

## MATERIALS FOR A REVISION OF LAURACEAE III \*

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## SUMMARY

1. In this paper a total of 153 species of Lauraceae (not including the 96 species reduced to synonymy) are discussed.
2. New species are described in *Alseodaphne* (1), *Beilschmiedia* (6), *Cinnamomum* (23), *Cryptocarya* (3), *Endiandra* (3), *Lindera* (1), *Litsea* (24), *Persea* (2) and *Phoebe* (4).
3. New combinations are proposed in *Beilschmiedia* (2), *Endiandra* (1) and *Litsea* (3).
4. New names are coined for species of *Beilschmiedia* (1), *Cinnamomum* (2) and *Litsea* (2).
5. Reductions are made in *Actinodaphne* (5), *Alseodaphne* (1), *Beilschmiedia* (5), *Cinnamomum* (45), *Endiandra* (3), *Lindera* (1), *Litsea* (11), *Machilus* (1), *Neolitsea* (3), *Persea* (2), *Phoebe* (4), *Tetradenm* (3) and *Tetranthera* (11).
6. *Beilschmiedia maingayi* Hook. f., *Cinnamomum sibavenium* Miq., *Litsea artocarpifolia* Gamble and *L. castanea* Hook. f. are recorded for the first time for Java.

## INTRODUCTION

The third part of the "Materials" was partly worked out and written under very adverse conditions, the author being detained on the — already proven false — accusation of being involved in a murder case. After a period of almost unbearable hardship, the authorities of the Office of the Prosecuting Officer in Bogor provided me with an adequate working space and facilities to carry on my scientific work. For this and for the kindness extended to me during this difficult period, I herewith extend my thanks to the Authorities concerned.

## ALSEODAPHNE Nees

*Alseodaphne ramosii* Kosterm., *spec. nov.* — Fig. 1

Arbor fere glabris in omnibus partibus ramulis gracilis laevis foliis alternantibus coriaceis obovatis obtusis basi sensim attenuatis utrinque

\* The first and second parts appeared in *Reinwardtia* 7: 291-356 and 451-536 respectively.

perdense minutissime prominulo-reticulatis supra nitida nervo mediano prominulo costis filiformis prominulis subtus subnitida nervo mediano prominulo costis filiformis vix prominulis petiolis longis paniculis axillaribus foliis brevioribus paucifloris vix ramosis pedunculis communis longis tepalibus ellipticis acutis aequalis vix pilosis staminibus glabris exterioribus antheris ovalis introrsis interioribus cellulis extrorsis glandulis basalibus parvis.

TYPUS: *Ramos*, B. Sc. 80J+26 (BO).

Tree, almost glabrous in all its parts except a few, sparse hairs on the leaves of the flush and on the tepals. Branchlets slender, smooth; branches with small, round lenticels. Leaves spirally arranged, coriaceous, obovate, 1.5 x 3.5 — 3.5 x 8 cm, obtuse, base gradually tapered into the 1 — 1.5 cm long petiole, very densely, minutely, prominulously areolate-reticulate on both surfaces; upper surface glossy, midrib prominulous or flush with the surface, lateral nerves filiformous, prominulous; lower surface more dull, midrib prominulous, lateral nerves 4 — 6 pairs, very slender, hardly prominulous, erect-patent, somewhat arcuate.

Panicles axillary under the flush, 3 — 5 cm long, few-flowered, peduncle long, branches few, apical, very short. Tepals aequal, elliptic, acute, 3 mm long, stamens 1.5 mm, anthers oval, as long as the slender filaments, those of the outer stamens with 2 pairs of introrse cells, inner row with narrow anthers with extrorse cells, the upper pair very small, basal glands sessile, small; style slender, as long as the stamens. Pedicel 3 — 5 mm long.

Related to *Alseodaphne philippinensis*, but the leaves different. The leaves resemble those of *Dehaasia cairocan*.

PHILIPPINES: Batanes Pfov., Batan Isl., June - July, fl., *Ramos* B. Sc. 8042/1 (BO, NY, SING), distributed as *Endiandra coriacea* Merr.

#### BEILSCHMIEDIA Nees

##### 1. BEILSCHMIEDIA ACUTIFOLIA Teschn.

Cf. Kostermans, *Bibl. Laur.* 115. 1964. — Typus: *Schlechter* 17112 (BO, SING), syn-types: *Schlechter* 17227 (P), 1761)5 (P).

New synonyms: *Beilschmiedia archboldiana* Allen, cf. Kos-termans, *I.e.* 116. — Typus: *Brass & Versteegh* 13533 (A, BO, L); *Beilschmiedia tessendorffiana* Teschn., p.p. (quoad specim.: *Ledermann* 9313).

The leaf size varies from 2 x 5 cm (near the inflorescence) to 5 x 15 cm. *B. tessendorffiana* has a much shorter acumen and the flowers are almost glabrous.

Additional specimens: NEW GUINEA. W. Irian, Isl. Biak, Serui, alt. 50 m, ster., 66. 30734 (A, BO, L); Manokwari Distr., Prafi, alt. 150 m, common, tree 26 m tall, bole 21 m, diam. 42 cm, no buttresses, bark smooth, brown, white inside, slash red, wood white, ster., *B.W. 8171* (L, LAE), distributed as *Cryptocarya multinervis*; Wariki, 50 km W. of Manokwari, alt. 3 m, rather common, tree 12 m, diam. 40 cm, bark smooth, brown, inner bark whitish inside, slash light brown, sapwood white, Aug., buds yellowish green, *B.W. 5796* (BO., L); E. New Guinea, Sogeri region, ster., *Forbes 788* (FI); *ibid.*, ster., *N.G.F. 2824* (LAE), leaves more rigid; Markham Point, 6° 4' S, 146° 55' E, in *Quercus* forest near top of hill, alt. 500 m, tree 25 m, bole 13 m, diam. 60 cm, bark lightbrown, flaking off in small patches, under bark brown, wood pale orange yellow, leaves green above, bluish grey underneath, Nov., buds white, *N.G.F. 20165* (A, BO, BRI, CANB, K, L, SING).

## 2. *Beilschmiedia eusideroxylocarpa* (Kosterm.) Kosterm., *comb. nov.*

*Endiandra eusideroxylocarpa* Kosterm. (basionym) in *Reinwardtia* 5: 348, t. 9. 1960; *Bibl. Laur.* 486. 1964. — Typus: *Brun. 0831* (BO).

Inflorescence axillary, glabrous, slender, hardly branched, up to 3 cm long; flowers very few, on 3 — 7 mm long pedicels, glabrous.

Additional specimen: SARAWAK, Baram Distr., Mt. Mulu, path from Sg. Melinau Paku, alt. 1250 m, tree 23 m, 25 cm diam., June, buds, *S. 4579* (A, BO, K, L, SAR, SING).

## 3. BEILSCHMIEDIA GLAUCIPHYLLA Kosterm.

Cf. Kostermans, *Bibl. Laur.* 129. 1964. — Typus: *Beccari 686* (BO, G, K, L, S), ster., Borneo.

New synonym: *Beilschmiedia gynotrochioides* Kosterm. in *Reinwardtia* 7: 292. 1969. — Typus: *S. 18908* (A, BO, K, KEP, L, SAN, SAR, SING).

Additional specimens: BORNEO, Sarawak, Semengoh Arbor., Kuching, mixed Dipterocarp forest, leached yellow, sandy soil, alt. 15 m, tree 10 m, diam. 10 cm, bark smooth, grey, May, buds pale yellow, *S. 13957* (A, BO, K, KEP, MEL, P, SAN, SAR, SING); Mt. Santubong, heath forest on sandstone slope, alt. 50 m, tree 10 m, diam. 20 cm, bark rough, slightly flaky, June, *S. 21531* (A, BO, K, KEP, L, SAN, SAR, SING); Carapa Pila, Ulu Mujong, Balleh, pole forest, basalt plateau, alt. 1000 m, tree 33 m, diam. 40 cm, no buttresses, bark ochreous, coming' off evenly in small, chartaceous flakes, inner bark 12.5 mm, dull brown, wood cream with lenses of storied structure, April, immature fr., *S. 19997* (A, K, L, SAN, SAR, SING), fruit ellipsoid, 4.5 X 7 cm, green, stalk cylindrical, 1 cm long, 1 cm diam.

## 4. *Beilschmiedia lucidula* (Miq.) Kosterm., *comb. nov.*

*Cryptocarya lucidula* Miquel (basionym), *Pl. Ind. bat.* 1: 922. 1858, cf. Kostermans, *Bibl. Laur.* 413. 1964. — Typus: *Horsfield s.n.* (BM, BO, CAL, K, U), Banju-mas, Java, fl.

Synonyms: *Beilschmiedia praecox* K. & V., cf. Kostermans, I.e. 145. — Typus: Herb. Koorders, E. Java (BO, L); *Beilschmiedia nervosa* (Elmer) Merr., cf. Kostermans, I.e. 140; *Linodera iiervosa* Elmer, cf. Kostermans, I.e. 782. — Typus: *Elmer 11833* (BO, K, L, UC), Todaya, Mt. Apo; *Pygeum nervosum* Elmer, Leaflets Philip. Bot. 2: 1653. 1913 ex Koehne in Engl. Bot. Jahrb. 52: 337, 345. 1915; Hallier in Meded. Rijks Herb. Leiden 35: 33. 1918; *Endiandra sumatrana* Miquel, cf. Kostermans, I.e. 496. — Typus: *Teijsmann 1010 H.B.* (U) near Batang baroe, "Kaju wada"; *Beilschmiedia assamiew* Auct. (non Meissn.), Backer & Bakh., Fl. Java 1: 130. 1963; *Beilschmiedia leytenis* Merr., cf. Kostermans, I.e. 134. — Typus: *Wenzel 501* (Ki, syn-typus: *Wenzel 183*, *Whitford 11633*, *Meyer & Foxworthy 13561*).

The best specimen of Horsfield's type collection is at the British Museum, a flowering branch, which leaves no doubt that my conclusion (in Reinwardtia 5: 395. 1961) that this is conspecific with *Beilschmiedia praecox* was right.

I assumed at that time, that it was conspecific with *B. ivightii* of S. India and *B. assamica* of Assam, Burma and Bengal, but after careful comparison I have come to the conclusion, that the Malesian *Beilschmiedia lucidula* is different from the continental *B. assamica* because of the shape of its foliar bud scales, the much shorter inflorescences and the not impressed midrib. These characteristics seem to be constant.

Elmer mentioned in the discussion of his *Linodera nervosa* that the type specimen was distributed as a *Pygeum* (but he did not mention a specific epithet), hence the name *Pygeum nervosum* is attributed to Koehne.

##### 5. BEILSCHMIEDIA MAINGAYI Hooker f.

Cf. Kostermans, Bibl. Laur. 137. 1964. — Typus: *Main gay 1268* (K).

Additional specimen (first record for Java): W. Java, bivouac, Denu, Tjipatja, Distr. Tasikmalaja, rare, Aug., fl., fr., *Backer 8977* (BO, L).

Additional reference: Anderson in Gardens Bull. S.S. 20: 196. 1963.

##### 6. *Beilschmiedia morobensis* Kosterm., *spec. nov.* — Fig. 2

Arbor ramis sat gracilis lenticellatis laevis apicem versus minutissime gracile adpresse pilosis foliis alternantibus chartaceis glabris ellipticis vel anguste ellipticis obscure acutis basi acutis supra nitida obscure reticulata nervo mediano vix prominulo costis filiformis prominulis subtus subnitida nervo mediano prominulo pustulato costis filiformis vix prominulis rete sat obscuris petiolis brevis paniculis axillaris foliis aequilongis vel longioribus sat dense minutissime (sub lente) sublanuginoso-tomentellis tepalis ovatis acutis pilosis antheris exterioribus late ovalis fila-

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mentis latis pilosis cellulis introrsis, interioribus angustis cellulis lateralis ovario subglobosa stylo breve.

TYPUS: *Havel N.G.F. 9151* (BO).

Tree, 40 m tall, diam. 110 cm, crown dense; bark 18 mm thick, outer bark rough, peeling off in small, irregularly shaped flakes, red-brown, underbark flesh and wine red, marbled, inner bark light brown with red veins, turning red brown, corky, non-fibrous with fruity smell, wood of medium weight and hardness, straw, characterized by irregularly spaced bands of parenchyma. Branches slender, smooth, with numerous small, pale lenticels, towards their apices minutely (under high power lens) adpressed pilose. Leaves spirally arranged, chartaceous, glabrous, elliptic or narrowly elliptic, 2 x 6 — 4 x 9 cm, both surfaces rather glossy with rather obscure prominulous reticulation and some pustular dots, acutish base and top, midrib pustular, prominulous on both surfaces, lateral nerves ca 9 — 11 pairs, very slender, rather obscure, prominulous on both surfaces, erect-patent. Petiole 5 — 8 mm, rather slender.

Panicles axillary, densely very minutely grey sublanuginose-tomentellous, 4 — 10 cm long with long peduncle, tepals ovate, acutish, 2.5 mm; stamens almost as long as the tepals, outer anthers broadly oval, pilose, cells introrse, filament broad, as long as the anther, inner anthers very narrow with lateral cells and large, sessile, globose glands; ovary ovoid-globose merging into a very short style with inconspicuous stigma.

Characterized by the smooth lower leaf surface; related to *B. acutifolia* and *B. tessendorffiana*.

TERRITORY OF NEW GUINEA, Bulolo, in lower sawmill Creek L.A., Morobe distr., alt. 800 m, leaves thin, membraneous, glabrous, venation indistinct except for midrib, tepals yellow green with red tinge, anther yellow, June, fl., *N.G.F. 9159* (BO); *ibid.*, alt. 1200 m, tree 30 m, diam. 60 cm, June, fls. cream, *N.G.F. 7469* (BO, LAE). — W. IRIAN, Mimika Distr., Aria (Uta), alt. 4 m, tree 20 m, diam. 40 cm, ster., *bb. S2865* (BO).

### 7 *Beilschmiedia murutensis* Kosterm., *spec. nov.* — Fig. 3

Arbor ramulis dense minutissime ferrugineo tomentellis lenticellatis foliis alternantibus vel suboppositis coriaceis ellipticis acutis basi breve acutis vel subobtusis supra glabra nitida prominule reticulata nervo mediano lato piano costis filiformis prominulis subtus opaca dense minutissime ferrugineo pilosa nervo mediano prominente costis arcuatis erecto-patentibus prominulis rete laxe sat obscure connectis petiolis bene evolutis paniculis axillaris foliorum multo breviorum dense minutissime pilosum pauciflorum tepalibus aequalis intus pilosis staminibus tepalibus brevioribus filamentis pilosis.

TYPUS: *Bias Paie S. 2650k* (SAR).

Tree 10 m, diam. 25 cm. Branchlets densely, very minutely brown or rusty pilose. Leaves spirally arranged and opposite, coriaceous, elliptic, 2.5 x 4 — 4.5 x 8 cm, acute, base contracted into the petiole, obtuse or

acutish; upper surface glabrous, glossy, densely, prominulously reticulate, midrib broad, flush with the surface, lateral nerves very slender, prominulous in a groove, lower surface dull, densely, minutely, rusty pilose, midrib prominent, lateral nerves 6—7 pairs, erect-patent, prominulous, arcuate, connected by lax, hardly prominent secondary veins. Petiole 5—10 mm long, stout, flat above. Panicles axillary, few-flowered, densely, minutely rusty pilose, up to 2 cm long, hardly, very shortly branched, bracts caducous. Flowers 1.5 mm diam.; tube shallow, tepals 1.5 mm, ovate, acutish; stamens 1.75 mm long on ca 0.5 mm long, pilose filaments, outer anthers subovate, truncate, cells introrse, inner anthers narrower, cells extrorse, basal glands small, sessile, ovary subglobose, glabrous, style slightly shorter than the ovary, stigma inconspicuous.

BORNEO, Sarawak, G. Murut, near summit, alt. 2300' m, Oct., fl., *Bias Paie S.* 2650% (BO, K, L, SAR).

8. *Beilschmiedia novae-britanniae* Kosterm., *spec. nov.* — Fig. 4

Arbor ramulis lenticellatis apice minutissime adpresse pilosis foliis suboppositis chartaceis ellipticis sensim subacutis basi in petiolum brevem contractis supra glabra subnitida obscure laxe gracile reticulata nervo mediano prominulo costis filiformis prominulis subtus pallidiora sub lente minute sparsissime adpresse pilosis gracile sat laxe reticulatis nervo mediano prominentibus costis erecto-patentibus prominentibus paniculis laxis latis gracilis multifloris longis sparse minutissime griseo tomentellis vel adpresse pilosis tepalis ovato-ellipticis acutis filamentis pilosis sat latis glandulis basalibus globosis sessilibus ovario glabro stylo breve stigmatate inconspicuo.

TYPUS: *Frodin N.G.F.* 26752 (LAE).

Tree 12 m, diam. 15 cm, branchlets minutely lenticellate, at the apex minutely adpressed pilose. Leaves subopposite, chartaceous, elliptic, up to 11 x 30 cm, gradually acuminate with blunt tip, gradually narrowed to the base, which contracts into the 5—10 mm long, rather thick petiole; upper surface slightly glossy, minutely, rather laxly reticulate, midrib prominulous, lateral nerves filiformous, hardly prominulous; lower surface paler, laxly, minutely adpressed pilose (under high power lens), midrib prominent, minutely pustular, lateral nerves ca 10 pairs, erect-patent, arcuate, slender, prominent.

Panicles axillary near the apex of the branchlets, slender, very minutely grey tomentellous or subadpressed pilose, up to 24 cm long, the branches, widely spaced, slender, up to 7 cm long; pedicel filiformous, 1 mm long, contiguous with the filiformous branchlets, bracts deciduous; tepals slightly, minutely adpressed pilose, narrowly ovate, 1.5 mm, acutish; stamens 1 mm, outer row with oval anthers with large, introrse cells, as long as the broad, pilose filaments; inner row with narrow anthers and extrorse-lateral cells, basal glands globose, sessile; ovary globose-ovoid, style slightly shorter, subconical, stigma inconspicuous.

NEW BRITAIN, Talasea, limestone pothole region, 10 m. S. of Cape Runge, 5°35'S, 147° 24'E, alt. 200 m, bark red-brown thin, slightly fissured, lenticels few, blaze dark orange-brown, wood straw with yellow vessels, odourless, exudate orange, leaves dark-green on both sides, May, fls. white, anthers yellow, *N.G.F.* 26752 (BO, LAE); Woodlark Isl., Kulumadau, alt. 30 m, subcanopy tree of 20 m, Nov., fls. whitish, *Brass* 23601 (L), leaves up to 10 X 21 cm, inflorescence 23 cm long; Solomon Isl., Bougainville, Koniguru, Buin, alt. 900 m. common tree 7 m, Aug., fr. dark red, oblong, 17 X 50 mm (fresh), *Kajewski* 2126 (BISH, BM, BO, K, L, SING).

9. *Beilschmiedia oligocarpa* Kosterm., *spec. nov.* — Fig. 5

Arbor parva ramulis gracilibus glabris foliis oppositis subcoriaceis glabris ellipticis laevis acutiusculis basi cuneatis supra subnitida nervo mediano costisque obscuris subtus pallidiora nervo mediano piano obscuro costis obscuris petiolis brevis fructus ellipsoideus pedicello crasso cylindrico sparse minutissime adpresse puberulo imposito.

TYPUS: *Anderson S. 3101* (BO).

Tree, diam. 12 cm; branchlets slender, sulcate, glabrous; end bud densely, minutely grey-sericeous; branches slender, grey, smooth. Leaves opposite, thinly coriaceous, elliptic, 2 x 5 — 4 x 9 cm, acutish, base cuneate, tapering into the ca 5 mm long, sometimes concave petiole, both surfaces very smooth, upper one rather glossy, midrib faint, prominulous or flat, lateral nerves ca 6 pairs, hardly visible; lower surface paler, very smooth, midrib flat, lateral nerves hardly visible.

Infructescence axillary, 1 cm long, not branched, thick, bearing one ellipsoid fruit of 13 x 24 mm on a thick, cylindrical, minutely adpressed pilose, 5 mm long pedicel.

A peatswamp forest species, very characteristic because of its smooth leaves, hardly showing the main nerves and the one-fruited, very short infructescence.

BORNEO, Sarawak, Tinsu Peninsula, low, swamp forest, Nov., fr., *Anderson S. 3101* (BO, SAR, SING).

10. *Beilschmiedia pullenii* Kosterm., *spec. nov.* — Fig. 6

Arbor ramulis sat crassis minute lenticellatis apicem versus minutissime (sub lente) sericeis foliis alternantibus rigide chartaceis glabris anguste ellipticis obscure acuminatis basi acutis supra sat obscure laxe prominule reticulata nitida nervo mediano prominulo vel piano costis filiformis subtus nervo mediano prominulis strictis erecto-patentibus rete sat obscure prominulis petiolis longis paniculis axillaribus multifloris foliis longioribus sparsissime minutissime (sub lente) pilosis floribus subglabris tepalibus ovatis acutis staminibus dense griseo pilosis antheris staminibus exterioribus magnis ovatis dense pilosis cellululis parvis introrsis antheris interioribus angustis glandulis basalibus ovario glabro subgloboso stylo breve stigmatem inconspicuo.

TYPUS: *Pullen 5888* (CANB).



Tree 37 m tall, bole 29 m, trunk white; branchlets minutely lenticellate, towards the apex very minutely sericeous; end buds densely, minutely, white sericeous. Leaves spirally arranged, stiffly chartaceous, glabrous, narrowly elliptic, 3 x 9—4.5 x 14 cm, obscurely acuminate, base, gradually tapered into the slender, up to 2.5 cm long petiole; upper surface glossy, rather obscurely, prominulously reticulate, midrib prominulous or flush with the surface, lateral nerves filiformous, slightly impressed, lower surface dull, obscurely reticulate, midrib prominent, lateral nerves 10—13 pairs, prominulous, slender, erect-patent, straight (curved near the margin).

Panicles axillary, many-flowered, rather wide, up to 15 cm long, very sparsely, minutely (under high power lens) pilose, branches widely spaced, up to 4 cm long. Flowers practically glabrous, immature, tepals ovate, acutish, 1—1.5 mm, stamens densely grey pilose, anthers of the outer stamens elongate ovate, densely pilose, cells small, apical, introrse, filaments not yet developed, inner stamens much narrower with lateral cells and basal, sessile glands; ovary subglobose, glabrous, merging into a very short style, stigma inconspicuous.

NEW GUINEA, Papua, Northern Div., N. side of Sibium Range, S. of Toma, Bariji-Managalase area, alt. ca 900 m, *Arauearia-Anisojjitera* forest, local name: Towa (Baryi-Managalase), Sept., buds yellowish green, *Pullen* 5888 (BO, CANB, LAE).

### 11. *Beilschmiedia pustulata* Kosterm., *nom. nov.*

*Endiandra dielsiana* Teschner (base) in Engl. bot. Jahrb. 58: 417. 1923. — Typus: *Ledermann* 8885 (SING), syn-typus: *Ledermann* 124.38; cf. *Kostermans in Reinwardtia* 7: 476. 1969.

Of this species mature flowers are still unknown. The subopposite leaves, the reticulation and the pustules on the leaves common in several species of *Beilschmiedia* make it evident, that this belongs in *Beilschmiedia*. The type specimen of the conspecific species *Endiandra glandulosa* Allen has ripe fruit, which are also typical for *Beilschmiedia*.

The specific epithet "*dielsiana*" is already pre-occupied in *Beilschmiedia*; neither can the epithet of the conspecific *Endiandra archboldiana* Allen be used.

Additional specimens: W. IRIAN, Vogelkop Peninsula, S. slope of Mt. Nettoti, path Andjai-Wekari R., alt. 1750 m, *Nothofagus-Comfer* forest, tree 20 m, diam. 35 cm, leaves bluish underneath, Nov., fl. buds yellow, *Van Royen & Sleumer* 74.08 and 74.90 (BO, L); Aifat R. valley, alt. 1400 m, crest of the E. part of the Tohkiri Range, path Sururem' to Chaquai, mossy *Nothofagus* forest, tree 15 m, diam. 30 cm, leaves dark green and glossy above, greyish-green underneath, Oct., buds yellow, *Van Royen & Sleumer* 7081 (BO, L).

12. *Beilschmiedia rosseliana* Kosterm., *spec. nov.* — Fig. 7

Arbor mediocris ramis gracilis nitidis griseis lenticellatis ramulis apicem versus dense minutissime pallide subsericeis foliis alternantibus chartaceis lanceolatis sensim acuminatis basi in petiolum gracilem brevem sensim attenuatis supra obscure reticulata nervo mediano prominulo pustulate costis filiformis sat obscuris subtus pallidiora sub lente minutissime sparse sericea glabrescentia nervo mediano prominente costis gracilis prominulis arcuatis erecto-patentibus rete obscuro paniculis axillaribus foliis brevioribus sat paucifloris gracilibus sparse minutissime adpresse pilosis brevissime et pergracile ramosis pedicellis brevis filiformis tepalis subovatis acutis staminibus pilosis antheris exterioribus cellulis parvis introrsis antheris interioribus anguste ovalis cellulis lateralis glandulis basalibus magnis sessilibus stylo breve stigmatate inconspicuo.

TYPUS: *Brass 28446* (L).

Tree, 15 m tall; branches slender, grey, glossy with numerous lenticels; branchlets near their apices densely, minutely pale sub-sericeous. Young leaves densely white-sericeous underneath, mature ones spirally arranged, chartaceous, lanceolate, 1.5 x 5—3 X 11 cm, gradually acuminate with blunt tip, base gradually tapered into a slender, ca 5 mm long petiole; upper surface rather obscurely reticulate, glabrous, rather glossy, midrib prominulous in a groove, pustulate, lateral nerves very faint, the entire surface covered with tiny (high power lens!) pustular dots, lower surface paler, minutely, sparsely adpressed pilose, glabrescent, midrib prominent, lateral nerves ca 8—9 pairs, slender, erect-patent, arcuate, secondary nerves and reticulation slender.

Panicles axillary beneath the terminal leaf bud, very slender, 1.5—4 cm long, shortly branched, very minutely, sparsely adpressed pilose, bracts caducous, pedicels filiformous, 1—2 mm long, continuous with the filiformous branchlets; flower tube very shallow; tepals ovate-elliptic, acutish, ca 1.5 mm long, minutely sparsely sericeous; stamens 1 mm long, minutely pilose, outer ones with diamond-shaped anthers with small, round, introrse cells, the filaments rather broad, pilose, as long as the anthers; inner anthers narrow with lateral cells and large, sessile basal glands; ovary ovoid-globose, style very short, stigma inconspicuous. Fruit (immature) ellipsoid, pustular, acutish, 7 X 13 mm on a slender, pilose pedicel.

Two species of Lauraceae from Iiossel Island, which came to my attention (*Cinnamomum* and the *Beilschmiedia* above) proved to be both endemics.

ROSSEL ISL., S. slopes of Mt. Rossel, rainforest, alt, 700 m, sub-canopy tree, leaves grey below, aromatic, fls. yellow, fruit immature, Oct., *Brass 28446* (BO, L).

## CINNAMOMUM Schaeffer

The genus *Cinnamomum* is perhaps the most difficult one of Lauraceae, because of **the** very early writings on cinnamon bark and leaves;

the latter were based almost always on detached leaves of uncertain origin, sometimes bought in markets (*Cinnamomum rauwolffii* Bl.) and perhaps mostly picked from immature plants. With the variability in shape and texture of *Cinnamomum* species, it needs a very thorough knowledge indeed of the vegetative parts of the different species in order to "place" the inadequate material. The main characteristic to identify leaves are: 1. the length of the two basal or sub-basal, ascendent lateral nerves and 2. the indumentum. Secondary reticulation can hardly be used, as it may be very conspicuous in young leaves and entirely absent in mature leaves. The shape of the hairs seems to be fairly constant (not the density). In most cases, however, fertile material is necessary for identification; the flowers are rather uniform and differ only in size; it should be taken into account, that the tepals, even when they are caducous, tend to become longer until after anthesis. The number of anther cells of the third whorl of stamens is a useful characteristic. The most important feature to distinguish *Cinnamomum* species are the cups under the fruit; these may be hemispheric (deep) or shallow, abruptly contracted into the cylindrical pedicel or fleshy and gradually merging into an obconical pedicel; the rim may be clear-cut and thin, or the tepals may persist as a whole or partly. After anthesis the demarcation line where the tepals will break becomes already visible, the lower part indurates, the upper part remains thin; sometimes only the very bases of the tepals persist and the cup margin is slightly wavy; in other species the basal half of the tepals persists and indurates and the cup margin is distinctly toothed (with truncate teeth) or the entire tepal hardens and persists. Size of the plant and a combination of the above features distinguishes *Cinnamomum* species very well.

Anticipating a complete monographical revision, some new facts on several species, together with new species are enumerated below.

1. *Cinnamomum alternifolium* Kosterm., spec. nov. — Fig. 8

Arbor ramulis sat crassis dense minutissime brunneo sublanuginoso-tomentellis gemmis perulatis foliis alternantibus rigide chartaceis ovato-ellipticis sphacelatis basi breve acutis supra glabra nitida nerviis tres principalis prominulis nerviis obscuris articulatis parallelis connectis subtus minutissime sat sparse sublanuginoso-tomentellis nerviis tres prominentibus nerviis basalibus apicem laminarum attingentibus nerviis secundariis prominulis laxis articulatis subparalleliis.

TYPUS: J & M.S. Clemens 28812 (BO).

Tree 13 m tall; branchlets rather thick, densely, minutely, dark brown sublanuginose-tomentellous, buds with the same tomentum, the end bud covered by large, up to 1 cm long scales. Leaves alternate, thickly charta-

ceous, subovate-elliptic, 5 x 13—10 x 21 cm, apices not present, base shortly acute; upper surface glossy, smooth, the 3 main nerves prominulous, connected by faint secondary nerves, lower surface laxly, minutely pale brown sublanuginose-tomentellous, midrib prominent, the two basal lateral nerves prominent, reaching the tip of the leaf, connected (also laterally) by prominulous, lax, parallel secondary veins, which are sharply bent in the middle. Petiole 10—15 mm, pilose.

Although the type material is sterile, the species is so easily recognized by its alternate leaves, the perulate end bud and the tomentum, that I have described it here. By its large perulate end bud it belongs to the section *Camphora*.

N. BORNEO, Kinabalu, Tenompok, jungle behind lodge, alt. 1600 m, March, ster., *J. & M.S. Clemens* 28812 (BO).

## 2. CINNAMOMUM ANGUSTTTEPALUM Kosterm.

Cf. Kostermans in *Reinwardtia* 7: 455, fig. 10. 1969. —i Typus: S'. 1621,2 (BO).

Additional specimens: SARAWAK, Kuching, Munggu Unjam Forest Reserve, ster., *Kep. 79313* (SING), tree 20 m, diam. 20 cm, steep buttresses, smooth red-brown bark; the leaves of the flush are covered with a very dense, very minute, sublanuginose red-brown tomentum. — KALIMANTAN, G. Klam, ster., *Hallier 21+69* (BO, G, K, L).

## 3. *Cinnamomum arbusculum* Kosterm., *spec. nov.* — Fig. 9

Arbuscula in omnibus partibus glabris floribus exceptis ramulis sat crassis strictis rigidis apicem versus applanatis foliis oppositis perrigide coriaceis late ovatis vel ovato-suborbicularis obtusis vel sensim attenuatis basi subcordatis utrinque nitidis sublaevis supra nerviis perobscuris subtus nervo mediano et costis lateralis basalibus gracilis V2 — % longitudine laminarum attingentibus prominulus nerviis lateralis caeteris obscuris subtus subareolatis petiolis brevis paniculis fructiferis brevis nee ramosis gracilis fructus subovoideo-ellipsoideus cupula parva basi tepalorum persistentibus.

TYPUS: *Anderson 4726* (SAR).

Shrub, glabrous in all its parts except the flowers. Branchlets stiff, smooth, flattened towards apex. Leaves opposite, very rigidly coriaceous, ovate to ovate-suborbicular, 2 x 3 — 3 x 6 — 5 x 7 cm, rounded or gradually tapered towards apex, base sub-cordate or rarely rounded; both surfaces glossy, upper one with obscure main nerves, flush with the surface, lower one obscurely, minutely subareolate-reticulate, midrib prominulous, the 2 basal lateral nerves slender, arcuate, reaching 1/2 — % the length of the lamina, other lateral nerves rather patent, numerous, obscure. Petiole 5—8 mm, stout, channeled above.

Infructescences pseudo-terminal, not branched, rather slender, 3 cm long, with a single fruit. Fruit ellipsoid-ovoid, apiculate, 6 x 9 mm; cup small, 5 mm diam., 2 — 3 mm high, the base gradually merging into the obconical ca 3 mm long, slightly pilose, slender pedicel, the margin with persistent, enlarged, basal parts of the tepals and hence slightly incised.

In leafshape and habit the species resembles strongly *C. microphyllum* Ridley (syn.: *C. cordatum* Kosterm.), but the infructescence and fruit cup are entirely different.

BORNEO, Sarawak, Mt. Api, common shrub in submontane forest on limestone hill, July, fr., *Anderson 1(726)* (SAR).

#### 4. CINNAMOMUM ARCHBOLDIANUM Allen

Cf. Kostermans, *Bibl. Laur.* 252. 1964. — Typus: *Brass 8953* (A, BO, L), secondary growth near Hollandia (= Djajapura), fr.

There is some — of the usual — discrepancy in leaf size and shape in the enumerated specimens. The lowland material has much larger leaves with a less pronounced acumen; *Carr's* material from Boridi has more ovate, smaller leaves with a long acumen, whereas the *Van Royen* specimen has more narrow, elongate leaves. However, all specimens show some intermediate leaves. The species has glabrous inflorescences and the flush has at most some tiny sericeous hairs on the lower leaf surface. It is close to *C. piniodorum* and *C. frodinii*.

Additional specimens: W. IRIAN, Steenkool, road to Tambuni, km 1.5, hills east of road opposite Police barracks, alt. 80 m, Quercus forest, common, May, fl., *Van Royen 3568* (BO, L, SING), tree 12 m, bole 8 m, diam. 25 cm, fls. whitish yellow; hill north of Hollandia, alt. 50 m, July, fr., *bb. 25066* (A, BO, K, L, NY, SING), leaves up to 5 X 14 cm; Sukarnapura, slope of Cycloop Mts., alt. 300 m, Aug., fl., *Kostermans & Soegeng 174* (A, BO, K, L, P), tree 5 m, diam. 6 cm, bark smooth, thin, with strong clove smell, fls. greenish; Japen Isl., Wasaburi near Serui, Aug., fr., *Aei & Idjan 394* (A, BO, K, L), leaves 4.5 x 14 cm. — EAST NEW GUINEA, Boridi, alt. 1000 m, Sept., fl., *Carr 13132, 13235, 13135* (BO, SING); *ibid.*, alt. 1400 m, Nov., fl., *Carr 14814* (BO, SING); Isigaun, alt. 600 m, June, fr., *Lauterbach 350* (Breslau).

#### 5. CINNAMOMUM AUREO-FULVUM Gamble

Cf. Kostermans, *Bibl. Laur.* 255. 1964. — Typus: *Ridley 2103* (SING), Hulu Semangko, Aug., fl.

Additional specimens: MALAY PEN., Selangor, Bunga Bua, broad forested ridge, alt. 1200 m, tree 13 m tall, May, fls. cream, *Whitmore FRI 0293* (KEP, SING); G. Semangkok, ster., flush, *Ridley 15598* (SING); Fraser Hill upon the Selangor border, alt. 1300-1400 m, ster., *Burkill & Holttum 8940* (SING); Pahang, Pine tree Hill, alt. 1600 m, Aug., fls. brown, *Nur S.F.N. 11052* (SING).

## 6. CINNAMOMUM BEJOLGHOTA (Hamilton) Sweet

Cf. Kostermans, *Bibl. Laur.* 256. 1964.

Synonyms: *Laurus bejolghota* Hamilton, cf. Kostermans, *I.e.* 569 (exclus. syn.: *Laurus malabathrica* Hort. Beng.). — Typus: Herb. Hamilton, forests of Camrup, Sistam R. near Patgong (where?); *Laurus bezolghota* Hamilton ex Nees, cf. Kostermans, *I.e.* 573; *Laurus obtusifolia* (non Pavon, nee Willd.) Roxb., cf. Kostermans, *I.e.* 677. — Typus: Wallich, *Cat.* 2574 A and C, Silhet, fl. (BO, K); *Cinnamomum obtusifolium* (Roxb.) Nees, cf. Kostermans, *I.e.* 327 (exclus. vars. *birmanica*, *lourciroi* and Wallich, *Cat.* 2569 C); *Laurus macrophylla*, and *L. obtusifolia* Roxb. in Wall., *Cat.* 2575, cf. Kostermans, *I.e.* 650 (no. 220b); *Laurus cassia* Hamilton, cf. Kostermans, *I.e.* 573; ? *Laurus bazania* Nees, cf. Kostermans, *I.e.* 569. — Typus: Wallich, *Cat.* 2573 E; *Cinnamomum bazania* Nees, cf. Kostermans, *I.e.* 256; ? *Cinv. amoinum rauwolffii* BL, cf. Kostermans, 342, typus: one leaf, bought by Rauwolff in the market of Aleppo, during his travels from 1573-1575 (where?).

The leaves have a very characteristic smooth pitting underneath. This is lacking in the Burmese specimens, but the Yunnan specimen shows it in the flowering sheet, not in the fruiting one. The cup (Yunnan specimen) is large, broadly funnel shaped with persistent enlarged tepals.

Specimens examined: INDIA, Madras Pres., Coimbatore, ster., *Bharadwaja s.n.* (DD); E. Bengal, fl., *Griffith Kew Distr. J+2U* (DD)<sup>1</sup>; Khasia Hills, fl., *Griffith s.n.* (BO, 4 sheets, DD), one leaf up to 13 X 33 cm; *ibid.*, *Griffith s.n.*, buds (BO); Assam, fl., *Masters s.n.* (DD, 2 sheets); Silhet, fl., *Wallich 257U* (BO); Assam, hills near Gowhatty, buds, *Simmons s.n.* (BO, 2 sheets); culta in Horjt. Calcufct, fl. (DD, 2 sheets); Tenasserim, ster., *Falconer s.n.* (BO), tree 20 m, diam. 50 cm, fls. white. — CHINA, Yunnan, Szemao, fl., *Henry 12819* (BO), et fr., *12819 A* (BO). — BURMA, Tavoy Distr., *Palmer anno 1886* (DD); Arakan Yoma, Jan., after anthesis, unknown coll. *11914* (DD); Hlaingbwe Reserve, ster., *Lace i581* (DD); locality not indicated, ster., *Brandis s.n.* (CAL). — INDOCHINA, S. Cochin, Thudamot, ster., *Pierre 5170* (BO, P).

## 7. CINNAMOMUM BURMANI BL.

Cf. Kostermans, *Bibl. Laur.* 258. 1964. — Typus: *Blume s.n.*, W. Java (L) and herb. Burman (G) as *Bellonda Bontii* (*L. cassia*).

Synonyms: *Laurus burmanni* C. G. & Fr. Nees, cf. Kostermans, *I.e.* 577; *Cinnamomum kiainis* Nees, cf. Kostermans, *I.e.* 309. — Typus: *Blume s.n.*, W. Java (L); *Laurus cassia* Blume, *Cat.* (ki-amis), cf. Kostermans, *I.e.* 593 (no. 76 p.). — Typus: *Blume*, W. Java, kiamis (L); *Laurus dulcis* Roxb., cf. Kostermans, *I.e.* 614. — Typus: *Roxburgh* in *Herb. Willdenou*; 7765, paratypus: *Wallich*, *Cat.* 2581, A.B.; *Cinnamomum dulcis* (Roxb.) Sweet, cf. Kostermans, *I.e.* 291; *Cinnamomum chinense* BL, cf. Kostermans, *I.e.* 282; *Cinnamomum mindanaense* Elmer, cf. Kostermans, *I.e.* 322. — Typus: *Elmer 11105* (BO, L, LEN); *Cinnamomum loureiri* Auct. (non Nees) Allen in *J. Arnold Arb.* 20: 52. 1939, quoad *Clemens 3523*.

The specimen *Sarip* A69 from Bali, enumerated by Cammerloher (cf. Kostermans, I.e. 258) under *C. burmanni* represents *C. sintoc* Bl.

Some of the Chinese mainland specimens, enumerated by Allen, are real *C. japonicum* and not *C. burmanni*.

Additional specimens: CHINA, Kwangtung, Sun-wol Distr., April, fl., *Tso & Tsiang* 2042 (SING); Hainan, Ching Mai Distr., Pak Shik Ling-, Ku Tung village, Febr., fl., *Lei* 389 (SING); Tai Wong Ling, Tung Pin Tin village, after anthesis, *Lei* 151 (SING), local name: Kwei shu. — PHILIPPINES, Jolo, Sulu Prov., Me. Dahu, Sept., fl., *Ramos & Edano B.Se.* 43920 (SING). — INDOCHINA, Annam, Hue and vicinity, May - July, after anthesis, *J. & M. S. Clemens* 3523 (MO); Phong Y, Prov. of Than-hoa, July, after anthesis, *Poilane* 1652 (BO, P), local name: Cay sanh; Prov. of Quangtri, May, after anthesis, *Poilane* 10703' (P, SING); *ibid.*, Mailanh, May, fl., *Poilane* 116! (P, SING), local name: Cay tren-tren; Prov. of Thoa thiey, May, after anthesis, *Poilane* 1405 (SING). — BORNEO, Sabah, Bandukan, top of ridge, alt. 500 m, ster., *B.N.B.F.D.* 5978 (BO, SAR, SING), local name: Keningau or kayu manis (Bandukan Dusun), tree 23 m, diam. 20 cm, used as condiment in cooking, also as a charm medicine; *ibid.*, March, fl., *A* 465 (SING); Tambunan, ster., *Umbol* 5261 (SING); Keningau near Laing Cave, Apin-apin, alt. 700 m, Aug., after anthesis, *San* 44576 (SAR, SING), tree 13 m, bark brown, inner bark reddish, but after 5 minutes turning yellow, sapwood white; Kalimpisau, 9 miles N.E. of Ranau, alt. 900 m, Sept., fr., *San* 28543 (SAR, SING), tree 10 m, inner bark greyish, turning reddish when exposed, cambium and sapwood yellow, bark tastes slightly sweet and hot; Sensurun valley, alt. 100 m, ster., *Keith* 5999 (SING), local name: Kalingau (Dusun Sensurun), Keningau (Kwijjan), in the beginning of 1900 important export product, bark and leaves used for flavouring tapai (fermented rice). — W. FLORES, Manau near Ruteng, alt. 1200 m, April, fl., *Kostermans & Wirawav* 624 (A, BO, CANB, G, K, L, US).

#### 8. CINNAMOMUM CALCIPHILUM Kosterm.

Cf. Kostermans *hi* Reinwardtia 7: 456. 1969. — Typus: *S.* 15285 (BO, K, L, SAR, SING), G. Staat, Ban, fr.

Panicles axillary and pseudo-terminal, partial ones up to 6 cm long with 5 cm long filiform peduncle, branches few, apical, up to 1 cm long or none; pedicels slender, 2 — 4 mm; flowers microscopically silvery sericeous, tube short, tepals narrowly ovate, acutish, 2.5 mm; stamens 1.5 mm with narrowly oval anthers, those of the outer stamens with 4 introrse cells, of the inner whorl with 2 lateral cells, filaments slightly longer than anthers, pilose, basal glands relatively large, stipitate, stalk adnate to the filament; staminodes ca 1 mm long, consisting of a sub-sagittate apex and a pilose, longer filament; ovary ellipsoid, ca 1 mm, style slightly longer with small, peltate stigma.

Additional specimens: SARAWAK, 1st. Division, Bau, summit Bukit Jebong on limestone slope, alt. 400 m, April, fl., *S. 25616* (K, SAR), treelet 3 m, diam. 22 cm, calyx cream, tepals and anthers yellow, pistil white, leaves up to 6 X 13 cm; *ibid.*, near Tai Ton, summit of limestone hill, 'mor' soil, June, fl., *S. 13815* (BO, K, L, SAR), tree 8 m, diam. 5 cm, fls. flesh coloured, leaves narrower, up to 4 x 13 cm, petiole up to 2 cm long.

#### 9. CINNAMOMUM CASSIA Presl

Cf. Kostermans, *Bibl. Laur.* 276. 1964. — Typus: unknown; *C-innamomum cassia* Blume, cf. Kostermans, *l.e.* — Typus: culta Java, ster., *Blume* (BO, L); *Cinnamomum aromatienvi* Nees, cf. Kostermans, *l.e.* 253. — Typus: culta in Java and a cultivated specimen of the Bot. Gard. Breslau, fr. 29 Nov. 1832 (where?).

Additional references: Van Dongen in *Pharmaceut. Weekblad* 50: 152. 1913; Walker, Fifty-one common ornamental trees Lingnan University Campus (*Sci. Bull.* 1): 67, tab. 1930; Roi, *Pl. médic. chinoises* 146. 1955 (with bibliography); Hegnauer, *Chemotaxonomy* 4: 376. 1966.

Presl's name antedates Blume's by one year. I assume, **that Presl** based his name on cultivated specimens and the commercial bark.

Blume's description was based on material imported from **China** in Java and cultivated in Bogor (where two trees are still extant in the Economic Garden).

There is some confusion with *C. burmanni* Bl. (*C. dulce* Nees); in several botanic gardens *C. burmanni* was distributed from Florida, U.S.A. under the wrong name of *C. cassia*.

Specimens examined: KWANGTUNG, Loting, Sept., young fr., *Y. Tsiang 1201* (SING), distributed as *C. iners*; Kung Ping<sup>1</sup> Shan, T'aan Faan, Fang Ch'eng Distr., Sept., young fr., *W.T. Tsang 26709* (A, BO); Na Leung, Fang Ch'eng Distr., July, young fr., *W.T. Tsang 26516* (A, BO); Tonkin, Taai Wong Mo Shan, Chuk-phai, Ha-coi, Nov. - Dec, fr., *W.T. Tsang 2732!* (A, BO); culta in Java, ster., *Blume s.n.* (BO, L); culta in Kebumen, Java, villag-e garden, March, young fr., *Forest Officer s.n.* (BO); culta in Purwokerto, Centr. Java, ster., *Wolff van Westerrode s.n.* (BO); culta in Economic Garden, Singapore, March, fl., *Nur s.n.* (BO); culta in S. Tome, Nova Moca, alt. 800 m, Jan., fl., *Vie gas da Graca 146* (BO); culta in Hort. Petropolit. e India, fl., *Regel s.n.* (BO, LEN).

#### 10. *Cinnamomum caudifer* Kosterm., *nom. nov.*

*Alseodaphne caudata* Lecomte (base) in *Nouv. Arch. Mus.*, Ser. 5, 5: 97. 1913; cf. Kostermans, *Bibliogr. Laur.* 64. 1964. — Typus: *Cavalerie & Fortunat s.n.* (= 1002), Pin-Fa, Kéou-chéou (BO, P).

So far only known from the type collection.



## 11. CINNAMOMUM CELEBICUM Koorders

Cf. Kostermans, *Bibl. Laur.* 281. 1964. — Typus: *Rieder S.N.* in Herb. De Vriese, ster. (U, L).

*Cinnamomum spec.* indet. (no. 1) Koorders in *Meded. Lands Plantentuin* 19: 573. 1898.

Additional specimens: SULAWESI, Manado, Mt. Klabat, alt. 340 m, April, fr., 66. 15758 (BO), tree 26 m, diam. 45 cm; *ibid.*, alt. 340 m, Febr., fl., 66. 13510 (BO); *ibid.*, alt. 1300-1600 m, Jan., fl., *Koorders 17408* (BO, L); Tondano, Danowudu, alt. 300 m, ster., 66. 5555 (BO, L); Lulumbulan near Paku ure, alt. 700 m, April, young<sup>1</sup> fr., *Koorders 174-01* (BO, L); Karowa near Popo Tomposo, alt. 300 m, ster., *Koorders 17406* (BO); Makale, Rantaupau, Bukit Pongaloh, alt. 2060 m, ster., 66. 26273 (BO, L), smaller and more pronouncedly acuminate leaves; Malili, Toli-toii (Kawata), alt. 500 m, ster., *Cel/V-321* (BO, L); between Malino and Makassar, ster., *Rant 403* (BO); Masamba Peororoa, 1300 m alt., ster., 66. 24159 (A, BO, L); culta in Hort. Bogor, sub VIII G. 13, ster. (BO); Balehangin, ster., *Teijsmann H.B. 12685* (BO); *ibid.*, fl., *Teijsmann 12742* and *12119* (BO, L). — PHILIPPINES, Mindanao, ster., *Ahem 647 Q* (BO, 2 sheets); Camp Keithley, lake Lanao, Febr., fl., *Clemens 951* (BO); Palawan Isl., Puerto Princesa (Mt. Pulgar), April, fl., *Elmer 12992* (BO); Mindanao, Todaya (Mt. Apo), Distr. of Davao, May, fl., *Elmer 10473* (BO).

12. *Cinnamomum corneri* Kosterm., *spec. nov.* — Fig. 10

Arbor ramulis glabris foliis oppositis chartaceis vel rigide chartaceis glabris ovato-ellipticis ellipticis vel lanceolato-ellipticis sensim longe acuminatis basi acutis supra laevia nitida nerviis tres principalis prominulis snbtus pallidiora obscure reticulata nerviis secundariis irregulariter sub-parallelis horizontalis costis lateralis basalis fere ad laminarum apicem petiolis gracilis paniculis pseudo-terminalis gracilis strictis nitidis glabris apicem versus minutissime sparse sericeis pedicellis filiformis longis cupula hemisphaerica parva in pedicello obconico sensim transeuntibus.

TYPUS: *San 28012* (SING).

Tree, 10 — 25 m tall, up to 30 cm diam.; bark smooth, light brown; inner bark pale brown, white near cambium; sapwood white. Branchlets smooth, glossy, glabrous, end bud microscopically, sparsely sericeous. Leaves chartaceous or chartaceo-coriaceous, glabrous, narrowly elliptic to lanceolate or ovate-elliptic, 2.5 x 6 (apical leaves) — 3 x 12 — 5 x 17 (— 6 x 14) cm, apex gradually long-tapered, subacuminate with blunt tip, base acute; upper surface glossy with obscure transverse venation or smooth, the 3 main nerves prorainulous, lower surface paler, smooth or with parallel, horizontal, obscure slender secondary nerves, spaced 2 — 3 mm, sometimes irregular, basal nerves reaching  $\frac{1}{2}$  —  $\frac{3}{4}$  of the lamina length, prominulous. Petiole 7 — 12 mm, slender, glabrous, concave above.

Panicles pseudo-terminal and axillary, aggregate, slender, stiff, smooth, glossy, glabrous, towards the flowers microscopically, sparsely sericeous, 4 — 15 cm long. Pedicel filiform, 3 — 5 mm. Fruit ellipsoid, 6 x 10 mm (immature), cup hemispheric, up to 7 mm diameter, 3 — 4 mm

high, fleshy, margin entire, base not separated and gradually merging into the obconical, ca 3 — 4 mm long pedicel.

The leaves are extremely variable in shape and size, partly due to the fact that the leaf tips were damaged in their flush stage; the normal leaf is lanceolate, the apex gradually tapered into a long, blunt acumen (as in the specimen *Carr.S.F.N. 26852*), in the specimen *San J+7917* some leaves are ovate-elliptic with a much shorter acumen.

The flowers (*Carr S.F.N. 26852*) are sparsely, microscopically sericeous with a short tube and narrowly ovate, acutish, 2 mm long tepals, partly pilose on the inside too. Stamens 2 mm with 1 mm long, slender, glabrous filament, the outer ones with 4 introrse cells, the inner whorl 2-celled, extrorse, basal glands large on long stalks adnate to the filament (glands almost touching the anther) ; staminodes slender, acute, stalked; ovary ellipsoid-ovoid with slender style and inconspicuous stigma.

The species resembles *C. microcarpum*, but has thin leaves with less densely packed secondary nerves and a different fruit cup.

BORNEO, Sabah, Kinabalu, Kinataki Stream, alt. 1200' m, April, fl., *Carr S.F.N. 26852* (SING); Ranau, Sosopodon, For. Res. along\* Kinabalu Nat. Park, alt. 1300 m, Dec, young fr., *Sore U7917* (K, L, SING); *ibid.*, Mile 36 & 37 Ranau Rd., alt. 1900 m, Sept., after anthesis, *San S87S1* (SAR, SING) ; *ibid.*, mile 35 ifrom Tamporuli Rd. to Ranau, alt. 1400 m, Dec, young fr., *Saw 28012* (SAR, SING); Sarawak, Bt. Mersing-, basalt ridge, alt. 1000 m, Sept., young fr., *S. 22108* (A, BO, K, KEP, L, MEL, SAN, SAR, SING).

### 13. CINNAMOMUM CRASSINERVIUM Miq.

Cf. Kostermans, *Bibl. Laur.* 285. 1964. — Typus: *Mutter s.n.*, ster., Borneo (L, a branch with 5 leaves).

Small tree, up to 10 m tall and 8 cm diam.; branchlets glabrous, smooth, glossy; end bud minutely, pulverulently sericeous. Leaves opposite, glabrous, very stiffly chartaceous to subcoriaceous, narrowly elliptic, 5 x 16 — 6 x 20 cm, conspicuously acuminate, base acute, both surfaces glossy, smooth (in younger leaves the upper surface marked with numerous, dense very faint, parallel, horizontal secondary nerves), main nerves prominulous on upper surface, very much prominent on lower surface, the two basal lateral nerves running out at the leaf tip. Petiole slender, 10 — 13 mm, glabrous, glossy, slitlike channeled above.

Panicles pseudo-terminal, crowded, very stiff, up to 9 cm long, lax, minutely sublanuginose-sericeous, more densely and subsericeous towards the densely, minutely sericeous flower buds.

Additional specimens: BORNEO, Sarawak, Kuching, Semengoh Forest Arbor., alt. 100 m, Aug., buds, *Sar 3391* (BO, K, L, SING); Upper Plieran, R. Kanaban, alt. 600 m, *Pickles S. 3U69* (SAR, SING), sapling<sup>1</sup> of 5 m, diam. 3 cm, leaves up to

8 X 29 cm, petiole 15 mm, acumen 2 cm, bark smooth, patchy red brown and grey red, outer bark not, inner one yellow green, soft, fibrous, sapwood light brown.

A sterile specimen: *Hallier 1562* (BO) picked from a sapling, Ulu Kenapai, Kalimantan, might belong here.

#### 14. CINNAMOMUM CULILABAN (L.) Presl

Cf. Kostermans, *Bibl. Laur.* 285. 1964. — Typus: Tabula 14, Rumph. Herb. Amboin. 2: 65, 66. 1741. (original in L).

Synonyms: *Laurus culilaban* L., cf. Kostermans, I.e. 606; *Laurus culilaban* Buch.-Ham., cf. Kostermans, I.e. 608; *Laurus euliban* Steudel, cf. Kostermans, I.e. 606; *Cinnamomum cirfiban* Rafin., cf. Kostermans, I.e. 285; *Laurus culitlawan* Stickmann, cf. Kostermans, I.e. 608; *Cinnamomum culitlawan* (Roxb.) Nees (sphalm. = *culitlaban*), Kostermans, I.e. 287; *Cinnamomum. culilawan* BL, cf. Kostermans, I.e. 285 (non *C. culilawan* (Roxb.) Presl); *Laurus culilawan* Hort. ex Nees, cf. Kostermans, I.e. 607; *Laurus cidilawang* Reinw. ex Nees, cf. Kostermans, I.e. 608; *Cinnamomum culitlaban* Sweet, cf. Kostermans, I.e. 287; *Laurus culitlaban* Roxb., p.p. cf. Kostermans, I.e. 608; *Cinnamomum culiwavan* Spach, cf. Kostermans, I.e. 288; [*Culitlawan* Rumph., Herb. Amboin., cf. Kostermans, I.e. 442; *Cortex caryophylloides albus* Rumph., cf. Kostermans, I.e. 378; *Cortex culilaban* Houttuyn, cf. Kostermans, I.e. 379; *Cortex caryophylloides amboinensis*-Cartheuser, cf. Kostermans, I.e. 378].

Apart from the confusing state of orthography (Malay: kulit = bark, lawan(g) = clove), the taxonomic situation is worse. Rumphius was well aware, that the kulitlawan(g) of commerce was the product of different species, which he kept separate as far as possible. Blume (*in Tijdschr. Nat. Geschied. en Physiol.* 1: 46 — 65) went to great pains to disentangle the species. The Amboinese kulit-lawan(g) tree, named by Linnaeus: *Laurus culilaban* in 1753 and by Stickmann: *Laurus culitlawan*, was based solely on plate XIV of Rumphius Herbarium Amboinese and the pertinent text (vol. 2: 65, 66). Presl's combination is the earliest one and must be adopted, although Stickmann's name represents the proper spelling (Nees' homonym is actually a misspelling, as it was based on *Laurus culitlaban* of Roxb., which moreover, covers a plant, grown in the Botanic Gardens in Calcutta, imported from the "Moluccas", but evidently not the Amboinese species).

Blume called Rumphius' Amboinese tree *Cinnamomum culilawan*; the description was based on sterile collections of Teijsmann and Zippel from Amboina, in combination with Rumphius description and plate. Blume discovered from original drawings of Rumphius, conserved at Leiden, that initially two plates were drawn, one for *Cortex caryophylloides albus*, the other for *Cortex caryophylloides ruber*, but as these plates were so similar they were combined in Rumphius printed opus in such

a way that the inflorescences of "ruber" were combined with the drawing of the branch of "albus". Blume made of "ruber" a separate species, based on the original Rumphian drawing in Leiden; no herbarium material has ever been collected of this dubious species (which was amalgamated with "albus" by Meissner).

The Javanese source of kulitlawan(g), mentioned by Rumphius was described by Blume as *Cinnamomum sintoc* (later he changed the orthography to *sintok*) and based on Javanese herbarium material.

For the description of Rumphius' New Guinea kulitlawan(g) tree, Blume used material collected by Lesson and Zippel and named it: *Cinnamomum xanthoneurum*; both collections were sterile.

Rumphius' kulitlawan(g) "Papuanis et Moluccis" must have had its source from more than one species and I suspect that *C. eugenoliferum* Kosterm. (described in this paper) and *C. massoia* Schewe are more common than *C. xanthoneurum* and hence a more important source of the kulitlawan(g) of commerce.

The rest of the species, discussed by Rumphius, was called by Blume *Cinnamomum nitidum* Hook. f. (non Nees) ; he recognized three varieties which he thought occurred in India, Ceylon (Herb. König) and Java. This represents a mixture of at least two species, whereas the König material of Ceylon is almost certainly *Neolitsea cassia* (L.) Kosterm. The Indian one, if referring to a cultivated specimen in the Calcutta Botanical Garden is *C. iners* Reinw. ex Bl.; the 3 varieties, enumerated by Blume from W. Java, Bantam and from Java and Sumatra respectively represent all the same *C. iners*, which is not a source of kulitlawan(g).

In Bogor two sterile specimens of *C. culilaban* (L.) Presl from Amboina are conserved (*De Vriese s.n.* and sine Coll. no. 5557, the latter marked: oelit halawan and koliet lawan). A specimen {*Lam 2903*} from Karakelong, S.W. slope of Mt. Duata, alt. 250 m, Talaud IsL, might be the same; another specimen, *Lam 2858* (BO, L), resembles this closely, but has much larger leaves with distinct parallel, widely spaced secondary veins on the lower surface, it might represent a youth stage.

#### 15. CINNAMOMUM CUSPIDATUM Miq.

Cf. Kostermans, *Bibl. Laur.* 288. 1964. — Typus: *Korthals s.n.*, fr., Mt. Malintan, Sumatra (L, 2 sheets, LEN).

New synonyms: *Cinnamomum graciliflorum* Gamble, cf. Kostermans, *I.e.* 298. — Typus: *Scortechini 1228*, *Wray 366U* (non vidi); *Cinnamomum alexei* Kosterm. in *Reinwardtia* 7: 454, fig. 9. 1969. — Typus: *Buwalda 3818* (BO).

The description of *C. graciliflorum* fits our species perfectly.

Additional specimens: MALAY PENINSULA, Perak, Tamango, July, fr., *Ridley s.n.* (SING), ripe fruit ellipsoid, 1 X 1.5 cm, cup thin, 6 mm diam., 3 mm deep, the persistent, indurate tepals 2-3 mm long. — SUMATRA, Res. Atjeh, Gajo Lands, confluence of Kapi and Aunan R., alt. 1100 - 1250 m, March, fr., *Van Steenis 9976* (BO, K, L), the leaves more elongate than usual; *ibid.*, alt. 1250 - 1500 m, March, fl., fr., *Van Steenis 10015* (A, BO, K, L); Tapanuli, Angkola & Sipirok, Panobasan, alt. 1000 m, ster., 66. *31551* (A, BO, K, L, NY, SING); *ibid.*, alt. 500 m, ster., *bb. 51556* (A, BM, BO, BRI, K, L, NY, P, SING); Padang Sidempuan, village Grunggung, alt. 150 m, sandstone, Dec, fl., *Kostermans '22022* (BO, K, L), treelet 5 m, bark odourless, fls. pale green.

#### 16. CINNAMOMUM ENGLERIANUM Schewe

Cf. Kostermans, *Bibl. Laur.* 293. 1964. — Typus: *Ledermann 960A* (L), Sepik region, buds.

Tree ca 8 m tall, outer bark dark reddish brown, quite smooth, inner bark straw, bark and leaves spicy-fragrant. Branchlets very slender, glabrous, smooth; end bud glabrous or microscopically subsericeous. Leaves opposite, chartaceous, glabrous, lanceolate, 2.5 X 10.5 — 4.5 x 16 cm, long and gradually acuminate, base acute, upper surface glossy, minutely reticulate, the 3 main nerves filiform, prominulous, lower surface paler, dull, rather smooth, midrib prominent, basal lateral nerves slender, reaching % — •% the lamina length, the remainder arcuately connecting the one or more pairs of rather patent, very slender lateral nerves. Petiole 5 — 10 mm, slender, concave above.

Inflorescences pseudo-terminal, the young ones densely, very minutely grey-sericeous, adult ones glabrous, filiform, the partial ones up to 3.5 cm long, not branched, one-flowered, flowers pale yellow, pedicel filiform, 10 mm, tube short, 1 mm, tepals ovate, acute, almost glabrous, inside minutely sericeous, 2 mm long, stamens 1.5 mm long, filaments pilose at base, rather broad, as long as the oval, 4-celled anthers, those of the 2 outer whorls introrse, of the inner whorl lateral, basal glands large, subsessile, staminodes sagittate on rather broad stalks, ovary ellipsoid, 1 mm, style 1 mm, stigma small, sub-peltate.

Additional specimen: TERRITORY OF NEW GUINEA, Morobe Distr., above Bakaia, about 15 miles S.E. of Garaina, alt. 2150 m, Febr., fl., *Hartley T.G.H. 12884* (L).

#### 17. *Cinnamomum eugenoliferum* Kosterm., *spec. nov.* — Fig. 11

Arbor magna ramulis strictis glabris foliis oppositis coriaceis glabris late ovato-ellipticis obscure breve lateque acuminatis basi cuneatis supra nitida laevia vel obscure reticulata nervo mediano costisque prominulis subtus glauca opaca nervo mediano prominentibus costis basalibus arcuatis prominentibus apice laminarum subattingentibus venis prominulis vel deest inflorescentiis racemiformibus brevis axillaris dense minuteque

atro-brunneo pilosis floribus longe pedicellatis tepalibus lanceolatis fructus ellipsoideus cupula hemispherica basin versus angustata.

TYPUS: *N.G.F. 3614-0* (BO).

Tree, 28—40 m tall, bole 17—23 m, diam. 35—75 cm, slightly buttressed, crown regular, dense or open with rather large branches. Bark light brown, rather smooth, not fissured, aromatic (eugenol odour); branchlets stiff, towards their apices sub-angular, glabrous; end bud densely, minutely adpressed pilose. Leaves opposite or sub-opposite, coriaceous, glabrous, broadly ovate-elliptic (rarely elliptic), (3—9) 5.5 x 11—8 x 16—6 x 9 cm, obscurely, broadly, shortly acuminate, base shortly cuneate, upper surface very glossy, smooth (or with obscure, lax reticulation), midrib and lateral nerves prominulous, lower surface dull, glaucous, midrib prominent, the 2 basal nerves reaching almost the tip of the leaf, arcuate, prominent, other nerves invisible or laxly reticulate (the secondary nerves bent in the centre). Petiole stout, 10—18 mm, concave above.

Inflorescences axillary, pseudo-racemiform, densely, minutely, dark brown subsericeous, 1—4 cm long, few-flowered. Flowers white, densely, minutely pilose, slender, up to 5 mm long, tube slender, funnel-shaped, 2 mm, tepals lanceolate, 3—3.5 mm long, pilose inside, filaments 1.5—2 mm, glabrous, slender, the anthers very narrow with 2 large cells, basal glands small, stipitate, style 2 mm, stigma small, capitellate. Pedicel slender, up to 6 mm long, continuous into the branchlets. Fruit ellipsoid, 8—10 x 13—15 mm, blue green with lighter spots (immature), cup sub-hemispheric, 8 mm diam. and 6 mm high with entire thin rim, the base gradually merging into a 4—10 mm long pedicel.

This species is perhaps one of the main sources of the kulit lawan (g) of commerce from New Guinea. There must at least be a dozen or more species yielding kulit lawan (g) bark, all characterized by a high content of eugenol and smelling of nutmeg or cloves or a combination of both.

W. IRIAN, Mimika, Sei. Aindua (Uta), alt. 5 m, July, fl., 66. 23907 (A, BO, K, L), tree 26 m, diam. 37 cm, local name: Teemee keekeeree (Tarië language); *ibid.*, July, fl., *Aet U25* (A, BM, BO, BRI, CAL, CANB, G, K, L, NY, P, SING); Wermenu, ster., 66. 22519 (A, BO, L); Kebar valley, hills N. of Api R., alt. 800 m, ster., *B.W. 6365* (BO, L), tree 27 m tall, diam. 35 cm, buttresses up 80 cm, out 40 cm, thick 5 cm, bark greenish brown, local name: Toom (Kebar language); Idenburg R., Bernhard camp, alt. 100 m, ster., *Brass & Versteegh H010* (A, BO, L), tree 24 m, diam. 38 cm, bark grey-brown, scaly, sapwood light brown, heartwood brown. — TERRITORY OP PAPUA, near Maipa Airstrip, Maipa village, Kairuku Subdistr., Centr. Distr., ster., *Darbyshire 979* (BO, LAE); Ifoge roge (near Rouna II), 16 miles E. of Port Moresby, subdistr. Sogeri, Central Distr., alt. 350 m, ster., *N.G.F. 36141* (A, BISH, BO, BRI, CANB, K, L, LAE, SING, SYD, US), local name: Waubessa (Goari), api-api (Motu); *ibid.*, *Casuarina, Flindersia, Eugenia, Cinnamomum*] forest, understorey of *Gnetum gnemon* and *Cryptocarya*, Jan., fl., young fr., *Zieck N.G.F. S6U0* (A, BISH, BO, BRI, CANB, K, L, PNH, SING, SYD, US); *ibid.*, Febr., fr.,

*N.G.F. 3615%* (same herbaria); Sogeri, near Surinumu, alt. 600 m, gallery forest in gully, surrounded by Eucalypt savannah on the ridges, Febr., fr., *Womersley N.G.F. 19127* (same herbaria).

18. ***Cinnamomum frodinii*** Kosterm., *spec. nov.* — Fig. 12

Arbor ramulis gracilis apicem versus dense minutissime ferrugineo sublanuginoso-tomentellis mox glabris foliis chartaceis juvenilis sublanuginoso-tomentellis mox glabris ovato-ellipticis conspicue acuminatis basi in petiolum contractis supra nitida laevia nerviis tres principalis vix prominulis subtus pallidiora opaca nervo mediano costisque basalibus filiformis prominulis basalibus apicem laminarum non attingentibus nerviis caeteribus inconspicuis vel costis apicalis adest infructescentiis axillaris sat brevis gracilis vix ramosis dense minutissime sub-lanuginoso-tomentellis tepalibus dense griseo tomentellis cupula immatura infundibuliformis margine integris.

TYPUS: *Frodin N.G.F. 26404 (BO)*.

Tree, up to 13 m tall, bole up to 7 m, diam. 15 cm, bark redbrown (dark), shallowly fissured, inner bark same, brighter with nutmeg odour, wood cream. Branchlets slender, glabrous, the young ones densely, minutely, rusty sublanuginose-tomentellous; end bud with the same tomentum. Leaves opposite, chartaceous, ovate-elliptic, 2.5 x 5.5 — 4 x 9 cm, conspicuously acuminate, base rounded and very shortly subcuneate. Leaves of the flush densely, minutely rusty sublanuginose-tomentellous (especially underneath), soon glabrous, upper surface smooth, glossy, the 3 main nerves filiform, pale, prominulous, lower surface dull, paler, smooth or occasionally with a few, filiform lateral nerves near the upper part of the leaf, midrib slender, prominulous, the 2 basal nerves slender, prominulous, running out ca 1 — 2 cm below the leaf apex. Petiole slender, glabrescent, 5 — 7 mm.

Infructescences lateral and subterminal, slender, densely pale brown or grey sublanuginose-tomentellous, 1.5 — 4 cm long (partial inflorescences) with a few fruit on very short, slender branches. Fruit cup funnel-shaped, fleshy with entire margin, 5 mm diam. at apex, together with the obconical pedicel slightly less than 10 mm long, tepals up to 2 mm long, densely, minutely grey-tomentellous.

The species is close to *C. archboldianum*, but the indumentum is very different and the fruit cup is bigger.

TERRITORY OF NEW GUINEA, trail above Wakaia, Morobe Distr., alt. 900 m, montane Fagaceae forest, June, young fr., *Frodin N.G.F. 'Z6U0U (BO, SING)*, leaves whitish green underneath. — W. IRIAN, Namtoo Mts., S. of Arfak Mts., alt. 700 m, Sept., fr., *Kostermans 2032 (BO, K, L)*, bark smelling slightly of nutmeg, fruit ellipsoid, 6 x 8 mm, black, cup 7 mm diam., fleshy, merging into the pedicel, the whole 6 mm long; *ibid.*, ster., *Kostermans s.n. (BO, K, L)*; Arfak Mts., path to Angi Gita lake, alt. 1000 m, ster., *Kostermans 2010 (BO, L)*, leaves up to 5 X 16 cm.

**19. *Cinnamomum gigaphyllum* Kosterm., spec. nov. — Fig. 13**

Arbor ramulis crassis glabris quadrangularis innovationibus dense minutissime sericeis foliis oppositis chartaceis glabris ovato-ellipticis magnis sensim attenuatis basi rotundatis utrinque minute reticulatis nerviis tres principalis utrinque prominentibus basalibus apicem ramulorum attingentibus petiolis magnis brevis.

TYPUS: *Pullen 6202* (CANB).

Tree 14 — 24 m tall, bole 13 — 17 m, diameter 10 — 20 cm, bark brown, heavily covered with small stipules and with spicy fragrance when cut. Branchlets stout, smooth, glabrous, quadrangular. End bud microscopically, densely grey-sericeous. Leaves opposite, chartaceous, glabrous, ovate-elliptic, 16 x 42 — 20 x 35 cm, gradually tapered with obtuse tip, base rounded; both surfaces densely, minutely reticulate, the 3 main nerves pale, prominent, basal lateral nerves reaching the tip of the leaf. Petiole stout, 10 — 12 mm long, broadened towards the apex.

This is one of the largest leaved cinnamoms known, next to *C. granai-folium* from Borneo, and hence I venture to describe it although flowers and fruit are unknown. The bark is aromatic, the leaves not. It resembles *C. hentyi* by its short, stout petioles.

**TERRITORY** OP PAPUA, N. Div., N. side of Sibium Range, S. of Toma village, Bariji-Managalase area, alt. 900 m, *Araucaria-Anisoptera* forest, Sept., ster., *Pullen 6201* and *6202* (CANB), local name: moho-u.

**20. *Cinnamomum glaucescens* (Nees ex Wall.) Drury**

Cf. Kostermans, *Bibl. Laur.* 297. 1964. — Typus: *Wallich 2560', A-B* (K).

Synonyms: *Laurus glaucescens* Buch.-Ham. ex Nees, cf. Kostermans, *I.e.* 631 (no. 162b). — Typus: *Hamilton, Silhet; Tetranthera glaucescens* Wallich ex Nees (non (H.B.K.) Spr., 1825), cf. Kostermans, *I.e.* 1397. — Typus: *Wallich 2560, A-B* (K), paratypus: Malabar, Herb. Hooker (K); *Camphora caniflora* Meissner ex Hooker f., cf. Kostermans, *I.e.* 191. — Typus: *Griffith U2U7* (LEN); *Cinnamomum glanduliferum* var. *caniflorum* Meissner, cf. Kostermans, *I.e.* 281 (sphalm.: *caniflora* sub *Cecidodaphne*; it should be on page 297 sub *C. glanduliferum*). — Typus: *Griffith 2476* Bootan (K), syn-typus: *J.D. Hooker & Thorns, s.n.*, Sikkim (K); *Cinnamomum, Cecklodaphne* Meissn., cf. Kostermans, *I.e.* 281; *Cecidodaphne glaucescens* Nees, cf. Kostermans, *I.e.* 238. — Typus: *Wallich 2560, A - B* (K).

Hooker, following Meissner, accepted this as a variety of *C. glanduliferum*. This is certainly not, as besides of the different tomentum, the fruit cup differs considerably, being large, fleshy and merging into the obconical pedicel.

I suspect that some specimens enumerated by Hooker under *Cryptocarya amygdalina* are actually this species.



The flush (and inflorescences) in bud is covered by large silky scales forming a cone-shaped body.

Specimens examined: NEPAL, sine collect., March, fl. (DD). — INDIA, Assam, Sibsagar, fl., *Peal* 250 (BO, DD); Bon Sum, buds, *Peal* 92 (BO); Kamrup Distr., 25th mile, April, young fr., *Kanjilal* 5U90 (DD), bark and habit are very near; those of *Schirna wallichiana* (Theaceae); same tree, March, fl. (DD), native name: Gonhorai or Gandrai; Lakkimpore Div., May, young fr., *Div. For. Officer s.n.* (CAL, DD); Rongrenggiri, Garo Hills, July, fr., *Purkayastha s.n.* (DD); culta in For. Research Inst. Dehra Dun, July, fr. (BO, DD); Kaunli Garden, Dehra Dun, Febr., fl., *Gamble* 25338 (DD). — BURMA, Upper Chindwin, fr., sine coll. (BO, DD); Myitkyina Distr., Nanyinka Reserve, alt. 250 m, April, after anthesis, *C.B.S.* 281 (DD), tree 40 m, wood strongly aromatic.

21. *Cinnamomum halmaherae* Kosterm., *spec. nov.* — Fig. 14

Arbor parva ramulis glabris foliis oppositis chartaceis ovato-ellipticis acuminatis basi rotundatis et breve subcuneatis supra nitida obscure dense minute reticulata vel laevia glabra nerviis tres principalis filiformis prominulis subtus subglaucis minute dense subadpresso tomentellis mox glabris nervo mediano gracilis prominulis costis basalibus gracilis usque ad % laminis excurrentibus prominulis costis caeteris apicalibus nerviis secundariis laxis prominulis sat patentis ad medio articulatis pedicellis longis puberulis inflorescentiis axillaris et pseudo-terminalis aggregatis foliis brevioribus dense minute flavobrunneo tomentellis pedunculis longis gracilis ramulis apicalibus paucis brevis vel nullis pedicellis filiformis tepalibus intus sericeo-tomentellis.

TYPUS: 66. 2U929 (BO).

Tree, 5 — 10 m tall; branchlets smooth, glossy, near the end bud with a few, rather coarse, minute hairs, end bud grey, subadpressed tomentellous. Leaves opposite, chartaceous to stiffly chartaceous, ovate-elliptic, 4 X 10.5 — 8.5 X 16 (—10 x 26) cm, acuminate, base rounded and very shortly subcuneate into the pilose, 10 — 15 mm long (in young plants up to 20 mm), slightly flattened above petioles, upper surface glossy, rather smooth or (in younger leaves) densely, minutely reticulate, the 3 main nerves slender, prominulous, lower surface dull, subglaucous, midrib slender, prominulous, the basal nerves slender, prominulous, running out at ca % of the lamina length and apically continued by loops from the few rather patent, slender, prominulous other lateral nerves, the main nerves connected by very slender, prominulous, almost horizontal secondary veins (bent in the middle), spaced 5 — 10 mm (these veins are also present at the marginal side of the two main basal nerves).

Inflorescences axillary and pseudo-terminal, densely, minutely pale brown tomentellous, 3 — 8 cm long, consisting of a slender, weak peduncle of 2 — 6 cm (several peduncles branching from a very short, obscure main

peduncle), ramifications apical, few, short (up to 5 mm) or none, pedicels (immature) 1 — 2 mm, slender; flower buds densely, minutely pale brown tomentellous, tepals inside densely grey, adpressed pilose.

The species is close to *C. macrophyllum* and *C. xanthoneurum*, differs from the former by its leafshape, smaller leaves and different reticulation, from the latter by its broader leaves with different tomentum. The buds were too young to be analysed. The specimen *bb. 2595U* is glabrous, but has the typical tomentum on the end buds. A peculiar characteristic is that the leaves dry almost black.

HALMAHEIRA, Weda, alt. 30 m, May, buds, 6b. *U929* (A, BO, G, K, L, NY, SING); Morotai Isl., Totodoku, alt. 30 m, ster., *Kostermans- 786A* (A, BO, K, L), bark and roots smelling of cloves, lower leaf surface pale green, nerves yellowish on lower surface; E. Ceram, Kwaos, Mt. Tunlean, ster., *bb. 25954-* (A, BO, L), tree 10 m, diam. 15 cm, local name: "Eik",

## 22. *Cinnamomum hentyi* Kosterm., *spec. nov.* — Fig. 15

Arbor ramulis crassis glabris laevis foliis oppositis coriaceis glabris late ellipticis basi subrotundatis brevissime subcuneatisque utrinque sublaevia nerviis principalis prominulis nerviis basalibus apicem laminarum attingentibus nerviis secundariis laxis vix conspicuis petiolis robustis brevis inflorescentiis brevis paucifloris perdense minutissime sericeis cupulis fructiferis hemisphericis coriaceis tepalibus parte basalibus in crassatis persistentibus in pedicellum obconicum transeuntibus.

TYPUS: *Henty N.G.F. 10583* (BO, 2 sheets).

Tree, 20' m tall (top broken), bole 13 m, slightly buttressed to 2 m, diam. 60 cm; bark brown, roughened with numerous lenticels, inner bark reddish brown, blaze yellowish, sapwood very pale straw, bark aromatic; end bud minutely silvery sericeous. Leaves of the flush densely, pulverulently silvery sericeous underneath. Branchlets thick, glabrous, smooth, towards the apex quadrangular. Leaves opposite, coriaceous, glabrous, broadly elliptic, 5 x 11—8 x 18—7.5 x 13 cm, apices missing, base rounded and shortly, broadly cuneate, both surfaces rather smooth (the filiform secondary nerves faintly showing, lax), the basal lateral nerves reaching the leaf tip, lower surface slightly glaucous, paler. Petiole stout, 5—10 mm, much broadened towards the apex.

Inflorescences axillary of the apical leaves, few-branched, few-flowered, stiff, rather stout, 4 cm long, the densely, minutely sericeous flowers crowded at the apex; the young fruit-bearing branchlets sparingly sericeous; young fruit embedded in a deep hemispheric fleshy cup, merging gradually into the obconical pedicel, the bases of the tepals persistent, enlarged, indurate.

Related to *C. eugenoliferum* and *C. gigaphyllum*, characterized by the robust, short petioles and the cup.

TERRITORY OF NEW GUINEA, Busu Logging area near Lae, Morobe Distr., alt. 30 m, Dec, buds and young fr., *E.E. Henty, N.G.F. 10583* (BO, 2 sheets); Lae Sub-distr., Sankwep logging area, alt. 300 m, tree 10 m, March, young fr., *N.G.F. 37A6G* (BISH, BO, BRI, CANB, K, L, SING, SYD).

23. ***Cinnamomum impressicostatum*** Kosterm., *spec. nov.* — Fig. 16

Arbor mediocris ramulis gracilis apicem versus minutissime griseo sericeo-tomentellis foliis oppositis chartaceis subtus sparse minutissime sericeis mox glabris lanceolatis sensim attenuatis basi acutis supra laevia nitida nerviis tres principalis subimpressis subtus pallidiora nervo mediano costisque basalibus pergracilis prominulis costis basalibus apicem laminorum attingentibus venis secundariis parallelis obscuris petiolis bene evolutis paniculis paucifloris axillaris gracilis plerumque foliis brevioribus sparse minutissime sericeo-tomentellis pedicellis filiformis floribus dense minutissime subsericeis tepalis subovatis acutis filamentis gracilis pilosis cellulis staminibus exterioribus 4 introrsis interioribus 2 lateralibus glandulis stipitatis staminodiis filamentorum longis pilosis cupulis subcupuliformibus crassiusculis in pedicellam obconicum sensim attenuatis basi tepalibus incrassatis persistentibus.

TYPUS: *Burkill & Holttum 8U7* (SING).

Small tree of 7—8 m or weak bush of 2 m tall; inner bark whitish fibrous, very spicy, slash wood slightly yellow, very spicy. Flush dull red; branchlets slender, towards the apex densely, minutely grey sericeous-tomentellous. Leaves opposite, chartaceous, lanceolata to subovate-elliptic, extremely variable in size, the apical leaves 1.5 x 6—2.5 x 14 cm, lower down up to 4 x 15 cm, gradually acuminate, base acute; upper surface smooth, glossy, the three main nerves very slender, slightly impressed, lower surface pale, sparsely, minutely sericeous, soon glabrous, midrib very slender, prominent, basal nerves very slender, reaching the apex of the lamina, secondary nerves obscure, parallel, horizontal. Petiole ca 1 cm concave above.

Tepals 2 mm, subovate, acutish, inside adpressed pilose; stamens 1.5 mm, the narrowly oval, 4-celled anthers as long as the slender, pilose filaments; inner stamens adhering at the base, anthers 2-celled, lateral, the elongated glands on long stalks adnate to the pilose filaments; staminodes 1 mm with a small cordate head and long, very hairy filament; style as long as the ovary, stigma peltate.

MALAY PENINSULA, Fraser Hill upon the Selangor border, 1300-1500 m, Sept., fl., *Burkill & Holttum 8801* (BO, SING) and *8U7* (SING); *ibid.*, Sept., after anthesis, *S.F.N. 1150U* (SING); *ibid.*, June, fl., *Strugnell 22S8U* (SING), next to narrow leaves some broad ones of 5.5 X 12 cm are represented; E. ridge of Mt. Benom, Game Reserve boundary, alt. 1200 m, March, buds, *Whitmore F.R.J. 3170* (SING); Mt. Tahan, Wray's Camp, July, after anthesis and fr., *Ridley 16182* (SING).

24. **CINNAMOMUM JAVANICUM** Bl.

Cf. Kostermans, *Bibl. Laur.* 307. 1964 (exclus. vars.). — Typus: *Blume s.n.*, Mt. Burangrang, Prov. Krawang, Aug., fl., "Kiteja" (L), para-typus: *Blume* (?), Bantam near Harriang (L), Agri Preangerani, *Junghuhn 751* (L); Palembang', *Praetorius s.n.*, ster. (L).

Synonyms: *Laurus pseudo-cassia* Herb. Reinw. ex Meissner, cf. Kostermans, I.e. 691, typus: Herb. Reinwardt, Sintok, fl. = *Blume 14J+0* (L); *Cinnamomum sulphuratum*, var. 13 Miquel, cf. Kostermans, I.e. 353 (no. 399b); *Melastoma reinwardtianum* Bl. (quoad fol.), cf. Kostermans, I.e. 951, typus: *H.L.B. 908 {132-335 et 336}* (L); *L. malabattrum* Horsfield, cf. Kostermans, I.e. 653 (no. 228b).

Blume, in his original description did not indicate a type specimen but quoted simply: "sylvis montanis Javae" and the vernacular name Kiteja; in *Rumphia* 1(3) : 42. 1836 he was more explicit and mentioned four specimens, three from Java, one from Sumatra, the one marked Kiteja from Mt. Burangrang is accepted as the holo-type.

In *Rumphia* Blume added some synonyms, which I do not think belong here; *Sindoc Valentijn* and *L. malabattrum* N.L. Burm. (quoad ad *Rumphii* synom.), *Syndok boom* Houtt. are almost certainly *C. sintoc* Blume.

The variety *neglectum* (Bl.) Meissner represents *C. iners*; the variety *oblongifolia* Kurz is *C. tavoyanum*.

This beautiful treelet occurs in Western Malesia.

25. **CINNAMOMUM KAMI** Kosterm.

Cf. Kostermans in *Reinwardtia* 7: 539, fig. 30. 1969. •— Typus: *Kostermans & Soegeng Reksodihardjo 790* (BO).

Additional specimens: TERRITORY OF NEW GUINEA, vicinity of Kagaba Camp, site, Hagen-Mendi Rd., S. Highland's Distr. 3000 m, Sept., buds, *N.G.F. 40071* (A, BO, BRI, CANB, K, L, SING, SYD); W. Highlands, ridge of Andyuku, alt. 3200 m, Oct., post anthesis, *Walker ANU 745* (LAE).

26. **Cinnamomum kerangas** Kosterm., *spec. nov.* — Fig. 17

Arbor parva ramulis crassis nitidis glabrescentibus foliis oppositis vel sub-oppositis glabris rigide coriaceis magnis subovato-ellipticis sphacelatis basi breve cuneatis supra nitida laevia nerviis tres principalis prominulis subtus pallidiora nervo mediano prominente nerviis basalibus vel sub-basalibus prominentibus apicem laminarum attingentibus nerviis secundariis numerosis parallelis curvatis gracilis prominulis petiolis robustis paniculis pseudo-terminalis foliis subbrevioribus griseo-sericeis floribus dense griseo-sericeis antheribus 4-cellulatis filamentis longis gracilis glandulis basalibus elongatis tertia parte basalibus filamentorum adnatis ovario glabro.

- TYPUS: *Sar. 2288* (SING).

Tree, up to 7 m tall and 15 cm diam.; bark smooth, greyish brown, scented, fairly hard, brittle. Leaf bark and the yellowish wood highly scented; branchlets stiff, smooth, glossy, glabrous, the apical part very minutely adpressed grey pilose. Leaves opposite and sub-opposite, glabrous (except the basal part underneath with microscopical adpressed hairs), coriaceous, subobovate-elliptic, 7 x 25 — 10 x 33 cm, base shortly cuneate, apices lacking, upper surface glossy, smooth or with marked, numerous, horizontal, parallel veinlets, the 3 main nerves prominent, lower surface paler, midrib prominent, the two lateral basal or sub-basal nerves prominent, reaching the top of the leaf, connected by numerous, horizontal, thin, parallel, slightly concave, prominulous secondary nerves, reticulation obscure. Petiole stout, ca 2 cm, minutely adpressed pilose, glabrescent.

Panicles pseudo-terminal, aggregate, up to 25 cm long, many-flowered, densely grey-sericeous. Pedicel slender, up to 5 mm. Tepals oval or elongate ovate, acutish, 2 — 3 mm, both surfaces sericeous; stamens slightly shorter than the tepals with long slender filaments, slightly longer than the oval, 4-celled anthers, of which the upper pair of cells is much smaller than the lower one, anthers of the 2 outer whorls introrse, of the third whorl lateral, basal glands elongate, attached one third from the filament base (stalk adnate to the filament); staminodes acicular, pilose; ovary glabrous, style long, slender.

Closely related to *C. grandifolium* Cammerl. but the panicles sericeous and the stamens different.

BORNEO, Sarawak, First Div., Kuching Distr., Setapok For. Res., alt. 25 m, podsol (kerangas), March, fls. white and yellow, *Sarj* 2288 (SAR, SING); *ibid.*, in peat swamp forest, Febr., fl., *Sar* 4751 (SAR, SING); *ibid.*, ster., *S.* 0022 (SAR); Kuching, Febr., fl., *Haviland & Hose* 3301 (SAR); *ibid.*, 6 miles from Kuching-, Febr., fl., *Haviland & Hose* 3290 (BO).

Perhaps the following two collections belong here: Kalimantan, P. Madjang, ster., *Teijsmann* 8909 (BO); Sinkawang, Pangkalan Batu (Lokabang), 50 m alt., ster., 66. 26021 (A, BO, L).

## 27. *Cinnamomum kerrii* Kosterm., *spec. nov.* — Fig. 18

Arbor ramulis strictis glabris innovationibus dense minutissime sericeis foliis oppositis rigide coriaceis glabris suboblanceolatis brevissime acuminatis basi sensim attenuatis acutis utrinque laevia nerviis tres principalis filiformis supra prominulis subtus nervo mediano prominulo nerviis basalibus vix prominulis usque ad apicem laminarum petiolis sat gracilis paniculis subracemiformis axillaris foliis brevioribus paucifloris pedunculis longis subglabris ramulis paucis brevissimis gracilis floribus sparse minute sericeis tubus brevissimis tepalibus elongatis sat sparse sericeis intus dense sericeis antheris pro genere magnis filamentis gracilis pilosis cellulis antheribus exterioribus introrse spectantia glandulis basalibus parvis sessilibus staminodiis parvis sagittatis stipitatis stylo magno stigmatate subpeltato.

TYPUS: *Kerr* 20071 (BO).

Tree 15 m tall; branchlets stiff, smooth, glabrous; end bud densely grey sericeous. Leaves opposite, rigidly coriaceous, glabrous, suboblanco-late, 2 x 5.5—2 X 7—3 X 9.5 cm, very shortly acuminate, base gradually tapered into the 7—10 mm long, slightly concave, dark (in sicco) pedicel, both surfaces smooth, upper one with filiform, prominulous main nerves, usually slightly sunk in a groove, lower surface with prominulous midrib, the 2 basal lateral nerves slender, reaching the leaf apex, almost flush with the surface.

Panicles resembling racemes, axillary (sometimes more than one in each axil), rarely extra-axillary, 2—4 cm long, consisting of a long, rather slender, glabrous peduncle, the few branches slender, up to 5 mm long. Pedicel 2—3 mm, slender, subglabrous. Flower tube very short, tepals elongate, oval, acutish, 3—4 mm, slightly sericeous, inside densely grey-sericeous. Stamens 2.5 mm, the large oval anther of the outer stamens as long as the slender, sericeous filaments with 4 large, introrse cells, the inner stamens slightly smaller with narrower anthers of which the upper pair of the extrorse cells is very small, basal glands small, sessile; staminodes small, sagittate, stipitate; style robust, as long as the ovary with small, sub-peltate stigma.

SIAM, Kao Krading-, Loi, alt. 1200 m, Febr., fl., *Kerr 20071* (BO, K).

#### 28. CINNAMOMUM KOORDEESII Cammerl.

Cf. Kostermans, *Bibl. Laur.* 310. 1964. — Typus: *Koorders 17405* (BO).

Additional record: SULAWESI, Bonthain Peak, ster., *Everett GO* (SING).

#### 29. CINNAMOMUM ? KUNSTLERI Ridley

Cf. Kostermans, *Bibl. Laur.* 310. 1964. — Typus: *Kunstler 5568*, Perak, Larut (K, non vidi).

The following sterile specimens conform with the description of the type material: MALAY PEN., Pahang, Fraser Hill, alt. ca 1400 m, ster., *Burkill & Holttum 8700* (SING); *ibid.*, Oct., fr., *F.D. 22550* (SING), cup small with entire margin, 4-5 mm diam., 3 mm high, pedicel short, thick, minutely sublanuginose-tomentello's. — BORNEO, Sarawak, Nyabau Catchment area, Bintulu, 4th Div., alt. 70 m, tree 20 m, diam. 25 cm, June, buds, *S. 24611* (A, BO, K, KEP, MEL, L, SAN, SAR, SING); *ibid.*, tree 15 m, diam. 12 cm, June, buds, *Ding Hou 349* (L, SAR); Ranau, Bukit Ampuan, alt. 900 m, ster., *San 21007* (SING), tree 13 m, diam. 7 cm, bark smooth, greyish brown, inner bark soft.

#### 30. *Cinnamomum lanaoensis* Kosterm., *spec. nov.* — Fig. 19

Arbor mediocris fere in omnibus partibus glabris ramulis gracilis laevis foliis oppositis vel alternantibus rigide coriaceis ovato-ellipticis vel lanceolatis acuminatis basi acutis utrinque nitida laevia nerviis principalis tres prominulis nerviis basalibus fere apicem laminarum attingentibus nerviis secundariis subtus rete laxo formantibus petiolis gracilis paniculis

axillaris pseudo-terminalibusque bracteis lanceolatis pilosis subpersistentibus pedicellis filiformis tepalibus late ovatis.

TYPUS: *Liborio Ela Ebaló 10U1* (BO).

Tree 10 m, diam. 15 cm, glabrous in all its parts except the adpressed grey-pilose tip of the end bud, the slightly sericeous lower inflorescence bracts and the inside of the flower tube. Branchlets smooth, slender, cylindrical, yellow-brown (in sicco). Leaves opposite and spirally arranged, stiffly coriaceous, ovate-elliptic to lanceolate, 3.5 x 9 — 2.5 X 9 cm, conspicuously acuminate, base acute, both surfaces glossy, smooth, the lower one paler with a faint, lax, irregular reticulation of the secondary nerves, the 3 main nerves slender, prominulous, the basal ones reaching almost the tip of the lamina. Petiole slender, 5 — 7 mm, concave above.

Panicles axillary and pseudo-terminal, stiff, lax, up to 12 cm long with long peduncle, the lateral branches filiform, subtended by concave, lanceolate, acute, subpersistent bracts, the lowest up to 6 mm long. Pedicel filiform, up to 4 mm. Tepals broadly ovate, acute, 1 mm (immature).

The buds are too immature to be analyzed, there are well-developed basal glands. The species resembles *C. mercadoi* superficially, but differs by the glabrous inflorescences with subpersistent bracts, the smaller flowers and the different reticulation of the lower leaf surface.

PHILIPPINES: Prain, mountain, Febr. - Mar., buds, *Liborio Ela Ebaló 10H* (BO, MICH), vernacular name: Kamiyamo (Maranao), flowers white.

### 31. *Cinnamomum lawang* Kosterm., *spec. nov.* — Fig. 20

Arbor ramulis crassis glabris foliis oppositis rigide coriaceis glabris ellipticis vel late ellipticis sphacelatis basi rotundatis et breve cuneatis supra pernitida laevia vel obscure parallelo-venosa nervo mediano costisque basalibus prominulis subtus opaca nervo mediano gracile cum nerviis basalibus arcuatis apicem laminarum attingentibus prominulis nerviis secundariis sat obscuris parallelis horizontalis reticulatio dense subprominulo paniculis pseudo-terminalis aggregatis multifloris foliis brevioribus perdense minutissime tomentellis pedicellis sat crassis tepalis ovatis acutis coriaceis intus pilosis antheris ovalis 4-locellatis filamentis dense griseo pilosis ovario glabro stylo aequilongo stigmatate peltato infructescentiis mono- vel bi-fructiferis fructus ellipsoideus cupula magna tepalibus valde incrassatis persistentibus.

TYPUS: *bb. 28100* (BO, two different collections).

Tree, up to 27 m tall, bole up to 17 m and 72 cm diam. Branchlets stiff, robust, grey, longitudinally cracked, glabrous; end bud densely, pulverulently brown tomentellous. Leaves opposite, rigidly coriaceous, glabrous, elliptic to broadly elliptic, 5.5 x 13 — 12 x 25 cm, tips lacking, base rounded and shortly subcuneate, upper surface glossy, the 3 main nerves prominulous, other nerves obscure, lower surface dull, midrib slender,

prominulous, basal (or sub-basal) lateral nerves arcuate, slender, prominulous, reaching the tip of the leaf, secondary nerves faint, parallel, horizontal, connected by an obscure reticulation, sometimes a faint inframarginal vein connecting the loops of the secondary veins. Petiole stout, 1.5—2 cm, channeled above.

Panicles pseudo-terminal, clustered, many-flowered, robust, up to 12 cm long, minutely, pulverulently brown tomentellous; large bract scars at the base of the branches. Pedicels rather thick, up to 3 mm; tepals (immature) ovate, acutish, thick, 2—3 mm, inside also tomentellous, anthers oval, the outer ones 4-celled, filaments densely pilose; ovary glabrous, style as long as ovary with peltate stigma.

Inflorescence up to 15 cm long with one or two fruit; fruit ellipsoid, 10 x 13 mm, deeply embedded in the cup, which consists of a fleshy, broad, funnel-shaped basal part, 5—14 mm long (pedicel included) and the strongly enlarged and thickened, explanate, persistent, ovate-rectangular, acutish, up to 8 mm long tepals (up to 5 mm wide at base).

The fruit cup resembles strongly that of *C. pendulum*, but the leaves are entirely different.

W. KALIMANTAN, Melawi, Ng. Betung, B. Tenkujung, alt. 450 m, Nov., fr., 66. 28100 (A, BO, K, L, SING); Melawi, Tjatit, B. Ronsa, alt. 350 m, May, buds, 66. 28100 (A, BO, K, L, NY, P, SING); Melawi, B. Ulu, 475 m, ster., 66. 29036 (A, BO, L, SING); B. Lamas, alt. 300 m, ster., 66. H5H (A, BO, L).

### 32. CINNAMOMUM LEDERMANNII Schewe

Cf. Kostermans, *Bibl. Laur.* 311. 1964. — Typus: *Ledermann 101 U1* (L), paratype: *Ledermann 10373 A* and *12639*.

New synonym: *Cinnamomum eleniensis* Allen, cf. Kostermans, *I.e.* 284. — Typus: *Clemens 3867* (A, BO).

The leaves vary considerably in size (5.5 x 13—2.5 X 6.5 cm), shape (narrowly sub-ovate-elliptic to broadly ovate-elliptic, caudate-acuminate to acuminate), texture (chartaceous to coriaceous, upper surface often bullate in young leaves).

The species is close to *C. velufmum* Ridley and might be only a form of it, the shape of the fruit cup (so far unknown) will decide this.

Additional specimens: Lala R., alt. 1700 m, Febr., fl., *Carr 15716* (BO, SING); Sepik R., fl., *Ledermann 10U1* (L); TERRITORY OF NEW GUINEA, Wagau, Buang-region, Morobe distr., alt. 1500 m, Nov., fl., *N.G.F. 1781\*2* (A, BISH, BO, BRI, K, L, PNH, SING, SYD, US); Okasa, 10 miles S.W. of Okapa, E. Highlands, alt. 1600 m, May, after anthesis, *N.G.F. 2J,920* (A, BO, BRI, CANB, K, L, SING), tree 10 m, bole 5 m, diam. 15 cm, bark grey, under bark green, inner bark straw, aromatic, wood white, fls. cream; *ibid.*, Wanitabe, Nov., buds, *Hancock 44* (LAE). — NEW BRITAIN, Mt. Talawa, S.W. slope, Talasea, alt. 1500 m, cloud forest, May, fl.,



*N.G.F.* 26827 (A, BISH, BO, BRI, K, L, PNH, SING, SYD, US). — W. IRIAN, Wissel lake area, Djatej, alt. 1750 m, Sept., buds, *Eyma* 5189 (A, BO, K, L, PNH, SING) and ster., *Eyma* 5093 (A, BM, BO, K, L, SING).

33. *Cinnamomum lineatum* Kosterm., *spec. nov.* — Fig. 21

Arbor ? ramulis gracilis apicem versus minutissime adpresse griseo pilosis foliis oppositis chartaceis longis linearis sensim acuminatis basi sensim acutis utrinque dense minute reticulatis supra nitida glabra nervo mediano gracile prominulo subtus pallidiora subglauca mox glabra nervo mediano prominulo nerviis basalibus filiformis ca dimidio laminarum decurrentis petiolis gracilis.

TYPUS: 66. 23796 (BO).

Tree ? Branchlets slender, the apical part microscopically adpressed grey pilose; end bud densely, minutely grey sericeous. Leaves opposite, chartaceous, linear, 1.5 x 16 — 2.5 x 19 cm, gradually tapered, base gradually acute; both surfaces densely, minutely reticulate, upper one glabrous, midrib slender, prominulous, lower one paler, subglaucous, dull, sparsely, microscopically adpressed pilose, soon glabrous, midrib slender, prominulous, basal nerves slender, prominulous, running out at ca  $y \pm$  of the lamina length, other lateral nerves numerous, rather patent, very slender, arcuately connected at some distance from the margin. Petiole rather slender, puberulent, glabrescent, channeled above, 3 — 7 mm long.

A striking plant, because of its linear leaves; the reticulation is due to the immature stage of the leaves.

MOLUCCAS, W. side of Isl. Obi, Telaga Obi, alt. 100 m, Nov., ster., 66. 23796 (A, BO, G, K, L, P).

34. *CINNAMOMUM MACROPHYLLUM* Miq.

Cf. Kostermans, *Bibl. Laur.* 316. 1964. — Typus: *Teijsmann H.B.* 5623 (BO, U), Batjan Isl., ster., local name: Soengana orang.

[Rumphius, *Herb. Amb.* 2: 68, "speciei tenuioris eortieis, e Batsjam nomine corticis culilawan ad se misse"].

Of this species only sterile material is known. It is typified by the minute, coarse tomentum of the young branchlets and the lower leaf surface of young leaves. The specimen: *Kostermans 1230* was collected from a tree of 20 m height and 20 cm diam. with rather hard wood; the leaves of this specimen vary between 4 x 14 and 6 x 25 cm, and apparently represent the mature stage; all other specimens were collected from saplings (leaves up to 11 x 40 cm).

The leaves of the flush of the specimen 66. 24-547 are covered on both sides with a very dense, pale redbrown, glossy, sublanuginose-tomentose minute tomentum.

Teijsmann's vernacular name is nonsense, in Morotai the constant local name was "Biselo".

In the Bogor Herbarium a specimen (*bb.* 23095, ster.) from Kaimana, W. Irian, is conserved which belongs to a closely related species with the same kind of indumentum, but the leaves are thinner and smaller, it produces also kulit lawan(g) bark.

Additional material: MOLUCCAS, Isl. Morotai, Tutuku, ster., 66. U547 (A, BO, K, L, NY, SING), local name: Biselo (Galela language); *ibid.*, Mtl. Para-Para, ster., *Kosterma*«s 1230 (A, BO, BRI, K, L, LAE, PNH, SING); Isl. Obi, Telaga Obi, ster., *bb.* 2379.4 (BO) and 23795 (A, BO, L).

### 35. CINNAMOMUM MASSOIA Schewe — Fig. 22

Cf. Kostermans, *Bibl. Laur.* 319. 1964 (exclus. cit. *Massoia aromatica* Becc). — Typus: *Hollrung 158* (BO), para-typus: *Schlechter s.n.*, near Weng-i, ster.

Large tree, up to 50 m tall and 100 cm diam.; bark light brown with persistent flakes, pustular; inner bark reddish brown with strong spicy smell; sapwood pale straw-coloured, undefined, heartwood pinkish yellow, moderately soft, cuts and splits well, strong, spicy odour. Branchlets stiff smooth, glabrous, end bud glabrous to densely, minutely pulverulently pilose. Leaves opposite, chartaceous to stiffly chartaceous, glabrous, sub-ovate-elliptic, ovate-elliptic to elliptic, 4 x 9 — 6 x 12 cm, obtuse or broadly, shortly acuminate, base rounded to sub-truncate or shortly cuneate, upper surface glossy, dark green, main nerves faint, pale; lower surface less glossy, pale, midrib prominulous, lateral basal nerves slender, prominulous, arcuate, reaching  $y\%$  —  $\%$  the length of the leaf; other lateral nerves (upper part of the lamina) ca 3 pairs, very slender, obscure with numerous intermediate, very obscure secondary veins. Often 2 extra short, basal, very slender nerves present. Petiole slender, 15 — 20 mm long, channeled above.

Infructescences axillary and pseudo-terminal, slender, 2 — 13 cm long, slightly, microscopically pilose, unbranched. Fruit ovoid-ellipsoid, purple, 13 x 20 mm, apiculate, pericarp thin, fleshy, cots cream-coloured; cupula cup-shaped, thin, up to 10 mm in diam., 5 mm high with thin, slightly indented margin (bases of tepals), base abruptly contracted into the slender, 5 — 8 mm long, pilose pedicel.

Inflorescences (*Carr 11457*) densely, minutely pale brown pulverulently pilose.

Of this species, as far as I know, only the sterile type material *Hollrung 158* (BO) is extant, the remainder was destroyed in Berlin; the Bogor sheet has Constantinshafen as locality.

The fruiting material, enumerated and described here differs slightly from *Hollrung's* specimen by the shorter basal nerves and the more irregular other nerves, the leaves are, moreover, shorter. However, in the

sterile material at hand, both types of leaves occur in the same collection. There is another discrepancy: the infructescences are usually short, bearing one fruit only, but the specimen *N.G.F. 1304.8* has also long infructescences, although of the same shape.

The possibility should not be excluded that the flowering and fruiting material represents not *C. massoia*.

In sterile condition it is very difficult to separate it from *C. eugenoliferum*. It has usually shorter petioles (not always), but the shape of the fruit cup is decisive: sharply demarcated from the thin pedicel in *C. massoia* and fleshy and merging into an obconic pedicel in *C. eugenoliferum*; the latter species has a more brownish tomentum.

Schewe's variety *rotundatum*, also based on sterile material, cannot be placed until abundant material will be available.

Additional specimens: W. IRIAN, Inanwatan, Idore, alt. 300 m, ster., 66. 22291 (A, BO, L, SING), tree 15 m; Votgelkop Peninsuls, Namtoo Mts., S. of Arfak, alt. 700 m, ster., *Kostermans 2030* = 66. 33651 (A, BO, L), tree 20 m, bark with a strong smell of nutmeg, local name: Mehau; Japen Isl., Watibu, alt. 300 m, ster., 6b. 802U2 (A, BO, K, L, SING), tree 18 m, diam. 20 cm, local name: Mawai or Korosusu (Mentenbu language, Ambai dialect); Hollandia, Pionierbivak, alt. 30 m, ster., 66. 31323 (A, BO, L), tree 22 m, diam. 40 cm, local name: Mook (Kaowerawetj language); *ibid.*, near Berap, Nimburan, ster., 66. 28U2 (A, BO, K, L, NY, SING), local name geruwo, tree 20 m, diam. 43 cm. — PAPUA, Central Distr., Brown line near Port Moresby, fr., *N.G.F. 130U8* (A, BO, BRI, K, L, LAE), local name: Bait (Waria dialect); *ibid.*, 3 mile Black, Brown R., alt. 30 m, Aug., fr., *N.G.F. U600* (BO, LAE), tree 34 m, diam. 70 cm; Constantinshafen, sterile, *Hollrung 158* i(BO); Finschhafen, ster., *Lauterbach 1155* (BRESLAU); near Ponganit Falls, Managalase area, N. Div., alt. 600 m, ster., *Pullen 6200* (CANB), tree 15 m, local name: Misuwa (Managalase); Pongani valley, between Dareki and Ondoro, Managalase area, alt. 700 m, ster., *Pullen 6109* (CANB), tree 17 m, bark with sharp cinnamomum smell. — TERRITORY OF NEW GUINEA: Yalu near Lae, ster., *N.G.F. 3351* (BO, SING), tree 53 m, bole 30 m, narrowly buttressed to 180 cm, leaves dark green with almost white main nerves; Morobe Distr., Bulolo, ster., *N.G.F. 10139* (BO), close to *C. hentyi*; Usino, Madang Distr., alt. 130 m, Aug., fr., *N.G.F. 28025* (A, BO, BRI, CANB, K, L), forest of flood plain, tree 31 m, diam. 100 cm, local name: Kup (Karia language); Kanosia, sea-level, Febr., buds, *Can- 1H57* (SING), native name: Api-Api; Koitaki, alt. 500 m, May, fr., *Cart- 12127* (SING), fr. purple, local name: Api-Api.

36. *Cinnamomum microcarpum* Kosterm., *spec. nov.* — Fig. 23

Arbor in omnibus partibus inflorescentiis exceptis glabris ramulis subgracilis strictis foliis coriaceis ellipticis vel lanceolatis apice obscure late acuminatis vel sensim attenuatis basi acutis venis tres principalis utrinque prominulis basalibus fere apicem laminarum attingentibus supra

nitida laevia subtus pallidiora rete laeve conspicue nervulis secundariis creberrimis parallelis horizontalis paniculis strictis axillaris vel pseudo-terminalis glabris nitidis apicem versus minutissime sparse adpresse pilosis cupulis parvis in pedicellis cylindricis abrupte contractis.

TYPUS: *Cheiv, Corner & Stainton 8 (BO)*.

Tree 20—25 m tall and 30 cm diam., without buttresses; bark smooth, ochre-brown, somewhat mottled; branchlets stiff, slender, smooth, glossy, glabrous; end bud with a sparse tomentum of microscopic, adpressed hairs. Leaves opposite, thinly, stiffly coriaceous, glabrous, varying from shortly elliptic to elongate lanceolate or ovate-elliptic, 3.5 x 8—5.5 x 18—6 x 12 cm, shortly, broadly acuminate with obtuse tip or long-tapered, base acute or shortly cuneate, the 3 main nerves prominulous on both surfaces, the basal nerves reaching almost the top of the leaf; upper surface smooth, glossy, lower one paler with close, parallel, horizontal prominulous secondary veins, connected by a smooth, similar reticulation, sometimes the veins very obscure. Petiole 7—10 mm, glabrous, flat or concave above.

Panicles axillary and pseudo-terminal, crowded, cream (fresh), glossy, smooth, glabrous, stiff, 6—14 cm long with few, rather patent, short, slender branchlets. Pedicel filiform, 2—3 mm, obscurely pilose, cup rather shallow, thin, 4—5 mm diam. with a wavy margin (base of tepals persistent), 2 mm high, sharply demarcated from the slender, cylindrical pedicel. Fruit (immature) cylindrical-obovoid, up to 3 x 5 mm, much smaller than the cup, apiculate with remnants of an adpressed, microscopical tomentum.

The leaves differ considerably in size and shape, those near the inflorescence are shortly elliptic with a short, obscure acumen; leaves lower down are tapered. There is more than one panicle in each axil, actually a branch of an extremely short main peduncle.

The species is mainly distinguished by the numerous, narrowly spaced, parallel secondary veins on the lower leaf surface, the stiff infructescences, the small, thin cup, sharply defined from the pedicel and the narrow fruit, which does not fill the cup completely. Its alliance is with *C. corneri* and *C. subavenium*, the latter has the main nerves hardly prominent on the upper surface and in a groove and the cup rim is entire (not wavy).

BORNEO. Sabah, Mt. Kinabalu, Eastern Shoulder, alt. 1100 m, June, young fr., *Cheiv, Corner and Stainton 8 (BO, K, L, SAR, SING)*; Sarawak, Ulu Stirau Labang, Bintulu, March, young fr., *S. 18099 (A, BO, K, KEP, L, MEL, P, SAN, SING)*, low ridge in primary mixed dipterocarp forest, podsolized, yellow sandy soil, tree 27 m, diam. 30 cm without buttresses, bark smooth, ochrous brown, somewhat mottled; Bukit Mersing, Anap, basalt ridge, submontane forest, alt. 300 m, Sept., young fr., *S. 22108 (A, BO, K, KEP, L, MEL, SAN, SING)*, tree 17 m, diam. 20 cm.

## 37. CINNAMOMUM MICROPHYLLUM Ridley

Cf. Kostermans, Bibl. Laur. 322. 1964. — Typus: *Robinson s.n.*, G. Kerbau (K).

Synonyms: *Cinnamomum parviflorum* Ridley, cf. Kostermans, I.e. 334; *Cinnamomum cordatum* Kosterm. in Reinwardtia 7: 295. 1968. — Typus: *Symington CF. 32130* (K, KEP, SING).

## 38. CINNAMOMUM MOLLISSIMUM Hk. f.

Cf. Kostermans, Bibl. Laur. 322. 1964. — Typus: *Curtis s.n.* (= 308), Penang, fl., fr. (K, SING).

*Cinnamomum trichophyllum* Merr. has slightly shorter hairs and hardly any fruitcup, but very large persistent tepals.

Additional specimens: MALAY PENINSULA, Penang, West Hill, July, fl., fr., *Curtis 308* (SING, 3 sheets); Perak, Larut, alt. 30 m, Pebr., fl., *King's Coll. 5568* (BO); Goping, alt. 200 m, April, fl., *King's Coll. 6013* (SING); Kota Lama, Kuala Kampar, ster., *S.F.N. 15547* (SING), sapling, leaves up to 11 x 30 cm; *ibid.*, ster., *S.F.N. 16028* (SING), a decoction of the leaves is taken after childbirth; without locality, fl., *Wray 2696* (SING), narrow leaved, 3 X 11 — 3.5 X 13 cm; Trolak For. Res., tree 7 m, diam. 10 cm, fls. yellowish white, buttresses 15 cm, 7.5 cm thick, short, bark smooth brown white, outer bark brittle, inner bark white, mottled, sapwood yellow, March, fl., *Kep. 104614* (SING, 2 sheets); Pahang, Uhi Sg. Kuantan, alt. 200 m, June, fl., *S.F.N. 28770* (BO, SING); Cameron Highlands, Nov. - Jan., fr., *Batten-Pooll* (SING); near Tanah Kota, Cameron Highlands, alt. 1600 m, ster., *S.F.N. 18005* (SING), bark dark chocolate, 7.5 mm, wood whitish yellow, smells of foenegrice; Selangor, Kuala Lumpur, Wild Hills, Nov., fl., fr., *CF. 872* (SING); *ibid.*, Febr., fl., *CF. 3013* (SING); Kedah, Rompin, G. Lesong, alt. 70 m, April, fls. yellow, tree 13 m, *Kep. 83455* (SING); Negri Sembilan, Senawang For. Res., Dec, fl., *S.F.N. 9942* (BO, SING); Sg. Ujong, buds, *Alvins s.n.* (SING); Kelantan, Gobek, Kerilla Estates, Tamangan, alt. 70 m, tree 7 m, March, fr., *Shah & Kadim M.S. 527* (A, BO, K, L, SING); Trengganu, 23rd mile Trengganu-Besut Rd., ster., *S.F.N. S9921* (SING); Pangkor, ster., *Curtis s.n.* (SING); Malacca, Nov., fl., *Alvins 3H\*6* (SING); Johore, Mawai, April, fr., *S.F.N. 30885* (SING); Sg. Kayu Ara, Mawai - Jemaluang Rd., May, fl., *S.F.N. 29325* (BO, SING) in dry *Dryobalanops* forest; Mawai, Aug., fl., *Kostermans s.n.* (BO, L); Mile 2, S. of Labis For., fresh water swamp forest, low alt., tree 7 m, crown deep, dome-like, old leaves bluish below, April, fl., *F.R.I. 0190* (KEP, SING).

## 39. CINNAMOMUM PEDATINERVIUM Meissn.

Cf. Kostermans, Bibl. 335. 1964. — Typus: *Seemann 376* (K).

New synonym: *Cinnamomum carolinense* Koidzumi, cf. Kostermans, I.e. 275 (cum. var. *oblongum* Kanehira in Bot. Mag. Tokyo 46: 452. 1932; Fl. Micrones. 118, fig. 37. 1933), typus (var. *oblongum*): *Kanehira F.N. 4242* (FU).

Additional specimens: PONAPE, Param, alt. 100 m, abundant, Febr., buds, *Takamatsu 615* (BISH, BO), leaves up to 10 x 17 cm, those near the inflorescence

55 X 9 cm; Kusaie, Moto, March, fl., fr., *Kanehira F.N. U2k2* (FU); Fidji, slopes of Mt. Victoria, alt. 1000 m, ster., *Gillespie 408J*> (BISH); locality not indicated, fr., *Home 867a* (BO).

#### 40. CINNAMOMUM PENDULUM Cammerl.

Cf. Kostermans, *Bibl. Laur.* 338. 1964. — Typus: 66. 2089 (BO, L), Kuala Kapuas, Sg. Ruhung (Roehoeng).

New synonym: *Cinnamomum endlicheriaecarpum* Kosterm. in *Reinwardtia* 7: 460, t. 13. 1969. — Typus: *Brim. 5285* (BO).

*Cinnamomum pendulum* has been for a long time a puzzle for me; the description was based on wholly inadequate material, a young branch with inflorescences; in *Cinnamomum* mature leaves are necessary to identify and characterize the species. The name "pendulum" referring probably to the inflorescences is wrong, the panicles are erect.

Luckily I had the opportunity to collect the species with mature and immature leaves and these, together with a specimen, of which the fruit were attacked by a fungus and had turned into an enormous depressed globose powderpuff ball of 8 cm diam. and 4 cm high, still showing the very large, persistent tepals gave a clue to the identity, as moreover, another specimen with mature leaves and fruit (*S. 27141*) had some of its fruit already partially deformed by the same fungus.

Mature leaves are completely devoid of any reticulation as described for *C. pendulum*.

The bark smells strongly of nutmeg and is one of the sources of the kulit lawan(g) of commerce (cf. *C. culilaban*), the roots have also medicinal properties and seem to smell of wintergreen oil. The fruit are used, because of their aromatic properties, by Dayak women.

The type collection of *C. pendulum* was wrongly quoted by Cammerloher, it should be 2089 and not 1099.

Additional specimens: BRUNEI, Ulu Tutong at Rh. Sigat, slightly acid, swampy, alt. 25 m, local name: Belong (Iban language) or Lawang (Tutong Iban), sapling of 2 m, bark of roots ground with penang nuts, fold in a sirih leaf and chewed with a little gambier is said to cure cough, a sick stomach and flatulence, it has a warm, aromatic taste on the tongue, *Briin. 899* (SING), leaves up to 9 X 27 cm, sharply acuminate; Sabah, Hulu Bole, alt. 400 m, pole tree, ster., *B.N.B.F.D. 3150* (BO), vernacular names: Batunuk (Idahan), Tatagas bo kabuaan (Murut), Ka/u manis (Malay), tree 6 m, diam. 7.5 cm, roots aromatic like wintergreen, used as a medicine on wounds. — SARAWAK, Nangga Sepulau, Segan For. Res., 4th Div., rich clayey loam soil, alt. 200 m, Aug., fr., *S. 27H-1* (A, BO, K, KEP, L, SA NJ, SING), tree 23 m, diam. 20 cm, bark smooth, buttresses small; Saribas, ster., no collector, s.n. (BO, SAR), vernacular names: Balong or Lawang, the fruit are much

esteemed by Dayak ladies for the sake of the smell. — W. KALIMANTAN, Melawi, Bukit Lamas, alt. 200 m, ster., 66. 2U52h (BO, SING). — E. KALIMANTAN, Peak of Balikpapan, Be-ul, alt. 600 m, ster., *Kostermans* 7330 (BO, K, L, PNH, SING), fruit attacked by a fungus, tree 25 m, bole 18 m, diam. 100 cm, bark smooth, light brown, 0.5 mm, living bark 20 mm, orange yellow, inside 2 mm, lightbrown, wood white; bark and wood with a strong nutmeg<sup>1</sup> odour, rare; *ibid.*, alt. 900 m, ster., *Kostermans* 7621 (A, BO, K, L), tree 15 m, diam. 20 cm, bark smooth, brown, 0.5 mm, living bark 6 mm, brown, lower leaf surface pale; wood white; E. Kutei, Sangasanga near Samarinda, alt. 50 m, Aug., fl., *Kostermans* 7732 (A, BISH, BO, BRI, CAL, CANB, K, L, LAE, MEL, NY, P, PNH, SING), tree 25 m, diam. 45 cm, bark lightbrown, glossy, smooth, cracked, 1 mm, living bark 12 mm, lightbrown, hairy-fibrous, nutmeg smell, buds greenish; perhaps also: Melawi, Tjatit, Bkt. Kelawaideras, alt. 350 m, ster., 66. 28118 (A, BO, L); Sumatra W. Coast, Bukittnggi, ster., 66. 6U70 (A, BO, K, L).

#### 41. *Cinnamomum percoriaceum* Kosterm., *spec. nov.* — Fig. 24

Arbor parva ramulis strictis glabris laevis foliis oppositis rigide coriaceis glabris ovalis utrinque laevis obscure late acuminatis basi acutiusculis supra nitida subtus opaca pallidiora costis basalibus apicem laminarum fere attingentibus paniculis pseudo-terroinalis aggregatis foliis multo longioribus glabris nitidis apicem versus sparse minutissime sericeis cupulis immaturis pilosis margine integris in pedicello sensim transeunte.

TYPUS: S. 26395 (SAR).

Small tree, 7 m tall, 7 cm diam.; branchlets glabrous, smooth, glossy. Leaves opposite, rigidly coriaceous, oval, 3 x 8—4 x 10 cm, obscurely, broadly acuminate, base contracted into the petiole, shortly cuneate or acutish, both surfaces smooth (obscure parallel, horizontal secondary nerves sometimes slightly showing on the upper surface) with prominulous main nerves, the basal ones reaching almost the apex of the leaf. Petiole stout, ca 1 cm, broadened at apex, flat above. Panicles pseudo-terminal, crowded, lax, few-branched, yellowish (fresh), up to 15 cm long, towards the flowers sparsely, microscopically sericeous, lower branches up to 8 cm long, rather patent; young fruit cup with entire margin, the base gradually merging into the pedicel.

Close to *C. corneri* and *C. microcarpum*, characterized by the oval, very thick leaves and the fruit cup which tapers into the pedicel.

BORNEO, Sarawak, Path of Mt. Murut (Camp 4), Lawas, ridge at 2200 m alt., Oct., young fr., S. 26395 (SAR).

#### 42. CINNAMOMUM PINIODORUM Schewe

Cf. *Kostermans*, *Bibl. Laur.* 339. 1964. — Typus: *Ledermann Ull* (L), Sepik region, buds.

New synonym: *Cinnamomum gilgianum* Schewe, cf. Kostermans, 1 c. 296. — Typus: *Ledermann 8170* (SING), Sepik region, buds.

The differences between the two species fall within the variability of the leaves (common in *Cinnamomum*), the latter has more elongate leaves, but also some, which match those of the former.

Additional specimen: TERRITORY OF NEW GUINEA, off Wau-Bulolo Rd., 10 miles from Wau, Morobe Distr., Araucaria hardwood forest, alt. 1100 m, Dec, buds, *N.G.F. 26337* (BO, BRI, CANB, K, L, PNH, SING, SYD, US).

#### 43. CINNAMOMUM PODAGRICUM Kosterm.

Cf. Kostermans in *Reinwardtia* 7: 462, fig. 14. 1968. — Typus: *Havel, N.G.F. 9188* (BO).

Additional specimens: TERRITORY OF NEW GUINEA, Kainantu, E. Highland Distr., oak forest, alt. 1800 m, July, after anthesis, Womersley, *N.G.F. 24652* (A, BO, BRI, K, L, SING); Morobe Distr., alt. 1500 m, logging area, mostly Fagaceae, Febr., after anthesis, Sayers, *N.G.F. 21699* (A, BO, BRI, CANB, K, L, PNH, SING, SYD, US); *ibid.*, Crystal Creek, ster., *N.G.F. UU* (BO, SING).

#### 44. CINNAMOMUM POLITUM Miq.

Cf. Kostermans, *Bibl. Laur.* 340. 1964. — Typus: *Korthals s.n.*, ster., summit of Mt. Sakoembang, Borneo (L, 3 sheets).

New synonym: *Cinnamomum xylophyllum* Kosterm. in *Reinwardtia* 7: 467, f. 16. 1969. — Typus: *Kostermans 13067* (BO).

The type collection consists of two sheets with rather narrow leaves, 2.5 x 10 — 4.5 x 14 cm, with a long, slender acumen and one sheet with broader leaves, 3 x 8 — 5 x 11 cm with much shorter acumen, there is one branch with both types of leaves.

Additional specimens: BORNEO, Brunei, Bukit Biang, alt. 400 m, leached yellow, sandy soil, ridge, April, fr., *Brun. 369* (SING), tree 20 m, diam. 15 cm, mottled purple and dove grey, smooth bark, sapwood yellow, honey-coloured cambium, inner bark rich light orange brown, 6 mm, outer bark thin, strongly aromatic; Berakas For. Reserve, alt. 50 m, 'mor' on podsolized white sand terrace, old secondary kerangas forest, Dec, fl., *Brun. 5047* (SAR, SING), grey, smooth bark and aromatic yellow sapwood; *ibid.*, May, fr., *S. 7803* (SAR, SING), tree 33 m, diam. 35 cm, sharp, 90 cm buttresses, bark smooth, grey with small knobs and ridge; the latter horizontal, but not encircling the trunk, outer bark thin, inner bark plum coloured, 12.5 mm, sapwood pale buff, heartwood dark brown with strong smell of cinnamon, when freshly out; Sarawak, Sg. Tubau above Tuban village, alt. 250 m, heath forest on sandstone plateau, April, fr., *S. 18388* (A, BO, K, KEP, L, MEL, P, SAN, SING), tree 37 m, diam. 25 cm, buttresses 15 m, concave, large, bark brown and grey mottled, slightly, superficially cracked at base; Baram, ster., *S. 1293* (SING). — KALIMANTAN, G. Sakumbang, *Korthals s.n.*, ster. (L, 3 sheets).



## 45. CINNAMOMUM PORRECTUM (Roxb.) Kosterm.

Cf. Kostermans, *Bibl. Laur.* 340. 1964.

Synonyms: *Laurus porrectum* Roxb., cf. Kostermans, *I.e.* 689. — Typus: *Jack s.n.* (Brussels in *Herb. Mart.*, fl., Sumatra); *Camphora porrecta* (Jack) Voigt, cf. Kostermans, *I.e.* 197; *Parthenoxylon porrectum* (Roxb.) BL, cf. Kostermans, *I.e.* 1191; *Cinnamomum parthenoxylon* (Jack) Nees, cf. Kostermans, *I.e.* 332; *Laurus parthenoxylon* Jack, cf. Kostermans, *I.e.* 680. — Typus: *Jack; Camphora parthenoxylon* (Jack) Nees, cf. Kostermans, *I.e.* 197; *Parthenoxylon pseudo-sassafras* BL, cf. Kostermans, *I.e.* 319. — Typus: *Griffith S.Jl.*, Malacca, fl. (K, non vidi); *Laurus pruinosa* Reinw. Java (L, 2 sheets, branches of a sapling); *Persea pseudo-sassafras* Zoll., cf. Kostermans, *I.e.* 1249. — Typus: *Zollinger & Moritzi s.n.*, fl. (L); *Laurus pseudo-sassafras* BL, cf. Kostermans, *I.e.* 691; *Cinnamomum pseudo-sassafras* Meissn., cf. Kostermans, *I.e.* 341 (cum var. *imperfurata* (Miq.) Meissn.); *Camphora pseudo-sassafras* Miq., cf. Kostermans, *I.e.* 197; *Cinnamomum inodorum* Meissn., cf. Kostermans, *I.e.* 305. — Typus: *Korthals s.n.*, Borneo, young fr. (L, 6 sheets); *Camphora inodora* Bl. ex Miq., cf. Kostermans, *I.e.* 193; *Cinnamomum sumatranum* (Miq.) Meissn., cf. Kostermans, *I.e.* 353; *Camphora Sumatra* Miq., cf. Kostermans, *I.e.* 198<sub>w</sub> — Typus: *Junghuhn s.n.*, Hochangkola, Sumatra, ster. (U); *Cinnamomum malaccense* Meissn., cf. Kostermans, *I.e.* 319. — Typus: *Griffith s.n.*, Malacca, fl. (K, non vidi); *Laurus pruinosa* Reinw. ex BL, cf. Kostermans, *I.e.* 690. — Typus: *Laurus pruinosa* Reinw., Java (Copenhagen), para-typus: *Blume*, Bantam (LEN); *Parthenoxylon pruinatum* BL, cf. Kostermans, *I.e.* 1191; *Litsaea pruinosa* (Reinw.) Nees, cf. Kostermans, *I.e.* 869; *Cinnamomum neesianum* Meissn., cf. Kostermans, *I.e.* 324. — Typus: *Laurus chinensis* Hort. Berolin.; *Camphora chinensis* Nees, cf. Kostermans, *I.e.*; *Phoebe latifolia* Champ, ex Meissn., cf. Kostermans, *I.e.* 1286. — Typus: *Champion; C. neesianum* var. *petiolaris* Meissn., cf. Kostermans, *I.e.* 324. — Typus: *Champion s.n.*, Hongkong and *Jenkins s.n.*, Hort. Calcutt.; *Cinnamomum glanduliferum* Nees, cf. Kostermans, *I.e.* 296. — Typus: *Wallich 2601* (BO, K), top of Sheopore, anno 1821, fl.; *Camphora glandulifera* Nees, cf. Kostermans, *I.e.* 191; *Cinnamomum simondii* Lee, cf. Kostermans, *I.e.* 349. — Typus: *Simond 190* (P); *Phoberos maritima* Miquel, -p.p., cf. Kostermans, *I.e.* 1267. — Typus: *Junghuhn s.n.*, Sumatra (L).

I have not been able to find any differences between the mainland specimens, described as *C. glanduliferum* and the Malesian species, described as *C. parthenoxylon* (which confirmed Hooker's assumption). Fruit and flowers are constant in shape, size and tomentum.

The leaves, however, differ considerably in size, shape and texture, but all intermediate forms are met in the Malesian material. The under surface of the leaves has sometimes pits in the axils of the lateral nerves, corresponding with rather obscure bullate parts on the upper surface. They fail in other specimens or are only faintly indicated. The bud containing the inflorescences is a large, globose body, covered by large scales, the outer glabrous, the innermost minutely sericeous. The continental specimens have smaller leaves, but the smallest are found in specimens from the island Bangka (Sumatra).

In the Brussels Herbarium two specimens are conserved from Roxburgh's collection (Herb. Martii) representing flowering branches from Sumatra, one label bears the additional annotation: Cayoo gadees of Marsden, Sumatra 129; whether these are original Jack specimens, I am not sure, but I accept them as the (lecto) type.

The specimen *Hoiv 71851*, identified by Allen as *C. parthenoxylon*, is not that species, probably *C. tonkinensis*, whereas *Chun 5708*, identified by her as *C. camphora*, var. *glaucescens*, belongs here.

The species *C. ilicioides* Chev. and *C. tonkinensis* Lee. are closely related, but differ by their tomentum, leaf shape and fruit cup. The type material being not available to me, I refrain from discussing these two species here.

Specimens enumerated here represent a selection, the abundant Malesian material is not enumerated.

INDIA, Nepal, fl., *WallicR 2601* (BO, K); Shillong, Kany Hills, alt. 2000 m, fl., *Boy 17304* (DD); Sikkim, Darjeeling, alt. 2000 m, ster., *Gamble 10014* (DD); Assam, Leitkar forest, Khasi and Yayanti Hills, June, fr., sine coll. (DD); *ibid.*, Rang-umchia, ster. (DD); Sibsagor, fr., *Peal 260*, p.p. (CAL); culta in Hort. bot. Calcutt., ster., *Laurus glandulifera* Wall., anno 1834 (BO, 2 sheets); *ibid.*, fl. (BO). — HONGKONG, fr., *Hayata s.n.* (TI). — CHINA, Yunnan, Mao Kou tchang above Ta fun tze, May, fl., *Delavay 2565* (BO, P); Mekong-Salween divide, alt. 3000 m, shrub, 4 - 7 m, June, fl., *Forrest 16517* (MO); around Mo-so-yu, Aug., fr., *Delavay U558* (BO, P); Szemao, alt. 1500 m, fl., *Henry 11960 B* (MO); Kwangsi, Na I, Ling Yiin Hsien, June, fr., *Steward & Cheo 591* (BO), shrub 2.5 m; Ta tse Tsuen, Yang Hsien, May, fl., *Steward & Cheo 781* (SING); Kwangtung, fr., To Kangi Peng *et at. 12646* (BO); Lu F'au Mt. near Iu, fl., *CCC 12035* and *12646* (MO); S. Szechuan, between Yumen and Pai Kua Wan, tree 6 m, March, fl., *Schneider 6013* (A, BO); W. Hupei, tree 16 m, fl., *Wilson 2226* (BO); Hainan, Lin Fa Mts., ster., Tsang, *W.T. 1678S* (MO), local name: Cheung Shua; Pak Shik Ling, Ching Mai distr., Ku Tung village, Nov., fr. (galled), *Lei 223* (BO), shrub 3 m tall. — BURMA, S. Shan States, July, fl., since coll. 1914 (DD) et ster. (DD), local name: Karawa; Burma, S. Tenasserim, Ladi Circle, *F.D. 3954* (DD); TONKIN, Tai Wong Mo Shan, Chuk-phai, Ha-coi, Oct., fl., Tsang, *W.T. 27066* (BO). — SIAM, Kapa, Ranaung, alt. 10 m, Jan., *Kerr 16718* (BO, K); Ban Pien, Songkla, alt. 200 m, March, fr., *Kerr 14833* (BO, K); Ban Map Amasit, Chumpawn, alt. 50 m, June, fl., *Kerr 11422* and *A* (BO, K); Chandabury, Kao Tjalab, ster., *Put s.n.* (BKF); Kao Ri Yai, Kanburi, alt. 900 m, Febr., fl., *Kerr 10425* (BO, K). — MALAY PENINSULA, Penang, fl., *Wallich 26a* (BO); Negri Sembilan, Mt. Angai, N. slope, ster., *S.F.N. 11703* (SING); *ibid.*, Kopin For. Res., April, fl., *C.F. 1866* (SING); Pahang, Pantian, fr., *C.F. 3557* (SING). — W. JAVA, tree above Tjibelokan, Aug., fr., *Kuhl & Van Hasselt s.n.* (L); without locality, fr., *Blume s.n.* (L, 2 sheets, type of *Parthenoxylon pseudo-sassafras* Bl.); Mt. Cede & Salak, fl., *Zollinger & Morttzi = Zoilinger 2141* (U, L), type of *Persea pseudo-sassafras* Zoll. & Mor.; *id.*, ster., *Blume s.n.* (L, 5 sheets),

para-type of *Partenoxylon pseudo-sassafras* Bl. — BORNEO, *Koi\*thals s.n.*, ster. (L, 2 sheets), type of *Cinnamomum inodorum* Meis'n. = *Camphora inodora* Bl. ex Miq.; cult. in Batumi Bot. Garden, Black Sea, fl., *Kostermans s.n.* (BO).

#### 46. CINNAMOMUM RACEMOSUM Kosterm.

Cf. *Kostermans in Reinwardtia* 7: 463, fig. 15. 1969. — Typus: *Ashton S. 18310* (BO).

The specimens from the Ranau region differ slightly in their leaf reticulation (denser, more pronounced), otherwise I cannot find differences. The specimen *San 48142* has inflorescences up to 15 cm long with sometimes a few, short branches. The ripe fruit is ellipsoid, 2.5 x 1 cm, apiculate; the calyx 8 mm diam., 6 mm high, subhemispheric, margin with broad undulation (tepal bases), the base merging into a fleshy, obconical pedicel.

Additional specimens: BORNEO, Sabah, Elopura, Kabili-Sepilok For. Res., edge of Hill near swamp, alt. 33 m, March, young fr., *Enggoh F.D. 10182* (SING), tree 6 m, diam. 6.5 cm; *ibid.*, Febr., young fr., *San A 3861* (BO, BRI, K, KEP, L, SING), tree 12 m; Kinabalu, Ranau distr., Bukit Nosopod, Poring-Nalumad path, alt. 1200 m, Oct., fr., *San 26737* (SING), tree 7 m, diam. 15 cm, outer bark grey, slash and inner bark pale brownish, sapwood yellowish, smells of cinnamon; Ranau, above Hot Spring, alt. 1200 m, Febr., buds, *San 24002* (BO), tree 13 m, bole 10 m, diam. 15 cm, bark grey brown, outer bark very thin, cork cambium reddish brown, inner bark 4 mm, laminated reddish brown, sapwood ochre yellow; Ranau, behind Resthouse, alt. 700 m, Febr., after anthesis, *Sam 4,8142* (SAR), tree 7 m, diam. 20 cm, green near cambium; Sarawak, R. Julian, Usun Apai Plateau, alt. 1100 m, ster., *S. 3810* (SING), tree 7 m; N. slope Mt. Kalulong, alt. 700 m, Febr., young fr., *S. 3711* (SAR, SING), tree 9 m; S. Tuban above Tuban village, shallow sandy clay, alt. 100 m, narrow ridge, mixed dipterocarp forest, April, fr., *S. 18379* (SAR); Bintulu, Sg. Binio, alt. 7 m, March, young fr., *S. 8698* (BO), small tree on kerapak and kerangas.

#### 47. CINNAMOMUM RHYNCHOPHYLLUM Miq.

Cf. *Kostermans, Bibl. Laur.* 344. 1964. — Typus: *Teijsmann H.B. 1031*, Loeboe along, W. Coast Sumatra, ster. (BO, U).

Synonym: *Cinnamomum lampongum* Miq., cf. *Kostermans, I.e.* 311. — Typus: *Teijsmann H.B. 4550*, Lampong, G. Batin, ster. (BO, U); *Cinnamomum rhynchophyllum* var. *lampongum* (Miq.) Ridley (quoad nomen), cf. *Kostermans, I.e.* 345.

The specimen *King's Coll. 4802* from Larut, Perak, represents another, undescribed species. *C. rhynchophyllum* has thus far not been collected in the Malay Peninsula.

Additional specimens: SUMATRA, Palembang, Banjuasin and Kubu regions, alt. 15 m, Aug., fl., *52 T. IP. 80* (BO, CAL, G, K, L, P, SING), tree 15 m; *id.*, Sept., fl., same number (BO, L); *ibid.*, ster., *Grashoff 733* (BO, L); Palembang, buds,

*Boorsma s.n.* (BO); Palembang, forest Panerokan, ster., *Buurman van Vreeden 63* (BO); forest Taminang, ster., *Buurman van Vreeden 71* (BO), tree 15 m; B. Coast, Simalungun, alt. 340 m, May, fl., *bb. 5362* (BO, L), tree 21 m, diam. 32 cm, fls. yellowish white; Central Sumatra, ster., *Koorders 10345* (BO); Lampong, Mt. Batin, fr., *Teijsmann H.B. 4230* (BO, U) and *4550* (BO, L, U); Lampong, Sept., fl., *Zollinger 248* (BO, U), this sheet bears also a label *H.B. 1727, C. camphoratum* Bl. — BORNEO, Sarawak, Lundu, Mt. Gadin, Oct., fl., *J. & M.S. Clemens 22194* (BO, 3 sheets), tree 12 m; Sampadi For. Res., Aug., fl., *F.D. 0544* (KEP); Kalimantan, Ulu Kenapai, ster., *Hallier 1463* (BO, L); *ibid.*, sapling of 50 cm, *Hallier 1997* (BO, L); Mempawah, G. Kerokok, alt. 200 m, Nov., fr., *Hamzah 17* (BO, L); E. Kutei, Kelindjau R., near Melan, ster., *Kostermans 9622* (A, BO, K, L, P, PNH, SING), tree 8 m, diam. 20 cm, bark smooth, dark brown, living bark 4-5 mm, the white wood and bark with a strong nutmeg odour, lower leaf surface glaucous; Sg. Wain near Balikpapan, alt. 40 m, treelet 5 m, fls. pale green, bark without smell, *Kostermans 4559* (A, BO, BRI, K, L, PNH, SING); W. Kutei, Telen R., L. Djenean, alt. 40 m, Nov., fl., *Endert 5074* (BO, CANB, K, L, US).

#### 48. CINNAMOMUM SCORTECHINII Gamble

Cf. Kostermans, *Bibl. Laur.* 347. 1964. — Typus: *Seortechini 322* (BO, K), G. Perak at camp on Ulu Batang Padang, alt. 1500 m, fl.

Synonym: *Cinnamomum velutinum* Ridley, cf. Kostermans, *I.e.* 360. — Typus: *Ridley 16110* (K, SING), Pahang, G. Tahan, Teku woods, fl.; *Cinnamomum scortechinii* var. *selangorensis* Ridley, cf. Kostermans, *I.e.* 347. — Typus: *Burn-Murdo'k 339* (SING).

The affinity of this species is with *C. longitepalum* of Borneo, but it differs by the impressed nerves, the reticulation and long petioles. The type material of *C. scortechinii* is very poor, leaftips are missing, the leaves are narrower, but the specimen *Caulfield s.n.* has the same leaves together with the normal ovate, long acuminate ones.

Additional material: MALAY PENINSULA, Pahang, G. Tahan, July, fl., *Ridley 16110* (SING), leaves up to 8 x 16 cm with 1.5 cm long acumen, panicles 5-11 cm; Cameron Highlands, Rhododendron Hill, June, fl., *S.F.N. 11207* (SING); *ibid.*, Batu Brinchang Camp, alt. 1600 m, ster., *S.F.N. 18038* (BO, SING); Trengganu, G. Padang, alt. 1300 m, June, fl., *S.F.N. 31886* (SING), tree ca 13 m, fls. cream; Upper Perak, fl., *Caulfield s.n.* (SING); Selangor, G. Ulu Kali, fl., *Burn-Murdock 339* (SING).

#### 49. *Cinnamomum singularis* Kosterm., *spec. nov.* — Fig. 25

Arbor ramulis glabris gracilis laevis pallidis foliis alternantibus rigide chartaceis glabris anguste ellipticis obscure sensim longe acuminatis basi acutis vel cuneatis utrinque perobscure dense minute reticulatis supra nitida nerviis tres principalis prominulis venis secundariis horizontalis parallelis obscuris subtus subnitida nervo mediano gracilis prominulo nerviis basalis gracilis apicem laminorum decurrentibus prominulis nerviis secundariis obscuris petiolis gracilis longis infructescentiis

pseudo-terminalis foliis brevioribus vix et brevissime ramosis apicem versus minutissime dense adpresse pilosis fructus ellipsoideo-obovoideus cupulis infundibuliformis pilosis tepalibus persistentibus.

TYPUS: *N.G.F. 29U1* (BO).

Tree 20 m tall, 20 cm diam. Bark brown, under brownish pink, aromatic, ephedrine smell plus cinnamon. Wood dark straw. Branchlets slender, smooth glabrous, pale; axillar buds glabrous. Leaves light green, spirally arranged, stiffly chartaceous, glabrous, narrowly elliptic, 7 x 20 — 5.5 x 22 cm, apex gradually subacuminate, base acute or cuneate, both surfaces densely, obscurely, minutely reticulate; upper surface glossy, midrib and lateral nerves prominulous, secondary nerves parallel, horizontal, obscure; lower surface less glossy, midrib slender, prominulous, basal nerves running out at the base of the acumen, slender, prominulous, secondary nerves rather numerous, parallel, horizontal, faint. Petiole slender, glabrous, up to 2 cm long, broadened near the leaf lamina, flat above.

Infructescence pseudo-terminal, rather slender, 9 cm long with only one, 1 cm long side branch. Fruit ellipsoid-obovoid, 12 X 15 mm, cup broadly funnelshaped, thin, ca 8 mm diam. at the rim, 4 — 5 mm high, densely, minutely rusty pilose, tepals persistent, triangular, acutish, 4 mm high, pedicel rather slender, 3 mm, pilose.

The species is unique in the group of New Guinea and adjacent areas species because of its spirally arranged leaves (section: *Camphora*), as in *C. sleumeri*.

WEST NEW BRITAIN, Kapiura R. near Lavege village, alt. 33 m, May, fruit pale brownish, all heavily fungus-infected (the label reads insect-infested), local name Petingen, *N.G.F. 29U1* (A, BO, BRI, K, L, SING, SYD).

#### 50. CINNAMOMUM SINTOC Bl.

Cf. Kostermans, *Bibl. Laur.* 349. 1964. — Typus: Java, *Blume* (L).

New synonyms: *Cinnamomum camphoratum* BL, cf. Kostermans, *I.e.* 274 (exclus. var). — Typus: Herb. *Blume* 870, ster. (L, 3 sheets), G. Seribu, Java; *Laurus calophylla* Reinw. ex C.G. & Th. Nees, cf. Kostermans, *I.e.* 578. — Typus: Herb. *Reinwardt s.n.* (L), ster.; *Cinnamomum calophyllum* Reinw. ex Nees, cf. Kostermans, *I.e.* 261. — Typus: *Reinwardt s.n.*, ster. (L); *Laurus pseudo-cassia* Reinw. ex Bl. (nomen), cf. Kostermans, *I.e.* 691. — Typus: Herb. *Reinw. s.n.*, ster. (L, 2 sheets), Mt. Pangrango, Java; *Cinnamomum cinereum* Gamble, cf. Kostermans, *I.e.* 283. — Typus: *Wray* 2629 (K, SING), Waterfall Hill, para-typus: *King's Coll.*, 8515 (BO, K), near streams, Thaiping; *Cinnamomum coriaceum* Cammerl., cf. Kostermans, *I.e.* 106. — Typus: *BB. E 8U*, 66. 2567, 2769 (BO).

The type specimen of *C. sintoc* is sterile; so is the type material of *Laurus pseudo-cassia* Herb. Reinw., which also bears the identification *Laurus calophylla* Reinwardt. The type material of *Cinnamomum cam-*

*phoratum* Bl. is from a juvenile plant, hence the large leaves with pronounced reticulation and the different odour. Koorders collected similar material from saplings and concluded that they were simply youth forms of *C. iners* Reinw. However, even the youngest stages of *C. -triers* do not show this pronounced kind of reticulation. I have been able to collect many juvenile stages of *C. sintoc* around some mature *C. sintoc* trees in W. Java and these prove without doubt that *C. camphoratum* Bl. is a juvenile stage of *C. sintoc*. This is furthermore corroborated by a pencilled note on the type specimen of *C. sintoc* (Blume 870) that the bark smells of nutmeg and camphor, which fits *C. sintoc* and not *C. iners* and by the fact that Koorders juvenile shoots all bear the vernacular name *sintoc*.

The oldest name of this plant is *Laurus pseudo-cassia* Reinwardt ex Blume, which, however, is a nomen nudum, like *Laurus calophylla* Reinwardt ex C.G. & Th. Nees (1823), spelled by Blume (1823) as *L. callophylla* (as such it is written on the type material from Mt. Pangrango, conserved in Leiden).

The type material of *Cinnamomum cinereum* differs from the Javanese material by a poorer inflorescence, but since fruiting material has been collected in the Malay Peninsula the conspecificity with *C. sintoc* is evident. The Indo-Chinese material, described by authors (Lecomte, Liou Ho, etc.) there as *C. litseaefolium* is very close to *Cinnamomum sintoc* and is certainly not conspecific with the Ceylonese *C. litseaefolium*. The cup-like cupula of the fruit is larger than that of *C. sintoc* and sharply demarcated from the pedicel. The Sumbawa material has a slightly longer tomentum, other differences could not be observed, except the odour, which was noted as like that of *C. porrectum*, which is different from the nutmeg smell of real *C. sintoc*. On Mt. Gede above Tjibodas in W. Java a single tree was found at an altitude of ca 1500 m.

Specimens examined: MALAY PENINSULA, Kedah, Langkawi, Oct., fl., *F.D.* 20766 (SING); *ibid.*, Bukit Balud, March, young fr., *F.D.* 17789 (SING); Pahang, Fraser Hill, alt. 1300 m, Sept., fl., *S.F.N.* 11312 (BO, SING); Perak, Maxwell's Hill, June, fr., *Ridley s.n.* (SING); Larut, Febr., fr., *King's Collector* 3861 (SING); Waterfall Hill, alt. 360 m, fl., *Wray* 2629 (SING), iso-paratype of *C. cinereum*; *ibid.*, ster., *Wray* 4056 (SING); Thaiping, alt. 500 m, Febr., fl., *King's Coll.* 8515 (BO); *ibid.*, ster., *Holtum s.n.* (SING). — SUMATRA, Atjeh, Gajolands, Kapit area, confluence of K. Kapi and K. Aunan near bivoac Paja, alt. 1100-1250 m, March, fr., *Van Steenis* 9971 (A, BO, BRI, K, L, P, SING); Upper Serdang-, Gallia Estate, ster., *Lorzing* 11450 (BO); Palembang, Rawas, alt. 100 m, ster., *Grashoff* 1046 (BO, L), buttresses up to 3 m, thin and narrow, tree 22-25 m; *ibid.*, Lematang hilir, Semangus, alt. 100 m, ster., 66. 32267 (A, BO, L, SING); *ibid.*, Banjuasin and Kubu

regions, ster., 149 E IP. 841 (BO, L); Sumatra's West Coast, Pajakumbuh, alt. 100 m, July, fl., S.W./III-1S (BO) and *bb.* 2900 (BO), tree 34 m, diam. 50 cm; *ibid.*, Old Agam, Sg. Dareh, alt. 1200 m, ster., *bb.* 5521 (BO); *ibid.*, Madah Liki, Distr. Suliki, alt. 1300 m, ster., *bb.* 6530 (A, BO, K, L); Benkulu, Distr. Lebong, rimba Pengadang, alt. 1000 m, Jan., young fr., *bb.* 2796 (BO, K, L). — BORNEO, Sabah, Penibukan, alt. 1500 m, Jan., fr., *Clemens* 31108 (BO); Mt. Poi, fr., *Clemens* 20182 (BO); Kalimantan, W. Kutei, Mujup, alt. 60 m, ster., 66. 16874 (BO, L); Balikpapan, Sg. Mentawir, ster., *Kostermans* 9815 (A, BO, K, L, SING); Upper Mahakam, D. Parei, alt. 280 m, ster., 66. 20713 (BO), tree 26 m, diam. 50 cm; Sampit, Natai Nangka, ster., 66. 14079 (BO, L); Muara Tewe, Montalat, alt. 10 m, ster., 66. 29208 (A, BO, L), tree 27 m, diam<sup>^</sup> 40 cm. — JAVA, West Java, near Bandung, fr., *Ja*, 3660 (BO); Mt. Pangrango near Bogor, sapling, *Blume* 870 (L), type of *C. camphoratum* Bl., *Laurus pseudo-cassia* Reinw. and *C. callophyllum* BL; Mt. Salak, alt. 700 m, Sept., young fr., *Koorders* 24391 (BO, L); Sukabumi, Djampang kulon, ster., *Koorders* 3373 (BO, L); Banjumas, Pringombo, G. Kapal, Bandjarnegara, sapling *Koorders* 11133 (BO), identified as *C. camphoratum* = *C. iners* juvenilum; *ibid.*, ster., *Koorders* 27094 (BO); Kedu, Mt. Sindoro, alt. 1400 m, ster., *Koorders* 11318 (BO), identified as *C. burmanni*; Kaliwiro near Wonosobo, ster., *Vorderman s.n.* (BO, L); Madiuri, G. Willis, ster., *Koorders* 25330 (BO). — BALI, C. Patas, alt. 950 m, Nov., fl., *Sarip* 469 (BO). — SUMBAWA, N.W. part Mt. Batu lante near Pusu, moist dipterocarp forest, alt. 700—1000 m, April, fl., *Kostermans* 18542 (A, BISH, BO, BRI, CAL, CANB, G, K, KEP, L, LEN, NY, P, PNH, SAN, SAR, SING, US), buttresses 50 cm, out 50 cm, concave, bark dark brown, lenticellate, smooth, 1 mm, living bark pale brown, reddish-brown outside with white stripes, 9 mm with slimy sap and strong aromatic smell (of *C. porreotum*), fls. pale green, rare, bark used as a medicinal tea sold as kaju lawang. — SUMBA, Tabundang, ster., *Teijsmann s.\*n.* (BO). — PORTUGUESE TIMOR, buds, *de Castro s.n.* (BO). — SIAM: Chandabury, Aug., fl., sine coll. 404 (BKP); *ibid.*, *Larsen & Hansen* 144, Jan., young fr. (BO).

### 51. *Cinnamomum sleumeri* Kosterm., *spec. nov.* — Fig. 26

Arbuscula ramulis laevis glabris foliis alternantibus mox glabris late ellipticis vel suborbicularis obtusis vel obscure late acuminatis utrinque dense minute prominule reticulatis nervo mediano costisque basalibus prominulis supra nitida subtus pallidiora petiolis robustis paniculis foliis superantibus laxis floribus dense minute sericeis tepalis ovato-orbicularibus antheris 4-locellatis glandulis basalibus substipitatis.

TYPUS: *Van Roy en & Sleumer* 7640 (SING).

Shrub, ca 1.5 m tall; branchlets smooth, glabrous; end bud densely pale sericeous. Leaves spirally arranged, coriaceous, glabrous, broadly elliptic to sub-orbicular, up to 11 x 15 cm, obtuse or obscurely, broadly acuminate, base shortly cuneate, both surfaces densely, minutely, prominently reticulate, midrib and the two basal, arcuate nerves (which run out near the leaf apex) prominulous, slightly prominulous in a groove on the upper surface. Leaves of the flush sparsely sericeous underneath. Petiole stout, up to 2 cm long.

Panicles lax, large, up to 26 cm long, branching opposite, widely spaced, the lower ones up to 5 cm long, peduncle hardly pilose, the pilosity

denser towards the flowers. Flowers (immature) pale yellow (fresh), densely sericeous on slender, 3—4 mm long pedicles; tepals ovate-orbicular, 2—2.5 mm long; stamens 1.5 mm, anther rectangular, 4-celled, filament broad, short, basal glands sub-sessile.

An outstanding species because of its shrub-like habit, the unusual large panicles and the spirally arranged leaves. The Bogor duplicate has narrower leaves (7 x 15—8.5 x 15 cm) with a short acumen and only the top leaves are opposite.

W. IRIAN, Vogelkop Peninsula, Bamfot village, alt. 850, forest edge, Nov., fl., 7am *Royen & Sleumer 76A0* (BO, SING).

52. ***Cinnamomum soegengii*** Kosterm., *spec. nov.* — Fig. 27

Arbor in omnibus partibus glabris foliis oppositis coriaceis ovatis vel ovato-ellipticis sensim attenuatis vel obscure acuminatis obtusis basi in petiolum contractis brevissime cuneatis nerviis tres principalis utrinque prominulis supra nitida laevia subtus sublaevia petiolis robustis infructescentiis pseudo-terminalis aggregatis foliis aequilongis pauce-fructiferis vix ramosis sat gracilis nitidis fructus ellipsoideus vel obovoideo-ellipsoideus pro genere magnis cupulis nee profundis margine integris in pedicello vix obconico subite contractis.

TYPUS: *Chew & Corner J+750* (SAR).

Tree, 8—10 m tall and 15 cm diam.; bark brown, roughish by lenticels, outer bark 1.5 mm, layered, brown, inner bark 3—4 mm pinkish, turning orange brown or dark red after exposure; wood creamy white, quite hard; end bud with scarce, adpressed microscopic hairs. Leaves opposite, coriaceous, ovate to elliptic ovate, 4.5 x 12 (—13)—7.5 x 14 cm, gradually tapered with obtuse tip, base abruptly contracted and shortly cuneate, or acutish, main nerves prominulous on both surfaces, upper one smooth, glossy, lower one dull, paler, from the marginal side of the two basal nerves (which reach almost the top of the leaf) some strongly arcuate nerves bend off, in the broader leaves a pair of faint submarginal, short basal nerves. Petiole stout, ca 1 cm.

Infructescences aggregate, subterminal, with few fruit, hardly and shortly branched, 4—14 cm long, slender, glossy. Fruit ellipsoid or ellipsoid-obovoid, up to 12 x 20 mm, cup 10—14 mm diam. at the entire, thin margin, 5—8 mm high, cup-shaped, abruptly contracted into the slightly obconical or obconical, 5—10 mm long pedicel.

Distinguished by the not very deep, entire-margined cup, abruptly contracted into the pedicel, the large fruit, the glabrous inflorescence and the glabrous ovate or ovate-elliptic leaves. Without flowers at hand, I am not able to define its true affinities.

The species is named in honour of my pupil and fosterson, Dr. W. Soegeng Reksodihardjo, the durian and cocoa specialist, Assistant-Director



of the Regional Centre of Tropical Biology under the auspices of the S(outh) E(ast) A(sia) M(inisters) of E(ducation) C(ouncil).

BORNEO: Sabah, Ranau, Carson trail, alt. 1700 m, March, fr. bluish-grey (immature), cup light green, *San 49308* (SAN, SING); Kinabalu, Mesilau Cave, alt. 2000 m, March, fr. (immature fruit blue-green), *Chew & Corner R.S.W.B. 4750* (SING); Ranau, path to Kambarango, Kinabalu, alt. 1800 m, Febr., fr., *San 29076* (SAN, SING).

53. *Cinnamomum soepadmoi* Kosterm., *spec. nov.* — Fig. 28

Arbor ramulis sat gracilis glabris foliis suboppositis vel oppositis chartaceis glabris ellipticis vel elongato-ellipticis sphacelatis sensim attenuatis basi acutis nerviis tres principalis gracilis utrinque prominulis basalibus apicem laminarum attingentibus venis caeteris deest vel valde obscuris petiolis gracilis infructescentiis axillaris pseudo-terminalibusque glabris cupulis subhemisphericis margine in pedicello subite contractis.

TYPUS: *Kostermans 7389* (BO).

Tree 20 m, bole 10 m, diam. 30 cm, bark smooth, pinkish, 0.5 mm thick, living bark 10 mm, light brown, wood white. Branchlets rather slender, glabrous, the utmost apex minutely, pulverulently pilose, end bud acute, minutely sub-adpressed tomentellous. Leaves subopposite and opposite, chartaceous, glabrous, narrowly elliptical, 1.5 x 5 — 2.5 x 10 — 4.5 x 15 cm, gradually tapered, all tips missing, base acute, both surfaces smooth with slender, prominulous main nerves, the 2 basal nerves reaching the tip of the leaf. Petiole slender, 6—10 mm.

Infructescences axillary and pseudo-terminal, glabrous, 6—12 cm long with a few (or none) very short, slender, apical branches; cup sub-hemispheric, margin entire, thin, 7 mm diam., cup 4 mm high, sharply demarcated from the pedicel.

The species is named in honour of Dr. E. Soepadmo, my former pupil, a specialist of Malesian Fagaceae, who is now temporarily lecturing at the University of Malaya at Kuala Lumpur.

The leaves LOOK like those of *C. iners*, the cups are entirely different.

E. KALIMANTAN, Peak of Balikpapan (G. Beratus), alt. 700 m, July, fr., *Kostermans 7389* (A, BO, BRI, K, L, PNH, SING).

54. CINNAMOMUM SUBAVENIUM Miq.

Cf. *Kostermans, Bibl. Laur. 352. 1964.* — Typus: *Teijsmann s.n. (H.B. 1032 and 1037)*, ster. (BO, U), Solok, W. Coast Sumatra.

New synonyms: *Cinnamomum culilawan* var. *eelebicum* T. & B., cf. *Kostermans, l.e. 287.* — Typus: *culta* in Hort. Bogor. sub *VD 35* (BO, L); *Cinnamomum zeylanicum* var. *multiflorum* Auct. (non Wight) *Koorders in Meded. 's Lands Plantentuin Buitenzorg 19: 457. 1898.* — Typus: *Koorders 17407* (BO, L); *Cinnamomum borneensz*

Miq., cf. Kostermans, I.e. 257. — Typus: *Korthals s.n.*, ster. (L); *Cinnamomum borneense* Meissn., cf. Kostermans, I.e. 257 (part of no. 51). — Typus: *Motley 796*, 853 (K, non vidi); *Cinnamomum floribundum* Miq., cf. Kostermans, I.e. 295 (new name for *C. borneense* (Miq. non Meissner); *Cinnamomum glabrescens* Miq., cf. Kostermans, I.e. 296. — Typus: *Korthals s.n.*, ster., Pamatton, Borneo (L); *Cinnamomum rkileyi* Gamble, cf. Kostermans, I.e. 345. — Typus: *Ridley 4823*, fl., Singapore at Changi Ed. (K, SING); *Cinnamomum validinerve* Hance var. *poilanei* Liou-Ho, cf. Kostermans, I.e. 360. — Typus: *Pottane 103M* (BO, P), Prov. Quang Tri, Dent du Tigre, young fr., para-typus: *Poilane 11002* (P, non vidi); *Cinnamomum randaiense* Hayata, cf. Kostermans, I.e. 342. — Typus: *Hayata & Mori 7017* (non vidii, ? Tokyo); *Cinnamomum cyrtopoduin* Miq., cf. Kostermans, I.e. 288. — Typus: *Teijsmann H.B. 105S*, ster., Solok, W. Coast Sumatra (BO, U).

A widely distributed species, the area extending from the Asiatic mainland to Formosa, western Malesia, Celebes, no material of the Philippines has come to my attention, probably it has been described under another specific epithet.

The species is characterized by the conspicuously acuminate, more or less ovate and not very large leaves with a smooth lower surface, the small cups and the slender small fruit: it has usually "pockets" between the bases of the three main nerves on the lower surface.

The type specimen of *C. cyrtopodum* Miq., a sterile branch, is somewhat deviating because of its conspicuous horizontal, prominulous secondary nerves on the lower leaf surface; this, however, is matched by a specimen of Bunnemeyer, a seedling stage of *C. subavenium* and I suspect that *C. cyrtopodum* was based on a branch of a seedling.

The species is rather difficult to separate from *C. vimineum*, another wide-spread species (which I suspect to have been described under one or more other names on the Asiatic mainland), without mature leaves and fruit; the fruit cup of *C. vimineum* is gradually tapered towards the pedicel and larger than the cup-shaped cup of *C. subavenium*, which is sharply demarcated from the cylindrical pedicel.

The type material of *C. randaiense* was not available for examination, but a specimen (Chang, from Mt. Arisan) agrees very well with the Malesian material.

Tang-Shiu Liu (111. nat. and introd. Pl. Taiwan 1: t. 89.1960) included in *C. randaiense*: *C. bartheifolium* Hayata (based on *Mori 3295*, fl. July, Nanto, Mt. Randaisan) and Hui-Lin Li (Woody Fl. Taiwan 204. 1963) included moreover *C. longicarpum* Kanehira.

*C. borneense* Miq. and *C. borneense* Meissner were published almost simultaneously, but were based on different collections. Miquel later changed the name of his species into *C. floribundum* Miq.

Merrill (cf. Kostermans, l.e. 259) considered Meissner's and Miquel's collections to be conspecific and I agree, that Meissner's description (I did not see his type material) does not differ much from Miquel's concept of *C. subavenium*.

The 3 main nerves on the upper surface are as a rule slightly prominulous (or so in a groove), but in some specimens they are really slightly impressed, except for the basal part.

Many specimens show a kind of cavity between the bases of the 3 main nerves on the lower leaf surface; these are sometimes so well developed, that they show as narrow (bullate) raised parts on the upper surface; these pockets are absent in *C. vimineum*.

There is also a new record of this species for Java with two collections, one an old one, a fragment of a sterile branchlet (U), marked *C. camphoratum* Bl. ?, Hab. Java>e mont., which Schewe (in schedae) refered hesitatingly to *C. burmanni*; the other is a complete specimen from S. Priangan (W. Java).

The Indochinese material and the one from Mt. Kinabalu have more coriaceous leaves.

The Darjeeling material might eventually represent *C. pauciflorum* Nees.

Additional specimens: MALAY PENINSULA, Pahang, Kuala S. Kiah, Telom valley alt. 1300 m, Aug., fr., *S.F.N.* 23910 (BO, SING); Cameron Highlands, Boh Plantation, alt. 1300 m, ster., *S.F.N.* 32805 (BO, SAR, SING), tree with 30 m free bole of 25 cm diam.; Kemaman, Ulu Bendong, ster., *Corner s.n.* {SING}; Johore, Sg. Sedili, Bukit Naga Mengular, ster., *S.F.N.* 36896 (A, BO, K, L, SING), large-leaved; Singapore, without precise locality, fr., *Cantley's Collector s.n.* (SING); Changi Rd., fl., *Ridley 4.823* (SING). — SUMATRA, Atjeh, Gajo Lands, Lau Alas, alt. 2200 m, Febr., young fr., *Van Steenis 8716* (A, BO, L); Tapanuli, Angkola and Sipirok Subdistr., Panobasan, alt. 600 m, ster., 66. 31550 (A, BO, L), tree 11 m, diam. 15 cm; *ibid.*, ster., 66. 31557 (A, BO, L); *ibid.*, alt. 1000 m, ster., 66. 31552 (A, BO, K, L, SING), pole tree of 12 m with long, narrow leaves; Toba altiplane, alti. 2700 m, ster., 66. 5263 (BO), tree 25 m, diam. 40 cm; Si Matarkis, alt. 890 m, ster., 66. 4160 (BO, L), narrow leaves; Simelungun, Aek na Uli, alt. 1200 m, ster., 66. 35317 (A, BO, K, L, SING), tree 20 m, diam. 30 cm; *ibid.*, Masehat Huta, alt. 700 m, Oct., buds, 66. 4873 (BO, G, L), Batak name: Sabal; Serdang, Gallia Estiate above Bangun Purba, Nov., fl., *Lorzing 14630* (BO, L); Padang Tinggi, ster., *Heide s.n.* (BO, K, L), small, narrow leaves; Sumatra's West Coast, Solok, ster., *Teijsmann H.B. 1033* (BO, U), type of *C. cyrtopodum* Miq.; Solok, G. Tambang/go, alt. 640 m, ster., *Koorders 10673* (BO); Solok, ster., *Teijsmann H.B. 1032* and *1037* (BO, U); Sidjundjung Mararo, alt. 500 m, ster., 66. 9060 (BO), tree 17 m, diam. 35 cm; *ibid.*, Padang Lawas, alt. 390 m, ster., 66. 6628 (BO, K, L, SING, U), tree 11 m, diam. 45 cm; *ibid.*, s'ter., 66. 5809 (BO, L); Palembang, Pasemah Lands, Lb. Buntak, alt. 1200 m, ster., *T.B. 205* (BO, L); S.E. Bangka, Lobok Besar, alt. 20 m, sandy, Oct., fl., *Kostermans*

slender, prominulous, lower leaf surface smooth, dark grey (in sicco), densely, minutely sublanuginose tomentellous, glabrescent, the 3 main nerves slender, prominulous, the 2 basal ones reaching the tip of the leaf. Petiole ca 1 cm long, glabrescent, concave above.

Panicles axillary and pseudo-terminal, 10—20 cm long, very wide with rather patent, slender branches, lax, densely, minutely, pale brown sublanuginose tomentellous, common peduncle long, branchlets widely spaced. Fruit ellipsoid, 7 x 15 mm, cup hemispheric, ribbed, fleshy, 1 cm diam. at the margin, 1 cm high, the enlarged tepals subpersistent, pedicel short, thick, each inflorescence only one fruit.

I believe, that the Malay Peninsula material, enumerated below, belong to this species. (Gamble could not place these specimens and did not mention them in his materials). *C. subcuneatum* was based on a sterile shoot, apparently of a juvenile plant. The leaf shape of the flowering specimens differs considerably from that of the type material, although some intermediate forms are present. Typical is the indumentum of sublanuginose hairs; the hairs are longer in the Bornean material.

The three species: *C. iners*, *subcuneatum* and *paraneuron* are extremely difficult to differentiate in sterile condition. *C. iners* has a very undeeep fruit cup, microscopically sericeous hairs on the lower leaf surface, rather thick leaves, without a trace of reticulation on the lower surface. Nearest is *C. paraneuron*, which has the same indumentum, but a deeper cup (like that of *C. subcuneatum*) and faint, lax, more or less parallel nerves on the lower leaf surface, the leaves are thinner than those of *C. iners*. *Cinnamomum subcuneatum* is more easy to differentiate because of its sublanuginose tomentum, the deep cup, the thin leaves, which show, apart from the 3 main nerves only faint nerves curving off from the lateral part of the basal nerves.

Material examined: MALAY PENINSULA. Penang, July, fl., *Curtis s.n.* (SING); *ibid.*, Julloh Bahan, coast, Jan., fl., *Curtis 1548* (SING), cited as *C. paraneuron*; Wellesley, Krian, June, after anthesis, *Ridley 9381* (SING); Malacca, June, young fr., *Alvins 1876* (SING); March, buds, *Alvins 1180* (SING), the leaves obovate-elliptic; *ibid.*, Bukit Klana, March, fl., *Alvins 924* (SING), tree 10-13 m tall; Johore, Bukit Naga Meng-ular, Sg. Sedili, July, fr., *S.F.N. 36896* (SING); Malacca, buds, *Ridley s.n.* (SING). — SUMATRA, Tapanuli, Angkola & Sipirok, Panobasan, alt. 600 m, ster., *bb. 31543* (A; BO, K, L, NY, SING), cited as *C. turfosum* Kosterm.; Karo altiplane near Siberaja, 1150 m alt., sapling 3-7 m, *Lörzing 9546* (BO) and *11289* (BO), bark slimy, tastes and smells like *Psidium guajava*, according to local Bataks "never flowering"; W. coast Sumatra, Danau Manindjau, ster., *1023 H.B.* (BO), local name: Ranggandjai; Kota Nopan, ster., *Teijsmann H.B. 1016* (BO, U); near Eau, ster., *Teijsmann. H.B. 1017* (BO, U), local name: "kulit manis tupai"; locality not indicated, ster., *Korthals s.it.* (L, 4 sheets). — BORNEO, Sabah, Hula Tandulu, Tambunan, alt. 100 m, April, fl., *Angian F.D. 10493* (SING), tree 6 m,

diam. 12.5 cm; Kilnabalu, Tenompok, alt. 1600 m, May, fl., *J. & M.S. Clemens 29615* (BO); Ranau, Lakang, Nalumad, alt. 1100 m, Nov., after antihehesis, *San 18804* (SING), tree 13 m, bole 7 m, diam. 20 cm bark smooth, grey, outer bark soft, smelling, inner bark brown, hard, cambium pale, sapwood yellow; Menetendok, alt. 1000 m, ster., *Carr S.F.N. 266J,G* (SING).

56. ***Cinnamomum sublanuginosum*** Kosterm., *spec. nov.* — Fig. 29

Arbor ramulis juvenilis dense minuteque sublanuginosis, saepe quadrangularis foliis oppositis vel sub-oppositis coriaceis ellipticis vel lanceolato-ellipticis breve obscure acuminatis sensim attenuatis basi acutis supra glabra laevia nitida nerviis tres principalis prominulis subtus pallidiora dense minutissime sublanuginosa glabrescentia laevia vel perobscure reticulata costis basalibus apicem laminarum attingentibus paniculis pseudo-terminalis dense minutissime subsericeo-tomentellis foliis aequantibus floribus distincte pedicellatis pro genere magnis filamentis pilosis sat longis glandulis basalibus longe stipitatis staminodiis stipitatis ovario gracile stigmatate inconspicuo.

TYPUS: *Chew and Corner 7036* (SING).

Tree, up to 35 m tall and 40 cm diam., bole up to 30 m; bark brown, inner bark yellow, cambium white. Leaves opposite and sub-opposite, coriaceous, narrowly elliptic to lanceolate-elliptic, 3 x 1.1 — 4 x 0.9 — 5 x 1.4 cm, tapered, shortly, broadly acuminate with blunt tip, base shortly acute; upper surface glossy, smooth, the 3 main nerves slender, prominulous, lower surface with a very minute sublanuginose dense tomentum, glabrescent, smooth or with obscure parallel secondary nerves, midrib prominulous, rather slender, the two basal nerves reaching the tip of the leaf, arcuate, prominulous.

Panicles axillary and pseudo-terminal, densely, minutely sublanuginose tomentellous, up to 17 cm long, branches stiff, lower ones 3 — 4 cm long; pedicels 2 — 4 mm; flower tube rather slender, 2 mm; tepals narrowly ovate, acutish, 2 — 2.5 mm; stamens 2 — 3 mm, anthers of the 6 outer ones with 4 introrse large cells and a densely grey-tomentellous, 1.5 — 2 mm long filaments; inner 3 with 2 extrorse cells, the basal glands on long stalks adnate to the filament (gland slightly below the anther); staminodes 1.5 — 2 mm, acute, filaments long, pilose; ovary slender, ellipsoid, 1 mm, style 1.75 mm, slender, stigma inconspicuous.

Related to *C. velutinum* but leaf shape and reticulation different. The fruit are described below.

BORNEO, Sabah, Kinabalu, Mesilau R., alt. 1700 m, April, fl., *Chew & Corner 7036* (SAR, SING), tree 23 m, fls. yellow; Ulu Liwagu and Ulu Mesilau, alt. 1300 m, Sept., fl., *Chew, Corner & Stainton 2687* (SING), tree 10 m, leaves glaucous underneath, up to 5.5 x 1.5 cm; Mile 25 Ranau Rd., alt. 1700 m, April, fl., *San Mi91* (K, L, SAN, SING), tree 17 m, diam. 30 cm, fls. yellow; Pinosok Plateau, alt. 1500 m, Ster., *San 38435* (SAR), tree 35 m, diam. 40 cm, inner bark red-brown; Kota Belud,

1 M. north of Tenompok (12 M. west of Ranau), alt. 1800 m, Dec, fr., *San 17011* (BO, SING), fruit ellipsoid, 6 x 9 mm, cup small, margin entire, 6 mm diam., cup 3 mm high, contracted into the thin or rather thick, subcylindrical, 3—4 mm long pedicel; Ranau, Bundu Tuhan, 12 M. west of Ranau, alt. 1900 m, Sept., fr., *San 16377* (BO, SING).

#### 57. CINNAMOMUM SUBTETRAPTERUM Miq.

Cf. Kostermans, *Bibl. Laur.* 352. 1964. — Typus: *Junghuhn s.n.*, fr., Upper Angkola, Sumatra (BO, U).

The material enumerated below is partly sterile and hence the identity is not absolutely sure; one specimen (*Ichlas Dj. no. 8*) has fruits and the fruit cup is different from that of the type material. As, however, I can find not the slightest differences in the leaves, there is a possibility, that the fruit of the type collection are abnormal.

SUMATRA, N. Sumatra, Hochangkola, fr., *Junghuhn s.n.* (BO, U); Mt. Sago near Pajokumbuh, alt. 1000 m, fr., *Ichlas Dj. 8* (L, SING), tree 20 m, diam. 50 cm, cup large with entire margin, 15 mm diam., 10 mm high, pedicel obconical, ca 6 mm, fruit ellipsoid, 15 X 10 mm; N. slope of Mt. Sago, alt. 1000 m, young tree, *Meyer 3554* (BO); Bangka, Mt. Menumbing, ster., *Teijsmann s.n.* (BO, L); Padang Sidempuan, near village Gronggong, alt. 150 m, Dec, young fr., *Kostermans 22019* (BO); Atjeh, Gajo Lueus, Lintang, alt. 1800 m, ster., 66. 22423 (A, BISH, BO, BRI, K, L, NY, P, PNH, SING), tree 32 m, diam. 70 cm; Upper Serdang, alt. 100 m, sapling, *Lorzing 11389* (BO); Batang Baros, ster., 100*t* *H.B.* (U), Bonjol, 1024 *H.B.* (U); S. Sumatra, Enggano, young tree, *Lutjbharms 3972* — 66. 20945 (BO, K, CANB, L, LAE), enormous leaves, 13 X 28 cm.

#### 58. *Cinnamomum tenuipilis* Kosterm., *nom. nov.*

*Alseodaphne mollis* W.W. Smith (base) in *Notes Bot. Gard. Edinburgh* 13: 153. 1921; cf. Kostermans, *Bibl. Laur.* 69. 1964. — Typus: *Forrest 16021* (E), syn-typus: *Forrest 13667* (E).

An iso-type specimen of *Forrest 16021* (CAL), available for examination, shows the fruit as seated in a cup, which excludes this species from *Alseodaphne*. Additional flowering material makes it evident that it belongs in *Cinnamomum* sect. *Camphora*. As the specific epithet is already occupied in *Cinnamomum*, I have suggested the name above.

Material examined: YUNNAN, fr., *Forrest 16021* (CAL); NEPAL, Mechi Zone, Ilaml Distr., Tea Garden, alt. 400 m, June, fl., *Nicholson 3124* (BO, US); Bengal, Kurseong, fl., 439 *K* (DD). — THAILAND, Pu Huat, alt. 1300 m, tree 15 m, March, fl., *Kerr 4994* (BO, K). — INDIA, Assam, Garo Hill, 6th mile Damra Rd., alt. 700 m, March, fl., *Kanjilal 5311* (DD).

## 59. CINNAMOMUM TSANGII Merr.

Cf. Kostermans, *Bibl. Laur.* 359. 1964. — Typus: *Tsang* 20439 (A).

I suspect that *Cinnamomum merrillianum* Allen (cf. Kostermans, l.e. 321. — Typus: *Liang* 63752) belongs here; the description fits *C. tsangii* perfectly.

Specimens examined: CHINA, Kwangtung, Ngok Shing Shan, Sairlin-shan village, Sin-fung Distr., April, fl., *Taam* 540 (A, BO), mature leaves up to 5 X 12 cm; Sam Kok Shan, Ch'an Woh Tung village, Ts'ung4cwa (Tsong-fa) Distr., May, fl., *Tsang* 25172 (A, BO); Naam Hwan Shan, Tsengshin Distr., May, fl., *Tsang* 20354 (BO, SING).

## 60. CINNAMOMUM VIMINEUM Nees

Cf. Kostermans, *Bibl. Laur.* 361. 1964. — Typus: *Porter s.n.* = *Wallich Catal.* 2578, ster., Penang (BO, K, L).

The infructescence is glabrous, hardly and shortly branched, 1 — 2 cm long, axillary and has a single, ellipsoid fruit, up to 6 x 8 mm, seated in a rather shallow cup, 5 mm diam. at the thin, scaloped margin (the very bases of the tepals persistent), 6 mm high, base gradually tapered to the short pedicel.

It is very close to *C. tsoi* Allen from Hainan with identical leaves, but with shorter petioles and the cup of *C. tsoi* is larger and sharply demarcated from the longer pedicel.

The nerves are not impressed (this is stated by Meissner of the type collection).

Specimens examined: MALAY PENINSULA, Penang, ster., *Porter s.n.* = *Wallich Cat.* 2578 (BO); Moniots Rd., ster., *Curtis s.n.* (SING); West Hill, alt. 800 m, May, fr., *Curtis* 1571 (SING), small tree, bark very aromatic; Tiger Hill, ster., *S.F.N.* 39279 (SING), scent of Eucalyptus; Malay Peninsula, Fraser Hill upon Selangor border, alt. 1400 m, young fr., *Burkill & Holttum* 7758 (SING); id. 11304 (BO), ster.; lower slopes of Kedah Peak, Jan., fr., *Ridley s.n.* (SING); Benom, Hulu Cheka, ster., *Phytochem. Survey Malaya* 2571 (SING).

61. *Cinnamomum woulfei* Kosterm., *spec. nov.* — Fig. 30

Arbor ramulis dense minutissime ferrugineo-tomentellis foliis suboppositis chartaceis elongato-subovato-ellipticis sensim acuminatis basi acutis supra nitida laevia nerviis tres principalis gracilis prominulis subtus pallidiora minutissime sublanuginoso-tomentella mox glabra nervo mediano prominulo nerviis lateralis basalis gracilis apicem laminarum attingentibus nerviis secundariis perobscuris parallelis horizontals arti-

culatis paniculis axillaris et extra-axillaris foliis subaequantibus gracilis pauce ramosis minutissime subsericeis floribus sericeis tepalibus ovatis acutiusculis intus sericeis antheris quadrilocellatis glandulis basalibus sessilibus.

TYPUS: *Endert 4-703* (BO).

Tree, 18 m tall and 30 cm diam.; branchlets angular, densely, minutely ferrugineously tomentellous, end bud narrow, acute, densely adpressed pilose. Leaves sub-opposite, chartaceous, elongate-elliptic or subovate-elliptic, 2 x 8 — 3 x 13 (apical) to 5.5 x 35 cm (lower down), gradually tapered with sharp tip, base acute, upper surface glossy, smooth, the 3 main nerves slender, prominulous, lower surface dull, in young leaves minutely, ferrugineously sublanuginose-tomentellous, soon glabrous (longer persistent near the leaf base), midrib prominent, basal lateral nerves slender, prominulous, reaching the leaf tip, connected by very obscure, bent ("articulate"), parallel, lax, horizontal secondary veins. Petiole 6 — 10 mm long.

Panicles axillary and extra-axillary, lax, minutely brown adpressed pilose, 5 — 14 cm long with a long, slender peduncle and few up to 1.5 cm long branches. Flowers minutely sericeous, tube short, obconical, tepals ovate, acutish, 2 — 2.5 mm, both sides sericeous; outer stamens 2 mm, anthers narrowly ovate, 4-celled, introrse, filaments pilose, as long as the anthers; inner 3 stamens with much smaller anthers with 4 extrorse cells, glands elongate, rather large, basal.

The species is named in honour of Mr. A.J. Woulfe, logging manager of the Limbang Trading Company, Miri, Sarawak who has a keen interest and is a staunch supporter of scientific botany and is, moreover, a most generous man and a devoted friend, who helped me with what means were at his disposal during the difficult period, that I was detained on a framed accusation of being involved in a murder case in Djakarta.

E. Kalimantan, W. KUTEI, Telen E., near Long Petah, alt. 450 m, Oct., fls. light yellow, *Endert 4703* (BO, K, L).

## 62. CINNAMOMUM XANTHONEURUM B1.

Cf. Kostermans, *Bibl. Laur.* 363. 1964. — Typus: *Zippel 167/c* (BO, L, 2 sheets), New Guinea, ster., para typus: *Lesson s.n.* anno 1825 (L, a single leaf).

Synonym: *Persea 1 massoi* Zippel ex Blume, cf. Kostermans, *I.e.* 1240. — Typus: *Zippel 167/c* (L).

Blume {in *Tijdschr. Natuurl. Geschied. en Physiol.* 1: 63. 1833 and *Rumphia* 1: 33. 1836) based the description of this species, which he assumed to represent the "Culilawan ex Papuanis et Moluccis insulis" of Rumphius (*Herbar. Amboin.* 2: 66) on two sterile specimens: *Zippel* (L, two sheets, one marked *167/c*, *Persea ? massoi* Zippel., the other without



number) and *Lesson s.n.*, 1825 (L, a single leaf, marked: "feuilles de Massohy"). Blume saw the latter specimen in herbarium Kunth in Berlin and apparently obtained a leaf for the Leiden Herbarium.

As Blume remarked, both Zippel and Lesson originally mistook their specimens for the real massoi (*Cryptocarya massoia* (Oken) Kosterm.; for the history and discovery of this species cf. Kostermans in *Bull. bot. Gard. Buitenzorg*, ser. 3, 18: 435. 1950, under the name *Cryptocarya aromatica* (Becc.) Kosterm.) and much later Schewe again assumed (wrongly) that his *C. massoia* (cf. there) was the source of the massoi bark of commerce.

Blume managed to disentangle the different species, treated by Rumphius under kulit lawan(g); he recognized altogether 5 species: the Amboinese *C. culilaban* (L.) Presl, the Javanese *C. sintoc* BL, the New Guinea *C. xanthoneurum* and *C. nitidum* (non Nees), based on a mixture of specimens from India (as far as the cultivated specimens of the Botanic Garden, Calcutta, this is right), Ceylon (it does not occur there), Java and Sumatra. Blume described varieties of Java and Sumatra, which all represent *C. iners* Reinw. ex Blume, but are not a source of Kulit lawang.

Furthermore Blume recognized a Rumphian species: *C. rubrum*, based solely on a (original) plate of Rumphius in the Leiden Herbarium, no material was ever collected of this plant; Meissner sunk it in *C. culilaban*.

We now know, that the sources of the kulit lawan (g) bark are perhaps a dozen or more species, occurring all over Malesia and that the most common source in New Guinea is perhaps not *C. xanthoneurum*, but *C. massoia* Schewe and *C. evgenoliferum* Kosterm. Moreover *C. macrophyllum* Miq. from the islands of Batjan and Obi is another Moluccan source of kulit lawan (g) and Ceram must have one or more species, of which the bark is collected.

The material, enumerated below is not homogeneous, those with thicker, completely glabrous leaves might represent another species, for the time being I enumerate them here as has been done by Cammerloher.

Specimens examined: W. IRIAN, Eba, alt. 40 m, ster., B.W. 3201 (BO, L); Teminaboran, Dusun Kidui, Buru, alt. 10 m, ster., B.W. 9A6 (BO, L); Central Vogelkop, ster., bb. 22151 (BO); Isl. Gebeh, ster., *Teysmann s.n.* = 7455 H.B. (BO, 3 sheets), slightly thicker, completely glabrous leaves; Sorong, aSter anthesis, B.W. 246 (BO, L), glabrous leaves; Neu-Pommern, Ugana, ster., *Schavmach* 223 (BO, BRESLAU), leaves conspicuously acuminate, thinly coriaceous, glabrous (perhaps not this species); Key Isl., *Vorderman s.n.*, ster. (BO).

## 63. CINNAMOMUM SPECIES NOVA I

Only sterile specimens are available. The reticulation is similar to that of *C. bejolghota*, *C. dictyoneuron* and *C. racemosum*.

SUMATRA. North Sumatra, Tapanuli, Angkola and Sipirok, Panobasan, Dk. Puhutan Lajan, alt. 600 m, saplings, ster., 66. 31531, 31532, 31533, 31534, 31535 (A, BO, L); W. Coast Sumatra, Bonjol, ster., *Teijsmann 1021s. H.B.* (BO, U), leaves up to 10 X 27 cm; Bonjol, ster., *Teijsmann 1027 H.B.* (BO, U).

## CRYPTOCARYA R. Br.

1. *Cryptocarya nana* Kosterm., *spec. nov.* — Fig. 31

Arbor parva ramulis horizontalis gracilis dense ferrugineo tomentellis foliis chartaceis subovatis longe acuminatis basi acutis supra obscure subareolata glabra nerviis exceptis subtus glauca minutissime sparse pilosa costis paucis prominulis petiolis gracilis infructescentiis axillaribus parvis paucifloris dense minute tomentellis fructus globosus apiculatus.  
TYPUS: *Kostermans 22076* (BO).

Small tree, up to 2 m high with horizontal branches and pyramidal crown. Branchlets slender, densely, pale brown tomentellous. Leaves spirally arranged, chartaceous, subovate, 3 X 4.5 — 4 x 7 cm long, (up to 1 cm) slenderly acuminate, base acute, upper surface rather obscurely sub-areolate, glabrous, except on the main, hardly prominent nerves, lower surface glaucous, sparsely, very minutely tomentellous, the pilosity denser and longer on the main nerves, midrib prominulous, lateral nerves prominulous, 3 — 4 pairs, rather erect, curved, secondary nerves slender. Petiole 5 — 7 mm, very slender, tomentellous.

Infructescences axillary, short (up to 1 — 15 cm), densely minutely, pale brown tomentellous, hardly or not branched. Fruit globose, slightly ribbed, up to 12 mm diam., apiculate, pedicel 2 mm.

Related to *C. densiflora* Bl., but the leaves chartaceous, the nervation and pilosity different. This is so far the smallest *Cryptocarya* known. It is locally common and fruits already when it is one meter high. The leaves resemble those of *Lindera* species.

N. SUMATRA, Padang Sidempuan near village Grunggang, sandstone, alt. ca 300 m, Dec, fr., *Kostermans 22076* (BO).

2. *Cryptocarya rifaii* Kosterm., *spec. nov.* — Fig. 32

Arbor ramulis minutissime dense tomentellis foliis alternantibus perrigidis ellipticis vel late ellipticis rotundatis et apiculatis basi rotundatis supra laevia nerviis principalibus impressis subtus mox glabris basi nervo mediano excepta nervo mediano magno costis valde prominentibus

venis subparallelis connectis petiolis crassis infructescentiis robustis subterminalis dense minutissime tomentellis fructibus magnis ellipsoideis.  
TYPUS: S. 26401 (SAR).

Tree 12 m tall, 25 cm diam. Branchlets stout, sulcate, densely, minutely pale rusty tomentellous. Leaves spirally arranged, very rigidly and thickly coriaceous, elliptic to broadly elliptic, 6.5 x 11—8 x 10 cm, rounded and obscurely apiculate, base rounded, upper surface glabrous, smooth, the main nerves impressed, lower surface soon glabrous, except the basal part of the very stout, prominent midrib, lateral nerves 7—9 pairs, prominent, erect-patent, arcuate towards the margin, secondary nerves prominulous, parallel. Petiole ca 1 cm long, stout, densely, minutely, pale rusty tomentellous.

Infructescence pseudo-terminal, stout, partial ones up to 12 cm long, densely, minutely, pale rusty tomentellous; branches few, short, stout. Fruit ellipsoid, smooth, up to 20 x 32 mm, narrowed at apex; pedicel stout, 3 mm.

Easily recognizable by the shape of the leaves and the very strong reticulation on the lower leaf surface.

The species is named in honour of Dr. Mien A. Rifai, my fosterson, Director of the Herbarium Bogoriense.

BORNEO, Sarawak, Lawas, path to Mt. Murut on ridge, alt. 2400 m, Oct., fr., *llias Paie* S. 26401 (SAR).

### 3. *Cryptocarya tuanku-bujangii* Kosterm., *spec. nov.* — Fig. 33

Arbor parva ramulis crassis dense minutissime atro-ferrugineo tomentellis angulatis foliis alternantibus rigide coriaceis ovatis subacutis basi obtusis supra glabra laevia nerviis principalis subimpressis subtus perdense minutissime ferrugineo sericeis nervo mediano prominulis costis basalibus prominulis medio laminorum attingentibus costis caeteribus paucis petiolis crassis brevis inflorescentiis axillaris et pseudo-terminalis foliis subaequilongis perdense minutissime atro-ferrugineo adpresse pilosis antheris staminibus exterioribus ovatis introrsis filamentis aequilongis gracilis interioribus anguste ovatis acutis glandulis basalibus magnis globosis staminodiis cordatis acutis breve stipitatis stylus ovario subaequilongus stigmatate capitellatis.

TYPUS: S. 26404 (SAR).

Tree 5 m tall, 9 cm diam. Branchlets thick, angular, densely, minutely dark rusty tomentellous. Leaves spirally arranged, thickly coriaceous, ovate, 2 x 3—3.5 x 4 cm, shortly acutish, base truncate or obtuse or acutish, upper surface smooth, glossy, the 3 main nerves slightly impressed, lower surface densely, minutely, rusty sericeous, midrib prominent, the 2 basal nerves straight, reaching  $V_2 - \frac{1}{4}$  the leaf lamina, prominulous, sometimes 1 or 2 pairs of short other lateral nerves present, veins inconspicuous. Petiole stout, 3—6 mm long.

Panicles axillary, densely, minutely dark rusty adpressed pilose, up to 4 cm long, consisting of a rather thick peduncle, the short, erect branches congested at the apical part. Flowers 3 mm long, the tepals ovate, acute, stiff, hardly 1 mm long; outer stamens with large introrse cells, the filaments as long as the oval anther; inner anthers narrowly ovate, acute with extrorse-lateral cells, the filaments flanked by large, sessile, globose glands; style as long as the ovary with capitellate, small stigma.

The species is named in honour of H.E. the Governor of Sarawak, Tun Tuanku Haji Bujang bin Tuanku Othman, who takes a keen interest in Forest Botany and promotes the study of the rich flora of Sarawak.

It is related to some New Guinea mountain species, the tomentum resembles that of *Cinnamomum aureo-fulvum* Gamble.

SARAWAK, patjh to G. Murut (second summit), Lawas, alt. 2400 m, Oct., fls. brown, *Bias Paie* S. 26/M (BO, K, L, SING).

#### ENDIANDRA R. Br.

##### 1. *Endiandra bullata* (Allen) Kosterm., *comb. nov.*

*Beilschmiedia bullata* Allen in J. Arnold Arb. 23: 131. 1942. — Typus: *Brass & Versteegh 13112* (A, BO, L); cf. Kostermans, *Bibl. Laur.* 120. 1964.

Although the flowers are unknown, I believe this to belong to *Endiandra*, because of the distinctive areolate nervation on the lower leaf surface, which does not occur in *Beilschmiedia*.

I have excluded already the specimen *Brass 13693*, included by Allen in this species as a distinct species of *Beilschmiedia*; it has an entirely different reticulation.

##### 2. *Endiandra gemopsis* Kosterm., *spec. nov.* — Fig. 34

Arbor mediocris apicem ramulorum minutissime adpresse pilosis ramulis laevis lenticellatis foliis alternantibus chartaceis ellipticis glabris utrinque minutissime dense areolato-reticulatis brevissime acuminatis basi acutis supra nitida nerviis principalis impressis subtus pallidiora subnitida nervo mediano prominentibus pustulatis costis prominentibus erecto-patentibus subarcuatis nerviis secundariis gracilis prominulis petiolis supra subconcavis glabrescentibus inflorescentiis axillaris pseudo-spicatis minutissime adpresse pilosis ramulis brevissimis vel subnullis fructus ellipsoideus, sessilis.

TYPUS: *Kostermans 174* (BO).

Tree 5 — 12 m tall and 15 cm diam.; branches grey or pale violet brown with pale lenticels, near the apex minutely grey adpressed pilose.

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Leaves spirally arranged, chartaceous, glabrous, elliptic, 4 x 10 — 11 x 23 cm, shortly acuminate, base shortly acute, both surfaces very densely and finely areolate-reticulate; upper surface glossy, the main nerves impressed; lower surface paler, less glossy, midrib pustular, prominent, lateral nerves erect-patent, arcuate towards the margin, 6—7 pairs, prominent, secondary nerves very slender, prominulous. Petiole ca 1 cm long, slightly concave above, soon glabrous. End bud minutely grey sericeous.

Inflorescences axillary, spike-like, minutely adpressed pilose, up to 6 cm long, consisting of main peduncle with widely spaced glomerules of a few flowers. Flowers subtended by comparatively large bracts, densely sub-sericeous.

Fruit ellipsoid, 12 x 18 mm, almost sessile; tepals 2—3 mm long.

The species is close to *E. glauca*, but has a different tomentum and larger leaves; it is also near *E. gem*, but differs by its glomerules of flowers, the sessile fruit and the larger leaves.

W. IRIAN, Manokwari Distr., near Momi, alt. 10 mm, Aug., fr., *Kostermans 174* (A, BISH, BM, BO, CAL, K, L, P, SING), flowers rather large, meat-coloured, ripe fruit dark purplish-blue, local name (Manikiong language) "menako"; Aifat R., Sururem, alt. 540 m, Oct., buds, *Van Royen & Sleumer 6877* (BO, L); Andai, ster., *Beccari, FI 8111* (FI).

### 3. *Endiandra hayesii* Kosterm., *spec. nov.* — Fig. 35

Arbor ramulis dense ferrugineo tomentellis foliis alternantibus rigide chartaceis subovato-ellipticis sat obscure acuminatis basi in petiolum contractis supra nitida glabra nerviis primariis impressis obscure perdense minutissime areolatis subtus tomentellis nervo mediano cum costis valde prominentibus venis secundariis gracilis subparallelis prominulis petiolis sat gracilis paniculis axillaris brevis paucifloris dense minutissime ferrugineo pilosis pedicellis longis gracilis tepalis late depresso-ovatis acutis extus sublanuginosis staminibus glabris antheris ovalis cellulis magnis introrsis filamentis brevis.

TYPUS: *Hoogland & Hayes 8598* (BO).

Tree, ca 17 m tall, 30 cm diam. Branchlets densely, minutely rusty tomentellous; branches rather slender, smooth, cylindrical. Leaves spirally arranged, chartaceous or stiffly chartaceous, subovate-elliptic, 3 x 6 — 5 X 10 cm, indistinctly acuminate, base contracted into the rather slender, 5—10 mm long, pilose petiole; upper surface glabrous, glossy, midrib and lateral nerves impressed, the surface obscurely, densely, minutely areolate; lower surface pale brown rusty tomentellous, midrib robust, prominent, lateral nerves erect-patent, strong, curved at the margin, prominent, ca 7—8 pairs; secondary nerves slender, prominulous.

Inflorescence axillary, few-flowered, densely tomentellous, 5—20 mm long, peduncle 5—10 mm long, branches none or few, slender, very

short. Pedicel up to 5 mm long, slender. Tepals depressed, broadly ovate, acutish, 1.5 — 2 mm. Stamens shorter than the tepals, glabrous; anthers oval with large, introrse cells, filaments short.

The flower buds are too young to recognize all the flower parts. The species is related to *E. pubens*, but differs by the different reticulation, the more numerous lateral nerves, impressed on the upper surface and the large flowers.

AUSTRALIA, New S. Wales, in valley below Minyon Falls (ca 8 miles SW of Mullumbimby, N. coast), river banks, alt. 130 m, Oct., buds, *Hoogland & Hayes* 8598 (BO).

4. *Endiandra macrostemon* Kosterm., *spec. nov.* — Fig. 36

Arbor ramulis glabris apice sparse minutissime adpresse pilosis foliis alternantibus chartaceis glabris utrinque nitidis et dense minute reticulatis anguste ellipticis acuminatis basi sensim cuneatis supra nervo mediano prominulo basin versus subimpressa pustulata costis filiformis subtus nervo mediano prominulis costis filiformis prominulis petiolis gracilis supra concavis pustulatis paniculis axillaris gracilis paucifloris foliis brevioribus vix ramosis sparse minutissime adpresse pilosis floribus minutis tepalibus ovato-ellipticis acutis explanatis staminibus tepalibus aequilongis robustis pilosis.

TYPUS: *N.G.F. 17375* (BO).

Tree 20 m, diam. 50 cm; straight, unbuttressed 12 m bole, crown of medium width and depth; bark 1.5 mm thick, outer bark brown, with minute scales, inner bark light brown, corky, with faint resinous smell; sapwood straw, heartwood deep brown, heavy. Branches slender, smooth, the utmost apex with sparse, very minute adpressed hairs. Leaves spirally arranged, chartaceous, glabrous, narrowly elliptic, 3 X 10 — 5 X 16, to elliptic, 5 — 12 cm, acuminate, base gradually cuneate, both surfaces glossy with a very conspicuous dense, minute reticulation, midrib slightly raised in its upper half, somewhat impressed and pustular in its lower half on the upper surface, prominent on the lower surface, lateral nerves very slender, prominulous and faint on both surfaces, ca 10 pairs with in between almost as long lateral nerves. Petiole slender, concave above, pustular.

Panicles axillary with few flowers, slightly, very minutely adpressed pilose, 3 — 7 cm long, slender, branches few (up to 2.5 cm). Pedicel slender, 3 mm. Flowers slightly pilose in their basal part; tepals elliptic-ovate, 1 mm, acutish, explanate. The 3 stamens sessile, as long or even longer than the tepals, very thick, pilose (glandular) with large introrse-lateral cells, the connective protruding beyond the cells.

NEW GUINEA. Papua, Central Distr., 1 mile North of Brown R. Station, alt. 100 m, 9° 15' S, 147° 20' E. in monsoon rain forest, associated with *Pleiogynium*, *Pterygota*, *Alstonia*, *Celtis*, Pebr., fls. creamy yellow, *Havel N.G.F. 17375* (A, BO. BRI, CANB, K, LAE).

## 5. ENDIANDRA MINUTIFLORA Kosterm. — Fig. 37

Cf. Kostermans in Reinwardtia 7: 342. 1968, typus: *N.G.F. 8073* (A, BO), eyn-typus: *N.G.F. 8065* (A, BO).

Additional specimens: SOLOMON ISL., Bougainville, Koniguru, Buin, alt. 800 m, common, tree up to 20 m, leaves dull silver underneath, fruit) purple black, oblong with a point at the end, 18 X 33 mm (fresh), local name: Katanaba, Aug., *Kajewski 2004* (BO, L, SING); the leaves of this specimen vary between 3 x 6 and 10 X 18 cm, the petiole may be up to 4 cm long.

## LINDERA Thunb.

## 1. LINDERA APOENSIS Elmer

Cf. Kostermans, *Bibl. Laur.* 740. 1964. — Typus: *Elmer 11640* (BO, L, LEN).

Additional specimens: N. CELEBES, Menado, Wiau complex, Mt. Sani, alt. 700 m, June, fr., *Foreman 312* (BO, BRI, K, L, LAE, P, SING); Kinaleosan, alt. 900 m, Aug., young fr., 6b. *13653* (BO), tree 18 m, diam. 28 cm.

Fruit ovoid-ellipsoid, apiculate, up to 5 x 8 mm, cup disc-shaped, flat, 2—3 mm diam., thin, pedicel 2 mm, thickish, cylindrical, umbel peduncle up to 1 cm long; the short branchlets 5—15 mm long.

## 2. LINDERA CUSPIDATA (Bl.) Boerl.

Cf. Kostermans, *Bibl. Laur.* 747. 1964; *Aperula cuspidata* Bl., cf. Kostermans, *l.e.* 93. — Typus: collector unknown, Celebes (DC, L). 1

Umbels glabrous on almost glabrous, up to 1 cm long, slender peduncles and a few of these on very short, minutely rusty tomentellous, axillary short branchlets. Fruit ellipsoid, up to 8 x 11 mm, pointed; cup not present, merely a disc of 1 mm diam., pedicel ca; 5 mm long.

Additional specimens: N. Celebes, Minahassa, near Kajuwatu, alt. 200 m, Febr., fr., *Koorders 17478* (BO, L); N. of Mt. Klabat, Leleosan, Wiau complex, alt. 500 - 600 m, June, buds, *JPorman 239* (BO, K), tree 10 m, diam. 20 cm, fls. cream; *ibid.* near Pinilih, alt. 450 m, June, female fls., *Forman 339* (A, BO, K, L); Lolombulan near Paku-ure, alt. 450 m, April, fr., *Koorders 17501* (BO, L); *ibid.*, April, fr., tree 18 m, diam. 20 cm, *Koorders 17482* (BO, L); Pinamorongan forest near Kajuwatu, Febr., buds, *Koorders 17441* (BO, L).

3. *Lindera pedicellata* Kosterm., *spec. nov.* — Fig. 38

Arbor gracilis in omnibus partibus glabris ramulis gracilis subsucculentis foliis alternantibus membranaceis ovatis vel subovato-ellipticis acuminatis basi in petiolum gracile contractis utrinque sublaevis supra nervo mediano gracile impresso costis filiformis subprominulis subtus

pallidiora nervo mediano prominente costis erecto-patentibus gracilis prominulis nerviis secundariis per laxis obscuris inflorescentiis axillaris pedunculis umbellulis longis gracilis paucis floribus tubus brevis tepalis longis staminis tepalibus vix superantibus filamentis gracilis longis fructus ellipsoideus pro genere magnis pedicello perlongo impositis cupulis vix evolutis.

TYPUS : /. & M.S. *Clemens* 28522, fr., syn-typus: J. & M.S. *Clemens* 30302 (BO), male fls. and 28U75, female fls.

Slender tree, up to 10 m high and 10 cm diam., glabrous in all its parts; branchlets slender, glossy, succulent, branches pale grey, smooth. Leaves spirally arranged, membranous, elliptic to ovate, 8 X 12.5 — 8 x 16 — 8.5 x 14 — 12 x 17 cm, acuminate, base contracted into the petiole, shortly cuncate, both surfaces smooth, upper one with slender, impressed midrib and filiformous prominulous lateral nerves, lower surface paler, midrib prominent, lateral nerves filiformous, 7 — 10 pairs, erect-patent, arcuate, secondary nerves very lax, very slender. Petiole slender, 10 — 15 mm long, slitlike channeled above.

Inflorescences axillary, consisting of a few, long-peduncled umbels on short, slender branchlets; peduncles slender, 10 — 15 mm long. Florets on 2 — 3 mm long, filiform pedicels, tube short, funnel shaped, membranous, 0.5 — 1 mm, tepals narrow, strapshaped, up to 2 mm long; the stamens longer than the tepals (up to 4 mm), oval, acute, filaments filiformous, long. Fruit ellipsoid, up to 1.5 x 3 cm, fleshy, cup hardly visible, pedicel extremely long, up to 2.5 cm, pale. Female flowers without tube, tepals narrow, gland-dotted, 2 mm, style 2 mm long, slender, stigma shortly funnel shaped.

BORNEO. Mt. Kinabalu, Tenompok, alt. 1700 m, Febr., fr., J. & M.S. *Clemens* 28522 (BM); *ibid.*, back of lodge, March, male fls., J. & M.S. *Clemens* 28820 (BM, BO); *ibid.*, E. of lodge by pony trail, Febr., fls. lemon yellow, J. & M.S. *Clemens* 28193 (BM, BO); *ibid.*, above lodge, alt. 1800 m, Febr., fls. cream, fr. green, J. & M.S. *Clemens* 28A75 (BM, BO); *ibid.*, Febr., male fls., J. & M.S. *Clemens* 28100 (BO, SING); *ibid.*, Febr., buds, J. & M.S. *Clemens* 28195 (SING); *ibid.*, April, male fls., /. & M.S. *Clemens* 30302 (BO); *ibid.*, Febr., buds, J. & M.S. *Clemens* 30303 (BO); *ibid.*, Apr., after anthesis, J. & M.S. *Clemens* 30305 (BO); *ibid.*, Oct., young fr., /. & M.S. *Clemens* 268U9 (BO); E. Kalimantan, W. Kutei, near Mt. Kemul, alt. 1200 m, small tree, diam. 3 cm, Oct., young fr., *Endert* 3798 (BO, K, L).

#### 4. LINDERA TURFOSA Kosterm.

Cf. Kostermans *in* Reinwardtia 7: 497, fig. 28. 1969. — Typus: *Kostermans* 8136 (BO).

Additional specimens: SUMATRA, Bangka, Djebus, ster., *Teijsmann*, two collections, one with the vernacular name medang paja (medang = Lauraceae, paja = swamp) and one as medang pusung (BO, L).



## LITSEA Lam.

## 1. LITSEA ALVEOLATA Allen

Cf. Kostermans in *Reinwardtia* 7: 499. 1969. •— Typus: *Brass* 9559 (A, BO, L).

There are some differences between the enumerated specimens. The Lam specimen has very short petioles and is more glabrous, eventually it might represent another species, but without ripe fruit this is not possible to ascertain. The two collections from the Territory of New Guinea have long petioles, which conforms with the type material, but they have acute to sub-acuminate leaves. As, however, occasionally such leaves occur also in the type material (although acuminate to a lesser degree), I have included them here.

Additional specimens: NEW GUINEA. W. Irian, foot of Mt. Doorman, alt. 3000 m, Oct., buds, *Lam* 17A7 (BO, G, K); Territory of New Guinea, 3 miles from camp site on Mendi Rd., Mendi Subdistr., S. Highlands Div., alt. 3100 m, tree 20 m, diam. 35 cm, bark brown, fissured, inner pale pink, wood yellowish, scented, Sept., fls. and young fr., *N.G.F.* 39788 (A, BISH, BO, BRI, CANB, K, L, PNH, SING, SYD); Hindenburg Range, S. of Neranavin village, Sepik Distr., alt. 2900 m, tree 20 m, diam. 25 cm, wood yellow, leaves bitter aromatic, Sept., young fr., *N.G.F.* 28517 (A, BO, BRI, CANB, K, L).

2. *Litsea amieorum* Kosterm., *spec. nov.* — Fig. 38

Arbor mediocris ramulis apicem versus et innovationibus dense minutissime ferrugineo sublanuginoso-tomentellis ramis laevis griseis foliis alternantibus rigide chartaceis ellipticis vel subobovato-ellipticis breve late acutis vel obtusis basi acutis utrinque obscure dense areolatis supra nitida glabra nervo mediano costisque gracilis impressis subtus opaca glabrescentia nervo mediano costisque prominentibus nerviis secundariis parallelis connectis petiolis longis gracilis supra canaliculatis cupula parva glabrescentia pedicello sat crassa fructus infructescentiis minute rufo tomentellis.

TYPUS: *Kostermans & Soegeng* 728 (BO).

Tree 8—20 m, diam. up to 30 cm; bark cracked, soft, pale brown, 1 mm, living bark 4 mm, light brown, wood white, odourless, branches grey, smooth, glabrous; branchlets towards their apices (like the end bud) densely, minutely sublanuginose rusty tomentellous. Leaves spirally arranged, rigidly chartaceous, rather narrowly elliptic to subobovate-elliptic, 3 x 8.5—4 x 11—6.5 x 17 cm, top broadly acute or obtuse, base acute; both surfaces densely, minutely areolate; upper surface glossy, midrib and the slender lateral nerves impressed, lower surface dull, glabrescent, midrib and the erect-patent, 6—8 pairs of lateral nerves prominent, secondary nerves parallel, prominulous. Petiole up to 3 cm long, slender, channeled above. Fruit (immature) narrowly ellipsoid, up

to 6 x 20 mm, apiculate; cup shallow, thick, with remnant of a reddish tomentum, up to 6 mm diam., 2—3 mm high, pedicel thick, cylindrical, 5 mm, the pilose umbel stalk 5—10 mm and these on tomentellous short, thick axillar branches.

The species is distinguished by the long petioles, the areolate leaves and the shape of the narrow fruit and cup. I named it for my fosterson and friend Dr. W. Soengeng Reksodihardjo.

W. IRIAN. Baliem valley, Wellesey near Wamena, alt. 2000 m, Aug., young fr., *Kostermans & Soengeng Reksodihardjo* 728 (BO); *ibid.*, Aug., buds, *Kostermans & Soengeng Reksodihardjo* 716 (A, BO, G, K, L, LAE, P).

### 3. LITSEA ARTOCARPIFOLIA Gamble

Cf. *Kostermans*, *Bibl. Laur.* 791. 1964. — Typus: *Wray* 2233 (K).

New synonym: *Litsea megalophylla* Merr., cf. *Kostermans*, *l.e.* 847. — Typus: *Ramos* 1460, Sandakan, fr. (BO, UC, US), syn-typus: *Wood* 953 (US).

Additional specimens: SUMATRA, Eastcoast, Masihi For. Res., Asahan, Oct., fr., *Kruffcoff* 4115 (BO); Karo Lands, village Bassem, alt. 1500 m, ster., *bb.* 7168 (BO, L); Peak of Korintji, Siulak Daras, alt. 1600 m, tree 23 m, diam. 50 cm, Oct., buds, *bb.* 5936 (BO, L); Bengkulu, Redjang, village Karanganjar, alt. 950 m, Sept., fl., *bb.* 7282 (BO). — W. JAVA (first record), Bantam, Tjimara Udjungkulon near Batuhideung, Distr. Menes, subdistr. Batuhi, July, fr., *Koorders* 3385 (BO, L), wrongly published as *L. tomentosa* BL; Garut, Mt. Halimun, alt. 900 m, tree 21 m, diam. 40 cm, Jan., buds, *Ja* 46.1,9 (A, BO, L). — BORNEO, Sabah, Beaufort Hill, 15 miles N.E. of Beaufort Township, alt. 120 m, July, young fr., *San* 16946 (A, BO, BRI, K, KEP, L, SING); E. Kalimantan, Sangkulirang Distr., Sg. Susuk region, alt. 20 m, tree 20 m, diam. 60 cm, bark grey or beige, superficially fissured, living bark pinkish brown, 11 - 13 mm, buttresses 1 m high, out 40 cm, wood yellow, smelling of cedarwood, June, young fr. and fls., *Kostermans* 5513 (A, BO, K, L, SING); W. Kutei, Oct., fl., *Endert* 4196 (BO); Telen R., Long Hus, alt. 150 m, Aug., buds, *Endert* 2708 (BO, L); Belajan R. near Long Bleh, sandy loam, near marsh, April, fl., *Kostermans* 10374 (A, BO, K, L, SING), tree 25 m, diam. 30 cm, buttresses 15 m high, out 80 cm, thin, irregular, bark smooth, lightbrown, living bark brittle, 15 mm, pale with strong mango smell, wood pale yellowish with sour smell, leaves grey green underneath, fls. pale green; S. Kalimantan, Sampit Distr., Keminting near Kuala Kuajan, alt. 30 m, rather wet, tree 10 m, diam. 15 cm, bark smooth reddish brown, 0.5 mm, living bark 5 mm, brown, wood yellowish with faint smell of *Cinnamomum porrectum*, fls. yellowish white on trunk and older, bare branches, lower leaf surface grey-green, *Kostermans* 8057 (A, BO, CANB, K, KEP, L, LAE, PNH, SING).

### 4. *Litsea aurea* Kosterm., *spec. nov.* — Fig. 39

Arbor ramulis sat crassis apicem versus dense minutissime pulverulente aureo-tomentellis foliis alternantibus apice ramulorum sub-aggregatis, rigide chartaceis elongate ellipticis apicem versus sensim cuneatis

supra glabra nitida nervo mediano piano costis filiformis prominulis subtus dense minutissime aureo-brunneo sericeis nervo mediano prominentibus costis gracilis prominulis erecto-patentibus petiolis subalatis mlflorescentiis axillaris perdense minutissime sericeis umbellulis pedunculatis in racemis dispositis fructus depresso-globosus cupulis subplanis sat parvis pedicello crasso obconico.

TYPUS: 66. 8834 (BO).

Tree, up to 34 m tall and 80 cm diam. with 20 m free bole and small buttresses up to 3.50 m high. Branchlets rather thick, towards their apex densely, minutely, aureo-brownish, pulverulently tomentellous. End bud and flush densely silvery sericeous. Leaves spirally arranged, rather crowded towards the top of the branchlets, stiffly chartaceous or subcoriaceous, elongate elliptic, 4 x 8 — 8 x 23 cm, towards apex gradually acute, the tip obtuse, base gradually cuneate; upper surface smooth, the midrib flush with the surface, the filiformous lateral nerves prominulous, lower surface densely, minutely, subaureously sericeous, midrib prominent, lateral nerves up to 22 pairs, thin, erect-patent, prominulous, venis invisible. Petiole 10—15 mm long, narrowly winged.

Inflorescences axillary, densely, minutely pale brown sericeous, consisting of peduncled umbels arranged in a raceme of up to 5 cm long. Fruit depressed globose, up to 1.5 cm high and 2 cm diam.; cup flat, 10—12 mm diam., with wavy margin, the pedicel fleshy, obconical, 10—15 cm long.

Related to *L. garciae* and *L. robusta*, distinguished by the tomentum and the small, flat fruit cup. The specimen 66. 8697 has leaves of up to 9 x 27 cm.

SUMATRA, Benkulu (Bencoolen), Redjang, village Karanganjar, alt. 900 m, March, fl., 66. 8834 (BO, L); *ibid.*, Sept., buds, 66. 7281 (BO, K, L, U); *ibid.*, ster., 66. 8819 (BO, L); Sumatra's E. Coast, Simelungun, village Masihat Huta, alt. 700 m, Oct., buds, 66. 4889 (BO, L); Palembang, Pasemah Lands, village Djangkar, alt. 900 m, ster., 66. 8697 (BO, L, U); BORNEO, Sarawak, Ulu Mayeng, Kakus, alt. 200 m, basalt-derived soil, tree 27 m, Aug., buds, S. 21863 (A, BO, K, KEP, L, MEL, SAN, SING).

##### 5. LITSEA BARRINGTONIOIDES Kosterm.

Cf. Kostermans *in* Reinwardtia 7: 345. 1968. — Typus: *Kostermans* 13261 (A, BO, CANB, K, L, SING).

New record: E. KALIMANTAN, E. Kutei, Sg. Menubar area, N. of Sangkuliranig, limestone ridge, alt. 20 m, June, ster., *Kostermans* 5203 (BO, L).

##### 6. LITSEA CALOPHYLLANTHA K. Schum.

Cf. Kostermans, *Bibl. Laur.* 796, 1914, excl. var. *villosa* Lauterb. —• Typus: *Lauterbach* 1386 (where?).

Additional specimens: W. IRIAN, Hollandia (Jayapura), Humboldt Bay, alt. 40 m, Aug., young fr., *Gjellertip* 296 (BO). — TERRITORY OF NEW GUINEA, K. Wilhelmsland, Viehpark, buds, *Weinland* 92 (BO); Sepik area, fr., *Ledermann* 7435 (SING); Yellow R. near Sepik R., ster., *N.G.F.* 3855 (BO, LAE); *ibid.*, medium tree colonising sand banks, Oct., fls. creamish white, *N.G.F.\** 3908 (BO, LAE); Morobe Di'str., Boana, alt. 1200 m, May, fr., *Clemens* 8223 (A, BO); E. Highlands Distr., Arau, alt. 1400 m, substage of *Casianopsis-oak* forest, slender tree, 10 m, branches myrmecophilous, fruit lateral (below the leaves), leaves up to 45 cm long, Oct., fr. *Brass.* 32087 (A, BO).

7. *Litsea carrii* Kosterm., *spec. nov.*— Fig. 40

Arbor mediocris in omnibus partibus glabris ramulis gracilis pallidis laevis foliis alternantibus rigide chartaceis ellipticis vel subovato-ellipticis sensim acutis vel subacuminatis basi cuneatis utrinque minutissime reticulatis supra nitida nervo mediano impresso costis obscuris subtus opaca nervo mediano prominulo costis paucis filiformis erecto-patentibus arcuatis prominulis petiolis gracilis inflorescentiis axillaris umbellulis longe et gracile pedunculatis ramulis gracilis impositis fructus ellipsoideus cupula parva plana.

TYPUS: *Carr*<sup>7</sup>132AM..(BO)

Tree, 4—7 m, sometimes 21 m with 16 m free bole, glabrous in all its parts; bark creamy green to creamy brown, moderately smooth, blaze brownish; wood pinky straw. Branchlets very slender, pale, smooth, end bud glabrous. Leaves spirally arranged, rigidly chartaceous, elliptic or subovate-elliptic, 2.5 x 5—5 x 10 cm, more or less conspicuously acuminate, base cuneate, both surfaces densely, minutely reticulate; upper surface glossy, midrib slender, impressed, lateral nerves very slender, obscure; lower surface less glossy, midrib prominent, lateral nerves 4—5 pairs, filiformous, prominulous, arcuate towards the margin and often connected by loops. Petiole slender, 6—10 mm long, channeled above.

Inflorescences axillary, umbels glabrous on very slender, up to 10—15 mm long peduncles and these either single (near the apex) or inserted on small, slender, bracteate branchlets, up to 5 mm long. Umbel-bracts 2—3 mm long, concave; calyx broadly funnel-shaped, 0.5—0.75 mm with very small, triangular tepals, fimbriate at their margin; anthers 0.25 mm, broadly ellipsoid, the 4 cells introrse and introrse-lateral, filaments distinct, as long as the anthers. Fruit ellipsoid, up to 7 x 13 mm; cup flattish, small, 4—5 mm diam., 2 mm high, the pedicel slightly obconical, 5—7 mm.

TERRITORY OF NEW GUINEA. Northern Div., S. slopes of Hydrographers Range near Siurane, Managalase area, alt. 1200 m, Aug., buds, *Pull en* 5558 (CANB, L, LAE); Papua, Boridi, alt. 1700 m, Sept., buds, *Can-* 13242 (BO, SING); *ibid.*, alt. 2000 m, Oct., fr., *Carr* 14231 (SING); *ibid.*, alt. 1500 m, Nov., fl., *Carr* 14772 (SING); *ibid.*, alt. 2000 m, Oct., fl., *Carr* 14418 (BO, SING); *ibid.*, 1700 m, Oct.,

buds, *Can- 4414* (BO, SING); *ibid.*, alt. 2000 m, Oct., fl., *Can- 14631* (BO, SING); the Gap, alt. 2400 m, Jan., fl., *Can- 15069* (SING); Central Distr., Woitape, alt. 1700 m, Aug., fl., *Corner & Gray s.u.* (BO, SING).

## 8. LITSEA CASTANEA Hooker f.

Cf. Kostermans, *Bibl. Laur.* 797. 1964. — Typus: *Maingay, Keiv Distr. 1269* (K),

The species is a typical kerangas (heath-forest) tree. The Bornean Clemens specimen has short racemes, but does not differ in other respects. The cup of the mature fruit is smooth, thick, deeply hemispherical with a thin rim, up to 15 mm in diam. and 10—12 mm high, the pedicel is ca 5 mm long, thick, cylindrical.

Additional specimens: MALAY PENINSULA. Johore, Bukit Badak, Layang-Layang, Jan., fr., *H. 91* (BO, SING); Singapore, Bukit Timah (tree no. 199), ster., *S.F.N. 35904*, (BO, SING); *ibid.*, Dec, young fr. (tree no. 241), *S.F.N. 35782* (BO, SING); *ibid.*, Aug., buds (tree no. 175), *S.F.N. 34776* (BO, SING); Liana Rd., Bot. Garden, Nov., fl., *Sinclair 9366* (BO, SING) — SUMATRA. Isl. Singkep, Riau Arch., low, ster., 66. 2702 (BO) et 5592 (BO); E. Coast Sumatra, Simelwngun, Aekna-uli, alt. 1200 m, Pebr., buds, 66. 35320 (BO, K, L); Labuan Batu, Pasar baru, low, ster., 66. 8888 (BO); Palembang Distr., Ogan Ulu, Pagaragung, alt. 35 m, ster., 66. 83kh (BO); Lematang ilir, G. Megang, alt. 75 m, Jan., fl., *170 E. 3P. 523* (BO, L); *ibid.*, Jan., fr., *T. 3P. 523* (BO, K, L); *ibid.*, Aug., buds, *T. 587* (BO); Banjuasin 6 Kubu regions, April, fr., *T. 1063* (BO);<sup>1</sup> *ibid.*, alt. 10 m, Sept., fl., *170 E. IP. 864* (BO, G, L, P); *ibid.*, alt. 5 m, ster., *18 T. IP. 70* (BO, CANB, L); *ibid.*, Aug., fl., same number (BO, L, P); *ibid.*, Bajung lintjir, alt. 15 m, Aprils fr., *T. 1063* (BO); Tjaban For. Res. near Muara Enim, common, Sept., fl., *Kostermans 12073* (A, BM, BO, K, L, P, PNH, SING); Rawas, alt. 80 m, May, buds, *Dumas 1569* (BO, L); locality not indicated, sine coll., fr., "Medang serai" (BO, K, L); Isl. Bangka, Lobok Besar, alt. 20 m, Oct., buds, *Kostermans & Anta 1178* (A, BO, K, KEP, L, LAE, P, PNH, SING, SYD), tree 28 m tall, 55 cm diam., bark lightbrown, wood yellowish; *ibid.*, Sept., fl., *Kostermans & Anta 406* (A, BO, CANB); Mt. Mangkol, alt. 50 m, tree 12 m, diam. 20 cm, bark smooth, dirty brown, wood yellowish, Sept., buds, *Kostermans & Anta 712* (A, BO, K, KEP, L, LAE, NY, P, PNH, SING, SYD); *ibid.*, ster., *Kostermans & Anta, 713* (A, BO, K, L, SING); Benkulu (Bencoolen), Redjang, Kepahiang, alt. 600 m, ster., 66. 15421 (BO, L); Lais, Talangbenal, alt. 250 m, ster., 66. 8796 (BO). — BORNEO. Sabah, Mt. Kinabalu, Columbon R., alt. 700 m, Aug., buds, *J. & M.S. Clemens 34488* (BO); Sarawak, Kuching, Semengoh, Arbor., Aug., fl., *S. 14767* (A, BM, BO, K, L, SAR, SING); *ibid.*, ster., *Anderson 9445* (BO, K, L, SAR, SING); Bako Nat. Park, Bukit Tambi, June, fl., *S. 17881* (A, BO, L, SAN, SAR, SING); N.E. Kalimantan, Bulungan, Sebakis R., Castuarina forest on white sand, ster., *Kostermans 9300* (A, K, L, SING); E. Kutei, Sg. Kerajan, S. of Sangkulirang, alt. 5 m, sandy, tree 35 m, diam. 60 cm, without buttresses, bark

rather smooth, lenticellate, 0,5 mm, pale red-brown, living bark 12 mm, yellowish brown, wood pale yellow with faint cigarbox wood smell, sapwood 10 em, heartwood very dark, dirty yellow brown, July, buds pale brown, *Kostermana* 5876 (A, BO, K, L, LAE, P, SING); W. Kutei, Belajan R., Gunung Sahari, alt. 50 m, tree 35 m, young parts of branchlets flesh-coloured, Aug., fls. creams, *Formctn* 477 (A, BO, BRI, K, L, PNH, SING); E. Kutei, S.E. of Samarinda, Sg. Bambang, alt. 30 m, sandy ridge, tree 30 m, bark smooth, peeling off slightly, brownish-iwhite, 1-2 mm, living bark redbrown, 10 mm, wood pale yellow, bark and wood slightly aromatic, Aug., fls. yellow, *Kostermans* 6069 (A, BO, K, KEP, L, LAE, NY, P, PNH, SING, SYD); Tandjong Bangko, estuary of Mahakam R., alt. 40 m, sandy ridge, bark dull red brown, 1 mm, rather smooth, living bark 8 mm, light brown, wood light yellow, faintly smelling of cigarbox wood, upper leaf surface dark green with yellow nerves, young leaves of flush dirty redbrown underneath; S. Kalimantan, Kayup, June, buds, *Winkler* 24-63 (BO); W. Java. Mt. Salak near Bogor, leaves only, *Koorders* 21,385 (B, L).

9. *Litsea ceramensis* Kosterm., *spec. nov.* — Fig. 41

Arbor parva ramulis gracilis strictis glabris apice minute pilosis foliis alternantibus chartaceis glabris elangato-ellipticis sensim acutis basi sensim attenuatis utrinque dense minute obscure reticulatis supra nitida nervo mediano costisque vix prominulis subtus subnitida nervo mediano prominentibus costis gracilis erecto-patentibus vix arcuatis petiolis gracilis perlongis inflorescentiis axillaris gracilis, pedunculis communis gracilis longis pedunculis umbellurarum longis filiformis minutissime sparse tomentellis floribus dense longe tomentosis pedicellatis tubus tepalibusque deest filamentis longis pilosis.

*TYPVS: Rutten* 2009 (BO).

Treelet, 7.5 m high, branchlets stiff, rather slender, only the flush branchlets densely, minutely grey tomentellous. Leaves spirally arranged, chartaceous, glabrous, narrowly elliptic, 3,5 x 10 — 7 x 20 cm, gradually subacuminate, base gradually tapered, both surfaces densely, minutely, obscurely reticulate and somewhat glossy, upper surface with hardly prominulous midrib and lateral nerves, lower surface with prominent midrib, the 10 — 12 pairs of slender, erect-patent lateral nerves slightly curved towards the margin, prominulous. Petiole 12 — 45 mm long, slender.

Inflorescence slender, on up to 4 cm long, sometimes branched slender pilose branchlets; the umbels on very slender, sparsely pilose, up to 35 mm long peduncles, scales pilose, florets very densely silvery tomentose, pedicel up to 2.5 mm long, tube and tepals not present; filaments slender, long, pilose, anthers 4-celled, the lower cells lateral, large, the upper smaller, introrse.

CENTRAL CERAM, behind Seleman, forest on limestone, Febr., fls. yellow, *Rutten* 2009 (BO, L, U).

10. *LITSEA CHEWII* Kosterm.

Cf. Kostermans, *Bibl. Laur.* 799. 1964. — Typus: *Chew, Corner & Stainton 166* (BO, K).

Additional specimen: SABAH, Sipitang distr., W. ridge of Mt. Lumaku, 10 miles S.E. of Malaman, alt. 1500 m, Sept., fr., *Wood, San 16705* (A, BO, BRI, K, L, SING).

11. *LITSEA CUPREA* Merr.

Cf. Kostermans, *Bibl. Laur.* 810. 1964. — Typus: *Ramos 1267* (BO, US).

Additional specimens: SUMATRA, Palembang, Ogan Ulu, ster., *Teijsmann 3768 H.B.* (BO); BORNEO, Tikung, Nov., fl., *Amdjah 926* (A, BO, K, L); Tawao, buds, *Elmer 20519* (BO); Sandakan, buds, *Elmer 20221* (BO); Sandakan, Bettotan, buds, *S.F.N. 19184* (BO, SING), fls. yellowish white; Bukit Sg. Tulit, Sept., fr., *Amdjah 669* (BO, L). — E. KALIMANTAN, W. Kutei, Telen R., Long Puhus, Nov., fr., *Endert 4962* (BO).

12. *Litsea densiflora* (Teschner) Kosterm., *comb. nov.*

*Actinodaphne densiflora* Teschner (basionym) in Engler's bot. Jahrb. 58: 383. 1923; cf. Kostermans, *Bibl. Laur.* 22. 1964. — Typus: *Schlechter 1703* (BO, SING), K. Wilhelmsland, 830 m, in den Wäldern am Kaulo, 23-X-11-1907, buds.

Whereas the leaves of the type collection are narrowly obovate and up to  $3.5 \times 10$  cm, those of the Carr and Pullen collections are subobovate elliptical, up to  $6.5 \times 16$  cm. The fruit are cylindrical-ellipsoid, up to  $10 \times 25$  mm, pointed; the fruitcup is small, very shallow, up to 5 mm in diam. and 1 mm high on a thick, 2 mm long petiole, the peduncle up to 7 mm.

Additional material: NEW BRITAIN, Gasmata subdistr., alt. ca 1200 m,  $5^{\circ} 45' S$ ,  $151^{\circ} 10' E$ , secondary forest between villages, limestone, March, fr., *N.G.F. 24236* (A, BO, CANB, K, L, LAE), very common tree, leaves glossy, dark green above, glaucous below, fruit pale green, glossy with cream splotches, height 13 m; PAPUA, Koitaki, alt. 500 m, May, fr. dark purple, *Carr 12111* (SING); *ibid.*, tree 20 m, Febr., fr. red, *Carr 12783* (BO, SING); *ibid.*, July, buds, *Carr 12789* (L, SING); N. Div., S. slopes of Hydrographer's Range near Siurane, Managalase area, alt. 1200 m, tree 24 m, bole 11 m, Aug., fruit green with pinkish tinge, becoming dark red then black, *Pullen 5554* (CANB); N.W. New Guinea, Morobe Distr., Boana, alt. 1000—1700 m, steep slope near mission, tree 15—25 cm diam., April, fr., *Clemens 3120* (BO).

13. *Litsea discocalyx* Kosterm., *spec. nov.* — Fig. 42

Arbor (?) ramulis dense minutissime adpresse ferrugineo pilosis foliis alternantibus membranaceis suboblanceolatis acuminatis basi sensim acutis supra glabra laevia vel perobscure laxe reticulata nervo mediano gracile impressa subtus glabrescentia nervo mediano prominente excepta

costis plurimis sat erectis prominulis nerviis secundariis laxis conjunctis petiolis sat brevis umbellulis subsessilibus dense minutissime pilosis parvis fructus subglobosis cupulis parvis disciformis.

TYPUS: *Hallier 671* (BO).

Tree (?), branchlets densely, minutely adpressed pale rusty brown pilose. Leaves spirally arranged or subaggregate, membranous, suboblan-ceolate,  $4 \times 16 - 5 \times 20$  cm, rather gradually acuminate, base gradually tapered, acute; upper surface glabrous, smooth (or rarely obscurely reticulate), the slender midrib impressed, lower surface paler, glabrescent, except the prominent midrib which is tawny adpressed pubescent with coarse hairs, lateral nerves 15—17 pairs, rather erect, prominulous, curved towards the margin, connected by spaced, somewhat parallel prominulous secondary nerves. Petiole 1—1.5 cm long, channeled above, merging into the lamina.

Umbels small, pilose, almost sessile on very short bracteate branchlets. Fruit subglobose,  $5 \times 6$  mm, cup thin, flat, disc-like, 3 mm diam., 1.5 mm high, pilose.

KALIMANTAN, locality not indicated, fr., *Hallier 671* (BO).

#### 14. LITSEA DIVERSIFOLIA Bl.

Cf. Kostermans, *Bibl. Laur.* 812. 1964. — Typus: *Blume s.n.*, Java (L).

Synonyms: *Laurus obtusa* Reinwardt ex Blume (nomen), cf. Kostermans, l.c. 677. — Typus: Pondok Tenga, *Reinwardt s.n.*, Huru tjangkrien (L, 11 sheets, marked *Laurus obtusa* Reinw., *Litsaea obtusa* Bl. and *Laurus obtusifolia*); *Tetranthera obtusa* (Bl.) Nees, cf. Kostermans, l.c. 1414 (excl. cit. Zollinger, *Zollinger 572* represents *Litsea noronhae*); *Litsaea obtusa* (Reinw. ex Bl.) Bl., cf. Kostermans, l.c. 857; *Tetranthera Zollingeriana* Miq., cf. Kostermans, l.c. 1432. — Typus: Mt. Idjen, *Zollinger 2853* (BO, G), *2306* (G. LEN), *Teijsmann s.n.*, Java (L, marked *Tetranthera zollingeriana* Miq.); *Tetranthera elliptica* Miq. (non Nees), cf. Kostermans, l.c. 1390, based on *Junghuhn 688* (BO, U), buds.

A mountain species occurring from N. Sumatra (Mt. Kerintji) to Flores of the Lesser Sunda Islands, so far not collected in Borneo.

#### 15. LITSEA ELLIPTICA Bl.

Cf. Kostermans, *Bibl. Laur.* 814. 1964. — Typus: *Blume s.n.*, ster., Mt. Salak (L), "Huru madang".

New synonyms: *Litsea clarissae* (Tesch.) Kosterm., cf. Kostermans in *Reinwardtia* 7: 347. 1968; *Neolitsea clarissae* (Tesch.) Merr., cf. Kostermans, *Bibl. Laur.* 1039. 1964; *Tetradenia clarissae* Teschn., cf. Kostermans, l.c. 1366. — Typus: *Ledermann 6704* (BO, L, SING), buds, *7777* (SING), smaller leaves, *8597* (SING), buds, *8707* (BO, SING), young fr.; var. *pulchra* Teschn., cf. Kostermans, l.c. — Typus: *Ledermann 8884* (BO, SING); *Tetradenia latifolia* Teschn., cf. Kostermans, l.c. 1369. — Typus: *Ledermann 7768* (BO, SING), buds; *Neolitsea papuana* Merr., cf. Kostermans, l.c. 1045; *Actinodaphne engleriana* Teschn., cf. Kostermans, l.c. 23. — Typus: *Ledermann 6555* (BO, SING), male fls., *7992* (SING) ster.



The species occurs from the Malay Peninsula to E. New Guinea and is represented by numerous collections (ca 170 sheets in Bogor alone).

It is characterized by the strong, sweet-aromatic odour of the bark, similar to that of *Cinnamomum porrectum* (Roxb.) Kosterm. The ovate, gradually acuminate leaves with the impressed midrib and the long slender petioles, which are deeply, slit-like channeled to the very base, make it easy to distinguish the species even in sterile condition.

It occurs without doubt also in the Philippines, where it has been perhaps described under another name.

Additional specimens (from E. INDONESIA and NEW GUINEA only): Key Isl., fl., *Jaheri* 77 (BO, L); Halmaheira: Loa Tobaru, Dec., buds, *Beguin* 1910 (BO, L), vernac. name: Gogisoro, wood stinking; Morotai Isl., N. Totodoku, alt. 30 m, ster., *bb.* 33810 (A, BM, BO, K, L, LAE, NY, PNH, SING); W. Irian, Sidei, Manokwari alt. 7 m, ster., March, young fr., *B.W.* 1737 (BO, L); hill North of Djajapura (Hollandia), alt. 40 m, ster., *bb.* 25097 (A, BO, K, L, SING); Papua, W. distr., Upper Oriomo R., 43 miles from the coast on well-drained spur, May, fl., *N.G.F.* 8299 (BO, LAE), tree 27 m, diam. 55 cm, slightly buttress effect, bark light brown, scaly, brown, inner bark with overpowering essence smell (lemon), blaze cream brown with light streaks, sapwood yellow, turns blue on axe cut, hardwood yellow, conspicuous rays, not a strong timber, native names: Diuwa (Kuinga dialect), Wonge (Oriomo dialect), associated with *Acacia*.

#### 16. LITSEA ENGLERIANA Teschn.

Cf. Kostermans, *Bibl. Laur.* 815. 1964 et in *Reinwardtia* 7: 502. 1969. —  
 Typus: *Ledermann* 9830, *Schlechter* 17049 (UC).

Additional specimens: NEW GUINEA, W. Irian, Manokwari, village Prawi, alt. 150 m, Febr., buds, *B.W.* 507 (BO, L, LAE); Territory of New Guinea, Morobe Distr., mountains above Wakaia, alt. 1030 m, 7° 50' S, 147° 10' E, old garden with Pandanus, frequent, tree 20 m, 30 cm diam., bark fissured, slightly scaly, no lenticels, inner bark orange brown, wood cream, leaves rusty indumentum underneath, local name: "Hosea", Jan., buds brownish yellow, *N.G.F.* 26422 (BO, BRI, K, L, LAE); Busu logging area near Lae, tree 23 m, buttresses 120 cm high, diam. 50 cm, bark pale reddish brown, smooth, slightly pitted, inner bark brown, wood very pale straw, Dec., fls. brownish, *N.G.F.* 10585 (BO, LAE); Morobe distr., Gnalangumbum, 6° 45' S, 147° 0' E, alt. 70 m, dominant in lowland rainforest, associate *Vitex*, *Homalium*, slightly buttressed, tree 43 m high, 120 cm diam., outer bark light grey, overall smooth, but peeling off in small thin flakes, 13 mm thick, blaze light red-brown, wood straw to light brown, medium hard and heavy, local name: "hose dza" (Garaina dialect), used for building, fr. bluish, *N.G.F.* 17117 (BO, K, L, LAE); near Lae, June, fr., *N.G.F.* 5747 (LAE); Morobe Distr., lake Trist, 7° 30' S, 147° 00' E, montane forest, canopy layer, alt. 1400 m, tree 23 m, diam. 40 cm, Febr., buds, *N.G.F.* 24901 (BO, BRI, CANB, K, L, SING, SYD); Morobe Distr., Taun Creek, Bulolo, alt. 800 m, Jan., fl., *N.G.F.* 17367 (BO, LAE); Papua, Koitaki, alt. 500 m, May, fr., *Carr* 12185 (BO, SING).

17. *Litsea erectinervia* Kosterm., *spec. nov.* — Fig. 33

*Litsea ferruginea* Auct. (non Bl.) Gamble in J. As. Soc. Beng. 75(1): 186. 1912; Ridley, Fl. Mal. Pen. 3: 129. 1924; Kostermans, Bibl. Laur. 816 (143 a). 1964.

Arbor ramulis angulatis crassis minutissime dense ferrugineo tomentellis ramis griseis laevis foliis alternantibus ellipticis breve acuminatis basi obtusis vel acutiusculis supra sublaevia glabra nervo mediano plano vel vix impressa costis filiformis sat obscuris subtus laxe minutissime ferrugineo tomentellis glabrescentis nervo mediano prominentibus costis numerosis sat erectis strictis prominentis venis inconspicuis petiolis supra planis vel vix concavis sat crassis inflorescentiis axillaris dense minutissime ferrugineo-pilosis umbellulis pedunculatis floribus tubus infundibuliformis parvis tepalis reflexis lanceolatis dense rufo tomentellis antheris parvis filamentis gracilis glabris fructus depresso-globosus in cupula magna subhemispherica rugosa crassa subinclusa.

TYPUS: *Achmad 1338* (BO).

Tree, up to 30 m high and 50 cm diam., buttresses 30—150 cm high, bark dark brown, 12 mm thick; branchlets thick, angular, minutely, densely rusty tomentellous, branches cylindrical, grey, smooth. Leaves spirally arranged, subcoriaceous, elliptic,  $4 \times 10$ — $6 \times 16$ — $1.5 \times 19$ — $4 \times 17$ — $8 \times 31$  cm, shortly acuminate with sharp tip, base obtuse or acutish; upper surface smooth or obscurely reticulate, glabrous (except the long-persistent tomentum on the midrib), midrib flush with the surface or subimpressed, lateral nerves faint; lower surface rather laxly minutely rusty tomentellous, glabrescent, midrib prominent, lateral nerves 10—15 pairs, rather erect, straight (curved towards the margin), prominent, reticulation invisible or obscure. Petiole rather thick, 10—20 mm long, flat or slightly concave above.

Inflorescences axillary and in the axils of fallen leaves, densely, minutely rusty pilose; the umbel peduncles up to 8 mm long on very short branchlets. Flowers densely aureous tomentellous, the male ones with a short tube and up to 2 mm long lanceolate, acute, reflexed, rather thick tepals, anthers small, filaments shorter than the tepals, slender, glabrous. Female flower slightly larger, the staminodes with reduced anthers, style distinct, stigma capitellate. Fruit depressed-globose, up to 17 mm diam., for the greater part embedded in the thick, roughish, hemispheric cup, up to 25 mm diam. and 13 mm high with obconical, rough pedicel, 5—13 mm long.

In sterile condition the species may be distinguished from *L. ferruginea* by the spirally arranged leaves with a less or not impressed midrib on the upper surface. The fruit cup is distinctly different from that of *L. ferruginea*. The discrepancies of Gamble's and Ridley's description of their so called *L. ferruginea* are now understood, as theirs was not the same as Blume's *L. ferruginea*.

MALAY PENINSULA, Perak, Goping, May, female fl., *King's Coll. 6039* (BO, DD, K, SING); Larut, Nov., young fr., *King's Coll. 6826* (BO, K, SING); April, fl., *King's Coll. 7546* (BO, K); Singapore, Bukit Timah, buds, *S.F.N. 36391* (BO, K, SING); Mandai Rd., Apr., female fl., *S.F.N. 28093* (BO, K, SING). — SUMATRA, Atjeh, Simaloer, near Aerdingin, ster., *bb. 3038* (BO, L); Dec., buds, *Achmad 822* (BO, L, U); Nov., fr., *Achmad 716* (BO); Tapah (Defajan), Dec., buds, *Achmad 1567* (BO, K, L); June, fr., *Achmad 311* (BO, K, L, U); Aug., fr., *Achmad 1338* (BO, L); W. Coast, Ophir, Simpang (Parit), alt. 90 m, ster., *bb. 18724* (BO, L); Indragiri near Muara Serangge, alt. 50 m, ster., *bb. 30015* (A, BO, L); Palembang, Lematang ilir, Semangus, alt. 75 m, ster., *bb. 31726* (A, BO, L, SING); Tjaban For. Res. near Muara-enim, Febr., male fl., *Kostermans S. 32* (A, BM, BO, BRI, CAL, CANB, G, K, L, NY, P, PNH, SYD, US); Gunungmegang, Febr., fl., et ster., *3P. T. 924* (BO, L, U). — BORNEO, Sarawak, Semengoh For. Res., Kuching, alt. 15 m, Febr., buds, Haji Bujang, tree no. *4374* (A, BO, K, L, SAN, SAR, SING); E. Kalimantan, Central Kutei, Belajan R. near Long Bleh, alt. 60 m, April, young fr., *Kostermans 10352* (A, BO, BRI, CAL, K, L, P, PNH, SING); Sg. Wain region, N. of Balikpapan, alt. 50 m, Oct., fr., *Kostermans 4569* (A, BO, K, L) and *4577* (A, BO, K, L, SING); S. Kalimantan, Puruktjahu, Muara Djaan, alt. 100 m, buds, *bb. 10500* (BO, L).

### 18. LITSEA EXSUDENS Kosterm.

Cf. Kostermans, *Bibl. Laur.* 816, 1964. — Typus: *Brass 30304* (K), Mt. Wilhelm.

From the study of new material it becomes evident, that the white material which covers the lower leafside of leaves of the flush, the apex of the branchlets and the inflorescences, is actually a mold, which cakes together the dark rusty tomentum. Sometimes domatia are present on the lower leaf surface in the axils of the basal lateral nerves. The leaves differ considerably in size, which is especially striking in the specimen *N.G.F. 28210*, where crown and epicormic shoot leaves are represented. A description of fruit and its cup are given below.

Additional material: TERRITORY OF NEW GUINEA, Marafunga logging area, Chimbu divide, Upper Asaro valley near Goroka, E. Highl. Distr., alt. 2700 m, Sept., buds, *N.G.F. 14010* (BO), tree 20 m, leaves glaucous underneath, male fls. yellowish; S. Highl. Distr., Tari subdistr., Ibiwara, 6° S., 143° E., alt. 2700 m, tree 20 m, bole 5 m, diam. 30 cm, small stiltroots, bark dark brown, slash lightbrown, wood white, fls. greenish white, fr. green, flush light purplish brown, *Kalkman 4899* (BO, L); near Lei camp, S. E. slope of Mt. Ambua, 5° 55' S., 143° 10' E., alt. 2900 m, mixed montane forest (*Elaeocarpus*, *Quintinia*, etc.), tree 15 m, bark grey brown, rough, scaly with short, moderately deep fissures, lenticels scattered, large; blaze: outer layer orange, inner orange-yellow; wood straw, exudate absent; leaves green-glaucous underneath; fls. yellowish green to yellow, ovary green, July, buds, *N.G.F. 27000* (A, BO, BRI, K, L); *ibid.*, alt. 2700 m, tree 20 m, sucker leaves up to 6 × 12.5 cm with a long 1.5 cm, slender acumen; lower leaf surface pale green, Aug., fr., bright green, maculate, 5 × 8 mm, apiculate, cup 4 mm diam., cup-shaped, 1.5 mm high, *N.G.F. 28210* (A, BO, BRI, CANB, K, L, SING, SYD); Ibiware, Tari

Gap, 5° 55' S., 143° 10' E., alt. 2800 m, tree with untidy branching, 13 m tall, bole 3.5 m, diam. 30 cm, bark brown, corky, flaky, 6 mm thick, blaze flesh-coloured, granular, wood pale straw, semi-hard, leaves glossy green, petiole red, new leaves brown, adpressed pubescent, fruit green, ellipsoid, up to 4 × 6 mm, pointed, cup small, minutely rusty pilose, thin, 4 mm diam., ca 2 mm high on a short, rather thick, 1.5 mm pedicel, umbel peduncle up to 5 mm long, local name: "Kumu", June, *N.G.F.* 25131 (A, BO, BRI, CANB, K, L); Morobe Distr., Sambanga, Masak R. fall, alt. 2000-2300 m, tall tree, 30 cm diam., Dec., green buds, *Clemens* 7884 (A), leaves up to 4.5 × 11 cm, petiole up to 2.5 cm; *ibid.*, Timbe R. woods, alt. 1700 m, Nov., buds, *Clemens* 7741 (A, BO); Samanzing vicinity, alt. 2300-2700 m, Jan., buds, *Clemens* 9467 (A); Hindenburg Range, S. of Nerenavip village (Feremin valley), Sepik distr., alt. 2700 m, secondary mixed forest, leaves midgreen to dark yellow green above, green glaucous underneath, odour in leaves bitter aromatic, Sept., fls. yellow, fr. ellipsoid, up to 7 × 12 mm, apiculate, green with white spots, pedicel somewhat obconical, thickish, *N.G.F.* 32183 (A, BO, BRI, CANB, K, L); PAPUA, the Gap, alt. 2400 m, Jan., buds, *Carr* 15069 (BM, BO, SING); *ibid.*, ster., tree 17 m, *Carr* 15041 (SING), leaves up to 5 × 6.5 cm, petiole up to 12 mm, flush minutely, densely rusty pilose, branchlets at apex with the same tomentum.

### 19. LITSEA FENESTRATA Gamble

Cf. Kostermans, *Bibl. Laur.* 816. 1964. — Typus: *King's Coll.* 5938, 6859 (K, SING), *Forbes* 3174, *Haviland* 3088?

Additional specimens: MALAY PENINSULA, Kemaman, Ulu Gombak, Nov., young fr., *S.F.N.* 30491 (BO, K, SING); Ulu Selangor, Kanching For. Res., tree 27 m, ster., *Kep.* 66102 (KEP). — SUMATRA, Benkulu (Bencoolen), Redjang, village Karanganjar, alt. 900 m, Febr., buds, *bb.* 8815 (BO), tree 31 m, diam. 50 cm. — BORNEO, Sabah, Lahad Datu, Mostyn, mile 16, Kelumpang For. Res., alt. 100 m, swampy, black soil, tree 17 m, diam. 30 cm, outer bark yellow, inner bark brittle, yellow, 8 mm, wood yellow, March, fr., *San* 40857 (BO, K, L, SAN); Sarawak, Kuching, Semengoh For. Res., alt. 100 m, tree diam. 30 cm, May, buds, *S.* 16424 (BO, K, L, SAR); W. Kalimantan, Melawi Distr., village Klepuk, B. Sanggau, alt. 350 m, tree 27 m, diam. 57 cm, ster., *bb.* 29062 (A, BO, L); E. Kalimantan, Peak of Balikpapan, alt. 740 m, tree 25 m, diam. 45 cm, bark smooth, beige, 0.5 mm, living bark 10 mm, light brown, wood pale yellow, bark slightly smelling like *Cinnamomum porrectum*, July, fls. dirty yellowish white, *Kostermans* 7429 (A, BO, BRI, K, L, LAE, P, PNH, SING); Sangkulirang Distr., E. Kutei, alt. 50 m, ster., *bb.* 11873 (BO).

### 20. LITSEA FERRUGINEA (Bl.) Bl.

Cf. Kostermans, *Bibl. Laur.* 816. 1964; *Cryptocarya ferruginea* Bl. (basionym), cf. Kostermans, l.c. 400 (no. 94a). — Typus: Java, aan den berg Salak, *Blume* 831, Jan. 1823, "Huru tankala" (Sundanese), fr. (L, 2 sheets).

Synonym: *Cylicodaphne ferruginea* (Bl.) Bl., cf. Kostermans, l.c. 448; *Lepidadenia ferruginea* (Bl.) Miq., cf. Kostermans, l.c. 719; *Litsea blumii* Nees, cf.

Kostermans, l.c. 793; *Actinodaphne blumii* (Nees) Nees, cf. Kostermans, l.c. 18; *Tetranthera blumii* Nees, cf. Kostermans, l.c. 381. — Typus: *Blume*, montis Javae, fl. Nov. et Dec., "Huru Tangalak", fr.

The species is based on a specimen of Blume (cf. above), published as *Cryptocarya ferruginea* Bl.; Blume cited the wrong vernacular name: Huru tankala (K) (which is *Litsea garciae* Vid.). Blume mentioned the opposite leaves, which implies that Gamble's and Ridley's *L. ferruginea* represents another species (*L. erectinervia* Kosterm.), although it has the midrib impressed on the upper leaf surface, as is the case in *L. ferruginea* proper. The fruit are subglobose, slightly flattened at the apex, the cup is very shallow and thin, ca 4 mm high and 8 — 10 mm in diam.

Specimens examined: JAVA, fr., *Zollinger 3091* (FI) et buds (P), distributed as *Tetranthera vestita* Nees and *Actinodaphne blumii* Nees; Java, *Blume s.n.*, buds (BO, 3 sheets, L); Mt. Salak, Camp Bobodjong, alt. 1000 m, Sept., fr., *Koorders 24383* and *24384* (BO, L); Priangan, Djampangwetan, Takoka, buds, *Koorders 3420* (BO); Priangan, Mt. Tjiparai (S. slope of Mt. Gede), alt. 1000 m, April, fl., *Backer 15000* (A, BO, K, L); W. Java, Tjirarak near Djasinga, alt. 1000 m, Nov., fr. blood-red with dull green cup, *De Voogd s.n.* (BO); Tjiandjur Distr., Mt. Buleud near Tjidadap, alt. 1000 m, sapling 2 m, *Kostermans 23002* (BO, L), leaves alternate; Bantam, Mt. Karang, alt. 1050 m, June, fl., fr., *Koorders 3452, 3453, 3456* (BO); culta in Hort. Bogor, sub *D. 138*, July, buds (BO, L, U). — SUMATRA, Palembang Distr., Lematang ilir, alt. 75 m, May - June, fl., *139 T. 3P. 520* (BO).

21. *Litsea filipeduncululata* Kosterm., *spec. nov.* — Fig. 44

Arbor parva ramulis angulatis dense minutissime pallide brunneo pulverulente sublanuginosis foliis alternantibus chartaceis ellipticis breve acuminatis basi in petiolum longum contractis supra nitida glabra nervo mediano costisque subimpressis subtus sub lente minutissime gracile sublanuginosa nervo mediano prominentis costis arcuatis erecto-patentibus prominentis nerviis secundariis parallelis prominulis connectis umbellulis dense minutissime pallide brunneo pilosis pedunculis longis gracillimis ramulis contractis axillaris impositis.

TYPUS: *Docters van Leeuwen 9868* (BO).

Tree 6 — 20 m tall; branchlets angular, covered with a dense layer of pale brown, fine, sublanuginose (under high power lens) tomentum. Leaves spirally arranged, chartaceous, elliptic, 10 × 22 — 13 × 28 cm, shortly acuminate, base contracted into the slender, up to 4 cm long petiole; upper surface glabrous, glossy, smooth, the main nerves slender, slightly impressed, lower surface densely, minutely, sublanuginose (under high power lens), pale brown pilose, midrib prominent, lateral nerves erect-patent, prominent, 8 — 10 pairs, rather widely spaced, arcuate, connected by rather widely spaced, slender, prominulous, parallel secondary nerves.

Inflorescences densely, minutely, yellow-brown, sublanuginose pilose; umbels small on filiform, up to 2 cm long peduncles, which are attached to up to 3 mm long, bracteate, axillary short-branches.

NEW GUINEA. W. Irian, Rouffaer R., hill, 175 m alt., leaves bluegreen underneath, fl. buds yellowish white, Aug., *Docters van Leeuwen 9868* (BO, L); Papua, Central Div., Mafulu, limestone forest substage, alt. 1250 m, common, slender tree of 15-20 m, Sept.-Nov., fls. yellow, *Brass 5279* (A, BO); Finschhafen, Jan., fr., *Lauterbach 1386* (BO, Breslau), fruit globose, 8 mm diam., cup thin, not very deep, 8 mm diam., 2 mm high on a short, 3 mm long, obconical pedicel.

## 22. LITSEA FIRMA (Bl.) Hooker f.

Cf. Kostermans, *Bibl. Laur.* 817. 1964; *Tetranthera firma* Bl., cf. Kostermans, l.c. 1392. — Typus: Celebes, Borneo, etc. (L).

New synonym: *Tetranthera merawas* Miq., cf. Kostermans, l.c. 1409. — Typus: *Teijsmann s.n.* (= 4292 *H.B.*), Lampong near Kabagusan (iso-typus: BO), ster.

Miquel, in his protologue did not mention the exact locality of Teijsmann's collection merely: Lampong.

In Bôgor two sheets of Teijsmann, marked *Tetranthera merawas* Miq. (not in Miquel's handwriting) are represented of which one 4292 *H.B.*, from the Lampongs near Kabagusan conforms with his protologue and hence is considered an iso-type sheet, the other one, numbered 3853 *H.B.* (also in U) collected in the Lampong distr. near Muara dua represents a sterile specimen of *Litsea elliptica* Bl.

## 23. Litsea foveolata (Merr.) Kosterm., *comb. nov.*

*Beilschmiedia foveolata* Merrill (basionym) in *J. Arnold Arb.* 19: 30. 1938; cf. Kostermans, *Bibl. Laur.* 128. 1964. — Typus: *Pételot 5380* (A, BO, NY, P).

Merrill erred when he identified the fruiting specimen as belonging to *Beilschmiedia*. The fruit pedicels sticking out almost at right angles from the top of the common peduncle make it evident that this belongs in *Litsea*; the obconical pedicels, the fleshy, globose fruit and the minute areolation do not often occur in *Beilschmiedia*, but are common in *Litsea*. The species is related to *Litsea microphylla* of the Philippines.

## 24. LITSEA FULVO-SERICEA Allen

Cf. Kostermans, *Bibl. Laur.* 820. 1964. — Typus: *Brass & Versteegh 12520*, fr., Idenburg R., W. Irian (A, BO).

Additional collection: W. IRIAN, Hollandia Distr., Ifar Ormu, Mt. Boboku, alt. 1150 m, Nov., fl., *B.W. 903* (BO, L).

25. *Litsea gigaphylla* Kosterm., *nom. nov.*

*Cylicodaphne macrophylla* Blume (base), Mus. bot. Lugd. bat. 2(1): 14, 1856.  
— Typus: Zippel s.n., New Guinea (L).

Synonym: *Cryptocarya macrophylla* Zippel ex Blume, cf. Kostermans, Bibl. Laur. 415. 1964. — Typus: Zippel s.n., New Guinea (L); *Litsea macrophylla* Boerlage (non Blume 1826, nec Kurz 1875), cf. Kostermans, l.c. 844 no. 252a, quoad cit. Boerlage.

Boerlage rightly referred *Cylicodaphne macrophylla* Bl. to *Litsea* in 1900, but used the specific epithet *macrophylla*, which was already preoccupied by *Litsea macrophylla* Bl. 1826 and by *Litsea macrophylla* Kurz 1875.

The basionym *Litsea macrophylla* Bl. under *Cylicodaphne macrophylla* Bl. in Kostermans, Bibl. Laur. 450. 1964 has to be deleted.

Additional specimen: TERRITORY OF NEW GUINEA, Sepik Distr., Aitape Subdistr., along Bliri R. between Kaiye and Karandu, fairly tall forest on river flats, alt. ca 80 m, tree 13 m tall, 9 m bole, 12 cm diam, with few branches, July, fls. creamy, fr. green, vernacular name: Isil (Orne language, Kaiye), *Darbyshire & Hoogland 8211* (BO, CANB).

26. *Litsea globosa* Kosterm., *spec. nov.* — Fig. 45

Arbor mediocris in omnibus partibus glabris ramulis nitidis pallidis foliis alternantibus rigide chartaceis sub-obovato-ellipticis breve sub-acuminatis basi cuneatis utrinque dense prominule reticulatis nervo mediano utrinque prominulo costis gracilibus utrinque prominulis petiolis gracilibus fructus subglobosis pro genere magnis pedicellis cylindricis crassis impositis.

TYPUS: *Brass 11380* (BO).

Tree 12 m tall, glabrous in all its parts. Branchlets smooth, glossy, pale. Leaves spirally arranged, somewhat crowded at the apex, stiffly chartaceous, sub-obovate-elliptic,  $4.5 \times 9$ — $6 \times 15$  cm, acute or sub-acuminate with sharp tip, base shortly cuneate, tapered, both sides densely, prominulously reticulate, midrib prominulous above, prominent underneath; lateral nerves 10—15 pairs, erect-patent or rather patent, slightly arcuate, slender, prominulous on both sides. Petiole slender, 5—10 mm long.

Infructescences below the leaves on very short, tubercle like branchlets; the fruit globose, up to 2.5 cm in diam. on a thick, cylindrical, up to 2 cm long pedicel.

The species belongs in the *L. glutinosa* group and is characterized by the large fruit and the densely, prominulously reticulate sub-obovate leaves.

W. IRIAN, Bele R., 18 km N.E. of lake Habbema, alt. 2200 m, riverine rain forest, substage tree, 12 m high, leaves stiff, somewhat crowded below (A, BO).

27. *LITSEA GRANDIS* (Wall. ex Nees) Hk. f.

Cf. Kostermans, *Bibl. Laur.* 828. 1964; *Tetranthera grandis* Wallich ex Nees, cf. Kostermans, l.c. 1398. — Typus: *Wallich 2552* (BO, K, LEN).

Synonyms: *Litsea ampla* Merr., cf. Kostermans, l.c. 788. — Typus: *Merrill 1654* (BO, US), syn-typus: *Ramos 20866*; *Tetranthera multiflora* Miq. ex Zollinger, cf. Kostermans, l.c. 1411 (no. 145 b). — Typus: *Zollinger 3268* (FI, G).

Additional references: Ridley in *J. As. Soc. Straits Br.* 59: 163. 1911; Anderson in *Gard. Bull. Singapore* 20(2): 198. 1963; Smythies, *Common trees Sarawak* 76. 1965.

As Koorders & Valetton already pointed out the specimen *Zollinger 3268* was collected in the Bogor Botanical Garden. It is the base of the variety *javanica* Meissner; it does not differ from typical *Litsea grandis*. As pointed out in *Reinwardtia* 7: 347. 1968, a Teijsmann specimen, marked Java (BO, K), originally identified as this variety actually represents *Litsea castanea* Hk. f.

28. *Litsea henricksonii* Kosterm., *spec. nov.* — Fig. 46

Arbor ramulis sat crassis glabris foliis alternantibus coriaceis glabris ellipticis sensim sub-acuminatis basi in petiolum perlongum contractis supra nitida venis vix prominulis subtus opacis nervo mediano prominulo costis filiformis vix prominulis petiolis supra planis inflorescentiis sparse minutissime adpresse pilosis glabrescentis pedunculis communis sat longis.

TYPUS: *Brass 31451* (A).

Tree 25 m tall, 50 cm diam. Branches thick, glabrous, lenticellate; end bud densely, finely pilose. Leaves alternate, crowded at the end of the branches, coriaceous, glabrous, elliptic, 3.5—7 × 21 cm, gradually acute or subacuminate, base contracted into the petiole, shortly cuneate, upper surface glossy, the broad midrib and the filiform lateral nerves hardly prominent, secondary nerves faint, impressed; lower dull, smooth, midrib prominent, lateral nerves filiform, (7—) 9—12 pairs, erect-patent, slightly arcuate, secondary veins obscure. Petiole glabrous, 2—4 cm long, flat above.

Inflorescences axillary and in the axils of fallen leaves, sparsely, minutely, adpressed pilose, consisting of 3—7 peduncled umbels; peduncles up to 15 mm long, rather slender. Bud scales concave, 3—4 mm long, the inner ones densely pilose outside; umbel few-flowered. Flower tube broadly funnelshaped, 1.5 mm high, densely pilose, tepals extremely small; anthers large, 4-celled, almost sessile.

It is a pleasure and an honour to name this species after Dr. Carl Henrickson, professor of plant physiology and Chairman of the Botany



Dept., University of Kentucky, Lexington, U.S.A., who for some time taught at the Bandung University, Java. Due to him, I had the opportunity to teach at the Kentucky University as a visiting professor and could at the same time lay the ground work for a revision of Asiatic Lauraceae. Dr. Henrickson always took a keen interest in my work and in my endeavours to create a school of Botany in Indonesia and proved to be a trustworthy friend in difficult circumstances.

TERRITORY OF NEW GUINEA, E. Highlands Distr., Mt. Michael, northeast slopes, alt. 2000 m, *Castanopsis - Nothofagus* forest, subcanopy tree, leaves pale yellowish green, nerves whitish above, Sept., fls. yellow, *Brass 31451* (A, BO).

### 29. *LITSEA LEDERMANNII* Teschn.

Cf. Kostermans, *Bibl. Laur.* 840. 1964. — Typus: *Ledermann 7791* (SING), buds; *8663* (BO), buds; *8090* (SING), buds, all from the Sepik area.

New synonym: *Actinodaphne caesia* Teschn., cf. Kostermans, l.c. 18. — Typus: *Ledermann 6658* (BO), buds; *8022* (SING), young fr., Sepik area.

Additional specimens: MOLUCCAS, Morotai Isl., along Sangowo R., tree 30 m, diam. 30 m, bark reddish brown, wood hard, ster., *Kostermans 1125* (BO); *ibid.*, Tiai, alt. 10 m, tree 25 m, diam. 20 cm, buttresses 1.5 m high, bark brown, living bark 10 mm, wood pale yellow, June, fl. white, *Kostermans 1435* (A, BO, BRI, K, L, PNH); *ibid.*, Mt. Para-para, alt. 900 m, common tree of 30 m, diam. 30 cm, May, fl. pale yellow, *Kostermans 1129* (A, BM, BO, BRI, K, L, LAE, NY, P, PNH, SING); Halmaheira, Galela, Soa Tobaru, Dec., fl., *Beguín 1921* (BO, L); Sula Isl., Sanana Isl., Molbufa, alt. 150 m, ster., *bb. 29820* (BO, SING); Isl. Buru near Balobalo, alt. 50 m, ster., *bb. 25182* (A, BO, L); Ambon, Hitu, Mt. Kadera, alt. 300 m, sapling, *Kostermans ?* (BO); *ibid.*, Ahulu, alt. 400 m, ster., *bb. 14297* (BO). — W. IRIAN, Japen Isl., Serui, alt. 370 m, ster., *bb. 30439* (BO, SING); *ibid.*, near Mariatu, alt. 370 m, ster., *bb. 30453* (A, BO, L); E. of Sorong, Warsamon valley, alt. 50 m, rather common, tree 30 m, diam. 40 cm, buttresses 1 m high, out 1 m, 4 cm thick, bark 0.5 mm, smooth, living bark shiny, white inside, slash 5 mm, brown, wood yellowish, ster., *B.W. 12335* (BO, L); Sidai, 65 km W. Manokwari, alt. 20 m, Oct., buds, *B.W. 6768* (BO, L); Aug., young fr., *B.W. 7688* (L, SING); near Idore, Mangeria, March, fr., *bb. 22534* (A, BO, L); Aifat R. valley, N. slope of the E. part of Tohkiri Range near Sururem in *Castanopsis* forest, Oct., buds, *Van Royen & Sleumer 7099* (BO, L); W. of lake Sentani near Dosai, tree 32 m, diam. 50 cm, bark smooth, light brown, 0.5 mm, living bark 10 mm, light brown, wood white, smelling slightly sourish, Aug., fl. greenish yellow, *Kostermans & Soegeng Reksodihardjo 219* (A, BO, K, L, P); Nassau Mts., alt. 700 m, Oct., buds, *Docters van Leeuwen 10648* (BO).

### 30. *Litsea longipedicellata* Kosterm., *spec. nov.* — Fig. 47

Arbor mediocris ramulis apicem versus minutissime adpresse pilosis foliis alternantibus coriaceis glabris ellipticis obtusis vel breve obscure

late acuminatis basin versus cuneatis supra nitida nerviis vix prominulis subtus opacis nervo mediano lato prominulo costis filiformis paucis prominulis petiolis longis inflorescentiis axillaris minutissime adpresse brunneo pilosis pedunculis umbellularum gracilis fructus ovoideus cupulis cupuliformis subhemisphaericis in pedicellum longum subobconicum sensim transeunt.

TYPUS: *Brass 3037* (BO).

Much branched tree, 3—10 m; branchlets stiff, straight, towards their apex densely, minutely adpressed brown-pilose; end bud with the same indumentum; branches grey-striate. Leaves spirally arranged, glabrous, somewhat fleshy (fresh), elliptic,  $2.5 \times 4.5$ — $4 \times 7.5$  cm, obtuse or obscurely, shortly, broadly acuminate, base cuneate, somewhat decurrent into the broad, up to 2 cm long petiole, which is flattened above; upper surface smooth, glossy, midrib and the faint lateral nerves hardly prominent; lower surface dull, midrib broad, prominulous, the 4—5 pairs of filiformous erect-patent, often irregular lateral nerves prominulous, veins invisible.

Umbels axillary, laxly, minutely adpressed pilose on filiform, up to 5 mm long peduncles (immature) and these on extremely short branchlets. Fruit ovoid,  $8 \times 11$  mm; cup subhemispheric, 6—10 mm diam., 4—5 mm high, on an obconical, up to 15 mm long pedicel; the umbel peduncle 6—8 mm long.

SOLOMON ISL., San Cristoval Isl.: Hinuahaoro, mountain forests, alt. 900 m, common, much branched tree, 3-10 m; leaves shining and somewhat fleshy, Sept., fruit purple, smooth and shining, *Brass 3037* (A, BO).

### 31. *LITSEA MALUENSIS* Teschner

Cf. Kostermans, *Bibl. Laur.* 846. 1964. — Typus: *Ledermann 7737*, Sepik region, fl. (BO, SING).

New synonym: *Litsea gilgiana* Teschner; cf. Kostermans, l.c. 822. — Typus: *Schlechter 17219* (BO, SING), forests of Kani Mts, buds Jan.

The type specimen of *L. gilgiana* has more elongate leaves and usually longer petioles, but a few elongate leaves and one with a similar long petiole are also found in the type specimen of *L. maluensis*.

Additional specimens: PAPUA, Kokoda, alt. 400 m, March, buds, *Carr 16278* (SING), secondary forest; N.E. New Guinea, Morobe Distr., above Boana, mountain bush, alt. 1300-1700 m, tree 90 cm diam., Aug., fr., red, *Clemens 8587* (BO), fruitcup very small, flattish, fruit elongate ellipsoid.

### 32. *Litsea morotaiensis* Kosterm., *spec. nov.* — Fig. 38

Arbor parva ramulis dense minute ferrugineo velutinis ramis glabris rubro-brunneis-laevis foliis alternantibus chartaceis ellipticis vel sub-

obovato-ellipticis magnis breve acuminatis basin versus attenuatis subobtusis supra glabra laevia nerviis principalis impressis subtus sat laxe ferrugineo pilosis nervo mediano prominente costis erecto-patentibus vel subpatentibus strictis ad marginem arcuatis prominulis venis secundariis laxis parallelis prominulis connectis rete obscuro petiolis crassis dense velutinis umbellulis axillaris dense minutissime ferrugineo tomentellis subsessilis cupulis minutis laevis pilosis fructus anguste ellipticis dense pilosis.

TYPUS: *Lam 3511* (BO).

Small tree, 4—6 m high; branchlets angular, densely, minutely ferrugineously velutinous, end bud large; branches glabrous, smooth, redbrown. Leaves spirally arranged, chartaceous, elliptic or subobovate-elliptic, 12 × 22—17 × 28 cm, acuminate (acumen 1—1.5 cm long, blunt), base gradually tapered and subobtusate; upper surface glabrous, smooth, midrib, lateral nerves and (sometimes) secondary nerves impressed; lower surface rather sparsely minutely ferrugineously velutinous, midrib prominent, lateral nerves ca 15 pairs, erect-patent or rather patent, straight, arcuate near the margin, rather slender, prominent, connected by slender, widely spaced, prominulous, parallel secondary nerves, reticulation lax, obscure. Petiole stout, 1.5—2 cm long, densely rusty velutinous, concave above.

Inflorescences in the axils of large leaf-scars, consisting of a very small bracteate, pilose contracted branchlet, bearing the very shortly peduncled densely, minutely pilose small umbels. Fruit narrowly ellipsoid, 7 × 15 mm, densely, minutely rusty pilose; cup hemispheric, thin, smooth, pilose, 4 mm diam., 2—3 mm high on a very short, thick pedicel.

The species is outstanding because of its pilose fruit and the small, almost sessile cup.

Moluccas, ISL. MOROTAI, W. slope of Mt. Sabatas, alt. 100 m, June, fr., *Lam 3511* (BO, L), tree 6 m, fruit brownish green (apparently immature); Mt. Sangowo, alt. 900 m, common tree of 4 m, May, buds yellow, *Kostermans 1118* (A, BO, L, PNH, SING).

### 33. *Litsea paludosa* Kosterm., *spec. nov.* — Fig. 49

*Litsea grandis* Auct. (non Hook. f.) Anderson in Gard. Bull. Sing. 20(2): 198. 1963.

Arbor ramulis sulcatis dense minutissime sublanuginoso tomentellis foliis alternantibus rigide coriaceis subobovato-ellipticis obtusis vel retusis vel apiculatis basin versus sensim attenuatis supra nitida laevia glabra nerviis primariis costisque impressis subtus glaucis minutissime sparse pergracile sublanuginoso-tomentellis nervo mediano prominentibus costis erecto-patentibus arcuatis prominentibus venis secundariis parallelis prominulis connectis venulis tertiariis obscuris parallelis petiolis sat crassis

pilosis umbellulis minutissime laxe pilosis pedunculis sat gracilis ramulis contractis brevis axillaris impositis cupulis immaturus laxe villosis profundis.

TYPUS: *Anderson S. 14520* (BO).

Tree, up to 13 m tall and 30 cm diam.; branchlets densely, minutely yellow brown, sublanuginose tomentellous, stiff, sulcate. Leaves spirally arranged, stiffly coriaceous, subobovate-elliptic,  $4.5 \times 7 - 7 \times 12$  cm (in saplings  $10 \times 18 - 20 \times 36$  cm), obtuse, retuse or apiculate, towards the base gradually tapered, upper surface smooth, glossy, glabrous, midrib and lateral, slender nerves impressed; lower surface glaucous, grey, laxly, minutely, sublanuginose brown tomentellous, midrib prominent, lateral nerves 6—8 pairs, prominent, erect-patent, arcuate, connected by non-horizontal, parallel, prominulous, slender, secondary nerves and these in turn connected by very fine, parallel tertiary nerves. Petiole rather stout, minutely pale brown pilose, 10—15 mm long, flat above.

Inflorescences axillary, consisting of a very short (ca 5 mm) thick, densely, minutely light-brown condensed branchlet, bearing the sparsely, minutely pilose umbels on rather slender, 3—5 mm long, pilose peduncles. The unripe fruit with a deep, sparsely villous cup on a distinct pedicel.

The species is related to *L. grandis* Hk.f., but has a different tomentum, a glaucous lower leaf surface, less lateral nerves, subobovate-elliptic leaves, slender umbel peduncles. It is confined to peat swamp areas.

SUMATRA, Bengkalis, Selat Pandjang, tree 16 m with small buttresses, Dec., fr., *Beguïn 520* (BO); *ibid.*, Tdg. Kebal, alt. 2 m, June, fl., *bb. 12487* (BO, L); Tapanuli, Dairi Lands, Dellong, alt. 1066 m, April, buds, *bb. 15357* (BO); Bangka, Blinju, ster., *s.n.* (BO, K, L), apparently picked from a sapling, the leaves very large, the petioles 5 cm long; S. Bangka, Bikang, low, tree 22 m, diam. 35 cm, April, buds, *bb. 15109* (BO, L); *ibid.*, Rias, alt. 10 m, tree 21 m, diam. 35 cm, ster., *bb. 15393* (BO, L). — BORNEO, Sarawak, Distr. Simanggang, Triso P.F., alt. 3 m, peat swamp forest, Aug., buds and young fr., *Anderson 14520* (BO, K, L, SAR, SING); Betong, Saribas For. Res., low, ster., *Anderson 8532* (BO, SAR); E. Kalimantan, Central Kutei, Belajan R. near Long Bleh, tree 20 m, bark smooth, pale yellow brown, living bark 6 mm, dull chocolate, odourless, wood white, odourless, April, fr., *Kostermans 10355* (A, BO, BRI, K, L, SING); Sg. Sangasanga near Samarinda, alt. 5 m, tree 25 m, diam. 30 cm, bark rather smooth, somewhat cracked, lightbrown, 0.5 mm, papery, living bark 10 mm, pinkish inside, outer layer greenish, inside of dead bark pure white, sapwood 5 cm, dark yellow, heartwood yellowish brown, Aug., buds, *Kostermans 7740* (A, BO, BRI, CAL, K, L, P, PNH, SING); S. Kalimantan, Sampit, tree 40 m, March, buds, *Kostermans (Dahrie) 121* (A, BM, BO, K, L, PNH, SING); Dajak, Tuwanan, ster., *bb. 9446* (BO).

#### 34. *Litsea pipericarpa* (Miq.) Kosterm., *comb. nov.*

*Polyadenia pipericarpa* Miquel (basionym), Fl. Ind. bat. 1(1): 962. 1858; of Kostermans, Bibl. Laur. 1312. 1964. — Typus: *Teijsmann s.n.*, fr., Sumatra, Rau & Mandaheling, vernac. name "Antarsa" (BO as 2214 H.B., 2 sheets and U).

Synonyms: *Linders pipericarpa* (Miq.) Boerl., cf. Kostermans, l.c. 765; *Tetranthera diepenhorstii* Miq., cf. Kostermans, l.c. 1389 and in *Reinwardtia* 7: 497. 1969. — Typus: *Diepenhorst s.n.*, Priaman, ster. (BO, K).

Miquel was only acquainted with a fruiting specimen; he spelled the name *pepericarpa*, which was improved by Boerlage to *pipericarpa*, which certainly is more correct.

Additional material proves this to be *Litsea* with 4-celled anthers. The vernacular name antarsa is also used for *Litsea cubeba*. *Litsea euosma* W.W. Smith is very closely related to this and may represent only a variety.

Additional specimens: N. SUMATRA, Rau and Mandaheling = Mandailing), fr. *Teijsmann 2214 H.B.* (BO, U), local name kulit (= bark) antarsa or kulit pulaga; Palembang, Pasemah Lands, G. Dempo Estate, alt. 900 m, Oct., buds, *bb. 35078* (BO, L); Atjeh, Gajo Lands, Putjuk Agasan, bivouac 1 to 2, alt. 2500 m, dense rejuvenation of burnt ridge forest, localized, not common, vernac. name: kaju (= wood) lasu (Gajo language), Jan., fr., *Van Steenis 8403* (A, BO, K, L, SING); *ibid.*, top Goh Lembuh, alt. 3000 m, burnt shrub on summit, very common and luxuriant, Febr., fl., *Van Steenis 9096* (BO, L); Mt. Kerintji, Laut Paepandji, alt. 2050 m, above solfataras, Sept., young fr., *Van Steenis 6522* (BO); Benkulu (Bencoolen), Lebong, Bukit Daun, alt. 2400 m, ster., *bb. 17029* (BO); N. foot of Sibajak crater cone in subalpine scrub, alt. 1800 m, locally common, treelet 4 m, lower leaf surface bluish green, the nerves dark brown, flowers bright yellow, fragrant, June, fl., *Lörzing 9074* (BO); E. Mt. Sibajak, on bare fresh landslides, it is one of the pioneer plants and grows often gregariously; most parts especially the bark smelling of lemon grass or of *Pelargonium radula*, Aug., fl., *Lörzing 13483* (BO, K, L).

35. *Litsea pruriens* Kosterm., *spec. nov.* — Fig. 50

Arbor ramulis gracilis griseis laevis glabris apicem exceptis foliis chartaceis late ellipticis acuminatis basi in petiolium longum gracilem contractus supra glabra nervo mediano costisque filiformis impressis exceptis subtus sparse minute tomentellis nervo mediano dense pilosis prominentibus costis sat patentibus gracilis prominulis venis secundariis prominulis connectis infructescentiis ramulis impositis minutissime dense pilosis cupulis immaturus profundis glabrescentibus.

TYPUS: *Kostermans 12675* (BO).

Tree 25 m, diam. 40 cm; bark smooth, pale brown, in some places peeling off irregularly in large, 1 mm thick pieces; living bark 5 mm, light brown; wood dirty white with faint cigarbox wood smell, heart wood darker; bark inside with stinging hairs. Branchlets slender, smooth, whitish, the utmost apex minutely densely rusty tomentellous, branches slender, bearing the infructescences. Leaves spirally arranged, thinly chartaceous, elliptic, 5 × 10 — 8.5 × 17 cm, shortly acuminate, base contracted into the 2.5—4 cm long slender, minutely, densely pilose, glabrescent, narrowly channeled petiole, upper surface smooth, glabrous

except on the impressed midrib and impressed, slender lateral nerves; lower surface minutely, laxly tomentellous, tomentum denser on the prominent midrib and the 8—9 rather patent, prominent lateral nerves, which are connected by prominulous, slender, lax parallel secondary veins.

Infructescences on the bare branchlets; the umbels densely, minutely brown tomentellous, almost sessile with 5—7 mm long stalks; the young fruit cups glabrescent, subglobose with a narrow aperture and short, 2—3 mm long pedicels.

*Description of the flowers:* umbels with glabrous outer scales, inner ones sericeous, peduncle 6—7 mm long, minutely, densely pilose; short branches 1 mm long, densely aureous tomentellous; florets densely aureous-tomentellous, tube very shallow, pedicel 2 mm, tepals narrow, 2 mm; stamens 2—2.5 mm with small, oval anthers and filiformous tomentellous filaments.

The species has stinging hairs in its bark, called "miang" by the natives. The lower leaf surface has (fresh) rusty pilose veins. The species is characterized by its very long petioles, its pilosity, its ramiflorous infructescences. The fruit are still included in the cup; of the latter the shape at the mature stage cannot be predicted.

N. SUMATRA, Serdang, Gallia estate, alt. 150-200 m, ster., *Lörzing 14611* (BO), common tree of 25-30 m, yields a useful, but not very durable timber. — BORNEO. Sabah, Tawau, mile 12 Apas Rd., May, fl., *San 21472* (BO), tree 20 m, bole 17 m, diam. 20 cm, bark flaky, grey, outer bark soft, 1 mm, cork cambium dark brown, inner bark brown, soft, cambium yellowish brown, sapwood yellow, leaves 4.5×10 — 6×11.5 cm; W. Kalimantan, Distr. Melawi, Ng. Betung, alt. 375 m, ster., *bb. 31619* (A, BO, L); E. Kalimantan, W. Kutei, along Belajan R. near Tabang, alt. 100 m, Aug., young fr., *Kostermans 12675* (A, BM, BO, CANB, K, L, NY, P, PNH, SING); Upper Mahakam, Parei, alt. 300 m, ster., *bb. 20687* (A, BO, L, SING); Balikpapan Distr., Mentawir R. region near G. Mentawir, alt. 100 m, flatland along river, March, young fr., *Kostermans 10147* (A, BISH, BM, BO, CANB, K, KEP, L, NY, P, PNH, SING), tree 40 m, bole 25 m, diam. 60 cm, buttresses rather numerous, regular, 1 m high, very concave, out 2 m, bark smooth, brown, living bark almost white, 10 mm, without odour, sapwood 5 cm, hardly differentiated from the pinkish pale brown heartwood with strong cigarbox wood smell; timber unusually hard for a *Litsea*, midrib of leaf reddish; *ibid.*, Sambodja, alt. 40 m, Sept., fl., *Sabana 21* (A, BISH, BM, BO, L, LAE, K, KEP, NY, P, PNH, SING); S.E. Kalimantan, Martapura, village Djungur, alt. 350 m, tree 26 m, diam. 60 cm, Sept., buds, *bb. 10387* (BO, L), leaves 2.5×6 — 5.5×12 cm.

### 36. *Litsea psilophylla* Kosterm., *spec. nov.* — Fig. 51

Arbor in omnibus partibus innovationibus exceptis glabris ramulis gracilis foliis alternantibus coriaceis obovatis obtusis basin versus sensim attenuatis utrinque minutissime dense reticulatis supra nitida nervo mediano impresso costis filiformis prominulis subtus subnitida nervo

mediano prominulo costis sat patentibus subirregulariter filiformis prominulis petiolis gracilis subcanaliculatis inflorescentiis mono-umbellatis vel pluri-umbellatis ramulis parvis gracilis impositis pedunculis filiformis longis.

TYPUS: *Pullen 477* (L).

Tree 10 — 14 m tall, glabrous in all its parts, except the minutely adpressed pilose end bud. Branchlets thin, smooth, grey. Leaves spirally arranged, thinly coriaceous, as a rule obovate,  $1.5 \times 2.5$  —  $3 \times 6$  cm, apex rounded or obscurely very broadly, obtusely acuminate, base cuneate, both surfaces densely, minutely prominulously reticulate, upper surface somewhat glossy, midrib slender, prominulous, lateral nerves very slender, slightly prominulous; lower surface dull, midrib slender, prominulous, lateral nerves filiformous, 5 — 6 pairs, rather patent, prominulous, secondary nerves reticulate. Petiole 5 — 10 mm long, slender, concave above.

Inflorescences axillary consisting of a single (rarely more) peduncled umbel on a very short, slender, bracteate branchlet, peduncle filiformous, up to 1 cm long. Umbel bracts 2 mm, concave; anthers oval, large, introrse on slightly shorter filaments, basal glands small.

The species is close to *L. exsudens* and *L. carrii*, differs from the former by its glabrousness and from both by the obovate leaves with prominulous midrib on the upper leaf surface.

The collections: *Carr 15290* (BO, SING) and *15296* (SING) from Mt. Ganeve, alt. 2700 m might be this too, the leaves are exactly like those of *L. psilophylla*, but have an impressed midrib on the upper surface. Fruiting material is necessary to make sure whether this is not a different species, the tree is up to 23 m tall.

TERRITORY OF NEW GUINEA, E. Highlands Div., Goroka subdistr., Asaro-Mairifutica divide, alt. 2700 m, 1 mile S. Daulo camp, ridge forest, tree 14 m, perianth pale green, anthers brown, leaves aromatic, Sept., fl., *Pullen 477* (L); *ibid.*, ca 0,5 mile N.W. Daulo, ridge forest at 2910 m, tree 10 m, diam. 12 cm, Aug., buds, *Saunders 833* (L).

### 37. *Litsea pumila* Kosterm., *nom. nov.* — Fig. 42

*Tetradenia uniflora* Kanehira & Hatusima (base) in Bot. Mag. Tokyo 57: 192, f. 9, 1943; cf. Kostermans, *Bibl. Laur.* 1371. 1964. — Typus: *Kanehira & Hatusima 14067* (BO, FU).

Emendated description: Tree or shrub, 2 — 8 m tall, bole up to 5 m and 10 cm diam.; branchlets rather slender, stiff, straight, often patent, near the apex densely, minutely, adpressed, brown pilose. Leaves spirally arranged, thinly but stiffly coriaceous, glabrous, elliptic to subovate or subobovate-elliptic,  $1.5 \times 4$  —  $4 \times 9$  cm, both surfaces laxly, prominu-

lously reticulate, apex shortly, obtusely acuminate, base acute, above midrib flat or slightly impressed, lower surface soon glabrous with prominent midrib, the 3 — 5 filiformous pairs of lateral nerves erect-patent, arcuate, prominulous. Petiole 5 — 10 mm, slender, soon glabrous.

Umbels pale yellow, minutely, sparsely adpressed pilose, small, on up to 2 — 3 mm long thin peduncles and these on slender, up to 1 cm long, bracteate, short branchlets in the axils of leaves or of fallen leaves. Fruit ellipsoid, dark green (immature), 6 × 10 mm; cupule shallow, broadly funnel-shaped, 4 mm diam., up to 2.5 mm high, narrowed into a very short petiolar part, sessile, umbel peduncle thickish, 5 — 6 mm long.

In habit this tree or shrub resembles somewhat *Litsea umbellata* (Lour.) Merr.

W. IRIAN, Angi Gita lake, Arfak Mts., slope near outlet of lake, alt. 1900 m, shrub 2 m, fls. greenish yellow, Oct., fl., fr., *Kostermans 2041* (A, BO, L); Nettoti Range, S. slope of Mt. Nettoti, path Andjai-Wekari R., alt. 1750 m, shrub 2 m, Nov., fls. pale yellow, *Van Royen & Sleumer 7424* (BO, L); *ibid.* in Conifer-*Nothofagus* forest, tree 8 m, bole 5 m, diam. 10 cm, leaves light green underneath, Nov., fls. pale yellow, fr. (immature) dark green, *Van Royen & Sleumer 7886* (BO, L); *ibid.*, alt. 1650 m., in mossy forest, shrub 2-3 m, Nov., buds greenish yellow, *Van Royen & Sleumer 7905* (BO, L); Aifat R. valley, Tamrau Mts. East, path from Waumi R. camp to waterdivide, alt. 1900 m, in dense mossy forest, shrub 2 m, Nov., fl., *Van Royen & Sleumer 7188* (BO, L); Angi, Arfak Mts. in low dry spinneys on Kubre Mts., alt. 2300 m, tree 5 m, April, buds, *Kanehira & Hatusima 14067* (BO, FU); Ridge Doorman Summit, alt. 1420 m, tree 6 m, bark brown, Oct., buds, *Lam 1504* (BO, K, L).

### 38. *Litsea rigidifrons* Kosterm., *spec. nov.* — Fig. 53

Arbor ramulis angulatis crassis perdense minutissime ferrugineo sublanuginosis foliis alternantibus percrassis ellipticis subacutis basi acutis supra nitida laevia glabra nervo mediano lato subimpressa excepta costis et venis secundariis gracilibus impressis subtus dense minutissime ferrugineo sublanuginosa nervo mediano prominentibus costis erecto-patentibus prominentibus venis parallelis prominulis connectis rete laxo obscure petiolis bene evolutis.

TYPUS: *Brass & Versteegh 11964* (BO).

Tree 25 — 33 m high, up to 34 cm diam.; bark thick, soft, brown, smooth, 6 mm; wood white to brownish yellow, sapwood light yellow. Branchlets thick, angular, densely, minutely rusty sub-lanuginose; end bud with the same tomentum greyish or ferruginous. Leaves of the flush both surfaces with the same red rusty dense tomentum. Leaves spirally arranged, very stiffly thickly coriaceous, elliptic, 5.5 × 13 — 7 × 19 cm, gradually acutish, base rounded to cuneate; upper surface soon glabrous, except the slightly impressed, broad midrib, lateral nerves thin, impressed, secondary veins obscure or subimpressed; lower surface densely, minutely



brown or rusty sublanuginose, midrib prominent, lateral nerves ca 9 — 12 pairs, erect-patent, slightly arcuate, prominent, secondary nerves prominentulous, slender, parallel. Petiole 12 — 15 (— 30) mm long, thick, pilose, shallowly channeled above.

Although the specimens are all sterile, there is no difficulty to recognize this species.

W. IRIAN, 15 km S.W. of Bernhard Camp, Idenburg R., alt. 1770 m, rare tree, *Brass & Versteegh 11964* (A, BO, L); 9 km N.E. of Lake Habbema, rare in mossy forest at 2780 m alt., *Brass & Versteegh 10470* (L).

### 39. LITSEA RUBICUNDA Kosterm.

Cf. Kostermans in *Reinwardtia* 7: 351. 1968. — Typus: *S. 19262* (A, BO, K, KEP, MEL, SAN, SING).

Additional specimens: MALAY PENINSULA, Pahang, Lubok Tamang, 1200 m alt., June, fl., *Henderson F.M.S. Mus. Field No. 11018* (BO); Sumatra, Tapanuli, Angkola and Sipirok, village Mandurana, alt. 1500 m, ster., *bb. 5640* (BO, G, L). — BORNEO, Sabah, Mt. Kinabalu, Ulu Liwagu and Ulu Mesilau, alt. 1700 m, Sept., buds, *Chew, Corner & Stainton 2798* (BO, K, L); *ibid.*, alt. 1300 m, Aug., buds, *Chew, Corner & Stainton 2507* (BO, K, L); Dahobang R., Febr., fr., *J. & M.S. Clemens 31521* (BO); Dallas, alt. 100 m, Sept., fl., *J. & M.S. Clemens 26388* (BO); *ibid.*, E. Ravine, alt. 800 m, Dec., buds, *J. & M.S. Clemens 27464* (BO); *ibid.*, Sept., buds, *Clemens 30240* (BO); *ibid.*, Aug., fr., *J. & M.S. Clemens 26170* (BO); *ibid.*, Sept., buds, *J. & M.S. Clemens 26277* (BO); Sarawak, Bukit Mersing, Anap, alt. 700 m, Sept., buds, *S. 22105* (A, BO, K, KEP, MEL, L, SAN, SING); 6½ miles Bakam Rd., Miri, riparian forest with sandy soil, April, buds, *S. 25185* (A, BO, K, KEP, MEL, SAN SING). — PHILIPPINES, Luzon, Prov. Cagayan, Jan., fr., *Curran F.B. 17798* (BO); *ibid.*, Jan., fr., *Ramos B.Sc. 13812* (BO); Lucban, Mt. Banajao, Prov. Tayabas, Jan., fr., *Ramos B.Sc. 19515* (P).

### 40. LITSEA RUFO-FUSCA Kosterm.

Cf. Kostermans in *Reinwardtia* 7: 352. 1968, typus: *bb. 33044* (BO, L).

Additional specimens: BORNEO, Sarawak, Saribas, Tj. Keranji, disturbed Alan Bunga forest in peat swamp, Dec., fl., *Anderson S. 26695* (BO, K, L). — SUMATRA, Bangka Isl., Blinju, ster., *Teijsmann s.n.* (BO, L).

### 41. *Litsea sepikensis* Kosterm., *spec. nov.* — Fig. 54

Arbor ramulis angulatis glabris innovationibus dense minutissime (sub lente) argenteo sericeis foliis alternantibus coriaceis ellipticis obscure acutis basi breve acutis supra glabra nervo mediano lato plano costis gracilis impressis subtus pallidiora sub lente dense minutissime adpresse pilosa nervo mediano robusta prominente costis plurimis subarcuatis prominulis rete deest petiolis crassis sat longis.

TYPUS: *N.G.F. 28516* (BO).

Tree 15 m, diam. 12.5 cm; bark orange-brown, relatively smooth; lenticels scattered, small; blaze lightbrown; wood yellow-straw. Branchlets angular, thick, glabrous; end bud (under high power lens) minutely, grey sericeous. Leaves spirally arranged, elliptic,  $7 \times 16 - 9 \times 22$  cm, acutish, base contracted into the petiole, obtuse or acutish; upper surface glabrous, glossy, midrib broad, flush with the surface; lateral nerves thin, impressed (sometimes secondary nerves impressed); lower surface paler, dark, smooth, very minutely (high power lens), densely pale brown sericeous, midrib robust, prominent, lateral nerves ca 15 pairs, erect-patent, rather thin, prominulous; secondary nerves lax, hardly visible. Petiole robust, 1.5 — 2 cm long, flat above. The densely, minutely, rusty pilose warts from which the umbels start rather small, axillary of fallen leaves.

Although the type specimen has lost its flowers, it is so easily recognized by the leaves, that I have ventured to describe it.

TERRITORY OF NEW GUINEA, Hindenburg Range, S. of Nerenavip village, Sepik Distr., alt. 2900 m, lat.  $5^{\circ} 15' S$ , long.  $141^{\circ} 41' S$ , leaves copper sericeous on lower surface, green glaucous only in old leaves, flower buds lightgreen, young fr. green, local name: "Wotal" (A, BO, BRI, CANB, K, L), *N.G.F.* 28516 (BO, LAE).

#### 42. *Litsea spathulata* Kosterm., *spec. nov.* — Fig. 55

Arbor ramulis dense atro-ferrugineo pulverulente pilosis foliis alternantibus rigide chartaceis ellipticis apice sensim acutis vel subacuminatis basi cuneatis supra glabra laevia costis vix impressis subtus perdense minutissime sublanuginoso ferrugineo pilosa nervo mediano prominulo costis gracilis erecto-patentibus vel sat erectis arcuatis nerviis secundariis filiformis subparallelis subhorizontalis petiolis perlongis inflorescentiis axillaris dense minutissime ferrugineo pilosis pedunculis communis longis fructus ellipsoideus apiculatis cupulis parvis applanatis pedicellis crassis.

TYPUS: *Carr 14400* (BO).

Tree 17 — 33 m tall, branchlets near their apex densely, very minutely, dark rusty pilose; branches lenticellate. Leaves spirally arranged, stiffly chartaceous, elliptic to subobovate-elliptic,  $3 \times 8 - 4 \times 13 - 6 \times 15 - 7 \times 23$  cm, rather obscurely acuminate, base cuneate, upper surface smooth, glabrous (except for the rather persistent pilosity on the midrib), midrib hardly prominulous, lateral nerves slender, slightly impressed, secondary nerves very obscure, lower surface with a dense layer of very minute, rusty, sublanuginose tomentum, midrib prominent; lateral nerves erect-patent or rather erect, ca 8 pairs connected by parallel prominulous secondary nerves. Petiole slender, 2 — 4 cm long, glabrous, flat and slightly, narrowly channeled above, its base slightly thickened.

Inflorescences densely, minutely brown tomentellous, the branches 5 — 15 mm long, bearing the stalked (5 — 20 mm long) densely pilose umbels; umbel bracts concave, 3 mm long, the outer ones brown pilose with dark red hairs along the margins, the inner ones with longer dark

red hairs. Flower tube 1.5 — 2 mm, funnel-shaped, with relatively long, dark red hairs, tepals very small, triangular, hairy outside, anthers almost sessile, ovate, acute, introrse.

Fruit ellipsoid, up to 10 × 13 mm, apiculate; cup very shallow, thick, 5 mm diam., 2 mm high, pedicel 4 — 5 mm thick.

The specimen *Carr 14169* has much longer umbel peduncles than the other specimens, but otherwise there are no differences.

PAPUA, locality not indicated, fl., *Carr 14457* (BO, SING); Boridi, alt. 1700 m, buds brownish, fr. green, Oct., *Carr 14410* (BO, SING); *ibid.*, Oct., fr., *Carr 14577* (BO, SING); *ibid.*, Oct., fls. cream, *Carr 14554* (BO, L, SING); Alola, alt. 2000 m, Jan., fl., *Carr 14169* (BO, SING). — W. IRIAN, near outlet of Angigita lake, Arfak Mts, alt. 1900 m, Oct., fl., *Kostermans 2001* (A, BISH, BO, BM, BRI, CAL, K, L, P, PNH, SING); *ibid.*, ster., *Kostermans 2009* (A, BO, BRI, K, L, PNH, SING).

#### 43. *Litsea steenisii* Kosterm., *spec. nov.* — Fig. 56

Arbor parva ramulis sat crassis apicem versus minutissime griseo pulverulente adpresse pilosis foliis alternantibus coriaceis mox glabris sublanceolatis sensim acutis basi cuneatis supra laevia nervo mediano vix prominulo costis filiformis vix prominulis subtus opaca nervo mediano prominulo costis filiformis vix prominulis venis secundariis laxis sat obscuris pedicellis brevis inflorescentiis axillaris pedunculis communis bene evolutis mono-umbellatis vel apicem versus umbellulis pedunculatis vix pilosis fructus subglobosis parvis apiculatis cupulis vix evolutis planis.

Typus: *Van Steenis 9568* (BO).

Small tree (?), branchlets glabrous, rather thick, towards their apex minutely grey adpressed pilose. Leaves spirally arranged, dense, coriaceous, soon glabrous, sublanceolate, 1 × 2 — 2 × 4.5 cm, gradually subacuminate with sharp tip, base cuneate, upper surface glossy, smooth, midrib and the filiformous lateral nerves hardly prominent, lower surface dull, paler, midrib prominulous, lateral nerves filiformous, up to 14 pairs, rather patent, arcuate. Petiole slender, 3 — 5 mm long.

Inflorescences axillary, consisting of one to several stalked umbels on a ca 1 cm long slender main peduncle, umbel stalks minutely densely pilose.

Fruit subglobose, up to 6 mm diam., apiculate; cup hardly developed, flat, 1 — 1.5 mm diam., pedicel ca 3 mm long.

The species is related to *L. cubeba* and *L. pipericarpa*; it has the numerous lateral nerves of *L. pipericarpa*, but has glabrous and coriaceous, small leaves. According to the a note on the label it seems to be common locally. It is an honour and a privilege to name this species after Dr. C.G.G.J. van Steenis, editor and authority of the Flora of Malesia.

N. SUMATRA, Atjeh, Gajolands, Mt. Kemiri, bivouac 1 to 2, alt. 2900 m, in burnt ridge scrub, very prosperous, March, fl., fr., *Van Steenis 9568* (BO, K, L).

44. *Litsea subauriculata* Kosterm., *spec. nov.* — Fig. 57

Arbor ramulis crassis pulverulente minutissime pilosis foliis alternantibus chartaceis glabris ellipticis magnis obscure late acuminatis basin versus attenuatis subauriculatis utrinque minutissime subobscure areolatis supra nitida nervo mediano lato impressa costis filiformis subtus opaca nervo mediano magno prominente costis erecto-patentibus prominentibus venis secundariis parallelis connectis petiolis brevis sulcatis inflorescentiis ramifloris dense minutissime brunneo pilosis fructus ellipsoideus apiculatis cupulis semi-hemisphericus late infundibuliformis pilosis sessilis.

TYPUS: *Kostermans & Soegeng Reksodihardjo 910* (BO).

Tree 15 m tall, diam. 25 cm, bark smooth, light brown, 0.5 mm thick; living bark 6 mm, light brown, odourless; wood dirty white. Branchlets thick, densely minutely, pulverulently pilose. Leaves spirally arranged, congested at the end of the branchlets, thinly chartaceous, glabrous,  $11 \times 37$  —  $15 \times 45$  cm, gradually acute, narrowed towards the subauriculate base, upper surface glossy, the broad midrib impressed, lateral nerves slender, flush with the surface, secondary nerves pale, faint; lower surface dull, paler, the massive midrib prominent, lateral nerves ca 16 pairs, erect-patent, prominent, connected by often almost perpendicular slender, parallel, prominulous secondary nerves, both surfaces with a very fine dense areolation. Petiole stout, 5 — 10 mm long, sulcate above, minutely pulverulently pilose. Flowers on the bare branches (which have large leaf scars), the inflorescence densely, minutely, lightbrown pilose; main branch short (up to 5 mm), peduncle 5 — 10 mm; budscales densely, minutely pilose. Fruit broadly ellipsoid, up to  $8 \times 10$  mm, apiculate; cup hemispherical to broadly funnelshaped, thin, densely, minutely pilose, up to 9 mm diam. and 6 mm high, furrowed (in sicco).

The species resembles in leaf shape *L. barringtonioides* from Borneo, but the fruit cup is entirely different.

W. IRIAN, Biak Island near Parieri, secondary forest, savannah, low alt., Sept., buds, fr., *Kostermans & Soegeng Reksodihardjo 910* (A, BO, G, K, LAE, US).

45. *Litsea subovata* (Miq.) Kosterm., *comb. nov.*

*Tetranthera subovata* Miquel (basionym), Fl. Ind. bat., Suppl. Sumatra 146. 1860 et 362. 1861; cf. Kostermans, Bibl. Laur. 1427. 1964. — Typus: ster., *Teijsmann s.n.*, Palembang, Baturadja (BO, L).

Boerlage referred all Indonesian *Tetranthera* to *Litsea*, but missed or left out on purpose *Tetranthera subovata* Miq., of which an iso-type

specimen is represented in the Bogor Herbarium as 3894 H.B. "Medang Kladi".

Another specimen: *Pl. Junghuhn. ineditae Javae no. 155*, identified by Koorders as *Litsea robusta* Bl., belongs here. I doubt, however, whether this latter specimen is from Java, although labeled as such.

Additional specimen: JAVA (?), fl., *Pl. Jungh. ined. no. 155* (BO, 2 sheets, L).

46. *Litsea sulavesiana* Kosterm., *spec. nov.* — Fig. 58

Arbor ramulis crassis angulatis glabris foliis magnis coriaceis oppositis late ellipticis obtusis basi in petiolum crassum breven contractus supra laevia glabra nervo mediano lato vix prominulo costis filiformis vix prominulis subtus perdense minutissime flavo sericeis nervo mediano prominentibus costis erecto-patentibus marginem versus arcuatis prominentibus nerviis secundariis obscuris laxis subparallelis inflorescentiis axillaris dense minutissime flavo subsericeis pedunculis immaturis crassiusculis brevis ramulis nanis brevis impositis.

TYPUS: *Kjellberg 2475* (BO).

Tree; branchlets thick, towards the apex angular, glabrous. Leaves opposite at the widened nodes, coriaceous, broadly elliptic, 21 × 35 cm, obtuse, base contracted into the thick, 2 cm long, densely, pulverulently pilose petiole; upper surface with faint secondary nerves, midrib wide, almost flush with the surface, lateral nerves filiformous, hardly prominent in a groove; lower surface very densely, minutely dirty pale yellowish sericeous, midrib robust, prominent, lateral nerves 15 pairs, erect-patent, prominent, arcuate towards the margin; secondary nerves faint, lax, parallel.

Inflorescences axillary, densely, minutely dirty yellowish sub-sericeous; the umbels (immature) with fleshy, up to 5 mm long bracts, the fleshy peduncle up to 8 mm long (immature) and these either sessile or on thick, up to 1 cm long branchlets.

The species is easily recognizable by its enormous opposite leaves with the pale yellowish sericeous tomentum.

SULAWESI (Celebes), Preho, alt. 500 m, Oct., buds white, *Kjellberg 2475* (BO), from a fallen branch, 3 florets in every umbel.

47. *Litsea talaumifolia* Kosterm., *spec. nov.* — Fig. 59

Arbor magna ramulis cum foliis juvenilis tomentum minutissimum ferrugineum sublanuginosum obtectis foliis alternantibus sub-coriaceis oblanceolatis obtusis basi breve cuneatis utrinque sublaevis vel subtus reticulatis nervo mediano supra impresso subtus prominentis costis sub-erectis petiolis perlongis gracilis glabrescentibus supra canaliculatis inflorescentiis ramifloris pedunculis umbellularum longis gracilis.

TYPUS: *bb. 7186* (BO).

Tree, up to 40 m tall and 50 cm diam., buttresses up to 1.50 m. Branchlets rather thick, towards their apex densely, minutely, rusty sublanuginose, like the very young leaves of the flush. Leaves spirally arranged, subcoriaceous or stiffly chartaceous, oblanceolate,  $3.5 \times 11 - 9.5 \times 21$  cm, obtuse, base shortly cuneate, ultimately rounded, both surfaces smooth or the lower one with slender, parallel secondary, prominulous nerves and a rather obscure reticulation, upper surface with an impressed midrib with a rather long persistent indumentum, lateral nerves faint, smooth, hardly prominent or prominent in a groove; lower surface more dull, midrib prominent, the 5—8 rather erect, rather straight lateral nerves prominulous. Petiole 2—4.5 cm long, slender, glabrescent, narrowly channeled above.

Inflorescences ramiflorous on yellowish (in sicco) thick branches, the umbels at anthesis 5—6 mm in diam., bracts glabrous, peduncles slightly, minutely, sublanuginose tomentellous, slender, up to 15 mm long and a few of these on very short (2 mm), thick, bracteate, densely, minutely rusty sublanuginose short branchlets. Florets densely red-rusty or aureous glossy subadpressed tomentellous, the tube short, the tepals slender, long. Anthers oval or rectangular, obtuse, of the outer stamens the cells introrse and the filaments slender, glabrous, longer than the anthers, of the inner stamens the cells lateral, the small glands adnate to the filaments, attached slightly below the anthers.

The species is characterized by the ramiflorous long peduncled umbels, the densely tomentose florets, the "high" position of the basal glands and the peculiar leaf shape, which reminds that of *Talauma candollei* (Magnoliaceae).

SUMATRA, E. coast of Sumatra, Asahan, village Simpang Toba, alt. 30 m, sandy soil, Aug., fls. yellow, *bb.* 7186 (BO, G, K, L); *ibid.*, Masihi For. Res., alt. 40 m, ster., *bb.* 6343 (BO); *ibid.*, Labuanbatu, village Guntingsago, alt. 50 m, sandy soil, ster., *bb.* 7728 (BO); W. coast Sumatra, Lubuksikaping, village Tandjongbungo, alt. 370 m, ster., *bb.* 6515 (BO, L).

48. *Litsea timonioides* Kosterm., *spec. nov.* — Fig. 60

Arbor ramulis crassis glabris foliis alternantibus apice ramulorum congestis coriaceis glabris obovato-ellipticis brevissime acuminatis basi in petiolum magnum breven contractus supra laevia subnitida nervo mediano lato vix prominulo costis gracillimis in sulcis prominulis subtus opacis prominule reticulatis nervo mediano magno prominulo costis erectopatentibus arcuatus prominulis inflorescentiis axillaris dense minutissime flavo pilosis pedunculis brevis.

TYPUS: *Hoogland 4478* (BO).

Tree 20 m tall, 8 m bole, 40 cm diam., flanged; bark ca 15 mm thick, flaky with small flakes, pale-brown and purplebrown mottled; inner bark straw, turning pinkish; wood straw, turning pinkish. Branchlets thick,

glabrous, smooth, with a few tiny lenticells; end bud small, densely, minutely palebrown adpressed pilose. Leaves spirally arranged, glabrous, obovate-elliptic,  $6.5 \times 15 - 9 \times 27$  cm, rounded and very shortly acuminate base contracted into the large, 1.5 — 2 cm long petiole which is flattened and slightly sulcate above; upper surface rather glossy, smooth, the broad midrib somewhat prominulous, the slender lateral nerves prominulous in a grove; lower surface dull, prominulously reticulate, midrib prominulous, lateral nerves ca 8 — 10 pairs, erect-patent, arcuate, prominulous.

Inflorescences axillary, densely, minutely yellow-brown pilose; umbel stalks short; branches up to 6 mm long, densely pilose, immature buds 4 mm diam.

A specimen, *Schodde & Craven 3777* (A, BO, BRI, K, L, LAE, PNH, US), Bougainville, montane forest, alt. 900 m on the lower slopes of Lake Loloru crater, ca 17 miles N. of Buin, might belong here. The nerves on the leaves are covered with a white substance, there are slightly more lateral nerves. The fruitcup is small, 8 mm diam., 2.5 mm high on a slightly obconical, 5 mm long pedicel, the umbel stalk 10 mm; fruit subglobose, ellipsoid,  $17 \times 20$  mm. In both collections the midrib dries dark red; it is sunk in the type specimen.

The leaves resemble a common species of a New Guinea *Timonius*.

TERRITORY OF NEW GUINEA, Northern Distr., Lake Ridubidubina, Tufi Subdistr., alt. ca 650 m, open tall forest on slope, leaves yellowish underneath, Aug., fls. greenish yellow, *Hoogland 4478* (BO), "Kaina'en" (Onjob language, Koreaf).

#### 49. *Litsea trichophylla* Kosterm., *spec. nov.* — Fig. 61

Arbor ramulis crassis dense minutissime atro-rubro pilosis foliis magnis alternantibus rigide chartaceis obovato-ellipticis rotundatis et apiculatis basin versus attenuatis rotundatis vel acutiusculis supra glabra nerviis principalis exceptis nervo mediano lato vix prominulis costis filiformibus subtus minutissime atro-ferrugineo pilosis nervo mediano valde prominentibus costis sat patentibus rete creberrimis prominulis petiolis brevis magnis pilosis inflorescentiis axillaris umbellulis dense minutissime ferrugineo-pilosis subsessilibus cupulis fructiferis tenuis sessilibus pilosis semi-hemisphaericis pedunculis communis bene evolutis.

TYPUS: *N.G.F. 33023* (BO).

Tree 12 — 23 m tall and 10 — 30 cm diam., the massive branches straight, spreading upward; bark smooth, lightbrown, 0.5 mm; living bark orange-brown, 6 mm, odourless; wood pale yellow or pinkish straw without odour. Branches stout, furrowed, densely, minutely, sublanuginose dark rusty pilose. Leaves spirally arranged, crowded near the end of the branchlets, thickly chartaceous, obovate-elliptic,  $13 \times 28 - 17 \times 38$  cm, apex rounded and apiculate, base rounded or acutish, tapered; upper surface

glabrous, except on the main nerves, the broad midrib almost flush with the surface, the slender lateral nerves slightly prominent, secondary nerves as a rule slightly impressed; lower surface densely, prominently reticulate, minutely, dark rusty, sublanuginose tomentellous, the massive midrib prominent, the ca 15 pairs of lateral nerves rather patent, prominent, slightly arcuate, the secondary nerves more or less parallel and almost erect. Petiole stout, densely pilose, 10 — 15 mm long, flat above.

Inflorescences axillary, densely, minutely rusty pilose, consisting of 3 — 8 shortly peduncled umbels (immature) on very short, very thick, densely pilose burr-like branches. Fruit cup thin, pilose subhemispherical, 8 mm diam., 5 mm high, sessile, the main peduncle stout, pilose, 10 mm long.

Fruit cup and inflorescence are like those of *L. subauriculata* and *L. collina*; leaf shape and indumentum are characteristic. I assume that both *L. subauriculata* and this species have the same habit of tree.

AUSTRALIAN NEW GUINEA, W. Div., Inggambit, 141° 0' E, 5° 38' 33" S, sandy loam soil, alt. 125-160 m, May, buds, *Soengeng Reksodihardjo 297* (A, BO, CANB, G, K, L, LAE, P, US); *ibid.*, dense regrowth on ridge, buds, *N.G.F. 33023* (A, BO, BRI, K, L, SING); Kassar Pass, Kainantu Subdistr., East Highland Div., alt. 1400 m, ster., *N.G.F. 32680* (A, BO, BRI, CANB, K, SING). — W. IRIAN, Mamberamo R. region, alt. 30 m, ster., *bb. 31117* (BO, L).

#### 50. LITSEA TRUNCIFLORA Gamble

Cf. Kostermans, *Bibl. Laur.* 883. 1964. — Typus: *King's Coll. 4582* (K), *8211* (BO, K), *s.c. 448*.

Additional specimens: BORNEO, Brunei, Bangar, Temburong, semi swampy, white sand, alt. 10 m, tree 5 m, smooth grey bark, Sept., red fr. borne on the stem, *Brun. 478* (BO); E. Kalimantan. W. Kutei, near Mt. Kemul, alt. 1000 m, tree 15 m, diam. 20 cm, Sept., fr. green on the bare branches, *Endert 4199* (BO, K, L).

The Bornean material has a broader leaf base than the type material; the mature fruit cup is very deep, thin, hemispheric and covers most of the subglobose fruit, the latter sits rather loose in the cup.

#### 51. LITSEA UMBELLATA (Lour.) Merr.

Cf. Kostermans, *Bibl. Laur.* 889. 1964; *Hexanthus umbellatus* Lour., cf. Kostermans, *l.c.* 539. — Typus: *Loureiro s.n.* (BM).

Synonyms: *Litsea hexantha* Juss., cf. Kostermans, *l.c.* 830; *Litsea amara* Blume, cf. Kostermans, *l.c.* 787; *Tetranthera amara* (Bl.) Nees, cf. Kostermans, *l.c.* 1375; *Tetranthera acuminatissima* Bl., cf. Kostermans, *l.c.* 1375. — Typus: *Herb. Waitz, Sumatra, fl.* (L, 2 sheets); *Tetranthera amara* var. *acuminatissima* (Bl.)



Miq., cf. Kostermans, l.c. 1375; *Tetranthera capitulata* Miq., cf. Kostermans, l.c. 1383. — Typus: Pengalengan, Java, *Junghuhn s.n.* (L) and *Teijsmann s.n.*, Sumatra (L); *Tetranthera faginea* Miq., cf. Kostermans, l.c. 1391. — Typus: Angkola, *Junghuhn s.n.* (L, *Junghuhn 306* as var. *ochracea* Bl.); *Tetranthera fructicosa* (Reinw. ex Nees) Nees, cf. Kostermans, l.c. 1393; *Laurus fructicosa* Reinw. ex Nees, cf. Kostermans, l.c. 627. — Typus: *Reinwardt s.n.*, Java, buds (L, LEN); *Litsea utilis* (Meissn.) Boerl., cf. Kostermans, l.c. 890 (sphalm.: p. 895), *Tetranthera utilis* Meissn., cf. Kostermans, l.c. 1429. — Typus: *Motley 837*, fl., Bandjarmasin (K, NY); *Tetranthera xanthophylla* Bl., cf. Kostermans, l.c. 1431. — Typus: Herb *Waltz*, Sumatra, fl. (L, 5 sheets).

Two new synonyms are enumerated above: *Litsea* (*Tetranthera*) *utilis* (Meissn.) Boerl. and *Tetranthera xanthophylla* Bl.

*Tetranthera areolata* Bl. (cf. Kostermans, l.c. 1379) and *Litsea areolata* (Bl.) Boerl. (cf. Kostermans, l.c. 790), enumerated by Koorders & Valetton under *Litsea amara*, might represent a species of *Cryptocarya*.

## 52. LITSEA VERTICILLATA Hance

Cf. Kostermans, *Bibl. Laur.* 892. 1964. — Typus: *Henry* in *Herb. Hance 22051*, Yün-ha-tin, 10 m. p.a. Canton, Sept.-Nov. 1881 (Breslau).

Synonyms: *Litsea multiumbellata* Lecomte, cf. Kostermans, l.c. 851. — Typus: *Pierre 643* (BO, P, UC); *Litsea brevipetiolata* Lec., cf. Kostermans, l.c. 794. — Typus: *Bois 230* (BO, P); *Litsea verticillata* Lec. var. *brevipetiolata* (Lec.) Allen, cf. Kostermans, l.c. 893; var. *annamensis* (Liou Ho) Allen, cf. Kostermans, l.c. — Typus: *Poilane 7547* (P); *Litsea multiumbellata* forma *annamensis* Liou Ho, cf. Kostermans, l.c. 851. — Typus: *Poilane 7547* (P).

The species varies considerably in the size of its leaves and in the length of its petioles. Long and short petioles may be found on the same specimen. This holds also true for the length of the umbel peduncles, which vary between 2—20 mm.

## 53. *Litsea zuccarinii* Kosterm., *nom. nov.*

*Daphnidium lancifolium* Siebold & Zuccarini (base), *Fl. Jap. Fam. nat.* 2: 83. (1846). 1847 (in *Abh. Akad. Wiss. München Math. Wiss. Cl.* 4(3): 207 (1846). 1847) (non *Daphnidium lancifolium* Thwaites, 1881, cf. Kostermans, *Bibl. Laur.* 462. 1964, quoad *Neolitsea lancifolia* Kosterm.), cf. Kostermans, l.c. 461 (no. 12a). — Typus: *Von Siebold s.n.*, anno 1843 (L, LEN).

Synonyms: *Iozoste lancifolia* (S. & Z.) Bl., cf. Kostermans, l.c. 548; *Actinodaphne lancifolia* (S. & Z.) Meissn., cf. Kostermans, l.c. 28; *Litsea lancifolia* (S. & Z.) Auct. (non Villar) Hemsley, cf. Kostermans, l.c. 837 (no. 226 b).

The type specimen of *Daphnidium lancifolium* S. & Z., a Japanese plant, belongs in *Litsea*, it has sessile umbels with the normal, persistent bracts; the leaves are spirally arranged.

It is not possible to transfer the specific epithet to *Litsea* because of *Litsea lancifolia* (Roxb. ex Wall. ex Nees) Villar (1880), based on *Tetranthera lancifolia* Roxb. ex Wall. ex Nees (1831), an entirely different plant.

## PERSEA Miller

### 1. PERSEA BONII (Lec.) Kosterm.

Cf. Kostermans, Bibl. Laur. 1206. 1964; *Machilus bonii* Lec., cf. Kostermans, l.c. 902. — Typus: *Bon 4254, 3343, 2306* (P), Tonkin, forest of Van-la.

New synonym: *Persea dunicola* (W.W. Sm.) Airy Shaw, cf. Kostermans, l.c. 1217; *Alseodaphne dunicola* W.W. Smith, cf. Kostermans, l.c. 66. — Typus: *Forrest 18071* (E).

Additional specimens: TONKIN, Prov. of Sontany, Da Chong, along rivulet, shrub, Nov., fl., *Pételot 2568* (A, BO); Tu Phap area, tree 5-6 m, Nov., fl., *Balansa 2423* (BO, L, P).

### 2. *Persea malayana* Kosterm., *spec. nov.* — Fig. 62

Arbor ramulis sat gracilis pallidis glabris nitidis innovationibus minutissime adpresse griseo pilosis foliis alternantibus aggregatis rigide coriaceis glabris oblongis acuminatis basi breve acutis vel subrotundatis utrinque laevis vel subtus minutissime subareolatis, supra nitida nervo mediano impressa subtus costis deest subtus subglauca nervo mediano prominentibus costis pergracilis petiolis longis gracilis canaliculatis paniculis axillaris foliis brevioribus pedunculis longis subglabris floribus dense subadpresse pilosis.

TYPUS: *S.F.N. 31042* (BO).

Tree, branchlets rather slender, stiff, pale, glossy, sulcate and lenticellate, bare. Leaves spirally arranged, aggregate at the end of the branchlets, coriaceous, glabrous, oblong,  $3.5 \times 11$ — $5.5 \times 17$  cm, acuminate (acumen 10—15 mm long), base shortly acute or subobtuse, both sides smooth or the lower surface minutely, rather obscurely subareolate, upper surface glossy, midrib impressed, lateral nerves hardly visible, lower surface dull, subglaucous, midrib prominent, lateral nerves ca. 10 pairs, erect-patent, filiformous, somewhat arcuate, prominulous. Petiole slender, 1—3 cm long, canaliculate, above. End bud minutely, densely, adpressed grey brown pilose.

Panicles axillary, 4—9 cm (immature), peduncle 3—6 cm long, almost glabrous, branches few, short, puberulous. Flowers densely subadpressed pale brown pilose. Tepals (immature) equal, ovate, acute, ca. 1.5 mm long.

The flowers are too immature for description. The leaves resemble somewhat those of *Persea duthiei*.

MALAY PENINSULA, Trengganu, Gunong Padang, June, buds, *L. Mosey* S.F.N. 31042 (BO, SING).

3. *Persea sumatrana* Kosterm., *spec. nov.* — Fig. 63

Arbor ramulis sulcatis lenticellatis apicem versus dense minutissime subadpresso tomentellis foliis alternantibus apicem ramulorum subaggregatis coriaceis obovato-ellipticis acuminatis basin versus sensim attenuatis supra laevia nitida nervo mediano costisque impressis subtus foliis junioribus dense minute tomentellis maturitate glaucescentia sparse minutissime gracillime pilosa nervo mediano costisque sat erectis prominentibus venis secundariis prominentibus parallelis connectis rete sat obscuris petioli longis supra concava paniculis basin innovatione ortis foliis longioribus vel subaequantibus dense minutissime flavo-brunneo tomentellis multifloris tepalis lanceolatis tubus brevis staminibus glabris fructus globosus tepalibus reflexis persistentibus.

TYPUS: *Schnepper 12* (BO).

Tree, up to 28 m tall and 40 cm diam., branchlets rather thick, densely, minutely yellow-brown, subadpressed tomentellous, sulcate with sharp ridges, with elongate pale lenticels. Leaves spirally arranged, rather crowded at the apex of the branchlets, coriaceous, obovate-elliptic, 4 × 10 — 7 × 12 cm, shortly acuminate, base gradually cuneate; upper surface smooth, glossy, the midrib and the slender lateral nerves slightly impressed; lower surface in young leaves densely brown sublanuginose-tomentellous, mature ones rather laxly, minutely, finely, yellow-brown pubescent, midrib strongly prominent, lateral nerves 8 — 11 pairs, prominent, rather erect, rather straight (curved at the margin), secondary nerves prominent, subparallel, veins rather obscure. Petiole 1.5 — 2.5 cm long, glabrescent, slightly channeled above. Flush very densely yellow or rusty brown pilose.

Panicles axillary, immediately below the flush, aggregate, rather stiff, densely, minutely yellowish brown tomentellous, 10 — 15 cm long, peduncle up to 9 cm long. Flowers densely yellowish brown subsericeous, 5 mm long, tube very short, tepals almost equal, sublanceolate, acutish, up to 4.5 mm long, rather thick, inside pilose. Outer stamens 3 mm long with oval anthers with large, introrse cells, filaments slender, 2 mm, glabrous; inner stamens slightly shorter with small, stipitate basal glands; staminodes sagittate, sessile; ovary glabrous, style long, stigma peltate. Fruit globose, 1.5 cm diam., finely apiculate, the strongly reflexed, enlarged, 7 mm long tepals persistent; pedicel cylindrical, pilose, ca 5 mm long.

There is a *Persea sumatrana* Teijsm. & Binnend., published as a nomen nudum (cf. Kostermans, *Bibl. Laur.* 1259. 1964), which belongs to Sapotaceae.

Apart from *Persea velutina* and *P. bonii* of the Asiatic mainland this is the only Asiatic *Persea* with a dense tomentum on the lower leaf surface.

SUMATRA: Atjeh, Takengon, village Lampahan, alt. 900 m, ster., *bb.* 11462 (BO, L); Sibolangit, Galungi, E. Sabuatan in virgin forest (tree no. 829), alt. 1350 m, Febr., fls. and young fr., *Schnepper 12* (BO); Atjeh, Gajo Lands, lake Laut Tiga Sagi, Mt. Korintji, alt. 1400 m, March, fr., *Van Steenis 10038* (BO); Gajo Lueus, village Penosan, alt. 1900 m, Febr., fl., *bb.* 22378 (BO, K, L, SING); W. Coast Sumatra, Painan, Barung-barung & Balantai, ster., *bb.* 6132 (BO); W. Coast, Korintji, Siulak Deras, alt. 1600 m, ster., *bb.* 5938 (BO); E. Coast Sumatra, Karolands, village Tongkoh, alt. 1535 m, ster., *bb.* 7201 (BO); *ibid.*, June, fl., *bb.* 6864 (BO); Benkulu (Bencoolen), G. Aning, Lebong Subdistr., near Rimba Pengadang, alt. 1000 m, ster., *bb.* 2798 (BO).

#### 4. PERSEA VELUTINA (Champ. ex Benth.) Kosterm.

Cf. Kostermans, *Bibl. Laur.* 1262. 1964; *Machilus velutina* Champion ex Benth., cf. Kostermans, l.c. 890. — Typus: *Champion 181* (K).

New synonyms: *Actinodaphne magniflora* Allen, cf. Kostermans, l.c. 31. — Typus: *Tsang 23203* (A), syn-typus: *Honkong 659* (A); *Machilus grijsii* Hance, cf. Kostermans, l.c. 908. — Typus: *Grijs 6788* (Herb. Hance, Breslau); *Persea grijsii* (Hance) Kosterm., cf. Kostermans, l.c. 1228.

A very common shrub or tree, flowering already when it is one meter high. All intermediate forms between narrow, oblanceolate, long-acuminate leaves and more elliptic ones with shorter acumen are found.

*Machilus velutina* forma *rosea* Liou Ho, cf. Kostermans, l.c. 930. — Typus: *Poilane 11154* (BO, P), does not belong here; it represents another species.

### PHOEBE Nees

#### 1. Phoebe birmanica Kosterm., *spec. nov.* — Fig. 64

Arbor in omnibus partibus glabris foliis alternantibus rigide chartaceis ellipticis obscure breve late acuminatis vel obtusis basi in petiolum longum gracilium abrupte contractis supra nitida obscure dense minutissime reticulata nervo mediano plano costis filiformibus prominulis subtus pallidiora opaca laevia vel perobscure minutissime areolato-reticulata nervo mediano prominulo costis filiformis prominulis infructescentiis axillaris foliis longioribus pedunculis longis gracilis ramulis paucis tepalibus induratis fructus immaturus adpressis.

TYPUS: *Unknown collector 3661* (BO).

Tree, glabrous in all its parts, except a few adpressed, microscopical hairs at the tip of the leaf bud. Branchlets rather slender, sulcate, smooth. Leaves spirally arranged, stiffly chartaceous, elliptical, (3.5 × 5) 4.5 × 9

—  $6 \times 12$  cm, obtuse or obscurely, broadly, shortly acuminate, base contracted into the petiole, obtuse or shortly cuneate; upper surface glossy, very minutely rather obscurely, densely reticulate, midrib flush with the surface, lateral nerves filiformous, prominulous, lower surface pale, dull, almost smooth, midrib prominulous, lateral nerves 5—8 pairs, erect-patent, filiformous, prominulous. Petiole slender, 1.5—2 cm long.

Fruiting panicles axillary, 9—15 cm long, peduncle long, slender, branches few, slender. Fruit immature, clasped at the base by the indurate, glabrous tepals.

The species is easily recognized by the very smooth lower leaf surface and the very thin lateral nerves.

BURMA: Sankangyi Res., Mandalay Distr., alt. 1000 m, Dec., fr., unknown (undecipherable) collector 3661 (BO, DD), stem whitish grey.

## 2. *Phoebe dehaasiaefolia* Kosterm., *spec. nov.* — Fig. 65

Arbor ramulis crassis sulcatis griseis nitidis apicem dense minutissime pilosis foliis alternantibus apicem ramulorum congestis rigide chartaceis vel subcoriaceis obovatis obtusis vel brevissime late subacuminatis basin versus sensim attenuatis utrinque perdense minutissime areolato reticulata supra glabra nitida nervo mediano impressa costis filiformis subimpressis subtus pallidiora sub lente minutissime adpresse pilosa glabrescentia nervo mediano prominentibus costis gracilis erecto-patentibus prominulis nerviis secundariis obscuris parallelis connectis petiolis gracilis supra subconcavis paniculis axillaris foliis subaequilongis vel longioribus pedunculis longis glabris ramulis paucis erecto-patentibus floribus dense minutissime griseo adpresse pilosis distincte pedicellatis tepalibus inaequalibus ovatis acutis.

TYPUS: *Kerr 15008* (BO).

Tree, 20 m tall; branchlets thick, sulcate, grey, glossy, near the apex densely, minutely, light brown pilose. Leaves spirally arranged, aggregate near the apex of the branches, subcoriaceous or stiffly chartaceous, obovate,  $4 \times 6$ — $9.5 \times 19$  cm, obtuse or shortly, broadly acuminate, base gradually tapered, both surfaces densely, minutely, subareolate-reticulate; upper surface glossy, glabrous, midrib impressed, lateral nerves filiformous, subimpressed, lower surface paler, dull, under the lens minutely adpressed pilose, glabrescent, midrib prominent, lateral nerves 8—10 pairs, erect-patent, slender, prominulous, connected by rather obscure, very slender, parallel secondary veins. Petiole slender, 1—2 cm long, concave above.

Panicles axillary, 6—23 cm long, with a long, 5—15 cm long, almost glabrous peduncle, the few branches erect-patent, the lower ones up to 3 cm long. Flowers densely, minutely, grey-tomentellous or adpressed pilose, pedicel slender, 3—5 mm long; tepals ovate, acute, outer ones 3 mm, inner ones 4 mm long, stamens 3 mm long, anthers 1 mm, filaments pilose, outer anthers with introrse cells, inner ones with extrorse cells

and shortly stipitate, adnate basal glands, staminodes shortly hastate on a rather broad, pilose,  $\frac{3}{4}$  mm long filament; ovary ovoid, style short, stigma small. Fruit ellipsoid,  $4 \times 8$  mm, apiculate, the indurate, erect perianth 5 mm long.

In sterile condition this could be easily mistaken for a species of *Dehaasia*.

SIAM. Kao Bangto, Pung-na, alt. 900 m, Febr., fr., *Kerr 17180* (BKF); Kao Kalukivi, Pattani, alt. 500 m, April, fl., *Kerr 15008* (BO); *ibid.*, alt. 700 m, April, fl., *Kerr 14993* (BKF); Kau Tong, Chumpawn, alt. 600 m, Jan., fl., *Kerr 11528* (BKF).

### 3. PHOEBE ELLIPTICA Blume

Cf. Kostermans, *Bibl. Laur.* 1276. 1964; *Phoebe (Lasiodaphne) elliptica* Blume. — Typus: *Blume s.n.*, Java, Mt. Salak, May, fl., "Kitallies songong" (Sundanese) (L, 4 sheets).

Synonyms: *Phoebe macrophylla* (Bl.) Bl., cf. Kostermans, l.c. 1287; *Persea macrophylla* (Bl.) Bl. (non Sprengel), cf. Kostermans, l.c. 1239 (except. var. *cuneata*). — Typus: *Blume s.n.*, Java (L, 3 sheets); *Persea elliptica* Blume ex Boerlage, cf. Kostermans, l.c. 1218; *Phoebe macrophylla* var. *elliptica* Miq., cf. Kostermans, l.c. 1288.

*Phoebe macrophylla* (Bl.) Bl. was based on *Persea macrophylla* Blume (1826), which is antedated by *Persea macrophylla* (H.B.K.) Sprengel (1825), cf. Kostermans, l.c. 1239 (no. 177a) and consequently cannot be maintained. The next valid name for this species is *Phoebe elliptica* Blume (1851), published at the same time as *Ph. macrophylla* (Bl.) Bl.

*Persea elliptica* Blume ex Boerlage is apparently a mistake for *Phoebe elliptica*, although the name *Persea (Lasiodaphne) elliptica* appears on the type specimen of *Phoebe elliptica* in the Leiden Herbarium.

The name is rather inappropriate, as the leaves are always obovate, never elliptic.

### 4. PHOEBE FORBESII Gamble

Cf. Kostermans, *Bibl. Laur.* 1278. 1964. — Typus: *Forbes 215* (K), *693* (K), *805* et *A* (K).

New synonym: *Phoebe novoguineensis* Teschn., cf. Kostermans, l.c. 1292. — Typus: *Ledermann 9294* (L).

### 5. *Phoebe laevis* Kosterm., *spec. nov.* — Fig. 66

Arbor ramulis gracilis laevis glabris apice minutissime pulverulente pilosis foliis alternantibus aggregatis coriaceis obovatis vel obovato-

ellipticis breve acuminatis basi attenuatis supra nitida laevia nervo mediano impressa costis inconspicuis subtus pallidiora opaca sub lente minutissime pulverulente pilosa laevia nervo mediano prominentibus costis paucis prominulis petiolis longis canaliculatis glabris paniculis axillaris sub innovatione aggregatis dense minutissime pilosis plerumque foliis longioribus pedunculis longis tepalibus aequalibus subovatis acutis intus pilosis filamentis gracilibus longis sparse pilosis fructus subovoideus tepalibus incrassatis induratis persistentibus.

TYPUS: *Kostermans 9959* (BO).

Tree, up to 18 m tall and 20 cm diam., bole up to 14 m long, crown depressed-globose; bark smooth or slightly rough, peeling off irregularly in small bits, mottled grey and pale pinkish yellow brown, 1 mm thick; living bark 10 mm, outer layer lightbrown, rather hard and brittle, the inner 3 mm pale, soft, fibrous; wood dark yellow with a faint cigarbox-wood odour. Branchlets slender, smooth, grey, glabrous, near their apex minutely, densely, pulverulently pilose. Leaves spirally arranged, crowded at the end of the branchlets, coriaceous, obovate or obovate-elliptic,  $3 \times 7$  —  $8 \times 15$  —  $9 \times 16$  cm, shortly acuminate, base gradually tapered; upper surface smooth, glossy, the slender midrib impressed, the lateral nerves obscure, lower surface paler, dull, smooth, midrib prominent, the 5 — 7 (—10) lateral nerves prominulous, widely spaced, erect-patent, somewhat curved and the lower ones not reaching the margin. Petiole slender, 1 — 2 cm long, channeled above.

Panicles axillary, crowded below the flush, densely, minutely light brown pilose. The flowers open late in the morning, calyx very short, pale green, sepals white, narrowly ovate, acute, stiff, inside pillose, ca 3 mm long. The stamens somewhat shorter than the tepals, the anthers of the outer ones shortly oval with introrse cells and a long, slender, slightly pilose filament, anthers of the inner ones narrower, the lower cells extrorse, the upper ones lateral; basal glands small, sessile; style slender, stigma small, peltate.

The species resembles somewhat *Ph. opaca*, but the leaves are smooth and have less lateral nerves. Typical are the very slender, smooth, pale branches. Ecologically this is a heath forest and peat swamp species.

BORNEO. Sabah, Temburong, Kuala Belalong, alt. 70 m, March, buds, *San 17058* (A, BO, BRI, K, KEP, SAN, SING); Sarawak, Betong Distr., Saribas For. Res., peat swamp forest, ster., *Anderson 8538* (BO, SAR); E. Kalimantan, Bulungan, Sg. Simendurut, village Kabiran, alt. 100 m, ster., *bb. 11738* (BO); Nunukan Isl., alt. 70 m, March, fl., *bb. 34542* (BO, L); *ibid.*, ster., *Kostermans 10806* (BO, L); *ibid.*, Febr., buds, *bb. 34650* (BO); *ibid.*, alt. 125 m, ster., *bb. 34646* (BO, K, L); Samarinda area, Loa Djanan, sandy ridge, Sept., fl., *Kostermans 9959* (A, BM, BO, CAL, CANB, K, L, LAE, MEL, NY, P, PNH, SING); Sangasanga area, downstream of Samarinda, sandy, marshy, alt. 5 m, Aug., buds, *Kostermans 7738* (A, BO, BRI, K, L, SING); Balikpapan Distr., Mentawir R. area near village Mentawir, sandy ridge, alt. 40 m, Febr., fr., *Kostermans 10042* (A, BO, K, L, PNH, SING);

ibid., alt. 50 m, July, buds, *Kostermans 9858* (A, BM, BO, CANB, K, L, LAE, NY, P, PNH, SING); Sg. Wain region, periodically inundated, sandy, alt. 20 m, Oct., buds, *Kostermans 4307* (A, BO, K, L); ibid., alt. 40 m, Oct., post anthesis, *Kostermans 4063* (A, BO, BRI, K, L, LAE, P, PNH, SING); S. Kalimantan, Sampit, Distr., Sampit, peatswamp, Aug., buds, *Kostermans 8143* (BO, K, L); ibid., sandy hill, alt. 30 m, ster., *Kostermans 4697* (BO, L); Tanah Bumbu, Sg. Anjar, alt. 200 m, Nov., fr., *bb. 14080* (BO, L); Sampit, peatswamp, March, fr., *Kostermans (Dachlan) 16* (A, BM, BO, K, L, PNH, SING); W. Kalimantan, Kubu Distr., Ambawang, alt. 5 m, ster., *bb. 8034* (BO).

## 6. PHOEBE LANCEOLATA (Wall. ex Nees) Nees

Cf. *Kostermans, Bibl. Laur. 1285. 1964* (cum var. *caudata* Meissn.); *Ocotea lanceolata* Nees, cf. *Kostermans, l.c. 1102* (no. 234a); *Laurus lanceolata* Wall. ex Nees, cf. *Kostermans, l.c. 644*. — Typus: *Wallich 2599 A-E* (C, K, L, LEN); *Ocotea lanceolata* var. *β* Nees. — Typus: *Wallich, Nepal, fl. (Herb. Martius, B)*; *Laurus lanceolaria* Roxb., cf. *Kostermans, l.c. 644*.

Synonyms: *Ocotea ligustrina* Nees, p.p., cf. *Kostermans, l.c. 1105*; *Laurus ligustrinum* Wall. ex Nees, cf. *Kostermans, l.c. 647*. — Typus: *Wallich 2588 A*, p.p. (B, K); *Phoebe ligustrina* Nees, cf. *Kostermans, l.c. 1286*; *Phoebe lanceolata* var. *ligustrina* Meissn., p.p., cf. *Kostermans, l.c. 1286*.

Closely related to *Ph. tavoyana*, the two might be only varieties of the same species. There is a wide variation in petiole (1—4 cm) and leaf length (8—36 cm). The flowers are completely glabrous. I have included the specimens with a sparse, adpressed tomentum of the flowers in *Ph. tavoyana* as these have always tomentose leaf buds.

I have not had the opportunity to check all Wallich's material; Hooker excludes var. *ligustrina* Meissner, which he incorporated in *Ph. declinata*. A specimen, marked *Ocotea ligustrina* in Martius' Herbarium (Herb. Lambert, Brussels) is certainly *Ph. lanceolata*, although the midrib is impressed on the upper leaf surface. In several specimens the basal part of the midrib is impressed.

The distributional area covers: Nepal, Kashmir, Yunnan, Assam, not Burma and Indochina and further the Malay Peninsula, Java and Bali.

Specimens examined (the Javanese are not enumerated): YUNNAN, Kien Shuei Hsien, alt. 1500 m, April, buds, *Tsai 53207* (A, B); Kumaon, Baisani, alt. 1500 m, after anthesis, *Strachey & Winterbottom 1* (B). — INDIA, Kashmir, Gullena R., April, fl., *Gamble s.n.* (DD); Srinagar, buds, *Jameson s.n.* (DD); Mussoree, fl. (DD); Bengal, fl., *Griffith 4258* (BO); Damsang, Pankasan, Jista Div., fr., *Guha 18* (DD); Gowhatty, Oct., fl., sine coll. (BO); Punjab, Kangra, alt. 700 m, fls., *G.S.H. 146* (Blatter Herb., Bombay); Assam, Cachar Div., fl., *Owden s.n.* (DD), distributed as *Ph. pallida*; without locality, fl., Col. *Jenkins s.n.* (BO); fl., *Simmons s.n.* (BO); Sikkim, fl., *Thomson s.n.* (BO). — THAILAND, Chiangmai, Doi Sutep, alt. 500 m, April, young fr., *Sørensen et al. 2628* (BO, C); ibid., alt. 700 m, Febr., fl., fr.,



Sörensen et al 6891 (BO, C). — MALAY PENINSULA, Pahang, Tembeling, July, fr., *S.F.N.* 21790 (BO, SING); Kelantan, Sg. Chalil, S. Letir, low, July, fr., *S.F.N.* 29529 (BO, SING), distributed as *Ph. tavoyana*, petioles up to 4 cm long. — SUMATRA, Atjeh, Gajo Lands, Gumpang, E. slope of Mt. Kemiri, alt. 800-1500 m, very common, March, buds, *Van Steenis 9494*; id., fl., 9758 (A, BO, BRI, K, L, SING); Takengon, village Lampahan, alt. 900 m, May, buds, *bb. 11466* (BO, K, L); Tapanuli, Angkola & Sipirok, village Sajur Matinggi, alt. 550 m, ster., *bb. 5627* (BO). — BALI, Mt. Sangiang, Negara, alt. 800 m, July, fr., *Kostermans et al. 286* (A, BM, BO, K, L, NY, P, SING, US); Brambang, July, young fr., *Sarip 1* (BO, G, L).

*Phoebe longepetiolata* Kosterm., *spec. nov.* — Fig. 67

Arbor magna ramulis laevis glabris apice sub lente minutissime dense pulverulente pilosis foliis alternantibus rigide chartaceis ellipticis obscure acuminatis basi cuneatis supra glabra nitida laevia nervo mediano impressa costis supra glabra nitida laevia nervo mediano impressa costis sat obscuris subtus pallidiora opaca sub lente minutissime sparse adpresse pilosa nervo mediano prominente costis gracillimis prominulis nerviis secundariis parallelis subprominulis vel inconspicuis foliis juvenilis subtus dense adpresse pallide sericeis petiolis perlongis gracilis canaliculatis paniculis axillaris foliis subaequantibus vel longioribus pedunculis longis sat crassis glabris floribus dense minutissime adpresse griseo-pilosis pro genera magnis tepalis subaequalis intus sericeis filamentis pilosis glandulis breve stipitatis ovario minutissime griseo lanuginoso stylo gracile longo stigmatate peltata.

TYPUS: *bb. 11467* (BO).

Tree, 50 m tall, bole 20 m, diam. 110 cm. Branchlets smooth, glossy, the tip of the flush branchlets minutely, densely pulverulently pilose. Leaves spirally arranged, crowded near the end of the branchlets, chartaceous to subcoriaceous, elliptic,  $3 \times 6$  —  $6 \times 15$  cm, obscurely acuminate, base acute; upper surface smooth, glossy, glabrous, the slender midrib impressed, lateral nerves very faint, lower surface paler, dull, under the high power lens sparsely, minutely adpressed pilose, midrib prominent, lateral nerves 8 — 10 pairs, very slender, prominulous, erect-patent, secondary nerves faint, parallel or not visible. Petioles slender, 3 — 5 cm long, canaliculate.

Panicles axillary below the flush, 15 — 20 cm long, consisting of a long, smooth, glabrous, cylindrical peduncle, branching near the apex. Flowers densely, minutely grey adpressed pilose; tube short; tepals erect, stiff, narrowly ovate, acute, ca 5 mm, inside sericeous; stamen 3 mm long, anthers ca 1 mm, those of the outer stamens oblong with introrse cells, those of the inner whorl narrow with extrorse cells, filaments rather broad, densely adpressed grey pilose; basal glands small on short pilose stalks, adnate to the filament; staminodes broadly hastate, 1 mm on a broad, short filament; ovary subglobose, the upper part minutely, densely grey woolly, style slender, as long as the anthers, partly pilose, stigma

small, thin, peltate. Fruit ellipsoid, apiculate,  $10 \times 15$  mm, indurate tepals and tube ca 8 mm long.

Interesting is the pilose ovary. The relationship is possibly with *Ph. rigida*, of which the flowers are unknown.

N. SUMATRA. Atjeh, Takengon, Lampahan, May, fl., *bb. 11467* (BO, K, L, U); E. Coast Sumatra, Karo Lands, village Tongkah, alt. 1525 m, April, buds, *bb. 8356* (BO, L); Takengon, village Redelong, local name: kulee, tree 33 m, diam. 24 cm, Dec., fr., *bb. 12266* (BO, L); W. Coast Sumatra, Bukittinggi, alt. 920 m, March, fl., fr., *Theunissen I* (BO, L), tree 17 m, diam. 45 cm, bark grey with shallow, longitudinal cracks, locally planted for construction timber.

#### 8. PHOEBE RIGIDA Miq.

Cf. Kostermans, *Bibl. Laur.* 1298. 1964. — Typus: *Teijsmann s.n.* (BO, L, U), fr., Sumatra near Rau, "medang telur ayam".

New synonym: *Phoebe kunstleri* Gamble, cf. Kostermans, l.c. 1284. — Typus: *King's Coll. 4491* (BO, SING), syn-typus: *Kunstler s.n.*, *King's Coll. 6180, 8173*, *Scortechini 497* (L), *Wray 3934*, *Ridley 5915*, *Herb. Singapore 2325*, *Haviland s.n.* (Borneo).

Of *Ph. kunstleri* I have only examined the Bogor and Leiden material. I doubt, whether the Indo-chinese specimens, enumerated by Lecomte, belong here.

Additional specimen: SUMATRA, Upper Riau, Pakanbaru, Tenajan R., sandy loam, alt. 30 m, tree 15 m, diam. 25 cm, bark rough, cracked, peeling off in small pieces, blackish brown, 3 mm, living bark dark brown, 15 mm, wood yellow, fruit blue green, pedicels pinkish brown, Aug., *Soepadmo 179* (BO).

#### 9. PHOEBE TAVOYANA (Meissn.) Hooker f.

Cf. Kostermans, *Bibl. Laur.* 1302. 1964; *Machilus tavoyana* Meissn., cf. Kostermans, l.c. 927. — Typus: *Pariak 151* (K).

New synonyms: *Phoebe cuneata* Auct. (non Bl.) Lecomte, *Fl. Indochine* 5: 125. 1910; Liou Ho, *Laur. Chine et Indoch.* 66. 1932; *Phoebe cuneata* var. *glabra* Liou Ho, l.c. 67, cf. Kostermans, l.c. 1275. — Typus: *Poilane 12088* (P); *Ocotea pubescens* Nees (non Mez), cf. Kostermans, l.c. 1126; *Laurus pubescens* Wallich ex Nees, cf. Kostermans, l.c. 692 (no. 308b, p.p.). — Typus: *Wallich 2595 B*, *Amherst 1827* (B, K); *Phoebe angustifolia* Auct. (non Meissn.), Liou Ho, l.c. 73, quoad *Poilane 12551* (BO, P); *Phoebe paniculata* var. *glabrescens* Meissn., cf. Kostermans, l.c. 1294. — Typus: *Wallich 2595 B* (B).

As pointed out already by Hooker, the confused state in *Phoebe pallida*, *tavoyana*, *pubescens*, *paniculata* and *lanceolata*, is partly due to Wallich, who mixed up the species and to the fact that Wallich's type material was distributed partly without adding a, b, c, etc. to the Catalogue number or without any number at all (like in Copenhagen).

Nees broke up Wallich's conglomerate, but his herbarium has not been located and the only clue are the specimens in the Martius Herbarium in Brussels (but these often have no Wallich number). Meissner took a position in between and created a confusing number of varieties often belonging to different species.

*Phoebe tavoyana*, based on a Tenasserim specimen, is very closely related to *Ph. lanceolate*, from which it only differs by its tomentum, *Ph. lanceolate* being glabrous. So far it has been collected in Indochina, Burma, India (one specimen), Siam and Hainan; *Ph. lanceolata* has been recorded from Nepal, Yunnan, Assam, Siam, Sumatra, Java, Bali, but remarkably enough not from Indochina. I think that the two should be better considered to be varieties of a single species. *Phoebe pallida* Nees is a puzzle, an iso-type sheet (BO) differs only from *Ph. tavoyana* by the impressed nerves of the upper leaf surface, but in some specimens of *Ph. tavoyana* and *Ph. lanceolata* some leaves — at least partly — have a sunken midrib. The pilosity shows a large degree of variation, it is densest and long in Burmese species (*Helper K.D. 4260*), is less in the Indo-chinese and Hainan specimens, where the flowers may become subglabrous. The latter resembles strongly the tomentum of *Ph. pallida*. The variation in leaf length and length of the leaf acumen is very large, connected by intermediate stages.

*Phoebe cuneate* and *angustifolia*, with which *Ph. tavoyana* was confused by Lecomte and Liou Ho, are entirely different. The Hainan specimens, identified by C.K. Allen, have been distributed under various names (not as *Ph. tavoyana*).

The N. Sumatra specimens are perhaps from a planted tree, although Lörzing thought, that the tree in the park was a forest remnant.

Specimens examined: INDIA, Khasya Hills, fl., *Griffith s.n.* (BO). — HAINAN Isl., Young Lam Shan, May, fr., *Lau 6144* (A, BO); Bak Sa, May, fr., *Lau 26690* (A, BO); Chem Fung Mts., Jan., fr., *Lau 5290* (A, BO), narrow-leaved form, nearing *Ph. henryi*; TONKIN, Cho Canh, April, fr., *Pételot 887* (P); Phu Ho, Prov. of Phu Tho, June, fr., *Pételot 1062* (P); road of Vin Yen to Tam Dao, alt. 300 m, April, buds, *Pételot 4680* (P); Tuyen Luang, June, fr., *Pételot 1932* (P); Prov. Phu Tho, forest of Dao Gia, April, fl., *Chevalier 37464* (BO, P); Tuyen quang, April, after anthesis, *Chevalier 37400* (BO); Tien-yen, region of Man Cay, May, fl., *Chevalier 37563* (BO, P); LAOS, near Savannakhet, March, after anthesis, *Poilane 12088* (P); ANNAM, Ca-Na, Prov. Phanrang, Febr., fl., *Poilane 8797* (BO, L); Cochin, Bien Hoa, Station of Giaxay, Nov., fl., *Chevalier 39258* (BO, P); CAMBODIA, Mt. Schraal, Prov. Savomtong, April, fr., *Pierre 9* (BO, P); locality not indicated, fr., *Harmand 117* (P). — BURMA, Tenasserim, fr., *Helper, Kew Distr. 4260* (BO, C, K); ster., *Falconer 753* (BO); Kawbiya Reserve, N. Pegu, Febr., buds,

*Ba Te 793* (DD); Bhamo Distr., alt. 800 m, April, buds, *Cubitt 391A* (DD); Leikpok Chaung, Mergui, alt. 130 m, fr., *Braylow's Coll. 198* (DD); Mohniyn Reserve, Kadu Range, alt. 300 m, March, fl., *Mauwng 2392* (DD); Amherst, fr., *Wallich 2595 B*, anno 1827 (in Herb. Martius, B as *Ocotea pubescens* Nees, *Laurus pubescens* Wall. and *Phoebe paniculata* var. *glabrescens* Meissn.). — THAILAND, Kao Saming, Korat, Jan., *Put 514* (BKF); Dan Chumpan, Korat, alt. 50 m, Dec., fl., *Kerr 17670* (BKF); Chiet, Ubon, alt. 100 m, May, fr., *Kerr 21556* (BKF); Bang San, Champawn, alt. 30 m, Jan., young fr., *Kerr 11330* (BKF); Siep Guan, Champawn, Dec., fl., *Kerr 16254* (BKF); Yala, Jan., buds, *Put 3672* (BKF); Roi Et, Febr., buds, *Kassard 68* (BKF); Doi Duan, Muang Fan, alt. 750 m, March, fl., *Kerr 5105* (BKF); Ban Kawn Kiep, Surat, Aug., fl., *Kerr 13322* (BKF); Kaw Sanui, Surat, Nov., fl., *Put 1297* (BKF, BO); Kao Krading, Loi, alt. 1200 m, Febr., buds, *Kerr 20101* (BKF); Dan sui, Loi, March, fl., *Kerr 8879* (BKF); Wangka, Kanburi, alt. 200 m, Febr., *Kerr 10458* (BKF); Fako, Jung Suan, Febr., buds, *Kerr 11906* (BKF); Sriracha, fr., *Collins 2044* (BKF); Kawpua, Ranawng, Dec., fr., *Kerr 16337* (BKF); Kawpua, Ranawng, *Kerr 47012* (BKF); Muang Van (Nan), Febr., fr., *Kerr 4898* (BKF); Pattani, Koi Kevi, March, buds, *Laksanakarna 377* (BKF); Bachaw, Pattani, July, fl., *Kerr 7228* (BKF); Klaung Tem, Satiat, March, fr., *Kerr 14576* (BKF); Kop Poing, Pang-nga, March, fr., *Kerr 18532* (BKF); S. Thailand, 44 km. S.W. of Surat Thani, alt. 50 m, secondary forest, Sept., fl., *Wirawan 50* (BO, L). — MALAY PENINSULA, Kedah, Koh Mai Forest Res., April, fr., *S.F.N. 35211* (BO, SING); N. SUMATRA, Sg. Beras, W.S.W. of Medan, in a park, July, fr., *Lörzing 16905* (BO, K, L); *ibid.*, after anthesis *Lörzing 15015* (BO).

#### 10. MACHILUS SCORTECHINII Gamble

Cf. Kostermans, *Bibl. Laur.* 925, 1964. — Typus: *Scortechinii 492* (K), syntypus: *King's Coll. 8413* (K); *Persea scortechinii* (Gamble) Kosterm., cf. Kostermans, l.c. 1256.

This is a species of *Phoebe*; the specimen *King's Coll. 8413* has one flower, where the tepals are already indurate and erect.



Fig. 1. *Alseodaphne ramosii* Kosterm., (after holotypus).



Fig. 2. *Beilschmiedia morobensis* Kosterm. (after holotypus).

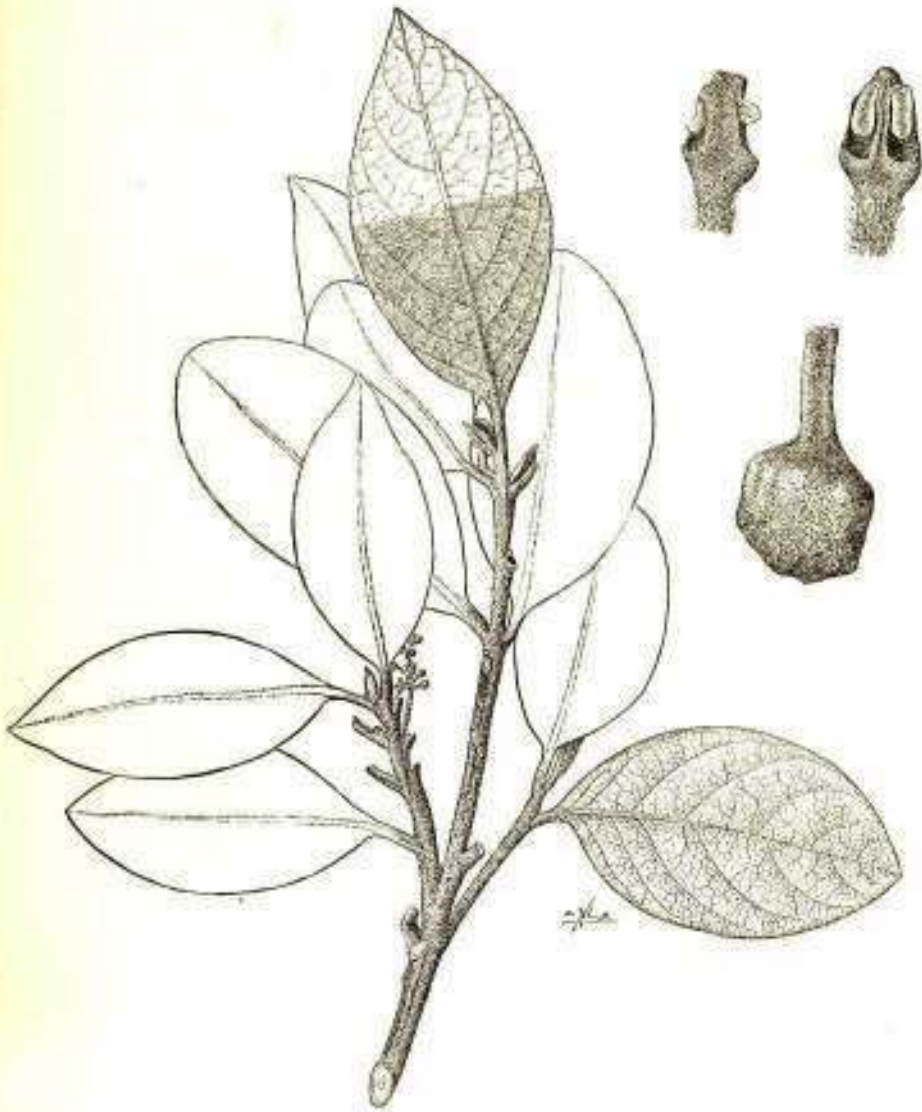


Fig. S, *Beilschmiedia murutensis* Kosterm, (after holotypus).



**Fig. 4.** *Beilschmiedia novae-hritwnniae* Kosterm. (after holotypus).





Fig. 5. *Beilschmiedtia oligocarpa* Kosterm. (after holotypus).



Fig. 6. *Beilschmiedia pullenii* Kosterm. (after holotypus).

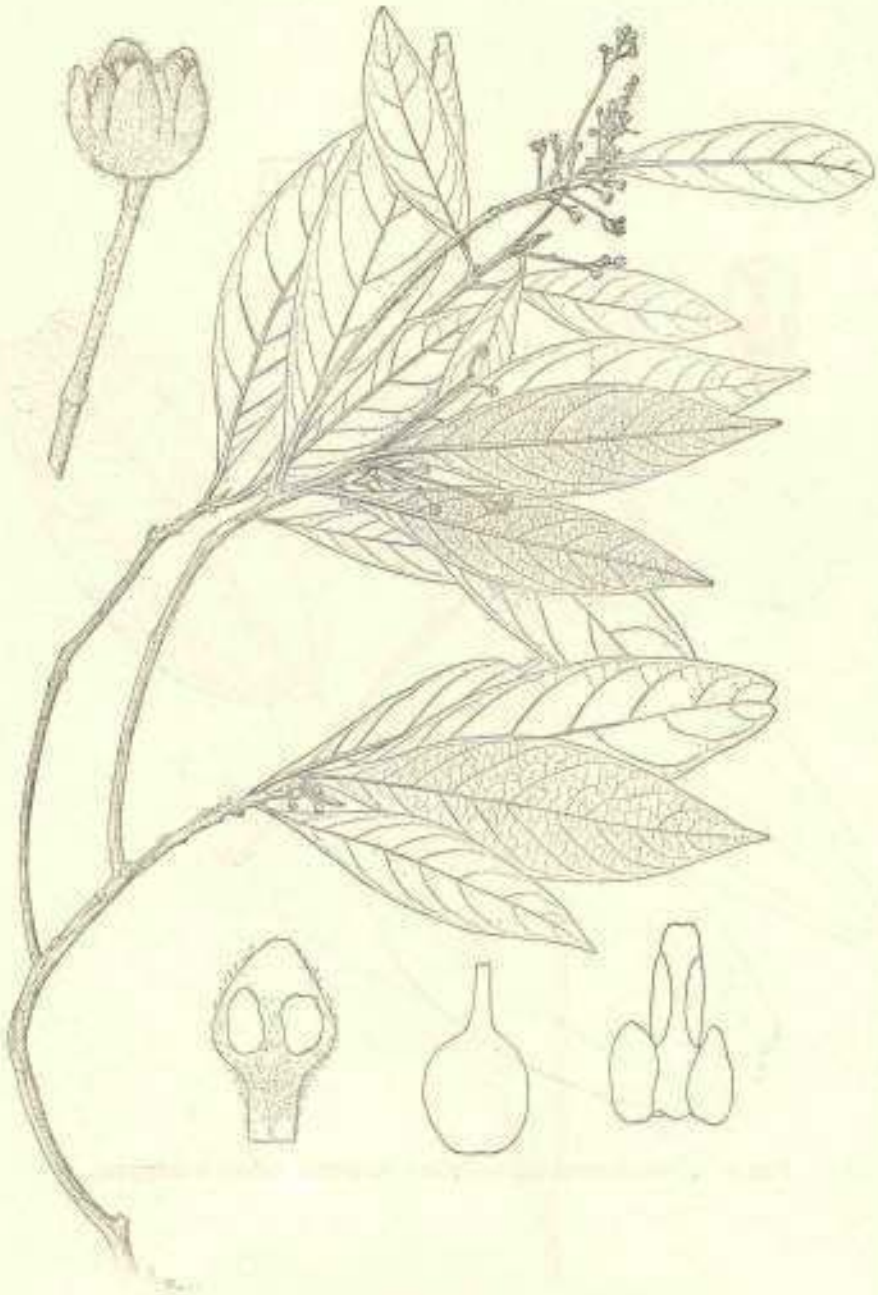


Fig. 7. *Beilsohmiedia rosseliana* Kosterm. (after holotypus).



Fig. 3. *Cinnamomum alternifolium* Kosterm, (after holotypus),



Fig. 9. *Cinnamomum arbusoulum* Kosterm. — after Anderson 4726 (SAR).



Fig. 10. *Cinnamomum corneri* Kosterm. (after holotypus).



Fig. 12. *Cinnamomum frodinii* Kosterm. (after holotypus).

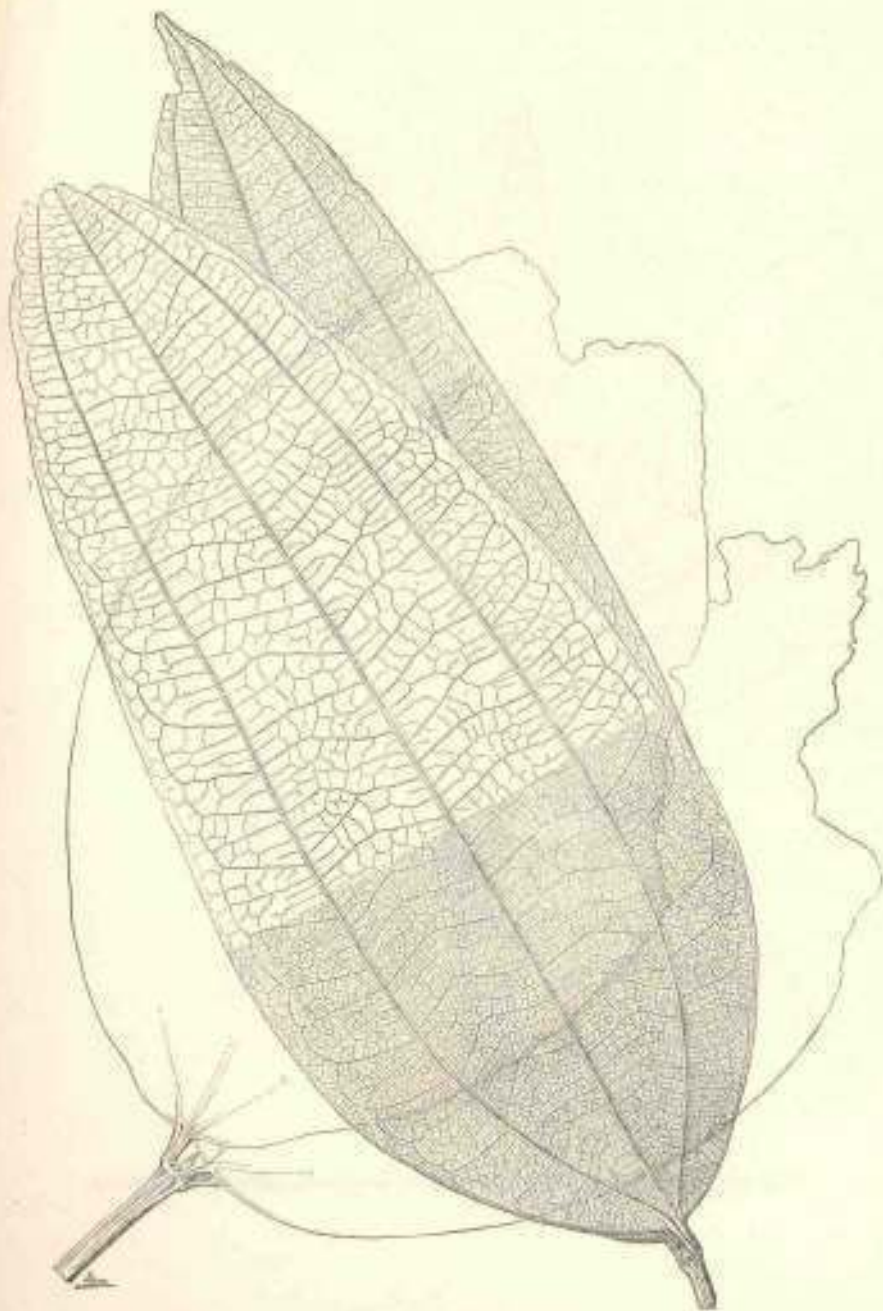


Fig- 13. *Cinnamomum gigaphyllum* Kosterm. (after holotypus).





Fig. 14. *Cinnamomum halmaheirae* Kosterm. (after holotypus).



Fig. 15. *Cinnamoniuvi hentyi* Kosterm. (after holotypus).



Fig. 16. *Cinnamomum impressicostatum* Kosterm., — after *Strugnell 22384* (SING).

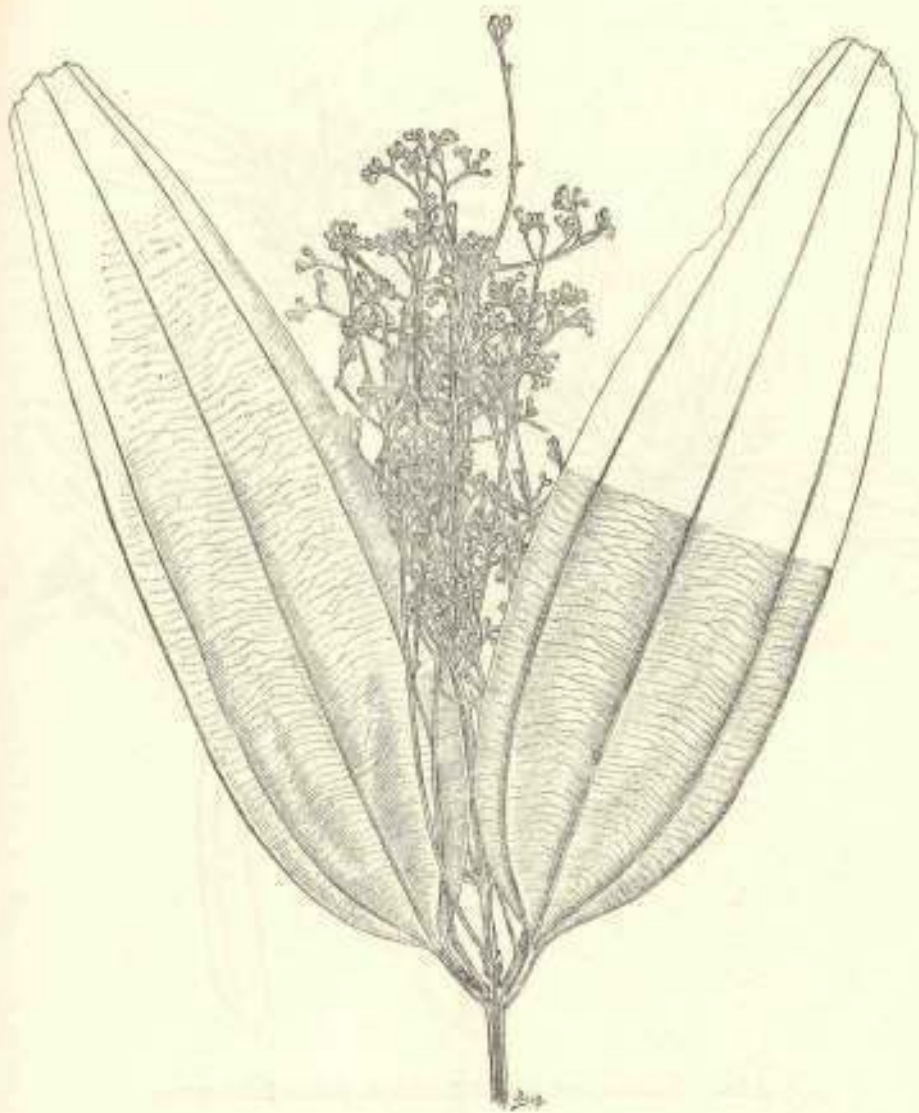


Fig. 17, *Cinnamomum kerangas* Kosterm., — after *Haviland & Hose SSOI* (SING).



Fig. 18. *Cinnamomum kerrii* Kosterm. (after holotypus).



Fig. 19. *Cinnamomum lanaoensis* Kosterm. (after holotypus).



Fig. 20. *Cinnamomum lawang* Kosterm. — after *bb.* 28100 (BO).



Fig.21. *dnnamomum Uneatum* Kosterm. (after holotypus).



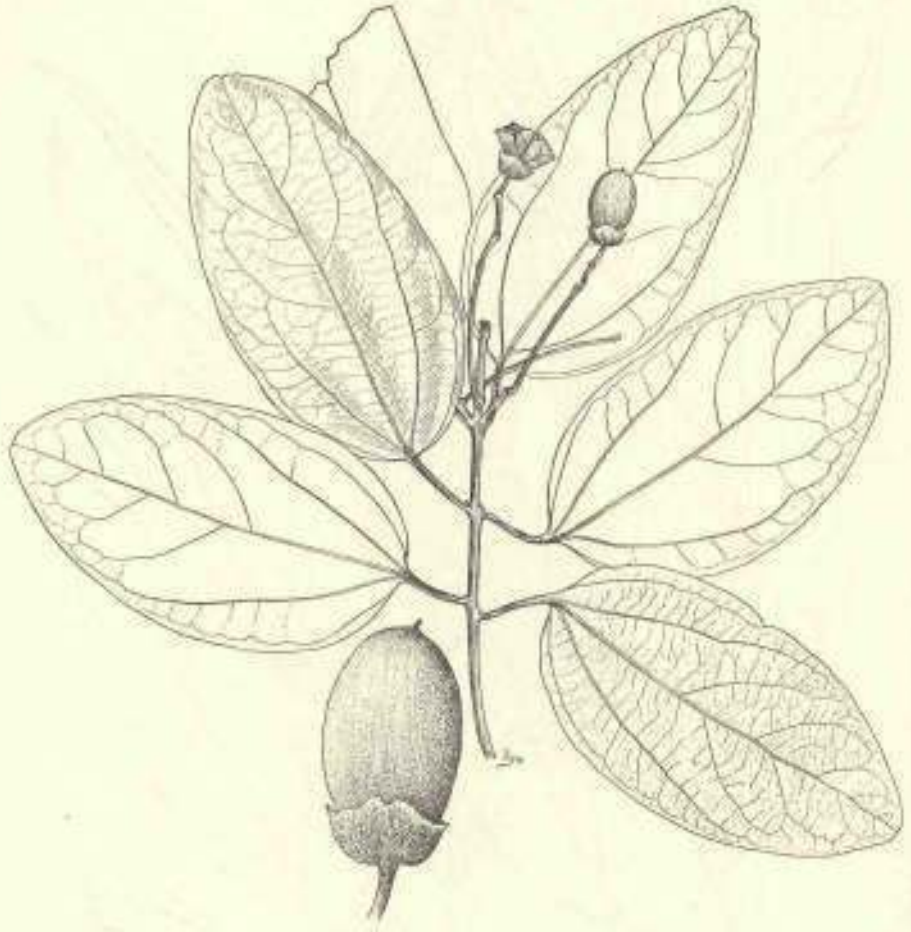


Fig-2. *Cinnamomum massoi* Schewe — after NGF 4600 (BO).



Fig. 23. *Cinnmnomum miwoearpiim*- Kosterm, — after S. 18099 (BO),



Fig. 24. *Cinnamomum pereoriaceum* Kosterm. (after holotypus).

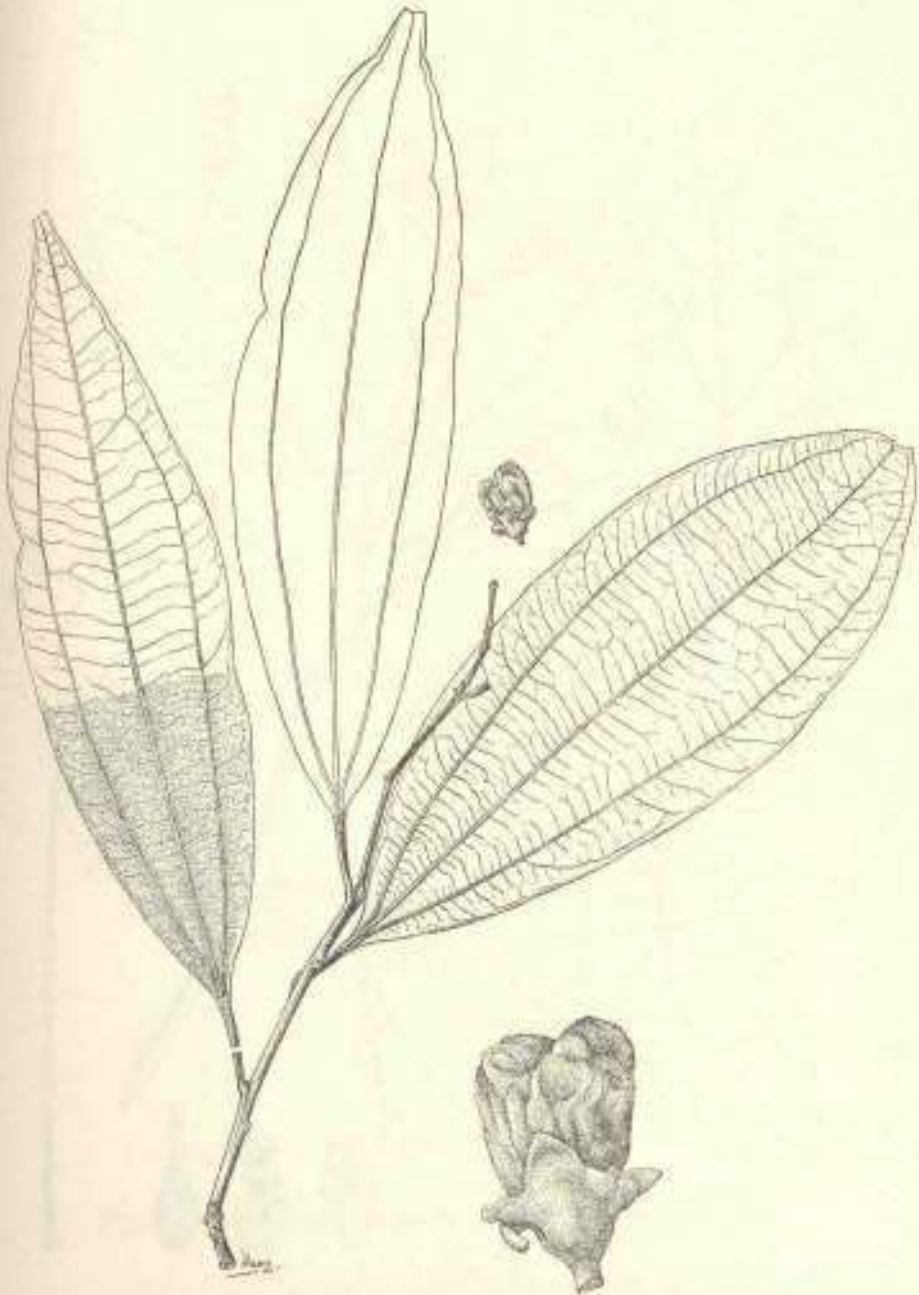


Fig. 25. *Cinnamomum singularis* Kosterm. (after holotypus).



Fig. 26. *Cinnamomum sleumeri* Kosterm. (after holotypus).



Fig. 27. *Cinnamornum soegengii* Kosterm. (after holotypus).

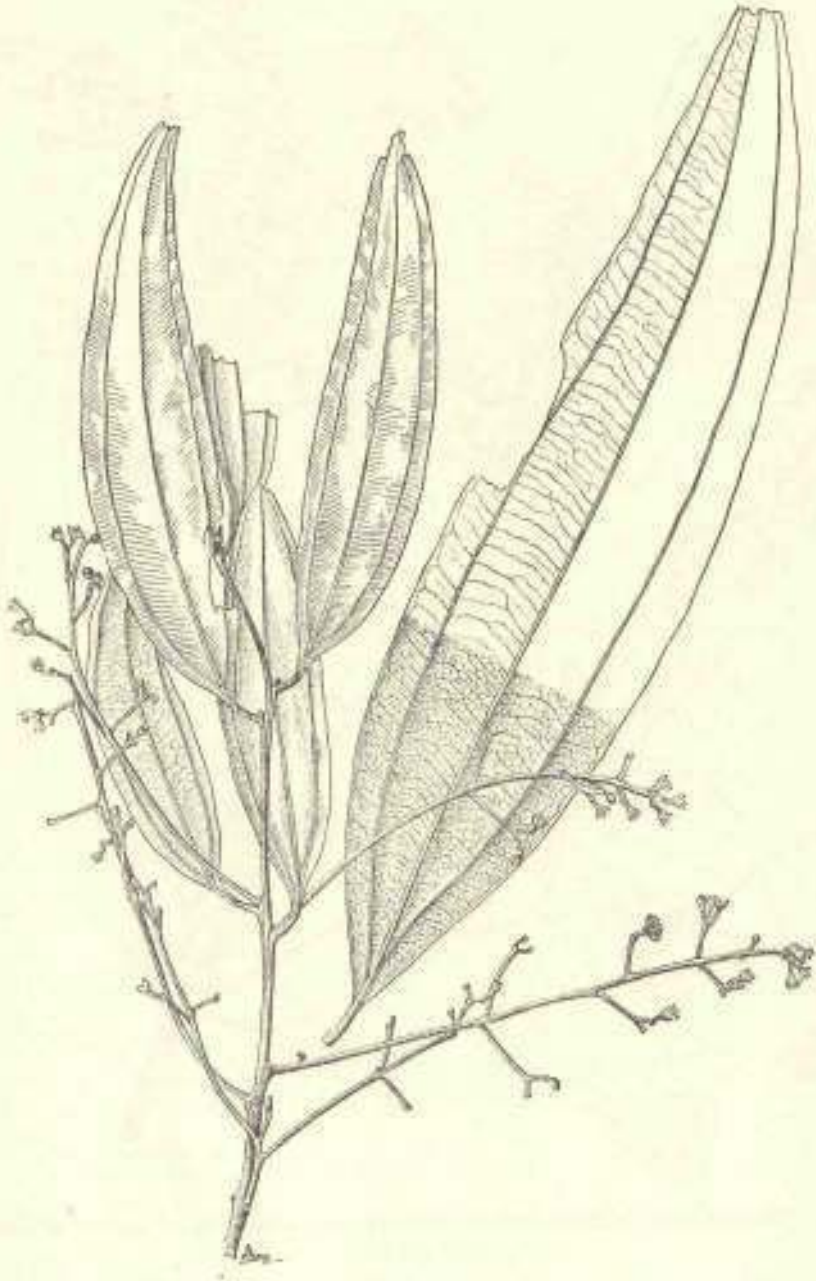


Fig. 30. *Cinnamomum woulfei* Kosterm. (after holotypus).



Fig. 31. *Cryptooarya nana* Kosterm. (after holotypus).





Fig. 32. *Cryptocarya rifaii* Kosterm. (after holotypus).



Fig. 33. *Cryplocarya tuanku-bujangii* Kosterm, (after holotypus).



Fig. 34. *Endiandra gemopsis* Kosterm. — fruit after holotypus, flowering branch after van Roy en & Sleumer 6877 (BO).



Fig. 35. *Endiandra hayesii* Kosterm. (after holotypus).



Fig. 36. *Endiandra macrostemon* Kosterm. (after isotypus).



Fig. 37. *Endiandra minutiflora* Kosterm., — after NGF 8073 (BISH).



Fig. 38. *Lindera pedicellata* Kosterra. (after holotypus).



Fig. 39. *Litsea amicorum* Kosterm. (after holotypus).





Fig. 40. *Litsea aurea* Kosterm. (after holotypus).



Fig. 41. *Litsea carrii* Kosterm. (after holotypus).



Fig. 42. *Litsea ceramensis* Kosterm. (after holotypus).



Fig. 43, *Lilsea discocalyx* Kosterm. (after holotypus).



Fig. 44. *Litsea erectinervia* Kosterm, — after Aohmad 1338 (BO).



Fig. 45. *Litsca filipedunculata* Kosterm. (after holotypus).



Fig. 46. *Litsea globosa*, Kosterm, (after holotypus).



Fig.47. *Litsea henricksonii* Kosterm. — after isotypus (BO).





Fig. 48. *Litsea longipedicellata* Kosterm. (after holotypus).



Fig. 49. *Litsea morotaiensis* Kosterm. (after holotypus).



Fig. 50. *Litsea pahtdosa* Kosterm. (after holotypus).



Fig. 51. *Litsea priiriens* Kosterm. (after holotypus).



Fig. 52. *Litsea psilophylla* Kosterm. (after holotypus).



Fig. 53. *Litsea pumila* Kosterm. (after holotypus).



Fig. 54. *Litsea rigidifrons* Kosterm. — after isotypus (L).



Fig. 56. *Litsea spathidcuta* Kosterm. (after holotypus).





Fig. 57. *Lilsea steenisii* Kosterm. (after holotypus).

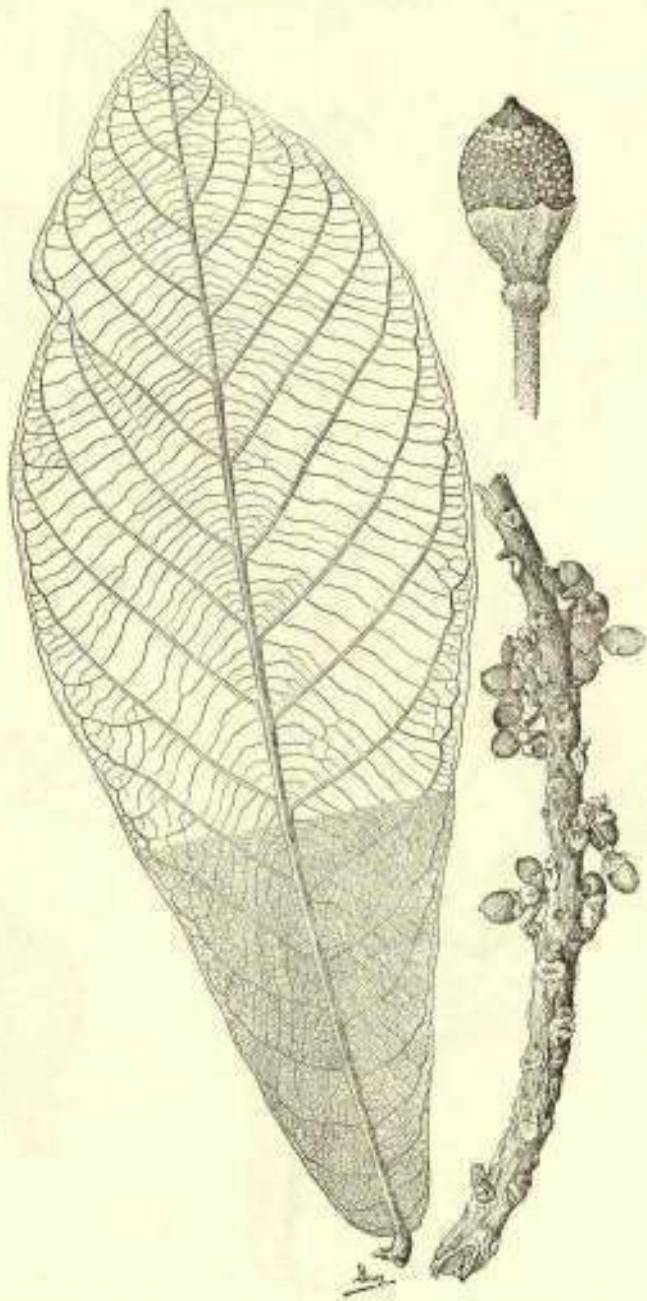


Fig. 58. *Litsea, subauriculata* Kosterm. (after holotypus).

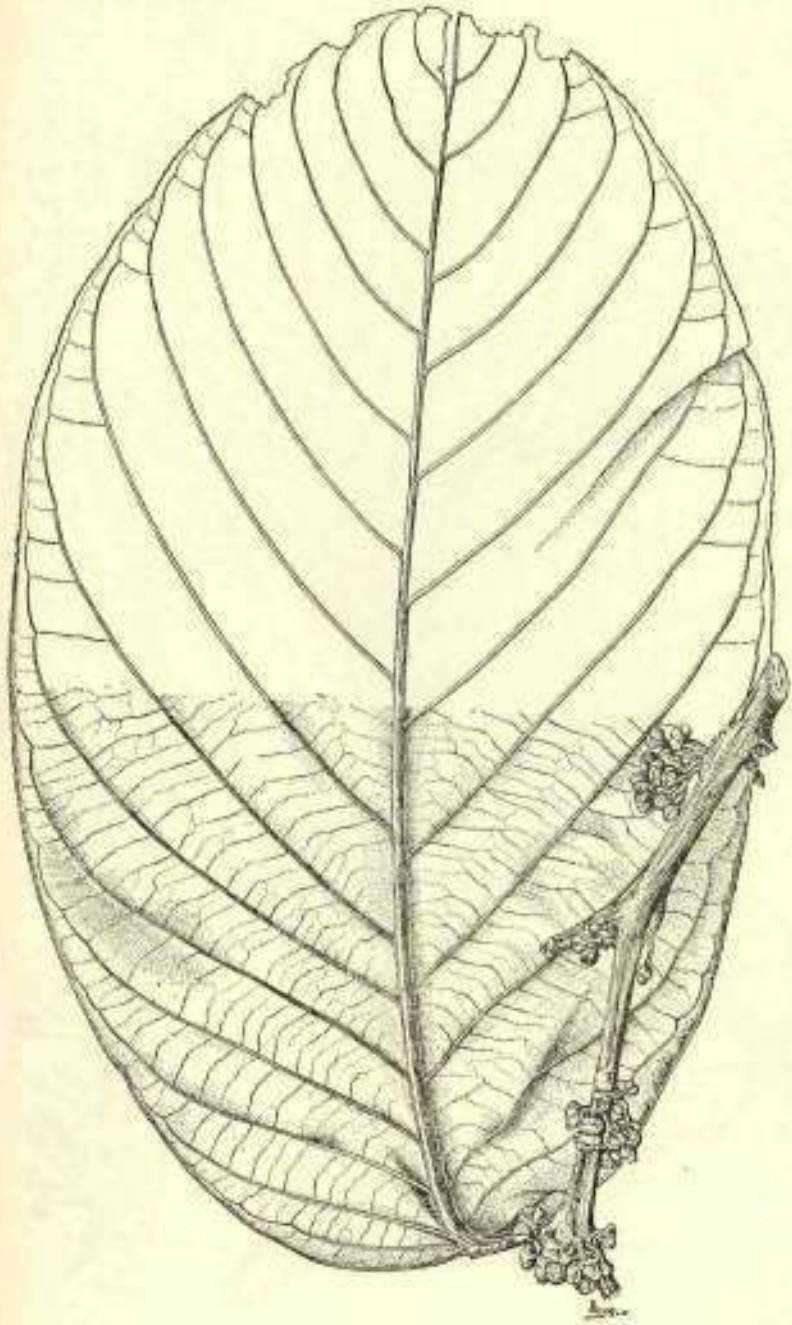


Fig. 59. *Litsea sulavesiana* Kosterm, (after holotypus).



Fig. 60. *Litsea talaumifolia* Kosterm. (after holotypus).



Fig. 61. *Litsea timonioides* Kosterm. (after holotypus).

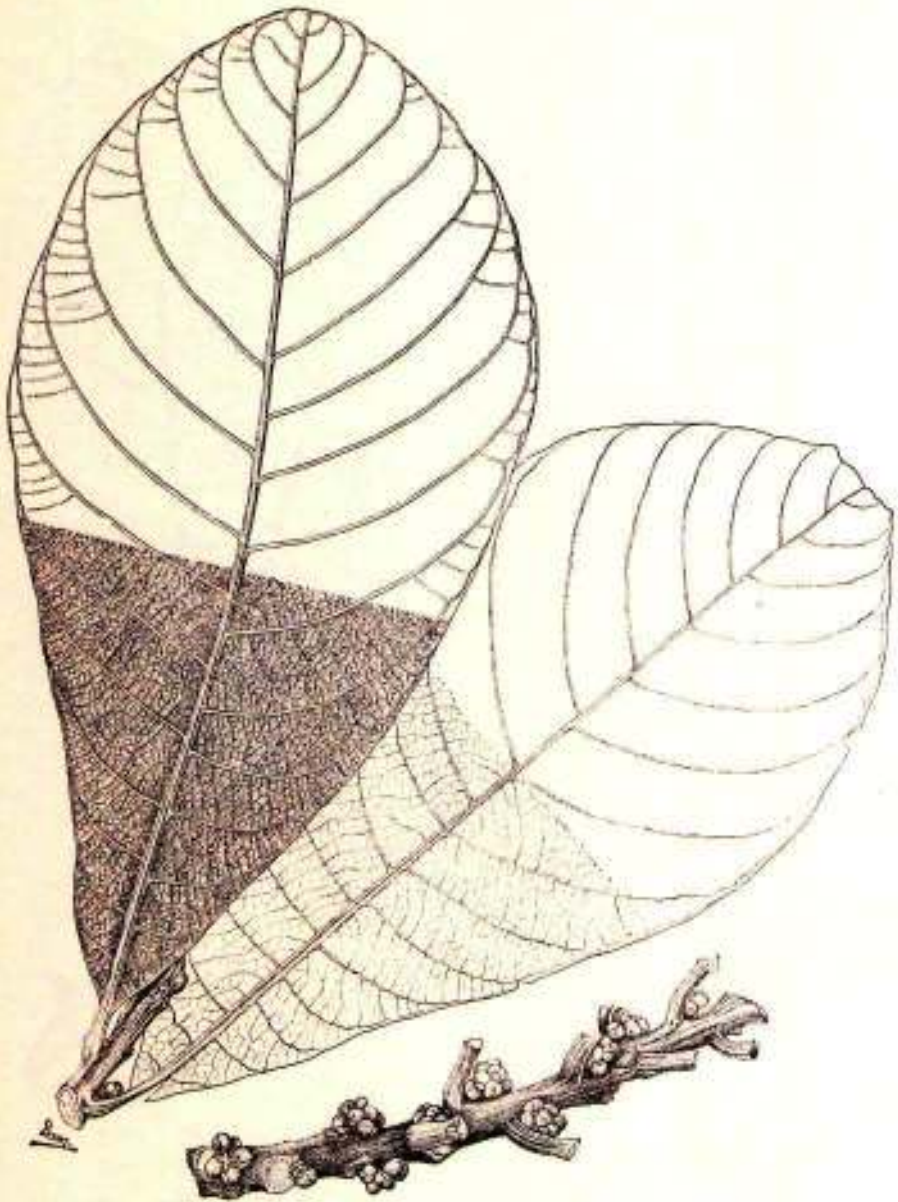


Fig. 62. *Litsea trichophylla* Kosterm. (after holotypus).



Fig. 63. *Persea malayana* Kosterm. (after holotypus).

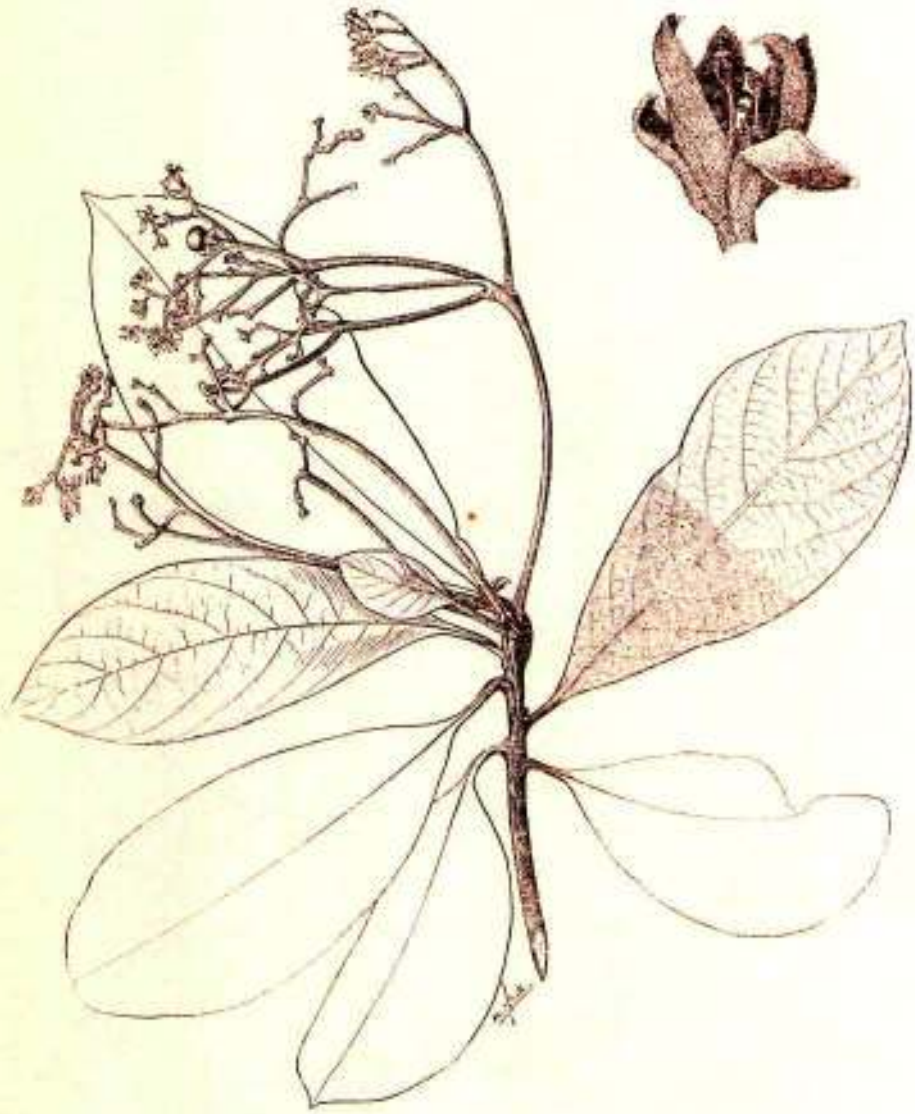


fig. 64. *Persea sumatrana* Kosterm. (after holotypus).



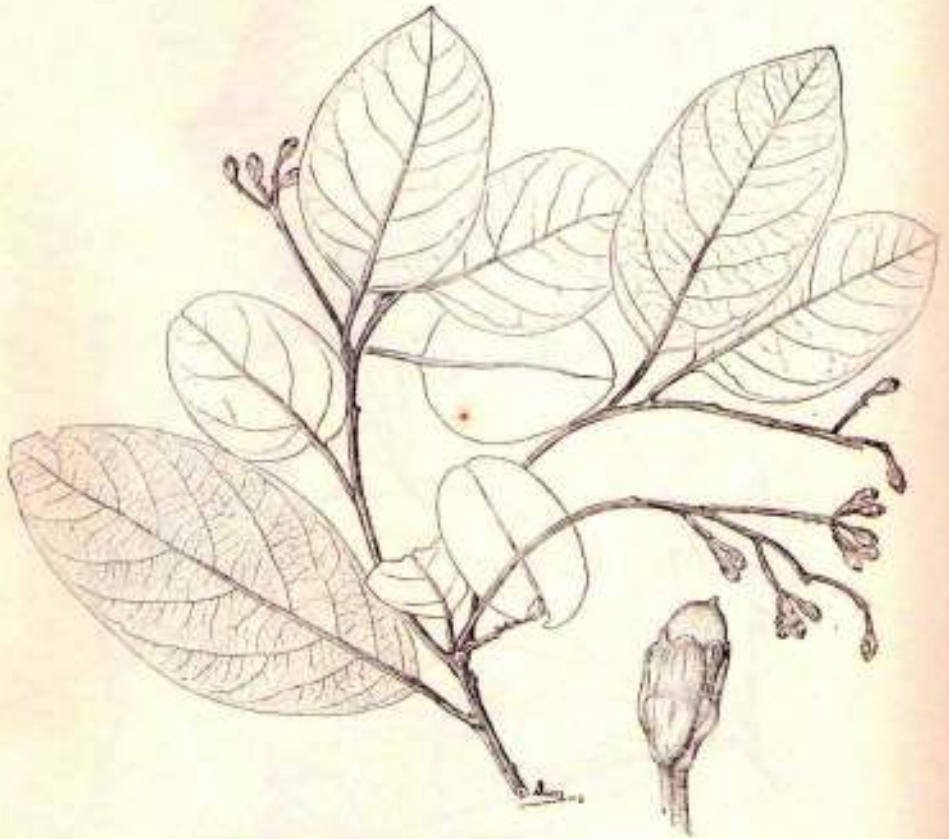


Fig. 65. *Phoebe birmanica* Kosterm. (after holotypus).



fig. 66. *Phoebe dehaasiae folia* Kosterm. (after holotypus).



Fig. 67. *Phoebe laevis* Kosterm. (after holotypus).



fig. 68. *Phoebe longipedicellata* Kosterm. (after holotypus).