *R. rugosa* (Vahl) Gale; 12. *R. gracilUma* Thwaites.

In Kiikenthars system as adopted in his "Vorarbeiten zu einer Mono-Sraphie der Rhynchosporoideae" they belong to two subgenera and five sections:

I. Subgen. *Haplostyleae* (Nees) Benth. & Hook.
   1. Sect. *Longirostres* (Kunth (sp. 1—3)
   2. Sect. *Polycephalae* Kiik. (sp. 4)
   3. Sect. *Pauciflorae* Kiik. (sp. 5—10)

II. Subgen. *Diplostyleae* Benth. & Hook.
   4. Sect. *Stenophyllae* Kiik. (sp. 11)
   5. Sect. *Tenues* Kiik. (sp. 12)

Unfortunately only one of these names is in accordance with the rules °' botanical nomenclature, as may appear from the following synonymy:

I. Subgen. *Haplostylis* (Nees) Pax in E. & P., Pfl. Fam. II, 2, 1887, 116; Knk., Bot. Jahrb. 74, 1949, 387 *("Haplostyleae").* — *Haplostylis* Nees, Edinb. New Phil. J. 34, 1834, 265; in Wight, Contr. Bot. Ind., 1834, 115; Linnaea 9, 1835, 295. — Ser. *Haplostyleae* Benth. in B. &

H., Gen. PI. 3, 1883, 1059; Clarke, PL Br. Ind. 6, 1893, 668; Kew Bull. add. ser. 8, 1908, 117. — T.: *Haplostylis meyenii* Nees.

1. Sect. *Longirostres* Kunth, En. 2, 1837, 292[x]); Kiik., Bot. Jahrb. 74, 1949, 408. — *CalyptrostyHs* Nees & Mey. ex Nees, Linnaea 9, 1835, 295. — Sect. *Calyptrostylis* (Nees) Benth. in B. & H., Gen. PL 3, 1883, 1060. — Div. *CalyptrostyUs* sect. *Aureae* Clarke, Kew Bull. add. ser. 8, 1908, 118. — Lectotype: *Rhynchospora longirostris* Ell.
2. Sect. *Echinoschoenus* (Nees) Benth. in B. & H., Gen. PL 3, 1883, 1060; Pax in E. & P., PfL Flam. II, 2, 1887, 116. — *Echinoschoenus* Nees & Mey. ex Nees, Linnaea 9, 1835, 297. — Div. *Polycephalae* Clarke, Kew Bull. add. ser. 8, 1908, 118. — Sect. *Polycephalae* Clarke in Urban, Symb. Ant. 2, 1900, 104; Kiik., Bot. Jahrb. 74, 1949, 429. — T.: *Echinoschoenus triceps* (Vahl) Nees.
3. Sect. *Haplostylis.* — Sect. *Capitatae* Kunth, En. 2, 1837, 288. — *Sphaeroschoenus* W.-A. & Nees ex Nees, Nov. Act. Ac. Caes. Leop.-Car. 19, Suppl. 1843, 97. — Sect. *Haplostylis* (Nees) Benth. in B. & H., Gten. PL 3, 1883, 1059; Clarke, Fl. Br. Ind. 6, 1893, 669. — Sect. *Sphaeroschoenus* (Nees) Clarke, Fl. Br. Ind. 6, 1893, 668. — Sect. *Pauciflorae* Kiik., Bot. Jahrb. 74, 1949, 479. — T.: *Haplostylis meyenii* Nees.

II. Subgen. *Rhynchospora.* — Ser. *Dichostyleas* Benth. in B. & H., Gen. PL 3, 1883, 1059. — Ser. *Diplostyhae* Clarke, FL Br. Ind. 6, 1893, 671; Kew Bull. add. ser. 8, 1908, 119. — Subgen. *Distylis* Pax in E. & P., PfL Fam. II, 2, 1887, 117. — Subgen. *Diplostyleae* Kiik., Bot. Jahrb. 74, 1949, 500. — T.: *Rhynchospora alba* (L.) Vahl.

4. Sect. *Glaucae* Clarke in Urban, Symb. Ant. 2, 1900, 106; Kew Bull, add. ser. 8, 1908, 120. — Sect. *Stenophijllae* Kiik., Bot. Jahrb. 75, 1950, 142. — T.: *R. rugosa* (Vahl) Gale = *R. glauca* Vahl.
5. Sect. *Campyhrhachis* Benth. in B. & H., Gen. PL 3, 1883, 1061[2]). — Sect. *Tenues* Kiik., Bot. Jahrb. 75, 1950, 186. — Lectotype: *Rhynchospora gracillima* Thwaites.

XIII. RHYNCHOSPORA HOOKERI BOECK.

A remarkable species, apparently often mistaken for the common *R. corymbosa* (L.) Britt., to which it is very similar in habit. It can readily be distinguished by the quite different nut suddenly narrowed at the apex into a short cylindrical neck and crowned by the narrow conical-subulate beak (the persistent style-base), which is only half as wide as the nut proper.

Kükenthal (Bot. Jahrb. 74, 1949, 427) mentions *R. hookeri* from a few Indian localities and a single one in Burma, as well as from the only Malaysian locality known (W. Java, Indramaju, forestry Plosokerep: *van*

[x]) Kunth's epithets are intended as sectional names; cf. his Enumeratio 2, p. 64 sub 13, p. 79 sub 17, p. 94 sub 19, etc.

[2]) Validly published, although provided with a question mark; cf. Code 1956, art. 33, note 1.

Steenis 6675, 7473). **It occurs also in Siam** ***{Howard 27*** **and** ***Kerr 13064*** **in K,** ***Kostermans 1309, 1324*** **in L), Cambodia** ***(Poilane 15380,*** **P) and** Tonkin *(d'Alleizette s.n. in 1908,* L). In Java it was collected away back in the last century by Korthals (L, sub nos 909.90.318 and 909.90.338, without precise locality), and in the Malay Peninsula as early as 1910: Perlis, Kanga fields: *Ridley s.n.* (SING).

XIV. RHYNCHOSPORA RUBRA (LOUR.) MAKINO VAR. HIRTICBPS KOK.

In *Rhynchospora rubra* the stems and leaves are usually glabrous. A specimen from Luzon *(Vanoverbergh 463)* with the stems setulose-pilose at the apex and the margins and midrib of the leaves densely ciliate was distinguished as var. *hirticeps* Kiik., Bot. Jahrb. 74, 1949, 495. I have seen this remarkable variety also from the following localities:

CELEBES. **SE. Celebes, Rumbia, Wambukowu, 40—130 m, monsoon forest:** ***Elbert 8092*** **(L).**

NEW GUINEA. **SE. New Guinea, Koitaki, 1500 ft, open grassy hillside:** ***Carr 11910*** **(L, SING).**

XV. NOTES ON RHYNCHOSPORA SUBMARGINATA KttK.

Rhynchospora submarginata Kiik., Bot. Jahrb. 74, 1949, 498 — *Rhynchospora marginata* Clarke, Kew Bull. add. ser. 8, 1908, 89; Domin, Bibl. Bot., Hteft 85, 1915, 469; non Steud., 1855 — *Rhynchospora longisctis* R. Br. Prodr., 1810, 230, p.p. — *Rhynchospora wightiana* (non Steud.) Camus,' PI. O6n. I.-C. 7, 1912, 146; Ridl. Fl. Mai. Pen. 5, 1925, 164.

1. *Rhynchospora marginata* Clarke was based on a collection of "R. Brown (in hb. Kew. BeroL); North Coast, R. Brown, n. 5993 pro parte (in hb. Mus. Brit.)". The name was replaced by *R. submarginata* Kiik. because of the earlier homonym *R. marginata* Steud.

On the sheet in the Kew Herbarium the following annotation is found: "This was no doubt *part* of Bentham's *Rhync. tenuifolia,* for he has drawn the description of the nut of *tenuifolia* (nut bordered by a nervelike margin) from the present plant, whereas in the. two authentic type specimens the nut is absolutely immarginate. Nor does the present plant agree with *tenuifolia* Benth. as to habit. The nut is unlike the nut of any of this group (capitate *Haplostylis)* in the Old World and I make it a sp. nova viz *Rynchospora marginata.* C. B. Clarke, May 1889."

This name was only published after Clarke's death, in 1908. The "two authentic type specimens" of *R. tenuifolia* Benth., 1878 (non Griseb., 1866 = *R. subtenuifolia* Kiik.) are: N. Australia, Victoria River, *Elsey;* Queensland, Rockingham Bay, *DaUachy,* both in the Kew Herbarium. From them it is clear that Clarke's remark is wrong, for they perfectly agree with Bentham's description "hypogynous bristles 3 nearly as long as the glume, 3 scarcely longer than the nut; beak abruptly contracted at the base so as to appear stipitate" and the nuts are really bordered V a nervelike margin. One of the differences between the nuts of #. *submarginata* and those of *R. sititenuifolia* lies in the fact that in

the former the whitish margin strongly contrasts **with** the blackish surface, whereas in the latter the margin and the surface are more eoncolorous, both light brown.

Ridley, I.e., mistook **R. *submarginata*** \'>>r //. *wightimut* (NeesJ Steud., to which it is certainly nearer than **to** B, *subtewrifolia.* Kiikunthal, 1. c, contrasts *It. wightuma* and *R.* ***sitbrnafginata*** as follows:

H. ivightiami; **Inflorescentia** 1—***V/a em*** diam., bractcis 4—7 demiim **divergentibaa** vel **deflexis** sulTuha. Spiculae 5—6 mm longae. Stylus ha si cum vert ice nut* is aequilata linea **constricts ab ea separata.** Nux ex toto tuberculata et apice hispidula.

R. submarginattt: Inflorescentia 6—10 mm diam., bracteis 3—4 (ima

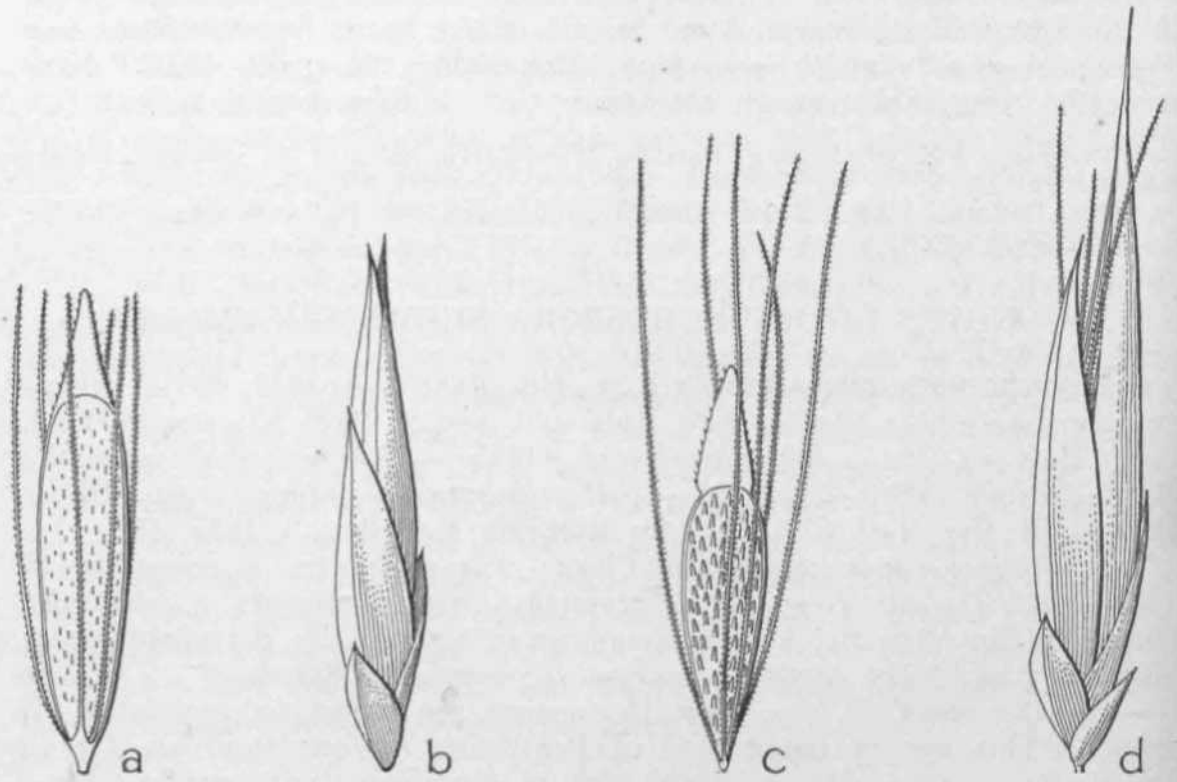


Fig. 4. a—1). **Nut** and spikelct of *Rhynphospora* ***wibmargmata*** Kiik.; *c*—d. nut :iml Hpikciet of *S.* ***wightiana*** (Noes) Bteud, — All X 10.

ad 10 em longa ereeta culmum continuant?) suffulta. Spiculae **5 mm** longae. Basis styli cum mice **aeqtrilata** ad luimertxs **ejua** decunvns. Nux per faeiem totam brevitor **bispida** hand **tubereulata.**

It may **be** remarked that no value can be **attached** to the number of involueral **braets, the** lowest bract in **ft. *tvbmargvnata*** is noi always erect and can reach a **length** of 20 cm, the spikelets in *R. wightutnn* are up **to** 8 mm long, and the style-base in the latter species is only slightly (sometimes hardly) contracted at the base. A character of great value >s furnished **by** the **length** of the **nut-bearing (§th)** glume and the next **lower** one: **in** *ft.* ***submarginata*** they are about equal in length, in *I,'.* ***uHghHana*** **the former** is about 2 mm longer than the latter. AM fl **consequent* fche** spikelet in *h\ wightimut* **is** somewhat **gaping** and the hypogynous bristles are **soon** exserted from the glumes, and visible from the

outside, whereas in *R. submarginata* the spikelet remains closed, the glumes completely hiding the (shorter) bristles. As a rule the upper flower in *R. submarginata* is more reduced than in *R. wightiana.* In the former species it consists of 1—2 stamens without any trace of bristles or a pistil, in the latter one there are 2 (very rarely 3) stamens, often some short bristles and very rarely a strongly reduced pistil. The stems in *R. siib-marginata* are usually stouter and more distinctly compressed, and the loaves broader than in *R. wightiana.*

Rhynchospora submarginata var. *tonkinensis* Kiik. may represent an extremely stout form, also collected in the Malay Peninsula^ *(Nauen SF 35854).'*

The only Malaysian record of *R. submarginata* cited by Kiikenthal, is that of var. *glabrinux* Kiik.: nut 4 mm long, quite glabrous, somewhat concave on both sides. — Papua: Lake Daviumbu, Middle Fly River, on floating islands, *Brass 7705.* I have not seen this collection, but from the description I greatly doubt whether it can belong to *R. submarginata.*

Attention may be drawn to a mistake which has crept into literature on the distribution of sexes in at least all Malaysian members of Sect. *Haplostylis* (see e.g. Olarke, Illustrations of Cyperaceae, t. 64, f. 7 & 11). Even in the recent publications of Kiikenthal's the flowers are described as follows: flos inferior hermaphroditus, superior masculus. I nearly always find the lower flower female, without any trace of an androecium (in *R. rubra* exceptionally a single stamen is present), the upper one (in *R. rubra* sometimes two) male, very rarely functionally male (with an abortive pistil), quite in agreement with Kunth's descriptions in his Enumeratio of 1837 and those of Nees's (in Nov. Act. Ac. Caes. Leop.-Car. 19 Suppl., 1843, 97 & 101).

A peculiar character in all Malaysian *HaplostyUs* species, which fell into oblivion after the publication of Kunth's admirable Enumeratio is found in the shape of the anthers, which are destitute of polkn at the more or less attenuate base (see En. p. 288, sect. *Gapitatae:* "antherae saepe basi attenuatae et vacuae", and under the species of this section). In later publications I found it mentioned only by Nees, op. cit., p. 99.

Both the distribution of sexes and the shape of the anthers may prove to furnish important sectional characters.

The distribution of *R. submarginata* is insufficiently known. I have seen it from India *(Wight 2911* in K), Siam (several collections m SING), Indo China (all collections cited by Camus under *R. wtghhana),* Australia (Brown's type collection), and the following Malaysian localities (all in SING if not otherwise indicated):

MALAY PENINSULA. Sctul, heath: *Kidlry 14814, 14815* (also in K) - Wellesley, AOP Gading: *BurMl 6593,* one of the weeds of the *'T*M* « ^ « Ploughed in i ffweil manure. - Perak, Sungai Kepar Padi TestJ^ta^on: B ^ - 1L W - Trenffanu-. *Yapp S57* (K, L). — Pahang, heaths Kuala Paliang: *B%dleyl725.* — P. Langkawi,ri^-field near Kuah: *Corner * Nauen SF 87972.* - P. Penang, Telok Kumbat (Bayan Lepas): *Nauen SF S5854.*

2. Of *R. wightiana* (Nees) Steud. I have seen only a single Malaysian collection:

MADURA, Pamekasan, in oryzetis exsiccatis BOO-IOOC, 7 & 8. VT. IS.KS: *Zollvnger 3945* (L).

XVI. COSTULARIA PILISEPALA

Costularia pilisepala (Steud.) Kern, comb. nov. — *Carpha arundinacea* Brongn. in Duperrey, Voy. Coq. Bot. 2, 1829, 169, t. 30, non *Costularia arundinacea* **(Vahl) Kiik. —** ***Asterochaete arundinacea*** **Kunth, En. 2, 1837,** 312, p.p. (quoad pi. molucc, excl. pi. nov.-caled.); Steud., Syn. 2, 185*5, 155, p.p.; Miq., Fl. Ind. Bat. 3, 1856, 338, p.p., non *Schoenus arundinaceus* Vahl — *Restio piliwpalus* Steud., Syn. 2, 1855, 256; F. v. M., Descr. Not.- 2, 1885, 18 — *Carpha urvitteana* (Jaudich. [ex Nees, Linnaea 9, 1835, 300, nom. nud.] ex Boeck., Linnaea 38, 1874, 272 — *Lophoschoenus urvilleanus* ((Jaudich. ex Boeck.) Stapf, J. Linn. Soc. Bot. 42, 1914, 180; Merr., En. Born., 1921, 63; Pfeiff. in Fedde, Rep. 23, 1927, 346, in nota — *Costularia urvilleana* (Gaudich. ex Boeck.) Kiik. in Fedde, Rep. 46, 1939, 28; S. T. Blake, J. Arn. Arb. 29, 1948, 95.

Restio pilisepalus Steud. was based on a plant of D'Urville collected in Waigeou Island (S. Moluccas, near New Guinea). The specimen is preserved in the Paris Herbarium (P; coll. Steudel). It is not a Restionacea, but a Cyperacea, as was already stated by Masters (in DC, Mon. Phan. 1, 1878, 301) and in the Index Kewensis. It belongs to the species of which the synonymy has been given above, and in all probability to the collection on which also *Carpha urviUeana* Gaudich. ex Boeck. was based. In describing the flowers as having "perianthii laciniis 4 lanceolatis marginc dense et longe pilosis; 2 planiusculis apice sub diktat is" Steudel misinterpreted their structure. Each spikelet contains 2 flowers, the lower one male, the upper one bisexual, both with 6 plumose hypogynous bristles and 3 stamens with persistent liguliform filaments.

XVII. MISCELLANEOUS NEW RECORDS

1. Cyperus sphacelatus Rottb.

AUSTRALIA.. Queensland, near Cairns, Dec. 1936: *J. MaunUon $ TV. D. Francis s.n.* (LD). — POLYNESIA, Tahiti, presqu'ile de Taravas, unc plantc qui envahit les pâturages: *BoubSe en 1955* (P).

Previously known from tropical Africa and America, and recently introduced into Malaysia (see Kern, Reinw. 2, 1952,107; Blumea 8, 1955, 162).

There is an old collection from Coromandel in the Paris Herbarium: ***Macé s.n.*****, as *"Cyperus compressus* Rottb., Vahl."**

2. Cyperus sulcinux Clarke.

CHINA. K\Vaugsi, Shap-Man-Taai-Shan, near Hoh Lung village SE of Shaxig" sze, fairly common in garden, dry sandy soil, June 29, 1933: *W. T. Tsang 88598* (&)•

Previously known from India, Farther India, Malaysia, and Australia (Queensland).

3. Fimbristylis dipsacea (Rottb.) Clarke.

SUMATRA. Palomban-g, scalevel, roadside, May 1930: *Kjellberg s.n.* (S).

In Malaysia.very rare, previously only known from a few localities in Madura, Bawean, B. Borneo, Luzon, Mindanao, Central Celebes, and Papu[a]-

Index to collectors numbers

The numbers between brackets refer to the paragraphs.

Index

The numbers refer to the paragraphs. New names are printed in **bold** «gures, synonyms in *italics,* Figures are indicated by an asterisk (*).

REVISION OF THE BURSERACEAE OF THE MALAYSIAN AREA IN A WIDER SENSE

Vb. Haplolobus, a revised revision

by

H. J. **L A M**

(Rijksherbarium, Leiden)

(Issued 1. VII. 1958)

GENERAL PART

On studying newly received material of *Haplolobus*, mostly from New Guinea, the key in Husson & Lam 1953[*]) proved to be far from satisfactory in several respects. This is why all material now available has been given a critical consideration or reconsideration, as the case may be, and from this originated a new revision with a new key, which is presented here.

Since the flowers of the various *Haplolobus* species are of the same type and very uniform, and since they arc wanting in so many specimens either in one of the sexes or in both, it appeared, for the time being at least, unfeasible to use them for differential characteristics in the key. The same holds true for the fruits. Only when abundant flowering and fruiting material will be available is there **a** chance (but no certainty) that good differential characters will be detected in flowers and (or) fruits.

This is why the new key has been primarily constructed on the basis of vegetative characters in addition to those presented by the anatomy of the petioles (resiniferous vascular bundles in the pith; r. b.) and by the structure and disposition of the inflorescences (infructescences).

*) The most frequently used literature has boon quoted in the following abbreviations (chronological arrangement):

Lauterbach 1920 = C. Lauterbach, Engl. bot. Jahrb. 3C, 317 a. s.
Lam 1931 = H. J. Lam, Ann. Jard. bot. Buitenz. 42, 23 s. s.
Lam 1932a = H. J. Lam, Ann. Jard. bot. Buitenz. 42, 207 8. s.
Lam 1932b = H. J. Lam, Bull. Jard. bot. Buitenz. Il1, 12, 404 s. s.
Lam 1938a = H. J. Lam, Blumea 3 (1), 111 s.s.
Lam 1938b = H. J. Lam, Blumea 3 (1), 129 s.s.
Husson and Lam J953 = A. M. Husson & H. J. Lam, Blumea 7 (2), 413 s.s.
Lam 1955 = H. J. Lam, Blumea 8 (1), 175 s.s.
Leenhouts 1956 = P. Leenhouts, Flora Malesiana I, 5 (2), 238 s.s.

^ost of the older literature may be found quoted in Lam 1932b and Husson & Lam 1953.

It is clear, however, that, though the new key is hoped to be a better guide to the differentiation of this puzzling genus than the previous one proved to be, it cannot be but far from final. Of some of the species now accepted, the material available is so scanty that nothing can be said about their variability. In other groups the extremely vague delimitations made us combine several species hitherto considered separate ones and transfer certain specimens from one species to some other one on account of the fact that specific limits had to be altered with the increase of our insight on account of more material.

The following changes have been made as compared to Husson & Lam 1953 and Lam 1955 unless otherwise indicated (synonyms in *italics):*

H, acuminatus (Schum.) H. J. Lam — Some specimens removed and now described as H. pubescens H. J. Lam, nova spec.
var. *gldbrior* H. J. Lam (Lam 1955) = H. floribundus (Schum.) IL J. Lam.

//. *aneityensis* (Guill.) Huss. (incl. Lam 1955) = H. floribundus (Schum.) H. J. Lam.

H. anisander (Laut.) H. J. Lam = H. leeifolius (Laut.) H. J. Lam var. anisander; in addition several sterile specimens from the Moluccas were transferred to H. celebicus H. J. Lam.

//. *borneensis* H. J. Lam (incl. Lam 1955) = Santiria apiculata Benn. -

H. celebicus H. J. Lam — sterile specimens from the Moluccas (and Palau?; Lam 1955) transferred to H. leeifolius (Laut.) H. J. Lam var. anisander.

H. clementium Huss. — type = H. leeifolius (Laut.) H. J. Lam var. anisander; other specimens (incl. Lam 1955) = H. leeifolius (Laut.) H. J. Lam var. leeifolius.

H. floribundus (Schum.) H. J. Lam — several specimens transferred to H. leeifolius (Laut.) H. J. Lam var. anisander, others to H. decipiens • H. J. Lam, nova spec.

H. hussonii H. J. Lam — type = H. leeifolius (Laut.) H. J. Lam var. leeifolius; other specimens = H. floribundus (Schum.) H. J, Lam.

//. *maluensis* (Laut.) H. J. Lam (incl. Lam 1955) = H. floribundus (Schum.) H. J. Lam.

H. megacarpus H. J. Lam — 9 type = H. leeifolius (Laut.) H. J. Lam var. leeifolius; c? type (Lam 1955) = H. floribundus (Schum.) H. J. Lam.

H. monticola Huss. = H. glandulosus Huss. var. monticola.

H. nubigenus (Laut.) H. J. Lam has been split up into its two original components, resulting in the new combination H. triphyllus (Laut.) H. J. Lam. One specimen was transferred to H. glandulosus.

H. versteeghii H. J. Lam = H. floribundus (Schum.) H. J. Lam.

Three new species have been recognised, of which one based on fresh material, *viz H. lanceolahts,* the two others being *H. decipiens* (formerly under *H. floribundus),* and *H. pubescens* (formerly under *H. acuminatus)* - There is one new combination: *H. triphyllus* (Laut.) H. J. Lam (formerly under *H. nubigenus).*

Thus, of the 22 species dealt with in Husson & Lam 1953 and Lam 1955 no less than 9 were reduced to synonymity (of which two in the status of varieties, *viz H. amsander* and *H. monticola),* and one *(H. borneensis)* was transferred to another genus *(Santiria).* Consequently the total number is now 17.

In a previous paper (Lam 1938b) it was pointed out that *Haplolobus* is one of the four*) closely allied genera of the *Canarieae* and that, though all these genera were reticulately connected regarding most characters, *Haplolobm* stands clearly apart by its peculiar fruit and seed characters *viz* thin dry pericarp, papery pyrene walls, and entire, flat cotyledons. These' characters arc perfectly correlated and I know of no transitional or intermediate conditions to other genera in this respect. They seem to call for a "large (system) mutation" and if this should have been the case it could hardly be expected to have occurred more than once independently. In this connection we might have a look at the distribution pattern of the *Canarieae* according to the most recent data[2]):

	Trop. Am.	Trop. Aft.	Masc. & Madag.	Trop. Asia-Polynesia					
				Cont.	W.Mai.	E. Hal.	N.G.	Pol.	Austr.
Dacryodes (54 spec.)	15[8])	22	—	(11)	(16)	17 (1)	0)	—	—
Santiria (23 spec.)	–	6	—	(11)	(15)	17 0)	(1-2)	—	—
Canarium (75 spec.)	–	2	2	(11)	(34)	72 (12)	(21)	(14)	(3)
Haplolobus (17 spec.)	—	—	—	—	0)	17 (4-5)	(12)	(2)	—

As to fruit and inflorescence characters *Haplolobm* is evidently closest to *Dacryodes* and *Santiria,* much less so to *Canarium.* From the above statement it appears that

a) *Dacryodes* is more or less equally represented in all tropical countries except Polynesia; in Malaysia its centre is clearly west of Wallace's line;

h) *Santiria* is represented in both the African and Asiatic tropics, with a distribution in Malaysia almost exactly like that of *Dacryodes;*

<0 *Canarium* is represented both in Africa (and Madagascar and the

[J]) Originally five, but I agree with Lcenhouts (Nova Guinea new scr. 8 (2), 1957, [17]7) that *Scutinanthe* belongs to the *Proticae* rather than the *Canarieae.*

[a]) Cf. for *Dacryodes* and *Santiria:* C. Kalkman, Blumea 7 (3), 1954, 500—546 [a]nd Lecnhouts 1956, 219—238; and for *Canarium:* Lcenhouts 1956, 24&—296 and MS [to] be published in Blumea '9 (2), 1958.

***) Cf. J. Cuatrecasas in Tropical Woods n. 106, 1957, 46—65. In the American *Dacryodes* species the ovary (and the fruit) is 2—3-oelled!**

Mascarenes) and in Asia, with a heavy preponderance in Malaysia and a good representation in W. Polynesia, a poor one in Australia;

d) *Haplolobus* is almost exclusively Bast Malaysian with a marked preponderance in New Guinea.

Although *Haplolobus* and *Dacryodes* are united by a terminal style (as has *Canarium),* there is little or no evidence of a relationship with *Dacryodes,* except perhaps by means of the only papuan *Dacryodes* species *(D. papuana* Huss.), which shows some resemblance with *H. glandulosus.*

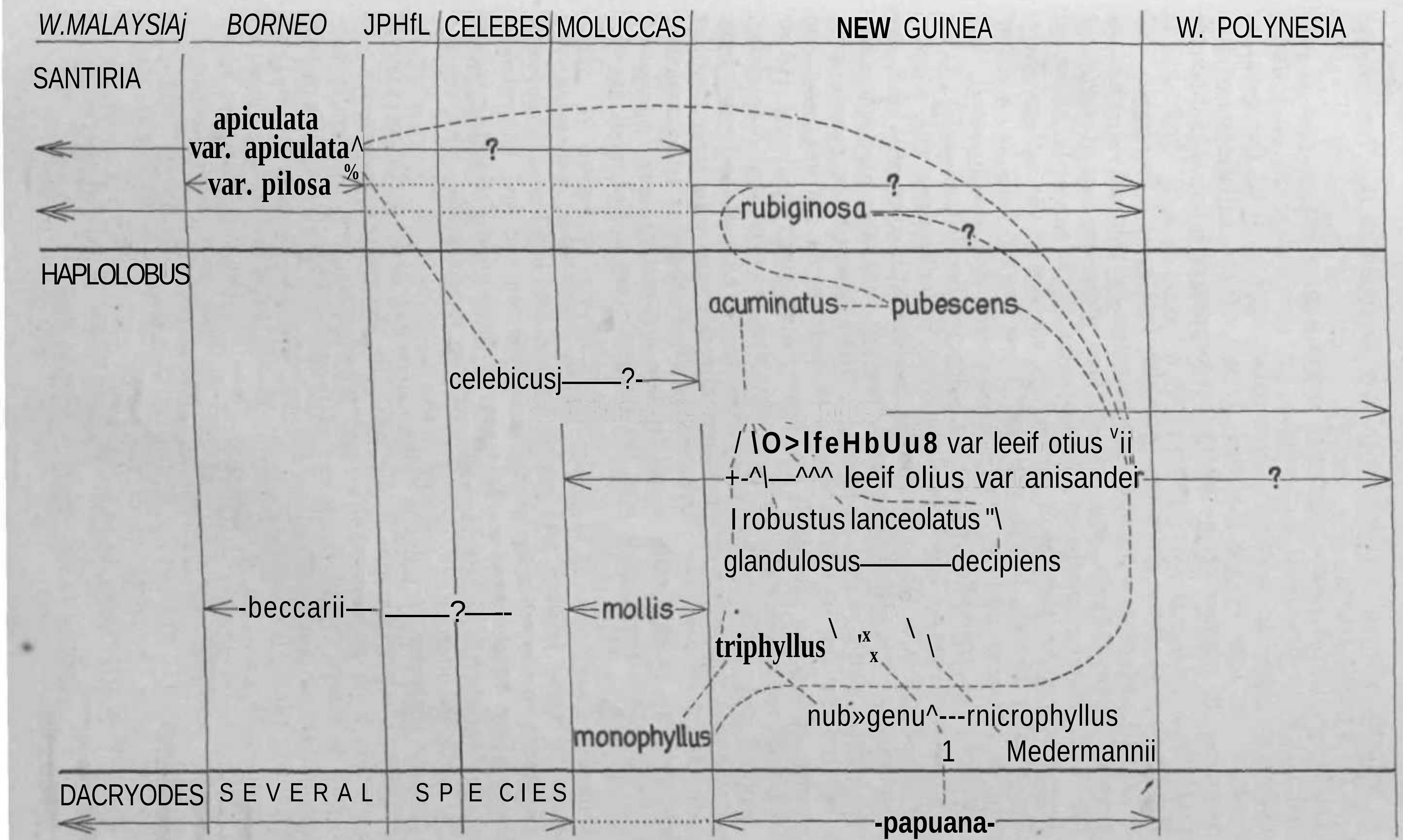
In *Santiria,* however, there are two species that somehow seem to be allied to certain species of *Haplolobus* (cf. diagram on p. 241) even to the extent that sterile material may be hard to be identified generically. The most important of these species is *8. apiculata* Benn. (with which *H. borneensis* had to be combined), with certainty (fruits!) known from Malaya, W. Malaysia as far east as the Philippines (Celebes?), and the Moluccas, while some doubtful (sterile) specimens of its var. *pilosa* (Bngl.) Kalkm. (for the rest only known from Borneo) have been collected in New Guinea. The second species is *8. rubiginosa* Bl., known to occur in Malaya and Sumatra to Borneo (not in the Philippines, Celebes, and the Moluccas), and of which 5 specimens have been collected in New Guinea (Geelvink Bay islands and Sepik area; cf. Kalkman in Blumea 7 (3), 1954, 544), but their resemblance with *Haplolobus* species is less confusing than in the case of *S. apiculata.* The generic disjunction is even more marked here than in *Dacryodes.*

In our paper on the phylogeny of *Haplolobus* (Lam 1938b) it was suggested that that genus roots in Sangria-like ancestors and that it originated biphyletically. The first part of this thesis still stands but I hesitate to maintain a possible biphyly on account of the grounds given above: the improbability that the well-correlated and sharp characters of fruit and seed should have 'been brought about more than once.

The most puzzling species in this respect is *H. beccarii* (Sarawak), the only one known from the Sunda-land. Next to being isolated in a geographical sense, it is also isolated taxonomically, since *H. beccarii* is the only species which does not show clear relations with others, the only possible (geographical and taxonomical) link being *H. mollis* (Halmahera) which has similar almost cauliflorous inflorescences, but is otherwise quite different, though this species, too, shows little affinity to the rest of the genus. Even so, however, it presents the only possibility to maintain the obvious assumption that the present centre, New Guinea, is also the original centre of dispersal, the alternative (supported by the relations to *Dacryodes* and *Santiria* just mentioned) being a bi- or polytopic origin, which is still harder to assume than a westward migration from New Guinea. Remains the problem how *Haplolobus-potentialities* managed to cross Macassar Strait and thus reach (western!) Borneo.

All other *Haplolobus* species are interrelated in some way or other and the following diagram shows our present ideas in this respect (see p. 241).

The following remarks may serve both as a more detailed description of the specific interrelationships pictured in the above-mentioned diagram



Suppoftfd r.ltitimiships in- und outside Haplolobus. ——————occurring in the area (f = doubtful). .... indicates disc intinuoas distribution; . . . . suspected relationships (f = doubtful ones). Single arrows indicateamiboundaries double ones extension into continental Asia.

and as a justification of the key which may be found in the Taxonomical Part of the present paper.

The key which of course primarily serves a practical purpose is constructed on: 1. pubescence; 2. nectaries; 3. size and shape of leaflets; 4. number of jugae in the leaf; 5. number of r. b. *) in the petioles; 6. shape of the base of the leaflets; 7. size of the inflorescences (infructescences; 8. number of secondary nerves; 9. domatia; 10. diameter of branchlets.

Hardly any of these characters provides full specific Constance and in the majority of cases a number of characters is required to draw the line 'between species. Again, only few of these characters are of sufficient use for distinguishing groups of allied species. This can only be stated to a limited extent for the size of the leaflets, the size of the inflorescences, and the number of r. b. in the petioles. There is, for instance, a group of more or less mountain-dwelling species which have mostly small leaflets *(monophyUus, triphyUus, nubigenus, microphyUus, lederniannii)*. There are a number of species which combine short inflorescences with a small number (1—5) of r. b. Cthe above-mentioned small-leafed species and also the mountain species *glandulosus* and *decipiens,* and the preponderantly lowland species *leeifoUus* var. *anisander).* There seems to be some correlation between the size of leaflets and inflorescences on the one hand and the number of r. b. on the other, the latter being mostly elevated (10 or more) in such species as *moluccanus, acuminatus, robustus,* and *lanceolatus.* But *beccarii* and *moUis* with 15-^-20 and 8—10 r. b., respectively, have large leaves and very short inflorescences and *celebicus* with large panicles has only (1—)4—8 r. b. The polymorphous *H. floribundus* takes an intermediate position in this respect; its leaflets are neither large nor small, there are (1—)3—7(—12) r. b., and the inflorescences are of moderate size (♂ 5—24, 9 1.5—11).

Pubescence occurs in *H. beccarii, moUis, acuminatus, pubescens,* and *robustus.* Of these *beccarii* and *mollis* on the one hand and *acuminatus* and *pubescens* on the other are probably related two and two, 'but *robustus* is clearly allied to *floribundus.* In some of these species showing pubescence, the character is rather variable, perhaps in connection with the age of the parts in question.

Another character of dubious value and vague limits is the occurrence of "nectaries", glandlikc pits in the axils of the nerves underneath. In some species, such as *microphyllus* and *glandulosus,* they are quite constant, but in others (or in specimens of doubtful identity) they are rare or not distinct or not confined to the nerve axils. In some cases there are hairtufts (domatia) in their stead, e. g. in *monophyUus,* and these are also occasionally found in *H. leeifoUus* (both varieties). Structures whioh seem intermediate between nectaries and domatia have been occasionally observed in specimens ascribed to *H. glandulosus* (= *H. monticola,* cf. Husson & Lam 1953, 414—415). *H. ledermannii* is very much like *H. microphyllus* but lacks the nectaries of the latter.

The core of the genus, so to speak, is a group of related species which

*) r. b. = rcsinifcrous vascular bundles in the pith of thp petioles.

may be arranged in a linear way, as has been more circumstantially discussed in Husson & Lam 1953, 433—434. In this arrangement the leaflets become narrower and their base more acute, their size and that of the inflorescences decrease, as does the number of r. b., all more or less conespondingly from west to east. These species are: *moluccanm-ceUbicus-**floribiindus-leeifolius(vav. leeifolius-vsir. anisander).***

H. florihundus and *H. leeifolius* are both variable species, including several taxa, most of which were previously considered to represent separate species. They have also by far the widest distribution of all *Haplolobus* species and in some cases it is impossible to identify sterile specimens with any satisfactory degree of certainty *(celebicus* vs *moluccanus, celebicus* vs ***leeifolius-anisander, floribundus* vs *leeifolius-leeifoliits).***

Some species are clearly peripheral to this *floribundus-leeifolius* group, such as *robustus* which is hairy, and *lanceolatus* which is distinguished by the shape and size of its leaflets and its larger female inflorescences. //. *decipiens* is a mountain species which shows characters of both *floribundus* and *leeifolius* and though nectaries are wanting, it seems to be allied to //. *glandulosus* in one way or another. The last-named species shows some resemblance with *Dacryodes papuana* which also lacks nectaries, and seems to be the only imaginable living link between *Dacryodes* and ***Haplolobus.***

***IL leeifolius* var. *anisander* is clearly allied to *H. monophyllus* on the** one hand, and to *H. pubescens* on the other. Both ends of the chain just mentioned are somehow connected with *Santiria, H. celebicus* with *8. apiculata* **and *H. leeifolius* var. *anisander* with both *8. apiculata* and, though** less distinctly, *8. rubiginosa.*

Finally *H. acuminatus* seems somewhat akin to the *floribundus<omj)]ox* and the certainly allied *pubescens* suggests connections both with //. *leeifolius* **var. *anisander* and with *Santiria apicidata* var. *pilosa.***

TAXONOMICAL PART

Haplolobus H. J. Lam in Lam 1931, 2; id. 1932a, 207; id. 1932b, 404; Husson & Lam 1953, 419. — Forest trees of moderate height. Branchlets mostly without resiniferous vascular bundles (r. b.) in the pith. Leaves imparipinnate, more rarely unifoliolate, petioles always with r. b. in the Pith, exstipulate. Inflorescences paniculate, axillary or pseudoterminal (with a more or less obsolete terminal bud), mostly short-peduncled, cf ones mostly larger and more-florous than *9* ones. Flowers small and though functionally probably always unisexual, organs of the other sex always extant and sometimes only little reduced in size; sepals 3, mostly connate for at least halfway up; petals 3, free, with inflected tip; stamens 6, inserted outside the annular disk or the filaments slightly connate to it at base; ovary 3-celled, each cell with two collateral descendent axile epitropous ovules; stigma 3-lobed to subglobular. Fruit small, ovoid to sub-?obular with spreading calyx and terminal stigma; pericarp dry and thin, smooth; pyrenes connate with very thin papery walls, mostly 1-seeded, the two sterile cells very small, rarely 2-seeded *{H. leeifolius* var. *anisander)* [a]»d then either the two seeds in one cell or with two one-seeded cells

and one sterile cell; seeds subglobular, with a very thin testa and without albumen (endosperm), the cotyledons entire and thick, plano-convex, unfolded, the flat plane between them (in one-seeded fruits) in the plane of the septum between the sterile cells, the hilum above the middle of the cell; radicle minute, superior. — Some 17 species from Borneo and Celebes through the Moluccas and New ftuinea to western Polynesia, from sea-level to about 1800 m alt.

Type species: *H. moluccanus* H. J. Lam (1932).

Key to the species

Note. A question mark behind the generic symbol (H.[1]?) indicates that mature fruits are so far unknown and that accordingly the generic identification is not entirely beyond doubt. The resiniferous vascular bundles in the pith of the petiole are abbreviated to r. b. When the size and shape of the leaflets and pctiolules are mentioned, reference is exclusively made to the lateral ones, unless otherwise stated.

1a. Branchlets, inflorescences (infructescences), and leaves (at least on midrib and nerves underneath) more or less pubescnt or hairy. 2

b. All parts entirely glabrous but for occasional terminal buds and hair tufts (domatia) in the nerve axils underneath. 6

2 a. Inflorescences (infructescences) along stout branchlets (1—2 cm in diam.) or on very short lateral shoots along same. 3

b. Inflorescences (infructescences) axillary near tips of more slender branchlets or, if branchlets thick, then 9 inflorescences over 10 cm long. 4

3 a. Leaflets lanceolate, 21—36 cm long and 7.5—10 cm wide, secondary nerves 25—30, petioles about 23 cm long, with 15—20 r. b.; leaves up to 6]/&-jugate, branchlets 1.7—2.2 cm in diam.; infructescences 4—7 cm long — *W. Borneo*

2. H. beccarii Huss.

b. Leaflets (ob) ovate to elliptic, more or less bullate, 7—19 by 5—11.5 cm, secondary nerves 8—15; petioles 3.5—8 cm long with 8—10 r. b.; leaves 1%—3%-jugate; branchlets about 1 cm in diam.; 9 inflorescences (infructescences) only up to 2 cm long along short lateral shoots — *Moluccas (Ualmahera)*

11. EL? mollis H. J. Lam

4a. Leaflets with 12—18 secondary nerves; petioles with 16—17 r.b.; branchlets 0.5—2.2 in diam. 5

b. Leaflets with 7—10 secondary nerves, petioles with 1—9 r. b.; branchlets not over 0.5 cm in diam.; leaves up to 4^-jugate, petioles 4—7.5 cm long, with 4—9 r.b.; leaflets oblong to oblong-lanceolate, 6.5—13.5 by 2—5 cm, petiolules 0.4—0.9 cm long; inflorescences of both sexes up to 8 cm long, rather lax, with straight ramifications — * *New Guinea*. . . . . 15. EL pubescens H. J. Lam

5 a. Leaflets ovate- to obovate-oblong with curved margins and tapering apex, rather thin; 9 inflorescences (infructescences) 2.5—5 cm long, slender, with more or less tortuous ramifications — *New Guinea* . 1. H. acuminatus (Schum.) H. J. Lam

b. Leaflets oblong with more or less parallel margins and abruptly acuminate apex, rigid; infructescences stout and stiff, 10—13 cm long — *New Guinea*

16. H. robustus H. J. Lam

6 a. Leaflets with glandular pits (nectaries) in the nerve axils underneath, mostly small, secondary nerves 4—12, r. b. 1—3; mountain species (400—*1S00* m alt.) 7

b. No such nectaries extant, but sometimes hair tufts (domatia) in their stead . !>

7 a. Secondary nerves 4—5; leaflets 3.7—7 by 1.4—2.4 cm, with a long tapering acumen — *New Guinea*. . . . . 10. H.? inicrophyUus Huss.

b. Secondary nerves (5—12. 8

8 a. Proportion of length and width of leaflets 1.7—2; leaves 1%—2 %-jugate, leaflets ovate, 5—10.5 by 3—5.5 cm; petiolules 1—1.5 cm long; secondary nerves 6—9, not or hardly prominent underneath — *New Guinea*

6. H.? glandulosus Huss. var. glandulosus

b. Proportion of length and width of leaflets about 3; leaves 2%—9%-jugate, leaflets oblong-lanceolate, 10—16.5 by 4.5—5.5 cm; petiolules 1.5—2.5 cm long; secondary nerves 10—12, distinctly prominent underneath — *New Guinea*
6. H.? glandulosus Huss. var. **monticola** (Huss.) H. J. Lam

9a. Leaflets small to very small, rarely over 13 by 6 cm; r.b. 1—3(—5) . . . 10
b. Leaflets mostly larger than 13 by 6 cm; r.b. (1-—)3—10(—40) 15

10a. Leaves 1—3-foliolate, r.b. 1; $ inflorescences up to 5 <«m long; mountain species (200—1000 m) . . U
b. Leaves (%—)1%—4%-jugate, r.b. 1—5 . . 22

11a. Leaflets very rigid, nervation hardily to little conspicuous particularly on upper side, no domatia — *New Guinea* . . , 17. H.? **triphyllus** (Laut.) H. J. Lam
b. Leaflets not very rigid, reticulation minute and clearly conspicuous; ^domatia in the nerve axils underneath extant*) — *Moluccas (Morotai)*
13. H.? monophyllus H. J. Lam

12 a. Male inflorescences 10—17 cm long, not very slender, widely branched, flowers not very small; leaves *2%*—3%-jugate, leaflets 7—13 by 4.5—5.5 cm, base acute to subrotundate; r.b. about 4; in the hills (450—900 m) — *New Guinea*
4. H.? **decipiens** PI. J. Lam
b. Male inflorescences not over 4 cm long, mostly slender . . 13

13 a. Leaflets ovate to ovate-lanceolate, 4—12 (—15.5) by (1.5—)2—6(—7) *cm*$_f$ with 7—11 (—14) secondary nerves and 1—3(—5) r.b. in the petioles; inflorescences of both sexes up to 4 cm long, the male ones very slender, flowers very small — ***Moluccas, New Guinea, New Britain, Valav.?, mostly vn, the lowland***
9. H.? leeifolius (Laut.) H. J. Lam
var. anisander (Laut.) H. J. Lam
b. Leaflets lanceolate, up to 8 by 3 cm, with 5—8(—10) secondary nerves; mountain species (850—1000 m) . . 14

14a. Greatest width of leaflets at the middle; apex subabraptly acuminate, leaflets 3.7—8 by 1.8-^2.8 cm; leaves (l%—)2%—3%-jugate; fl inflorescences 2—3 cm long — *New Guinea*. . . . . **14. H.? nubigenus** (Laut.) H. J. I*m
b. Greatest width of leaflets below the middle, leaflets l.tt—6 by 0.4—2.5 cm, with a long tapering apex; leaves 2%—4%-jugate; infloresconcos of both sexes 1.5—*2* cm long — *New Guinea* . . . . **8. H. ledeimannii** (Laut.) H. J. Lam

15a. Petioles with 16—40 r.b.; inflorescences large, 9 7—19, £ 23—32 cm long, widely branched; leaves large, up to 4%-jugate, leaflets 12—38 by 7—18 cm, broad ovate or elliptic; secondary nerves (9—) 12—18 — *Moluccas (Halmahcra, Morotai)*
12. H. **moluccanus** H. J. Lorn
b. Petioles with 1—14 r.b.; inflorescences and leaflets mostly smaller and the leaflets narrower . . 16

16 a. Base of leaflets generally acute (angle 90° or less) and sometimes more or less abruptly decurrent; branchlets fairly slender, mostly not over 0.5 cm in diam. . 17
b. Base of leaflets rounded (angle 90°—180°), sometimes minutely decurrent; branchlets stout (about 1 cm in diam.), often verrucose . . 20

17 a. Male inflorescences widely branched, (5—) 10-^23 (—24) cm long, many together in the axils of successive leaves . . 18
b. Male (and female) inflorescences not widely branched, slender to very slender, 2—7(—10) cm long, not always many together . . 19

18a. Petioles (2—)6.5—9.5 cm long with (1—)4—8 r.b.; leaflets (6—)9—21 by (2.5—) 4—8.5 cm, mostly narrowly oblong, with 7—11 secondary nerves, base mostly acute; inflorescences $ stiff, few-florous, about 10 cm long, $ mostly large and widely branched, 5—22 cm long, many-florous, flowers small — *Celebes*
3. H. **celebicus** H. J. **Lam**
b. Petioles 3.5—6 cm long with 1—4 r.b.; leaflets 6—13 by 3.3—5.5 cm, coriaceous, oblong to elliptic, base rounded to acute; £ inflorescences 4r-16 cm long ($ ones **and fruits unknown) — *New Guinea, in the hills (450—900 m)***
4. EL? **decipiens** H. J. Lam

19 a. Leaflets (8.5—)11—22 by 3.5—8.5 cm, petioles 4—5(—12) cm with (1—)3—6(-10) P# fc. *yew Giwnea* . . . 9. H.? **leeifolius** (Laut.) H. J. Lam var. **leeifolius**

*) Domatia are occasionally also found in //. *leeifolius* (both varieties), but there the number of secondary nerves is 6—14 anèfcthat of the r.b. 1—6(—12;.

b. Leaflets (3.5—) 4—12 (—15.5) by (1.5—) 2—6 (—7) cm, petioles 1.5—3.5 (—6.5) cm with 1—3(—5) r. b. — *Moluccas, New Guinea, New Britain, Palau?, mostly in tJie lowland* . 9. XL leeifolius (Laut.) H. J. Lam var. anisander (Laut.) H. J. Lam

20 a. Leaves (%—)2%—3%(—4%)-jugate; leaflets elliptic to lanceolate, base broadly rounded to acute; female inflorescences not over 10 cm long 21

b. Leaves 3%—7%-jugate, petioles 6.5—20 cm long with (3—)6—11 (—13) r. b.; leaflets oblong-lanceolate, with narrowly rounded (or sub-acute) base, (9—)15—20 (—26.5) by (3.5—)5.5—8(—9) cm, petiolules 0.5—1 cm long; inflorescences of both sexes many together, very stout and widely branched, the female ones 10—26, the male ones 18—21 cm long' — *New Guinea (Cycloop Ra.)* 7. H. lanceolatus H. J. Lam

21 a. Branchlcts mostly over 0.5 cm thick, often verrucose, leaflets broadly elliptic with rounded basis, (5—)12—17 (—33) by (2—)4—7(—9) cm, petiolules (0.5—) 1—3 cm; female inflorescences (1.5—)3—7(—11) cm long, male ones (5—)8—16 (—24) cm, both stout; variable species — *New Guinea to Fiji, from sea level to about 1200 m alt.* . . . . . 5. H. floiibundus (Schum.) H. J. Lam

b. Branchlets slender, mostly not over 0.5 cm in diam.; leaflets 6—14 by 3.3—6 cm, petiolules slender, 0.8—1.8 cm; female inflorescences unknown, main ones 5—17 cm, slender — *New Guinea, in the hills (450—900 m)* . 4. H.? decipiens H. J. Lam

Enumeration of the species

In the following enumeration only those data have been incorporated which were deemed essential for the up to date insight in the taxonomy of the genus. This is based on the material now available, which means that some specimens that have after our last review (Husson & Lam 1953) been returned to their owners, have not been re-examined; only in a few cases in which the specimens were essential for reviewing the genus again were they requested on loan again (B, FI). It is a pleasure here to tender my thanks to the directors of the institutions concerned for their kind cooperation.

In order to present the user with a well-balanced survey, all species have been treated on the basis of a more or less strict scheme, as far as the data available permitted and the specific characters demanded. This includes record of first publications and of papers containing additional information; full synonymy with quotation of literature and type specimens; full iconography of the species in the delimitation here accepted; 9 and cf specimens have, as far as available, been mentioned separately, a measure of whose necessity I became convinced since I came across cases in which it is very difficult to decide upon conspecificity of 9 and cf specimens (cf. *H. megacarpus* H. J. Lam).

In the specific diagnoses only essential characters have been described. Detailed description of flowers has been mostly omitted, except in the cases of new species, and in some particular instances.

The enumeration of the collections is restricted to specimens now available. In cases in which their quotation may be found in earlier papers, it is here confined to collector and number. The enumeration has been arranged in three groups: 9 specimens, cf specimens, and sterile ones; of some of the latter the identification may be dubious. At the end of each species those specimens have been quoted which were excluded from the species in question as compared to earlier papers (Husson & Lam 1953,

and Lam 1955) and the species to which they have been transferred are indicated. Finally a survey is given of the distribution and remarks of an enlightening nature have been added whenever this seemed necessary or desirable.

Abbreviations applied are:

FRI = Forest Research Institute, Bogor (BO);
NGBW = Forestry Service of Netherlands New Guinea, formerly at Hoilandia (HOLL), now at Manokwari (MAN);
NGF = Forestry Service of the Territory of New Guinea and Papua, Lae (LAB);
NIFS = Netherlands Indies Forestry Service, Bogor (BO),
r. b. = resiniferous vascular bundles in the pith of the petioles.

1. H. acuminatus (Sehum.) H. J. Lam in Lam 1932a, 207; id. 1932b, 410; Husson & Lam 1953, 427; Leenhouts 1956, 242.

Type specimens — 9 neotype: *Ledermann 10390* (L); cf type: *Hollrung 737* (K; dupl. in L, MEL).

Iconography: Lam 1931, tab. VII, fig. 46 (vase, supply of <? flow.); Lam 1932b, 413, fig. 43 (cf ML, leafl, *d* and 9 flow., fr) and fig. 44 (leafl., anat. branchl. and pet., *d* infl. and flow.); Husson & Lam 1953, 428, fig. 5 (infr. and fr.); Leenhouts 1956, 242, fig. 16 (habit with leaf, anat. of pet, *d* and 9 flow., infr.).

Synonyms:

1889 - *Santuia aeuminata* Schum. in Schumann & Hollrung, PI. Kais. WiUUand 1889, 64 _ type specimen: *Uollritng 737* ($)(£)•
1920 - *Canarium paehypodum* Laut. in Lauterbach 1920, 324 - type specimen: Leder-
1932 - E R E iSjJX X M W - ^ i . L- 1932a, 207; id. 1932b, 411.

Branchlets 0.5—1.0 cm in diam., pubescent as are petioles, leaflets underneath, and inflorescences, pith occasionally with some tiny r b. Leaves li/0 2i/2(—3V2)-jugate, petioles 2—8 cm long with 6—17 r b.; leaflets obovate to oblong with broad and rounded to broadly acute base and a short abrupt narrow acumen, older ones glabrescent, 9—21 by 4-10 cm; secondary nerves 12—18, tertiary ones transverse, near midrib often some perpendicular to it; petiolules 0.5-2.5 cm long. Inflorescences with short peduncles, if any, 9 2.5-4.5 cm long, *d* 6-12 cm long; ramifications tortuous, particularly in *d* inflorescences. Fruits ovoid, bluntly pointed, 1.3—1.9 by 0.8—1.2 cm.

Collections (already previously quoted):

9 : *Becoari P.* P. *876 (Herb. Fir.* « Iff* *A, MS B); Lam 705; Ledermann 10S90* - all from New Guinea. /i,,«™
$: *Uollnmg 737; Ledermann 97£4* — both from New Guinea.
Sterile: *NGBW 1773) NGF 3754* — both from New Guinea.

Excluded (all from New Guinea).

Transferred to *E. floribundus* (Sehum.) H. J. Lam: *NGBW 1573* (77. *aottmtnuta,*

H. J. Lam: *Becoari P.P. 54,; NIFS bb 30470.*

Distribution: West to East New Guinea, lowland.

Remarks: The sterile specimens match the fertile ones in pubescence, shape and size of leaflets, and number of r. b., but differ from them in the colour of the dried specimens, which is dark reddish brown in the fertile ones, greenish brown in the sterile ones. Intermediate positions in this respect are occupied by *Lam 705* and *NGBW 1773.*

2. H. **beccarii** Ilusson, in Husson & Lam 1953, 431.

Type specimens — $ (fr): *Beccari P. B. 1803* (PI); *d*: unknown.

Iconography: Husson & Lam 1953, 432, fig. 7 (habit, leaf, anat. of pet., fr.).

Branchlets more or less pubescent, very stout, 1.7—2.2 cm in diam., verrucose. Leaf (only one known) 6Vfc-jugate, petiole stout, about 23 cm long, r. b. 15—20; leaflets lanceolate with acute base and with a long and narrow gradually contracted acumen, 21—36 by 7.5—10 cm, secondary nerves 25—30 much prominent below and pubescent as is midrib and sometimes the transverse tertiary nerves; petiolules about 2 cm long. Inflorescences densely and minutely pubescent, 4—7 cm long, peduncles very short or none; fruits ovoid to subglobular, about 1.3—1.5 by 1.2 cm. — Flowers of both sexes as yet unknown.

Collections:

The type specimen is the only one known.

Distribution: Borneo (Sarawak).

3. H. celebicus H. J. Lam, in Lam 1938, 111; Husson & Lam 1953, 435; Lam 1955, 177 (excl.); Leenhouts 1956, 243.

Type specimens— $ (fr.) lectotype: *FRI CelJV-312* (BO; dupl. L); *d* : *FRI CelJV-208* (L; dupl. BO).

Iconography: Lam 1938, 112, fig. (habit, anat. branchl. and'pet., cf and $ infl., *tf* flow, with diagr., fr. with cross-sect.).

Glabrous. Branchlets rather thin 0.4—0.7 cm in diam. Leaves (1%—) $2i/_2$—$3y_2$(—41/^)-jugate, petioles 5—8 cm dark brown to black when dry, r. b. 1—4(9)—7 (cf); leaflets chartaceous, greenish to light brown when dry, oblong with acute basis and apex (which is shortly acuminate), 9—21 by 3.5—8.5 cm, secondary nerves (6—)8—11, tertiary nerves rather laxely reticulate, more or less transverse near the margin, perpendicular to the midrib near this; petiolules 1.2—2.1 cm. Inflorescences cf laxely branched, black when dry, 10—22 cm long; peduncle very short; pedicels 0.2—0.3 cm; $ (infructescences only) about 10 cm long, on a very short peduncle, much less branched than the *6* ones, rather stiff. Fruits ovoid, a little pointed, 1.2—1.6 by 0.7—1.1 cm.

Collections (already previously quoted):

9 : ***FBI Cel V/312.***
$: ***FBI Cel V/208.***
Sterile: ***NIFS bb 24500, S1850, 81878V*** **(ex** ***II. anis.), S1901, 38598, 32604.***
All from Central Celebes, one specimen from Banggai (*).

Transferred with doubt from *H. leeifolius* (Laut.) H. J. Lam var. *anisander (= II. anisander* (Laut.) H. J. Lam):
$: *NIFS bb 24852?* (infl. 2.5—7 cm) and *24882?* (infl. 4 cm).
Sterile: ***NIFS bb 16456?, 22832?, 24939?, 25841?, 25878?***
All from the Moluccas.

Excluded.

Transferred to *H. leeifolius* (Laut.) H. J. Lam, var. *anisander* (Laut.) H. J. Lam: Sterile: *Main $ Aden 1417, NIFS bb 28182, 28840,* and *28871,* all from Moluccas-*Kanehira 1874?* (cf. Lam 1955, 177), from Palau.

Distribution: Central Celebes, ? Moluccas (Ternate, Halmahera, Ceram, Buru).

Remarks: There are two species, with which the present one can be easily confused when sterile material only is available. One of them is *Santiria apiculata* Benn., in which, however, the secondary nerves are mostly archingly joined near the margin at some distance fromvit, while in *H. celebicus* (and *H. leeifolius)* these nerves are mostly diminishing towards the margin without distinctly joining.

The second species with which confusion is possible, is *H. leeifolius* var. *anisander* and the distinction between the two is more arbitrary, as has already been circumstantially explained in Husson & Lam 1953, 433—435. In *H. leeifolius* **var.** *anisander* the leaflets are mostly smaller *viz* (3.5—)5—12(—15.5) by (1.5—)2.5—6 and the number of r. b. is only rarely more than 3. The inflorescences in the last-named species ;(var.) are only up to 4 cm long and very slender, particularly the malei ones. The above-mentioned male specimens from Halmahera *(NIFS bb 24852* and *24882)* are therefore more or less intermediate between *H. celebicus* **and *H. leeifolius* var. *anisander.***

Of the above-mentioned sterile specimens those from Celebes tally with the type specimens; they have 5—8 r. b. in the petioles and the size of their leaflets leaves little doubt as to their identity, except in the case of the specimen from Banggai *(NIFS bb 31878),* the two leaves of which are young ones, the leaflets very thin, rather small and very acute at base.

The sterile specimens from the Moluccas have generally leaves of the type of *H. celebicus* bpt they have only 1—5 r. b.

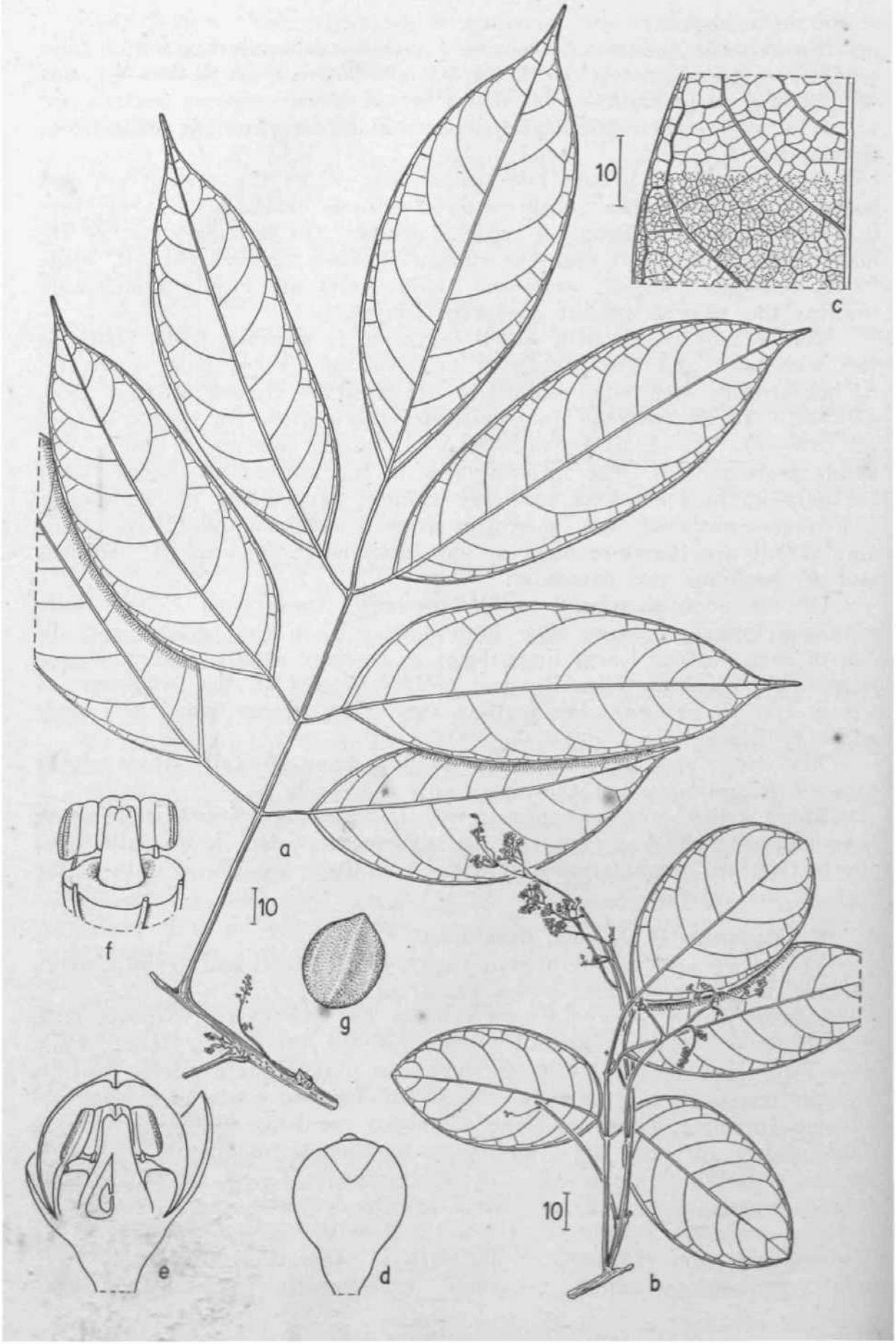
There is also an evident relation with *H. moluccanus* from the Moluccas, both regarding the leaf type and the inflorescences, but in *H. moluccanus* the leaflets are much larger and wider and there are 1O—40 r. b. in the pith of the petioles.

*. **H.? decipiens** H. J. Lam, nova spec.

Iconography: the present paper, *fig. 1* (habit and <? infL, nerv., c? flow, and long, section; pollen grain).

Description of <f type specimen *(9* Unknown): *Clemens 1752.*

Arbor (?) glabra. Bamuli teretes 0.3—0.4 cm diam., leaves. Folia 2i/o—31/2-jugata, petioli 3.5—6 cm longi, basi plus minusve sulcati, medulla vasculis resiniferis *c.* 4 percursa; foliola subcoriacea, ovata ad oblonga vel oblongo-lanceolata, 6—13 cm longa, 3.3—5.5 cm lata, basi paulo obliqua subrotundata ad acuta, apiee plerumque subabrupte longiuscule acute acuminata, petioluli laterales 0.5—1.2 cm, terminates 1.6—3 cm longi; costa subtus'prominens; nervi secundarii graciles, eurvati, angulo c. 75° de eosta adscendentes, subtus vix, supra haud prominuli, margines versus indistincte arcuatim conjuncti, 6—8, tertiarii pergraciles, transversim reticulati reticulatione minuta conjuncti. Inflorescentiae paniculatae, brevi-


10
c
a
10
f
g
e
d
10
b

pedunculatae, late ramosae, graciles, 5—17 cm longae. Flores parvi, in alabastro globoso 0.1 cm alti et diametro, sepalis 3 deltoideis acutis, petalis 3 orbicularibus apice inflexis. Stamina 6, filamentis extra discum annularem in disci sulcis insertis, antheris (juvenilibus) plano-quadrangularibus adjunctis ovarii rudimentum paulo superantibus, pollinis granis fertilibus. Ovarii rudimentum parvum, ovulis (sterilibus ?) includens.

Collections:

EAST NEW GUINEA- Morobe distr., Sattelbcrg-Heldsbach 600—900 m: *Clemens 1752* £ (typo specimen, L); same loc, 450—GOO m: *Clemens 846 $* (A, B, L); both ex *II. floribundus.*

Distribution: East New Guinea.

Remarks: The second specimen is practically identic with the type. The present species seems to belong to the *floriouwLus-UeifoUus* group. It occupies a sort of intermediate position between these two species in that the base of the leaflets may be rotundate as well as acute, but their size is markedly smaller than in *H. fhribundus* and *H. leeifoUus* var. *leeifolius* and the *d* inflorescences are much larger than those of the last-named variety. From the small-leafed *H. leeifoUus* var. *anisander* it differs moreover in the often broad basis of the leaflets.

Another ally seems to be *H. glanduiosus* (incl. *monticola)* which has been collected higher up in the mountains., but in *H. decipiens* there is no trace whatsoever of the glandular pits. Unfortunately there is no way of comparing *d* inflorescences, since these are unknown in *H. glandvtosus,* whereas 9 ones are lacking in *H. decipiens.*

5. H. floribundus (Schum.) H. J. Lam, in Lam 1932a, 207; Lam 1932b, 412; Husson & Lam 1953, 436; Lam 1955, 177; Leenhouts 1956, 244.

Type specimens— 9 neotype: *NGBW 1573* (L); *d* lectotype: *HoUning 543* (K; dupl. in MEL, P).

Iconography: Lam 1932a tab. XI, fig. 62 *(d* flow., *H. sepik.);* id. fig. 63 (9 flow., //. *furf.);* id. fig. 97 (tf and 9 flow., *H. maluensis);* Lam 1932b, 413, fig. 42 (leafl., *d* ML, <? and 9 flow., *H. furf.),* fig. 45 (habit, 9 flow., *H. florib.),* and fig. 48 (leafl., infract, and fr.f cf flow., *H. sepik.);* Husson & Lam 1953, 437, fig. 8 (habit, anat. of branchl. and id. fig. 63 (9 flow., *H. furf.);* id. fig. 97 *(d* and 9 flow., //. *maluensts);* id. 441, fig. 9 (leaf, infract, and fr., *H. versteeghdi);* id. 450, fig. 14 (habit, anat. of pet, *d* infl. and flow., infract., *H. aneityensis);* Leenhouts 1956, 212, fig. 2f (cross-sect, fr. without embryol and 16e (infract.).

Synonyms.

1889 — *Santiria floribunda* Schum., in Schumann & Hollrung, Fl. Kais. Wilh.land, 1889, 63 — type specimen: *Hollrung 543* (♂) (lectotype K; dupl. in MEL, P).

1920 — *Canarium furfuraceum* Laut., in Lauterbach 1920, 325 — type specimen: *Ledermann 9796 (&)* (type lost, dupl. in L).

J920 — *Santiria sepikensis* Laut., in Lauterbach 1920, 3J3 - type specimen: *Ledermann 10455* (fr.) (type lost, dupl. in L).

Pi*. 1 — *naplolobus decipiens* H. J. Lam, nova spec. — a. leaf and young $ inflorescences; b. ditto; c. nervation; d. $ flower bud; e. * flower, longitudinal Action; f. ditto, stamens and disc; g. pollen grain; dimensions in mm — a, c-g. after *Seme ns 1752,* b. after *Clemens 846.*

1920 — *Santiria maluensis* Laut., in Lauterbach 1920, 334 — type specimon: (type- lost, neotype plate in L).
1932 — *Haplolobus sepikensis* (Laut.) H. J. Lam, in Lam 1932a, 208.
1932 — *Haplolobus maluensis* (Laut.) H. J. Lam in Lam 1932a, 208; Husson & Lam 1953, 436; Lam 1955, 177; Lcenhouts 1956, 244.
1933 — *Canarium oneityense* Guillaumin, J. Am. Arb. 14, 1933, 51 — type specimen: *Kajewski 943* (<$) (A; dupl. P).
1950 — *Haplolobus salomonensis* C. T. White, J. Am. Arb. 31, 1950, 92 — type specimen: *Walker 242* (£) (BBI; dupl. in L).
1953 — *Haplolobus versteeghU,* H. J. Lam, in Husson & Lam 1953, 440; Leenhouts 1956, 244 — type specimen: *Brass 4" Versteegh 12546* (L; dupl. in A).
1953 — *Haplolobus aneityensis* (Guill.) Husson, in Husson & Lam 1953, 449; Lam 1955, 179.
1955 — *Haplolobus aouminatus* (Schum.) H. J. Lam, fa *glabrior* in Lam 1955, 175 — type specimen: *NGBW 1573* (9) (L; dupl. MAN)."
1955 — *Haplolobus megaoarpus* H. J. Lam quoad spec. £ in Lam 1955, 178 — type specimen: *NGBW 1015 ($)* (L; dupl. MAN).

Glabrous, variable in most characters. Branchlets more or less angular, the older ones 0.5—1.0 cm in diam. and often verrucose. Leaves (1%—)2%—8%(—4%)-jugate, petioles 3—9 cm long, with (1—)3—6(—12) r. b.; leaflets rather stiff, ovate or obovate to oblong, base mostly broad and more or less oblique, more rarely broadly acute, apex mostly subabruptly narrowed, more rarely rounded, often bluntly acuminate, (6—)12—15 (—33) by 4—7(—9) cm, secondary nerves (7—)10—13, tertiary ones obscurely transverse, all venation between the secondary nerves more or less minutely reticulate., the more conspicuously so as more rigid leaflets are examined, often some perpendicular to midrib near it. Inflorescences 9 5.5—11 cm long, little branched, stiff, with rather large flowers; cf more profusely branched, (5—)8—24 cm long, rather coarse with subsessile rather large flowers. Infructescences (2.5—)5—9, very coarse and crooked; fruits variable in shape and size, ovoid to subglobular, sometimes pointed, 1.7—2.2 by 0.8—1.4 cm.

Collections. (• indicates new material, *vide infra):*

9 — New Guinea: *Brass 4" Versteegh 12546,* fr. (ex *H. versteeghU); Carr 12247,* fr.; *Jloogland 3723* (ex *H. maluensis,* Lam 1955, 177); *Hoogland $ Womersley 3238* (eri\ 3258 in Lam 1955, 177); *NGBW 1573* (ex *H. aoum.,* fa *glabrior* in Lam 1955, 175); *NGF 1312*,* fr., 1564.
Polynesia: *A. C. Smith 5858,* fr., and *6160,* fr. (both ex *H. aneityensis).*
£ — New Guinea: *Brass 25432*; Ledermann 9796; NGBW 1015* (ex *H. megac.* in Lam 1955, 178).
Polynesia: *Kajewski 574* (f 9) and *943; Walker 242* (all ex //. *aneit.).*
Sterile — New Guinea: Braft & Versteegh 12544 (ex *H. verst.);* NGBW 444*, 610*, 1004 (ex *H. megac.* in Lam 1955, 178), 1014#, 1217*, 1550*, 1630*, 1634*, 1890*, 1892*, 1903*; NITO bb 14536, 30371 (ex *H. hussonti),* 30515 (ex *E. huss.),* 30694, 30840, 31471 (ex *H. huSs.),* 33437, 33468.

New material (sterile unless indicated otheiwise).

NEW GUINEA. West New Guinea, Manokwari, Prafi, 150 m, old forest: *NGBW 444 (Brouwer)* (L, MAN), tree 31 m, nat. (Manikiong) n.: seriga; Oransbnri, low alt.: *NGBW 1890, 1892, 1903* (all coll. by *Schram)* (L, MAN), all with nat. (Manikiong) n.: bowwic; same local.: *NGBW 1556 (Schram)* (L, MAN), tree 25 m, nat. (Manikiong) n.: hoddjai; Numfore Isl. in Geelvink Bay, 50 m: *NGBW 610 (Jarissetouvo)* (L, MAN), tree 35 m, nat. n.: nas; same local. 7 m: *NGBW 1014 (Koster)* (L, MAN), tree 20 m, same nat. n.; Meoswaar Isl. in Geelvink Bay, 7 m alt., old forest: *NGBW 1217 (Koster),* tree, 16 m, very young (£f) flow, in June 1956, nat. (Manikiong) n.: bowie; Hollandia,

Tami, old for., 2 m alt.: *NGBW 1680* and *1684* (both by *Sdhram)* (L, MAN), tree of 30 and 32 m resp., nat. (Skou) n.: djaato, kenari. — Eaat New Guinea, Papua, Milne Bay area, swampy, 10 m alt., % mile 9. of Waigami Plantation: *NGF 18[illegible]* (L. J. Brass), tree 36 m, bole 24 m, fr. blackish, in March 1945, nat. (upper Waria) n.: ratitunga; Normanby Island, Waikaiuna, rain forest, 20 m alt.: *Brass 25452* (A, K, LAE, L, PNH, S, US), tree 35 m, ♂ flow. cream coloured, in April 1956.

Excluded.

Transferred to *//. lanocolatus* H. J. Lam: A7F5 *bb £5088,* from New Guinea.

Transferred to *H. leeifolius* (Laut.) H. J. Lam var. *anisander: NIF8 bb 25015 (2), 28070, 806M, 807$t, 80764 ($?), 80777, 81079;* all from New Guinea.

Transferred to *H. dedpiens* H. J. Lam: *Clemens 846, 175ft* (both Sattolbcrg, 450—900 m).

Distribution: New Guinea from the Manokwari area eastward to Milne Bay and Normanby Isl., Solomons (Guadalcanal), "New Hebrides (Aneityum, Vanikoro), Fiji (Viti Levu), Samoa (Savaii), mostly in the lowlands from sea level upwards into the hills (Milne Bay 450 m, Fiji 700—800 m), some specimens known from the Central Range at an altitude of 1170 m.

Remarks: *H. floribundus* is a fairly variable species. It is a rather lofty tree with coarse branchlets and relatively broad and often rigid leaflets From its nearest relative *H. leeifolius* it is different by its mostly larger and more rigid leaflets with a broad sometimes rounded basis and the much stouter and (*d*) longer inflorescences. It is also related. to *H. lanceolatus* which has, however, narrow, lanceolate leaflets and much larges inflorescences ($!). Another relative is *H. decipiens,* which is different from *H. floribundus* by its more slender rf inflorescences and smaller and narrower leaflets with acute to subrotundate base.

A rather striking contrast is to be observed between the (9) flowers of *Hooglcmd & Womersley 3238* and of *NGBW 1573.* In the first-named specimen the flowers are beyond anthesis and up to 0.4 cm long with oblong, exsert (loosening) petals, and short filaments, the anthers not surpassing the ovary; in the second one the flowers are in bud, in those just open the total length is somewhat over 0.2 cm and the stamens possess long filaments which are only slightly shorter than the petals. There is, however, no essential difference in the structure of the two types. In *Hoogland & Womersley 3238* some flowers are 4-merous (cf. Lam 1931, 25—54 where pleiomery and meiomery of certain *Canamim* species have been discussed).

The sterile specimens present little doubt as to their conspecificity with the types.

In spite of its variability regarding most characters (shape of leaflets, size of inflorescences, flowers, and fruits) there is no reason and even no possibility to distinguish any varieties or formae. Even the Polynesian types which were formerly comprised in *//. aneityensis* (Guill.) Huss. and which are characterised by the more or less poplar-like leaflets, show no Constance in this respect.

6. H.? glajidulosus Huss., in Husson & Lam 1953, 423; Leenhouts 1956, 241.

Type specimen (sex uncertain): *Clemens 4988* (B).

Iconography: Husson & Lam 1953, 424, fig. 3 (habit, glandular pits, anat. of pet.) and 426, fig. 4 (leaf, 9 infl. and flow., glandular pits, anat. of pet.; *H. montic.).*

Synonym:

1953 — *II. monticola* Huss., in Husson & Lam 1953, 425; Lconhouts 1956, 241 — type specimen: *Clemens 1924.*

Glabrous trees of moderate height. Branchlets slender to fairly stout, 0.3—0.7 cm in diam. Leaves $1^1/^{\wedge}$—3i/£-jugate, petioles flattened at base, 2.5—5 cm long with 1—3 r. b. in the pith; leaflets chartaceous to coriaceous, ovate to oblong-lanceolate, 5—16.5 by 3—5.5 cm; secondary nerves 6—12, with nectaries in their axils underneath; tertiary nerves generally transverse, reticulate. Inflorescences $ axillary, 1.5—7.5 cm long, cf unknown. Fruits unknown.

Distribution of the species: New Guinea, in the mountains (1000—1750 m alt.).

Var. **glandulosus.**

Leaves \y%—**2%-jugate;** leaflets ovate, twice as long as broad or less, 5—10.5 by 3—5.5 cm, with 6—9 not or hardly prominent secondary nerves; petiolules 1—1.5 cm long.

Collections (already previously quoted):

Clemens 4988; Carr 1SSS8* £ ? (ex 27. *nubig.).

Distribution of the variety: East New Guinea, in the mountains (1500—1750 m alt.).

Var. monticola (Huss.) H. J. Lam, nov. stat. — Synonym: *H. monticola* Husson — Type specimen: *Clemens 1924* 9 (B).

Leaves $2y_2$—3Vfe-jugate; leaflets oblong-lanceolate, broadly to narrowly acute at base, thrice as long as wide, 10—16.5 by 4.5—5.5 cm, with 10—12 prominent secondary nerves; petiolules 1.5—2.5 cm long.

Collections (already previously quoted):

***Clemens 1924* 9 ; *Brass 18152,* ster.**

Distribution of the variety: West and East New Guinea., in the mountains (about 1000 m alt.).

Remarks:. This is an incompletely known species. The types of *H. glandulosus* and *monticola* do not differ so much as to justify maintaining specific rank. They have been combined under the name of *glandulosus* which has page priority. Only in the type of var. *monticola* (*9)* flowers are known; fruits are so far unknown as are rf flowers.

The specimens *Carr 13338* and *Brass 13152* are not very convincing members of the species, but if they belong to *Haplolobus* at all they would fit into no other species but the present one. In *Carr 13338* (type variety) the nectaries are small but extant in almost every nerve axil. They are still less distinct (and very shallow) in *Brass 13152* (var. *monticola)* and the leaflets are almost subrotundate at base; this specimen would certainly have to be inserted in *H. floribundus* but for the nectaries which are unknown in that species.

As far as can be judged fit>m the very scanty and heterogeneous material the alliance of the present species is with *H. decipiens* and

H. floribwndus, **particularly the former, which has the same type of leaf and inflorescence but is entirely devoid of nectaries.**

7. H. lanceolatus H. J. Lam, nova spec.

Iconography: the present paper, *fig. 2* (habit, $ and & infl., leaflets, $ and tf flow., fr. with cross-section).

Description of $ type specimen: *NOBW 4040 (Van der Sijde).*

. Arbor parva glabra. Ramuli crassi verrucosi vel sublaeves, plus minusve angulati, 0.9—1.3 cm diam., medulla aresinosa. Folia glabra, *Sy*$_2$—7%-jugata, petioli 6.5—20 cm longi, 0.3—0.6 cm diam., ima basi inteklum excepta teretes, in sicco striati, medulla vasculis resiniferis 6—11 percursa; partes rhochidis interjugales 2—5 cm longae; foliola brevipetiolulata lanceolata ad lanceolato-oblonga, basi paulo vel vix obliqua, variabilia, anguste rotundata ad acuta, apice acuta vel breviter acute acuminata, rigide chartacea, in sicco virescentia, (9—)15—20(—26.5) cm longa, (3.5—)5.5—8(—9) cm lata, latitudine maxima plerumque supra medium; petioluli laterales breves 0.5—1 cm, terminates 1.7—2 cm longi; nervi subtus prominuli, secundarii (12—)16—18, sensim curvati, angulo 70°—80° de costa adscendentes, prope marginem haud confluentes, tertiarii pauci transversi marginem versus secundariis, prope costam ea perpendiculares, reticulatione sublaxa. Inflorescentiae multae in axillis foliorum superiorum vel incipientium ortae paniculatae; paniculae pcdunculatae 10—26 cm longae, ramificationes laterales usque ad 8 cm longae, haud multiflorae; pedunculi 2—9 cm longae cum axibus florigeris in sicco striati plus minusve angulati vel bicarinati. Florum post anthesin pedicelli 0.1—0.2 cm longi; calyx trifidus, 0.2 cm in diam. et altus, sepalis deltoideis acutis; petala 3 oblonga acuta 0.3 cm longa 0.15 cm lata; stamina parva sterilia 6, 0.1 cm longa vel paulo longiora gracilia, filamentis anguste deltoideis extus discum annularem insertis; ovarium (fructus juvenilis) stylo terminali in sicco atrum, triloculare. Fructus maturi desunt.

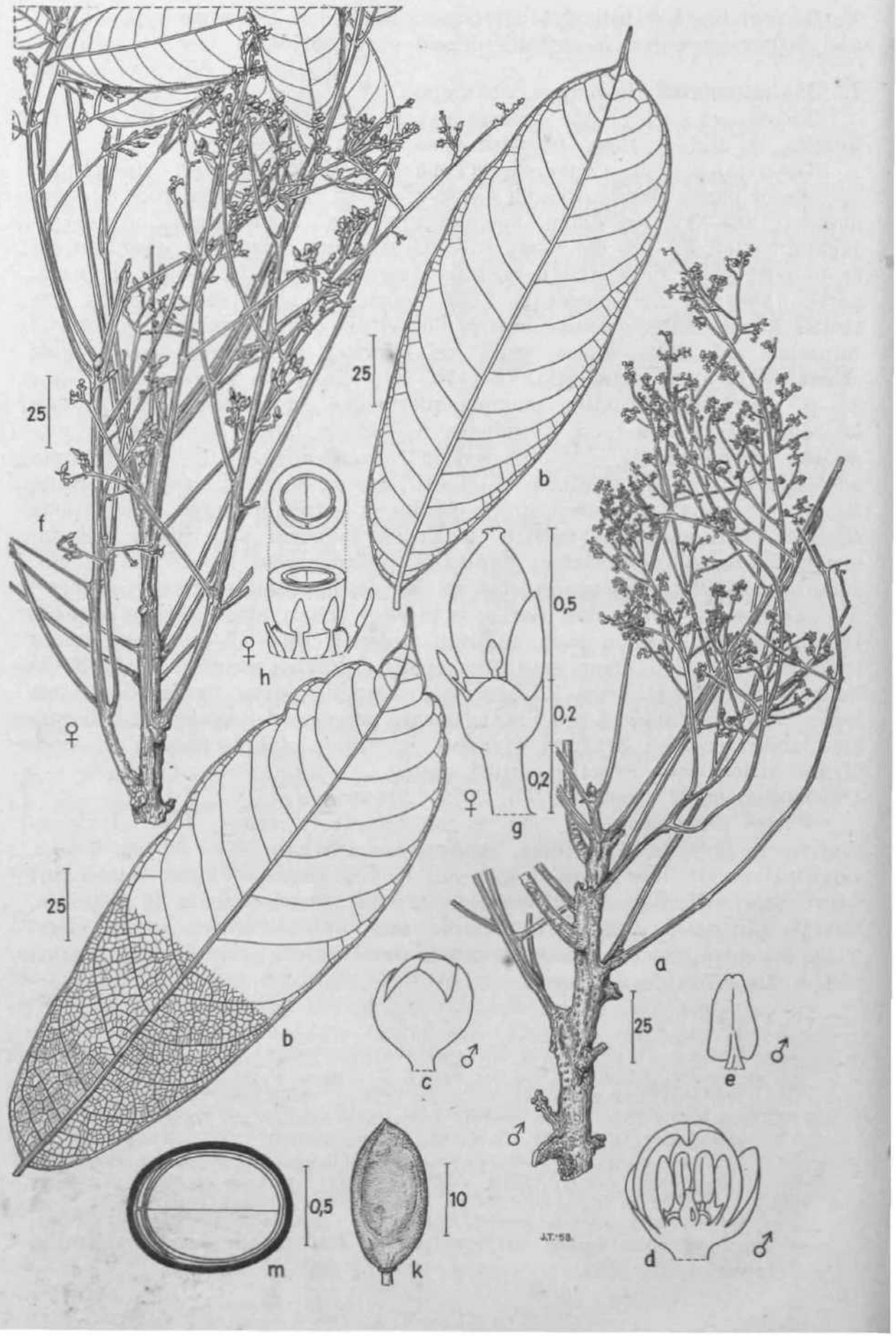
Description of <? type: *NOBW 2659 (Brouwer).*

Partes vegetativae eis typi ? similes; vase, resinif. 7—9. Inflorescentiae ut in typo 9 positae, paniculae multiflorae, 18—21 cm longae, ramificationibus lateralibus usque ad 10 cm longis. Flores (alabastra) parvi brevipedicellati, subglobosi, c. 0.15 cm diam.; sepala 3 deltoidea, dimidio altitudinis connata, petala 3 ovata, apice distincte inflexa; stamina 6, extra discum minutujri annularem inserta; ovarii rudimentum staminibus c. duplo brevius.

Collections:

9 — jf$_{EW}$ **GTJINEA. West Ntow Guinea, near Hollamlia, 10 m alt. on slope in old forest- *NGBW 4040 (Van dcr Sijde),* $ type specimen (L; dupl. in MAN), tree 12 m high, bole 8 m, very young fr. in Aug. 1956; same locality, 50 m alt.: *NIFS bb $5088*** **(BO, L), fr. in July 1938; same locality, alt. 80 m: *ZtGBW 409$ (Van der S&de)*** **(L, MAN), fr. black, in Oct. 1956.**

$ **— NEW GUINEA. West New Guinea, Cycloop Range, 500 m alt. on steep slope in second growth forest: *NGBW $659 (Brouwvr), $*** **type specimen (L; dupl. MAN), tree 21 m high, bole 19 m, straight, diam. breast high 0.21 m, bark grey, 01 cm thick, slightly grooved, peeling of in small flakes, resin translucent white; wood white (spint) to grey (centre), flow, in bud yellowish green, in Nov. 1955.**


25
f
♀
25
b
h
♀
0,5
0,2
0,2
g
♀
25
b
a
25
c
♂
e
♂
♂
0,5
m
10
k
d
♂

Sterile — NEW GUINEA, Cycloop Range, 500 m, on steep slope in second growth forest. *NGBW £656 (Browwer)* (L, MAN), tree 17 m high, bole 12.50 m, straight, same characters as no 2659.

Comprehensive description of all specimens (there is no doubt whatever about their conspecificity):

Moderate-sized glabrous tree. Branchlets 0.5—1.5 cm thick, pustular, pith without resiniferous ducts. Leaves *(2y2—)Sy2*—7V^-jugate, petioles 6.5—20 cm long, 0.3—0.6 cm thick, r. b. 3—13; leaflets lanceolate to lanceolate-oblong, base somewhat oblique, narrowly rounded to acute, apex acute to acutely acuminate, (8—)15—20(—32) by (3.5—)5.5—8(—9) cm, petiolules 0.5—1 cm; secondary nerves (10—)12—18, more or less prominent below. Inflorescences paniculate, together in the axils of the uppermost leaves or their primordia, in both sexes large, 10—26 cm long, lateral branchlets up to 10 cm, $ inflorescences fewer-florous than cf ones. Flowers 3-merous with 6 stamens inserted outside an annular disk. Fruits ovoid, smooth, black, 1.6—2.1 by 0.8—1.2 cm, one-seeded.

Distribution: Only known from the Cycloop Range near H>1-landia, 10—500 m alt.

Remarks: This species is undoubtedly akin to //. *floribundus* but again there is no doubt that it is markedly different by several important characters and it seems not very likely that more material will be able to shake this opinion. Not only are the leaves in the material so far available jmuch larger (except in *NIF8 bb 25088, vide infra),* the leaflets much longer and narrower, and the petiolules shorter than in *H. floribundhis,* but the inflorescences are in both sexes of approximately the same size. Its area is so far very much restricted.

Only one specimen *(NIF8 bb 25088)* was so far known. It has previously been identified as *H. floribundus* (Husson & Lam 1955, 438) and it is, indeed, the only specimen which somewhat tends to th*jt species by its smaller leaves *(2y2*—3V£-jugate), shorter $ panicles (1(^-14 cm), and fewer r. b. (3—5). In the texture and shape of the leaflets and the short petiolules it is exactly matching the types of *H. lanceolatus.* Moreover *NGBW 4040* shows small leaves next to large ones.

8. H. ledermannii (Laut.) H. J. Lam, in Lam 1932a, 207; id. 1932b, 408; Husson & Lam 1953, 427; Leenhouts 1956, 241.

Type specimens— 9 lectotype dupl.: *Ledermann 9013* (K), with fr.; <?; *Ledermann 12506a* (lectotype dupl. of *8. caudata,* if still in existence; if not, it is proposed to use the plate in the Icones-collection of the Rflksherbarium as a neotype, until a neotype can be selected from fresh material).

Iconography: Lam 1932b, 413, fig. 41 (habit with tf infl., tf How., old $ flow., fr. with cross-section).

Fig. 2 — *Jlaplolobus lanceolatus* H. J. Lam, now spec. — a. branchlet with $ inflorescences; b. leaflets; c, d, e. & flower with longitudinal section and stamen; f. branchlet with 9 inflorescences; g. old $ flower; h. base of same with androccium, disc and cross-section of young fruit; k, m. fruit and cross-section; , dimensions in mm — *-e- after *NGBW 2659)* f-h. after *NGBW 4040;* k and m. after *NIFS bb 85088.*

Synonyms:

1920 — *Santiria ledermanni* Laut., in Lautcrbach 1920, 334 — type specimen: *Ledermann 9013* $ (K).

1920 — *Santiria oaudata* Laut., in Lauterbacḥ 1920, 336 — lectotype specimen: *Ledermann 9877* 9 (K, dupl.).

Glabrous tree of moderate height. Branchlets slender, 0.1—0.5 cm in diam. Leaves l[1]/^—3V&(—4*/£) -jugate, in total up to 14 cm long, petioles 0.9—3.6 cm long, pith with 1(—2) r. b.; leaflets thin-coriaceous, ovate-lanceolate with a rounded or broadly acute base and a long and narrow, blunt acumen, 1.6—6 by 0.4—2.5 cm, acumen 0.5—1.5 cm, petiolules (0.1—)0.3—0.6 cm long; midrib prominulous below., secondary nerves delicate, (6—)8—10, tertiary ones hardly conspicuous, indistinctly transverse, generally reticulate. Inflorescences of both sexes 1.5—2 cm long; flowers of the usual type, stamens inserted outside the disc, ovary in the c? flower hardly exserting from disc. Fruits ovoid, 0.7—0.9 by 0.5—0.6 cm.

Collections (already previously quoted):

$ f: New Guinea: *Ledermann 9915.*

Distribution: East New Guinea, in the mountains, 850—1400 m alt.

Remarks: Most probably a near ally to *II. microphyllus* Huss. from West New Guinea (1780 m) which, however, differs by its fewer-jugate leaves (1%—*2y2).*, fewer secondary nerves (4—5) and the presence of glandular pits in the nerve axils underneath.

9. H. leeifolius (Laut.) H. J. Lam, in Lam 1932a, 208; id. 1932b, 417; Husson & Lam 1953, 454; Leenhouts 1956, 246.

Type specimens — 9: New Guinea: *Beccari P.P. 862 (Herb. Fir. 2222)* (PI, neotype, fr.); rf : New Guinea: *Ledermann 9760* (ster. in L, lectotype; plate with *d* infl. and flow., neotype).

Iconography: Lauteybach 1930, 339, fig. 4 (habit, *d* infl. and flow.; stamens incorrect; *Sant anis.)*; Engler & Prantl, Nat. Pfl.fam. cd. 2, 19a, 1931, 454, fig. 218 (same as Lauterbach 1920); Lam 1932b, 413, fig. 46 (leafl., *d* flow.; *H. anis.)* and 50 (leafl., cf infl. and flow.; *H. leeif.)*; Husson & Lam 1953, 442, fig. 10 (habit, infr., fruit, anat. pet., nervation; *H. huss.)*, 444, fig. 11 (habit, anat. pet., nervation, fr.; *H. megac.* $), 448, fig. 13 (habit, $ infl. and flow., infr., fr., anat. pet.; *H. clem.)*, and 445, fig. 15 (leafl., infr., fr. with cross-section; *H. leeif.)* \ the present paper: *fig. 3* (fruit types in cross-section).

Synonyms:

1920 — *Santiria. leeaefolia* Laut., in Lauterbach 1920, 335 — lectotype (ster.): *Ledermann 9760* (L), neotype: plate *$* (L).

1920 — *Santiria anisandra* Laut., in Lautcrbach 1920, 339 — lectotype: *Ledermann 7719 $* (K).

1953 — *Ifaplolobus hussonii* H. J. Lam, in Huason & Lam 1953, 443; Leenhouts 1956, 245 — type specimen: *Becoari Herb. Fir. ttte* $ (and *tt£4A$_t$* dupl.) (FI).

1953 — *Haplolobus megacarpus* H. J. Lam, quoad spec. $ in Husson & Lam 1953, 443; Leenhouts 1956, 245 — type specimen: *Beccari 2225B,* fr. (and *2%t5, eM5A,* dupl.) (FI).

1953 — *Ilaplolobus dementi urn* Husson, in Husson & Lam 1953, 449; Lam 1955, 179; Leenhouts 1956, 245 — type specimen: *Clemens 1768* 9 (B; dupl. in A)*

1933 — *Haplolobus anisander* (Laut.) H. J. Lain, in Lam 1932a, 207; id. 1932b, 414; Husson & Lam 1953, 452; Leenhouts 1956, 246.

Glabrous. Variable species. Branchlets smooth, 0.25—0.7 cm in diam.. Leaves* (}£--) l}£-_8%(—4 1/2)-3ugate> petioles 1.5—10 cm long with 1—14 r. b.; leaflets "variable in size and shape, ovate to ovate-lanceolate, base mostly acute, rarely su'brotundate, apex subabruptly acuminate, 3.5—22 by 1.5_8.5 cm; secondary nerves 6—14, occasionally with hair tufts (domatia) in their axils, petiolules 0.5—3 cm long. Inflorescences small and slender, particularly the *tf* ones; <? ones 1.5—7.5 cm long, 9 ones 1—6 cm. Fruits sometimes 2-see4ed (only species of *Haplolobus* in which this is kfcown, cf. fig. 3), variable in size and shape, 1.1—2.8 by 0.7—1.8 cm, ellipsoid or ovoid to subglobular.

Distribution of the species: Moluccas through New Guinea to New Britain (and Palau?).

Var. leeifolius — Synonyms: *Santiria leeaefolia* Laut; *Haplolobus hussonii* H. J. Lam quoad spec. 9 ; for literature see above.

Leaves (1%—)2%—3y2-jugate; petioles 4—5(—12) cm long with (1—)3_6(_12) r. b.; leaflets rather large, chartaceous, (8.5—)11—17 (—22) by 3.5—8.5 cm, petiolules 0.5—2 cm long; secondary nerves (7—) 9—14. Inflorescences 9 % 2.5— 6 cm long, *d* ones 5.5—7.5 cm.

Collections (already previously quoted) :

9 _ New Guinea-. *Beecari PJ. (Serb. Fir. UM)\ Beccart Serb. Fir. ggg4* and *gggdA* (*E*™ r£ri *Herb. Fir. gggS, gggSA, gggSB,* and *me* (all ex *E. megac.* 9): *Voders vcm Leeuwen 10800* (ex *E. clem.).*

$ - 1& Guinea*: *Beccari P.P. 918 (Eerb. Fir. mi)* *f; *Ledermmn 9760.*

Sterile — New Guinea: *NIFS bb 3046g?* (ex *E. hvxs.).*

NEW G S ! w S ! Nat Guinea: Manokwari, fairly frequent in old forest on coral flimestone, 135 m alt.: *NGBW 3695 (Kalkmm)* (L, MAN), tree, 24 m, nat. (Manikiong) n.: bowwie; domatia!, r.b. 1(—*2).*

Distribution of the variety: Northern New Guinea from Arfak to Sepik, including Japen Isl. (Geelvink Bay), from the lower hills up to 1000 m in the Central Range.

Var. anisaader (Laut.) H. J. Lam, nov. stat. — Synonyms: *SanUna anisander* Laut.; *Haplolobus ckmentium* Huss.; *Haplolobus anisander* (Laut.) H. J. Lam; for literature see above. - Type specimens, cf : *Ledermann 7719* (K, lectotype); 9 : *Clemens1768* (type of *H. demen-Hum* Huss.; neotype of *H. leeifolius* (Laut.) H. J. Lam var. *anvtander* (L. t. Lam).

hh£i ?V2-)iy2-3V2-Jugate, petioles 1.5-4(-6 5) cm long, with l_3f_5) r b.; leaflets rather small and often narrow, thin to subconaceous, (3.5-)4-12(-15.5) by (1.5-)2-6(^7) m, occasionally with some Hair tufts in the nerve axils underneath, petiolules l-2(-3) cm long, secondary nerves (6-)7-11(-14). Inflorescences of both sexes 1-4 cm long, the $ ones few-florous and rather stiff, the *d* ones ve^ slender Fruits sometimes 2-seeded, and then somewhat broader.

Collections:

An asterisk • indicates new material (description *vide infra).*

$ - New Guinea: *Clemens 1768* (ex *E. clem.); NGBW 935 (Vent.)* (ex *E. clem.)*

and £660* *(Brouwer); NGF 7859*; NIFS bb 25015, 30692 91, 30764* 9? (all three ex *R. florib.); Van Boyen 3782* (ex *E. clem.).*

£ — Moluccas: *Main f Aden (Kosternuins) 1253* (ex *11. anis.).*

New Guinea: *Ledermann 7719* (ex *II. anis.,* plate); *NGBW 3948* (Verst.); NIFS bb 30973* (ster. in L, *$* in A) (ex *//. anis.).*

Sterile — Moluccas: *Alain $ Aden (Kostermans) 1417* (ox *77. oe 1.); NIFS bb 23182, 28840, 28871* (all three ex *77. eel).*

New Guinea: *NGBW 2602 (Brovwer)*, 2707 (Browwer)*,* and *4317 (Roster)*; NGF 162* (ex *H. anis.;* New Brit.); *NIFS bb 28970* (ex *II. florib.), 30306* (ox *77. anis.), 30722* and *30777* (both ex *77. florib.), 30824* (ex *77. anis.),* and *31079* (ex *H. florib.).*

Palau: *Kanchira 1874?* (ex *H. celeb.,* in Lam 1955, 177).

New material (sterile unless indicated otherwise):

NEW GUINEA.. West New Guinea: Sorong, Sausapor, old forest on slope, sandy clay, 15 m, scattered: *NGBW 3948 (Versteegh)* (L, MAN), tree, 20 m, diam. 0.35 m, buttresses to 1.1 m high, buds in October 1956, nat. n.: imlolee (Manikiong), gwal (Karoon), dulok (Mooi) ; Manokwari dist., Oransbari, rather frequent in second growth forest on slope: *NGBW 2602 (Browser),* tree 26 m (L, MAN), nat. (Manikiong) n.: bowwie; Hollandia, Cycloop Range in old forest on slope, 380 m alt.: *NGBW 4317 (Koster)* (L, MAN), tree, 17 m, bark brown peeling off in flakes, resin little, whitish; same locality, about 500 m alt., rather frequent in young forest: *NGBW 2660 (Brouwer)* (L, MAN), tree, 15 m, $ flow, buds in December 1955; Hollandia, near mouth of Tami river, old forest on flat, fairly frequent: *NGBW 2707 (ScJi-ram)* (L, MAN), tree, 21 m, nat. (Sko) n.: djong. — East New Guinea: Morobe distr., Buang track along ridge above Gabensis, 570 m alt.: *NGF 7259 (Floyd) (LAB,* L), tree, 18 m, old 9 flow., fr., in May 1955, fr. ovoid, black, borne in great abundance (1- and 2-seeded).

Excluded.

Transferred with doubt to *77. celebicus* H. J. Lam:

Moluccas: *NIFS bb 16456, 22832, 24852, 24882, 24939, 25841, 25878, S9878* (all ex *H. anis.).*

Distribution of the variety: Moluccas (Sula, Batjan, Morotai), New Guinea (northern part incl. islands in Geelvink Bay) from Sorong to Morobe dist. (incl. New Britain), Palau?; from sea level to 1000 m (Morotai).

Remarks: Although the two varieties are connected by some intermediate specimens (e.g. *Clemens 176S,* the type of *H. clementium),* the majority of the specimens are well distinguishable as belonging to one of the two varieties, which are particularly characterised by the size of their leaflets and inflorescences. Also the distribution of the two varieties is fairly markedly different., var. *anisander* having the wider one. All these facts made us choose the rank of varieties rather than forms, but their difference appeared to be insufficient to justify to keep them apart as species.

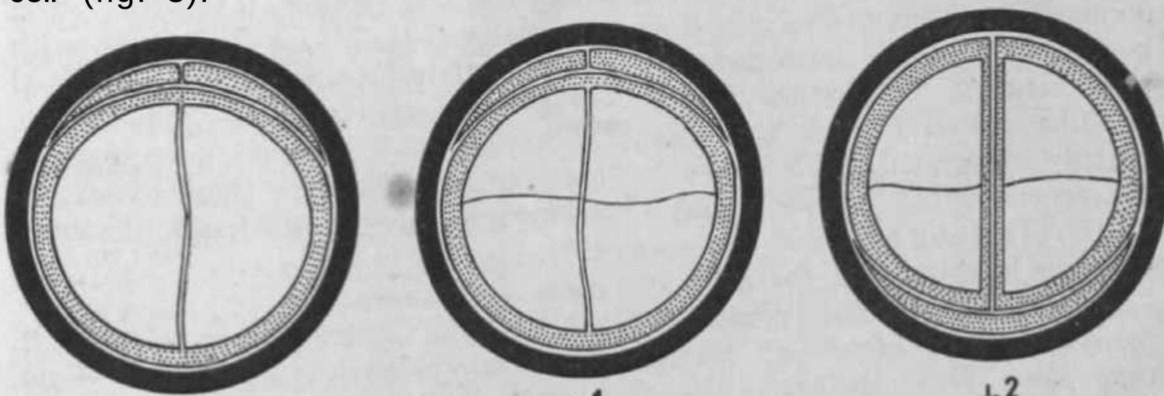
Some specimens of var. *anisander* show some traces of hair tufts (domatia) in the nerve axils underneath and it is striking that two of these *(Main & Aden 1253* and *1417)* have been collected in Morotai, and that the altitude of one of these *(1253)* is indicated as 1000 m. The point is that *Main & Aden 1316,* the type of *H. monophyllus* H. J. Lam, was collected at the same locality (Mt Pare-Pare) and the same altitude. It should well fit in *H. leeifolius* var. *anisander* but for the fact that the leaves are only l-r-3-foliolate and that there are domatia in all nerve axils. The above-mentioned specimen *Main & Aden 1253* has 5—7 leaflets and 3 r. b. in the petioles (*//. monophyllus:* 1).

Another specimen (of var. *anisander)* with some traces of domatia

is \IFS bb 30973 from Now Guinea (IsL of Meosnum, 200 m); it shows domatia were also found in the type variety (NGBW 3695)

h are only two sterile specimens with extraordinarily large leaves and lanc ...eifolius ?), of which the oblong- ...cm with petiolules up to 2.5 cm and about 19 secondary nerves, r. b. 1– ... and Main & Aden 1253 (var. anisander) with oblong leaflets of ab... cm, petiolules about 2.5 cm long, number of secondary nerves normal, r. b. 3. The other sheet of this number is normal and c?- Both speeun,,., nro c-onsidered suckers.

...eeded fruits (the first ones detected in the genus) are tound next ...e-seeded ones in a prop... both the two seeds in one cell (fig. 3).



... leeifolius (Laut.) H. J. Lam, var. anisander (Laut.) H. J. Lam — diagrams of 1- and 2-seeded fruits — a. one-seeded; b¹. two-seeded, one cell; b². two-seeded, two ceUa — after NGt " 7259.

H. heifoUus is unduubiedh ...elated to H. floribiindrus, from which it is distinguished by the generally acute base of its leaflets which, particularly in var. .ptofcr, are ^ « " 2 S ...bly smaller than in H. fioribundus, in which the inflorescences, and ...ularly the male ones, are considerably longer than in H. leetfoUus.

Sterile spe.in.ns, or ^ther specimens withou... of var. ...ander may be easily confused with those of Santiria a^ ta^ U to a lesser extent, with S ^ ^ Bl., which are both known to overlap the generic area Haplolo... though with a gap in the Moluccas (ct diagram on n ii41). HI <*•* ir <•*-, fact they can only be identified with doM on the ** ... *;,nc characters which are fairly v « ™ ^ are mostly not clearl>.

In var. fln«a»d«r the second* ... if » ^ es ...e distflncc to the margin archingly joined near the margin, am "- J' (]is)ill,flv n,insv,rse. m is ven- s,nall. and the ternary ne 1 «. •• llv ^ ^ ^ j (^ e l S o » ^ r W » < the tertiary v,n o - ne" ^ ter V ...e often ^ ^ to the secondary nerves), and » * ' a ^ ^ fl·om the m;iri,in, while the archingly joined at * « * ^ *g ? l & than in S@M« "* ...tertiary venation is transv... folius var. rt»n'.s(f ...der.

The leaflets of the latter arc mostly rather rigid. Tender ones may be still young and in regard to their identification the line against *Santiria apiculata* has 'been on account of the nervation. On this ground the only (sterile and therefore doubtful) specimen of *Santiria apiculata* from Celebes was identified as such. On the other hand *Main & Aden 1253* could as well be regarded as a representative of *Santiria apiculata* but for its occasional domatia. For further remarks see under *H. borneensis* (excluded).

10. H.? microphyllus lluss., in Husson & Lam 1953, 423; Leenhouts 1956, 240.

Type specimens — 9 : *Brass & Versteegh 11198* (L; dupl. in A); cf : unknown, as are fruits.

Iconography: H^usson & Lam 1953, 422, fig. 2 (habit, nervation and glands., 9 flow, and cross-section of ovary).

Glabrous tree of moderate height. Branchlets slender, 0.15—0.3 (—0.5) cm in diam. Leaves *iy2*—2Vk-jugate, petioles 2.5—3.5 cm long, pith with 1(—3) r.b.; leaflets lanceolate with subrotundate base and long protracted blunt acumen, coriaceous, 3.7—7 by 1.4—2.4 cm, .acumen 0.9—1.2 cm, petiolules 0.9—1.3 cm long; secondary nerves 4—5, curved, near margin^ archedly connected, with above bullate glandula^ pits in their axils. Inflorescences 9 few-florous, about 5 cm long; cf flowers and fruits unknown.

Collections:

The type specimen is the only one thus far known.

Distribution: West New Guinea, in the Central Range, 1780m alt.

Remarks: Probably related to *H. ledermannii* (Laut.) H. J. Lam, from East New Guinea (850—1000 m), which shows the same type of leaflets though somewhat smaller and with more secondary nerves (8—10) without glandular pits and shorter inflorescences (1.5—2 cm long in both sexes).

11. H.? mollis II. J. Lam, in Lam 1955, 177; Leenhouts 1956, 242.

Type specimens — 9 : *Pleyte 345* (L; dupl. in BO); cf : unknown, as are fruits.

Iconography: Lam 1955, 176, fig. 1 (habit, nervation, 9 infl. and flow.).

A tree of moderate size with pubescence on smaller branchlets, petioles and leaflets underneath. Branchlets stout, about 1 cm thick, verrucose. Leaves *Vfe*—8%-jugate, petioles 3.5—8 cm long with 8—10 r.b.; leaflets ovate with a broad rounded more or less oblique base and a short abrupt acumen, sparsely pubescent underneath, 7—19 by 5—11.5 cm, petiolules 1—2.2 cm long, secondary nerves 8—15, tertiary ones transverse, wide apart. Inflorescences 9 lateral on short shoots, branched from base, only 1.5—2 cm long; 9 flowers small, glabrous, cf ones and fruits unknown.

Collections:

The type specimen is the only one known.

Distribution: Moluccas; Halmahera, 600 m.

Remarks: There is no clear relationship with other species but both the hairiness and the short lateral inflorescences link *H. mollis* somewhat up with *H. beccarii* from Sarawak, whfch is, however, very different by its long and narrow leaflets.

12. H. moluccanus H. J. Lam, in Lam 1932a, 270 and in 1932b, 407- Husson & Lam 1953, 433; Leenhouts 1956, 243.

Type specimens — 9 lectotype: *Beguin 1902* (BO), with fr.; cf : *Beguin 2225* (L; dupl. in BO). — Both from Halmahera*

Iconography: Lam 1931, tab. VII, fig. 45 (vase, supply of *tf* flow.); id. 1932a, tab. XI, fig. 60 (cf flow, and diagram); id. 1932b, 413, fig. 40 (leaf, tf infl., anat. of pet., longit. sect, of fr.).

Glabrous tree of moderate size. Branchlets stout, 1—1.5 cm in diam., verrucose, striate as are petioles. Leaves Sy_2—5^-jugate, petioles 8—16 cm long, about 0.7 cm thick, adaxial side flattened, pith with (10*-) 16—25 (—40) r. b.; leaflets chartaceous, broad-ovate to oblong, with broadly acute to rounded or subcordate, slightly oblique base and blunt or shortly acuminate apex, 12—38 by 7—18 cm, petiolules 1.5—3.8 cm long, secondary nerves (9—)12—18, tertiary ones transverse and wide apart. Inflorescences widely branched, in the upper leaf axils, 9 ones (infract.) 7—19 cm long, rather stiff, <f ones very slender with small flowers, 23—32 cm long. Fruits ovoid to ellipsoid, 1.7—2.2 by 0.8—1.2 cm.

Collections (already previously quoted):

•9 : ***Begwin 1902.***
$* : *Beguin 2225; NIF8 bb £4847.
Sterile: ***Begwin 2801; Lam 8588* and *8658) NIFS bb 28158* and *88782.***

Distribution: Moluccas (Halmahera, Morotai, Batjan).

Remarks: As has been explained in Husson & Lam 1953, 434 there is a clear relation with *H. celebicus* in which, however, the number of r.b. is much smaller (1—7) and the leaflets both smaller and narrower. Clearly intermediate types have so far not turned up.

13. H.? monophyllus H. J. Lam, in Husson & Lam 1953, 445; Leenhouts 1956, 245.

Type specimens— 9 : unknown; cf *: Main & Aden (Kostermans) 1316.*

Iconography: Husson & Lam 1953, 446, fig. 12 (habit, rf infl. an^l flow., nervation).

Small tree, glabrous but for the domatia on the lower side of the leaflets. Branchlets slender, 0.2—0.4 cm in diam.. Leaves %—l^-jugate (1—3-foliolate), petioles 2.7—3.3 cm long, pith with 1 r.b.; leaflets ovate, fairly rigid, 6—12.5 by 2.5—5.7 cm, base broadly acute, apex shortly and bluntly acuminate, lower side with conspicuous hair tufts (domatia) in the nerve axils, secondary nerves 6—9, tertiary ones transverse and few, merging into the minute reticulation; petiolules 1.5—1.7 cm long. Inflorescences 9 unknown, cf 0.7—5 cm long, very slender. Fruits unknown.

Collections:
The type specimen is the only one known.

Distribution: Moluccas (Morotai, 1000 m).

Remarks: As has been explained under *H. leeifolius* var. *anisander,* the relation of the present species is most probably with that variety. It differs from it by the characteristics of the leaf (1—3-foliolate, domatia) which are occasionally also found in *H. leeifolius* (both varieties, but the latter never possesses the combination of characters characterising *H. mono-*

phyUus and it **never** has the very minute reticulation of //. *monophylhts.* As to the reticulation and some other **characters** there seems to **be** ;'I[SO] some relationship with the **equally** mountainous //. *nubiycnus* from New **Guinea,** in -which **the leaflets** are still more rigid and **also** smaller, lacking the domatia.

14. H.? nubigenus (Laut.) II. -I. Lain, in Lam 1932a, 208, p.p., id. 1932b, 415, p.p.; ITusson & Lam 1953, 447, p.p.; Leenhouts 1956, 245, p.p.

Type specimens — $: unknown; c? : *Ledermann 9989*, neotype (L).

Iconography: Lam 1932a, tab. 11. fig. 61 (cT How. exc. perianth) ; Lam 1932b, 413, fig. 47b (? **flow.;** the other figures represent *H. triplnjlhts);* the present paper, ***fig.*** *4* (habit, *rf* infl., nerv., 9 flow, **with** long, **sect.,** *d* flow, bud **in** long. sect.).

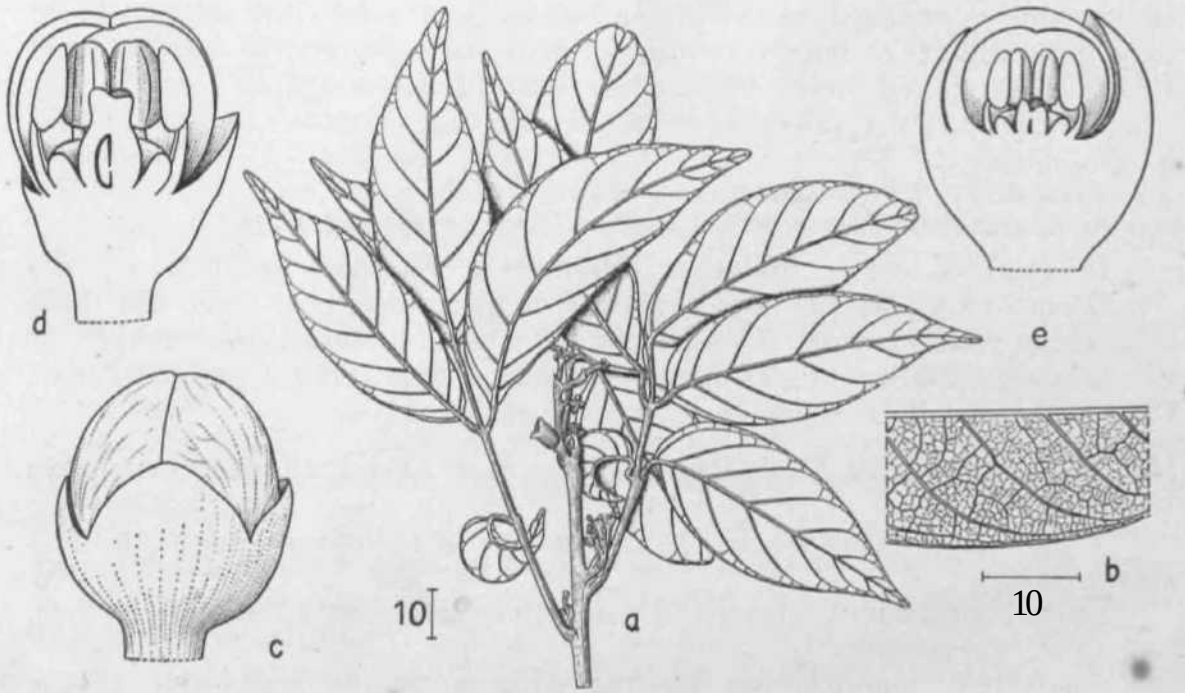


Fig. 4 — *Haplolohas nithiffunus* (Laut.} H. J. Lum — a. liaiiit with *$* **inflowscences;** 1), in*rviit'n»ti ; c-ii. 9 flower with linijiitiidinul section; *o.* J flower bud, longitniliiitit **section;** dimensions in mm — a, b, c. after *Ledernwini !)!>X!>;* <'-d. after ***Ledermann*** *JOSSS* (orig. type, lost).

Synonym:

!!iL'n — ***Santiria nabiffana*** Limt., in Ijiutfrbncli **L920j** :i3ō.

Eeconstxuetion of the description after notes **by** the author on and **Lauterbach's description** of the lost *ty\m* ***(Ledenmmn*** *10323* 9), and the accepted **neotype** ***(Ledermann*** *9989 d,* **cf.** Husson & Lam 19.^, 447); **data** from the neotype between **brackets.**

A sniiill in moderate-sizod gla'brous tree. Branch lets **slender,** 0.5 em (0.2—4).3 cm) in diarn., the innovations furfuraceous. Leaves ***{Vfe—)2%—*** **3^-jtigate,** H)—17(5—**15)** cm IOTIIT, petioles (slender) subcanaliculate (somewhat flatt(ined at. base. **0.8**—3.2 cm **Long, with** 1 r. **b.)**; leaflets coriaceous, t'lliptic* with subi'otundate base, bluntly acuminate, **margins** revolute (Ian-

ceolate with subrotundate to acute base and gradually acuminate apex, 3.7—8 by 1.8—2.8 cm), midrib and the 6—8(7—10) secondary nerves (more or less) prominent underneath, (reticulation conspicuous on either side); lateral petiolules 0.3—0.8, terminal ones 1.2—2.5(1.2—1.8) cm long. Inflorescences 9 paniculate, shorter than the leaves, 2—3 em long, lateral ramifications 0.2—0.3 cm (cM, very young), flowerbuds 0.2 cm. P'ruits unknown.

Collections:

The neotype is the only specimen known: East New Guinea, Sepik area.

Excluded.

Transferred to *R. triphyllus* (Laut.) II. J. Lam: *Ledermann 970S* $ and *9565* **sler. Transferred to** //. *glandulosus* Huss.: *Can 1SSS8* ($ f).

Distribution: East New Guinea, 1000 m.

Remarks: Lam 1932b considered *Santiria nnbigena* and *8. triphytta* conspecific, and Husson & Lam 1953 maintained this opinion. On second consideration, however, it seems preferable to keep the two apart as separate species until more material gives us an opportunity for a better founded decision. Unfortunately Lauterbach's description of the type specimen *(Ledermann 10323* $) is rather poor and the neotype from the same locality, referred to by Lauterbach as probably related to *Santiria nuhigena* differs in some points, e. g. the shape of the leaflets, and is, moreover, from a cf plant. The only remainder of the type *{Ledermann 10323)* is a figure of a longitudinal section of the 9 flower, made by me when examining the type before it was lost in the Berlin herbarium fire, and this figure helps us very little. It is a pity that in my paper of 1932 (b) I gave a description based on all specimens then considered to constitute the species (including the specimens now reconsidered to represent //. *triphyllus)* and the only comment given was that *Ledermann 9989* cf differed "from the other specimens by its more minute venation". As a matter of fact, its leaflets show much resemblance with those of *H. microphyllus* Huss. as to the venation type but they are much shorter acuminate and lack the very characteristic glandular pits in the nerve axils. I am afraid th^ this puzzle will prove to remain unsolvablc unless a duplicate of the type *(Ledermann 10323)* turns up.

//. *nubigenus* as here interpreted differs from //. *triphyllus* by its conspicuous reticulation, its narrower and less rigid leaflets and its *V/2*—3Vk-jugate leaves.

15. **H. pubescens** II. J. Lam, nova spec.

Iconography: the present paper, *fig. 5* (habit with cf infL, ncrv., infr.).

Description of 9 type specimen *{Beccari P.P. 542, Herb. Fir. 2220 & 2220A)* **(FI).**

Arbor? Innovationes cum foliis inflorescentiisquc lanuginoso-pubestes. Ramuli tcretes pubescentes 0.3—0.4 cm diam., medulla aresinosa. Folia (?—)3i/>.—AV_2-jugata, foliolorum facie superiore execpta pubescentia, petioli teretes, graciles, 5—6.5 cm longi, medulla fasciculis resiniferis 7—9 pcrcursa; foliola ovata ad oblongo-lanceolata, membranacea vel chartacea, basi rotundata ad late acuta, apice subaibrupte obtuse acuminata, 6—13 cm loiigii'


10
b
c
10
a
10
J.T. '58.

2—5.8 cm lata, petioluli 0.4—0.9 cm longa; costa media cum nervis secundariis 8—10 marginibus haud conjunctis, angulo c. 75° de costa adseendentibus paulo curvatis cum reticulatione subtus conspicue prominuli, nervis tertiariis transversi prope costam ea perpendicularibus. Flores ignotae. Infructesoentiae novellae in axillis foliorum superiorum confertae, pubescentes rigidae e basi ramosae, 4—8 cm longae. Fructus subglobosi vel ovoidei, 1.3—1.4 X 1.2—1.3 cm, cotyledones planae.

Description of cf type specimen *(NGBW 927 (Versteegh))* (L).

Arbor mediocris. Ramuli cum foliis ut in typo 9 (folia 4^-jugata, petioli 5—6.5 cm longi, fasciculis resiniferis 4—6, foliola 6.5^-13.5 cm longa, 3—5 cm lata, nervi secundarii 7—10, petioluli 0.4—1.1 cm longi). Inflorescentiae graciles a basi ramosae dense pubescentes 7—8 cm longae. Flores novelli 3-meri parvi, certe masculi, sepalis extus longe pilosis, intus glabris, petalis glabris, stamina 6.

Collections (already previously quoted, cf. Husson & Lam 1953, 428 and Lam 1955, 175, both under *H. acuminatus)*:

9 : *Bcccari P.P. 542* (W. New Guinea, Andai).
***$: NGBW 927 Werstecgh)* (Cycloop Ba., 680 m).**
Sterile: *NIFS bb S0470* (Japen Isl., Geelvink Bay, 370 m alt.).

Distribution: West New Guinea.

Remarks: Formerly included in *H. acuminatus* (Schum.) H. J. Lam but on second consideration regarded as a separate species, differing from *H. acuminatus* by the smaller and particularly narrower leaflets *(ac.:* 9—21 by 4—10 cm) which are light coloured when dry, the smaller number of r. b. *(ac.:* 6—17; *pub.:* 4-9) and secondary nerves (ac: 12—18; *pub.:* 7__10). The relation with *H. acuminatus.*lies in the pubescence and the short (but not tortuous) inflorescences.

The 9 and *d* types are almost certainly eonspecific (as far as certainty goes in this genus). The sterile specimen matches the types very well indeed. There is some superficial resemblance with *Santiria apiculata* Benn., var. *pilosa* (Engl.) Kalkm., which has also been collected in some dubious sterile specimens (the type is from Borneo!) in which, however the leaves are mostly only $2y_2$-jugate (rarely 1%- or 3*/2-jugate), the pubescence is much less pronounced and the secondary nerves are mostly clearly archingly joined near the margins, the number of r. b. in the petioles being 1—4. The specimens referred to are *NGBW. 1131, 1874, 1894,* and *4507,* all from the Manokwari-Oransbari region in West New Guinea, and *Saunders 226* from the Ramu Valley, 180 m alt. in East New Guinea.

16. H. robustus II. J. Lam, in Husson & Lam 1953, 429; Leenhouts 1956, 243.

Type specimen — 9 : *Brass & Versteegh 13111 (h;* diipl. in A), with fr.; *cf :* unknown.

Fig. 5 — *napMob-us pubescens* H. J. Lam, nova spec. — a. habit with *J* ^lorea" cences; b. infructescences; c. nervation; dimensions in mm — a, c after *NGBW 927,* b. after *Beocari P.P. 542.*

Iconography: Husson & Lam 1953, 430, fig. 6 (habit, infruct. and fr., nervation).

A tree of moderate size, with the young parts, petioles, inflorescences and the leaflets on lower side densely pubescent. Branchlets stout, 1 cm in diam. or over, the pith without r. b. Leaves 2Vk—3V£-jugate, petioles stout, about 7 cm long, pith with about 15 r. b.; leaflets rigid, oblong, base rounded to subcordate, hardly oblique, apex abruptly acuminate, 14—21 by 6—9 cm, midrib and the 12—16 secondary nerves strongly prominent underneath, pubescent as are the transverse tertiary nerves, upper side glabrous except on midrib. Inflorescences and flowers unknown; infructescences pubescent, robust and stiff, 10—13 cm long, peduncle 1—*4y*$_2$ cm long, lateral ramifications 3.5—8.5 cm long. Fruiting calyx pubescent outside. Fruits 1—1.3 by 0.7—1 cm.

Collections (already previously quoted):

Brass cf *Versteegh 13111; NGBW 1060 (Roster).*

Distribution: West New Guinea.

Remarks: Despite its pubescence obviously related to *H. floribundus* from which it also differs by the very stout infructescences and the more numerous r.b. in the pith of the petioles. Its relation with *H. acuminatus* (cf. Husson & Lam 1953, 431) is rather doubtful.

The second specimen *(N6BW 1060),* in spite of the great difference in altitude (850 vs 18 m), matches the type very well in the shape and size of branchlets and leaflets and the number of r. b. (17) but its pubescence is less dense and the resemblance with *H. floribundus* therefore more striking.

17. H.? triphyllus (Laut.) II. J. Lam, nov. comb.

Type specimens: 9: *Ledermann 9703* (L, dupl.); cf : unknown.

Iconography: Lam 1932b, 413, fig. 47 except b (leaf and 9 inf 1., old 9 flow.); the present paper, *fig. 6* (habit with 9 infl., nerv., 9 flow, with long, and transv. sect.).

Synonym:

1920 — *Santiria triphylla* Laut., in Lauterbach 1920, 330. Treated as a synonym to *Santiria. nubigena* Laut. (= *Ilaplolobus nubi genus* (Laut.) H. J. Lam) in Lam 1932a, 208; id. 1932b, 415; Husson & Lam 1953, 447; Leenhouts 1956, 245.

Description of 9 type duplicate; data from Lauterbach between brackets:

A glabrous, small to moderate-sized tree. Branchlets slender, somewhat angular, about 0.3(—0.4—0.5) cm thick, pith without r.b. Leaves %—IVirjugate (1—3-foliolate), (7—10 cm long), petioles flattened above, 1.2—1.7 cm long, pith with 1 r. b.; leaflets very rigid, ovate to lanceolate (elliptic), with broadly acute base and bluntly acuminate apex and revolute margins, 3.5—9* by 1.5—3.8 cm (5—7 by 2.5—3.5 cm); midrib and the 5—8 (6—7) secondary nerves prominent beneath, reticulation little conspicuous above, hardly so on upper surface, near midrib more or less perpendicular to it; lateral petiolules 0.5—1 cm, terminal ones (or in solitary leaflets) up to 1.8 cm. Inflorescences (9) 1—2.8 (2—3) cm long, branched from the base (lateral ramifications 0.5—0.8 cm long), flowers about

0.lf ** long, (sepals deltoid 0.07 **em, petals** 0.1 **em,** stamen* 6, 0.1 **en,** long). Fruits unknown.

Collections (already ^viourfy quoted):

New Guinea: East New Guinea, Sepik area, 200—400 m: *Ledermann 9703* ♀ (type dupl., L); same loc., 850 m: *Ledermann 9565* (in Lauterbach 1920, 337 erroneously quoted as 97(J5).

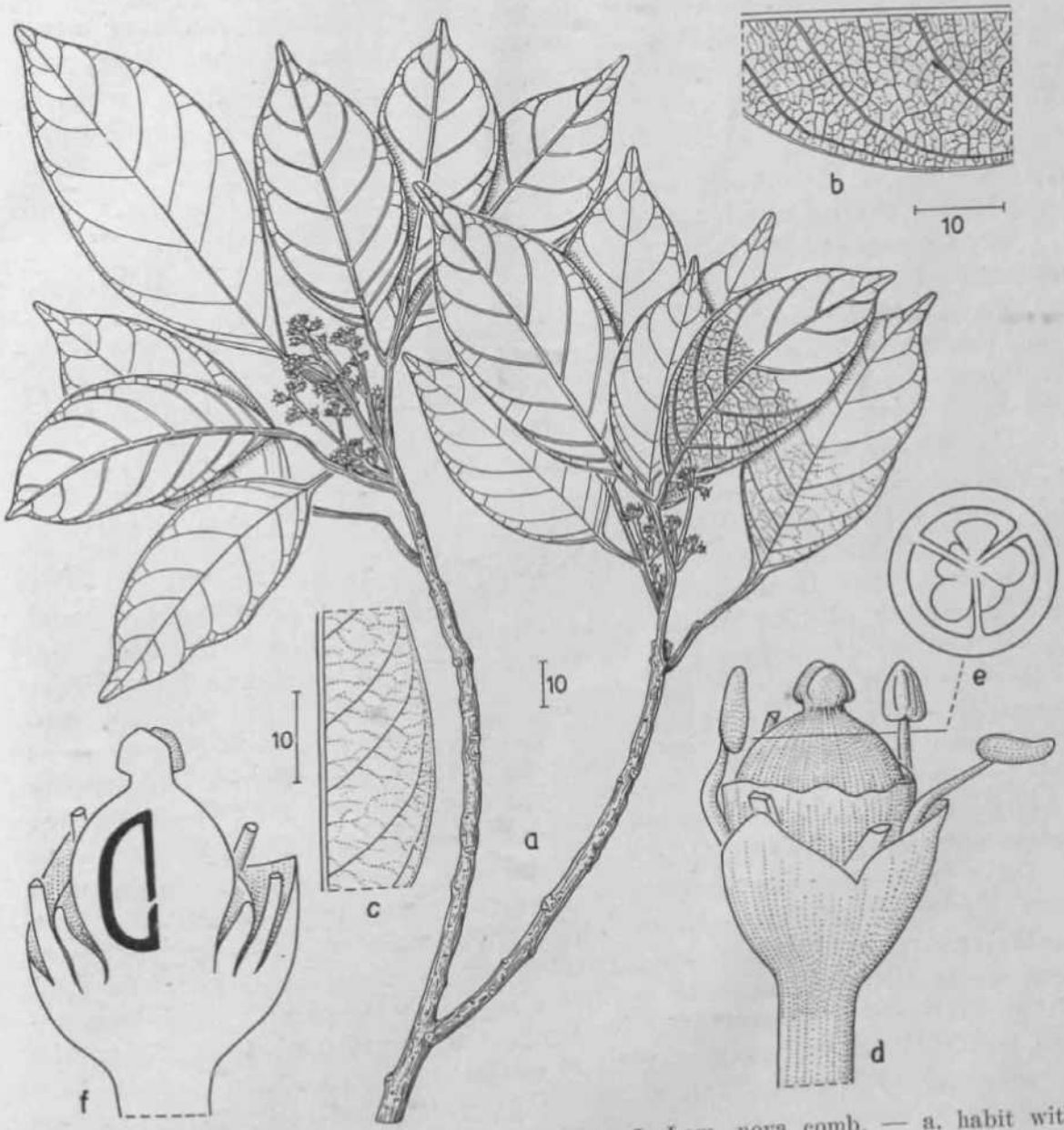


Fig. 6 — *Haplolobus triphyllus* (Laut.) H. J. Lam, nova comb. — a. habit with ♀ inflorescences; b. nervation, lower side; c. ditto, upper side; d–f. ♀ flower with longitudinal section and cross-section of upper part of ovary; dimensions in mm — after *Led* nun mi 9703.*

,.,•,„„, ^00—SOU m.

Remarks: The sterile spec... leaflet shape, size, colour and **stiffncsB, but the retwfttl-** with the **type as to**

ation shows somewhat more distinctly than is the case in the type, whose leaflets are almost smooth above.

The relationship of the present species is not clear. There may be some alliance with *H. nubigenus* (see there), and **perhaps with //. *monophyllus*** from the Moluccas, as well as with *H. glxmdulosus,* but it lacks both domatia and nectaries in the nerve axils and in no other species known to me are the leaflets so rigid. The **"glandular** pits" (outside the nerve axils) referred to in earlier papers may just **be** the results of insect stings and may have nothing in common **with nectaries** but their dark colour and their shallow concavity.

Excluded

H, t borneensis H. J. Lam, in Lam 1932b, 418; Hnsson & Lam 1953, 452; Lam 1955, 179; Leenhouts 1956, 245 — Santiria apiculata Benn.

Type specimens — 9: *Clemens 50337* (L; dupl. in BM) ; *d* : *Clemens 29338* (L; dupl. in BM).

Iconography: Lam 1932b, 525, fig. 93 (habit, *d* infl. and flow., anat. of branchlet and pet.): Lam 1955, 179, fig. 3 (loaf and 9 infl., 9 flow.); Leonhovits 1956, 235, fig. 13 (habit, 9 infl., 9 and *d* flow., fr.; *Sant. apic.).*

Collections (already previously quoted):

$: *Clemens S0SS7.*
$ i Clemens £9SS8, S9SS8A, SOUS, 50441, 505SS.
All from Mt Jviiiabalu, Brit. North Borneo, 1500 m alt.

Remarks: In my previous paper (Lam 1955) I expressed my doubt on the generic identity of the present species in relation to *Snniirin upiculxita,* also on account of the fact that whereas all specimens known **bear** flowers (though only, one 9), fruits remained unknown. I am now convinced that the cause of this condition is that any fruit-hearing specimens were never compared with //. *borneensis* because their fruits immediately led to identification with *Suntina* ***apiculata*** Benn. On **reviewing** the ^material of the last-named species preserved in the Rijksherbarium, I came across specimens, from both Borneo and the Moluccas which on account of their fruit characters belong to ***Santiria,* and** have, correctly I think, been identified as *S.* ***apiculata,*** and -which, even apart from the fruit characters, perfectly mat eh the ***Haplolobus borneensis*** material. In **fact,** two of the Clemens **numbers,** quoted above *(50441, 50563)* have been inserted in *Santiria apiculata* by Kalkman (Blumea 7 (3), 1954, 539), who was not particularly familiar with ***Haplolobus*** species.

The specimens of *Santina* ***apiculata*** which are most important for comparison with *Haplolobus* ***borneensis*** material arc the following:

NORTH BORNDO. Sipitang, 1050 m alt.: *SAN 16271 (Wood),* fr.; same lor. r *SAN 16664 (Wood),* fr.

MiJ'txws. Morotai, 800 m. alt.: ***Main*** tC *Aden (Ko&tenmms) 995,* fr,; same . Inc., 900 m: *same coll. 1103,* fr.

All these specimens have been identified by Kalkman and/or Leenhouts : *S. apicuhitn* Benn. var. ***apiculata.***

As all of **Clemens'** specimens mention the flowers to be **cream-gree**

or yellowish, it may be assumed (cf. Leenhouts 1956, 234) that most specimens formerly combined under *Haplolobus, borneensis* H. J. Lam **actually belong to *Santiria apiculata* Benn. var. *apiculata.***

The identification of *Haplolobus borneensis* with *Santiria borneensis* is, however, not an absolute certainty. The cf type is almost certain]y *8. apiculata,* and so are the other cf specimens. In the $ type, however *(Clemens 50337),* which bears flowers just shedding their petals, the style of the ovary is still perfectly terminal. This need not be conclusive, but it is a fact that even in very young fruits of *Santiria apicuiata* the style is already strongly excentric, although in the *9* flower it is still perfectly terminal. It therefore remains an open question how the ovaries of *Clemens 50x17* would have developed had they been allowed to do so.

The r. b. in the petioles fail to procure evidence. In both *H. borneensis* and *H. leeifolius* var. *anisander* (cf p. 262) there are 1—5 of these, in fruiting specimens of *Santiria apiculata* the majority has 1; 2 and 3 came next, in one specimen there were 6—8 (!) and in another none at all.

It is certainly remarkable that *Santiria apiculata* (incl. *H. borneensis)* and *Haplolobus leeifolius* var. *anisander* have a common mountain station in Morotai.

Index to the identity of specimens

The number between brackets 'behind the specimen quotation is that of the species it is representing. Those which were quoted previously (and in the above text) and do not have their identity changed, are omitted. For particulars about them the earlier papers should be consulted.

A. New specimens.

Brass 25432 (5); NGBW 444 (5), 610 (5), 1014 (5), 1217 (5), 1556 '(5), 1634 (5), 1890 (5), 1892 (5), 1903 (5), 2602 (9), 2656 (7), 2659 (7), 2660 (9), 2707 (9), 3695 (9), 3943 (9), 4040 (7), 4092 (7), 4317 (9); NGF 1312 (5), 7259 (9).

B. Specimens with changed identity (previously quoted under a different species).

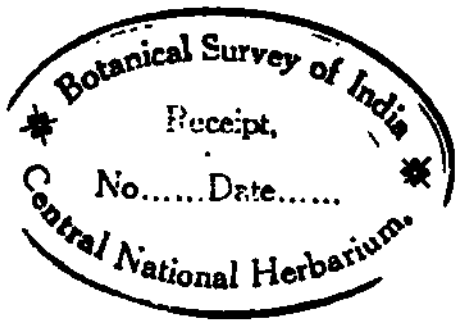
Brass 13152 (6); Brass & Versteegh 12544 (5), 12546 (5); Beccari Herb. Fir. 2225 (and A & B) (9), 2226 (9); Boccari P.P. 542 (15), 862 (9); Carr 13338 (6); Clemens S46 (4), 1752 (4), 1768 (9), 1924 (6), 29338 (and A) (excl.), 50242 (excl.), 50337 (excl.), 50441 (excl.), 50563 (excl.); Docters van Leeuwen 10800 (9); Hoogland 3723 (5); Hoogland & Womersley 3238 (not 3258, cf. Lam 1955, 177) (5), Kostermans, v. Main & Aden; Ledermann 7719 (9), 9565 (17), 9703 (17); Main & Aden (Kostermans) 1253 (9), 1417 (9); NGBW 927 (15), 935 (9), 1004 (5), 1015 (5), 1573 (5), 2660 (9); NGP 162 (9), 7259 (9); NIPS bb 16456 (3), 23832 (3), 23182 (9), 24852 (3), 24882 (3), 24939 (3), 25015 (9), 25088 (7), 25841 (3), 25878 (3), 28840 (9), 28871 (9), 28970 (9), 30306 (9), 30371 (5), 30462 (9), 30470 (15), .30515 (5), 30692 (9), 30722 (9), 30764 (9), 30777 (9), 30824 (9), 3097» (9), 31079 (9), 31878 (3); Van Royen 3782 (9); Smith 5858 (5), 6160 (5); Walker 242 (5).

C. Specimens previously quoted but no longer available and therefore not considered in the preparation of the present study. The numbers between brackets are those of the species they probably belong to.

Brass 685 (1); Christophersen 3279 (5); Clemens 4941a (6); For. Off. Sol. Isl. letter D. 6299 (5); Gillespie 2314 (5); Hollrung 543 (5); Kajewski 574 (5), 943 (5); Kanehira 1874 (£>?); Kanehira & Hatusima 11522 (5); Lam 3550 (12); Lodcrmann 7483 (9); NIFS bb 25095 (5), 25925 (9).

Index nominum

Note. The numbers in brackets behind the names are those of the species in the above enumeration. New species and new combinations are denoted by an asterisk *. Accepted names in roman, synonyms in italics.



Review

TAYLOE, W. B., Marine Algae of the northeastern coast of North America, ill. by Ohin-Chih Jao, second revised edition, IX + 509 pp., with 60 full page plates — University of Michigan Studies, Scientific scries, Vol. XIII, 1907 — Ann Arbor, University of Michigan press. Price $12.50.

The second edition of this well-known and much appreciated book has given the opportunity to the author to incorporate recent views in taxonomic algology, and to make the nomenclature up-to-date.

To the interesting chapter "algal habitats" of the first edition a description of the vegetation of the east coast of Canada could be added. The chapter "collection and preservation" being a good and fairly complete narrative already in the first edition has been supplied with a useful note on staining slides made from herbarium material. In contradistinction to the first edition all specific names arc written with a small letter.

The *Xantliophyceae* have been incorporated in the key, comprising the *Heterosipliomles,* to which the *Vaiiohcriawae* belong. In agreement with recent views this family had to be removed from the *Siphonales.* The four species of *Vauclieria* in the first edition have increased to nine.

In the *Ulotricliales* the *Trentcpohliaceae* of the first edition have been replaced by the ***Chaetopetfaceae*** and the ***Gomontiaccac.*** The ten species of ***Monostroma*** in the first edition have been reduced to five.

In the *Phaeophyceae* the *Lithodcrmataceae* and the *Ealfswceae* have been removed from the *Ectocarpales* and placed in the *Chordariales.* The flame has been done with **the *Aerothricaceae* removed from the *Desmarcstialcs,* and the *Stilophoraceae* removed from the *Punetariales.* We find *Dictyosiphon hippuroides* reduced to a forma of** *D. foenioulacew;* and, added to the species of the same genus in the first edition *D. cliordaria. Gobic baltica* having been dropped. The *Fucales,* comprising one family in the first edition, arc subdivided into *Fuoaoeae* and *Sargassaccac.* To the three species of *Sargassum* in the first edition a fourth has been added.

Colaoonema has been removed from the *Bang%aks,* and placed in the *Nemalumales.* To the *Acrochaetiaceae* of this order have been added the genera *Kylinia* and *Adouinclla. Furoelkria fastigiata,* a doubtful record in the first edition, is enumerated with certainty. To the species of *Phyllophora* in the first edition a fourth has been added. There are some minor changes in the keys to *Callithamnion* and *Ceramium.*

The beautiful illustrations have been left unaltered.

J. TH. KOSTER.