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THE GENUS TEIJSMANNIODENDRON KOORDERS (VERBENACEAE)

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SUMMARY

1. The present notes on *Teijsmanniodendron* are based on a study of the specimens from Herbarium Bogoriense and the Herbarium of the Singapore Botanic Garden.

2. The taxonomic value of the principal characters and their variation are discussed. Each of the species recognized is annotated.

3. A delimitation and subdivision of the genus in two sections, *'Plurifoliolatae* Kosterm.' and *'Unifoliolatae* Kosterm.,' is proposed.

4. A key to the 12 species and 1 variety distinguished, is included.

5. One new species is provisionally described (but not named), and one new variety, *Teijsmanniodendron pteropodum* var. *auriculatum* Kosterm., is published.

6. The following new combinations are made: *Teijsmanniodendron coriaceum* (C. B. Clarke) Kosterm., *T. hollrungii* (Warb.) Kosterm., *T. holophyllum* (Bak.) Kosterm., *T.novoguineense* (Kan. & Hatus.) Kosterm., *T. sarawakanum* (H. H. W. Pears.) Kosterm., *T. smilacifolium* (H. H. W. Pears.) Kosterm., and *T. subspieatum* (Hallier f.) Kosterm.

7.. The genus *Xerocarpa* H. *3.* Lam *(non* Spach) is rejected; its only species, *X. avicenniaefoliola* H. J. Lam, is referred to *Teijsmanniodendron ahernianum* (Merr.) Bakh. In addition, the following reductions are made: *Teijsmanniodendron monophyllum* Kurata = *T. hollrungii* (Warb.) Kosterm.; *Vitex bankae* H. J. Lam = *T. ahernianum* (Merr.) Bakh., *V. bogoriensis* H. J. Lam = *T. ahernianum* (Merr.) Bakh.; *V. koordersii* H. J. Lam t= *T. pteropodum* (Miq.) Bakh.; *V. tetragona* Hallier f. = *T. sarawakanum* (H. H. W. Pears.) Kosterm.; *V. venosa* H. J. Lam = *T. coriaceum* (C. B. Clarke) Kosterm. Possible identity of *T. longifolium* (Merr.) Merr. and *T. bogoriense* is suggested: the identity of *T. simplicifolium* Merr. and *T. smilacifolium* (H. H-, W. Pears.) Kosterm. is indicated as probable.

8. *Vitex subspicata* Hallier f. and *V. holophylla* Bak., included by Lam in *Vitex hollrungii* Warb., are reinstated as distinct species of *Teijsmanniodendron.*

1. INTRODUCTION

My attention was drawn to this genus when identifying a specimen of *Vitex* (= *Teijsmanniodendrov) hollrungii* Warb. from a collection, made in 1948 in New Guinea, Geelvink Bay, where an extensive forest-area was strip-surveyed by the Forest Service of Indonesia. At the same time,

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I encountered a publication of Kurata,[1] who described *Vitex hollrungii* as a new species in *Teijsmanniodendron (T. monophyllum* Kurata). It soon became evident that a revision of the genus was desirable.

During the course of this study I was informed that Dr H. N. Moldenke of New York had accepted the elaboration of Verbenaceae for "Flora Malesiana"; therefore, I closed this study after having examined only the material from Herbarium Bogoriense and the Singapore Herbarium. Specimens from Singapore are indicated by "S," those from Bogor (Buitenzorg) are not further marked, or indicated by "Bg."

Local names are taken from field-labels; only a fraction of them is reliable.

Wood classes (durability) have been indicated in accordance with Den Berger *(in* Meded. Proefsta. Boschw. 13: 3-5. 1926).

HISTORY. — The genus *Teijsmanniodendron* was founded by S. H. Koorders[2] with one species, *T. bogoriense,* of which the description was based on material collected from a couple of trees of unknown origin in the Botanic Garden at Bogor (Buitenzorg). Koorders carried out a very thorough investigation of all parts of these trees and laid down his conclusions in an extensive publication, accompanied by excellent drawings.

He concluded that *Teijsmanniodendron* represented a separate subdivision (Teijsmanniodendrae) of the Viticoideae (Verbenaceae), characterised by a non-dehiscent, capsular fruit with a single seed. Except for its fruit characters the genus cannot well be distinguished from its nearest relative *Vitex* L.

The original spelling of the generic name is *Teijsmanniodendron,* with 'ij'. Perhaps this should be corrected into 'y' in view of what may be the correct spelling of the name Teysmann. In the botanical names the original spelling is retained because I have not yet satisfied myself completely as to how Teysmann's name must be spelled precisely.

In "The Verbenaceae of the Malayan Archipelago," Lam recognised only one species *(T. bogoriense).*

The genus was.again revised by Bakhuizen van den Brink Sr.[3] This revision was rather incomplete for reasons that become evident from a short note by the author, attached to a herbarium sheet of *Xerocarpa avicenniaefoliola* H. J. Lam in Herbarium Bogoriense. He explained in this note that, when he revised *Teijsmanniodendron,* Lam was working on *Vitex,* and thus the revision of these two genera became a little arbi-

1 *In* Bull. Tokyo Univ. Forests 35: 203. 1947.
2 *In* Ann. Jard. bot. Buitenzorg 19: 19. 1904.
3 *In* Lam & Bakh. *in* BulJ. Jard. bot Buitenzorg **III** 3: 29. 1921.

trary and confused. According to this note several species of *Vitex* should be transferred to *Teijsmanniodendron* and apparently he already had his doubts, too, about *Xerocarpa* H. J. Lam as a proper genus. Bakhuizen van den Brink's death in 1945 put an untimely end to his investigations. Several specimens of *Vitex* in Herbarium Bogoriense have been indicated in his handwriting as actually belonging to *Teijsmanniodendron.* In his publications Bakhuizen van den Brink[4] transferred two species to the genus, viz. *Vitex pteropoda* Miq. and later on *Vitex aherniana* Merr.

THE TAXONOMIC VALUE OF CERTAIN CHARACTERS. — The number of the leaflets in the multifoliolate species usually varies between three and five. This makes the number of leaflets unsuitable for delimiting species in this group. I had the opportunity of studying several species in living condition; it became clear that also the absolute length of leaves and petioles had little or no specific value.

The inflorescence of all species thus far known is built along the same principle: a lax panicle with distant, short, and not or very shortly branched, lateral branchlets. Sometimes the panicle is more or less spike-like.

The flowers are either sessile or stalked and grouped in more or less condensed cymes and more or less reduced glomerules.

The calyx is always distinguished by well-developed teeth before and during anthesis. As the teeth do not grow along with the rest of the calyx after anthesis, the calyx-cup in mature flowers has either hardly visible and distant traces of the original teeth, or its margin may become completely entire.

The corolla does not show much variation in the different species. Its lobes may be narrower or broader and the incision in the lower lip more or less pronounced.

The number of stamens is four as a rule; they are didynamous. The only exception thus far observed I found in *Teijsmanniodendron ahernianum,* in which five stamens are present which are almost equal in size and alternate with the petals. Occasionally one of the five stamens is lacking.

The ovary with four ovules grows out into a one-celled fruit. Only one ovule develops into a seed which is attached to the roof of the cavity.

The exocarp of the fruit is either thick, with scattered sclerenchymatic cells *(T. bogoriense, T. pteropodum),* or thin and very brittle *(T. ahemianum, T. hollrungii).* Intermediate stages may be found in other species.

4 *In* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg **III** 3: 29. 1921; *in* J. Arnold Arb. 16: 74. 1935.

DELIMITATION AND SUBDIVISION OF THE GENUS. — *Teijsmanniodendron* is very closely related to *Vitex*, and segregation from the latter genus is perhaps debatable. However, the delimitation of the other genera of Verbenaceae is often less convincing than in the case of these two groups. It must be left to a monographer, who will be able to revise the entire family, to elaborate a more or less definite system of delimitation of its genera. As matters stand now, *Teijsmanniodendron* might well be considered a proper genus. Even in vegetative characters the species of *Teijsmanniodendron* may nearly always be recognised by the well-developed and conspicuously swollen articulations of the petiolés and the petiolules.

The 12 species, which are treated below, may be conveniently divided into two sections: *'Plurifoliolatae'* with palmately compound leaves, and *'Unifoliolatae'* with one-foliolate leaves.

Lam,[5] who treated most of the species of *Teijsmanniodendron* under *Vitex*, followed Briquet's subdivision[6] of *Vitex* sect. *Agnus-Castus* (Endl.)

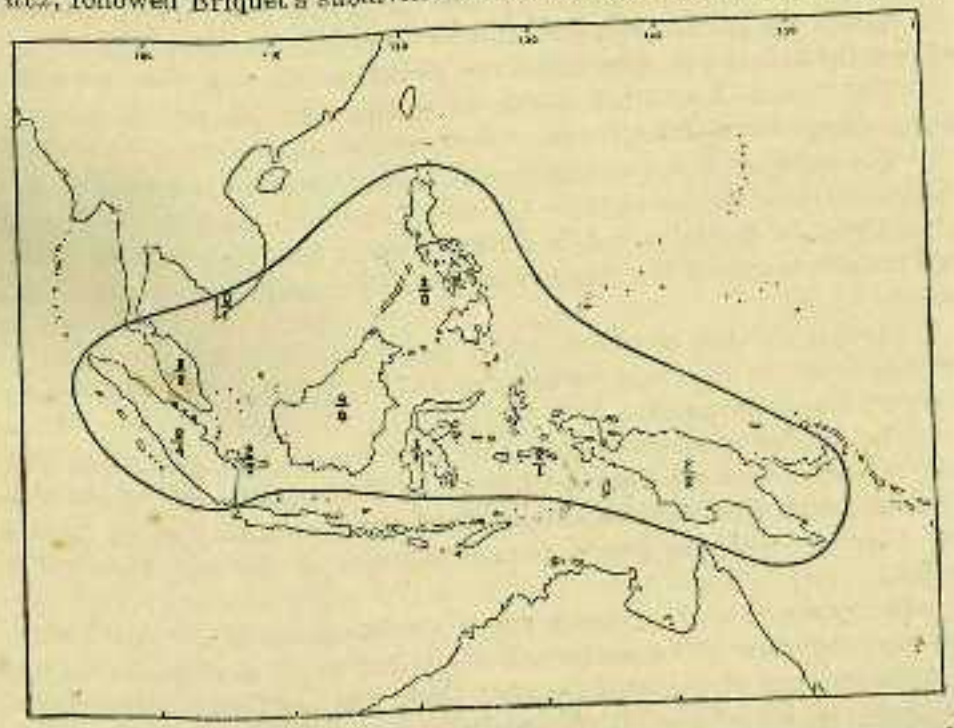

FIG. 1. Distribution of *Teijsmanniodendron* Koord. The upper numbers indicate the number of species of section *Plurifoliolatae*, the lower ones that of section *Unifoliolatae*.

[5] The Verbenaceae of the Malayan Archipelago 165. 1919; in Lam & Bakh. in Bull. Jard. bot. Buitenzorg III 3: 48. 1921.
[6] Verbenaceae in Engl. & Pr., Nat. Pflfam. 4: 3a: 172. 1897.

Briq. in *'Axillares* Briq.' and *'Terminates* Briq.,' according to the inflorescences being axillary or terminal. This mode of division is abandoned here, as almost all species treated in this paper have both kinds of inflorescences, even with the same specimen. Moreover, the method of grouping followed by Lam results, in my opinion, in distancing allied species. I prefer to arrange the species with one leaflet and those with multifoliolate leaves in two distinct groups.

DISTRIBUTION. — The centre of distribution is apparently to be found in Borneo, where all species except *T. ahernianum* and *T. novoguineense* are represented. The genus is absent in Java and the Lesser Sunda Islands. Borneo is especially rich in representatives of the section *Unifoliolatae*. The species of this group are mainly restricted to Sumatra and Borneo; *T. hollrungii*, as an exception, occurs almost throughout Malaysia. Some species show a disjointed area of distribution.

In figure 1 the geographical distribution of the genus and the number of species known from each region are indicated.

It is quite possible that additional localities will be found represented among material now ascribed to other genera, e.g. to *Vitex*.

2. KEY TO THE SPECIES OF TEIJSMANNIODENDEON

1. Leaves palmately compound.
 2. Petiole conspicuously winged or auricled at its base.
  S. Petiole winged entirely or for the greater part. . . . . 4. *T. pteropodum*
  3. Petiole auricled at the base. . . . . 4a. *T. pteropodum* var. *auriculatum*
 2. Petiole not winged or auricled.
  4. Lower leaf-surface inconspicuously pilose, glabrescent or glabrous.
   5. Stamens 4, didynamous.
    6. Flowers pale pink. Mature fruit 4—5 cm long, with thick exoearp. 3. *T. bogoriense*
    6. Flowers dark violet. Fruit 1—1.5 cm long, with thin exoearp. 1. *T. coriaceuin*
   5. Stamens 5, arranged in a whorl. . . . . 2. *T. ahernianum*
  4. Lower leaf-surface densely rusty tomentose. . . . . 5. *T. spec.*
1. Leaves unifoliolate.
 7. Lower leaf-surface with numerous tiny holes. . . . . 12. *T. hollrungii*
 7. Lower leaf-surface without holes.
  8. Primary nerves in 3, rarely in 4, pairs.
   9. Peduncles and branchlets slender. Flowers stalked. . . . . 7. *T. simplidfolium*
   9. Peduncles and branchlets thickish. Flowers sessile. . . . 6. *T. smilacifolium*
  8. Primary nerves in more than 4 pairs.
   10. Flowers sessile.
    11. Leaves rigid-coriaceous; base rounded; primary nerves in 7—10 pairs, spreading, sharply curved and more or less anastomosing along the margin. 9. *T. subspicatum*

11. Leaves thin-coriaceous; base acutish; primary nerves in 5—6 pairs, obliquely spreading, slightly curved, not anastomosing along the margin. 11. *T.novoguineense*

10. Flower pedicelled.

12. Young fruit-calyx urceolate, with reflexed teeth. Leaf-base rounded; young leaves pilose below. . . . . 8. *T. holophyllum*

12. Young fruit-calyx campanulate, with erect teeth. Leaf-base acutish, rarely somewhat obtuse; young leaves glabrous. . . . . 10. *T. sarawakanum*

3. NOTES ON THE SPECIES

Sect. I. **Plurifoliolatae** Kostermans, *sect. nov.*

(Species **1**—5)

Folia 3—5-foliolata.

TYPE SPECIES. — *Teijsmanniodendron bogoriense* Koord.

1. **Teijsmanniodendron coriaceum** (C. **B.** Clarke) Kostermans, *comb, nov.* — **Fig.** *2,* 3.

Vitex coriacea C. B. Clarke *in* Hook, f., Fl. Br. India 4: 586. 1885 (basinym of new combination); Gamble *in* King & Gamble *in* J. As. Soc Bengal 74: 846. 1909; Lam, Verben. Malayan Arch. 200. 1919; *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 58. 1921; Ridley, Fl. Malay Pen. 2: 632. 1923.

Vitex venosa H. J. Lam *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 61. 1921.

This species was described after the specimens of Griffith, Kew Distribution no. 6065, and Maingay, Kew Distribution no. 1203, from the Malay Peninsula.

Gamble gave an excellent description of it and indicated the fruit as having a thin pericarp and being apparently one-seeded. The specimens which he enumerated were all from **the** Malay Peninsula. Lam's description (1919) more or less agrees with that of Gamble, but the fruit is called a drupe here. He mentioned this species as occurring only in the Malay Peninsula (1921).

Ridley also called the fruit a drupe.

Although no original specimens of *Vitex coriacea* were at my disposal, the specimens from the Malay Peninsula enumerated below agree perfectly with Clarke's description.

Vitex venosa H. J. Lam was described after the specimen Grashoff 890, collected in Palembang (Sumatra). According to Lam's key, it could be distinguished from *V. coriacea* by the position of the inflorescence (axillary in *V. venosa,* terminal in *V. coriacea).* In other respects the respective descriptions only differ, as to minor details. In the specimen

FIG. 2. *Teijsmanniodendron coriaceum* (C. B. Clarke) Kost. — a, about natural size; b, articulation of follicles, × 2; c-e, seed f, fruit, × ⅔, g, inside of fruit, × ⅔. — Drawings made after Van der Zwaan s.n. = 172 T.8 P.529.

Van der Zwaan T.576, however, both kinds of inflorescences occur on the same branch. (These types of inflorescences might be indicated as penultimate and terminal.) I, therefore, consider *V. venosa* conspecific with *Teijsmanniodendron coriaceum.*

I had the opportunity of collecting *T. coriaceum* in Bangka. On the slopes of Mount Maras (altitude 50—400 m) it is a common tree of medium size. The bark is grey, slightly fissured, the wood pale brown, not very hard; buttresses are absent or hardly developed. In this locality it is very common, but the bole seldom exceeds 30 cm in diameter. On the Mangkol hills (altitude 200 m) near Pangkalpinang it is very rare. It does not occur in southern Bangka.

In Borneo I discovered it on the low, sandy hills at the sources of Sungai Wain, north of Balikpapan on Borneo's east coast. Here it grows under the same conditions as in Bangka. It is restricted to the upper part of the about 100 m high hills, where it is common, but avoids the lower, moister parts, as well as the valleys.

The flowers are dark blue-violet with a bright yellow, hairy spot on the inner side of the lower lip. The fruit is black when ripe, with a brittle, thin exocarp and a one-seeded cavity. The leaves are rigid and conspicuously reticulate on both surfaces; the three leaflets, with usually distinctly swollen articulations, are as a rule 5—10 cm long, although they may occasionally become up to 20 X 9 cm.

In young specimens (up to 1 m high), unifoliolate leaves are not uncommon.

The heartwood has a density varying between 0.73—0.87, it is rather durable (durability class II/III) and comparatively strong (strength-class II).

SPECIMENS EXAMINED. — MALAY PENINSULA. Kedah. Lower woods of Kedah Peak, alt. 150 m, June, fl., *Ridley 5555* (S). Penang. Penang Gardens, Sept., fr., *Symington S. F. 28013* (S); Government Hill: July, fr., *Curtis s.n.* (S), July, fl., *Nauen S. F. 3581*7, Haniff s.n.* (S); Government Hill Road, alt. 150 m, Sept., fr., fruits yellow or orange-salmon, *Burkill 3287* (S); Ayer Hitam, Sister's Bungalow, alt. 200 m, June, fl., *Haniff 3735* (Bg, S). Selangor. 19th mile Ginting-Simpah Road, June, fl., *Strugnell S. F. 11176* (S). Pahang. Temerloh, Dec, fr., *Hamid 5727* (S). Malacca. Ayer Panas, Aug., fr., fruits yellow, *Goodenough 1285* (S), July, fl., local name jali batu, *Holmberg 861* (S); Merlimau, June, fl., *Berry s.n.* (S). Johore. Bukit Bruang, fl., *Berry 1029* (S). Locality not indicated: *Wray s.n.* (S). — SUMATRA. Atjeh. Wassenar, alt. 80 m, clay soil, July, fl., *Batten-*

EXPLANATION OP FIGURE 3

FIG. 3. *Teijsmanniodendron coriaceum* (C. B. Clarke) Kosterm.: *a,* flowering branch, about natural size; 6, flower-bud, x 5; c and *d,* flower, X 6; *e* and /, stamens, X 30; *g,* calyx, x 6; *h,* ovary, x 6. — Drawings made after Grashoff 890.

Fig. 3

Pooll s.n. (S). Palembang. Lematang-hilir Subdivision: Gunungmegang, alt. 75 m, July, fl., tree 25 m high with bole of 35 cm in diameter, local name tindjau blukau, *van der Zwaan s.n. = T. ill,* Jan., fl., flowers purple, base of lower lip yellow inside, calyx pinkish brown, stigma pale purple, style purple, ovary cremeous, Febr., young fruits, March, fr., fruits black, all, *van der Zwaan s.n. = T.3 P. 529,* March, fr., seedlings, *van der Zwaan* s.n. = *172 T.3 P. 529,* April, fr., *van der Zwaan s.n. = T. 576;* Semangus, alt. 100 m, July, ster., tree 24 m high with clear bole of 9 m and 43 cm in diameter, local name kaju gading, *Versteegh & Noerkamal 308 = bb. 32232.* Banjuasin and Kubu Lands Subdivision: alt. 20 m, Dec, fl., flowers heliotropium-coloured, the scent not very agreeable, tree up to 18 m high, local name krindjing daun talang, *Grashoff 890 {type* of *Vitex venosa)* ; Bajunglentjir, 15 m alt., April, fl., tree 23 m high with clear bole of 12 m and 35 cm in diameter, local name kerintjing daun, *Dorst s.n. = 172 T.I P.706.* Musi-Hilir Subdivision: IpiL alt. 9 m, April, fl., fr., young fruits orange, tree about 23 m high with clear bole of about 16 m and 30 cm in diameter, local name kaju kfasak, *Verduyn Lunel 8 = T.B.1072.* — BANGKA. West Bangka. Batubalai near Muntok, ster., *Teysmann s.n.;* Aerlimaii, 25 m alt., March, ster., tree 20 m high with clear bole of 10 m and 50 cm in diameter, local name melabumbong, *Oetoei 76 = bb. 8060.* Sungailiat: ster., *Teysmann s.n.;* Mt. Maras, 200 m alt., Oct., fr., tree of 6 m, wood pale brown, *Kostermans & Anta 1337,* Oct., fl., *Kostermans & Anta 1350.* Central Bangka. Mt. Mangkol near Pangkalpinang, alt. 5 m, granitic sandy soil, rare, Sept., ster., *Kostermans 756.* — BORNEO. East Borneo. Balikpapan Subdivision: N of Balikpapan, upper part of low hills near sources of Sg. Wain, alt. 100 m, common, Oct., fr., *Kostermans 4411.*

2. TEIJSMANNIODENDRON AHERNIANUM (Merrill) Bakhuizen van den Brink

Vitex aherniana Merr. *in* Publ. Bur. Govt. Lab.,[1] Manila No. 6: 18. 1904; Lam, Verben. Malayan Arch. 206. 1919; Merr., Enum. Philipp. fl. PL 3: 394. 1923.— *Teijsmanniodendron ahernianum* (Merr.) Bakh. *in* J. Arnold Arb. 16: 74. 1935.

Xerocarpa avicenniaefoliola H. J. Lam, Verben. Malayan Arch. 99. 1919; White *in* J. Arnold Arb. 31: 113. 1950.

Vitex ourranii H. J. Lam, Verben. Malayan Arch. 207. 1919.

Vitex bogoriensis H. J. Lam *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 60. 1921.

Vitex bankae H. J. Lam *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 62. 1921.

• The species was based on a collection by Merrill (F.B. 1007) from Luzon, Philippines. It was stated to occur abundantly there. Its local name in Tagalog language is igang.

Lam's description of the species deviates in some (minor) details from the original one. He stated that the leaves are 3- (rarely 4-) foliate, whereas Merrill described them as 3—5-; mostly 5-, digitate. In the material at my disposal, the number of folioles varied between three and five, both numbers occurring about equally frequent and both kinds often represented on the same branch. Furthermore, Lam described the leaves as chartaceous. As far as I can see the smaller (younger) leaves are chartaceous, the larger ones coriaceous. The young leaves are pubescent on the lower surface; in older leaves this pubescence disappears completely (last on midrib). The upper leaf-surface may be either smooth or in some cases densely, but rather inconspicuously, areolate.

As in other species the size of the leaves is very variable. The dimensions given by Merrill are 5—7 X 2—2.5 cm, whereas those by Lam are 10—24 X 6—10 cm. Merrill described a small-leaved specimen. The largest leaves are found in the specimen Brass 3441 from the Solomon Islands (up to 30 X 13 cm). The length of the petiolule varies accordingly from 5 to 40 mm; that of the petiole from 3 to 9 cm. The number of lateral nerves varies from 8 to 15.

The discrepancy in the description of the pubescence of the flowers (densely fulvous-pubescent calyx, according to Merrill; sparsely pubescent and glandular, according to Lam) must be ascribed to the age of the flowers. The calyx becomes glabrous, especially in its upper half, after the corolla has dropped off.

Lam furnished a description of the flower; Merrill mentioned only its colour (purple). The fruit of this species was unknown to both authors.

Vitex curranii was correctly reduced to the synonymy of *V. aherniana* by Merril.[7] This species was based on the specimen Curran 17463 from Negros, Philippines.

The monotypic genus *Xerocarpa* H. J. Lam,[8] with *X. avicenniaefoliola* H. J. Lam, was described after Ledermann 9510, 9789, 9792, 10828, and 9667 from New Guinea. Its author included the genus in Teijsmanniodendreae because of its capsular, non-dehiscent fruit and* separated if from the only other genus of that group, *Teijsmanniodendron,* on account of the following features:

(i) Corolla-lobes narrow, four of which are nearly equal,
(ii) Five stamens, instead of four,
(iii) Inflorescence consisting of lax spikes. .

As to the corolla-lobes, in *Teijsmanniodendron bogoriense* the two lateral ones and the posterior one are also nearly equal. These lobes are ovate, but not so wide as pictured by Koorders.[9] Figures 6 and 10 of his plate 2 give a better impression of the size of the flower parts, which I could study in living condition. The character of the lobes should not be considered as being of generic importance.

[7] *In* Philipp. J. Sci. 20: 439. 1922; Enum. Philipp. fl. PI. 3: 394. 1923.
[8] Verben. Malayan Arch. 98. 1919; not *Xerocarpa* Spach Hist. nat. Veget. Phaner. 583. 1840 = *Scaevola* L. (Goodeniaceae).
[9] *In* Ann. Jard. bot. Buitenzorg- 19: *pi. 2 f.7.* 1904.

As to the five stamens, in several flowers of *T. ahernianum* I observed that sometimes only four stamens were present with no trace of the fifth one. These four or five stamens are almost equal in length and inserted alternately with the petals. As the number of stamens is not constant in several genera of Verbenaceae *(Petraea* Jacq., *Geunsia* Bl., *Callicarpa* L., etc.) and as they may be didynamous or subequal in *Premna* L., the number of stamens does not warrant the separation of *Xerocarpa* from *.Teijsmanniodendron.*

When comparing the original descriptions of *Vitex aherniana* with that of *X. avicenniaefoliola,* one will not discover any difference of importance but for the inflorescence, which is called a spike or panicle in *Xerocarpa* and a cyme in *V. aherniana.* The inflorescences in the abundant material before me represent panicles, consisting of reduced cymes of sessile flowers.

The description of the flowers of either species fits in perfectly, also as to dimensions and pubescence. The lower lip is indicated by Lam as flat; in my specimens it is hollow. The number of stamens in *V. aherniana* is not mentioned by Lam. Although I did not see the type of *X. avicenniaefoliola,* I am convinced that it is conspecific with *T. ahernianum.*

Vitex bankae was described after the specimens Teijsmarm *s.n.* and Grashoff 36, collected in Bangka. Its author pointed out its relation with *V. aherniana* (= *T. ahernianum),* from which it was said to differ in its smaller calyx and the usually solitary peduncles of the inflorescence in its the leaf-axils.

In the same paper *Vitex bogoriensis* was described after specimens collected from a tree (no. XI.H.37) growing in the Botanic Garden at Bogor (Buitenzorg), imported from Bangka.

About the differences between these two last mentioned species of *Vitex,* the author is rather vague (p. 61) ; according to the key the main difference should be the size of the terminal leaflet (10—31 X 4—13.5 cm in *V. bogoriensis* and 9.5—15.5 X 3—8 cm in *V. bankae)* and of its petiolule (1—4.7 cm in *V. bogoriensis* and 3—8.5 cm in V. *bankae).* It is already evident from these figures that it is impossible to separate the species in this way. The size of the leaflets is very variable (as in all other species of *Teijsmanniodendron),* and material collected from the original tree of *V. bogoriensis,* which is still alive, shov/s a variation in length of the terminal leaflets from 6 to 35 cm.

Minor differences stated by Lam are in the number of lateral nerves (10—16 in *V. bogoriensis* and 7—10 in *V. bankae)* and the pubescence of the branchlets (densely pilose in *V. bogoriensis,* glabrous in *V. bankae).*

Comparison of abundant material made it clear that these differences, too, are not convincing.

The number of flower-peduncles per leaf-axil cannot be used as a differential character either, in my opinion. According to Lam's own statement the peduncles should be paired in *V. bogoriensis* and solitary in *V. bankae,* but in the four specimens of *V. bankae* he had at hand, one already had two peduncles per axil.

The herbarium specimens of *V. bogoriensis* bear a note by Bakhuizen van den Brink, that he also considered it conspecific with *V. bankae.*

Curiously enough the flowers and fruit of *V. bogoriensis* were still unknown. All specimens had been collected after the corollas had dropped off. After observing the living tree in the Botanic Garden at Bogor during a period of several months, I was lucky to find some full-grown flowers. The corollas drop within 12 hours after the buds open. The flowers are dirty pale yellow, the tip of the petals is dirty pale violet, they are slightly concave with the hollow part below. The lip is cup-shaped with the hollow turned upward and distinctly unguiculate, its margin irregularly fringed ; it is thinner than the other petals and covers the stamens and pistillum until the last phase of anthesis. The five stamens are erect with stiff, rather thick, white filaments and black anthers. They are arranged in a whorl. The throat of the corolla is densely covered by long, white hairs. The pistil is white, slightly longer than the stamens with a short bifurcate pistil, the tips of which are curved outward and downward.

It may now be safely assumed that *V. bankae* and *V. bogoriensis* both belong to *T. ahernianum.* The only difference with the flowers of the other specimens of the latter species which I have been able to find, is in the pubescence of the corolla and the calyx. In the specimens from Bangka the calyx is more glabrous than that of specimens from elsewhere, whereas the corolla-lobes are glabrous; in typical *T. ahernianum* the four equal petals are appressed-pilose outside. The unopened corolla of the specimens from Bangka shows the same kind of hairs. The calyx is slightly smaller, but this depends on its maturity.

Teijsmanniodendron ahernianum is known thus far from the Philippines, Bangka, New Guinea, and the Solomon Islands. It is quite likely, that it has been collected already under a different name in intermediate regions.

According to Merrill the timber is very valuable, being exceedingly hard and taking an excellent finish. The sapwood is white, with a density of 0.47; the heartwood is blackish brown. The specimen, collected by myself in Bangka (Kostermans 706) had yellowish sapwood and rather

hard and very dark heartwood. The dead bark is very thin (less than 1 mm), greyish and smooth; the living bark is about 6 mm thick, pale brown in cross-section. Neither in Bangka, nor in Borneo, did the tree attain large dimensions. Trees with a bole of 30 cm diameter and more are an exception there.

SPECIMENS EXAMINED.-BANGKA: fl., *Teysmann s.n.* West Bangka. Mt. Menumbing, fl., *Teysmann s.n.;* Djebus, ster., local name kaju melak, *Teysmann* 8« North Bangka. Belinju, fl., *Teysmann s.n.* (toctotype fTMTM ^ 25 m, Oct., fl., tree 20-25 m high, local name melak, *Grashoff* *%~ jf fr *Merrill F.B.1007.* Luzon. Cagayan Province: May, fl., *Ponce F.B.2 2U37* Albay Province: June, ster., *Curran F.B.10571.* Leyte. Dagami Aug., ±1., *ft Ramos B.Sci. 15377.* Mindanao. Surigao, July, fl., *Foxworthy, Demeses & VUlwmil F.B.1327U & 13536.-OBI* I. (Moluccas). A. Kasina, alt. 100 m, Nov., ster tree 21 m high with clear bole of 16 m and 38 cm in diameter local name kaju tehe *de Haan 296 = bb. 23798.* - BIAK I.: Sept., ster., tree 20 m high with cleazbole ot 10 m and 40 cm in diameter, local name asiowarris (Bosnik language) *van Dyk53, = bb. 30726.* - NEW GUINEA. Netherlands New Guinea Hollandia Subdivision: hill N of Hollandia, alt. 50 m, July, fl., fr., tree.*22 u*i high with dear bote of 13 m and 33 cm in diameter, *Meyer Drees 150 = bb.* W - SOLOMON IS. Ysabel I.: Tataba, alt. 50 m, Jan., fl., flowers white, *Brass 3U1.* Guadalcanal I. Soivorhio Basin, alt. 200 m, Febr., fr., fruit purple-green when ripe, tree 50 [.] m high, local name seupa, *KajewsH 2715.* -CULTIVATED. Hortus Bogonensis *XI.H.37* (from Bangka, *type* of *Vitex bogoriensis).*

3. TEIJSMANNIODENDRON BOGORIENSE Koorders

Teijsmanniodendron bogoriense Koord. *in* Ann. Jard. bot. Burtenzorg 19: 20 1904- Pilg *in* Engl. & Pr., Nat. PflFam. Nachtr. Ill zu Teil. II-IV, ErganzHft 2. 308 A47 908; Hall. f. *in* Meded. Rijks-Herb. Leiden No. 37: 55. 1918; Lam, Verben Malayan Arch! 97. 1919; Bakh. *in* Lam & Bakh. *in* BuH Jard^bot. Buxtenzorg III 3: 29! 1921; Beer & Lam *in* Blumea 2: 228. 1936; Kaneh. & Hatus. m Bot. Mag., Tokyo 56: 115. 1942. 191g.

Vitex fldbeUiflora Hall. f. *in* Meded. Rijks-Herb. Leiden No. 3 K 50. 1918, Lam *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 58. 1921

Teijsmanniodendron glabrum Merr. *in* Univ. Calif. Publ. Bot. 15. 263. 18M».

This was the species of the genus *Teijsmanniodendron* described first- It was extensively treated by Koorders. Index Kewensis (Suppl. 1908) incorporated it at first in Araliaceae, later (Suppl. 1929) in Verbenaceae." A short description is given by Pilger in Engler & Prantl's "Die naturliche Pflanzen-familien." Hallier f. described a specimen from Borneo. Lam did not add new localities. Bakhuizen van den Brink, too, only mentioned Borneo. Merrill[10] reduced *Vitex merrillii* H. J. Lam" (type: Femx 1590b,

10 *In* Philipp. J. Sci., Bot. 11: 310. 1916.
11 Verben. Malayan Arch. 212. 1919.

Mindanao) to *V. longifolia* Merrill, transferring it at the same time to *Teijsmanniodendron* (actual combination not made) and stating that it might not be distinct from *T. bogoriense.* In his "Enumeration," however, Merrill[12] kept *T. longifolium* (Merr.) Merr. separate from *T. bogoriense.* I liad no access to the authentic specimen to form an opinion of myself in this matter. Beer & Lam enumerated as the localities known of *T. bogoriense:* Borneo, Ceram, Ambon, and New Guinea. Kanehira & Hatusima mentioned a specimen from New Guinea.

Teijsmanniodendron bogoriense was described originally from a couple of trees of unknown origin, growing in the Botanic Garden at Bogor (Buitenzorg). These trees have since disappeared, but have been replaced by two other ones, grown from seed derived from the original tree. They are in the prime of their growth nowadays (no. XI.G. 82) and bloom and fruit profusely. Additional collections of wild growing trees make it acceptable that the original material was imported from New Guinea, perhaps from Andai near Manokwari (Geelvink Bay), where Teysmann collected seeds and where the species is very common.

Vitex flabelliflora, described after the specimen Jaheri 1539 from Borneo, which specimen is represented in Herbarium Bogoriense, was reduced to *T. bogoriense* by Bakhuizen van den Brink (identification on herbarium labels). I agree with Bakhuizen van den Brink, that the two are conspecific.

Teijsmanniodendron glabrum was published and described after the specimens Elmer 21616 and 21320 (type) from Tawao, Colony of North Borneo. Merrill gave as differential characters as compared with *T. bogoriense,* the glabrous or neai'ly glabrous inflorescences and the smaller fruit. In the material, enumerated below, glabrous inflorescences are not uncommon (specimens from Celebes).

Merrill's specimens are rather small-leaved ones, such as are found also among the numerous other collections. Consequently Bakhuizen van den Brink reduced this species to the rank of a variety of *T. bogoriense,* as may be found indicated on herbarium labels in Herbarium Bogoriense. I myself am of the opinion that the difference in pubescense does not even has varietal merit and I suggest, therefore, to refer this species to *T. bogoriense* as a straight synonym.

Thus far the species has not been recorded from the Philippines. I strongly doubt, however, whether *T. longifolium* Merr. is a separate species. In case it is conspecific with *T. bogoriense,* the distribution of *T- bogoriense* completely covers the Central and Eastern parts of the

12 Enum. Philipp. fl. PI. 3: 398. 1923.

Malay Archipelago. It is unknown, too, from the Malay Peninsula, Sumatra and Bangka.

The trunk of *T. bogoriense* is either devoid of buttresses (on dry soil) or the latter are well-developed (in marshy soil: Borneo!). The dead bark is about 1 mm thick, greyish; the living bark is about 10 mm thick, white or yellowish. The sapwood is white to yellowish; it has a density of 0.46 on an average (between 0.49 and 0.43) ; the durability is low (class V) ; the strength little (class III). Heartwood is rarely present; it is dark yellow.

SPECIMENS EXAMINED:—BORNEO. Colony of North Borneo. Elphinstone Province, Tawao, fl., *Elmer 21320 {type* of *Teijsmanniodendron glabrum),* fr., *Elmer 21616;* Sandakan, fresh water swamp, July, fl., flowers whitish green, *Matusop B.N.B.F.S.7417* (S). Sarawak. IVth. Division: Mt. Dulit (Ulu Tinjar), near Long Kapa, alt. 800 m, Febr., fl., tree of 19 m, *Richards 2570.* West Borneo. Sg. Landak, ster., *Teysmann s.n.;* Liang Gagang, fr., *Hallier B.S0S2;* Sg. Talut, Penikem, fl., *Jaheri 15-39* (Exped. Nieuwenhuis; *type* of *Vitex flabelliflora).* South Borneo. Sampit Subdivision: Sg. Sampur, Terantang, Nov., fl., fr., flowers rose-red, fragrant, fruits green, tree 15 m high with clear bole of 12 m and 35 cm in diameter, local name saluang, *Ramlie 6 = bb. 139U.* Lower Dajak Subdivision: Kahajan, Muara Nusa, Febr., fl., flowers purplish white, fragrant, tree 5 m high and bole of 40 cm in diameter, local name gragai, *Sevieroe 17 = bb. 2105.* Puruktjau Subdivision: Muara Djaan, alt. 100 m, Oct., ster, tree 26 m high with clear bole of 18 m and 40 cm in diameter, local name bulunasu, *Atjil 85 = bb. 10504.* East Borneo. Beraii Subdivision: Betemuair, alt. 5 m, May, ster., tree with bole of 14 m high and 40 cm in diameter, local name manuk-manuk, *van der Zwaan 1085 - bb. 19044;* Longlanuk, alt. 100 m, April, ster., tree 24 m high with clear bole of 14 m and 42 cm in diameter, local name gading batu (gading — ivory; batu = stone), *van der Zwaan 772 = bb. 18518.* West Kutei Subdivision: Sg. Kelesan, Djembajan, alt. 6 m, June, ster., tree 30 m high with clear bole of 8 m and 75 cm in diameter, local name mara beliung, *Pankeij 41 = bb. 25135.* East Kutei Subdivision: Sangkulirang, Gunung Sungeitapianlobang, alt. 40 m, June, ster., tree 12 m high with clear bole of 10 m and 24 cm in diameter, local name langsat behuang, *Abdulhamid 70* = 66. .ZS5S0.— CELEBES. Gorontalo Subdivision: Tuloa, alt. 75 m, Febr., fr., fruits pale red, greenish red when older, fetid, bitter, tree 26 m high with clear bole of 15 m and 35 cm in diameter, local name polajopo, *Monoarfa 1 = bb. 13677.* Poso Subdivision: Poso, alt. 50 m, Dec, ster.. tree 26 m high with clear bole of 16 m and 48 cm in diameter, local name pongoli, *Laleno 39 = bb. 19434.* Makassar Subdivision: Pankadjene, fl, *Teysmann 11785 HB.* Masamba Subdivision: Kawanga, alt. 300 *m,* March, fr, tree 15 m high with clear bole of 7 m and 35 cm in diameter, *Tobing E264 = bb. 24197.* Malih buD-division: Malili R, alt. 0 m, Nov., fl, fr, flowers pale violet with blue lower Up, tree 10 m high, *Kjellberg 2746;* Kawata, Tolitoli, March, fl, local name .tompua molaba (molaba = white), *Waturanduny 323 = Cel/V-244,* alt. 200 m, fr., tre • 20 m high with clear bole of 8 m and 36 cm diameter, local name tompirapuw (puti = white), *Waturandang 260 = CeUV-244.* - CERAM. West Ceram Subdivision- West Nari alt 0—100 m, Febr, fl, flpwers white to blue-white, upper HP pale blue, tree 10 m high, *Rutten 2066;* West Kawa, alt. 0—100 m, Nov., fl, flowers blue-white, tree 10 m high, *Rutten 1898.* Wahai Subdivision: Ninama, between Pasahari and Kaloa, alt. 20 m, Dec, fl, flowers pale purple, tree 7 m high, *Komassi 743;* Roho, alt. 100—200 m, Nov., fl, flowers blue, tree 10 m high, *Komassi 497.*— AMBOINA. Hatu, Hatupotue, alt. 150 m, Dec, ster, tree 15 m high with clear bole of 7 m and 50 cm in diameter, local name gandarusa putih, *Huka 18 = bb. 14274.*— JAPEN. I: alt. 700 m, July, ster, tree 8 m high with clear bole of 4 m and 18 cm in diameter, local name kumang (Ambai language), *van Dijk 69 = bb. 30294,* alt. 350 m, Aug., ster, tree 13 m high with clear bole of 7 m and 20 cm in dameter, local name ampinoi (Ambai language), *van Dijk 277* = 66.*30498,* alt. 350 m, Aug., ster, tree 18 m high with clear bole of 12 m and 38 cm in diameter, same local name, *van Dijk 290* = 66. *30.111,* alt. 350 m, Aug., ster, tree 18 m high with clear bole of 12 m and 30 cm in diameter, local name ampinoi (Menawi language), *van Dijk 308* = 66. *30529,* alt. 350 m, Aug., ster, tree 17 m high with clear bole of 10 m and 30 cm in diameter, local name ampinoi (Ambai language), *van Dijk 314* = 66. *30535,* alt. 350 m, Aug., ster, tree 19 m high with clear bole of 12 m and 30 cm in diameter, local name wanu (Menawi language), *van Dijk 325 = bb. 30545,* alt. 250 m, Sept, ster, tree 16 m high with clear bole of 12 m and 27 cm in diameter, local name raenggapi, *van Dijk 464 = bb. 30662;* Mariattu, alt. 370 m, Aug., ster, tree 21 m high with clear bole of 14 m and 62 cm in diameter, local name pirok (Ambai language), *van Dijk 210 = bb. 30431;* Watibu, alt. 300 m, July, ster, tree 16 m high with clear bole of 7 m and 40 cm in diameter, local name aniai (Mentenbu language) or kauba (Ambai language), *van Dijk 11 = bb. 30237.* — BIAK I.: alt. 50 m, Sept, ster, tree 19 m high with clear bole of 13 m and 42 cm in diameter, local name keram (Bosnik language), *van Dijk 563 = bb. 30749.* — NEW GUINEA. Netherlands New Guinea. Manokwari Subdivision: Woosi, alt. 25 m, Sept, ster, tree 25 m high with clear bole of 10 m and 35 cm in diameter, local name insune (Nomfur language), *Tetelepta 21* = 66. *15905;* Momi, alt. 10 m, Aug., ster, tree 25 m high with clear bole of 15 m and 40 cm in diameter, local name kossijdzj (Manikiong language), *Kostermans 180* = 66. *33398,* alt. 10 m, Aug., fl, tree 23 m high with clear bole of 12 m and 40 cm in diameter, *Kostermans 215 = bb. 33423,* alt. 10 m, Aug., fl, tree 15 m high with clear bole of 5 m and 30 cm in diameter, *Kostermans 312 = bb. 33499;* Ransiki, alt. 10 m, July, ster, tree 22. m high with clear bole of 11 m and 40 cm in diameter, local name kesoi (Atam language), *Soehanda & Ilham 38 = bb. 33285;* Ransiki, Warsui, alt. 10 m, July, fr, tree 23 m high with clear bole of 16 m and 50 cm in diameter, local name besoh (Atam language), *Ilham* 6" = 66. *33255;* Warnapi, alt. 10 m, July, fr, tree 20 m high with clear bole of 8 m and 40 cm in diameter, *Kostermans 2724* = 66.*33671;* Sennen, 40 km inward of Nabire, alt. 300 m, May, fr, fruits reddish purple, tree 6 m high, *Kanehira & Hatnsima 12405.* Hollandia Subdivision: Oloefle Depapre, alt. 2 m, Nov., ster, tree 14 m high with clear bole of 4 m and 46 cm in diameter, local name kamadin (Depapre °f Tanahmerah dialect), *Malessy 1 = bb. 14560;* Mamberamo region, Pionier-bivak, alt. 30 m, Oct., ster, tree 20 m high with clear bole of 12 m and 40 cm in diameter, Wai name kotar (Kaowerawetj language), *van Eechoud 10 = bb. 31074,* alt. 30 m, Nov., ster, tree 20 m high with clear bole of 8 m and 35 cm in diamete-r, local name ᵉtak (Kaowerawetj language), *van Eechoud 63 — bb. 31125.* Australian New Guinea. Papua, Central Division, Dieni, Onongo Road, alt. 500 m, Apr.—May, fl, tree 30 m high with grey lenticellate bark, peduncles, pedicels and calyx whitish,

corolla violet, *Brass 3837;* Borabere, alt. 200 m, Nov., fl., tree 14 m high, local name wena dahita, Brass *723.* — CULTIVATED. Hortus Bogoriensis, Oct., fl., Jan., fl., *XI.G.S2,* fl., *Koorders 427 54 j)* (collected from daughter trees of 78 & 78a, the *type).*

4. TEIJSMANNIODENDRON PTEROPODUM (Miquel) Bakhuizen van den Brink

Vitex pteropoda Miq., Fl. Ind. Bat., Suppl. • Sumatra 242 & 567. 1862; Gamble *in* King & Gamble *in* J. As. Soc. Bengal 74: 851. 1909; Lam, Verben. Malayan Arch. 170. 1919; Ridley, Fl. Mai. Pen. 2: 633. 1923. — *Teijsmanniodendron pteropodum* (Miq.) Bakh. *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 29. 1921; Merr., Enum. Philipp. fl. PL 3: 398. 1923; *in* Univ. Calif. Publ. Bot, 15: 262. 1929..

Vitex philippinensis Merr. *in* BUT. Forestry, Manila, Bull. 1: 52. 1903.

Vitex peralata King *in* Kew Bull. 1908: 112.

Vitex koordersii H. J. Lam *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 64. 1921.

Vitex pteropoda was rather superficially described after specimens collected in Sumatra (Palembang, on Dangku Lematang, local name sepungang, Teijsmann *s.n.).* Gamble mentioned some specimens from the Malay Peninsula. He called the fruit a drupe.

Lam accepted the species and expressed as his opinion that *Vitex peralata* (original specimens Wray 2029, 2254, and 2305 from Perak, King's collector 2064, 6187, 6874, and 8299, from Larut) might be conspecific with it, but as Lam had no access to these specimens, a difinite conclusion in this matter was postponed.

Bakhuizen van den Brink transferred the species to *Teijsmanniodendron.* adding as synonyms *Vitex peralata* and *V. philippinensis* (type.: F.S. 387, Mindanao, Zamboanga Province, Taganaan, March, flowering, local name buli-cahoy) and giving an extensive description. The combination under *Teijsmanniodendron* was accepted by Merrill (1923), together with the synonyms enumerated by Bakhuizen van den Brink.

Ridley, apparently unaware of this transfer, still retained the name *Vitex pteropoda* and copied *verbatim* its differences with *Vitex peralata* from Gamble's publication.

Merrill (1929) cited a specimen from the Philippines. The distribution of this species consequently covers now the Philippines, the Malay Peninsula, Borneo, Sumatra, and Bangka.

Vitex koordersii was described after the specimens Jaheri *s.n.* from Borneo, Buurman van Vrede 158, and Koorders 10483 (Expedition LJzerman) from Sumatra. These specimens are all sterile and differ from *T. pteropodum* in their very narrowly lanceolate, sometimes almost linear leaflets. As • is evident from the accompanying labels, they have been collected from young trees and, accordingly represent, in my opinion, only youthforms of *T. pteropodum.* A note on the sheet of the type of

Vitex koordersii by Bakhuizen van den Brink indicates that he was of the same opinion. A specimen (Ridley 6752a) from Singapore is more or less intermediate, whereas the specimen Corner *s.n.,* from Bukit Kajang, Kemaman, collected from a shrub 1 m high, is exactly like the original, specimens of *V. koordersii.*

Teijsmanniodendron pteropodum is cultivated in the Botanic Garden, Bogor (no. XI.K.9). Dissection of the living fruit revealed that they are built along the same principle as those of *T. bogoriense* Koord. The jelly-like, clear substance which fills the central part of the cotyledons in early stages, disappears later than in *T. bogoriense.* In the latter it has disappeared in a fruit of 4 cm long, in *T. pteropodum* it was found to be still present in a fruit of 5 cm length. The fruit is deeply furrowed outside. The flowers are pale blue-violet, almost white, the lower lip, however, being darker with yellow base inside. The anthers are dark violet.

The wood contains particles (called ma-ing in Borneo) which cause itching and skin eruptions. For this reason the wood is not cut.

The trees usually have large buttresses which continue upwards as ridges on the bole.

The dead bark is grey, smooth, and very thin; the living bark may be up to 15 mm thick, and is yellow and often has a disagreeable smell. The sapwood is yellow, gradually merging into the dark yellow heartwood; the density of the sapwood varies from 0.55 to 0.37 (on an average 0.48); it is not strong (class III/IV) and not durable (class V).

SPECIMENS EXAMINED. — MALA*Y PENINSULA. Kedah. Sg. Terap, Selama, low alt., May, fr., *Henderson S.F. 35439* (Bg, S). Penang. Ayer Hitam, May, fr., *Ridley 258O'-(S),* Trengganu. Kemaman, Bukit Kajang, Nov., ster., *Corner s.n.* (S). Pahang. Kota Tongkat, July, fl., *Evans S.F.13173* (S). Johore. Sg. Tebrau, Aug., fl., flowers blue, *Ridley S.F. 13493* (S); 2nd. mile, Kota Ting'gi-Mawai road, April, fl., *Corner S.F.32771;* Sg. Sedili, low alt., Aug., fr., *Comer S.F.2-1980* (S), July, fl., *Corner s.n.* (S). Singapore. Chua Chakang-, ster., *Ridley 6752a* (S). P. Damar: fr., *Max 6752* (S). Locality not indicated: *Cantley's collector 2092* (S). — P. SIMEULUfi (P. Simalur) : March, fl., flowers white with pale blue spot, bole 13 m high, local name tjempana, *Achmad 1013,* April, fl., fr., fruit green, bole 14 m high, local name tjempana pajo, *Achmad 10.74;* Tapah, Dec, fl., flowers pale blue, bole 17 m high, local name sipanuh-pajo, *Achmad 1545,* Febr., fl., flowers pale blue with brown spot, bole 15 m high, local name sipanuh-alafai, *Achmad 1702.* — SUMATRA. Atjeh. Singkil Subdivision: near Semardua, alt. 50 m, Sept., ster., tree 20 m high with clear bole of 12 m and 42 cm in diameter, *Thabranie 74 = bb. 12809.* East coast. Asahan Subdivision: Tandjongpasir, fl., *Yates 2553.* Tapanuli. Sibolga Subdivision: near Barussambung, alt. 0 m, Nov., ster., tree 30 m high with clear bole of 10 m and 54 cm in diameter, local name djandjung bukit (Toba-Batak language), *de Haan 881 = bb. 29567.* Bengkalis. Kampar R., Langgam, March, ster., *Koorders 1048 p* (Exp. IJzerman) ; Rawang

Sigati, local name punggung, ster., *Koorders 10483 ft* (Exp. IJzerman). Inderagiri. Upper Inderagiri Subdivision: near Muaraserangge, alt. 75 m, Sept., ster., tree 30 m high with clear bole of 20 m and 48 cm in diameter, local name tanggunan, *Buwalda 648 = bb. 30056.* P. alembang: Febr., fl., fr., *Endert E.828;* Menduduan forest, Febr., ster., *Buurman van Vrede s.n. (type* of *Vitex koordersii).* Lematang-hilir Subdivision: near Gunungmegang, alt. 75 m, Nov., ster., tree 24 m high with clear bole of 12 m and 61 cm in diameter, local name sepunggung, *van der Zwaan s.n. = T. 3 P. 825;* Lematang R., Dangku, ster., local name sepungang, *Teysmann 3680 HB.* Banjuasin & Kubu Lands Subdivision: near Bajunglentjir, alt. 15 m, June, fl., flowers purple, tree 27 m high with 17 m clear bole and 57 cm in diameter, *Dorst s.n. = T.I P.728.* — PHILIPPINES. Leyte. Palo, Jan., fl., *Elmer 7096.* Mindanao. District of Davao, Aug., fr., *Fenix B.S. 1326.* Surigao Province: Aug., fl., *Wenzel 3163;* Mt. Cantugas, March, fl., *Ramos & Convocar B.S.83466.*— BORNEO. Colony of North Borneo. Elphinstone Province, Tawao, fl., *Elmer 2169$* (Bg, S); Mt. Kinabalu, Koang, alt, 500 m. May, fl., *Carr S.F. 24-256* (S). East Borneo. West Kutai Subdivision: L. Petak, alt. 450 m, Oct., fl., tree 18—20 m high and 35—60 cm in diameter, *Endert U717,* Nov., ster., *Endert 3333.* Locality not indicated: ster., *Jaheri s.n. (syntype* of *Vitex koordersii),* fl., *Beccari 429.* — CULTIVATED. Hortus Bogoriensis, Apr. & Oct., fl., *XI.K. 9.*

Var. auriculatum Kostermans, *var. nov.*

Ab varietatis typica petiolo basi auriculato differt.

TYPE.—Abdulhamid 47. = bb.12563.

In Herbarium Bogoriense there are some specimens from Borneo bearing the manuscript name *Teijsmanniodendron auriculatum* Bakh. The leaves of these specimens, which are all sterile, differ from *T. pteropodum* in the small wings (auricles) at the base of the petioles. In the specimen bb. 14752 these auricles are even absent. In other respects the leaves are not different from those of *T. pteropodum.* As in the latter species the dimensions of the wings of the petiole vary considerably (in the specimen Corner S.F. 32771, the wing reaches only half way the petiole) and in the specimens mentioned below, traces of the remainder of the wings are sometimes found as small ridges along the petiole, or as narrow winglets near the top of the petiole, I do not dare to describe these specimens as representing a new species, but will call them by the above name, until supplementary material becomes available.

SPECIMENS EXAMINED. — BORNEO. East Borneo. Beraii Subdivision: Betemuair, alt. 50 m, May, ster., tree 25 m high with clear bole of 19 m and 45 em in diameter, local name rarak gunung, *van der Zwaan 954 = bb. 18932,* ster., tree 20 m high with clear bole of 12 m and 40 cm in diameter, local name lapak gari, *van der Zwaan-961 = bb. 18939;* Longlanuh, alt. 300 m, April, ster., tree 17 m high with clear bole of 13 m and 40 cm in diameter, *van der Zwaan 810 = bb.18550.* East-Kutei Subdivision: Sangkulirang, Gunung Sungeitapianlobang, alt. 30 m, June, ster., tree 12 m high with clear bole of 10 m and 35 cm in diameter, local name kaju gedang

(Bassap-Dyak language), *Abdulhamid 47 = bb.12563;* Manubar, Takat, alt. 15 m Nov., ster., tree 22 m high with clear bole of 18 m and 45 cm in diameter, local name ingkuh-ingkuh, *Abdulhamid 115 = bb. 14752.*

5. TEIJSMANNIODENDRON SPECIES

Folioles obovate-oblong, 8—9 cm long-, 3—10 cm wide, thinly coriaceous with obtusely and shortly acute apex and acute or cuneate base; upper surface glabrous except midrib, smooth, dull grey in dried condition, the midrib slightly impressed, the lateral nerves hardly visible; lower surface densely rusty-pilose, the midrib strongly prominent, the 4—7 pairs of lateral nerves arcuate, prominent; secondary veins rather few, laxly reticulate; veinlets slightly visible, densely reticulaie. Petiolule carinate above. Flowers and fruits unknown.

The dead bark is smooth, grey, 0,5 mm thick; the living bark is 7 mm thick, light yellow in cross-section. The sapwood is white, heartwood is lacking.

Differs from the other species of this section in the dense rusty tomentum of the lower leaf-surface. To my belief it represents **a** new species. Without flowers or fruit being available I refrain, however, from describing it formally. The articulations are very conspicuous.

SPECIMENS EXAMINED. — BORNEO. South Borneo. Puruktjaii Subdivision: near Matara Djaan, 100 m alt., Oct., ster., rare, local name kohokontak (Siengmurung-Dyak language), *Lot Obi 75 = bb. 10495.*

Sect. II. Unifoliolatae Kostermans, *sect. nov.*
(Species 6—13)

Folia 1-foliolata.

TYPE SPECIES. — *Teijsmanniodendron hollrungii* (Warb.) Kosterm.

6. **Teijsmanniodendron smilacifolium** (H. H. W. Pearson) Kostermans, *comb. nov.*

Vitex smilacifolia H. H. W. Pearson *in* Kew Bull. 1907: 159 (basinym of new combination); Lam, Verben. Malayan Arch. 175. 1919.

This species was described after the specimens Beccari 1097 and 1137 from Borneo.

Lam gave a description based on the specimen Hallier B. 219 from Borneo, cited below, it is the only specimen of this species present in Herbarium Bogoriense. The species is very close to *T. simplicif olium* Merr., from which it differs mainly in its larger leaves, the stout inflorescences, and the pedicelled flowers. It is quite possible that it represents only a luxuriously developed specimen of *T. simplicifolium.* Merrill[13] al~

[13] *In* Univ. Calif. Publ. Bot. 15: 264. 1929.

ready pointed out that, but for the fruit, the latter species would bey out in the group with *Vitex smilacifolia.*

SPECIMEN EXAMINED. — BORNEO. West Borneo. Kapuas R., above Sukalanting, Sept., fl., flowers pale blue, *Hallier B.219.*

7. TEIJSMANNIODENDRON SIMPLICIFOLIUM Merrill

Teijsmanniodendron simplicifolium Merr. *in* Univ. Calif. Publ. Bot. 15: 263. 1929.

Merrill described this species after the specimens Elmer 21837 (type) and 21618 from Borneo, stating that it was the first *Teijsmanniodendron* with unifoliolate leaves and that but for the fruit characters he would have placed it among the simple-leaved species of *Vitex* in the group with *Vitex smilacifolia* H. H. W. Pears.

This species is close to *T. smilacifolium* (H. H. W. Pears.) Kosterm. and to *T. holophyllum* (Bak.) Kosterm. From the latter it may be easily separated by its few (three, rarely four) pairs of lateral nerves and its slender inflorescences, the tiny broadly campanulate (not urceolate) calyces with erect teeth, and the almost sessile flowers. The flowers and young branchlets are glabrous. From *T. smilacifolium* it differs in its sessile flowers and more slender inflorescences. In the shape of the calyx it agrees with *T. subspicatum* (Hall, f.) Kosterm., which also has sessile flowers and erect calyx-teeth; the branchlets are also glabrous in the latter species. The shape of the leaf, however, is different, the base in *T. subspicatum* being rounded, not acute, the lateral nerves more numerous. Moreover, the inflorescences are not slender and the flowers slightly larger.

The bole has small or large buttresses; its bark is rather smooth and greyish; the sapwood is about 2 cm thick and of almost the same colour as the brownish yellow heartwood (Endert).

The very fragrant flowers are pale yellow or white; the lower lip has a dark yellow spot at the base inside; the tube has blue-purple longitudinal stripes; the calyx is yellow; the anthers are dark purple (Endert).

NOTE.—Two specimens (bb. 11204 and bb. 19034), collected in East Borneo, Beraii Subdivision, near Salimbatu and Betemuan respectively, differ from *T. simplicifolium* in the densely ferrugineous-hirsute pubescence of the petioles and the apical part of the branchlets. As no flowers or fruits are available and the plant is very close to *T. simplicifolium,* these specimens, although perhaps representing a new species, are not described here more fully.

SPECIMENS EXAMINED. — SUMATRA. Inderagiri. Upper Inderagiri Subdivision: near Keritang, alt. 40 m, July, ster., tree 19 m high with clear bole of 9 m and 35 cm in diameter, local name anggal, *Buwalda U31 = bb. 2865k.* — BORNEO. Colony of North Borneo. Elphinstone Province, Tawao, fl., *Elmer SI618 & 21837 {type).* Sarawak. IVth Division: Mt. Dulit (Ulu Tinjar), near Long Kapa, alt. 600 m, Feb., fl., corolla white, yellow spot on lip, fragrant, local name ubah sirih, *Richards 2568.* West Borneo. Tajan Subdivision: near Sg. Tebede, June, ster., tree 16 m high with clear bole of 11 m and 25 cm in diameter, local name butun, *Frijd 19 =: bb. 1356k.* East Borneo. Bulungan Subdivision: Sg. Bengalun, near Kabinsaran, alt. 150 m, July, ster., tree 22 m high with clear bole of 14 m and 40 cm in diameter, local name kaju gading, *van der Zwaan S19 = bb. 1167k.* West Kutei Subdivision: near Petak, alt. 700 m, rare tree, 18 m high and deeply furrowed trunk 40 cm in diameter, highly buttressed, Sept., fl., *Endert 3287;* near Keuwul, alt. 1200 m, tree 8 m high, Sept., fl., *Endert 3625.*

8. **Teijsmanniodendron holophyllum** (Baker) Kostermans, *jsomb. nov.* — Fig. 4.

Vitex holophylla Bak. *in* Kew Bull. 1896: 25 (basinym of new combination); Gamble *in* King & Gamble *in* J. As. Soc. Bengal 74: 844. 1909; Lam, Verben. Malayan Arch. 176. 1919.

This species was described after the specimens Greagh *s.n,* and Hugh Low *s.n.* from Sandakan, Borneo. Gamble enumerated in addition Ridley 4031 from Johore and Beccari 1111 from Sarawak.

Vitex holophylla was originally maintained by Lam with the distribution Johore (Malay Peninsula) and Borneo, but later on he incorporated it in *V.hollrungii* Warb., although with some doubt.[14]

None of the original specimens have been at my disposal. Clarke's description deviates slightly from the specimens examined in the branchlets which should be glabrous. This condition is represented in a specimen from Borneo (Jaheri *s.n.),* whereas in the specimen Henderson S.F. 20408 they are slightly pubescent and in the specimen Lake and Kelsall S.F. 4031, both from the Malay Peninsula, they are conspicuously hirsute. The same may be said about the hairiness of the lower leaf-surface. In the specimen Henderson S.F. 20408 only the young leaves bear a tomenturn, the older ones are completely glabrous. Usually the leaves are slightly bullate.

The sterile specimen bb. 12144 from Borneo has the same leaves and tomentum as the specimen Lake & Kelsall S. F. 4031 from the Malay Peninsula. The inflorescences of the flowering specimens, although varying considerably in size, have the same appearance; as a rule they possess two lateral and almost opposite, spreading branches near the basal part

[14] Lam *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 52. 1921.

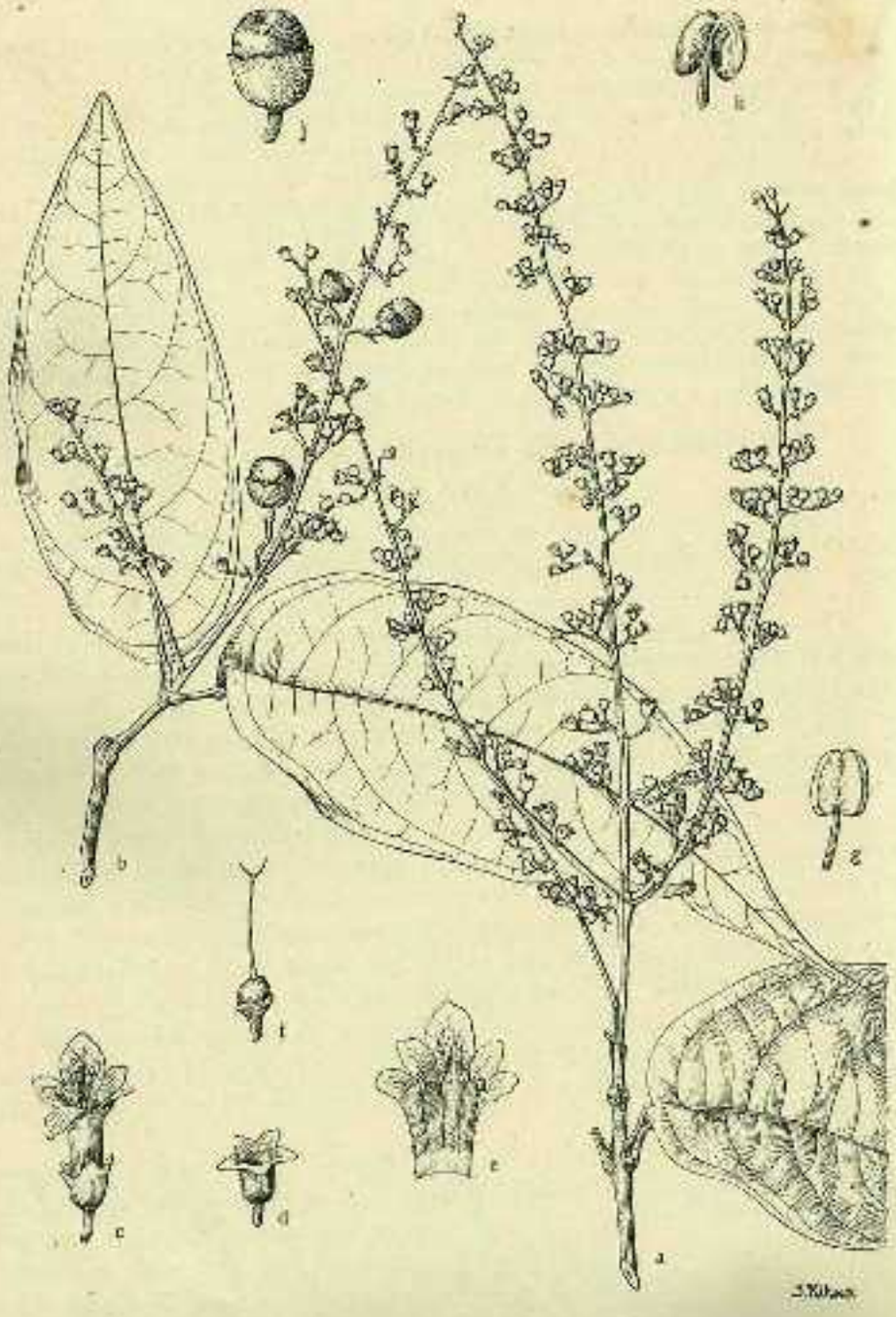

FIG. 4

of the peduncle. In the specimen from the Malay Peninsula they are hirsute, in the specimen from Borneo, collected by Jaheri, they are almost glabrous; in the other specimens cited, the pilosity is intermediate between the two mentioned above.

The petioles may differ considerably in size in the same specimen (2—6 cm).

SPECIMENS EXAMINED. — MALAY PENINSULA. Johore. Sg. Kahang, fl., *Lake & Kelsall S.F. 4031* (S). ANAMBAS IS. P. Djemada: above Letang, alt. 70 m, April, fl., shrub in secondary growth, *Henderson SJF. 20408.*— BORNEO. East Borneo. Beraii Subdivision: Inaran, alt. 100 m, Oct., ster., tree 25 m high with clear bole of 19 m and 43 cm in diameter, *van der Zwaan 609 — bb. 12144* (perhaps not typical). Locality not indicated: f 1., *Jaheri s.n.*

d. **Teijsmanniodendron subspicatunt** (Hallier f.) Kostermans, *comb. nov.*

Vitex subspicata Hall. f. *in* Meded. Rijks-Herb. Leiden No. 37: 52. 1918 (basionym of new combination) ; Lam, Verben. Malayan Arch.. 177. 1919.

This species was described after the specimens Forbes 3204, from ifSumatra, Hallier B. 1064 & B. 1122 from Sambas R, Borneo, and Korthals *s.n.* from southern Borneo. No type specimen was designated. I select Hallier B. 1064 as such.

Hallier stated the differential characters of this species and its closest relation *Vitex* (= *Teijsmanniodendron) hollrungii* Warb., as follows: "foliorum articulatione valde tumida, nervis subtus valde prominentibus internerviisque subbullatis, paniculae ramis subspicatis." These characters are indeed insufficient to separate the two species and consequently Lam separated them on the strength of the difference in the size of the fruit (see his key, p. 166). Afterwards he included *Vitex subspicata* in *V. hollrungii,* although hesitatingly.[15] He stressed the more gradually acuminate apex of the leaves in *V. subspicata.*

The specimens, cited below, differ from *T. hollrungii* (Warb.) kosterm. in the glabrous, or almost glabrous, inflorescences, and in the presence of the numerous tiny holes (glands) on the lower leaf-surface. I consider the latter character, which characterises *T. hollrungii,* of sufficient importance to keep *T. subspicatum* as a distinct species. The species comes very close to *T. sarawakanum* (Bak.) Kosterm. The scanty

[15] Lam *in* Lam & Bakh. *in* Bull. Jard. bot. Buitenzorg III 3: 52. 1921.

EXPLANATION OP FIGURE 4

PIG. 4. *Teijsmanniodendron holophyllum* (Bak.) Kosterm.: *a,* flowering branch, x 0.6; *b,* fruiting branch, X 0.6; c, flower, x 2.6; *d,* calyx after anthesis, x 1.8; *e,* inside of corolla, X 2.6; /, ovary, x 2.6; *g* and *h,* anther, x 2.6; *j,* ripe fruit, about natural ,size. — Drawings made after Jaheri *s.n.* from Borneo.

material is not sufficient to decide conclusively whether these two are perhaps conspecific.

The flowers have blue or pale bluish purple corolla lobes (darker inside) ; the lower lip has a yellow band with white hairs; tube and calyx are dark red-purple; style and filaments are white, pale blue at the base; the anthers are almost black.

SPECIMENS EXAMINED. — SUMATRA. Locality not indicated: fr., *Forbes 3204* (S). — BORNEO. West Borneo. Sg. Sambas, Nov., fl., *Hallier B.1064 (lectotype)* ; Terussan between Sg. Sambas and Lesser Sg\ Sambas, *Hallier B. 1122.* East Borneo. West Kutei Subdivision: near Hoet, alt. 130—150 m, rather common, small tree, Aug., fl., *Endert 2819,* Aug., fl., fr., *Endert 2529,* Nov., fl., fr., *Endert 4746.*

10. Teijsmanniodendron sarawakanum (H. H. W. Pearson) Kostermans, *comb. nov.* — Fig. 5.

Vitex sarawakana H. H. W. Pears, *in* Kew Bull. **1907**: 60 (basinym of new combination).

Vitex tetragona Hall. f. *in* Meded. Rijks-Herb. Leiden No. 37: 53. 1918; **Lam,** Verben. Malayan Arch. 202. 1919.

Vitex sarawakana was described after the specimens Beccari 2280, 2506, and 2851 from Sarawak, Borneo. None of them were examined by me. A sterile branch (Clemens 21826) collected in Sarawak, fits in with Pearson's description but for the larger leaves; this difference may be ascribed to the fact, that the specimen was collected from a young tree.

In comparing Pearson's description with the diagnosis of *Vitex tetragona* and with the material of the latter species (the type of which is represented in Herbarium Bogoriense), I could not find sufficient differential characters to keep the two species separate. The leaf-base of *V. sarawakana* is indicated as rotundate or subcuneate, whereas in the specimens examined the bases are as a rule acute. Hallier's species was described after the specimen Amdjah 955 from Borneo. According to Hallier it comes close to *V. subspicata,* differing by thinner and shorter, tetragonous branchlets, smaller leaves, and alternating axillary panicles. Lam, who put much stress on the position of the inflorescences in *Vitex* put *V. tetragona* in the subsection *Axillares* Briq. whereas *V. subspicata* was incorporated in the subsection *Terminates* Briq. and keyed them out accordingly.

EXPLANATION OP FIGURE 5

PIG. 5. *Teijsmanniodendron sarawakanum* (H. H. W. Pears.) Kosterm.: *a,* flowering branch, about natural size; *b,* top of leaf, about natural size; c, flower, x 7; *cl.* inside of flower, x 7; *e,* stamens, X 30; /, fruit, X 2. — Drawings made after **Amdjah 955.**

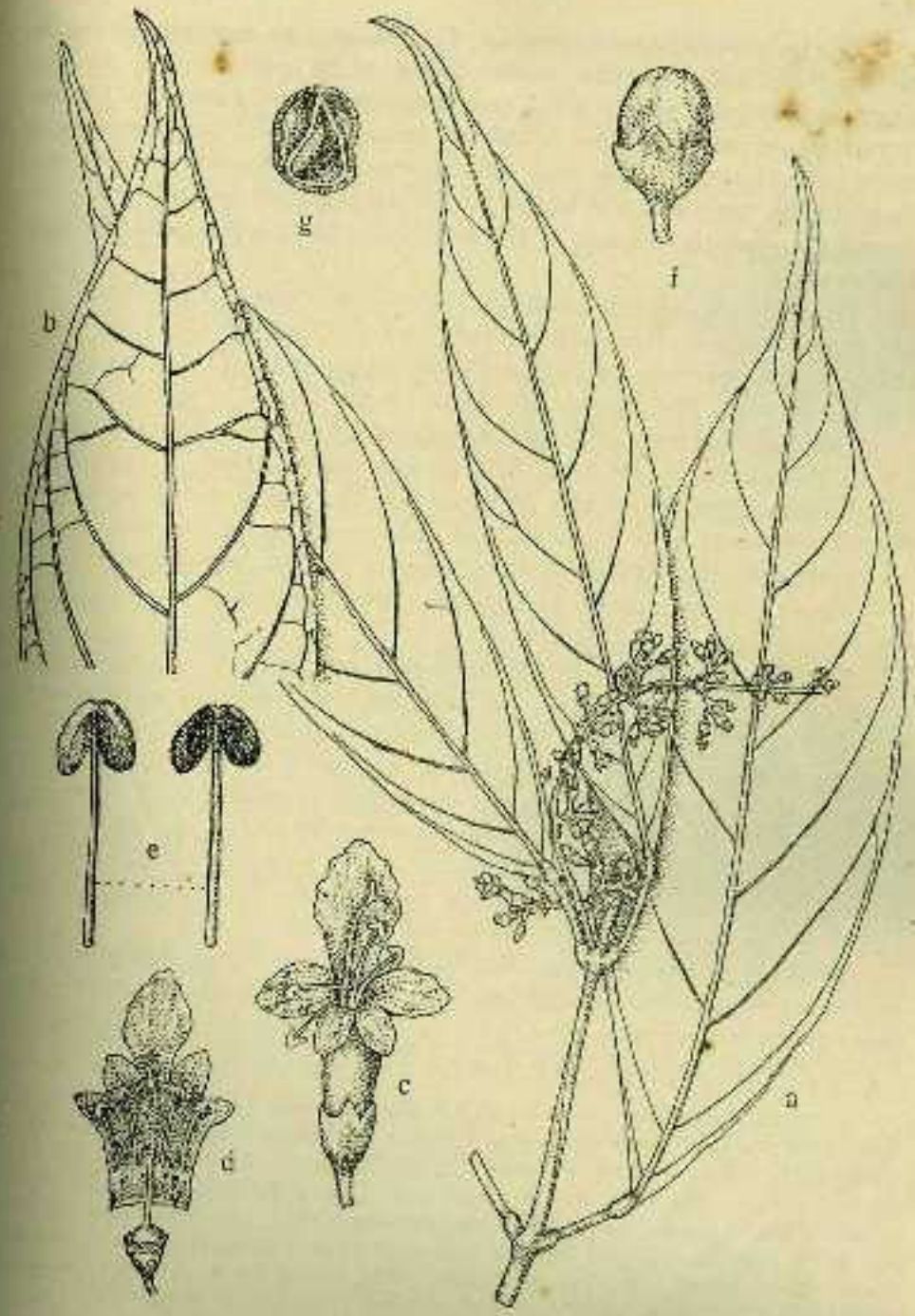

FIG. 5

The type already mentioned of *V. tetragona,* as represented in Herbarium Bogoriense, has the smallest leaves of all specimens (up to 19 cm long). It has very poorly developed penultimate inflorescences (up to 5 cm). The specimen Clemens 21825 has leaves up to 29 cm long with the same characteristic, very long and gradually narrowed acumen as is found in the type. The number of lateral nerves, their position, the intramarginal nerve, the texture of the leaves and their shape, exactly match Hallier's type.

The inflorescences are better developed in Clemens' specimen; they are terminal (up to five) and lateral (one) per axil, usually very shortly branched, and narrow, up to 15 cm long, glabrous except for the pedicels and the flowers. The flowers are up to 10 mm long.

The specimen Beumee A. 494 from Sumatra has undeveloped penultimate inflorescences, 6 cm long. The flowers match those of the type of *V. tetragona.* The leaves are up to 42 cm long, with up to 14 pairs of lateral nerves; In some leaves the intramarginal vein is very conspicuous.

Although there are slight differences in the number of lateral nerves and the size of the leaves, all the specimens mentioned above belong to the same species in my opinion.

The specimen Daud & Tachun 36053 has fully developed inflorescences, which may be up to 17 cm long; the peduncles and the branchlets are slender and broadened and flattened conspicuously at the ramifications. The shape of the calyx and the indumentum do not differ from those of the type of *V. tetragona.* The leaves possess strongly developed articulations; the upper nerves are connected by loops. The ripe calyx is 8 mm high and up to 12 mm in diameter, its margin is entire (Daud & Tachun 36068). The fruit is almost globular, up to 18 m in diameter (Daud & Tachun 35638) and one-seeded by abortion.

A specimen from Cochinchina, from a region quite outside the distribution-area of the other specimens, has leaves which are smoother than those of the typical ones. As I could find no differences in other respects, I provisionally, accept it as belonging to this species.

SPECIMENS EXAMINED.— ?INDOCHINA. South Cochinchina: Mt. Dinh at Baria, March, 11., fr., local name cam-tao or kum-tao (Annamite language), *Pierre 37.* —• SUMATRA. East Coast. Langkat Divison: Serangan R., alt. 100 m, April, fl.> *Beumee AiW.*— BORNEO. Sarawak. Upper Rejang R., Gat, small tree, flowers purple, juvenile, *Clemens 21825 & 21826;* Sg. Sama, Aug., fl., flowers green, *Daud & Tachun 36052* (S) ; Nanga Pelagos, July, young fruit, *Daud & Tachun 35638* (S); Sg. Senyarek, Aug., fr., *Daud & Tachun 36068* (S). East Borneo. Bulungan Subdivision: Pembeliangan, Nov., in bud, *Amdjah 955 (type of V. tetragona).*

11. Teijsmanniodendron novoguineense (Kanehira & Hatusima) Kostermans, *comb. nov.*

Vitex novoguineensis Kaneh. & Hat. *in* Bot. Mag., Tokyo 56: 116 /. *8.* 1942 (basinym of new combination).

Vitex novoguineensis was described after the specimen Kanehira & Hatusima 12578 from New Guinea and cited below. The species is very close to *T. hollrungii* (Warb.) Kosterm., but can easily be distinguished from the latter by the absence of the numerous holes (glands) of the lower leaf-surface and by the fewer lateral nerves. In addition, the leaves are less rigid.

On the duplicate of the type, deposited in Herbarium Bogoriense, Hatusima already made a note in 1943, that *V. novoguineensis* belongs to the genus *Teijsmam.niodendron.* Although the fruit is still unknown, the close resemblance of this species to *T. subspicatum* (Hall, f.) Kosterm. and *T. hollrungii* leaves, in my opinion, little doubt that it properly belongs in the present genus.

The species seems to be rather rare, as, besides the type, I found only one other specimen in Herbarium Bogoriense (Thomson *s.n.).* It differs from the type in its larger, paniculate inflorescence (20—30 cm) which is densely tomentose (more laxly so on the peduncles), and the larger flowers. I consider it, however, conspecific, as the leaves are identical and the type has a poorly developed inflorescence, which even shows the same pubescence in some parts; calyx and corolla are of the same shape, the ovary in both species has the same indumentum.

*

SPECIMENS EXAMINED. — NEW GUINEA. Netherlands New Guinea. Geelvink Bay, "Ayerjat" near Nabire, fl., *Kanehira & Hatusima 12578;* Mamberamo R-, Pionier-bivak, fl., Sept., *Thomson s.n.*

12. Teijsmanniodendron hollrungii (Warburg) Kostermans, *comb. nov.*

Vitex simplicifolia Clarke *in* Hook, f., Fl. Br. Ind. 4: 586. 1885; not *Vitex simplicifolia* Oliver 1875.

Vitex hollrungii Warb. *in* Engl. bot. Jb. 18: 208. 1894 (basin'ym of new. combination); Hall. f. *in* Meded. Rijks-Herb. Leiden No. 37: 51. 1918; Lam, Verben. Malayan Arch. 179. 1919; White *in* J. Arnold Arb. 31: 113. 1950.

Vitex clarkeana Gamble *in* King & Gamble *in 3.* As. Soc. Bengal 74: 845. 1908.

Teysmanniodendron monophyllum Kurata *in* Bull. Tokyo Univ. Forests 35: 203 *te* **pl. 2.* 1947.

The description of *Vitex hollrungii* was based on the specimen Holljmg 377, from former German New Guinea, cited below. Of this number sheet is available in Herbarium Bogoriense, representing a fruiting

The species is very widely distributed, occurring from the Malay Peninsula to New Guinea. From the labels one gathers that it prefers marshy banks of rivers. It may be either shrub-like or grow out into a small tree.

The most conspicuous character is the presence of numerous tiny holes (glands) in the lower leaf-surface. These holes are usually surrounded by a slightly elevated margin. In leaf-shape and leaf-texture the species is very close to *T. subspicatum* (Hall, f.) Kosterm., but besides the differences in .pilosity of the inflorescence, the gland-holes of the lower leaf-surface are not present in the latter species. Hallier added *Vitex punctata* Schauer *sensu* Merrill to the synonymy of *V. kollrungii. (V. punctata* Schauer has been reduced to *Vitex cofassus* Reinw.) The sterile specimen Robinson 1867, which I had the opportunity of examining, and which Merrill[16] wrongly identified as *V. punctata,* basing his opinion merely on the fact that both Robinson's specimen and the type of *V. punctata* came from the Moluccas, certainly belongs to *T. hollrungii.* After Hallier, Lam identified is as *V. hollrungii,* although he did not mention the synonym *V. punctata sensu* Merrill. Superficially it is difficult to refer sterile material either to *T. hollrungii* or to *V. cofassus,* however, a closer examination of the lower leaf-surface with a dissecting microscope will immediately show the difference: in *V. cofassus* tiny flat circular scales are present, in *T. hollrungii* there are minute holes.

Teijsmanniodendron monophyllum was described from a specimen collected in Netherlands New Guinea by Inokuma & Hara (No. 679), Bumu River near Nabire, local name paimi munor tato. The excellent drawing and the ample description do not leave the slightest doubt that this species is identical with *T. hollrungii.* The characteristic, glandular lower leaf-surface is mentioned by Kurata.

According to Kurata's drawing, the fruit contains two seeds, pendulous from the roof of the cavity. In reality they are the two cotyledons of the single seed. In most seeds, which I dissected from the specimens of *T. hollrungii* in Herbarium Bogoriense the fruit-capsule was empty. In the specimen Corner S.F. 33693 from Singapore, I found an exact replica of the fruit as drawn by Kurata.

Vitex unifoliolata Merrill,[17] based on the specimen Ramos & Edano B. Sc. 37048 from Mindanao,. Philippines, and of which Merrill, stated that its alliance with *Vitex clarkeana* Gamble (= *T. hollrungii)* is manifest,

[16] *In* Philipp. J. Sci., Bot. 11: 310. 1916.
[17] *In* Philipp. J. Sci., Bot. 20: 438. 1922.

is likely to be conspecific with *T. hollrungii.* The densely punctilate lower leaf-surface, indicated by Merrill, points in this direction.

The fragrant flower has white corolla-lobes; the lower lip is pale blue-purple with a yellow spot at the base inside; the filaments are pale purplish red; the calyx is dirty dark grey. The fruit is dark grey, almost black.

SPECIMENS EXAMINED. — MALAY PENINSULA. Penang. Ayer Hitam, June, fl., flowers yellowish, *Ridley 2151* (S). Perak. Sg. Krian Estate, July, fr., common riverside shrub, *Spare S.F. 36010* (S) ; Dindings, Teloksera, March, fl., *Ridley 7990* (S) & *s.n.* (S) ; Bruas, Dec, fr., *Curtis s.n.* (S); Pankor, Pankalan Bham, July, fr., *Curtis 1611* (S). Pahang. Pianggu, Endau, Aug., fl., *Evans S.F. 13174* (S); Sg. Pau, fl., *Ridley S.F. 11325* (S) ; near Rompin, Aug., fl., *Mohamad S.F. 17132* (S). Johore. Sg. Bahan, June, fl., frequent in brackish tidal zone of river, *Corner S.F. 28642* (Bg, S); Sg. Sedili, Sg. Gembut, Oct., fr., *Corner S.F.33693; Sg.* Sembrong, Oct., fr., *Lake & Kelsall 4-059* (S);. Mawai, flowers mauve with a pale yellow spot in the throat, *Corner s.n.* (S), Jan., fr., *Ngadiman S.F. 34711* (S). — SUMATRA. East Coast. Batubaru, fl., fr., *Yates 2133.* — BANGKA. Sungai1iat. Sg. Lajang, Oct., fl., fr., brackish river, *Teysmann s.n.* — BORNEO. Colony of North Borneo. Sandakan, April, fl., *Sales 3731.* Sarawak. Tandjong Kibong, Aug., fL, fr., fruit black, *Daud & Tachun S.F. 36085* (S). West Borneo. Landak, fl., fr., *Teysmann 11629HB;* Sg. Landak, fr., *Teysmann 11596HB;* Kapuas R., fl., fr., *Teysmann 8372HB;* Sukalanting, Sept., fr., *Hallier B.134;* Sg. Sambas, Nov., fr., *Hallier B. 1138.* South Borneo. P. Kembang, Sept., fl., *Hub. Winkler 3436.* Sampit Subdivision: Ketingan, Telokbuluh, Sept., fl., fr., on tidal river, local name luhampit, *van Wijk 3.* Lower Dajak Subdivision: Kualakapuas, May, fr., local name kaju (ta)kolok ampit (head of rice-bird), *"Zendings-hospitaal."* — CELEBES. G. Sungkuwatawo, fl., *Rachmat 792* (Expedition Van Vuuren). — SULA IS. P. Mangole, fl., *Hulstijn 32.* •— BUKU. Okie, fr., *Teysmann 1831HB.* — CERAM. East Ceram: near Turn, alt. 0 m, Jan., fl., fr., tree 7 m high, *Kornassi 878.* — AMBOINA: ster, *Robinson 1867* (Bg, S). — MISOOL. Waigama, Aug., fr., *Teysmann s.n.* — JAPEN I. Marioti near Serui, Aug., fl., local name metatari, *.van Dijk 351;* Sg. Papoma near Serui, Aug., fl., *van Dijk 705.* — NEW GUINEA. Netherlands New Guinea. May, fl., lip blue with whitish hairs, lobes pale purple, calyx brownish, shrub 4 m, *Versteeg 1025.* Manokwari Subdivision: Andai, fr., *Teysmann 17470HB & 17471HB;* . Momi, alt. 10 m, Aug., ster., local name sagotby (Manikiong language), *Kostermans 258 = bb. 33457.* Inanwatan Subdivision: Kamundan R., Dec, fl., tree 15 m high with clear bole of 10 m and 35 cm in diameter, *Matatula 150 = bb. 21941.* Hollandia Subdivision: Mamberamo R., mouth of river, Sept., fl., fr., tree 3 m, *Janowsky 491;* Pionier-bivak, 60 m alt., July, fl., tree 9 *m* high with clear bole of 4 m, bark grey, peeling off in large, irregular flakes, corolla-lobes pale cremeous, throat yellow, lip tuac with yellow base and pale lilac centre, calyx dirty yellowish green with pale bellow tube, flowers fragrant, *Lam 617;* near Prauwenbivak, alt. 100 *m,* Sept., fl., ree 25 m high, corolla white, lip yellowish with central lilac spot, calyx pale green, *Lam 1224.* South New Guinea Subdivision: Lorentz R., Jan., fl., fr., flowers lilac, fuits bluish black when ripe, tree 15 m high with bole 12 cm in diameter, *Salverda 30=* 66.*22105.* Australian New Guinea. Mandated Territory: Hatzfeldhafen, bank of Daigun R., Oct., fr., *Hollrung 377 (type).*

INDEX

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THE GENUS VIBURNUM (CAPRIFOLIACEAE) IN MALAYSIA

J. H. KERN *

SUMMARY

1. In the following pages an account of the genus *Viburnum* in Malaysia is presented.

2. The distribution of its species is briefly discussed and a map relating to it added.

3. The main part of the present paper consists of keys to the sections and species, followed by a systematic treatment of the 16 species admitted for the region.

4. Three new subsections are proposed, viz. *Viburnum* subsect. *Punctata* Kern, subsect. *Sambucina* Kern, and subsect. *Lutescentia* Kern. *Viburnum* subseries *Coriacea* Maxim, is reduced to the rank of a subsection.

5. Three species and two varieties are described as new, viz. *Viburnum amplificatum* Kern, *V. clemensae* Kern, *V. hispidulum* Kern, *V. coriaceum,* var. *longiflorutn* Kern, and *V. sambucinum* var. *subglabrum* Kern.

6. The following species are reduced to the rank of varieties: *Viburnum floribundum* Merr. has become *V. luzonicum* var. *floribundum* (Merr.) Kern, and *V. sinuatum* Merr. has become *V. luzonicum* var. *sinuatum* (Merr.) Kern.

7. The following reductions'to synonymy are made: *Viburnum longistamineum* Ridl. to *V. sambucinum-* var. *subglabrum* Kern; *V. sumatranum* Miq., *V.villosum* Ridl., and *V. inopinatum* Craib all to *V. sambucinum* var. *tovientosum* Hallier f.; *V. forbesii* Fawc. partly to *V. sambucimim* Bl., partly to *V. coriaceum* BL; and *V. zippelii* Miq. to *V. japonicum* (Thunb.) Spr.

8. Emended descriptions of *Viburnum beccarii* Gamble and of *V. junghuhnii* Miq. are given.

INTRODUCTION

In the present paper I have tried to give a critical survey of the Malaysian material of *Viburnum*, put at my disposal by the Directions of the following herbaria:

Herbarium of the Arnold Arboretum, Harvard University, Jamaica pJain, Mass. (U.S.A.) (A) ;

Herbarium Bogoriense, Kebun Raya Indonesia, Bogor (B) ;

The Gray Herbarium of Harvard University (G) ;

Rijksherbarium (National Herbarium), Leiden (L) ;

Herbarium of the Botanic Gardens, Singapore (S) ;

Botanisch Museum & Herbarium (Herbarium of the State University), Utrecht (U).

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