MALAYAN BIGNONIACEAE, THEIR TAXONOMY, ORIGIN AND GEOGRAPHICAL DISTRIBUTION

by

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Age and area will not do, distribution is a function of age and biology.
The mechanism of evolution is the main problem of biological science.

Introduction.

My publication on the *Bignoniaceae* of New Guinea [1]) has been the prime cause to study this family for the whole Malayan region. So this study forms a parallel to the publications of the families worked out by the botanists at Buitenzorg, which are an attempt to constitute a modern review of the Malayan flora.

That a review of this family was necessary may appear from a short historical survey.

History. Since the publication of „De flora van Nederlandsch Indië" by Miquel [2]), only 4 of the 5 Javanese species have been discussed by Koorders and Valeton [3]); Koorders [4]) gives only a short enumeration of the 5 Javanese species, together with the cultivated ones of Java.

Boerlage [5]) discussed the genera and gave an account of the species known then, but did not give a critical discussion of the species.

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1) Nova-Guinea 14 (1927) 293-303.

2) De Flora van Nederlandsch Indië. 2 (1856) 750-9.

3) Bijdrage tot de boomsoorten van Java. 1 (1894) 64.

4) Excursionsflora für Java. 3 (1912) 182.

5) Handleiding tot de kennis der flora van Ned. Indië. 2 (1899) 585.

For the extra-Javanese species there are only the elder works of Blume[1]) and Miquel[2]) and for *Deplanchea* the descriptions of Scheffer[3]).

As the genera and species were known only incompletely, the geographical distribution could not be indicated with any certainty and about the affinities was not known much either.

Geographical distribution. The remarkable distribution of the genera and species in the Malayan region have made me study especially the affinities of these with those of the surrounding countries and with allied genera. As it appeared to me that the *Bignoniaceae* of the Malayan region sensu stricto, without Malacca, the Philippines and New Guinea, are so closely connected with those of the surrounding countries I have tried to treat a more or less phyto-geographical unit, which extends from Malacca to New Caledonia. With some genera it became necessary to enlarge the region for the understanding of the geographical distribution of the genera or species, and so the reader will find some Chinese, Burmese and Indian species in some genera. The limits for a „Flora Malesiana" will be very difficult. Years ago H. Zollinger[4]) has given some critical remarks about the area used by Miquel. Since Miquel, affinities of the Malayan flora are more closely studied by several Dutch botanists and by Ridley, Merrill, etc. It has appeared that Malacca, Sumatra, Banka, Billiton, Riouw and Borneo show many phyto-geographical affinities, whereas Java and the isles eastern of it do not belong so close to this unit. The Philippines, though undoubtedly allied with the Borneo-Sumatra-Ma-

1) Rumphia. 4 (1848) 35.

2) Ann. Mus. Bot. Ludg. Bat. 1 (1864) 197. 3 (1867) 249.

3) Nat. Tijdschr. Ned. Ind. 31 (1870) 332.

4) Over het begrip der omvang eener Flora Malesiana. Nat. Tijdschr. Ned. Ind. Ser. III. 3 (1856) 293-322.

lacca-group, and on the other hand with the Moluccas, show many endemics and form in several respects a distinct phyto-geographical area.

The Moluccas show already signs of Australian influences, and New Guinea forms in many respects an area containing a mixed Malayo-Australian flora. On the other hand this enormous island contains a mass of endemics, wich do not occur neither in Malaya nor in Australia and forms also a unit. New Caledonia, of which R. Schlechter [1]) made a plant-geographical study, shows close affinities with Australia, just as one should expect, but contains a large endemic development like nearly all isolated, old isles.

After this discussion one will agree with me that it is difficult to limit the Malayan region, though a political unit, in plant-geographical respect. For different families it will not be the same.

For the *Bignoniaceae*-genera I have used a very large area; whereas, however, within this area many genera are limited, it forms in my opinion for my aim a genetic-plant-geographical unit. Thus it is explained that for some genera e. g. *Deplanchea, Oroxylum, Tecomanthe, Pandorea, Radermachera, Nyctocalos,* the treatise has become a floristic-monographical revision, though perhaps incomplete, due to lack of materials.

An other cause that I have used such a large area, is because of the fact that whereas many genera are limited to this area, it would be of interest to make more general conclusions in connection with the geological theory of A. Wegener [2]) and the genetic-plant-geographical ones

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1) Pflanzen-geographische Gliederung der Insel Neu Caledonia. Inaug. Diss. Reprint. Engl. Bot. Jahrb. 36 (1905) 1—41.

2) Die Entstehung der Kontinente und Oceane. Ed. 3. 1922.

of J. C. Willis [1]) and A. Engler. [2]) In relation with the remarkable endemism of a lot of species, an interesting result could perhaps be obtained.

Scheffer [3]) makes already some remarks about two *Deplanchea's*, *D. bancana* (*Scheff.*) *vSts.* and *D. tetraphylla* (*R. Br.*) *F. v. Muell.*: „Het is een zeer opmerkelijk feit, dat, zoo niet dezelfde, dan toch een zeer verwante species van een genus, dat onder zijn verwante scherp is gekarakteriseerd en daarvan door den habitus zeer afwijkt, voorkomen in twee, in vegetatie zoo zeer verschillende landen.

Wel zijn de vleugels van de platte zaden zeer voordeelig voor de verspreiding, doch in geene der tusschenliggende streken is de plant waargenomen; ofschoon sommige daarvan nagenoeg geheel bekend zijn."

Seemann [4]) when discussing the native country of *Tecomaria capensis Seem.*, also says of the remarkable question: "At first sight it would appear that the question respecting the native country could easily be settled by assuming the species to be endemic in both Africa and America, were it not opposed to the fact that all *Bignoniaceae*, notwithstanding their winged seeds, have a limited geographical distribution, and that no species, as far as I know, has been claimed as a citizen of both hemispheres."

Bureau [5]) pointing to the very interesting Bignoniaceae of New Caledonia, also remarks the typical distribution of the species. He says: „Les *Délostoma* sont américains, les *Catalpa* sont les uns de l'Amérique, les autres de la

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[1]) Age and Area. A study in geographical distribution and origin of species. 1922.

[2]) Versuch einer Entwicklungs-Geschichte der Pflanzenwelt (1879—82).

[3]) Het geslacht *Diplanthera Banks et Solander*. Nat. Tijdschr. Ned. Ind. 31 (1870) 336.

[4]) Revision of the natural order *Bignoniaceae*. Journ. Bot. 1 (1863) 23.

[5]) Bull. Soc. Bot. France. 9 (1862) 164.

Chine; il est donc remarkable de trouver, dans les trois espèces [1]) de *Bignoniacées*, de la Nouvelle Calédonie, trois types d'organisation différents: l'un [1a]) special à la Nouvelle Hollande, la terre la plus voisine, qui produise des *Bignoniacées*, mais les deux autres rappelant des flores très éloignées; le premier [1b]) identique avec un type indien, le dernier [1c]) se rattachant à des formes plus spécialement américains. Quelque peu nombreuses que soient les *Bignoniacées* de la Nouvelle Calédonie, elles ne sont pas sans interêt au point de vue de la géographie botanique".

The origin of the *Bignoniaceae* of New Caledonia must indeed be explained in connection with those of Australia and New Guinea, though it possesses an endemic development, no species being found elsewhere.

This is a question of historical plant-geography.

In my opinion the *Bignoniaceae*, with their disjunct areas and their endemism, notwithstanding the — apparently — easy manner of spreading by the wind, are especially fit to give some points of view about their origin and distribution in general, based upon geological theories.

Something will be said also about adaptation in some genera, e. g. *Tecomanthe* and *Dolichandrone* and of parallel forms in *Tecomanthe*.

The geographical distribution of most of the genera is to be found on my maps. They are founded on both herbarium-materials I saw and literature. The limits of most of the areas are in general rather well established, but it will appear probably that those of the Moluccas, Borneo, Celebes and New Guinea are not satisfactorily known nowadays. The numbers of the areas accord with those of the species of the text. Of a single species, e. g. *Haplophragma macroloba (Miq.) vSts.*, the finding-places are marked with a +.

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[1]) *a. Pandorea austro-caledonica Bur.; b. Dolichandrone spathacea (L. f.) K. Sch.; c. Deplanchea speciosa Vieill.*

Materials studied. The materials of New Guinea and of the herbarium at Utrecht I had at my disposal by the kindness of its Director Prof. Dr. A. Pulle; I was very much obliged by the materials I received from the respective Directors of the herbariums at Leyden, Buitenzorg, Dahlem and Kew. Prof. H. Lecomte granted me his hospitality in the Paris Museum to study materials and rare literature. Further I am greatly indebted to Prof. Dr. W. M. Docters van Leeuwen (Buitenzorg), who lent to me the *Bignoniaceae*, he gathered in New Guinea last year; to Prof. E. D. Merrill (Berkeley), who was so kind as to give me some information about Philippine plants.

I am greatly indebted to all of them; without their aid the results would not be so complete as I hope they are now.

All materials were dried specimens, except a few New Guinean ones gathered by Docters van Leeuwen. So, figures, descriptions, etc. are all made after dried materials, in connection with the remarks of the labels,

It is a remarkable fact that the collected specimens never show capsules, with only few exceptions [1]). Flowers, too, are often lacking. This was especially striking with the materials I saw from the Forest Research Institute (Boschbouw-Proefstation) at Buitenzorg; e. g. those of *Radermachera* gathered in Borneo and Sumatra.

It is a pity that without flowers, the bulk of the *Bignoniaceae* cannot be identified. The leaves of *Bignoniaceae*-species of one genus, those of different genera and even those of different divisions are hardly distinguishable. So determinations after sterile materials are better to be kept in petto. Moreover it occurs that some *Bignoniaceae*-genera in sterile state have often been mistaken with other families and so on the contrary. E. g. *Oroxylum* with *Araliaceae*

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1) Urban mentions the same. Ber. Deutsche Bot. Ges. 34 (1916) 728.

(p. 819) and *Deplanchea* with *Verbenaceae* [1]) such as *Oxera* and *Faradaya* (p. 911).

As to the species, it is the same question, e. g. in *Deplanchea, Radermachera, Tecomanthe,* etc.

Further there is the difficulty how to distinguish parallel forms. E. g. I found this in *Tecomanthe*; *T. nitida vSts.* and *T. arfaki vSts.* show a more than striking resemblance, so that one would even suppose them to belong to the same species. Further examination showed, however, that there are differences in the calyx and the corolla. The geographical distribution also pointed to the acceptance of 2 different species, *T. nitida vSts.* being found in the Mt. Wichmann (Central N. Guinea), *T. arfaki vSts.* being collected on the Arfak-Mts., the complex on the north-western peninsula. Both at high altitudes of about 3000 m. Now these mountains are only connected via the Mt. Warikeri of about 3—700 m. high. So *T. arfaki vSts.* and *T. nitida vSts.*, both alpine plants, are isolated from each other, but show a remarkable resemblance as to their habits. Now the ovary has shown that the species are of different origin; *T. arfaki vSts.* has certainly affinities with § *Dendrophilae,* whereas *T. nitida vSts.* shows the most close alliances with *T. saxosa Diels.*

Sub-species, varieties, forms, races. I have followed most of the systematists in regard to the most rational conception of these different forms.

Sub-species form in my opinion together a *Linneont;* however, they show many differences, though not important enough to distinguish them as distinct species. Most times there are links between the sub-species. They have a variability-curve of their own.

In many respects the *geographical races* are to be con-

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[1]) *Oxera Labill.* was first arranged as a doubtful *Bignoniaceae* by Billardière (1824) and so *Faradaya F. v. Muell.* (Fragm. 5 (1865) 21.

sidered as sub-species, but often these units are too small for this. It is a well-known fact that plants of one finding-place are very much alike, more than those of different finding-places; the resemblance of specimens of one species is mostly reversely proportional with the distance between the finding-places. The closest resemblance is found among specimens of one collection. This is among other things due to the fact that the individuals of one finding-place are grown up under the same conditions, probably belonging to one or few „reine Linien". Moreover specimens of one collection are preserved in the same manner.

I accept *varieties*, when specimens differ in one heriditary character, morphological or physiological.

I accept a *forma* for specimens, certainly differing in one or more characters, which are not heriditary and appear to belong to the natural variability-curve of the species. They are due to external influences.

Though all this is rather well-defined it is very difficult to distinguish them in dried materials; one ought to cultivate many specimens of different areas. On the other hand the routine of a florist gives help to discover the forms, varieties, etc. also with dried materials. Besides the cultivation of rare species from isolated regions is rather impossible.

Anatomical researches. I did not make any anatomical investigation, however remunerative it would appear for the *Bignoniaceae*, amongst which many lians are known. First I had no materials of several species and only a complete account of the anatomical structure of all species would gain scientific value. On the other hand anatomical differences were not necessary for the recognizance of the species, the morphological differences being sufficient.

Descriptions, nomenclature, figures. In the descriptions I have tried to give a most complete account of the variability of the species and I have mentioned small, but often peculiar characters, especially concerning the habit and biology.

New or altered diagnoses are in Latin, according to the rules adopted by the international congresses of Vienna (1905) and Brussels (1910). It was necessary therefore to alter some of the names I gave in "Nova Guinea".

If I knew the type of the genus or the type specimen I have cited it behind the description. Figures and descriptions are made if possible after these types. For very variable species it is impossible to give a satisfactory diagnose and in this case I availed myself of all specimens.

When I have accepted characters, diagnoses and specimens I have not seen, the author is cited in brackets behind. Of all (and only of) the specimens I examined, the herbarium where they are preserved is mentioned behind it in brackets.

The abbreviations of the herbariums are to be found at the end of this introduction.

Dates of collection are not mentioned for convenience' sake; often a date is missing on the labels. Mostly it is known, when a certain collector gathered in a certain area.

As to the geographical distribution I have divided the area in sub-areas, which are in general enumerated from east to west and from north to south: British India—Burma—Indo-China—China—Malay Peninsula—Nicobars and Andamans—Sumatra—Riouw Archipelago—Banka—Billiton—Java, Bali, Lombok, Timor — Borneo — Celebes — Philippines — Moluccas—New Guinea—Australia—New Caledonia. This differs a little for different species, according to their peculiarities.

Of every specimen I first mentioned the finding-place with contingent particularities; all this and the name of the collector are separated by a colon. The collector is cited with the collection-number. If this was missing I have used for the Leyden- and Utrecht-herbarium the herbarium-numbers.

As to the nomenclature I accepted the names given by B. D. Jackson[1]). The geographical names of the Dutch East-Indies are to be found in the dictionary of Ch. F. H. Dumont[2]). Since the latter work has been published, the government of the Dutch East Indies introduced other rules for spelling[3]). However rational the new names may be and though at Buitenzorg one has to accept them, I have not made use of this new list. Firstly, the list contains but the principal names for the present and further the new names are not to be found in the large atlasses as e. g. Stieler's Hand-Atlas, etc.

The names of the species often occur in the text without author; the latter is to be found at the top of the diagnose.

I often cited native names from literature, but I also used those of the labels. How far they are right I cannot judge. The collector and finding-place are always cited, so that they may be corrected later on.

Herbarium-names (nomina nuda) are accepted as synonyms or as new species, firstly in appreciation of the authors, on the other side for completeness' sake.

As to the figures, these are made after dried specimens cited behind.

Keys. I have made 2 keys. The first represents a rather natural scientific one, based upon important systematic characters. The second key is for the use of a student in Malayan plants. It contains also the often cultivated species of the Archipelago. It is based upon sterile characters if possible, as in most of the specimens capsules and often also flowers are missing.

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1) A glossary of botanic terms. London 1900.

2) Aardrijkskundig woordenboek van Nederlandsch Oost-Indië. 1917.

3) Lijst van de voornaamste Aardrijkskundige namen in den Ned. Ind. Archipel. Landsdrukkerij Weltevreden (Java) 1923.

Species, which are only cultivated in the Buitenzorg botanical gardens are not mentioned.

Both keys are dichotomous, this being the easiest manner in my opinion.

Abbreviations. The following abbreviations are used:

(B) = Herbarium Buitenzorg.
d = doesoen (village).
(D) = Herbarium Dahlem.
distr. = district.
G = goenoeng (mountain).
Gouvt. = gouvernement (province).
geogr. distr. = geographical distribution.
Hort. Bog = Bot. Gard. Buitenzorg.
k = kampong (village of natives).
Kds. and Val. = † Dr. S. H. Koorders and Dr. Th. Valeton.
(L) = Herbarium Leyden.
Mt. = mountain.
(P) = Herbarium Paris.
P = poeloe (island).
pr. = prope (near).
Res. = residentie (province).
Reg. = regentschap (province).
(U) = Herbarium Utrecht.
V. n. = vernacular names.

CHAPTER I.

TAXONOMY.

KEY FOR THE GENERA AND SUB-GENERA.

A. Septum parallel to the valves

Tribus I. Bignonieae.

a. Lians without tendrils, leaves 3-foliolate

1. Nyctocalos (p. 805)

b. Trees, leaves 2-3-pinnate.

α. Calyx very large, 3-4 cm. l., stamens 5, with 2 fertile thecae . . 2. Oroxylum (p. 816)

β. Calyx small 0.2-0.3 cm. l., stamens 4 fertile, didynamous, one cell developed, calcarate at the base . . . . 3. Millingtonia (p. 825)

B. Septum perpendicular to the valves
Tribus II Tecomeae.

a. Septum terete, sometimes notched, spongy.

α. Ovulus in one row on each placenta, germ of the winged seeds trigonous, sunken in notches of the septum 15. Stereospermum (p. 946)

β. Ovules in many rows on each placenta, germ of the winged seeds flat, septum slightly bubbled. . 16. Radermachera (p. 953)

b. Septum flat or quadrangular, never terete, woody, spongy or membranous.

α. Septum quadrangular, false septum present, other septum sometimes reduced.

I. Calyx spathaceous.

1. Corolla-tube short, concealed in the calyx, not white, limb bilabiate, flowering at day-time. . . Markhamia (p. 929)
2. Corolla-tube long, funnel-shaped, much exceeding the calyx, white, fragrant, flowers nocturnal, limb almost actinomorphic.

×. Septum reduced, false septum large, leaves scattered, opposite or whorled, coriaceous. 13. Dolichandrone § Coriaceae (p. 931)

××. Septum nearly as broad as the false septum, leaves always opposite, mostly membranaceous. 13. Dolichandrone § Membranaceae (p. 936)

II. Calyx not spathaceous
Heterophragma (p. 999)

β. Capsule 2-locular, false septum absent.

I. Calyx spathaceous.

1. ∞ rows of ovules in each cell, calyx splits at the posterior side
14. Spathodea (p. 928)

2. 2 rows of ovules in each cell, calyx splits at the anterior side
Newbouldia. (p. 799)

II. Calyx not spathaceous.

1. Only 1 row of ovules on each placenta.

×. Lian, calyx without glands, cymes cauliflorous, corolla distinctly 2-labiate, leaves opposite, pinnate, thecae glabrous . Perichlaena (p. 840)

××. Shrubs or herbs.

□. Erect shrubs, calyx mostly glandular, tubular, campanulate, 5-toothed, leaves opposite, simple or pinnate, thecae hairy
11. Stenolobium (p. 904)

□□. Herbs, calyx splits open to the base, with 5 lobes, leaves scattered
Argilia (p. 1021)

2. Many (2-∞) rows of ovules on each placenta.

×. Trees, shrubs or herbs.

□. Capsule oblong, leaves large, simple, opposite or verticillate, trees . . . 12. Deplanchea (p. 906)

□□. Capsule linear or oblong-linear.

△. Thecae calcarate, herbs annual or perennial, leaves simple or 1-pinnate . . Incarvillea (p. 835)

△△. Thecae not calcarate.

*. Calyx tubular-campanulate coriaceous, capsule very long, glabrous little trees, thyrses cauliflorous . Kigelianthe (p. 1020)

**. Calyx campanulate, not coriaceous, mostly large trees, with rather dense pubescent or tomentose inflorescences.

†. Disk cushion-shaped, septum thin, capsule very long, spirally twisted, inflorescences cauliflorous Ferdinandia (p. 1000)

††. Disk annular, septum rather thick, spongy, capsule mostly curved, not spirally twisted, inflorescences not cauliflorous, terminal or lateral 17. Haplophragma (p. 998)

××. Lians.

□. Capsule linear.

△. Stamens exserted, ovules 2-seriate on each placenta, capsule compressed 6. Tecomaria (p. 831)

△△. Stamens included, ovules 3-∞-seriate on each placenta.

*. Calyx regularly 5-toothed, campanulate, when in flower inflate, disk cupular, 8 series of ovules per cell Podranea (p. 839)

**. Calyx campanulate, 5-toothed, not inflate when flowering, disk flat dish-shaped, many rows of ovules per cell
Campsidium (p. 838)

□□. Capsule oblong.

△. Calyx thick coriaceous, glandular, climbing with roots
Campsis (p. 837)

△△. Calyx coriaceous or membranous, without glands, climbing with the ultimate twigs.

*. Corolla actinomorphic, disk cupular, leaves 3-foliate or digitate.

†. Leaves 3-foliolate, corolla tubular 10. Hausmannia (p. 901)

††. Leaves digitate, corolla campanulate
9. Neosepicaea (p. 899)

**. Corolla more or less zygomorphic, disk annular, seldom sub-cupular, leaves 3-foliolate or 1-pinnate.

†. Calyx small up to 0.7 cm., truncate, mostly indistinctly 5-toothed, mostly thyrses (seldom racemes: *P. australis s. sp. linearis*), corolla small up to 2.5 cm. (seldom longer: § *Leptophyllae* and § *Grandiflores*), mostly bearded at the throat and on one side inside the corolla, not annularly stu-

pose near the insertions of the filaments
7. Pandorea (p. 833)

††. Calyx large, 5-lobed (seldom truncate: *T. aurantiaca*), 1.5-4 cm. l. (seldom smaller: *T. montana, T. aurantiaca*), corolla large 6—9 cm. (seldom smaller: *T. montana*), neither bearded at the throat nor on one side inside the tube, but distinctly (except *T. ternatensis*) stupose near the insertions of the stamens
8. Tecomanthe (p. 864)

PRACTICAL KEY FOR BIGNONIACEAE-GENERA OF MALAYA, THE PHILIPPINES, NEW-GUINEA, AUSTRALIA AND NEW-CALEDONIA, WILD AS WELL AS CULTIVATED.

(Not those of the Hort. Bog.).

1. Leaves 1-jugate, mostly with tendrils . . . 2
   Leaves 3-foliolate 3
2. Tendril 3-forked, leaflets ovate to ovate-lanceolate, flowers red-yellow, stamens inserted at the middle of the tube, cultivated plant
   4. Pyrostegia (p. 829)
   Tendril simple or none, leaflets obovate-oblong, flowers purple-violet, stamens inserted near the base of the tube, cultivated
   5. Arrabidaea (p. 829)
3. Lians 4
   Trees 9
4. Anthers exsert. 5
   Anthers included. 8

5. Corolla valvate, red, leaves 3-foliolate, disk cupular, Australian climber
10. Hausmannia (p. 901)
Corolla imbricate 6
6. Leaves digitate, 5-foliolate, New Guinean climber . . . . 9. Neosepicaea (p. 899)
Leaves 3-foliolate or pinnate 7
7. Leaves 3-foliolate, corolla mostly large, flowers in racemes, S. E. Asiatic and Malayan climber
1. Nyctocalos (p. 805)
Leaves pinnate, 3—4-jugate, cultivated
6. Tecomaria (p. 831)
8. Calyx large, 1. 5—3 cm. 1., 5-lobed, corolla large, 5—8 cm. 1., axillar racemes, seldom thyrses (see also *Pandorea leptophylla, Pandorea Curtisii* and *P. jasminoides* pp. ,), Malayan and New-Guinean climbers
8. Tecomanthe (p. 864)
Calyx small, truncate, ca. 0.3 cm. 1., corolla small ca. 2 cm. 1., thyrses, seldom racemes (see also *Tecomanthe aurantiaca* and *Tecomanthe montana* pp. ,), Malayan, New-Guinean and Australian climbers
7. Pandorea (p. 833)
9. Corolla with a transverse anterior plait, leaves simple or 3-foliolate, flowers 2-labiate, cultivated small trees, fruit a calabash
19. Crescentia (p. 1009)
Corolla without transverse plait 10
10. Calyx spathaceous 11
Calyx truncate, regularly or irregularly lobed 13
11. Flowers cauliflorous, small shrubbish tree, ca. 3 m. high, capsule linear-cylindrical, candle-like, cultivated tree . . 18. Parmentiera (p. 1008)
Flowers in terminal or axillar inflorescences 12

12. Corolla white, fragrant, tube cylindrical, calyx not oblique at the base, African, Indian, Malayan and Australian plants
13. Dolichandrone (p. 928)
Corolla-tube broad campanulate, exceeding the oblique calyx, cultivated tree
14. Spathodea (p. 945)
13. Leaves simple, large, verticillate, mostly coriaceous, always entire, Malayan, New-Guinean and Australian trees
12. Deplanchea (p. 906)
Leaves 1—3-pinnate 14
14. Thecae pubescent, tree 5 m. high, leaflets serrate, flowers yellow, calyx glandular, cultivated tree. . . . . . 11. Stenolobium (p. 904)
Thecae glabrous. 15
15. Calyx very large and broad, coriaceous, stamens 5, capsule flat, broad very large 1 m. l., Indo-Malayan tree . . . 2. Oroxylum (p. 816)
Calyx rather small membranaceous, stamens as a rule 4, didynamous, capsules always smaller, terete 16
16. Anthers with only 1 fertile cell, calcarate, Burmese tree with large leaves, capsule linear, cultivated throughout the tropics
3. Millingtonia (p. 825)
Anthers with 2 fertile cells, never calcarate 17
17. Septum flat, leaves 1-pinnate, inflorescences and innovations brown tomentose or yellow pubescent, Indo-Malayan trees
17. Haplophragma (p. 998)
Septum terete 18
18. Septum notched, seeds trigonous, germ sunken into the septum, ovules in 1 row per placenta, African, Indo-Malayan trees
15. Stereospermum (p. 946)

Septum entire, at most slightly bubbled, seeds flat, germ not sunken into the septum, ovules in ∞ rows on each placenta, Chinese, Indo-Malayan trees . . . 16. Radermachera (p. 953)

TRIBUS I. BIGNONIEAE.

1. NYCTOCALOS Teysmann et Binnendijk.

In Journ. Bot. Néerl. 1 (1801) 366; Bureau. Monogr. (1864) 52; Miquel in Ann. Mus. Bot. Lugd. Bat. 1 (1864) 201; ibid. 3 (1867) 249; Seemann Journ. Bot. 8 (1870) 147; Benth. & Hook. Gen. Pl. 2 (1876) 1040; K. Schumann in Engler-Prantl Pfl. Fam. IV. 3b (1895) 219; Boerlage Handl. Fl. Ned. Ind. 2 (1899) 588.

Fig. 1.

This genus was founded by Teysmann and Binnendijk on a flowering Javanese lian discovered by the former on the southcoast of Java near Wijnkoops Bay.

As there have come more materials and species certainly belonging to the genus, the diagnosis must be altered at some points, which I stated here.

Descr. emend. Frutices volubiles vel scandentes, glabri; *folia* opposita 3-foliolata, foliolis integerrimis, petiolulatis, ovatis vel lanceolatis; *flores* in racemis in apicibus ramulorum brevium foliigerum dispositi; *calyx* tubuloso-campanulatus brevis, truncatus, 5-dentatus; *corolla* mediocris vel magna, tubo longe cylindraceo fauce campanulato-dilatato, hypocraterimorpha vel elongato-infundibuformis regulariter 5-lobata lobis rotundatis, *stamina* 4 fertilia didynamia quinto rudimentario vel 5 fertilia subaequalia vel inaequalia binis anterioribus quidpiam longioribus, corollae tubo inserta atque inclusa; *antherae* biloculares, tortiles, lamellatae connectivo excedente; *discus* hypogynus carnosus annuliformis; *ovarium* oblongum compressiusculum quadrangulare, biloculare; *ovula* ∞ in utroque loculo dissepimenti marginibus 2-seriata inserta,

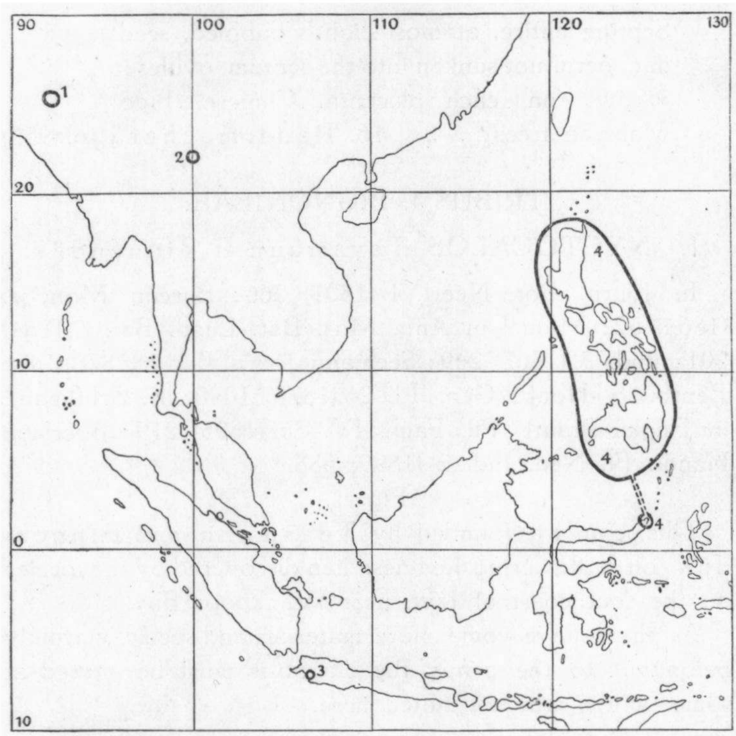

Fig. 1. Geographical distribution of Nyctocalos T. et B.
1. N. Thomsoni Hook. f. 2. N. shanica Gregor et Smith. 3. N. brunfelsiaeflorus T. et B. 4. N. cuspidatum (Bl.) Miq.

stylus elongatus filiformis, stigmate bilamellato; *capsula* lanceolato-siliquaeformis, plana, septifraga, valvis coriaceis glabris interdum obtuse carinatis, septo subcoriaceo; semina plana alata tenuiter membranacea praedita.

(T r i b u s B i g n o n i e a e. Spec. Asiaticae austro-orientales, Malayenses et Philippinenses. Type spec.: *N. brunfelsiaeflorus Teysmann* et *Binnendijk*).

As the first (1861) species described, *N. brunfelsiaeflorus T. et B.* and *N. cuspidatum (Bl) Miq.* (1867) possess five fertile stamens and *N. Thomsoni Hook. f.* (1865) is didynamous with a fifth staminodium, it seems to be necessary to expand the generic diagnosis. *N. Thomsoni Hook f.* is nearly allied to *N. cuspidatum (Bl) Miq.* but differs at first sight in the stamens and is further absolutely separated in geographical distribution.

How Schumann could suppose that the punctual original description of Teysmann and Miquel might be wrong, I cannot understand. He thinks that it may appear that *N. brunfelsiaeflorus T. et B.* and *N. cuspidatum (Bl) Miq.* have four fertile stamens and a great staminodium. I proved this on the species, but found of course his supposition wrong.

However it is remarkable that here in a *Bignoniaceae*-genus, wherein the species are closely allied, an origin of didynamy is to be seen.

I investigated the flowers of the here mentioned species. The stamens of *N. brunfelsiaeflorus* and *N. cuspidatum* are indeed equal in length; with a slight indication of 2 longer anterior and 3 shorter posterior ones. The Burmese species *N. shanica* I know but from the description; it has 2 shorter (anterior) stamens and 3 longer (posterior) ones, whereas *N. Thomsoni* is didynamous.

Taxonomical the latter represents a derived species with an intermediate state to the original scheme in which 5 equal stamens must be supposed. I do not mean that *N. shanica* is an intermediate form. At least *N. Thomsoni* shows in the other points and in habitus a close alliance with *N. cuspidatum*. This I have demonstrated in the following scheme.

N. cuspidatum (5 equal stamens)

N. Thomsoni (didynamous)

N. brunfelsiaeflorus (5 equal stamens)

N. shanica (2 shorter and 3 longer stamens)

If we want to explain the geographical distribution, we are obliged to accept, that:

1. *N. cuspidatum* is the eldest species and at the same time the ancestor of the 3 others, or:
2. *N. brunfelsiaeflorus* represents the ancient type and has given appearance to the others, or:
3. there is an extinct species, which has produced the 4 recent forms.

I neglect the possibility that *Nyctocalos* could have a polyphyletic origin, as the species show such close alliance to each other.

As I pointed out above the first possibility is very improbable.

In the second case we obtain the following scheme:

N. brunfelsiaeflorus → *N. shanica* → *N. Thomsoni*
└→ *N. cuspidatum*

In this case it should be very remarkable, that *N. cuspidatum* and *N. Thomsoni*, which are closely allied, must be understood as parallelly originated forms.

At any rate we are obliged to suppose that the ancient *Nyctocalos* was widely distributed in S. E. Asia and the Malayan Archipelago.

For the rest we can suppose that the areas yet known are incomplete. The regions in S. E. Asia, Java and the Philippines however are for a good deal worked out today. It may be said that the flowers of *Nyctocalos* are nocturnal. Among the materials I studied the bulk however was in a flowering state.

In my opinion I may conclude that the species of *Nyctocalos* do not represent progressive endemism, but on the contrary are relic-endemics on account of their taxonomy and geographical distribution.

Seemann devided the genus *Nyctocalos* 2 insub-genera:

Eu-Nyctocalos Seem. including the species with 5 fertile stamens: *N. brunfelsiaeflorus* and *N. cuspidatum.*

Hausmannia (F. v. M.) Seem. including *N. Thomsoni* and *Hausmannia jucunda F. v. M.* both with 4 fertile stamens and a rudiment. The latter Australian lian being first described by F. v. Mueller. (Fragm. Phytogr. Austr. 4 (1864) 148).

Seemann considers *Hausmannia* identical with *Nyctocalos.* However he was truly wrong in his supposition. *Hausmannia jucunda* remains still the only species of a distinct monotypic genus *Hausmannia F. v. M.*, differing principally from *Nyctocalos* in the long exserted stamens and the valvate corolla. Yet *Hausmannia* shows a remarkable conformity with *Nyctocalos*, being both lians, in the 3-foliolate leaves and the habitus.

KEY TO THE SPECIES.

1. Stamens 4, didynamous with a fifth staminodium, corolla very large ca. 18 cm., white . 1. *N. Thomsoni.*
   Stamens 5, fertile 2
2. Stamens unequal; 2 anterior shorter (ca. 0.6 cm.), corolla 5-6 cm., white . . . . 2. *N. shanica.*
   Stamens equal 3
3. Corolla short 5-7.5 cm., pale sulphureous, calyx 1-1.5 cm., teeth triangular acute . . . . 3. *N. brunfelsiaeflorus.*
   Corolla large 15-20 cm. white, calyx 1.5-2.5 cm., teeth calcariformous, linear . . . . . . 4. *N. cuspidatum.*

1. **Nyctocalos Thomsoni Hook f.** Bot. Mag. t. 5678; C. B. Clarke in Hooker Fl. Br. Ind. 4 (1885) 376; = *N. assamica Hook. f.* (nom. nud.) K. Schumann in Engler-Prantl. IV. 3b (1895) 231.

Fig. 1 (1).

High glabrate *climber, leaves* opposite 3-foliolate, entire; folioles ovate to oblong-lanceolate caudate acuminate ca.

15-7.5 cm. *Flowers* large ca. 17.5 cm. l., white in long ca. 15 cm. peduncled terminal cymes; *calyx* minute, sub-campanulate, equally 5-dentated; *corolla* elongate infundibuliformous with a terete tube slightly arcuate; limb 5-lobed, lobes sub-equal, the 2 inferior ones slightly greater, broad imbricate; *stamens* 4 with a fifth rudiment, at the throat of the corolla inserted, didynamous, included, filaments filiform-subulate, thecae divaricate pendulous at an apiculate connective; *disk* cushion-like; *ovary* bilocular; style elongate filiform; stigma bilamellate; ovules numerous at the margin of the placenta in 2 rows inserted; *capsule* lanceolate, plane, septifragal; valves in the middle carinate, leathery, almost woody; septum ultimately free, simple, flat; seeds 0.8-1.2 cm. diam., or including the wing ± 2.5 cm. diam.

Geogr. distrib. Assam — Mikir Hills: Simons; Gowhatty Hills: Jenkins (Hooker l.c.) — Assam — Herb. Bernhardi: H. & S. (D) — *Java* (cultivated) — Iter Warburgianum n. 1676, cult. in Hort. Bog. sub n. 1676. (D); cult. in Hort. Bog. sub. n. X. F. 150 a, from the Bot. Gard. Calcutta (from Assam) (B).

This species is closely allied with *N. cuspidatum* and differs in the stamens and the longer peduncled cymes. Moreover *N. Thomsoni* has much shorter 0.5-1 cm. petioled leaflets and these are long acuminate and opaque; the capsule is shorter ca. 15 cm., and broader, ca. 5 cm.

With *N. assamica Hook f.* (nom. nud.) mentioned by Schumann, the latter means the Assam species. However he points out: „hält die Mitte in der Länge der Blumenkrone zwischen *N. brunfelsiaeflorus* and *N. cuspidatum*", a statement that is undoubtedly wrong.

C. B. Clarke (in Hook. l. c.) draws from the didynamy the remark: "The Assam species constitutes a marked sub-genus". As I have stated the four species form a well-defined genus in which the species are closely allied and that shows a tendency to didynamy, a fact which appears in several *Bignoniaceae*-genera.

2. **Nyctocalos shanica Mc. Gregor et W. W. Smith** in Rec. Bot. Surv. Ind. 4 (1911) 280.

Fig. 1 (2).

A high glabrous *climber*, bark grayish much covered with warts; *leaves* opposite 3-foliolate, leaflets ca. 12 cm. l. broad elliptic, acuminate, entire, with 6-8 pairs of side-nerves; petiole 4-5 cm. l., petiolules 1-4 cm. l. *Flowers* ca. 1 cm. pedicelled in sub-corymbose pauci- (4-7) florous inflorescences. *Calyx* short 0.7-0.8 × 0.4-0.5 cm., campanulate, truncate equally ca. 0.1 cm. l. filiform dentate. *Corolla* white with a 5-6 cm. l. cylindrical tube towards the throat campanulately ampliate; limb equally 5-lobed, lobes 1-1.5 cm. l. ovate, obtuse, non-apiculate; *stamens* 5 fertile, 2 shorter, in the middle of the corolla-tube inserted and just reaching the throat. *Anthers* glabrous with oblong sub-parallel cells. Ovary on a very short gynophore, style filiform with a bilamellate stigma; capsule and seeds unknown.

Geogr. distr. Burma. — East of Keng Tung, Southern Shan States, Upper Burma at an elevation of 330 m.: Mc. Gregor. n. 672.

This species is more closely connected with those of the Malayan Arch., especially with *N. brunfelsiaeflorus*, than with *N. Thomsoni.* The only representative of the genus within the Indian boundary.

3. **Nyctocalos brunfelsiaeflorus Teysm. et Binnend.** — Miquel in Journ. Bot. Néerl. 1 (1861) 367; Miquel. Choix des Pl. rar. où nouv. 1863. t. VII; Miquel. Ann. Mus. Bot. Lugd. Bat. 1 (1864) 201 excl. syn. Blumei et stirpe celebica; ibid. 3 (1867) 248, t. 8A; Koorders Exc. Fl. Java. 3 (1912) 183.

Fig. 1 (3).

Descr. emend. Frutex volubilis, ramis ramulisque teretibus, glabris, griseis; petiolo 5—8 cm. longo, semiterete, superne obsolete angulato vel teretiusculo, basi et in geniculis incrassato; *folia* ternata; foliola varia ovali-oblonga, falcato-cuspidata, basi inaequali-rotundata, articulata, supra obscurius viridia, 9—12 cm. longa, 4—6 cm. lata, 1—2 cm. petiolulatum, petiolulis supra canaliculatis; *racemus* laxus, lateralis terminalisve, pedicellis bracteolatis, teretibus, laevibus; *calyx* 0.5 cm. longus, campanulatus, truncatus extus adnato-5-dentatus, viridus, margine purpurascente, intus laevissimus; *corolla* hypocraterimorpha alba, dein sulphurascens, regulariter quinque-lobata, lobis obtusissimis, rotundatis, basi angustatis, subauriculatis, subtus multiglandulosis, tubo longissimo, cylindraceo, superne ampliato, laeve, violascente; *stamina* 5 subaequalia, tubi parti tertiae superiori villosae affixa, inclusa, fertilia, filamentis teretibus basi incrassatis; antherae profunde bipartitae apice connectivo linguaeformi excedente affixae; pollen ellipsoideum; pistillum staminibus longius, glabrum, *disco* annulari crenulato integrove cinctum; *ovarium* oblongum 4-angulatum, glabrum, superne in stylum attenuatum, biloculare, dissepimentis utrinque in marginibus ovulis horizontalibus anatropis obsessis; *fructus* oblongus ca. 12 cm. longus, 4 cm. latus, utrinque rotundato-cuneatus, apice vix vel modeste acuminatus, valvis coriaceis, extus (in sicc.) fusco-virescens medio longitudinaliter sulcatus, intus luteus medio lineatus, sulcis indistinctis grosse reticulatis.

(Fruct. descr. ex. herb. spec. in Herb. Bog. coll. Dr. Ploem. Java).

Geogr. distr. — Java — Java occidentalis: van Hasselt (L sub n. 898, 100... 102); Cult. in Hort. Bog. sub n. X. F. 138 a. (B, L sub n. 920, 240... 43 and 920, 240... 44), Cult. Hort. Bog. (ex Wijnkoops Bay) sub n. 2248 HB (B); Palaboeanratoe in Res. Preanger: Kds. 34438β (spec.

ster.) (L, B) alt. 50 m.; Java: Dr. Ploem (B); Wijnkoops Bay ad litora (Teysmann).

Though Miquel had already described the capsule, his description is wrong because his specimen was the Celebic form *N. cuspidatum*, which I tested on his original specimens.

Miquel first thought the Javanese climber identical with the sterile specimen of Blume from Celebes, described by Blume as *N. cuspidatum*. Indeed it is remarkable that the foliage of the *Nyctocalos*-species is very difficult or impossible to distinguish, nor in form neither in nervation.

The colour of the corolla in Miquel's table (Choix) is wrong, not being pink but sulphureous to white.

Probably all the herbarium materials have descended from the only place hitherto known pr. Wijnkoops Bay in the south of the Res. Preanger near the coast up to 50 m. alt. Teysmann has already introduced it into the Hort. Bogor. where it is cultivated with success. The fragrant flowers open at 8 o'clock in the evening and drop already in the early morning. Notwithstanding that, it never produces capsules there, as far as I know.

N. brunfelsiaeflorus in only found in the cited region in Java and there strongly endemic. With respect to the geographical distribution of the other species it stands totally apart.

4. **Nyctocalos cuspidatum (Bl) Miq.** — = *Tecoma cuspidata Bl.* Rumphia 4 (1848) 35; Miquel Ann. Mus. Bot. Lugd. Bat. 3 (1867) 249, t. 8 B; — = *Nyctocalos macrosiphon Teysm. et Binnend.* (nom. nud.) in Cat. Hort. Bogor. (1856) 155; — = *Nyctocalos brunfelsiæflorus Teysm. et Binnend.* (quoad spec. celeb.) Miquel in Ann. Mus. Lugd. Bat. 1 (1864) 201; Merrill Philip. Journ. Sci. 1 (1906) Supp. 237; C. B. Robinson Philip. Journ. Sc. 6

(1911) Bot. 211; Merrill. Enum. Philip. Fl. Pl. 3 (1923) 443 — = *Beaumontia trifoliata* (In herb. Paris).

Fig. 1 (4).

High *climber* with terete lenticellate branches; *leaves* 3-foliolate, opposite, petioles ca. 9 cm. l. sub-terete-angulate with a thickened base; folioles elliptic-ovate, sometimes oblique at the base, modest to long acuminate at the apex, the terminal leaflet more or less obovate, lucid above, pale beneath with 6—8 pairs of sidenerves; petiolules 1—2 cm. *Flowers* in short pauci- (10—12) florous racemes at the end of short foliate pendulous sidebranches; calyx campanulate ca. 0.6 cm. l. truncate with 5 erect-patent equal teeth inserted immediately below the margin. *Corolla* in bud pale green later on creamy, hypocraterimorphous with a long ca. 15—17 cm. cylindric tube ampliate to the throat; limb equally 5-lobed, lobes rotundate obtuse reflexed; *stamens* 5 fertile, equal, thickened to the base, glabrous, inserted on 2/3 of the length of the tube and just reaching the mouth of the corolla; anthers sagittate, divaricate with a short toothed connective. *Ovary* subquadrangular, bilocular with ovules in two rows pro loculo; *disk* annuliformous crenulate; stigma bilamellate. *Capsules* shortly stipitate, broadly lanceolate to oblong much like those of *N. brunfelsiæflorus*, plane, compressed parallel to the septum, varying in length, when ripe 16—24 × 4—4.8 cm.; valves plane coriaceous median costulate; septum plane membranous-sub-coriaceous, in sicc. nigrescent on each side with two rows of seeds inserted at the margin; seeds sub-orbicular 3—4 cm. broad (including the wings 0.6—1 cm. br.) thin membranously winged.

Geogr. distr. Celebes — Moluccas: *Zippel* (L sub n. 898, 199... 103. Type specimen of Blume); Menado: Teysmann and H. de Vriese (L sub n. 907, 135... 804, n. 898, 199... 104, n. 898, 199... 105); Cult. in

Hort. Bog. ex. Menado sub n. H. B. 5729 (B, P, U); Celebes: Teysmann n. 14105 (B).

Philippines — Luzon — prov. Sorsogonpr. Irosin: Elmer n. 14426 (L, U, B); prov. Cavite et Batangas: Curran n. 7668 (D); Calawan, Manila: M. Callery n. 64 (P); Manila: M. Barthe (P) — *Palawan* — Bermejos n. 39771 (= F. B. 4718) (D) — *Polillo* (Merrill) — *Biliran* (Merrill) — *Basilan* (Merrill). In primary forests at low and medium altitudes (Merrill).

Nyctocalos cuspidatum (Bl) Miq. var. oblongum vSts. nov. var.

Habitus gracilis; *foliolis* oblongis vel oblongo-lanceolatis, basi cuneato-rotundatis 9—11 × 4—4. 5 cm.; *calyce* 0.6—0.7 cm. l.; pedunculus ca. 8 cm., tubus corollae 17—19 cm.

Geogr. distr. Philippines — Polillo — Mc. Gregor. n. 10396 (L, D).

Nyctocalos cuspidatum (*Bl*) *Miq.* is connected with *N. Thomsoni* from which it differs in the already mentioned characters.

Merrill notes a form from Luzon (prov. Ceram: Vidal n. 3395) which differs from the usual specimens by the longer calyx, the more acute not cuspidate leaves and the shorter petioles. This he thinks a mere form however. The cuspidate apex is indeed not the main point characterizing the species.

The geographical distribution is remarkable. Whereas in the Philippines it is very common in nearly the whole Archipelago, it is found in the Malayan region only in Celebes near Menado, where probably also Zippel collected the type-specimen. Whether it occurs in the Talaud Archipelago I do not know, but I did not receive specimens of Lam's collection which botanist explored there some time ago.

2. OROXYLUM Ventetat.

Ventetat. Dec. Gen. Nov. (1808) 8; — = *Calosanthes indica Bl.* Bijdr. (1825) 760; Endlicher. Gen. Plant. (1836—40) 4119; D. C. Prod. 9 (1845) 177; Bureau. Monogr. (1864) 45, t. 9; Benth. & Hook. Gen. Pl. 2 (1876) 1040; Baillon. Hist. Pl. 10 (1891) 39; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 225; Boerlage. Handl. Fl. Ned.-Ind. 2 (1899) 589.

Fig. 2.

A glabrous *tree*. *Leaves* opposite, large, 2—3-pinnate; leaflets ovate, entire. *Raceme* terminal, long. *Calyx* large, leathery, campanulate, truncate or obscurely toothed. *Corolla* large, campanulate-ventricose, white or purplish; lobes 5, subequal, round, crisped, toothed, *stamens* 5; anthers glabrous, 2-celled; cells parallel, oblong. *Capsule* large, linear, compressed parallel to the septum, septicidally 2-valved. Seeds thinly discoid; wing hyaline, broad.

1. Oroxylum indicum (L) Vent.

= *Bignonia indica Linn. var α.* Spec. Plant. 2 (1753) 625; Ventetat Dec. Gen. Nov. (1808) 8; Lamarck Encycl. Meth. 1 (1783) 423; Willd. Spec. Plant. 3306; — = *Pa-lega-Pajanelli Rheede* Hort. Malab. 1 (1686) 177, t. 43; Linné. Fl. Zeyl. 236; — = *Calosanthes indica Blume.* Bijdr. (1825) 760; Roxburgh Fl. Ind. Or. 3 (1850) 110; — = *Bignonia quadripinnata Blanco* Fl. Filip. (1837) 499; Moritzi Syst. Verzeichn. (1845—46) 46; D. C. Prod. 9 (1845) 177; Wight Icones. 4 (1850) t. 1337—8; Blanco Fl. Filip. ed. 2 (1845) 349; — = *Spathodea indica Pers.* Ench. 2.173; — = *Bignonia pentandra Lour.* Fl. Cochin. Ch. 2. 460; Miquel Fl. Ned. Ind. 2 (1856) 752; Blanco Fl. Filip. ed. 3 (1878) 283, t. 219; Brandis Ind. Timb. (1906) 496; Cooke. Fl. Bombay. 3 (1905) 327; Royle Ill. 295; Prain Beng. Pl. 787; Villar Nov. App. (1880) 151; Vidal Synopsis. Atlas (1883) 35, t. 73; Vidal Rev. Plant.

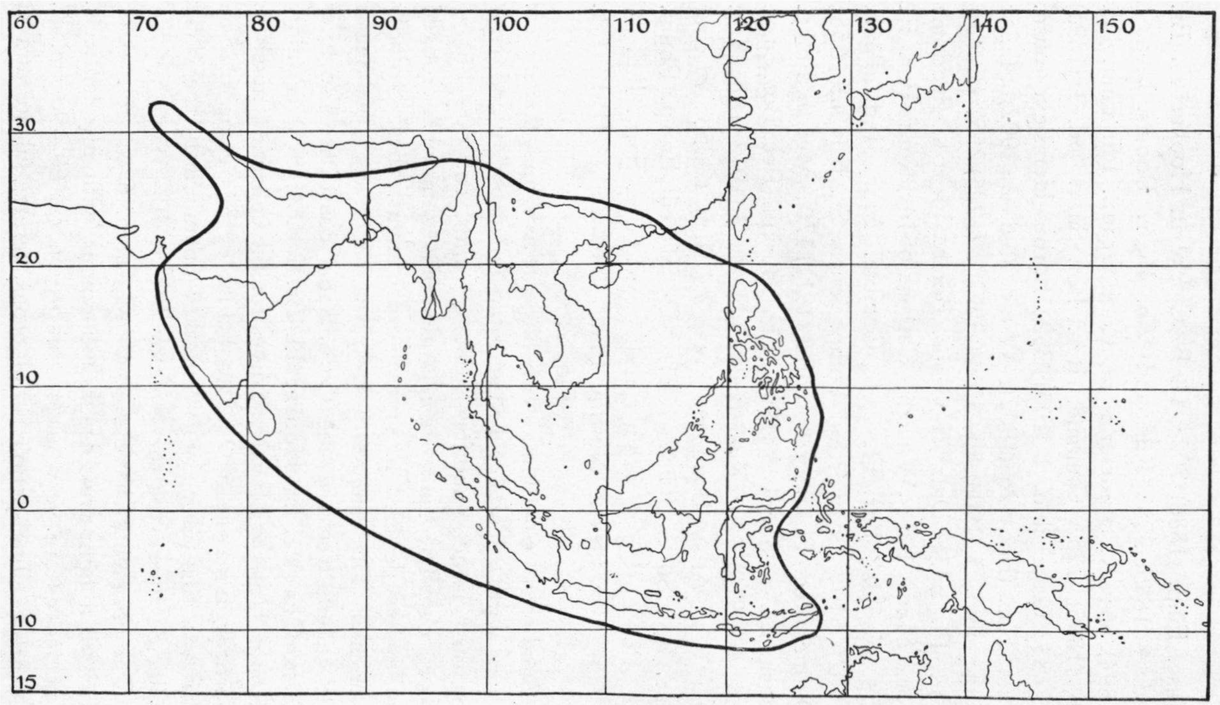

Fig. 2. Geographical distribution of Oroxylum indicum (L.) Vent.

Vasc. Filip. (1886) 202; C. B. Clarke in Hooker Fl. Br. Ind. 4 (1885) 378; Kds. and Val. Bijdr. Booms. Java. 1 (1894) 66; K. Schumann in Engl. Prantl. Pfl. Fam. IV. 3b (1895) 225; Gammie. Rec. Bot. Surv. Ind. 1 (1895) 65, 83; Gage. ibid. 1 (1901) 352; Forbes-Hemsley. Journ. Linn. Soc. (Bot.) 26 (1902); Wood. ibid. 2 (1902) 14, 25; Gage. ibid. 3 (1904) 86; Prain, ibid. 3 (1905) 255; Brandis For. Fl. 347; Dalz & Gibbs. Bomb. Fl. 161; Beddome For. Man. 148; Wallich. Cat. n. 6514; Kurz. For. Fl. 254; Kanjilal. For. Fl. 254; Gamble. Man. Ind. Timb. (1902) 510; Foxworthy. Philip. Journ. Sc. 6 (1909) 558; Duthie. Rec. Bot. Surv. Ind. 2 (1911) 170; Merrill. Philip. Journ. Sc. 1. Suppl. I (1906) 124; Burkill. Rec. Bot. Surv. Ind. 4 (1910) 123; Kds. Exc. Fl. Java. 3 (1912) 183; Kds. and Val. Atlas Baumart. Java 2 (1914) t. 358; Fischer Rec. Bot. Surv. Ind. 9 (1921) 132; Merrill Enum. Philip. Fl. Pl. 2 (1923) 548; Burkill Rec. Bot. Surv. Ind. 10 (1925) 331; Heyne Nuttige Plant. Ned. Ind. 4 (1917) 165.

Fig. 2.

Smal *tree* 6—13 m. with large *leaves* and *flowers* ca. 7 cm. with a leathery broad campanulate *calyx* and conspicious large siliquiform flat *capsules* ca. 60—120 × 7—10 cm. The main *stem* is generally somewhat crooked and below devided in several other stems, these strongly branched. The remark of Roxburgh (l. c. 110) "one of the tallest trees of the Coromandel coast" is, also after C. B. Clarke (in Hooker Fl. Br. Ind. 4, 378) certainly wrong. However Endert gives for the collecting number: Borneo: Endert n. 2325, a height of the tree up to 25 m. Perhaps this may be a mistake; unanimously the other collectors mark for the average height 10—12 m.

The branches have a smooth ca. o. 6—1 cm. thick bark of a light-gray or grayish colour with few lenticels. The leaves are very large, full-grown ca. 60—90 cm. l., 3-pinnate. The petiole is glabrous, terete, sulcate and at the base and near the insertions of the side-axes articulate. Therefore they show a striking resemblance with several *Araliaceae*. Indeed Miquel (Ann. Mus. Lugd. Bat. 1 (1863) 27) described a new species, namely *Arthrophyllum zeylanicum n. sp.?* on a sterile specimen collected by Potielle in Ceylon. The same mistake he made with an other sterile specimen, which he named *A. reticulatum Bl.* These specimens I found in the Leyden Herbarium; Hallier f. had already recognized them.

In sterile state *Oroxylum* is always to be recognized by the reticulate structure at the underside of the leaves, which is lacking in *Arthrophyllum*.

So I was able to distinguish a specimen in the Paris herbarium from Australia (East coast: M. Baume (*P*)), which seemed to be a mistake already from a geographical point of view, as the area of *Oroxylum* is established for a good deal now. Indeed the sterile specimen is not *Oroxylum*, or any other *Bignoniacea*, but perhaps also an *Araliacea*, though not an *Arthrophyllum*.

The folioles are petioled, smooth and shining above, and mostly sparely short tomentose not shining or totally glabrous beneath.

Along the midrib near the insertions of the primary nerves there are minute scattered glands. This was most clearly expressed in the cited specimen of Ceylon; that of Manila (Luzon: Elmer n. 15636) possessed not as many of such glands and the specimen of Java (Bantam: Kds. n. 223 β) showed only at the base of the folioles some single glands.

The folioles are ovate to ovate-oblong, oblique cordate or sub-cordate at the base, whilst the top is apiculate or short acuminate. The folioles are on the average 14.5 × 9 cm.; I saw several specimens with minute orbiculate folioles. So for instance a Philippine specimen (Merrill n. 125) measured 4.5-7 × 3. 5-5. cm. and so did another from the

Kangean Archipelago (e. g. Backer n. 26828), which was 6.5-8 × 4-4. 8 cm. and from Borneo (Endert n. 2325) where the folioles were broadly ovate 7-9 cm. l.. C. A. Backer also collected such a specimen near the k. Lima pr. Batavia, but remarks that it was a young tree; so Beumée (Beumée n. 531) notes the same of a specimen from Pekalongan (Java). Moreover the structure of the leaves of these young specimens is not sub-coriaceous but papyraceous. So I think this fact is owing to the age of the tree. Whether the habitat has something to do with it, I do not know, but it is not probable.

Miquel (Fl. Ned. Ind. 752) states a form β with sparely acute-dentate folioles. Of this form I saw but few examples. It is certainly an inherent quality of very young trees, this also occurring with *Dolichandrone spathacea (L. f.) K. Sch.*

The flowers are placed in large terminal racemes ca. 30 cm. l., have a dirty-dark-violet colour and a disagreeable smell. The calyx is very large, broad campanulate browny or violet-dirty-green coloured, thick leathery, persistent, truncate or obscurely 5-dentate. The corolla is outside dark-violet and inside dirty-yellow-gray. The buds are large and thick on stout pedicels. The large pendulous capsules are very conspicious on the little tree 60-120 × 7-10 cm.; the seeds are large too, 3-4 × 8-9 cm., ca. 3.5-4 cm. thin membranous winged.

Geogr. distr. S. E. Asia—Throughout *India* from the *Himalaya* to *Ceylon* and *Malacca*, common (Clarke in Hooker Fl. Br. Ind.) — Wight n. 2331 (L, P); *Br. India*: Jacquemont (P); Br. India: Herb. E. Lefèvre (P) — *Pundjab*, in the Teray-West to the Cherab (Brandis) — *Malabar* (Rheede); Malabar, Concan: Hook. f. & Thomson (P) — *Madras Presidency*, Anaimatai Hills in the Coimbatore distr. (Fischer); Cult. in Hort Pondichery: Perrottet n. 59 (P) — *Chutia Nagpur* (Wood) — *Ceylon*, type specimen of *Arthrophyllum zeylanicum Miq.*: Potielle

n. 116 (L); Ceylon Hook. f. & Thomson (P) — *Upper Gangetic Plan* (Duthie) — *Assam*, Sadija (Burkill) — *Namlur Forest*; G. Mann (L.) — *Lakhimpur distr.* (Gammie) — *Nepal* pr. Bichiakok, Khatmanda (Burkill) — Calcutta (Prain) — *Bengal:* Clarke (L. U); Bengal: Hook. f. Thomson (P) — *Siam* (Ridley) — *Burma* (Gage) — *Cochin China, Hainan, Hongkong* (Forbes-Hemsley) — *Ava* (Hooker) — *Andamans* (Foxworthy) — *Malay Peninsula*, common (Ridley).

V.n.: (Sanskr.) *shyonaka* (India); (Sanskr.) *mundookapoerna* (Roxb.); (Hind.) *shyona* (Roxb.); (Hind.) *vanga marum* (Roxb.); (Hind.) *pampena* (Roxb.); *gingen* (Chutia Nagpur); *dak-dowa* (Chutia Nagpur); *sicat* (Chutia Nagpur Wood); *ullu* (Upper Gangetic Plan: Duthie); *pharkhat* (idem); *pharri* (idem); *sanna* (idem); *totila* (Ceylon: Trimen); *bulai* (Mal. Penins.: Ridley).

Malayan Archipelago. — *Sumatra* (Miquel). — Deli (De Bussy). — Simaloer: Achmad n. 121 (L, B), n. 1254 (B); Atjeh P. Bras pr. Ooele-paya: Kds. 10653 β (B). — Siboelangit: Lörzing n. 5183 (B). — W. Karoland pr. Laoe Balang, Pĕrbĕsi: Lörzing n. 11269 (B). — Palembang, Afd. Maoera Doea: Greshoff n. 434 (B); Ins. Sĕbĕsi (N. Sum.): Docters v. Leeuwen-Reynvaan n. 5363 (B).

V.n.: *menglĕo* (Simaloer: Achmad); *habreng* (Atjeh: Kds.); (Mad.) *kapoeng-kapoeng* (Palembang: Heyne, Greshoff).

Java — Java? Moluccas? (sub *Arthrophyllum reticulatum* Bl. (L); Java: Leschenault (P.)—*Res. Bantam.*—Tjimara Oedjong: Kds. 223 β (L); Goenoeng Kantjana (L); Pasaroean: Backer n. 7274 (B); between Tjilèbès and G. Kantjana: Backer n. 1172 (B); between Djepitoe and Kemadang, G. Kidoel: Backer n. 2732 (B); Klappa Noeggal: Backer n. 5869 (B); Tjiratjap, Djampang Koelon: Backer n. 17336 (B); pr. Bantam: Zollinger n. 1012 (Zollinger)—*Res. Batavia*—Buitenzorg: Boerlage

(L); Laladon, Tji Apoes: Bakh. v. d. Brink. f. n. 2299 (B); Klappa Noenggal: Backer n. 23407 (B); Batavia: Backer (B); Batavia: Vorderman (B); Batavia pr. k. Lima: Backer (B)—*Res. Preanger*—C. Ploem (L); Tomo: Kds. 221 β (L); Palaboeanratoe: Kds. 220 β (L, P), Kds. 11710 β (L, B), Kds. 33130 β (L, B); Sea of Pendjaloe: Kds. 47919 β (B), Kds. 44308 β (B) — *Res. Banjoemas* — Noesakambangan: Kds. 20042 β (L, B), Kds. 24606 β (L), Kds. 26857 β (L); Bandjernegara Primgombo: Kds. 3864 β (L, B), Kds. 229 β (L, B), Kds. 34042 β (L, B); Noesakambangan: Amdjah n. 23 (B); Madjenang: Backer n. 18606 (B) — *Res. Cheribon* — Houten n. 191 (B) — *Res. Pekalongan* — pr. Margasari: Burger n. 3359 (B); pr. Weleri: Backer n. 16519 (B); Margasari: Beumée n. 531 (B); Soebah: Kds. β (L, P, B), Kds. 228 β (L, P, B), Kds. 37058 β (L), Kds. 14211 β (B) — *Res. Semarang* — pr. Boeloe: Oltmans (B); Kedoengdjati: Kds. 224 β (L), Kds. 26403 β (L, B), Kds. 27221 β (L), Kds. 225 β (L); Karangasem: Kds. 226 β (L, B); Ngarengan: Kds. 35007 β (L), Kds. 35008 β (L, B) — *Res. Rembang* — Sedan: Kds. 36445 β (L) — *Res. Madioen* — Pandan: Elbert n. 473 (L); Madioen: Wisse n. 132. — *Res. Besoeki* — Poeger Watangan: Kds. 230 β (L), Kds. 12835 β (L, B), Kds. 30154 β (L), Kds. 231 β (L); Rogodjampi: Kds. 680 β (L). — East-Java: Forbes n. 1284 (L).

V.n.: (Soend.) *pongporrang* (Bantam, Preanger: Kds. and Val.); (Soend.) *pongporang* (Preanger, Cheribon: Kds., Heyne); *praon; ki tongtorang* (Batavia); *poempoeran* (Kds. and Val., Blume); *ki lakaki* (Kds.); (Mal.) *boengli* (Batavia); (Jav.) *woengli* (Bantam, Pekalongan, Banjoemas); *moengli* (Banjoemas, Pekalongan); *dĕlĕg* (Besoeki: Kds.); *lanang* (Besoeki: Kds.); *kajoe lanang* (Semarang, Tegal, Soerakarta, Madioen, Kediri, Banjoemas, Pekalongan, Bagalĕn, Kedoe); *kadjen djaler* (Besoeki: Kds. and Val.); *padangan* (Semarang: Kds.); *kĕok* (Semarang).

Madoera — Sampang: Backer n. 19535 (B) — *Kangean Archipelago* — Ardjasa: Backer n. 26828 (L); Eteng pr. Tambajangan: Backer n. 27451 (B); N. of Ardjasa: Backer n. 27211 (B); Doeko: Dommers n. 47? (B); P. Paliat: Backer n. 29545 (B); Saboenten: Backer n. 29724 (B); Kangean: Dommers n. 285 (B); Mamboerit: Backer n. 27329 (B); Sepapan: Backer n. 28497 (B) — *Timor* — Miquel in Fl. Ned. Ind. 2 (1856) 752; Timor: Coll? (P.).

V.n.: dhang pedhangan (Madoera); *boenglo* (Kangean: Backer).

Borneo — Sanggouw: Hallier. f. n. B 920 (L, B); W. Koetai: Endert n. 2325 (B) — *Celebes* — Madjene: Noerkas n. 419 (L); Minahassa: Kds. 16096 β (L); G. Galesong pr. Malino, S. W. Cel: Bünnemeyer n. 10931 (B); Afd. Bonthain, 200 m. alt. n. bb. Cel. I 73.

V.n.: kajo karoe kadang (M. E. Borneo); (Mal.) *kajoe pĕdang* (Menado: Heyne); *boeli* (Celebes).

Philippines — Northern *Luzon* (Cagayan) to *Palawan* and *Mindanao* in most or all islands and provinces (Merrill 1923) — *Island of Negros* pr. Dumaguele: Elmer n. 6569 (L). — *Boroboro:* Com. Flor. For. Filip. n. 1626 (L). — *Luzon* pr. Irosin: Elmer n. 15636 (L); Luzon pr. Manila (L); Luzon pr. Antipolo: Merrill. Spec. Blancoanae n. 125 (L, B); Isabella Prov., Luzon: R. J. Alvarez n. F. B. 18576 (P).

V.n.: abang-abang (P. Bis); *abong-abong* (P. Bis); *balay uak* (Sul.) *barangan* (Ilk.); *bunglui* (Sul.); *balilang-uak* (Tag.); *balinag* (C. Bis.); *banlai* (Sul.); *bungai* (C. Bis.); *kamkampilan* (Ilk.); *kampilan* (Neg.); *maidboid* (Bik); *pingka pingka* (Tag.) *pingka-pinkahan* (Tag.); *taghilan* (Tag.).

Oroxylum indicum (L) Vent. fl. citrinus J. J. S. mss.
Cult. in Hort. Bog. XV K (B. IX) II. (B).

The appearance of *Oroxylum* is spreading in the forests at low and medium altitudes from 0 to 900 m. but constantly occurring through the whole area. In the Malayan Peninsula the species (Ridley l. c.) is "very abundant and conspicious near rivers and in lowland swampy countries". The species is certainly a striking one in the forests and thickets, but in high-stemmed primeval forests it lacks. However in the mountains south of the Himalaya *Oroxylum* occurs at greater altitudes, as for instance near Kumaon at 1300 m. above the level of the sea (Duthie l. c.).

As to the soil *Oroxylum* seems to be pretty indifferent.

The climate on the other hand influences the occurrence, e. g. it does not occur in the dry regions of N. W. British India.

As for the Malayan Archipelago Backer gives many remarks on frequency and habitat on his collecting labels; so for instance in the Res. Bantam (Java) it occurs seldom in secondary forests (shrubwildernesses), but never socially. In the Res. Madioen (Java) Wisse notes the same and in the Res. Banjoemas *Oroxylum* is rarely found according to Koorders.

As to the Philippines Merrill (1923. l. c.) remarks "occurring in thickets and secondary forests at low and medium altitudes". Thence it is remarkable that in the Kangean Archipelago, perhaps part the east frontier of the area, Backer gives some remarks on the frequency there. *Oroxylum* seems to be very rare in this region which is excellently worked out by this botanist. So for G. Eteng pr. Tambajangen he only found 1 specimen and likewise in Saboenten and Mamboerit.

In general it seems that the total number of individuals is consistent distributed in the whole area except in the eastzone.

This may be clear if we assume that *Oroxylum*, originally endemic in S. E. Asia, extended the area towards the east and that this process still goes on. Then indeed it is probable that on the Kangean Archipelago we have got to do with pioneer-specimens. From Bali, Lombok, Soembawa, Soemba, the Solo Arch., the Alor Islands, etc. I miss all materials or other notes. Only in Timor it occurs.

The matter of spreading seems to go easily; Burkill (1925) states the appearance "in a particular type of new jungle between Sadija and Saikhoa." Prain (1905) says about this near Calcutta: "occasionally planted and sometimes selfsown." The wind appears to me the main factor in the question of the matter of spreading. Whether this goes on large distances I do not know, but thereby the appearance in the Malayan Archipelago in so many islands would be explained.

For the use of the wood, etc. Heyne (l. c. 165-166) gives some remarks on the use of *Oroxylum* in the Malayan Archipelago. Scheffer notes that the roots are used together with other remedies against *impotentia virilis.* In Java the natives do not use the timber, this being too small and not durable (Kds. and Val.). Koorders (Tectona III 121) notes that the timber is used in the matches-industry. He (Minahassa) also remarks that in North Celebes the weak part between the bark and the wood is used for stanching blood.

Not only in the paleaotropics it is cultivated here and there, but also in the neotropics, though perhaps very rare; e. g. in Martinique (Introduced and cultivated in the Jardin Colonial: Hahn n. 1297 (P)).

3. MILLINGTONIA Linn. f.

Suppl. (1781) 45, 291; A. L. de Jussieu Gen. Pl. (1789); D. C. Prod. 9 (1845) 182; Bureau Monogr. (1864) 45; Benth. & Hook. Gen. Pl. 2 (1876) 1040; K. Schumann in Engler-Prantl Pfl. Fam. IV. 3b (1895) 226; Baillon Hist. Pl. 10 (1891) 39.

Monotypic genus; native country probably Burma, from Ava to Tenasserim. Perhaps also wild in Centr. India and on the Upper Godavery, according to Kurz and Clarke. Planted extensively throughout India and the Malayan Archipelago; in India sometimes sub-spontaneous.

Millingtonia hortensis Linn. f.

Suppl. (1781) 291; — = *Bignonia suberosa Roxb.* Cor. Pl. 3. 11, t. 214; — = *Millingtonia dubisa Span.* Linnaea 14 (1841) 326; Roxburgh. Fl. Ind. 3 (1832) 111; Wallich. Cat. n. 6513; Beddome. Fl. Sylv. t. 249; Kurz. For. Fl. 2. 238; Brand. For. Fl. 347; Miquel. Fl. Ned. Ind. 2 (1856) 753; Bureau. Monogr. (1864) 45, t. 8; Miquel. Ann. Mus. Lugd. Bat. 1 (1864) 753; C. B. Clarke in Hook. Fl. Br. Ind. 4 (1885) 377; Kds. and Val. Bijdr. Booms. Java. 1 (1894) 65; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 226, fig. 891; Wood. Rec. Bot. Surv. Ind. 2 (1902) 125; Gage. Op. cit. 3 (1904) 86; Prain. Op. cit. 3 (1905) 255; Saxton and Sedgwick. Op. cit. 6 (1918) 286; Kds. Exc. Fl. Java. 3 (1912) 183; Merrill. Enum. Philip. Fl. Pl. 3 (1923) 444; Foxworthy. Philip. Journ. Sc. 4 (1909) 558; Watt. Dict. 5. 247.; F. Villar, Novis. App. (1880) 150.

An erect *tree*, up to 25 m. high, bark corky. *Leaves* opposite, pubescent when young, mature nearly glabrous; to 1 m. l., 2—3-pinnate; leaflets ovate-lanceolate acuminate, sinuate or crenate 3. 5—5 cm. l. *Flowers* white in many-flowered, 3—7 cm. l. peduncled terminal panicles ca. 25—40 cm. l. on pendent branches; panicles minutely yellow pubescent. *Calyx* very short ca. 0.2—0.3 cm. l. campanulate, truncate with 5 obscure lobes. *Corolla* with slender 0.1—0.2 cm. br. tube ca. 7 cm. l., campanulate-dilatate towards the throat with 4 *stamens* and a rudiment; each fertile stamen having one fertile cell which is calcarate at the base, and a rudimental one also with a spur; stamens shortly exsert, didynamous; *corolla* distinctly bilabiate 5-lobed, lobes ovate-acute short pubescent at the margin, in bud sub-valvate. *Capsule* linear compressed parellel to the septum, septicidally 2-valved ca. 30 × 1.7 cm.; seeds thinly discoid with broad hyaline wings (includ. wings 1.4 × 3.5 cm.)

Geogr. distr. India — Cultivated throughout *India*, perhaps wild in *Burma* (Clarke); India orient: Wight n. 2332 (L, P); idem Mt. Nilghiri: Thomson (L sub n. 898, 199... 197) — *Siam* — Teysmann n. 5959 (U); Cult. in Hort. Calc.: Wallich n. 6513 c (P); Nellighery: M. Perrottet n. 281 bis (P); pr. Pondichery: Perrottet n. 285 (P); Bengal: Leschenault n.? (P); Penins. Ind. Or., Mt. Nilghiri & Kurg. (P); Pondichery: O. Debaux n. 503 (P); *Cochin China*, arbre ornamental: Réguier n. 241 (P).

V. n.: *tun piep* (Siam: Teysmann).

Malayan Archipelago — *Sumatra* — (Miquel Ann. 1 (1864) 753) — *Java* — de Vriese and Teysmann (L sub n. 898, 199... 92, n. 907, 135... 802) — *Res. Semarang* — J. Haak n. 568 (B,L) — *Res. Djokjakarta* — Here and there along the road from Djepiloe towards Kala: Backer n. 2807 (B) — *Res. Rembang* — pr. Toeban: Ch. Coster (B) — *Res. Soerabaya* — (L. sub n. 898, 199... 100); Solo cult.: Hemken n. 16 (B) — *Res. Kediri* — Forestry Tritik: Grutterink n. 3260 (B) — *Res. Besoeki* — Rogodjampi cult.; Kds. 219 β (B); Banjoewangi: Teysmann n. HB 1774 (B); Banjoewangi, pr. Sobo: Zollinger n. 2910 (P); Java: Leschenault? (P).

V. n.: (Jav.) *sekar poetie* (Pekalongan: Kds.); *amfioenan* (Kediri: Grutterink); *kembang poetie* (Java: Kds.); (Jav.) *tĕkar pĕtah* (Banjoewangi: Kds. and Val).

Madoera — pr. Sampang: Backer n. 19809 (B) — *Kangean Archipelago* — Bilibilis: Dommers n. 189 (B) — *Bali* pr. Beliling: Teysmann sub n. HB. 2764 (B); idem (U sub n. 032833); Bali (L. sub. n. 898, 199... 99,

n. 898, 199... 94); Bali: Cunningham n. 321 (L); ex. Herb. Paris (L sub n. 898, 199... 93) — *Timor* (U sub n. 032830); pr. k. Soenimela: H. Therik n. bb. 9560; N. M. Timor pr. k. Haoelassi n. bb. 7728 (L); Timor: Riedlé(P) — *Soembawa* — pr. Taliwang: Zollinger n. 2910 (P).

V. n.: *ketanggar* (Soemba); *karpoti* (Kangean: Dommers); *kanongoh* (Bali: Teysmann); *toka haoe* (Timor).

Celebes — pr. k. Rappang Enrekang: *Noerkas* n. 332 (L,B); pr. k. Saloeang Wolangitang: *Bontham* n. bb. Cel. I. 87.; Afd. Boeton, P. Moena: n. bb. 4998 (B) — *Ceram* — n. HB 1993 (L); (U sub n. 032832).

V. n.: (Makass.) *katangka* (Celebes: Bontham); *kaoelolo* (Celebes: bb. 4998).

In the Malayan Archipelago often cultivated for ornamental purposes, except perhaps in Sumatra, Borneo and the Philippines (Merrill); ripe capsules are seldom found.

Mr. J. Haak sent in 1903 the cited specimen from Semarang to Dr. Koorders with the remark that the species was used as a substitute for opium. The dried leaves were used in cigarettes; the same is done in Kediri. Heyne however does not mention this.

Miquel (Ann. l. c.) states some differences between the Siamese, Sumatranan and Timorese specimens: „foliola in siamensibus ovata vel deltoideo-ovata; in sumatranis ovato-oblonga, jugis singulis trifoliatis in timoranis oblongolanceolatis bi-tri-juga."

With a cultivated species as *Millingtonia hortensis* it is no wonder that such little aberrations appear, but these do not represent essential characters on which even a foundation for new varieties cannot be undertaken. For the rest we do not know anything about the heredity of these forms, nor whether they are the consequence of a natural variability. It seems that generally *Millingtonia hortensis* does not fructify frequently in the Malayan Archipelago.

4. PYROSTEGIA C. Presl.

Of this Bignonian genus only one species is cultivated in the Malayan Archipelago; native of Brasil.

Pyrostegia ignea (Vell.) Presl. Bot. Bemerk. (1844) 93; Abh. Böhm. Ges. Wiss. 3 (1845) 523; Symb. Bot. 2. 28, t. 77; = *Bignonia ignea Vell.* Flor. Flum. 4. 244, t. 15; Miers in Proc. Roy. Hort. Soc. London 3. 188; Bureau. Monogr. (1864) 42; Benth. & Hook. Gen. Pl. 2 (1876) 1034; H. Baillon. Hist. Pl. 10 (1891) 31; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 31.

Lian with costate twigs and opposite 1-jugate *leaves* with a terminal 3-branched tendril, seldom with a terminal leaflet; leaflets ovate to ovate-lanceolate, sub-obtuse to acuminate towards the top, 5—7 cm. l. *Flowers* red-yellow, in dense terminal inflorescences; *calyx* minute, broad campanulate, truncate with 5 short lobes ca. 0.3 cm. l., *corolla* in bud valvate, glabrous except the margin of the lobes, tube narrow, cylindric, ca. 5 cm. l., dilatate towards the ca. 0.8 cm. br. throat; lobes lanceolate ca. 1.5 cm. l.; *anthers* exsert, inserted at the middle of the tube, didynamous. *Capsule* narrow, cylindric with coriaceous valves and elleptic, membranous winged seeds.

Geogr. distr. Malayan Archipelago — Res. Preanger Reg. — Tjisoeroepan pr. Garoet in garden of hotel: Wigman Jr. (B); idem: Kds. 41004 β (B); Bandoeng cult.: Eyken (B); Soekaboemi cult.: Backer (B); Malabar pr. Pengalengan: Backer n. 26210 (B) cult. in garden of van Mullem (B); Lembang: v. Welsum n. 21, 30? (B); Bandoeng in garden hotel Kota: Kds. 41140 β (B).

Though this species is now and then cultivated in Java it seems never to run wild.

5. ARRABIDAEA P. DC.

Rev. Bign. in Bibl. Univ. Genève 17 (1838) 126; D.

C. Prod. 9 (1845) 183; Endlicher. Gen. Pl. (1836—40) n. 5727; Bureau. Monogr. (1864) 40; Benth. & Hook. Gen. Pl. 2 (1876) 1032; H. Baillon. Hist. Pl. 10 (1891) 27; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 213.

Lians or *shrubs*, *leaves* 2—3-foliolate, mostly with tendrils, opposite, mostly with pseudo-stipules. *Inflorescences* axillar or terminal, forming mostly composed paniculate thyrses, seldom pauciflorous. *Calyx* truncate, membranous or sub-coriaceous, sometimes toothed, glabrous, smooth, seldom with small glands. *Corolla* funnel-shaped or campanulate, mostly actinomorphic. *Anthers* 4, included, didynamous with a fifth rudiment. *Disk* variable. *Ovary* mostly elongate, mostly scabrous, with 2 or more series of ovules per cell. *Capsule* linear, mostly long, valves coriaceous.

Arrabidaea magnifica Sprague mss. in herb. U.

(Plants of Santa-Marta, U. S. of Columbia, collected by H. H. Smith. (1898—1901 n. 741).

Lian, branchlets terete, 2-foliolate, mostly with a large (15 cm.) long *tendril; pseudo-stipules* 2—3 cm. diam., ca. orbicular; petiole ca. 1. 5 cm. 1.; leaflets obovate oblong, shining above, opaque beneath, 8—12 × 4—6 cm., largest breadth at $^1/_3$ of the top, shortly obtuse-acuminate, cuneate to the base; nerves 3—4 pairs, lower pair reaching $^2/_3$ of the length, prominent, reticulations lax, prominent. *Thyrses* axillar and terminal, rather pauciflorous. *Calyx* firmly membranous, cupular-campanulate, smooth, glabrous, not toothed, 0.7 × 0.7 cm. *Corolla* rather large, purple-violet, tubular-infundibuliformous, sub-equally 5-lobed, lobes large; tube below narrow, 0.4 cm. diam., whitish purplish-striate, enlarged above ca. 1.5 cm. diam. *Stamens* 4, didynamous, fifth rudimentary. *Ovary* sub-scabrous, with 2 rows of ovules in each cell.

Geogr. distr. U. S. of Columbia — Santa Marta, 500 m. alt.: H. H. Smith n. 741, type specimen (U).

Malayan Archipelago — *Banka* — pr. Muntok: Kornassi (B) — *Sumatra* — Sibolangit, Arnhemia, ground of a controller's house, 3 m. high, 100 m. alt.: Lörzing n. 5501 (B, L) — *Gouvt. Sumatra's Oostkust* — Medan, Deli, cultivated up to 850 M. alt. (Lörzing).

This plant is sometimes cultivated in the Malayan Archipelago. As the capsules are always missing, I am not sure it is a true *Arrabidaea*, nor could I find the original description of Sprague [1]. The specimens I saw are just the same as the type specimen I cited above.

Lörzing mentions it as a species, which is rather often cultivated on Sumatra; it never produces capsules, but is only propagated with suckers. This points to self-sterility. Perhaps all specimens have originated from one individual. The flowers stink a little.

TRIBUS II. TECOMEAE.

6. TECOMARIA Fenzl.

Shrubs or sub-voluble plants with simple 1-pinnate *leaves*, leaflets serrate. *Inflorescences* terminal dense. *Flowers* orange or scarlet. *Calyx* regular, campanulate, 5-toothed. *Corolla*-tube narrowly funnel-shaped or almost cylindric, curved; limb markedly bilabiate. *Stamens* 4, exserted; anther-lobes connate for the upper third, divergent below. *Disk* cupular. Ovules 4-seriate in each cell. *Capsule* oblong-linear, much compressed parallel to the septum.

[Species 3, all African].

Only *Tecomaria capensis* is seldom cultivated in the

[1] Dr. T. A. Sprague was (Sept. 27, 1927) so kind as to inform me about *A. magnifica Sprague*; it is a new combination for *Bignonia magnifica Bull* ex Gard. Chron. July 19 (1879) 72, which Sprague did not publish yet.

Malayan Archipelago. It is a native of South Africa (Schumann): but naturalised in the neo-tropics.

Tecomaria capensis (Thbg.) Fenzl. — Spach. Hist. Vég. Phan. 9 (1840) 137; — = *Tecoma capensis Lindl.* Bot. Reg. t. 1117; Bureau. Monogr. (1864) 47; Benth. & Hook. Gen. Pl. 2 (1876) 1044; K. Schumann in Engler-Prantl. Pfl. Fam. IV 3*b* (1895) 229.

Climber without tendrils: *leaves* opposite imparipinnate, 3—4-jugate, 8—10 cm. l.; leaflets ovate short acuminate with few gross teeth especially near the top, 1—3 × 0.8-0. 2 cm.; terminal leaflet mostly the largest one. *Racemes* or panicles terminal ca. 10 cm. l.; *calyx* glabrous 0.4 cm. l. truncate shortly 5-dentated; *corolla* infundibuliformous, a little curved, the lower part inside pubescent, imbricate, ca. 4. 5 cm. l. *Stamens* exsert, cells divaricate, didynamous with a fifth rudiment inserted at the middle of the tube. *Capsule* linear, flat, seeds narrowly winged.

Geogr. distr. — *Malayan Archipelago* — *Java* — *Res. Semarang* — Salatiga: Backer n. 30322 (B) — *Res. Preanger* — cult. in a garden pr. Soekaboemi: Backer n. 22160, n. 23223 (B).

The native country of *Tecomaria capensis* was discussed by Seemann (1863), who gives several arguments for the neotropical origin; indeed, the plant seems to be naturalised in Brasil and was gathered by Miers and others in the natural vegetation. Moreover, Seemann [1]) quite rightly says that, if *T. capensis* was a native of Africa as well as of America, it would be the only *Bignonian* species occurring on two continents. The principal argument of Seemann was that the other *Tecomaria's* were found also in South America, viz. *T. fulva Seem.* and *T. rosaefolia Seem.* This has turned out to be wrong.

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[1]) Journ. of Bot. 1 (1863) 21 – 23.

K. Schumann (1895) mentions a second new African species: *T. Nyassae* (*Oliv.*) *H. Bn.* and therefore he thinks it not probable that *T. capensis* would be a native of the neo-tropics. Moreover Sprague[1]) has found that the American species of *Tecomaria* belong *to Stenolobium*, on account of the free anther-lobes and 2 rows of ovules in each cell of the ovary of *Stenolobium*. Thus *Tecomaria* has been established to be a true South African genus.

7. PANDOREA (Endl.) Spach.

Gen. Pl. (1836—40) 711, n. 4114*a* (Sect. *Tecomeae*); Spach. Hist. Nat. Vég. Phanérog. 9 (1840) 136; Ventetat. Jard. Malm. (*Bignonia*) t. 3; Maund. t. 8; Lindl. Bot. Reg. t. 2002; Bot. Magaz. t. 865 (*Bignonia)* 4094; D. C. Prod. 9 (1845) 225 (Sect. *Tecomeae*); Bureau Soc. Bot. Fr. 9 (1862) 163; Seemann. Ann. Mag. Nat. Hist. ser. III. 10 (1862) 31; Journ.Bot. 1 (1863) 19; Bureau. Monogr. (1864) 49; Bentham. Fl. Austr. 4 (1869) 537; Benth. & Hook. Gen. Pl. 2 (1876) 1045; Baillon. Hist. Pl. 10 (1891) 40; K. Schumann in Engler-Prantl. Pfl. Fam. IV 3*b* (1895) 230; Boerlage. Handl. Fl. Ned. Ind. 2 (1899) 590; Bailey. Queensl. Fl. 4 (1901) 1133; Diels. Engl. Jahrb. 57 (1922) 498; van Steenis. Nova Guinea 14 (1927) 294, 301.

Fig. 3 a, b, e; 4; 5 r; 16.

Descr. emend. Frutices parvi vel altiores, volubiles, lignosi, glabri, habitu Tecomanthis. *Folia* opposita, 1-pinnata, 2-11-jugata, rariter in apice ramulorum 3-foliolata, foliolis parvis vel magnis. *Inflorescentiae* terminales, parte infima interdum foliatae, rariter cauliforae, cymis in racemis dispositis, thyrsum efformantibus, pedunculi infima basi semper squamis minimis distichis vel verticillatis connatis praediti. Flores parvi 1—3. 5 cm. in *P. leptophylla* (*Bl.*) *Boerl.* et *P. Curtisii Ridl.* 5—7. 5 cm. *Calyx* semper parvus, trun-

1) In Dyer. Fl. Cap. 4 (1904) 448.

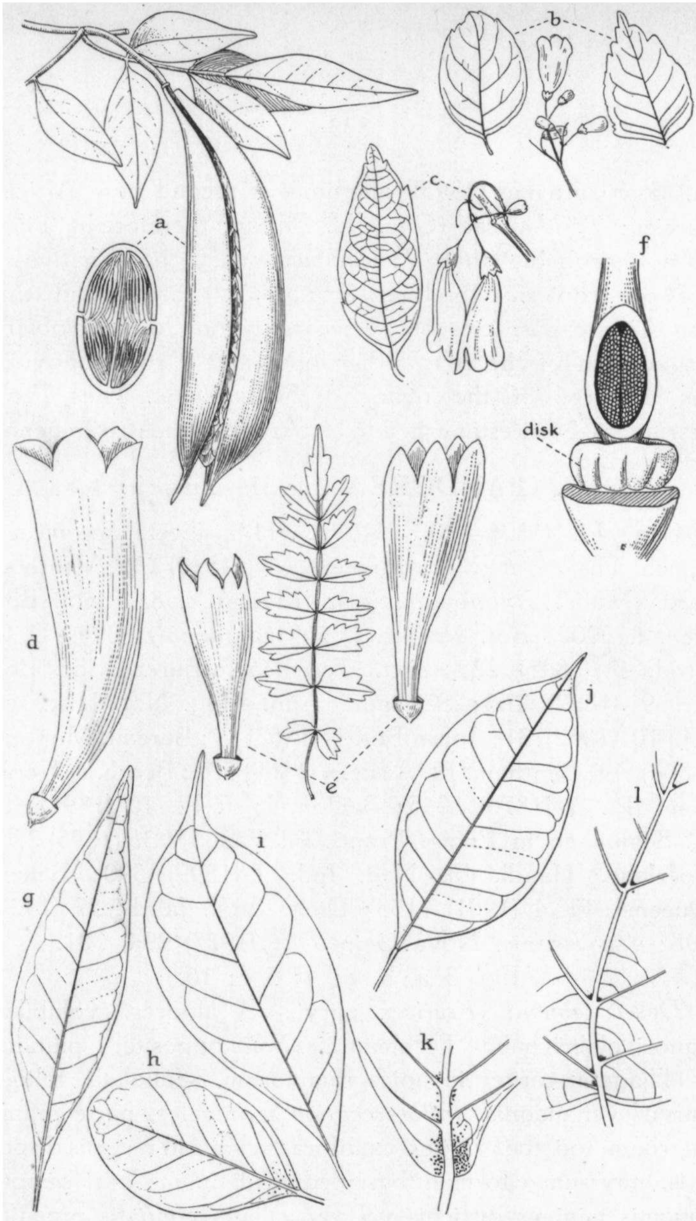

Fig. 3. Pandorea (Fenzl) Spach. a. P. australis (R. Br.) Spach. fruiting specimen and scheme of a transverse section of the capsule. (Cult. garden, Antibes: Thures (P). b. P. austrocaledonica Bur.. Left leaflet and inflorescence after the specimen: Compton n. 1804 (P); right one after the specimen: Vieillard n. 538 (P). c. Tecomanthe montana Diels. (Type specimen). d. T. aurantiaca Diels. (Type specimen). e. Pandorea leptophylla (Bl.) Boerl. (Type specimen). f. T. dendrophila (Bl.) K. Sch., disk and opened capsule, showing the placenta's and the ∞ -seriate ovules (Drs. van Leeuwen n. 11283. g. Radermachera siluyanensis Elm. (Type specimen) h. R. fenicis Merr. (Mc. Gregor n. 10124) i. R. fragrans (Flm.) vSts. j. R. elmeri Merr. Elmer n. 6179) k. R, glandulosa (Bl.) Miq. Glands on the underside of the base of a leaflet (Kds. n. 13250). l. Dolichandrone spathacea (L. f.) K. Sch., underside of a leaflet, showing the peculiar tufts of hairs in the axils of the primary nerves (After Kds. and Val. Bijdr. Booms. Atlas. Magnif. $^1/_2$ ×, except 3 f.

catus vel 5-dentatus, campanulatus vel cupulatus. *Corolla* parte inferiore anguste cylindracea, intus glabra vel stuposa, parte superiore infundibuliformis sub-campanulata vel rariter tubulosa, intus parte altera anteriore stuposa, altera glabra, inaequaliter 5-lobata, sub-2-labiata. *Stamina* 4, didynamia, quinto rudimentario, filamentis glabris vel basi stuposis. *Ovarium* oblongum, 2-loculare, placentis binis pro loculo, ovulis multi-seriatis praeditis. *Capsula oblonga*, plerumque apice acuminata, laevis; valvis aequalibus, firmiter coriaceis, concavis, septo plano, semina ∞ applanata, tenuitermembranaceo-alata.

(Tribus Tecomeae. Type *P. australis (R. Br.) Spach*. Species 10. Malay Peninsula to New Caledonia).

When giving a revision of this genus it seemed to be needful to give a short account of the history, together with that of the allied genera, which form in my opinion, though certainly of distinct generic rank, a large group or "Sippe", having the same origin in geographical and phylogenetical respect. Here it is not the place and moreover I do not feel competent to give a critical revision of these genera, which I have not especially studied for the greater part, because they do not inhabit the countries spoken about in this work. But to understand the origin and distribution of several Malayan *Tecomeae*, it is absolutely necessary to notice their affinities, which will appear to be of fundamental moment later on.

A. de Jussieu (Gen. 1789. 139) the creater of the genus *Tecoma* took elements together in this genus, which later on appeared to give raise to several distinct genera.

Endlicher (Gen. 1836—40. 4114) distinguished 3 sections amongst which the true *Pandorea* in section a *Campsis Lour.* he reckons synonymous with *Incarvillea Juss.*. *Stenolobium D. Don* he arranges as a synonym with *Bignonia Juss.* and *Tecomaria* forms section c. of *Tecoma*. The section *b.* was composed of American *Tecoma's* in *Eu-Tecoma*.

De Candolle (Prod. 9. 1845) accepts 2 sections, the first of which included sect. b+c of Endlicher and a.o. *Tecomella Don.* and *Campsis Lour.*. *Stenolobium* he placed also in *Bignonia*. Section II contained *Pandorea*.

Thus it was rational that Blume (1848) supposed the Malayan *Tecoma's: P. leptophylla, T. dendrophila* and *T. amboinensis* to belong to *Tecoma (Campsis)* and so did Miquel (1856). However, the latter (Ann. Mus. Lugd. Bat. I (1864) 197) supposes their affinities with *Pandorea*, but cannot decide, as the fruit is unknown to him.

Bureau (Monogr. 1861) distinguishes on the contrary in his group II (l. c. 47) distinct genera, e. g. *Tecomaria Fenzl., Tecoma Juss.* (part.), *Campsis Lour., Campsidium Seem. et Reiss.. Tecomella D. Don.*, which he points next to *Stenolobium D. Don* the latter being unknown to him, *Amphicoma Lindl.* and *Pandorea (Endl.) Seem.*

Bentham and Hooker (Gen. Pl. 1876) are of the opposite opinion and again took together several of the above mentioned genera to a large genus *Tecoma* owing to their interpretation in general about the limits of a genus. Within *Tecoma* they distinguish 4 sections, some according to mentioned distinct genera, but others still composed of heterogeneous elements. It is curious that they took *T. dendrophila* and 2 African *Pandorea's* together in section 3. *Eu-Tecoma* (*Campsis Lour.*), but left the Australian and New Caledonian *Pandorea's* separated in section 4. *Pandorea* Endl.

H. Baillon (Hist. Pl. 10.1891) agreeing with Bureau, again restores distinct genera and so does K. Schumann (Pfl. Fam. 1895).

Boerlage (Handl. Fl. Ned Ind. 1899) gives a review of the history of *Pandorea* and supposes the 4 Malayan

Tecoma's: Tecoma leptophylla Bl., T. ceramensis T. et B., T. dendrophila Bl. and. *T. amboinensis Bl.* preliminary to belong to *Pandorea*, however he points to their affiinities with *Tecomanthe H. Bn.*, an imperfect know genus then.

There are in my opinion the following relations between the genera allied with *Pandorea*.

These genera contain all lians, climbing without tendrils, with opposite 1-pinnate (seldom digitate) leaves, showing a *Tecoma*-flower, that is to say a calyx truncate 5-toothed, campanulate 5-lobed or rather tubular; a corolla narrow tubular below, enlarged above with 4 didynamous stamens and a fifth rudiment, included or exsert, an oblong capsule (seldom linear) with 2 concave coriaceous valves with several rows of seeds on each placenta.

Group I.

Pandorea (Endl.) Spach. Spec. 10. Malacca to New Caledonia. Flowers mostly small, calyx truncate, corolla on one side hairy inside, inequally 5-lobed, always thyrsal inflorescences, anthers included.

Tecomanthe H. Bn. Spec. 15. Ternate to New Guinea.

Flowers mostly large, corolla not on one side hairy within, inequally 5-lobed. Connected with transitional forms with *Pandorea*, having both racemes and thyrses, anthers included.

Neosepicaea Diels. Spec. 1. New Guinea.

Calyx short, truncate, corolla small, regularly 5-lobed, inside on one side hairy; leaves digitate; anthers included. Closely allied with *Pandorea*, not so immediately with *Tecomanthe*.

Group II.

Campsis Lour. Spec. ca. 5, perhaps more. Extending from Indo-China (Burma?) to China, Japan and in North America from Illinois to Florida.

It is composed of lians, climbing with roots (always?)

mostly allied with *Tecomanthe*, though having an other habit of the foliage. Fruit similar to that of *Pandorea* and *Tecomanthe*, disk cushion-shaped and not annular as in *Tecomanthe*.

Flowers in terminal thyrses on foliate twigs, calyx often glandular.

As I have noted (p. 878) in *Tecomanthe* there are also found roots on the stem but these are of no use to them for climbing.

I do not know the Burmese *Tecoma bipinnata Coll. et Hemsl.* (Journ. Linn. Soc. 28 (1890) 912), nor *Tecoma Cavalereia Léveillé* (Fl. Kouy-Tchéou. 1914/5.50—China: Kweichan), nor *Tecoma Mairei Léveillé* (Cat. Pl. Yunnan (1915) 20 — China: Yunnan). Perhaps these all belong to *Campsis Lour.*

C. grandiflora (Thbg.) K. Sch. (= *C. adrepens Lour.* Fl. Coch. Chin. 2 (1790) 377; — = *Tecoma sinensis Spach.* Hist. Vég. Phan. 9. 135 = *Tecoma grandiflora Loisel.* Herb. Amat. V. t. 286). It occurs in Japan, Korea, China and Indo-China. T. Mori (Enum. Pl. Corea (1922) 319) calls it a native of Japan. Hemsley (Journ. Linn. Soc. 26 (1889-1902) 235) supposes it to be indigeneous throughout China, Indo-China and Japan, where it is also cultivated.

C. radicans (L) Seem., occurs in the U. S. of America from Southern New Yersey and Penssylvania to Florida and Texas and north to Illinois and Iowa, escaped from cultivation further north, according to Britton and Brown (Ill. Fl. North. Unit. States 3. (1913) 237).

Whether *Tecoma filicifolia Nichols.* (Dict. Gard. 4 (1887) 13) of the Fiji Islands is a true *Tecoma* or a *Campsis* I do not know. I think it is the first.

Group III.

Campsidium Seem. et Reiss. spec. 2 (or more?) Chili.

Allied with *Campsis* and *Tecomanthe*; calyx without glands, corolla with rather short lobes, anthers included, filaments attached in the middle, capsule linear, with sturdy coriaceous valves. Certainly allied with *Tecomanthe* and *Pandorea*, but possessing a linear capsule and somewhat different anthers.

C. chilense Seem. et Reiss., C. valdiviana Skottsb.

Group IV.

Hausmannia F. v. Mueller. spec. 1. Queensland.

Allied with group I having a similar capsule, especially showing affinities with *Pandorea*, but rather isolated. The cupular disk and the foliage show affinities with *Neosepicaea*. It differs however, having exsert stamens and a remarkable valvate corolla, very curious characters indeed.

Group V.

Tecomaria Fenzl spec 3. All African.

Anthers mostly exsert. Ovules 4-seriate per cell. Flowers in terminal racemes or thyrses. Capsule linear, compressed. According to Sprague (in Dyer. Fl. Cap. 4. II (1904) 448) the American species belong to *Stenolobium D. Don.*, having only 2 series of ovules in each cell.

The group is rather isolated, but has affinities with *Campsidium* and *Campsis*, though differing in the 4-seriate ovules and the linear capsule.

Group VI.

Podranea Sprague spec. 2. Tropical Africa and the Cape.

P. ricasoliana Sprague (= *Tecoma Maikenii* Hort. ex W. Watson = *Pandorea ricasoliana Baill.*) in Dyer Fl. Cap 4 II 1904) 449. *P. Brycei Sprague* in Dyer. Fl. Trop. Africa. 4 II (1906) 515. Calyx campanulate, regular, 5-toothed, inflate when in flower, disk cupular; ovary oblong, capsule linear with 8 series of seeds per cell.

Certainly *Podranea* shows affinities with *Pandorea* in which genus Baillon first arranged *P. ricasoliana Sprague.*

As in *Tecomaria* the fruit however is linear and the plants are lians or undershrubs.

?. Group VII.

Perichlaena H.Bn. spec. 1 or 2? Madagascar.

P. Richardii H. Bn. is a lian, with cauliflorous cymes. The calyx is tubular, the corolla distinctly 2-labiate with a curvate tube. Disk cone-shaped, ovules in 2 rows per cell.

The Madagascarian lian is rather isolated from all the preceeding groups on account of its reduced number of ovules.

?? Group. VIII.

Stenolobium D. Don. spec. 4 (or more?). Argentinia to Mexico.

Shrubs with simple or pinnate leaves; calyx tubular-campanulate, often glandular. Thecae hairy, connective enlarged. Capsule linear with coriaceous concave valves. Ovules 2-seriate per cell.

Perhaps the American genus shows feeble affinities with some of the other groups, but it is not certain this is of true phylogenetical importance.

St. molle Seemann, St. stans (L) D. Don, St. fulvum Sprague, St. alatum Sprague.

In a general review of the affinities of the groups it appears that the first 6 groups, though totally differing in geographical distribution, show such characteristic common characters, that in my opinion there must be a narrow relation between them as to their origin. This I hope to make clear in chapter II.

Urban [1]) made an interesting study on the importance of the characters of tendrils and pollen-grains for the distinction of the genera of the *Bignoniaceae*. As the

[1]) Uber Ranken und Pollen der *Bignoniaceae*. Ber. Deutsch. Bot. Ges. 34 (1916) 728—758.

Malayan genera do not posses tendrils, this character was of no use for me.

I have not studied the pollen either. For the distinction of the genera it will be useful. For phylogenetic relations it seems to me of hardly any value. *Tecomaria Fenzl.*, *Campsis Lour.*, *Campsidium Seem. et Reiss.*, *Pandorea (Endl.) Spach. and Podranea Sprague* have the same kind of pollen, indeed, viz. "dreifurchigen granulierten Pollen". *Parabignonia Bur.* and *Dolichandra Cham.* also possess this pollen. Both however, have 2-foliolate leaves with tendrils; moreover, *Parabignonia* has only 2 rows of ovules per cell. And *Rhigozum Burch.*, *Catophractes Don.* and *Digomphia Benth.*, too, have the same pollen; all three of them having only 2 rows of ovules per cell and totally different leaves. On the other hand *Deplanchea Vieill.* has "3-furchigen Pollen" and *Delostoma D. Don* "furchenlosen Pollen". No doubt however these genera are closely allied.

KEY TO THE SPECIES.

1. Leaves narrow 7—11-jugate, leaflets gross-serrate, small 0.75—1 cm. l., flowers large 6—7.5 cm.
   § Leptophyllae.
   1. *P. leptophylla.*

   Leaves mostly 2—4-jugate, seldom up to 7-jugate, (but then flowers small ca. 2 cm. l and leaflets linear), leaflets mostly larger (if small not peculiar gross-serrate and then flowers ca. 1.5 cm. l), flowers small or large, not surpassing 5 cm. in length . . . 2
2. Flowers large, 4.5 cm. l . . . . . . **§ Grandiflorae** 3
   Flowers always smaller up to 2.5 cm. l **§ Parviflorae** 4
3. Flowers pinkish-yellow, ca. 5 cm. l, inside orange-yellow, lobes white, inflorescences racemes, leaflets 5, elliptic-caudate, 5 × 2.5 cm., 0.25 cm. l petioled
   2. *P. Curtisii.*

   Flowers delicate milk-white, ca. 4 cm. l, rose-red streaked in the throat, leaflets 5—7 (-9), ovate to lanceolate, obtuse acuminate, 2.5—5 × 1—2 cm., nearly sessile . . . . 3. *P. jasminoides.*

4. Leaves exceeding 60 cm., opposite or in whorls of 3 and 4, leaflets very large 12.5 × 5 cm., pale prominently reticulate at the underside, thyrses 7.5—45 cm., flowers cream-coloured, the lobes and throat shaded with pink, small 1.2 cm. l. 4. *P. Baileyana.*
Leaves never reaching 60 cm., but always less than 25 cm., always opposite, leaflets if having a prominent reticulate structure smaller than 12.5 cm., at most 9 cm. l, thyrses mostly smaller, corolla yellow, throat marked with purple 5
5. Leaves sub-coriaceous, with 8 distinctly prominent nerves and reticulations, corolla inside only stupose at the throat and not on one side of the tube, corolla 2 cm. narrow tubular, tube 0.5 cm. wide, disk cupular-annuliformous . . . . . . 5. *P. stenantha.*
Leaves papyraceous, nerves never distinctly prominent, mostly less than 8, reticulations lax and indistinctly prominent, tube inside stupose on one side, 2—3 cm. l, much broader, seldom tubular, mostly campanulate-infundibu liformous, disk annular. 6
6. Leaves 4—7-jugate, leaflets oblong-ovate never linear or obtuse and then sub-orbicular, but long acuminate (acumen ca. 1.5 cm.), 3—4 × 1.2—1.8 cm., nerves 5—7 . . . . 6. *P. ceramensis.*
Leaves 2—3-, seldom 4-jugate, if 6—7-jugate leaflets either linear, or obtuse and sub-orbicular, nerves 5—7 or less. 7
7. Leaflets ovate or sub-orbicular, rounded and always obtuse at the top, 2—3 (4—7) pairs, never linear, rather small 3—4 × 2—2.8 cm., sub-coriaceous when mature, nerves 3—6, thyrse rather small, 6—8 cm. l, 15—20-flowered. Calyx yellow, corolla outside

sulfureous on one side and yellow-purplish on the posterior one, inside the anterior part yellow, stupose and glandular, the posterior one deep-purple coloured and glabrous . . . . 7. *P. austro-caledonica.*
Leaflets 2—4 pairs, in case more, then leaflets linear, never obtuse and rounded at the top, seldom ovate, never sub-orbicular, mostly rather large and oblong to lanceolate, papyraceous, nerves mostly 6—8, if less leaflets lanceolate, corolla coloured in another manner 8

8. Leaflets large, lanceolate, ovate-oblong and acuminate, the greatest breadth in the middle, rather long 1—1.2 cm. petiolulate or sub-sessile, entire, 8—11 × 3.6—4.5 cm.; thyrses small, lateral, 4—14 cm. 1, corolla small rather narrow 1.5 × 0.5 cm., pale yellow, purple-brown streaked on the inside of the lobes. . . . . 8. *P. acutifolia.*
Leaflets smaller, most times all sessile, smaller or if rather large (6—10 cm. 1) and with 7—9 pairs of nerves, then the greatest breadth in the middle, thyrses mostly larger, corolla broader campanulate-infundibuliformous, mostly larger than 1.5 cm.. . . 9

9. Thyrses puberulous or shortly pubescent, branchlets densely lenticellate, leaves robust 10—20 cm. 1, oblong, rounded or sub-cuneate at the base, 6—10 × 3—4 cm. . . . . 9. *P. Poincillantha.*
Thyrses entirely glabrous, branchlets elenticellate or with few lenticels, leaves not robust, 5—10 cm. 1 seldom longer (and then leaflets mostly linear), mostly cuneate at the base, 2—7 × 2—2.5 cm.
10. *P. australis.*

1. **Pandorea leptophylla (Bl.) Boerl.**

— = *Tecoma* (*Cyathocoma*) *leptophylla Bl.* Rumphia. 4 (1848) 35; Blume Mus. Bot. Lugd. Bat. 1 (1849—50) 27; Boerlage. Handl. Fl. Ned. Ind. 2 (1899) 600; Miquel.

Fl. Ned. Ind. 2 (1856) 758; Miquel in Ann. Mus. Bot. Lugd. Bat. 1 (1864) 197; Warburg. Pfl. Papuas. Engl. Jahrb. (1890) 419; K. Schumann Fl. Deutsch. Schutzgeb. Südsee. (1900) 540; — = *Pandorea? leptophylla* (*Bl.*) *Diels*. Engl. Jahrb. 57 (1922) 499; van Steenis Nova Guinea 14 (1927) 301, t. 33.

Fig. 3 e; 4 (1); 16.

Many-branched glabrous *shrub*, sometimes climbing with roots (*Blume*); ultimate twigs voluble, sub-herbaceous, striate or sulcate, very slender 0.1 cm. thick, internodes 1—8 cm. l. Leaves patent, opposite 8—15 cm. l., lanceolate, when young tetragonous, later on sub-terete, remote or slightly crowded, 1—pinnate, 7—11-jugate. Petioles minutely alate, sub-terete, base somewhat thickened, 2—3 cm. l. connected with a sub-puberulous line; rhachis slightly alate, contracted near each pair of leaflets. Lateral leaflets small 0.75—1,5 × 1,5 - 3 cm., nearly sessile, peculiarly trapeziformous, membranous, acute or obtuse-acuminate, oblique, margin scabrous, anterior margin entire or 1—4 gross-obtusely toothed, posterior (1)—3—6 gross-obtusely toothed; terminal leaflet narrow lanceolate, entire or gross-obtusely toothed, ca. 0.5 cm. l. petiolulate. Nerves 2—3 pairs, slightly prominent, reticulations indistinct. Lamina beneath light-green with few scattered small glands as in *Radermachera*. *Racemes* axillar and terminal (Blume). Calyx short, cupular-truncate as usually in *Pandorea*, without teeth or with 5 equal minute teeth, blush-red, 0.5 × 0.7 cm., glabrous, smooth, coriaceous. *Corolla* rather large, 6—7.5 cm. l. (incl. lob.) blush-red, inside fuscous-striate, glabrous; tube rather narrow beneath ca. 0.5 cm. diam., slightly curved or nearly straight, stupose inside near the insertions of the stamens ca. 0.5 cm. above the base, infundibuliformous enlarged to the throat, ca. 2—2.5 cm. diam. at the throat, 5-lobed; lobes inequal, ovate, acute, margin sub-tomentose. *Stamens* 4, didynamous, ca. as long as the tube with a fifth rudiment; filaments filiform, stupose at the immediate base, glabrous. Style slightly longer than the filaments; stigma bilamellate. *Disk* annular, fleshy. *Ovary* cylindrical, sub-compressed, bilocular. Ovules ∞ in several rows on each placenta. Capsule unknown.

(Type specimen: Zippel (L sub n. 898, 200...112)).

Geogr. distr. New Guinea — S. W. New Guinea, coast-forest, flowering specimen, near Triton Bay?: Zippel (L sub n. 898,200...112, U sub n. 010795).

This very interesting shrubbish lian of the litoral forests of New Guinea seems to be very rare. Only Zippel gathered a flowering specimen nearly a century ago perhaps near Triton Bay. Warburg (l. c. 419) says that it, judging from the sterile twigs (he knows), the species also occurs near Finschhafen and Sigar. I found in the indeterminate sterile New Guinean materials of Pulle at Utrecht a specimen with scattered leaves, certainly no *Bignoniacea*, the foliage of which was very like that of *P. leptophylla*, so that it may be Warburg was mistaken. No German collector seems so have found any flowering specimen later on in N. E. New Guinea.

Taxonomically it is very interesting, as it shows affinities with several allied genera.

The habit of the foliage is much like that of *Campsidium* (e.g. *C. chilense Seem. et Reiss.*) also in its flowers, though the calyx of *Campsidium* is not as truncate as that of *P.leptophylla*.

Though I did not see any thick branches it seems to climb now and then with roots, a character pointing to *Campsis*.

For the rest possessing racemes (axillar as well as terminal, after Blume) and having a rather large corolla it has the nearest affinities with *Tecomanthe*, especially with *T.aurantiaca*, but differs totally by its foliage.

As to Boerlage, he called it a *Pandorea*. Being a link between *Pandorea* and *Tecomanthe* one may just as well call it a *Tecomanthe*, but it remains a link, showing affinities with both genera, though the nearest to *Pandorea* in my opinion.

2. Pandorea Curtisii Ridley.

— = *Tecoma Curtisii Ridl.* Journ. As. Soc. S. Br. 49.26; Fl. Malay Penins. 2 (1923) 553, fig. 125; van Steenis. Nova Guinea 14 (1927) 302.

Fig. 4 (2); 16.

Glabrous slender *twiner*. *Leaves* opposite, 10—12.5 cm. l., including the 2.5—5 cm. l. petioles. Leaflets 5, elliptic-caudate, base rounded, 5 × 2.5 cm.; lateral petiolules 0.25 cm. l., terminal one 0.6 cm. l., sidenerves 6—7. *Racemes* axillar and terminal. *Flowers* numerous, pedicels ca. 0.3 cm. l. *Calyx* cup-shaped, small 0.6 cm. l., greenish purple, 5-toothed. *Corolla* 5 cm. l., base cylindric, funnelshaped above, 2.5 cm. diam., outside pinkish yellow, inside orange yellow, lobes sub-orbicular, white. *Fruit* unknown.

Geogr. distr. Malay Peninsula — Rare and local (Ridley) — Penang, Batu Feringhii] and near the Chitty Temple (Curtis).

This species which I did not examine for lack of materials is a most interesting one with respect to the distribution of the genus. The very small calyx points undoubtedly to *Pandorea;* it is the only species known from the continent of Asia.

It is well distinguished by its 2-jugate leaves, its large 5 cm. l pinkish yellow corolla-tube with white lobes.

3. Pandorea jasminoides (Lindl.) K. Sch.

— = *Tecoma jasminoides Lindley.* Bot. Reg. t. 2002; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 230; All. Cunningham in London Hort. Brit. 582; Don. Gard. Dict. 4. 225; D. C. Prod. 9 (1845) 225; Bot. Magaz.

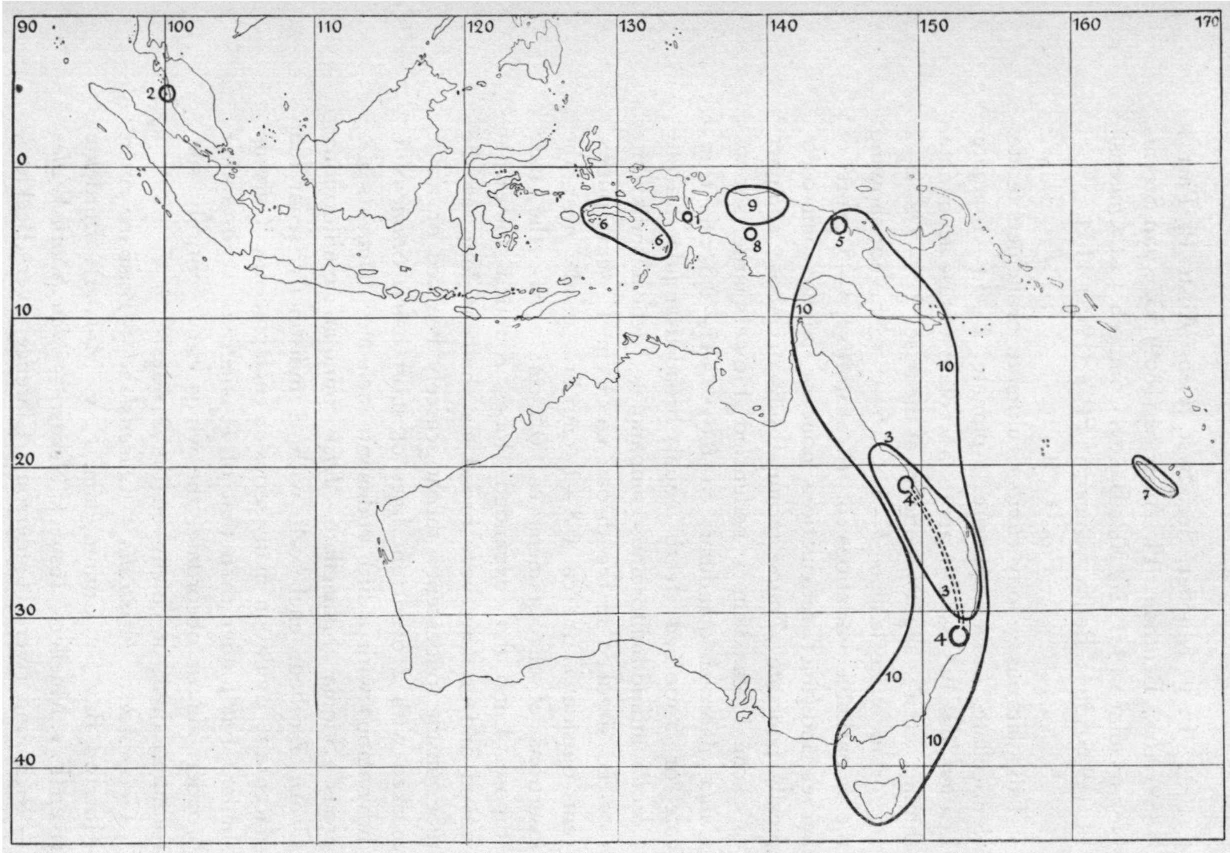

Fig. 4. Geographieal distribution of Pandorea (Endl.) Spach. 1. P. leptophylla (Bl.) Boerl. 2. P. Curtisii Ridley. 3. P. jasminoides (Lindl.) K. Sch. 4. P. Baileyana (Maid et Baker) vSts. 5. P. stenantha Diels. 6. P. ceramensis (T. et B.) H. Bn. 7. P. austrocaledonica Bur. 8. P. acutifolia vSts. 9. P. Poincillantha (Zipp.) vSts. 10. P. australis (R. Br.) Spach.

t. 1004; F. v. Mueller. Sec. Syst. Cens. Austr. Pl. Part. I (1889) 166; Bentham. Fl. Austr. 4 (1869) 537; van Steenis Nova Guinea 14 (1927) 302; Bailey. Compreh. Cat. Queensl. Pl. (1909) 364; Bailey. Queensl. Fl. 4 (1901) 1134.

Fig. 4 (3); 16.

Tall glabrous woody *climber*, ultimate branchlets terete, elenticellate. *Leaves* opposite, 1-pinnate, 2—3 (—4)-jugate. Leaflets nearly sessile, ovate to lanceolate, obtuse acuminate, shining, entire, slightly concave at the base, 2.5—5 × 1—2 cm. or in ovate leaflets 3—5 × 1.5—2.5 cm., not showing the remarkable variations of *P. australis;* 3—5 pairs of nerves, indistinct, reticulations none or minute, microscopically punctate. *Thyrse* terminal, sub-corymbose, compact, ca. 3 cm. l., ca. 3 cm. l. peduncled. Flowers large, showy. *Calyx* glabrous, glandular, ca. 0.6 × 0.45—0.5 cm., truncate or 5-toothed, teeth equal broad-triangular, acute. *Corolla* infundibuliformous-campanulate, delicate milkwhite rose-red streaked in the throat, ca. 4 cm. l., short pubescent outside. Tube ca. 0.8—1 cm. br., inside near the insertions of the stamens ca. 0.5 cm. above the base stupose. Limb flat, expanded; lobes rounded somewhat waved and crenate, very broad, ca. half as long as the tube, inside pubescent; throat scarcely bearded or inside marked with 2 decurrent lines of short hairs. *Stamens* 4, didynamous with a fifth rudiment, included; filaments glabrous. Stigma bilamellate. *Disk* annular-cupuliformous. *Ovary* 2-celled, each cell with 2 indistinctly separated placenta's; ovules in many series on each placenta. *Capsule* similar, but longer than that of *P. australis,* seeds rather broader, almost obcordate, the wings either entirely surrounding them or chiefly on the 2 sides.

Geogr. distr. Australia — Queensland — Brisbane river, Moreton Bay (A. Cunningham, F. v. Mueller); Burdekin river (F. v. Mueller); Ipswick (Nernst) — *New South Wales* — Richmond river (Henderson); Clarence river (Beckler?)

Malayan Archipelago — Cultivated in Hort. Bog. sub X. F. 133a. (B); idem sub n. 6012 (B); K. Bidara Tjima pr. Meester-Cornelis: Edeling (B); Gamboeng, north of Pengalengan, Bandoeng: Kds. 42081 β (B); Telagapatengan, south-west of Bandoeng, cultivated in garden, 1650 m. alt.: Backer n. 12533 (B).

The Australian climber differs distinctly from *P. australis* and from other *Pandorea's* in its large, white corolla, the throat being rose-red streaked, the rather compacted inflorescence and the glandular corolla.

It is often cultivated in the tropics (so e. g. in British India, Chutia Nagpur, according to Wood in Rec. Bot. Surv. Ind. 2 (1902) 125) and in the temperate regions; in the latter it is treated as a greenhouse-plant.

The leaflets are often infested with a blight-fungus, *Melasmia tecomatis C. et M.* (Bailey).

4. **Pandorea Baileyana** (Maid. et Bak.) vSts. nom. nov. — = *Tecoma Baileyana J. H. Maiden et R. T. Baker* Proc. Linn. Soc. New. South Wales. Sec. ser. 10 (592), pl. 51; Bailey Queensl. Fl. 4 (1901) 1134; F. M. Bailey Compr. Catal. Queensl. Pl. (1909) 364.

Fig. 4 (4); 16.

Tall woody glabrous *climber*. *Leaves* opposite 1-pinnate, 3—4-jugate, sometimes exceeding 60 cm., mostly 15—25 cm. l.. *Branchlets* ca. 0.4 cm. diam., ribby-alate; bases of the petioles thickened leafscars connected with each other. Petioles 3—5.5—7.5 cm. l., sub-terete, rhachis thickened near the insertions of the thickened bases of the petiolules; *leaflets* oblong, distinctly acuminate at the top, margin entire, chartaceous, oblique and rounded or slightly tapering at the base, nearly sessile; 10—11 sidenerves, just as the reticulations distinctly prominent at the underside; shining dark-green above, dull pale-green beneath. *Inflorescences* thyrsoid rather multiflorous, axillar, 7,5—45 cm. l., mostly

15—20 cm. l.; peduncle terete, 0.25 cm. diam., side-axis 2—3 cm. l., 7-flowered on the average; *calyx* articulated with the pedicel by a hypanthium, truncate, irregularly lobed or more or less distinctly 5-lobed, 0.3 × 0.4 cm., smooth, glabrous, purplish-brown. *Corolla* tubular, incurved, 1.2—1.3 cm. l., short tomentose outside, cream-coloured, lobes and throat shaded with pink; lobes almost equal, sub-orbicular, densely tomentose, tube inside somewhat bubbled, slightly hairy. *Stamens* 4, didynamous, included, glabrous, cells ovate-oblong, style glabrous, exceeding the stamens, stigmatic lobes sub-orbicular, crenate. *Ovary* sub-orbicular or ovate. *Capsule* unknown.

[Type specimen: *Bauerlen* (Queensland)].

Geogr. distr. Queensland — Near the Tweed River: W. Bauerlen (Bailey) — *New South Wales* — pr. Mullumbumby: W. Bauerlen (Kew).

Without doubt this species belongs to *Pandorea* (*Endl.*) *Spach.* I did not see any 3- or 4-verticillate leaves as *Bailey* mentions: Abnormous flowers occur sometimes, showing 5 stamens (3 longer, 2 shorter) and 10 equal corolla-lobes. Just as *Tecomanthe Hillii* (*F. v. Muell.*) *vSts.* the species seems to be rare.

It is nearest allied with *P. stenantha Diels,* on account of the structure of the leaves and the tubular small corolla, and not allied with Australian *Pandorea's.*

5. Pandorea stenantha Diels.

Engl. Jahrb. 57 (1922) 498; van Steenis. Nova Guinea 14 (1927) 302.

Fig. 4 (5); 5 r; 16.

Large glabrous *lian,* stem ca. 2.5 cm. thick, slightly rough, sulcate, nearly elenticellate; bark light-gray. *Leaves* pinnate, 3-jugate, sub-coriaceous, 10—15 cm. l.; petiole 2.5—3 cm. l. with several dark, not prominent ovate-oblong glands 0.2—0.3 cm. l., papillose-puberulous; leaflets sessile or up to 1 cm. l. petiolulate, oblong-acuminate, shortly serrate at the top, oblique at the base, all ca. of the same length, 6—8. 5 × 3.5—4 cm., lateral nerves ca. 8, curved, below as well as the reticulations prominent, connected with each other near the margin. *Thyrses* axillar and terminal, 10—25 cm. l. peduncled, many-flowered, especially dense at the top, minute puberulous. Peduncle slender ca. 0.1 cm. thick, naked below, except single opposite bracts at the immediate base, papillose-puberulous. Bracts minute-triangular, ultimate stalks 3-florous. Pedicels thin, ca. 0.5 cm. l. *Calyx* glabrous, smooth, articulate with the pedicel by a short hypanthium, campanulate-truncate, 0.4—0.5 × 0.3—0.35 cM., teeth small inequal, apiculate, broad triangular. *Corolla* with a yellow, narrow tube 2 × 0.5 cm., outside minute papillose pubescent, inside glabrous, 5-lobed, lobes short 0.3—0.4 cm. broad, ovate or sub-orbicular, inside pubescent at the throat, sub-inequal, 3 anterior ones emarginate, white. *Stamens* 4, included, didynamous, anthers divaricate, filaments glabrous, with scattered minute glands. Ovary oblong, glabrous, irregularly sulcate when dry. *Disk* cupular-annuliformous. Ovules ∞ on 2 placenta's per cell in many series. Capsule onknown.

(Type specimen: Ledermann n. 8909).

Geogr. distr. New Guinea — N. E. New Guinea, Sepik-district, on inclinations near the April river in dense moist primeval forest 2—400 m. alt.: Ledermann n. 9809, 2 specimens (D).

This species is characterized by its small narrow flowers, its somewhat cupular disk, and the glands on the petioles.

It occurs only at low altitudes and is but known from the Sepik-district.

It is closely allied with *P. Baileyana* (*Maid. et Bak.*) *vSts.* from E. Australia.

6. **Pandorea ceramensis (T. et B.) H.Bn.**

— = *Tecoma ceramensis Teysm. et Binnend.* Nat. Tijdschr. Ned. Ind. 25 (1863) 412; H. Baillon. Hist. Pl. 10 (1891) 40; Miquel. Ann. Mus. Bot. Ludg. Bat. 1 (1864) 197, t. 5; — = *Pandorea ceramica (T. et B.) Baill.* K. Schumann in Engler-Prantl. Pfl. Fam. IV 3b (1895) 230; Boerl. Handl. Fl. Ned. Ind. 2 (1899) 600; van Steenis Nova Guinea 14 (1927) 302.

Fig. 4 (6); 16.

Stem voluble, branches terete, ultimate branchlets 0.3 cm. diam., sub-quadrangular, bark brownish, striate when dry, with few small lenticels. *Leaves* opposite, 1-pinnate, (4-) 5—7-jugate, 15—25 cm. l.; petioles 3—4 cm. l., thickened and terete at the base, sub-sulcate above, eglandular or indistinctly glandular towards the base; rhachis striate, thin 0.1 cm. diam. minutely alate towards the apex. Leaflets papyraceous, sub-sessile, dark-green and shining above, paler beneath, margin entire or gross-dentated, oblique at the base, oblong-ovate and long acute-acuminate (acumen ca. 2—2. 5 cm.) or even caudate, the upper pairs even lanceolate-acute-acuminate, mostly 3—4 × 1.2—1.8 cm., rounded or sub-cuneate at the base, lateral ones sessile or subsessile, terminal 1 cm. l. petiolulate; nerves 5—7, slightly sunken in above when dry, indistinctly prominent beneath, reticulations lax, indistinctly prominent, underside distinctly glandular, glands pezizaeformous, small, orbicular. *Thyrses* axillar and terminal, ca. 15 cm. l., puberulous, rather multi-flowered; peduncle terete, at the base with some small opposite or verticillate cupular-connate bracts; primary axis being cymes, 2—7-flowered; pedicels slender 0.8 cm. l. with 2 minute opposite bracteoles at the middle. *Calyx* fulvous, cyathiformous or cupular-campanulate, truncate, mostly indistinctly irregularly toothed, articulating with the pedicel with a short hypanthium, slightly puberulous, 0.25 × 0.35 cm. *Corolla* tubular-campanulate, rather broad, glabrous, outside yellow, inside brown-purple striate and spotted, tube 2 × 1 cm.; lobes pale yellow, at both sides shortly pubescent, suborbicular, 0.9 cm. diam.; tube inside on one side stupose. Stamens 4, didynamous, inserted ca. 0.2 cm. above the base of the corolla-tube; filaments thickened at the base and glandular there, further glabrous; anthers oblong, cells divaricate. *Disk* annular. *Ovary* oblong, glandular as well as the base of the style, 2-locular, with 2 placenta's in each cell and ∞ ovules in several series on each placenta. *Capsule* oblong, rostrate at the apex, sub-compressed, 4-angular, 8 × 2.5 cm.; valves coriaceous, septum thick, shining, glabrous. Seeds ∞, transverse alate, obcordate, brownish.

(Type specimens: Teysmann n. HB. 5050).

Geogr. distr. Malayan Archipelago — Ceram — in forests: Teysmann n. HB. 5050 (L, B, U) — *Ambon*: Forsten (L sub n. 898, 200... 89, n. 898, 200... 88, n. 898, 200... 85, U sub n. 010796); in forests near the coast, G. Nona or Noesa Niwi: J. Boesveld (B).

Java — Cultivated in Hort. Bog. sub n. X. F. 118 (B.); Cult. in Hort. Bogor. ex. Ceram sub n. 6613 (B); Cult. in Hort. Bog. ex Klein Kei, pr. Toeal sub n. 32 (B).

The species occurs at low altitudes in Ceram, Ambon, and the Kei Archipelago. It is closely allied with *P. Poincillantha*. See for the differences the notes about that species on p. 859.

The specimens cultivated in the Hort. Bogor. ex Kei Islands differ from the type, showing broader and larger leaflets (5—7 × 2.5—3 cm.). Though the preserved specimens are sterile, I suppose them to belong certainly to *P. ceramensis;* the leaves are 5—6-jugate.

7. **Pandorea austro-caledonica Bur.**

Bull. Soc. Bot. Fr. 9. (1862) 163; Baillon Hist. Pl. 10

1891) 40; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 230.

Fig. 3 b; 4 (7); 16.

Voluble, glabrous *lian*, ultimate twigs thin, terete, striate; bark yellowish when dry. *Leaves* opposite, 1-pinnate, 2-3 (-4-7) jugate, 10-13 cm. l., upper ones under the inflorescence sometimes 3-foliolate. Petioles 1.5-4 cm. l., terete, thickened at the base, eglandular, connected with a prominent line; petiole and rhachis sulcate above; internodes 1.5 cm. l.. Lateral leaflets sub-sessile, terminal 0.5-1 cm. l. articulate-petioled, sometimes connate with one of the pair immediately beneath; 3-4 × 2-2.8 cm. l., concave, mostly broad elliptic or even sub-orbicular, seldom sub-oblong, rounded and oblique at the base, rounded and obtuse at the top; margin entire or with few gross teeth (2-4) at the top, revolute when dry; sub-coriaceous when mature, shining above, opaque beneath, narrowly running down along the petiole, microscopically punctate and with scattered sunken glands at the underside; nerves 3-6, curved, connected with each other near the margin, prominent, reticulations lax, indistinct. *Thyrse* 6-8 cm. l. including a 2-4 cm. l. peduncle, few (15-20) flowered, cymes opposite, 1-3 flowered, pedicels very slender, ca. 0.5 cm. l., bracts minute, oblong. *Calyx* yellow, small, ca. 0.3 cm. l., truncate, cupular-campanulate, ciliate, indistinctly 5- toothed, shortly mucronate, articulating, with the pedicel with a short hypanthium, glabrous, smooth, membranous. *Corolla* outside yellow on one side and yellow-purplish on the other (posterior), campanulate-infundibuliformous; tube 1.3 × 0.7 cm., glabrous outside, inside on the anterior part yellow, glandular and stupose, the other side being purple and glabrous; lobes 5 inequal, yellow, at both sides dense tomentose, sub-orbicular, 0.4 cm. diam.. *Stamens* 4, didynamous, fifth rudimentary, filaments arcuate, slightly thickened at the base with few glands, inserted 0.2 cm. above the base of the tube. Anthers ovate, cells divergent. *Ovary* sub-orbicular, compressed, each cell with 2 distinctly separated placenta's; ovules ∞ in 6-7 series on each placenta; ovary glandular as well as the basal part of the style, yellowish. Stigma bilamellate, lobes orbicular, ciliate. *Capsule* unknown.

(Type specimen: Vieillard n. 1002).

Geogr. distr. New Caledonia — N.W. New Caledonia — Mt. Balade: Vieillard n. 1002, n. 538 (P); Mt. Panié, thyrses only lateral, leaves 3-4-jugate: R. H. Compton n. 1804 (P); Mt. Canola, serpentine mountains 700 m. alt., leaves even 7-jugate: M. T. Lecard (P); forest of Guaro: de Pompéry (P).

This species is well characterized with its obtuse, small, almost ovate or even sub-orbicular leaflets, the varying number of pairs 3-7 and the colour and structure of its small corolla.

It seems to me to be allied with *P. ceramensis, Poincillantha, stenantha* and *australis*, but to differ distinctly from them.

It occurs at medium altitudes in the forestrial north-western part of the isle.

The habit shows especially affinities with *P. australis*.

8. **Pandorea acutifolia vSts.**

Nova Guinea 14 (1927) 303, t. 34, fig. C.

Fig. 4 (8): 16.

Large glabrous *lian*; stem terete 2 cm. diam.; bark rough, splitting, argentate when dry. Branches sub-quadrangular, brownish, firmly striate, densely lenticellate, lenticels small nearly 0.05 cm. diam.. *Leaves* 1-pinnate, 3-(or more?) jugate, ca. 27 cm. l.; petiole striate when dry, glabrous, with many small glands at the lower half; rhachis articulate, sub-terete, sulcate above, internodes 4-5 cm. l.. Inferior leaflets 1-1.2 cm. l. petiolulate, upper ones nearly sessile, all entire, papyraceous, 8-11 × 3.6-4.5 cm., ovate-oblong with the greatest breadth below the middle, apiculate or acuminate, sub-truncate and oblique at the base, somewhat concave, shining above; lateral veins ca. 9 pairs, sub-straight, connected with each other at the margin, a little prominent, reticulations lax, indistinct. *Thyrses* lateral, puberulous, on the old wood as well as on the young branches, narrow, rather lax but multi-flowered, 4-14 cm. l., sometimes foliate at the base, short ca. 1 cm. l. peduncled; stalks slender, the peduncle at the immediate base with 2 small opposite broad cupular-connate bracts; the opposite primary axis are 3-flowered cymes; pedicels 0.7-1.1 cm. l. with short scale-like bracteoles. *Calyx* sub-campanulate minute, 0.2 cm. l. on a short 0.1 cm. l. hypanthium articulate with the pedicel, 5-toothed; teeth equal, minute pubescent, ciliate, acute, mucronulate. *Corolla* small 1.5 × 0.5 cm., pale yellow purple-brown streaked on the inside of the lobes; tube sub-campanulate glabrous outside, stupose inside on one side; lobes unequal 0.3-0.4 cm. l., pubescent at both sides. *Stamens* 4 didynamous, fifth rudimentary, included. *Fruit* unknown.

(Type specimen: Pulle n. 1223).

Geogr. distr. New Guinea — S. New Guinea pr. Kloofbivak, Lorentz river, 40 m. alt. in primeval forest: Pulle n. 1223 (L, B.).

This species is well characterized with its small, pale yellow, narrow flowers, the lobes being dark-purple streaked inside, the rather large leaves, with apiculate leaflets, the glandular petiole reminding that of *P. stenantha* and the minute, 5-toothed calyx.

It is allied with that species, but differs in the smaller calyx, the rather short peduncled inflorescences, which are not contracted at the end, the smaller flowers, the lobes being not white, but pale yellow, dark-purple streaked. Moreover the leaflets of *P. stenantha* are dentated towards the top, are smaller and more elliptic-oblong, having the greatest breadth in the middle; the structure of the leaflets of *P. stenantha* is more firmly papyraceous and the reticulations are narrower and more distinctly prominent.

The petioles of both species are glandular, but the glands of *P. stenantha* are less in number and larger.

Most closely allied with *P. Poincillantha*. This species, however, has a much broader corolla, a truncate-cupular calyx with indistinct teeth, smaller leaves and long acuminate leaflets with the greatest breadth mostly at the middle.

9. **Pandorea Poincillantha (Zipp.) vSts.** — = *Bignonia Poincillantha Zipp.* Nomen in Herb. Lugd. Bat.; van Steenis Nova Guinea 14 (1927) 302; — ≐ *Tecoma ceramensis T. et B. var. elliptica Miquel.* Ann. Mus. Lugd. Bat. 1 (1864) 198; Scheffer. Ann. Buitenz. 1 (1876) 40.

Fig. 4 (9); 16.

Glabrous *climber* ca. 4—6 m. (or more?) high; branchlets 0.5 cm. thick, terete, firmly striate, densely lenticellate, lenticels minute, brownish. *Leaves* 1-pinnate, 10—20 cm. 1., 2—3 (-4)-jugate, opposite, glabrous; petioles 2—4 cm. 1. thickened at the immediate base, connected with a prominent line, glabrous, sub-terete, the lower half glandular, internodes 2—3 cm. 1.; leaflets firmly papyraceous, glabrous, shining dark-green above, entirely or (seldom) gross-dentated towards the top, lower pairs shortly 0. 2—0.5 cm. petiolulate, upper ones sessile, terminal 1—2.5 cm. 1. petiolulate, all elliptic-oblong, oblique and rounded or sub-cuneate at the base, acute or mostly acuminate, seldom caudate at the top, 6—10 × 3—4 cm.; sidenerves 7—9 pairs, a little prominent, reticulations lax, indistinct, underside of the leaflets sometimes glandular. *Thyrses* lateral and terminal 10—15 cm. 1., 1—3 cm. 1. peduncled; peduncle terete, 0.3 cm. thick, puberulous, at the base thickened and with opposite or verticillate minute cupular-cuneate bracts. Thyrse puberulous, especially multi-flowered at the top, the side-axis are (3)-7-flowered cymes; stalks slender; pedicels 0.5—0.8 cm. 1. puberulous, bracts minute, with 2 opposite bracteoles in the middle. *Calyx* cupular-campanulate, 0.2 cm. l., truncate, minutely equally 5-toothed, margin ciliate, articulated with the pedicel with a short hypanthium. *Corolla* yellow, not fragrant, 1.5—2 cm. l. sub-campanulate-infundibuliformous, inside on one side stupose; tube 1 × 0.8 cm., glabrous; lobes 5, sub-equal, sub-orbicular 0.5 cm. diam., short pubescent on both sides, marked with brown-red inside. Disk cone-shaped. *Stamens* 4, didynamous, inserted near the immediate base of the tube 0.1—0.15 cm. above it, fifth rudimentary; filaments glabrous, white, thickened at the base and densely covered with small glands there, nearly as long as the tube; *anthers* divaricate brown-purple, on curved filaments, obtuse, elliptic. *Ovary* glabrous, glandular at the top or throughout, style glabrous, smooth or glandular at the base, small ca. 0.4 cm. l., 2-celled; each cell with ∞ ovules in many rows on 2 placenta's. *Capsule* unknown.

(Type specimen: J a n o w s k y n. 433).

Geogr. distr. New Guinea — N. Guinea: Zippel (L. sub n. 898, 200... 92, n. 898, 200... 91, 898, 200... 90, n. 898, 200... 88 (partim), n. 898, 200... 86); North New Guinea, Humboldt Bay, bank of the Mbaai river, 10 m. alt., 1 specimen: K. G j e l l e r u p n. 971 (L, B.); North New Guinea, Bivak Hollandia, river bank, 10 m. alt.: K. G j e l l e r u p n. 405 (B, U, L, D, Kew); banks of the mouth of the Mamberamo river: R. F. J a n o w s k y n. 433 (L, B, D, Kew, U).

var. fragrans. vSts. nov. var. Flores fragrantes.

Geogr. distr. New Guinea — Meervlakte, Motor-bivak, bank of the Brown river, alt. 100 m., flowers yellow, fragrant: W. M. D o c t e r s v a n L e e u w e n n. 11152 (L, B).

This species is well characterized by its striate, slightly ribbed dense lenticellate branchlets (lenticels minute), corolla rounded at the base, the filaments which are thickened and glandular at the base and inserted nearly at the base of the tube and the rather broad corolla-tube, which is inside stupose on one side.

It is allied with *P. acutifolia*, from which it differs in its foliage, the large thyrses, the cymes of which are mostly 7-flowered, the truncate or obtuse-toothed calyx, the filaments, which are thickened and glandular at their base and the glandular ovary.

Moreover it shows affinities with *P. stenantha*.

It is most closely allied, however, with *P. ceramensis*, even that one might suppose the 2 species being both of the rank of a sub-species of one species *P. ceramensis*. As no capsule of *P. Poincillantha* is known for the present, it seems better to keep both as distinct species, though closely allied. For easiness'sake I give here the principal points of difference.

P. Poincillantha.	*P. ceramensis.*
Branchlets mostly dense lenticellate.	Branchlets elenticellate or with few ones.
Leaves 2-3-, seldom 4-jugate.	Leaves 5-7-, seldom 4-jugate.
Rhachis sub-angular.	Rhachis to the apex minutely alate.
Petiole distinctly glandular at the base.	Petiole indistinctly or eglandular at the base.
Leaflets rather large when mature, 6-10 × 3-4 cm. ovate-oblong, shortly acuminate.	Leaflets rather small, when mature 3-4 × 1.2-1.8 cm., oblong-lanceolate, even caudate, mostly long acuminate.
Nerves 7-9, slightly prominent.	Nerves 5-7 more indistinctly prominent.

10. **Pandorea australis (R. Br.) Spach.**

R. Brown. Prod. 471; ed. 2 (1827) 327; Spach. Hist. Nat. Vég. Phanérog. 9 (1840) 136; Sims. in Bot. Magaz.

(1795) n. 865; Maund. Botanist t. 8; — = *Bignonia Pandorana Andr.* Bot. Rep. t. 81; — = *Bignonia Pandorae Vent.* Malm. t. 33; — = *Bignonia australis Ait.* Hort. Kew. ed. 2. IV. 34; Bailey Queensland Fl. 4 (1901) 1134; — = *Tecoma australis R. Br.* D. C. Prod. 9 (1845) 225; — = *Tecoma floribunda Cunn.* in D. C. 9 (1845) 225; — = *T. diversifolia G. Don.* 4. 225; D. C. Prod. 9 (1845) 225; Bailey Compreh. Cat. Queensl. Pl. (1909) 364; Bailey in Queensl. Agric. Journ. Bot. Bull. 7 (1900) 349; F. v. Mueller Sec. Syst. Cens. Austr. Pl. 1 (1889) 166; Bentham Fl. Austr. 4 (1869) 537; Diels Engl. Bot. Jahrb. 57 (1922) 498; van Steenis Nova Guinea 14 (1927) 302.

Fig. 3 a; 4 (10); 16.

Tall glabrous woody *climber*, branchlets twining. *Leaves* 10-15 cm. l. very variable, opposite, 2-4-(6)-jugate. Leaflets ovate-oblong, ovate-lanceolate or almost linear, entire or here and there coarsely crenate, 2-8 cm. l, exceedingly variable, all small or all large, sometimes, especially on barren shoots, all coarsely toothed and then occasionally all very small and much more numerous, underside beneath glandularly punctate, rhachis and petiole glabrous, without glands, sidenerves 5-7, indistinctly prominent, reticulations indistinct. *Thyrses* glabrous, mostly loose and multi-flowered, but also sometimes more contracted or pauciflorous, leafy at the base, primary axis opposite. *Calyx* smooth, 0.2-0.3 cm. l. *Corolla* mostly yellowish-white, tube 1.2-2.5 cm. l., slightly curved and dilated upwards, lobes broad not 1/3 as long as the tube, the 2 upper ones rather smaller with purple or red spots at their bases, the throat bearded inside under the lower lip, tube bearded on one side and with small glands. Tube glabrous near the insertions of the stamens. *Stamens* 4, didynamous, glandular at the base, inserted near the base of the corolla. Disk annular. *Ovary* glandular, sub-compressed, 2-celled, each cell with 2 placenta's, each placenta with ∞ ovules in several rows. *Capsule* 3-7.5 cm. 1. acute or slightly acuminate at both ends; valves hard and very concave. Seeds flat oblong or rounded, surrounded by a broad wing.

Geogr. distr. Australia, New Guinea and Tasmania.

This species is ultimately variable and Bailey (l. c. 1134) distinguishes 3 forms, which he calls varieties. For the present it seems to me the best to keep these forms, though I mean they ought to be considered as sub-species, because they vary in many rather important characters and intermediate forms are present.

Diels (l. c. 498) who worked out the New Guinean materials of *P. australis* "findet aber keine Möglichkeit, diese Exemplare von der bisher aus Ost-Australien und auch dort sehr vielförmigen Pflanze zu trennen".

It will be necessary in the future to give a more distinct account of the sub-species, varieties, and forms, especially by Australian botanists based upon fieldknowledge and cultivation of *P. australis.*

Provisionally the following sub-species are to be distinguished.

s. sp. Pandorea Bailey — Queensl. Fl. 4 (1901) 1134; Compreh. Cat. (1909) 364; — =*Bignonia Pandorea Ventetat.* Jard. Malm. t. 43; Bot. Mag. t. 865; Maiden and Campbell Fl. Pl. and Ferns. N. S. W. n. 11; — = *Tecoma Latrobei F. v. M.* in Herb. P.

Leaflets on the flowering shoots 3, the lateral ones more or less oblique at the base, smaller than the terminal one, which is from 5—7. 5 cm. l., base broadly rounded, from whence narrowed into a long acuminate sharp point; terminal petioles long, lateral ones short. *Terminal panicle* often wide spreading. *Flowers* 2.5 cm. or longer, expanding upwards to nearly 1.8 cm. wide, emitting a strong disagreable odour. *capsule* dark-brown, the largest about 8 cm. l., valves stiff.

Geogr. distr. New Guinea (I did not see the New Guinean specimens cited below, but probably they belong to this s. sp.) *N. W. New Guinea* — South river, 400 m. alt.: Moszkowski n. 423; pr. Paraido: Moszkowski n. 430 — *N. E. New Guinea* — Mt. Kani, 1000 m. alt.: Schlechter n. 18271; forests of the Maboro: Schlechter n. 19861; in forests in Mt. Gati: Schlechter n. 16998.

Queensland — Rockingham Bay: Dallachi (U, L, P) — *New South Wales* — Port Jackson pr. Sydney (L sub n. 898, 200... 68); Blue Mountains pr. Sydney (P); pr. Wingham: J. L. Boorman (L sub n. 910, 151... 539); Paterson river: J. L. Boorman (L sub n. 908, 146... 2205); Australia Felix: F. v. Mueller (U).

I saw the following cultivated specimens: cultivated in a temperate greenhouse Jard. Pl. Paris, 1862 (P); Hort. Noisette, 1876 (P).

s. sp. meonantha Bailey — Queensl. Fl. 4 (1901) 1134; Compreh. Cat. (1909) 364; — = *Tecoma meonantha G. Don* Syst. 4. 24; — = *Bignonia meonantha Link.* Enum. Hort. Berol. II. 130; — = *Tecoma australis β? meonantha D. C.* Prod. 9 (1845) 225; Illustr. Bot Cook's Voyage. 71, t. 228.

Leaflets on the flowering shoots 3 or 5, usually oblong, mucronate. Panicles usually very narrow. *Flowers* fragant, seldom exceeding 1.25 cm. in length, narrow. *Capsule* the largest about 6 cm., valves rather thin.

Geogr. distr. New Guinea — Alexishafen, flowers yellow, inside blood-red striate, fragrant: P. Fr. Wiesenthal n. 46.

Australia — *Queensland* — Moreton Bay: F. v. Mueller (P, U, L, sub n. 900, 81... 135); Genoc river: A. Mar & Tailor (L sub n. 898, 200... 66); Australia Felix: F. v. Mueller (U. P, L); Burdekin river: F. v. Mueller (P); Australia, without locality (L sub n. 898, 200 ... 72); ex herb. Beaudoin (P); Banks and Solander (P) —

New South Wales — Port Jackson: Lhotsky (P); pr. Sydney: Arnony n. 44 (P); Port Jackson: R. Brown, type specimen of Tecoma australis R. Br. Prod.? (P); New South Wales: M. Busseuil (P); pr. Sydney: M. Verreaux n. 53 (P); Port Jackson: Beaudoin n. 68 (P); Port Denison (L sub n. 898, 200... 65); pr. Fitzalan (L sub n. 898, 200... 63); — *Victoria* — Dandenong Ranges pr. Melbourne: F. v. Mueller (P, L sub n. 900, 256... 449, n. 900, 256... 448, n. 898, 200... 46); Victoria river: F. v. Mueller (P); Victoria: Duncan (P); Victoria (L sub n. 898, 200... 61). *Tasmania* — sub Pandorea? (P).

I saw the following cultivated specimens: Garden Antibes, fruiting specimen: Thures (P); Korfoe; Cassa Rosa: C. Baenitz (P).

As the specimen of Antibes showed ripe fruits, the species seems not to be self-sterile, this being probably often the case with the *Bignoniaceae*.

s. sp. linearis Bailey — Queensl, Fl. 4 (1901) 1134, pl. 45; Compreh. Cat. (1909); 364 — = *Tecoma Oxleyi A, Cunn.* in D. C. Prod. 9 (1845) 225.

Leaves remote, from 4—6 pairs and a terminal leaflet, this one the largest, 2.5—5 cm. l. and seldom exceeding 0.4 cm. broad. The lateral ones scarcely half the size of the terminal one. Panicles on long peduncles, rather short, 4—6 cm. l., pauciflorous, about the size and form of s. sp. *meonantha*. *Capsule* 2—2.2 × 0.4—0.6 cm.

Geogr. distr. Australia — Queensland — Herberton: J. F. Bailey — *New South Wales* — A. Cunningham n. 386 (U); pr. Coolabah; J. L. Boorman (L sub n. 918, 3... 199); pr. Coolabah: Maiden and Boorman (P).

Excluded and doubtful species.

Pandorea Ricasoliana H. Bn. (Hist. Pl. 10 (1891) 40) = *Podranea ricasoliana Sprague* (in Dyer. Fl. Cap. 4 (1904) 450) — S. E. Africa.

Tecoma (*Pandorea*) *spec.* (Bentham & Hook. Gen. Pl. 2 (1876) 1045). Java.

I do not know any *Pandorea* from Java and even do not suppose that any *Pandorea* will be found in this island, which is worked out for a great deal nowadays. Boerlage (Handl. Fl. Ned. Ind. 2 (1899) 591) does not suppose the genus to occur in Java either.

8. TECOMANTHE H. Baillon.

Hist. Pl. 10 (1891) 41; K. Schumann in Engler-Prantl. Pfl. Fam. IV 3b (1895) 230; Boerlage. Handl. Fl. Ned. Ind. 2 (1901) 590-1; L. Diels. Bign. Papuas. Engl. Jahrb. 57 (1922) 496; S. Moore. H. O. Forbes's New Guinea Plants. Journ. Bot. 61 (1923) 38; van Steenis. Nova Guinea 14 (1927) 294.

Fig. 3 c, d, f; 5 a-g; 6; 16.

The genus *Tecomanthe* is founded by Baillon on *T. Bureaui Baillon* of which only an imperfect specimen was gathered near Triton Bay by Hombron. Only a branchlet with a naked peduncle and some flowers are present. So Baillon (p. 11) says: "Le *Técomanthe* de la Nouvelle Guinée, est une liane, a fleurs portées sur le bois des branches volubiles, et qui parait voisine des genres précédents, mais dont on ne connait ni les feuilles, ni le fruit." Baillon thus supposes the alliance with *Pandorea, Campsidium, Campsis, Tecomella* and *Tecomaria,* though he had seen neither the capsules nor the leaves. And so did Blume. It is again a proof of the existence of a certain "systematical intuition" founded upon a "systematical vision", as I would say, that Blume (1848) already placed the 3 *Pandorea's* and the *Tecomanthe's* known then, in the genus *Tecoma (Campsis),* though Blume also did not know anything about the fruits. That he mentioned the same about *Tecoma* (*Campsis*) *cuspidata* (=*Nyctocalos cuspidatum*) is due to the fact, that sterile specimens of

Nyctocalos show a striking resemblance with *Tecomanthe* § *Dendrophilae.*

Bentham & Hooker (Gen. Pl. 1045), who adopted a large genus *Tecoma* with several sections, which later on have given raise to distinct genera, placed the *Tecomanthe's* of Blume in the section 4. *Pandorea.*

The genus *Tecoma* in those days (1875) composed of truly heterogeneous elements, was limited later on to American climbers, the species of the palaeotropics being arranged in several new genera. This is amongst other things the case with our *Tecomanthe* (see for this also under *Pandorea* p. 836).

Baillon marks the type as a doubtful *Tecomea* (1891) the capsule being unknown. He says: "51.? *Tecomanthe H. Bn.* Flores fere *Campseos*; calyce membranaceo; lobis 5 inaequali-deltoideis; majoribus 2. Corolla e basi angusta sensim ampliata; limbi sub-2-labiati lobis acutiusculis. Stamina didynama, inclusa; loculis divergentibus. Staminodium antheram sterilem gerens. Discus annularis. Germen brevissime stipitatum; ovulis utrinque in septo ∞ seriatis; styli lamellis stigmatiferis longe rhomboideis — Frutex scandens; caule volubili (haud? cirrhoso) foliis. . . . ?; floribus amplis (ad 1 dm.) speciosis in ligno ortis. Genus in ordine valde anomalum, ob specimen valde mancum, male notum. (Nova Guinea. Spec. 1. *T. Bureaui H. Bn.*)".

K. Schumann does the same, as he says (p. 232) that he does not know other species than the single *T. Bureaui,* which he did not see. Later on Schumann [1]) recognized *Tecoma dendrophila Bl.* as a *Tecomanthe.* In the key he gives in the Pfl. Fam., he mentions as the only difference between *Pandorea* and *Tecomanthe* the cauliflory of the latter, against the flowers on foliate twigs of the former. In the description he adds that in *Tecomanthe* the calyx

[1]) K. Schumann. Flora Deutsch. Schutzgeb. Südsee (1900) 539.

is unequally 5-lobed, the corolla-tube being campanulate with a lower narrow part, the disk being annular; whilst in *Pandorea* the calyx is small with 5 teeth, the corolla being funnel-shaped or nearly campanulate and the disk being cushion-like.

Boerlage (p. 590—1) discusses the systematical place of *Pandorea* and *Tecomanthe*. He knows *T. amboinensis, T. leptophylla, P. ceramensis* and *T. Bureaui*. The latter species he did not see, otherwise he would have distinguished its immediate alliance with T. *amboinensis*. The former three species belong in his opinion to *Pandorea*. Thus Boerlage did not concept properly *Tecomanthe* and *Pandorea*, but only *Pandora*, and for a great deal he was quite right in his supposition, following Bentham & Hooker (Gen. Pl. 2. 1045), which authors placed *T. dendrophila Bl.* also in the sub-genus *Pandorea*.

As I have pointed out in Nova Guinea (p. 294) the two genera are not sharply separated by means of important taxonomical differences, but are connected with 3 links.

In my opinion this fact is exactly the ultimate expression of a true phylogenetic system, wherein the groups, small as well as large are connected with each other according to the evolution-hypothesis. Indeed the bulk of the *Tecomanthe's* and *Pandorea's* are easily recognizable and therefore I accept 2 genera, with the remark that they both belong to a large „Sippe" with some other genera, in earlier times united in *Tecoma*, thus having undoubtedly a common origin, which will be worked out in chapter II. It is of course necessary to give a new diagnosis, as there are described a lot of new species in both genera. It is a pity that only of *T. nitida* a capsule without seeds is known, but it is surely sufficient, as it shows strikingly the same structure as those of several Pandorea's.

Descr. emend. Frutices volubiles, plerumque majores, rami lignosi, interdum radicibus juxta cicatrices foliorum praediti, *folia* opposita, 1-pinnata, 1-5-jugata, linea distincta prominente inter sese connecta, rhachibus semiteretibus vel alatis; foliola opposita, plerumque foliolo terminali excepto, breviter petiolulata, papyracea vel coriacea, glaberrima vel sub-glabra, integra vel grosse dentata. *Inflorescentiae* racemosae, rariter thyrsiformes (*T. montana Diels* et *T. saxosa Diels*), solitariae vel geminatae, semper in axillis foliorum vel e ligno ortae, plerumque breves usque ad 5 cm. longae, rarius longiores; pedunculi infima basi semper squamis minimis distichis 1-vel pluri-jugis, praeterea nonnumquam foliis rudimentariis praediti. Pedicelli bracteolis 2 bracteaque 1 praediti. *Calyx* campanulatus interdum sub-urceolatus, magnus, 1.5—4 cm. longus, 5-lobatus, glaber, eglandulosus, lobis plerumque margine tomentosis, rariter parvus (*T. montana Diels*) vel sub-truncatus obscure 5-dentatus (*T. aurantiaca Diels*). *Corolla* magna, 5—10 cm., rariter minor (*T. montana Diels*), recta vel curvata, glabra vel apicem versus puberula, plerumque rosea vel rubescens, rariter aurantiaca; tubus parte inferiore angusta, intus stuposa, rariter puberula (*T. ternatensis vSts.*), parte superiore infundibuliformi recta vel curvata, intus semper glabra, 5-lobatus, lobis magnis, saepe puberulis, inaequalibus. *Stamina* 4, didynamia, quinto rudimentario; filamentis glabris vel basi stuposis. *Discus* annularis. *Ovarium* 2-loculare, placentis in utroque loculo binis; ovulis ∞, multiseriatis. Stylus filiformis glaber, stigma bilamellatum. *Capsula* 2-locularis, valvis coriaceis concavis, Semina applanata, tenuiter membranaceo-alata.

Tribus Tecomeae. Type *T. Bureaui H. Bn.* =? *T. dendrophila (Bl.) K. Sch.* Species 16. Ternate to Queensland).

The principal differences with *Pandorea* are the following:

Tecomanthe.	*Pandorea.*
Inflorescences always axil-	Inflorescences axillar and

lar, racemes, seldom thyrses (*T. mont.*, *T. aurant.*) Often caulifloro us, but also on foliate branches.	terminal, thyrses, seldom caulifloro us.
Leaves 3-foliolate or 1-pinnate.	Leaves 1-pinnate, never (or then reduced at the inflorescences) 3-foliolate.
Calyx large (except *T. mont.*), campanulate, 5-lobed (except *T. aurant.*), never cupular.	Calyx always small, truncate or shortly 5-toothed, often cupular.
Corolla large (except *T. mont.*) tubular infundibuliformous or somewhat enlarged at the throat.	Corolla small (except *T. leptop.*) infundibuliformous or sub-campanulate.
Corolla-tube inside always glabrous, except near the insertions of the stamens always stupose.	Corolla-tube mostly inside at one side hairy, mostly glabrous near the insertions of the stamens.

The groups I have distinguished within the genus were originally based upon habitus-characters and I did not know much about the phylogenetical relations, though I pointed out in New Guinea (l c. 292) that perhaps the montane species may have found their origin on successful trips into the mountains (by means of mutation or otherwise, nobody knows).

Now I have studied nearly all the species of *Tecomanthe* and I have found that I can support the above said statement for some species. Most sections have appeared to be probably quite right in phylogenetical respect.

The main point is the structure of the ovary, (Fig. 5) which shows two tendencies.

I take the normal structure of the whole *Pandorea*-group (p. 837) as the eldest. It is found in *Pandorea* (Fig. 5 r), *Neosepicaea* (Fig. 5 u), *Hausmannia* (Fig. 5 s) etc., and as Bureau already mentioned perhaps the primitive type (eldest) of the *Bignoniaceae*-gynaecium. It is found in *T. gloriosa* (Fig. 5 k), *T. Gjellerupii* (Fig. 5 l), *T. dendrophila* (Fig. 5 e), *T. acutifolia* (Fig. 5 f).

The first tendency is that the ovary remains sub-cylindric, but that the placenta's are "going" close to the endocarp and are inserted not only at the septum but also at the endocarp. This is the case with several links to the totally angular position of the placenta's.

We can make the following series of stadia:

T. aurantiaca (Fig. 5 g) → *T. cyclopensis* (Fig. 5 h) → *T. elliptica* (Fig. 5i). The reduction of the number of ovules on the external side of the placenta is going on. The placenta's are already asymetric. After these follows *T. ternatensis* (Fig. 5 o), where the placenta has an angular insertion and then *T. amboinensis* (Fig. 5 p) and *T. venusta S. Moore* (Fig. 5 q) showing an entirely angular position. This seems really striking to me.

The second tendency consists in an applanation of the ovary. We can use again the primitive *Pandorea*-groupstadium as the first type, e.g. *T. Gjellerupii* (Fig. 5 l), then follows *T. saxosa Diels* (Fig. 5 m) and at last *T. nitida* (Fig. 5 n).

It is a problem what is the principal means, with which we can distinguish ancestors. In the large groups there are indeed fundamental characters, which may be used. However, in small groups, e.g. relative small and rather uniform genera it is very difficult how to understand the phylogenetical relations. In this case e.g. we have the habitus and morphological characters of foliage and flowers, which I used for a division in groups, whereas later on I found the striking relations based on the structure of the ovary mentioned above; the first method being a more or less external one, the latter being more of internal character. Moreover, we have to consider the geographical relations (Fig. 6).

Let us take for instance the § *Volubiles*. *T. volubilis* I have not seen, but of *T. arfaki* (Fig. 5d) and *T. nitida* (Fig. 5n) I gave a description and a figure. It appears that these species do not show such close affinities in the structure of the ovary. As to its habit, if one did not know the colour of the flowers, one would think them at first sight to belong to the same species, so striking a resemblance they show. The geographical distribution, however, is totally different. *T. arfaki* is found at alpine altitude (2500 M.) on the „Bird's head" of New Guinea, a highland, isolated from the central alpine area by a peninsula of low altitude, some tops attaining at most 1200 m. but ca. 5—800 m. on the average.

In my opinion the structure of the ovary points out that both species have another origin and are one of the most striking examples of parallel evolution I know within a small group of species. (see Fig. 16, p. 1041).

Before I studied the structure of the ovaries I had already (in ms.) pointed out *T. saxosa*, which is found at medium altitudes (14—1500 m.), to be the immediate ancestor of *T. nitida*. The first is found in the Sepik-district, the latter in central New Guinea, so that from geographical point of view no objections can be made.

Indeed my suppositon has turned out to be most probable. Thus geographical distribution, habitus and morphological characters (leaves, flowers, ovary), all point in the same direction.

T. arfaki I consider as a parallel form in habitus but originated, with a link that I do not know now, from other lowland species such as *T. dendrophila*, *T. Gjellerupii*, or another allied species.

Further *T. ternatensis*, *T. amboinensis* and *T. venusta* have appeared to be closely allied with respect to their ovaries. But it is striking that they are also closely allied in habitus (2-jugate, rather large leaves and similar flowers).

I suppose there is a close relation between them in phylogenetical respect; perhaps they have originated from *elliptica-* or *acutifolia*-liking ancestors.

T. cyclopensis seems to represent a side-branch of the main-branch *T. acutifolia* → *T. elliptica* → *T. ternatensis*. It is a remarkable fact that the structure and length of the leaves of *T. cyclopensis* show resemblance with those of *T. saxosa*. Both species are found at medium to subalpine altitudes, the first at 1800 m., the latter at 14—1500 m.

We have first to conclude:

A. That the way in which *Tecomanthe* has produced montane and alpine species, shows, as to their habit:

1. *Enlarged number of leaflets* (1- → 2-3- → 4-5-jugate).
2. *Smaller leaflets* (Fig. b → c → d).
3. *Thickened lamina* (membranaceous → sub-coriaceous → coriaceous).
4. *Diminution of the height* of the plants. ((100-30-20-5 → 2 m.)

I do not know, what is the meaning of this tendency.

B. Species which are similar as to their habitus, may have been originated from different ancestors.

C. Some groups I recognized as to the habit, have appeared to present phylogenetical value; others, however, are composed of elements, which are not immediately related in phylogenetical respect.

I have tried to give a figure of the development of the *Tecomanthe's* in a scheme and their relation to *Pandorea* and some other genera (Fig. 16 p. 1041).

When more fruits will be gathered, they certainly will establish the above mentioned hypothesis, which is based principally on the structure of the ovary. It is a pity that now we know but 2 valves of *T. nitida*.

KEY TO THE SPECIES.

1. Calyx truncate or shortly dentate at most 0.8 cm. 1. 2
Calyx not shortly dentate nor truncate, but larger and distinctly 5-lobed, far above 0.8 cm. 1., at least 1.5 cm. 3
2. Robust lian, calyx truncate, leaves 3-foliolate, leaflets large, 10-15 cm. 1., corolla large 8.5-10 cm. 1., aurantiacous and firmly membranous . § **Aurantiacae**
1. *T. aurantiaca*
Small lian, calyx shortly 5-lobed, leaves 3-4-jugate, leaflets small, 3-6 cm. 1., corolla small 2-2.5 cm. 1., membranous, brown-yellowish . . . . § **Montanae**
2. *T. montana*.
3. Leaves 3-foliolate . . . . § **Dendrophilae** 4
Leaves 5-11 foliolate 6
4. Calyx rather small ca. 1.6 cm. 1., lobes triangular, leaflets broad elliptic abruptly acuminate 3. *T. elliptica*.
Calyx larger 1.6-2 cm. 1., lobes ovate-acute or lanceolate, leaflets elliptic-oblong or lanceolate, not abruptly acuminate 5
5. Leaflets lanceolate, acute, calyx lobes rather narrow, calyx narrow campanulate . . . . . 4. *T. acutifolia*.
Leaflets elliptic-oblong, acuminate, calyx lobes ovate-acute, calyx broader campanulate. 5. *T. dendrophila*.
6. Leaves small 4-7.5 cm. 1., 3-5-jugate, leaflets very small at most 2 cm. 1., coriaceous 2-3-nerved, small climbers of high altitudes . . . . . . § **Volubiles** 7
Leaves and leaflets much larger, 2-3-(seldom 5-: T. *gloriosa*) jugate, with much more pairs of sidenerves, high climbers of medium altitudes. . . § **Saxosae** 9
7. Corolla rather small ca. 6 cm. 1., very broad (ca. 3.5-4 cm. in sicc.) deep rosa, inside white longitudinally striate, calyx rather large 2-2.3 cm. 1. firmly papyraceous . . . . 6. T. *arfaki*.
Corolla larger ca. 8 cm. 1., narrower (ca. 2-3 cm.

broad in sicc.) calyx smaller ca. 1.8-2 cm. l., papyraceous 8

8. Leaflets very small, 0.8 cm. l., somewhat crowded on a rather long ca. 2.7 cm. petiole (entire length of leaf: 5 cm.), corolla pink, outside pilose at the apex of the tube. . . . . 7. *T. volubilis.*
Leaflets 1.3-2 cm. l., leaflets not crowded on a rather short 1-2 cm. l. petiole (entire lenght of leaf: 5-7 cm.), corolla rosea, yellow to the base, inside yellow with red lines . . . . 8. *T. nitida.*

9. Leaves 5-pinnate, very large ca. 7 cm. l. petiolulate, petiole and rhachis pubescent, leaflets 9-10 cm. l., puberulous-lepidote, corolla rose purple, creamy at the top just as the lobes . . . . . . 9. *T. gloriosa.*
Leaves 2-3-pinnate, mostly smaller and shorter petioled, glabrous 10

10. Calyx large 3-4 cm. l. (incl. lob.) 11
Calyx smaller 2, at most 2.5 cm. l. (incl. lob.) . 12

11. Small lian 8-10 m. high, leaves 2-3-jugate, 1.5-2 cm. l. petioled, rhachis narrow winged, leaflets ovate-oblong, dentated in the upper half, rather short 4-6 cm. l., calyx white, membranous, corolla pale rosa, 5-7 cm. l. . . . . 10. *T. saxosa.*
Large climber, leaves 2-jugate, 4-7 cm. l. petiolulate, rhachis sub-terete, leaflets entire, 7.5-12 cm. l., calyx papyraceous, blush-red, corolla coccineus, 8-10 cm. l.
11. *T. amboinensis.*

12. Corolla-tube near the insertions of the stamens nearly glabrous, margin of the calyx glabrous, at the top indistinctly ciliate, petioles and rhachis with small glands. Leaves 3-jugate. Corolla 6 cm. l., whitish, later on pink. Very large lian, 20-30 m. high
12. *T. ternatensis.*
Corolla-tube near the insertions of the stamens stupose, margins of the calyx puberulous to densely

tomentose, rhachis without glands. Leaves 2-3-jugate 13

13. Corolla 5-7.5 cm. l. tube pale, marked with purple lines, limb rosy purplish. Leaves 2-pinnate, leaflets 2-7.5 cm. l., ovate-lanceolate, thin . . 13. *T. Hillii.*
Corolla mostly longer, tube rosa-purpureus, limb mostly creamy. Leaves 2-3-pinnate 14

14. Leaflets small, 4.5-5 cm. l., lanceolate, sub-coriaceous, corolla rosea, tube ca. 6 cm. l. . 14. *T. cyclopensis.*
Leaflets longer 7-10 cm. l., papyraceous or chartaceous 15

15. Leaflets lanceolate-oblong, gray when dry, acute or slightly acuminate, entire, 7-10 cm. l., chartaceous, nerves ca. 7 pairs strongly prominent beneath, sunken in above, calyx dark rosea, lobes creamy, lanceolate-acuminate, corolla-tube ca. 6.5 cm., stalks rather rigid 15. *T. Gjellerupii.*
Leaflets-oblong ovate, somewhat abruptly acuminate, dark brown when dry, dentated to the top, 7-8 cm. l., papyraceous, sidenerves 6-7 rather softly prominent, not sunken in above, corolla outside roseo-purpureus, ca. 6 cm. l., stalks rather thin . . . 16. *T. venusta.*

1. **Tecomanthe aurantiaca Diels.** — Engl. Jahrb. 57 (1922) 497; van Steenis. Nova Guinea 14 (1927) 296.
Fig. 3 d; 5 g; 6 (1); 16.

Firm high *lian*, stem ca. 5 cm. thick; bark light-gray, branchlets ca. 0.5 cm. thick, sub-terete, cortulate. *Leaves* opposite, large, 3-foliolate; petioles stout, minutely winged, sub-terete, the bases connected by an indistinct line, 6—7 cm. l.; petiolules of the lateral leaflets short 0.6—1.5 cm., that of the terminal one 2.5—3.5 cm. Leaflets oblong, acuminate at the top, lateral ones distinctly oblique, shining above, coriaceous, 10—15 × 4.5—6 cm. with 8—10 pairs of veins distinctly prominent beneath. *Thyrses* short, peduncle ca. 8 cm. l., axillary, erect, on a foliate branch (always?); primary stalks 3-florous, ca. 1.5 cm. l., pedicels ca. 1 cm. l., bracts oblong ca. 0.15 cm. l. *Calyx* short, truncate, 0.5—0.8 × 0.8—0.9 cm. *Corolla* aurantiacous, curved, tubiform-infundibuliformous, minutely puberulous outside 8.5—10 cm. l., 2.2—2.7 cm. wide, inside near the insertions of the stamens densely stupose; lobes triangular-ovate, the margin densely puberulous, inside slightly puberulous, 1.2—2.5 cm. l.; *stamens* 4, didynamous, with a fifth rudimentary one, ca. 1 cm. above the base of the corolla inserted, filaments glabrous; style glabrous. *Fruit* unknown.

(Type specimen: Ledermann n. 9561).

Geogr. distr. New Guinea — *N. E. New Guinea* — Sepik-district, Etappen-mountain in 25 m. high rather mossy forest with many epiphytes, 850 m. alt.: Ledermann n. 9561 (D).

This species is rather interesting, possessing a comparatively short, truncate calyx, the inflorescence being a thyrse, whilst the other species having a raceme. From *T. dendrophila* it differs at first sight, having much larger leaflets, an orange corolla and a truncate small calyx.

In the flower it remembers much *P. leptophylla*, though it differs in other respects, e.g. in the foliage, totally from it. At any rate it is a *Tecomanthe* showing affinities with *Pandorea*, just as *T. montana*. For the rest the inflorescence is a thyrse, a fact also pointing to *Pandorea*.

2. **Tecomanthe montana Diels.** — Engl. Jahrb. 57 (1922) 497; van Steenis Nova Guinea 14 (1927) 296.

Fig. 3 c; 6 (2); 16.

Small *lian*, stem fingerthick, ca. terete, bark light gray. Leaves 1-pinnate, 3-4-jugate, opposite, 10—13 cm. l.; petiole 2.5—3 cm. l., sulcate above; rhachis especially to the apex 0.1 cm. broad leafy winged, all stalks articulated, thickened, leaflets papyraceous, nearly sessile, oblong, grosse serrate in the upper part of the margin or with 1—2 teeth, 3—6 × 1.5—2.5 cm.; nerves 5—6, curved, prominent beneath. *Thyrses* axillary on young shoots, genuine, ca. 4 cm. l., pauciflorous, pedicels ca. 1 cm. l. *Calyx* membranous, campanulate 0,7 × 0.6 cm. (incl. lob.) with 5 equal teeth ca. 0.15 cm. l., triangular. *Corolla* membranous, oblique-campanulate, glabrous, except near the insertions of the stamens stupose, 2—2.5 × 0.8—0.9 cm., brown yellowish, brown spotted at the throat, lobes sub-elliptical, rotundate, puberulous, ciliate 0.5—0.6 × 0.4—0.5 cm., white. *Anthers* 4, inserted just above the 0.6 cm. l. narrow part. of the tube, 1 cm. l., cells divaricate, elliptical, 0.15 cm. l., style setaceus, 2 cm. l. *Fruit* unknown.

(Type specimen: Ledermann n. 9916).

Geogr. distr. New Guinea — N. E. New Guinea — Sepik-district, Lordberg, 1000 m. alt. in mountain-forest: Ledermann n. 9916 (D); Hunsteinspitze, alt. 1350 m.: Ledermann n. 10925 (D); Hunstein Mountains, alt. 1350 m.: Ledermann n. 8518 (D); Hunsteinspitze, 1350 m. alt.: Ledermann n. 10962 (D).

This species seems to be endemic in the forests at medium altitudes in the Sepik-district. It is a small lian 6—8 m. high or more, very well characterised by its genuine thyrses, small flowers and 3-4-pinnate leaves.

T. montana forms with *T. aurantiaca* and *P. leptophylla* the links between *Tecomanthe* and *Pandorea*. The rather small flowers and the inflorescence, being a thyrse, point to *Pandorea*.

3. **Tecomanthe elliptica vSts.** Nova Guinea 14 (1927) 296, t. 34 D.

Fig. 5 a, i; 6 (3); 16.

Lian, ca. 5 m. high, branchlets ca. 0.5-0.7 cm. thick, internodes ca. 9-11 cm. l., bark gray, striate (in sicc.) with few lenticels; *leaves* 3-foliolate, 9-14 cm. l., petiole 2.5-3.5 cm. l. the bases connected by a puberulous prominent line, lateral leaflets 0.6-1.5 cm. terminal 1.3-2.8 cm.

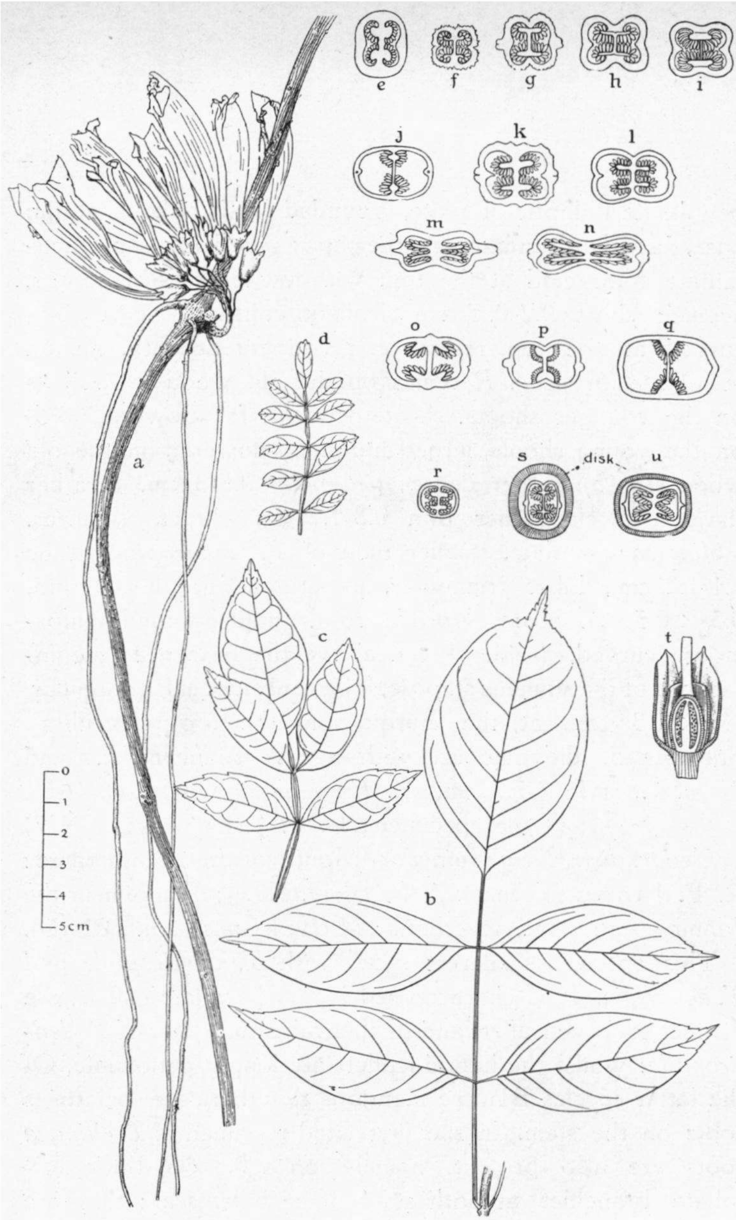

Fig. 5. Tecomanthe H. Bn. a. Inflorescence and roots on a naked branch of T. elliptica vSts. (Type specimen). b. Leaf of T. venusta S. Moore. (Gjellerup n. 54). c. Leaf of T. saxosa Diels. (Type specimen). d. Leaf of T. arfaki vSts. (Type specimen). Transverse sections of the ovary. e. T. dendrophila (Bl.) K. Sch.. (Drs. van Leeuwen n. 11263). f. T. acutifolia vSts. (Type specimen). g. T. auratianca Diels. (Type specimen). h. T. cyclopensis vSts. (Type specimen). i. T. elliptica vSts. (Type specimen). j. T. arfaki vSts. (Type specimen). k. T. gloriosa S. Moore (Forbes n. 622). l. T. Gjellerupii vSts. (Type specimen). m. T. saxosa Diels. (Type specimen). n. T. nitida vSts. (Type specimen). o. T. ternatensis vSts. (Type specimen). p. T. amboinensis (Bl.) vSts. (Kornasi n. 1372). q. T. venusta S. Moore. (Gjellerup n. 54) Pandorea. r. P. stenantha Diels. (Type specimen) Hausmannia s. H. jucunda F. v. Muell. (L sub n. 898, 199..70). t. longitudinal section H. jucunda F. v. Muell. (L. sub n. 898, 199..70) Neosepicaea. u. N. viticoides Diels (Type specimen). Magnif. $^2/_5$ ×, except e-u.

petiolulate, elliptic-obovate, rounded and oblique at the base, broad rotundate at the apex, suddenly short acuminate contracted at the top, with few teeth, papyraceous, acumen short 0.2-0. 5 cm., leaflets concave; nerves 8-9, curved at the top, reticulate, prominent beneath, sunken in above (in sicc.). *Racemes* on the old wood as well as on the younger shoots, short, pendent, few-flowered (3-5) on the young shoots, larger and many-flowered on the old wood (10-15), rather dense; peduncles 0.5-3 cm. l. rather thick, pedicels rather thin 0.8-1.2 cm., bracts setaceus. *Calyx* campanulate, smaller than of *T. dendrophila*, tube 1.1-1.2 cm., lobes triangular, puberulous at the margin, 0.5 × 0.5 cm. acute. *Corolla* rosa, tubular-infundibuliformous, curved, inside 1 cm. above the base near the insertions of the stamens stupose, lobes sub-inequal, triangular, 1.5 × 1.3 cm., at the margin and the top puberulous. *Stamens* 5, didynamous, with a fifth rudiment, 6.5 and 7 cm. l., style 7-7.5 cm., l.. *Fruit* unknown.

(Type specimen: R. F. Janowski. n. 427)

Geogr. distr. New Guinea — Mouth of the Mamberamo: R. F. Janowski n. 427 (L, B, D, Kew); Pamoi near the Mamberamo river, riverbank: Moszkowski n. 102 (D).

This species is nearest allied with *T. dendrophila* and *T. acutifolia*. It is characterised by its peculiar leaflets, the distinct concave leaflets and smaller calyx than that of *T. dendrophila*, whilst the lateral leaflets are longer petiolulate. Of the latter species Blume mentions that there are sometimes roots on the stem. In the first cited specimen of *T. elliptica* roots are also present, namely on a 0.5 cm. thick notfoliate branchlet at both sides of each leafscar; they are 30 cm. l. and not branched, as far as I could see on the dried materials. (See under *T. dendrophila* p. 883). Certainly the lian does not climb with this straight pendent roots, as is the case with other allied genera.

The leaves on some young ca. 0.3 cm. thick shoots are peculiarly placed. In the axil of a leafscar there is a short-shoot, a stalk, ca. 2-2.5 cm. l. bearing 2 opposite 3-foliolate leaves, whilst the top is represented by a scar. Perhaps the voluble apex of this shoot is broken off during collecting. At first sight there seems to be present 6-foliolate leaves.

The specimen of Moszkowski, which Diels referred to *T. dendrophila* appears to belong to this allied species.

Moszkowski n. 272 differs from the *T. dendrophila* and points to *T. elliptica* as to the form of leaflets; however it has another calyx and much shorter petiolulate leaflets,

4. **Tecomanthe acutifolia vSts.** Nova Guinea 14 (1927) 297.

Fig. 5 f; 6 (4): 16.

Lian, stem sub-quadrangular; branchlets 0.3 cm. thick glabrous, strigulose-striate slender, internodes 10-13 cm. l. *Leaves* 3-foliolate, opposite, papyraceous, 12-18 cm. l., petiole 2.5-5 cm. l., glabrous, sulcate above; lateral leaflets 0.5-0.7 cm., terminal 1.8-2.6 cm. l. petiolulate, lanceolate, acute or short sub-acuminate 7-9 × 2.3-3 cm., margin revolute (in sicc.), entire or minutely 1.-toothed on each side of the apex, sidenerves 6-7, prominent below, slightly prominent above. *Racemes* short, axillary, on the foliate young shoots (also the wood?), peduncle very short 0.4 cm. l. pendent, ca. 5-flowered. *Calyx* brown-purple 1.6-2 cm. l. (incl. lob.) tubular-campanulate, equally 5-lobed, lobes narrow lanceolate-acuminate 0.6-0.8 cm. l., margin puberulous. *Corolla* rosa, tubular-infundibuliformous, tube in the lower part near the insertions of the stamens stupose, 8-9 × 2-3 cm. (excl. lob.), lobes creamy, at the apex and the margin puberulous, inequal, triangular, acute 1.2 × 1.5 cm.. *Stamens* filiform, glabrous 6.5 and 7 cm. l.; style ca. 8 cm. l.. *Fruit* unknown.

(Type specimen: G. M. Versteeg n. 1538).

Geogr. distr. Dutch S. W. New Guinea.—Lorentzriver, near Alkmaar-east: G. M. Versteeg n. 1538 (L, B); v. Römer n. 951 (L).

This species is closely allied with *T. elliptica* and *T. dendrophila*, but with lanceolate leaves, large flowers with pale yellow lobes, a brown-purple calyx, sub-bilabiate flowers, the calyx-tube being narrower, the lobes narrow lanceolate-acuminate.

5. **Tecomanthe dendrophila (Bl.) K. Sch.**

— = *Tecoma (Campsis) Dendrophila Bl.* Rumphia. 4 (1848) 35, t. 190; K. Schumann Fl. Deutsch Ost-Asiat. Schutzgeb. Engl. Bot. Jahrb. 9 (1887) 218; — = *Dendrophila trifoliata Bl.* in tab. cit.; — = *Bignonia rhodosantha Zippel.* (Herb. nomen); Blume. Mus. Bot. Lugd. Bat. 1 (1849—51) 25; Miquel. Fl. Ned. Ind. 2 (1856) 757; Miquel. Ann. Mus. Lugd. Bat. 1 (1864) 197; F. v. Mueller. Descr. Notes Papuan Pl. 9. 64; — = *Campsis Dendrophila Seemann.* Journ. Bot. 5 (1867) 373; Scheffer Ann. Jard. Bot. Buitenz. 1 (1876) 40; K. Schumann Fl. Kais. Wilh. Land. (1889) 123; Warburg Pfl. Papuas. Engl. Bot. Jahrb. 13 (1890) 418; — =? *Tecomanthe Bureaui Baill.* Hist. Pl. 10 (1891) 41; — = *Pandorea dendrophila (Bl.) Boerl.* Handl. Fl. Ned. Ind. 2 (1899) 600; K. Schumann. Schutzgeb. Südsee. (1900) 539; L. Diels Bign. Papuas. Engl. Bot. Jahrb. 57 (1922) 496; van Steenis Nova Guinea 14 (1927) 297.

Fig. 3 f; 5 e; 6 (5); 16.

High *climber*, reaching the uppermost foliage of the trees; stem ca. 0.5—1 cm. thick, terete, often spirally twisted, bark gray or brownish gray (in sicc.), glabrous, rough with orbicular lenticels; branchlets terete, sub-sulcate or striate, with much smaller lenticels; inter-nodes 7—15 cm. 1. *Leaves* 3-foliolate, remote, opposite, glabrous, 8—15 cm. l., 2.5—3.5 cm. l, petioled. Leaflets membranaceous to firmly membranaceous, ovate to elliptic-oblong, acute or shortly acuminate, entire or mostly indistinct- to grosse-serrate to the top; petioles flat above, minutely winged, the bases connected by a glabrous prominent line; lateral leaflets nearly sessile, 0.2—0.3

cm. l. petiolulate, terminal 1.5—2 cm. l. petiolulate; leaflets 6—10 × 3-5 cm., sub-acute at the base, slightly oblique; sidenerves not very prominent beneath, in 6—7 pairs. *Racemes* on the old wood (cauliflorous) as well as on the younger foliate shoots, single, axillary, patent or bent back; peduncles short, 1—2 cm. (or sometimes longer ca. 7 cm.), 3—10-flowered (on the old wood sometimes 10—13 fl.), with some opposite minute lanceolate scales on the lower part; pedicels short, ca. 0.75—1 cm., slender, pendent. *Calyx* campanulate, with a small setaceus bract and 2 bracteoles, reddish-brown, ca. 2 cm. l. (incl. lob.), equally 5-lobed, glabrous or minutely puberulous, membranous to firmly membranaceous, lobes lanceolate ca. 1 cm. l., sometimes minutely mucronate or little acuminate, short whitish sericeo-tomentose at the margin. *Corolla* infundibuliformous, outside phoeniceus, inside lactescent, glabrous except 1 cm. above the base near the insertions of the stamens stupose, 8 cm. l. (excl. lob.); limb inequally 5-lobed, patent, lobes ovate somewhat obtuse. *Stamens* 4 included, didynamous, with a fifth setaceus sterile one; filaments lilac, filiformous, hairy at the base; anthers white, inserted at the top, glabrous, pendent, sub-divergent at the base; style somewhat longer than the stamens, glabrous; *disk* fleshy, annuliformous; *ovary* elongate. Fruit unknown.

(Type specimens of Blume leg. Zippel in the Leyden Herbarium).

Geogr. distr. New Guinea — Dutch New Guinea — In forests near the coast: Zippel (L. sub n. 898, 200... 94, n. 898,200... 95, n. 898,200... 96, U sub n. 010794); pr. Anday: Teysmann (B); Triton Bay: M. Hombron n. 1814 (P), type specimen of *Tec. Bureaui Baill.*; Lorentz river, Geluks-hill near Alkmaar: v. Römer n. 467 (L); Lorentz-river, on a hill near Nepenthes-hill: Versteeg n. 1376 (L B); Mamberamo-district, east-inclination, Doorman-ridge, 420 m. alt., brookbank: H. J. Lam n. 1408

(L, B, D); Taua, mountainforest: M. Moszkowski n. 272 (D); Naumoni, mountainforest, 75—300 m. alt.: Moszkowski n. 386 (D); primeval forest pr. Albatros Bivak, alt. 60 m., cauliflorous: W. M. Docters van Leeuwen n. 11283 (B).

Kaiser Wilhelms Land — pr. Wengi in forest: Schlechter n. 11610 (D); Neu-Mecklenburg: ? : n. ? (D); Sepik-district, K. Augusta river: Schultze n. 178 (D); Kollua pr. Finschhafen, cauliflorous: Hollrung n. 166 (D); lower course of the Gogol river in high forest; Lauterbach n. 1164 (D); K. Wilh. Land pr. Kelana, high climber: Hellwig n. 53 (D); mouth of the Bumi river near Finschhafen: Lauterbach n. 434 (D); Huon Bay pr. Samoahafen: Lauterbach n. 722 (D); K. Wilh. Land, high primary forest, 150—500 m. alt. common and spreaded: Lauterbach n. 2816 (D); near Kalueng (K. Hollrung); Sattel Mountains (Hollrung); Konstantinhafen (Hollrung); Bismarck mountains, high climber found in a "Gallerie-wald", 500 m. alt.: C. Lauterbach n. 2780 (D); Astralobe Gebirge: F. H. Brown n. 203 (D).

V.n.: å-n̄gann (Kollua).

British New Guinea. — In woods on the coast of New Naima (Seem.); Owen Stanley Range: Forbes (F. v. Mueller).

T. dendrophila is an endemic lian of the forests at low and medium altitudes up to ca. 500 m. in Papuasia. Though many materials are at hand, it is a pity there are no fruits collected as far as I know. It seems to be the commonest *Tecomanthe*, local as well as in general. So e.g. Warburg notes: "die grossen rosafarbigen Blüten liegen häufig massenhaft auf dem Waldboden dicht bei Finschhafen."

It is a high climber reaching the uppermost foliage in high primeval forets. The beautiful flowers are found as well on the old wood near the leafscars (axillary) as well as on the young shoots, which will be the case in most of the Tecomanthe's.

As to the remark of Scheffer: "folia passim bijuga", etc. I suppose this must be a mistake. In his material collected by Teysmann I did not see this; it is a true 3-foliolate species. So I cannot agree with the determination of the specimen Weinland n. 174 and Wiesenthal n. 10, which is a true 5-foliolate species (See p. 898).

The variability is not as great as I supposed to be the case, when I had seen but few materials. The flowers are uniformly described by the collectors, but the foliage shows differences. Diels supposes a heterophylly, some specimens having entire leaflets, others possessing a gross-dentated margin especially near the top. It seems to me that this is caused by light and shadow, influencing the younger shoots, a case comparable to that in *Lonicera Periclymenum* and *Symphoricarpus*, both showing the same structure in this irregular teeth. To make out the question one ought to have much larger specimens than are collected hitherto.

As to *T. Bureaui* I saw the imperfect specimen on which Baillon founded the species and genus *Tecomanthe*. Indeed it is, as Diels pointed out (1922) perhaps the same as *T. dendrophila*. Only a branchlet with a naked peduncle and some flowers are present. Whereas *T. elliptica* and *T. acutifolia* are distinguished in the first place by their foliage I am not absolutely sure in identifying *T. Bureaui* with *T. dendrophila*, but it seems to be most probable.

As to the roots Blume noticed in his table, I am not sure there are true roots as to their position, but on the other hand I cannot believe Blume represented some *Hepaticae*, which are indeed often found on the stem. Of *T. elliptica* I saw true roots, but these are placed truly on both sides of the leafscars, just as van der

Lek [1]) pointed out for those of *Salix amygdalina* L. (l.c. plate V.)

6. **Tecomanthe arfaki** vSts. Nova Guinea 14 (1927) 300, t. 34 B.

Fig. 5 d, j; 6 (6); 16.

Small ca. 2 m. high voluble *climber*, stem terete, spirally twisted, with few lenticels, bark brownish, stem ca. 0.3—0.4 cm. thick. *Leaves* opposite, 1-pinnate, 4—5-jugate, 5—6.5 cm. l., [petiole ca. 1—1.5 cm. l., internodes of the narrow winged rhachis 0.5—1 cm. l. Leaflets glabrous, coriaceous, shining, dark-green, elliptic, 1.3—1.8 × 0.7—0.9 cm., slightly oblique, cuneate at the base, nearly sessile, terminal leaflet 0.3 cm. l. petiolulate, acute at the dentate top, top somewhat recurved, nerves obscurely sunken in above, prominent beneath, 1—3 pairs. *Racemes* axillar 1.5—2 cm. l. peduncled or longer and then with 1 or 2 leafpairs, though reduced, pauci (4—5)-florous; bracts ca. 0.8 cm. l., pedicels 0.8—1.2 cm. l., with 2 subulate bracteoles. *Calyx* firmly papyraceous 2—2.3 cm. l. (incl. lob.), campanulate, sub-inequal 5-lobed, lobes ovate, obtuse, shortly mucronate, 1 × 0.65 cm., margin puberulous. *Corolla* campanulate-cyathiformous, tube 5.5—6 cm. l. and 3.5—4 cm. broad at the throat, glabrous except inside near the base stupose near the insertions of the stamens, deep-rosa, inside white longitudinally striate; lobes 5, triangular-orbicular 1.3—1.5 cm. diam., margin and apex of the lobes pubescent. *Stamens* 4, didynamous, filaments 3.3 and 4 cm. l., stupose at the base; style 5.5 cm. l. *Fruit* unknown.

(Type specimen: K. Gjellerup n. 1212).

Geogr. distr. New Guinea — Arfak Mountains, between the Angi-Seas, alt. 2500 m.: K. Gjellerup n. 1212 (L, B, D, Kew).

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[1]) H. A. A. van der Lek. Over de wortelvorming van houtige stekken. Diss. Utrecht 1926.

This small climber occurs as well as *T. nitida* on open places in a heath-shrubbery-vegetation on a mountain-ridge between the Angi-Seas. It has the same habit as *T. nitida* and *T. volubilis*, but differs in several points. (See what is said about this at the end of the descriptions of these allied species).

7. Tecomanthe volubilis Gibbs.

Phytogeogr. and Fl. Arfak Mts. (1917) 179; Diels. Engl. Jahrb. 57 (1922) 498; van Steenis. Nova Guinea. 14 (1927) 299.

Fig. 6 (7); 16.

Slender *twining glabrous plant*, branchlets terete, bark

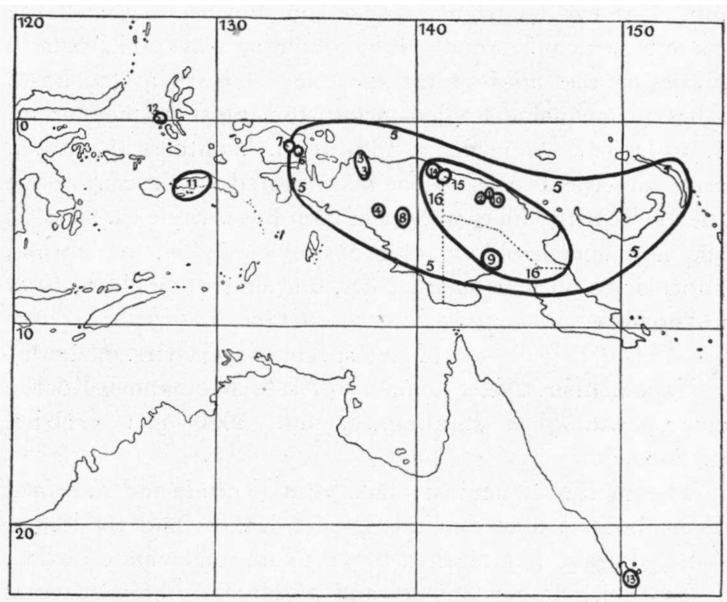

Fig. 6. Geographical distribution of Tecomanthe H.Bn. 1. T. aurantiaca Diels. 2. T. montana Diels. 3. T. elliptica vSts. 4. T. acutifolia vSts. 5. T. dendrophilla (Bl.) K. Sch. 6. T. arfaki vSts. 7. T. volubilis Gibbs. 8. T. nitida vSts. 9. T. gloriosa S. Moore. 10. T. saxosa Diels. 11. T. amboinensis (Bl.) vSts. 12. T. ternatensis vSts. 13. T. Hillii (F. v. M.) vSts. 14. T. cyclopensis vSts. 15. T. Gjellerupii vSts. 16. T. venusta S. Moore.

gray-strigulose, covered with prominent lenticels. *Leaves* small 5 cm. l. (incl. pet.) 2.7 cm. l. petioled, sub-4-angled, opposite, 1-pinnate, 4-jugate, rhachis contracted at the insertions of the leaflets. Leaflets 0.8 cm. l., the lower pair shortly petiolate and often smaller, elliptic, obtuse or acute, coriaceous, lateral veines 2—3, impressed above, surface beneath glandularly-punctate, longitudinally striate when dry and transversely so above. *Racemes* ca. 2 cm. l, axillar, short (1 cm. l.) peduncled, peduncle with a pair of subulate bracts and 2 or 3 pairs of reduced leaves or folioles; pedicels ca. 1 cm. l. with 2 opposite bracteoles 0.4 cm. l. *Calyx* ca. 2 × 0,8 cm., sub-equally 5-lobed, lobes ca. 1.3 × 0,6 cm., reflexed in flower. *Corolla* large ca. 8.5 × 4 cm., broadly infundibuliformous, pink, outside pilose at the apex of the tube, inside hairy at the base; lobes 5 unequal deltoideus-acute, tomentose at the margin, 1.3—0.6 cm. *Stamens* 3 and 4 cm. l. anthers 0.5 cm. l. with divergent cells, filaments inserted ca. 1 cm. above the base of the tube, stupose at their base. Style ca. 6 cm. l.; stigmatic lamella oblong, glabrous. *Ovary* cylindric, glabrous, bilocular, ovules in many rows, *disk* fleshy crenulate. *Fruit* unknown.

(Type specimen: Gibbs. n. 5603).

Geogr. distr. New Guinea — Arfak Mountains, Koebré ridge, twining in shrubberies, alt. 3000 m.: Gibbs. n. 5603.

The species is nearest allied with *T. nitida* and *T. arfaki.* From both it differs in the smaller leaflets and the longer petioled leaves, the leaflets of which are somewhat crowded. It has much larger flowers and absolutely otherwise (pink) coloured flowers than *T. arfaki* and *T. nitida.* It is not allied with *T. leptophylla* as Gibbs remarks, but this species was known to Gibbs only by its description. The pluri-jugate small, however gross-dentate leaves of the latter remember in the description somewhat those of

T. volubilis, but have a totally different structure as well as the corolla.

It was not only found in the heath-shrubbery vegetation of the Koebré ridge, but also in the forest below near the lake. In the latter place it was plentiful and the fallen corollas covered often conspicuously the ground, but on the Koebré Mt. it was still in flower, both on the old and young green wood. Certainly this variability is caused by local climatic conditions.

This species shows again, that the cauliflory and the character of terminal or axillar inflorescences does not indicate an important taxonomical difference, these 4 characters being found on one and the same plant.

The habit of the small climber with its reduced leaf-surface and the coriaceous structure of the leaves points to a montane xeromorphous adaptation.

8. **Tecomanthe nitida** vSts. Nova Guinea 14 (1927) 299, t. 33.

Fig. 5 n; 6 (8); 16.

Small voluble *climber*, *stem* thin, sub-quadrangular, bark with many lenticels ca. 0.3 cm. thick, spirally twisted. *Leaves* 1-pinnate, opposite, (3)-4(5)-jugate, 5—7 cm. l., internodes of the rhachis 1.5—2 cm. l., narrow-winged, petiole 1.5—2 cm. l. Folioles small, elliptic, cuneate at the base, involute at the short acute top, shining, coriaceous, nearly sessile, terminal 0.2—0.4 cm. l. petiolulate, main nerve prominent, sidenerves 2—4 pairs, slightly prominent, 1.5—2 × 0.65—1 cm. *Racemes* axillar, pauci (3—5) florous, peduncle 1.7—2 cm. l., at the immediate base with some minute opposite scale-like bracts and mostly a pair of reduced leaves; pedicels opposite ca. 1—1.4 cm. l.; bracts lanceolate 0.5 cm. l.: bracteoles 2 on each pedicel, linear. *Calyx* coriaceous, 2.5—3 cm. l., badious, glabrous, sub-infundibuliformous or campanulate, tube 1.8—2 × 2 cm.; lobes triangular, margin puberulous, 1 × 0.8 – 0.9 cm. *Corolla* glabrous, infundibuliformous, basal part of the tube narrow, enlarged above, ventricose, tube 8 × 3—3.5 cm., outside rosa, yellowish to the base, inside yellow with red lines, tube to the base, especially near the insertions of the stamens, yellowish-stupose; lobes 5, large, inequal, sub-orbicular 2.5 × 3 cm., at the margin and towards the top yellow-pubescent. *Stamens* 4, creamy, yellow-floccose at the immediate base of the 5.5 and 6 cm. l. filaments. *Ovary* bilocular, with 2 placenta's in each cell; ovules many-seriate. *Capsule* ca. 14 × 3 cm., valves concave, coriaceous, glabrous, shining inside. Seeds unknown.

(Type specimen: Versteeg n. 2401).

Geogr. distr. New Guinea — S. W. Guinea in Mt. Wichmann on open grounds, alt. 3100 m.: G. Versteeg n. 2401 (L, B, D, Kew, U).

This species belonging to the section § *Volubilis*, is found at high altitudes. It is allied with *T. volubilis* but differs in the larger leaves, shorter petioles and the colour of the flowers and also with *T. arfaki*, but possesses rather dense lenticellate branchlets, much shorter flowers, a differing calyx and nervature of the leaflets.

In habit the 3 species remember each other very much. As well as the 2 others, *T. nitida* is supposed to be originated from *Tecomanthe's* of lower altitudes and is fully adapted to the open montane vegetation, the probable ancestors being lians of primeval forests of Papuasia.

It is the single *Tecomanthe* of which a fruit, that is to say without seeds or septum is known. It is the proof that the genus belongs certainly to the *Tecomeae* and that it is closely allied with *Pandorea*.

9. **Tecomanthe gloriosa** S. Moore — Journ. Bot. 61 (1923) 38; van Steenis. Nova Guinea 14 (1927) 299.

Fig. 5 k; 6 (9); 16.

Lian, stem sub-terete 0.7—0.8 cm. thick, bark sordid.

Leaves opposite, 1-pinnate, 5-jugate, ca. 7 cm. l. petioled; petiole and rhachis pubescent, ca. 0.2 cm. diam., inferior leaflets slightly smaller than the others 9—10 × 3—4 cm., the superior 11—12 × 4.2—4.5 cm., oblong ovate ca. 1 cm. l. acuminate, top acute, base obtuse, entire, papyraceous, at both sides with hairy nerves, the lamina puberulous-lepidote, ca. 9 pairs of nerves; petiolules ca. 0.5 cm. l. pubescent. *Racemes* on the foliate branches multi-flowered, peduncle with scale-like bracts below, ca. 2 cm. l.; bracts setaceus, ca. 0.4 cm. l.; pedicels slightly swollen at the top, slightly puberulous 0.5-1.2 cm. l., *Calyx* campanulate 2.3 × 1.1 cm., the 5 equal triangular acuminate ca. 1.2 cm. l. lobes included, at the margin puberulous. *Corolla* tubular-infundibuliformous, rosa purple, creamy at the top just as the lobes; tube ca. 7 cm. l. curved at the narrow basal part, suddenly dilated; lobes puberulous, triangular, 1.2-1.5 cm. l., inequal, the posterior ones being shorter.

(Type specimen: H. O. Forbes n. 495, 622)

Geogr. distr. British New Guinea — Mt. Koikoko, 1000 m. alt.: H. O. Forbes n. 495, H. O. Forbes n. 622 (L).

Of this species I saw original materials except the leaves, which must be 5-pinnate and very large as it is said. As to the flowers, these remember those of *T. dendrophila*, but with respect to the foliage it differs entirely from that species.

10. **Tecomanthe saxosa Diels** — Engl. Jahrb. 57 (1922) 498; van Steenis. Nova Guinea 14 (1927) 297.

Fig. 5 c, m; 6 (10; 16.

Lian, glabrous throughout, stem ca. 2.5 cm. thick, 8-10 m. high, voluble, bark grayish, corky. *Leaves* opposite, 2-3-jugate, 1-pinnate, 7-13 cm. l., the terminal leaflet the greatest, 1.5-2.5 cm. l. petioled, narrow ca. 0.1 cm. br. winged just as the rhachis, papyraceous, ovate-oblong crenate-serrate in the upper part, acuminate, 4-6 × 1.5-2.

8 cm., nerves ca. 9, straight, prominent beneath, slightly sunken in above, along the margin connected with each other. *Thyrses* on the old wood, long (10-12 cm.) peduncled; peduncle with many small scales at the base, further smooth and glabrous. terete, genuine, 0.2 cm. thick. *Calyx* large. 1.5-2 × 1.5-1.7 cm. (excl. lob.), membranous, glabrous, white, lobes 5, triangular 1.5 × 1.8-2.3 cm., cuspidate. *Corolla* pale rosa, like that of *T. dendrophila* but smaller, 5-7 × 1.8-2.3 cm., tubular-infundibuliformous, lobes broad triangular, acute, 0.8-1 × 1.2-1.4 cm. inside and at the margin shortly pubescent, tube ca. 1 cm. above the base dense long stupose near the insertions of the stamens. *Stamens* 4, fertile with a fifth rudimentary one resp. 4 and 4.5 cm. l., anthers divaricate, pendulous, oblong, ca. 0.5 cm. l., filaments glabrous, style ca. 4.8 cm. l., with 2 spathulate flat stigma's.

Type specimen: Ledermann n. 12904)

Geogr. distr. N. New Guinea — Sepik district, in a shrubbery-forest, with few large trees, 14-1500 m. alt.: Ledermann n. 12904 (D).

This lian does not grow in a high-stemmed primeval forest, but in more bushy woods. In habit it reminds much of the species belonging to the § *Volubiles*: alate rhachis of the leaves, structure and nervature of the leaflets, large flowers. As to the habit and habitat it forms in many respects a link between the § *Dendrophilae* and the § *Volubiles*.

11. **Tecomanthe amboinensis (Bl.) vSts. nom. nov.** — = *Tecoma* (*Campsis*) *amboinensis Blume* Rumphia 4(1848)35; van Steenis Nova Guinea 14(1927)298; — = *Campana rubra Rumphius*. Herb. Amboin. 6(1755) Auctuar. Cap. 52; Miquel. Fl. Ned. Ind. 2(1856)757; — = *Bignonia speciosa Reinw*. (Herb. nomen); C. L. Blume. Mus. Bot. Lugd. Bat. 1(1849-51)26; — = ? *Pandorea spec. Hasskarl*. Neuer Schlüssel. Abh. Nat. f. Ges. Halle 9(1866) Heft 2.

143-389; — = *Campsis amboinensis Seemann* Journ. Bot. 5(1867)374; — = *Pandorea amboinensis* (*Bl.*) *Boerlage* Handl. Fl. Ned. Ind. 2(1899)600; — = *Tecoma amboinensis Reinwardt* (Herb. nomen?) ex Boerlage; — = ? *Pandorea spec.* E. D. Merrill. Interpret. Rumph. Herb. Philip. Bur. Sci. (1917) 469.

Fig. 5 p; 6 (11); 16.

Voluble *lian*, attaining the upper foliage of the trees, branches 0.5-1 cm. thick, terete, bark gray, tuberculate with orbicular ca. 0.075 cm. diam. lenticels, smooth, branchlets striate-sub-costate verrucose-punctate, glabrous. *Leaves* 1-pinnate, 5-foliolate, opposite, 15-25 cm. 1. glabrous or the underside of the folioles minutely puberulous; petiole 4-7 cm. 1. subterete, canaliculate above, thickened towards the base, the ultimate basal part and the narrow line uniting the bases short pubescent, patent; internode ca. 4-5 cm. as the petiole; lateral leaflets short 0.5 cm. terminal one 1-2.5 cm. 1. petiolulate, lateral leaflets smaller than the terminal one; leaflets 7.5-12 × 3-6 cm., glabrous or the underside slightly pubescent, elliptic, entire, smooth above, sub-rotundate at the base, the top acuminate or even cuspidate, papyraceous to thick membranous, sidenerves 8-9 at each side, curved, patent, prominent beneath. *Racemes* erect, short 2.5-5 cm. 1. peduncled, single or 2 by 2, axillary, 8-12-flowered, patent, rhachis with small opposite scales; bracts linear-acuminate, puberulous, deciduous, pedicels 0.8-1.2 cm. 1. with 2 minute bracteoles; *calyx* campanulate, sub-coriaceous, equally 5-lobed, glabrous, smooth, blush-red, 3-4 cm. 1. (incl. lob.), lobes ca. 2 cm. 1., lanceolate, aristate, margin thickened to wards the top, scabrate; *corolla* erect 8-10 cm. 1. (excl. lob.) broad infundibuliformous, red-coccineus, paler so beneath, glabrous, narrow part of the tube 2-3 cm., then enlarged, ca. 1 cm. above the base densely stupose near the insertions of the stamens, lobes 5, broad triangular-ovate, inequal, margin sub-pubescent.

Stamens 4, didynamous, glabrous, with a fifth setaceus rudiment, included, anthers 4, divaricate, pendulous; *ovary* cylindric, with a fleshy disk, style somewhat longer than the filaments, glabrous; stigma spathulate, 2-lobed. *Fruit* unknown.

(Type specimen Ambon: leg.? L sub n. 898, 200... 55).

*Geogr. distr. Malayan Archipelago—Ambon—*Ambon: Reinwardt n. 1413 (L. sub n. 898, 200... 57); idem ex. Herb. Lugd. Bat. (U sub n. 010793); Ambon: leg.? (L sub n. 898, 200... 55); Moluccas: Reinwardt (L sub n. 898, 200... 56): Ambon, valley of the Olifantsberg (Rumphius); Ambon, on the G. Hariel: Boerlage n. 40 (B).

V.n.: *uha utan* (Leytimor).

Ceram—W. Ceram. 500—800 m. alt. pr. T. Lomoli and Lohia Tala, along a stream: Rutten n. 1571 (B); M. Ceram, on the Mt. Isal: Kornasi n. 1372 (B).

Java. Buitenzorg, cult. in the Botanical Gardens sub n. X F. 140 a (B).

This beautiful lian seems to be truly common at medium altitudes in the woods of Ambon; it is also found by Rutten in Ceram in the west and centre of the island. Blume says about it; „una e stirpibus pulcherrimus, quibus ornantur sylvae Amboinenses," wich indeed must be the case as to the very large scarlet flowers, the lian reaching the uppermost foliage of the woods. C. L. Doleschall [1]) however does not mention it.

Blume says that the leaves are rarely also 3-foliolate, which I cannot affirm, his remark on this being surely a mistake.

From *T. dendrophila* it differs at first sight in the 5-foliolate leaves and the much larger calyx. The greatest affinity is to be found with *T. saxosa Diels*. The latter

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[1]) Korte karakterschets der flora van Amboina. Nat. Tijdschr. Ned. Ind. 14 (1850) 139.

however, has smaller, gross-dentated more sub-coriaceous leaflets, a smaller, more pale-red corolla and a thin membranous calyx.

12. **Tecomanthe ternatensis vSts. nov. spec.**

Fig. 5 o; 6 (12); 16.

Frutex volubilis prealtus, glaber, ramosus, caule brachiali, 20-30 m. altus; rami lignosi 0.7 cm. crassi, teretes, cortice rugoso, lenticellis paucis orbicularibus, ramulis ultimis teretibus striatis. *Folia* opposita 1-pinnata, 3-jugata, 14-18 cm. longa; petiolis 4 cm. longis, 0.2 cm. diam., semi-teretibus supra sulcatis, striatis, basin versus glandulosis, rhachi petiolo simili, interjugiis 3-4 cm. longis; foliola sub-sessilia vel 0.5 cm. petiolulata, foliolo terminali 0.5-1 cm. longe petiolulato, papyracea vel sub-coriacea, fragilia, oblonga, basi inaequalia, 6-7 × 2.5-2.7 cm., integra vel apice dentis paucis grossis praedita, apice sub-rotundata, acutata vel breviter acuminata basi rotundata vel sub-cuneata; nervis fere 4 angulo 45° divergentibus, vix prominentibus, reticulatione laxa indistincta. *Racemi* axillares e ligno orti, solitarii vel geminata. 2-6 cm.; pedunculis bracteis multis squamaeformibus aggregatis basi praeditis, teretibus, 0.2 cm. diam.; pedicelli 1 cm. longi, bracteolis binis, bracteis lanceolatis 0.3 cm. longis. *Calyx* in alabastro fere globosus, breviter apiculatus, pallide viridis, postea campanulatus, glaber, laevis, 1.5-2 × 1 cm. (lob. incl.) lobis ovato-triangularibus, margine paullo sinuatis, apice ciliatis, 0.5 × 0.7 cm. *Corolla* ca. 6 cm. longa (lob. incl.) tubo primo albido, deinde roseo, 5.5 × 2.5-3 cm. parte inferiore 1 × 0.5 cm., parte superiore tubuloso-infundibuliformi, glabro; lobis 5, inaequalibus, brevibus, latae triangularibus, acutis, 0.5 × 1.5 cm., nonnisi marginibus puberulis. *Stamina* 4, didynamia, quinto rudimentario, filamentis glabris, in apice partis inferioris vix stuposae insertis, 4.5 et 3.5 cm. longis, tubum haud superantibus. *Discus* annularis. *Ovarium* ovato-oblongum, glabrum, sub-compressum, 2-loculare, placentis in utroque loculo binis, valde distinctis. Ovulis ∞, multiseriatis obtectus. *Capsula* ignota.

[Type specimen: Beguin n. 1201].

Geogr. distr. Malayan Archipelago — Ternate — Branched lian, 30 m, high, probably more than 100 m. long, stem arm-thick, 600 m. alt. pr. Foramadiahi, flowering specimen: Beguin n. 1201, type specimen (B); lian 20 m. high, specimen in bud, pr. Foramadiahi, 1100 m. alt.: Beguin n. 1414, co-type (B).

This very large climber of the Moluccas shows affinities with *T. amboinensis* and several other species. It is distinctly separated from all other species by its rather small glabrous calyx, the glabrous 6 cm. l. corolla, which does not show the usual hairy ring near the insertions of the stamens and the 3-jugate leaves.

From *T. cyclopensis* it differs distinctly in the foliage; from *T. Gjellerupii* in the glabrous pink corolla, the totally other indistinct nervature of the leaflets and the shorter triangular acute not ciliate calyx-lobes; from *T. saxosa* in the foliage, nervature, etc. and 3-jugate leaves; while *T. venusta* has an entirely different foliage and a glabrous calyx and corolla.

13. **Tecomanthe Hillii (F.v.M.) vSts. nom. nov.** — *Tecoma Hillii F. v. M.* Fragm. 10.101, 11.136; Bailey. Queensl. Fl. 4 (1901) 1133; Bailey. Compreh. Cat. Queensl. Pl. (1909) 364.

Fig. 6 (13); 16.

Tall glabrous *climber. Leaves* 1-pinnate; leaflets 5, ovate-lanceolate, 2.5—7.5 cm. l., thin. Racemes 6-flowered. *Calyx* 1.25—2.5 cm. l., membranous. *Corolla* 5—7.5 cm. l., limb rosy-purplish, tube pale, marked with purplish lines, the lobes 0.6—0.8 cm. l., pubescent towards the margins. *Filaments* filiform, anthers yellow, cells equal, 0.3—0.4 cm. l., widely divergent. Staminodium 0.4—0.6 cm. l. Style filiform, glabrous, stigmatic lobes semi-lanceolate. *Capsule* 3.75 cm. l. (Bailey l.c.).

Geogr. distr. Queensland — Hervey Bay: F. Turner (Bailey).

There is but little doubt this species represents the only known Australian *Tecomanthe*. The few-flowered racemes, the large calyx and corolla point to this genus. It is a pity that I could not examine any materials. The species seems to be very rare. Bailey mentions that the only plant ever met with was found by Mr. Fred Turner in 1876, when collecting near the Hervey Bay for Mr. W. Hill.

14. **Tecomanthe cyclopensis vSts.** — Nova Guinea 14 (1927) 298, t. 34 A.

Fig. 5 h; 6 (14); 16.

Lian, ca. 2 m. high, stem 0.6—0.7 cm. thick, sub-quadrangular; bark grayish-yellow when dry, irregular, glabrous. *Leaves* 1-pinnate, 2-jugate, rigid; leaflets 5, lanceolate, 4.5—5 × 1.6—1.8 cm. nearly sessile, short cuneate and slightly oblique at the base, short (0.5 cm.) acuminate at the top with few (1—2) teeth at each side, shining dark-green, firmly chartaceous, with 5—6 sub-curved pairs of sidenerves, indistinctly prominent beneath, slightly sunken in above, reticulations none; petiole 2.5—3 cm. l., subterete as well as the rhachis. *Racemes* on the old wood and the branchlets, short 0.8—2 cm. l., single or 2 by 2 in the axils, at the immediate base with scale-like short opposite bracts, pedicels ca. 1.5 cm. l. with setaceus 0.5 cm. l. bracts. *Calyx* campanulate, 2.2 cm. l. (incl. lob.), glabrous, lobes sub-equal lanceolate-triangular, acuminate, 0.9—1.2 × 0.6—0.7 cm., puberulous at the margin. *Corolla* rosea, tube ca. 6 cm. l. broadly infundibuliformous, narrowed at the base, stupose near the insertions of the stamens, sub-equally 5-lobed, lobes short pubescent, obtuse triangular 1—1.3 × 1.6—2 cm. *Stamens* 4 and 5 cm. l., filaments glabrous, inserted 0.6 cm. above the base of the tube. Style filiformous, glabrous, 6 cm. l. *Fruit* unknown.

(Type specimen: K. Gjellerup n. 544).

Geogr. distr. Dutch New Guinea — Mt. Cycloop, alt. 1800 m., 1 specimen found on mossy half-dead trees on humus-soil: K. Gjellerup n. 544 (L, B).

This small lian of medium to high altitudes differs distinctly from *T. saxosa* in the very short racemes, the much smaller firmer calyx, the corolla possessing a wide mouth, the not narrow leafy alate petiole and rhachis and the narrower leaflets. Moreover the calyx is much firmer chartaceous and smaller.

It is allied with *T. venusta* and *T. Gjellerupii* as to the flowers, but differs immediately in the foliage. The same as to *T. gloriosa*.

15. **Tecomanthe Gjellerupii vSts.** — Nova Guinea 14 (1927) 298.

Fig. 5 1; 6 (15); 16.

Lian, ca. 3 m. high, stem ca. 0.4 cm. thick, sub-quadrangular, spirally twisted, internodes ca. 20 cm. l.; *bark* gray-brownish, striate, with many small lenticels. *Leaves* 3-jugate, 17—20 cm. l. opaque, darkgreen, opposite; petioles 3—4 cm. l. slightly alate, sub-terete, sulcate above, the bases connected with a strongly prominent line. Leaflets lanceolate-oblong, acute or shortly acuminate, entire, light grayish when dry, 7—10 × 3—4 cm.; nerves ca. 7-pairs patent curved, prominent beneath, sunken in above, reticulations lax, prominent, petiolules of the lateral leaflets 0.1—0.5 cm., of the terminal ones 1.2—1.7 cm. *Racemes* axillary, on foliate branchlets, peduncle puberulous short ca. 2 cm. l., few (ca. 7) flowered, with many scale-like short bracts at the immediate base; pedicels ca. 1 cm. l., with setaceus 0.5 cm. l. bracts. *Calyx* campanulate, equally 5-lobed, ca. 2.7 cm. l. (incl. lob.), dark rosa, the lobes cream-yellow ca. 1.5 cm. l., lanceolate-acuminate, margin shortly pubescent. *Corolla* tubular-infundibuliformous, rosa, sub-inequally 5-lobed, tube ca. 6.5 × 1.5—2 cm., glabrous, except in the narrow lower part ca. 0.7 cm. above the base stupose, lobes triangular, acute, 0.8—1.3 cm. *Stamens* included, didynamous, inserted ca. 1 cm. above the base of the tube, 4.5 and 5 cm. l., filaments glabrous; cells 0.5 cm. l., divergent. Style filiformous, glabrous with 2 stigmatic spathulate lobes. *Ovary* glabrous, bilocular, with many ovules on 2 placentas in each cell in many rows. Fruit unknown.

(Type specimen: K. Gjellerup n. 668).

Geogr. distr. Dutch New Guinea — North-coast near Humboldt Bay, 300 m. alt. near Hollandia, spreaded: K. Gjellerup n. 668 (L, B).

This slender lian is allied with *T. venusta* and less with *T. saxosa*. As to the first it differs in the shorter corolla, the larger calyx, the firmer papyraceous leaflets posessing a totally different nervature. As to *T. saxosa* it has larger entire leaflets, a much shorter few-flowered raceme and different flowers, the calyx being darker rosa and more firmly chartaceous.

16. **Tecomanthe venusta S. Moore.** Journ. Bot. 61 (1923) 38-39; van Steenis. Nova Guinea 14 (1927) 298.

Fig. 5 b, q; 6 (16); 16.

Lian, branchlets 0.3-0.5 cm. thick, densely tubercular-lenticellate. *Leaves* 1-pinnate, opposite, 5-foliolate, oblong-ovate, 0.5-1 cm. 1., acuminate, entire, base obtuse, papyraceous, glabrous, 7-8 × 3.5-4 cm., sidenerves 7, reticulations indistinct, 4 cm. 1. petioled, petiolules 0.5 cm. 1. *Racemes* multi-flowered on naked branchlets, peduncle ca. 2 cm. 1. with scale-like bracts; pedicels ca. 1.2 cm. 1. *Calyx* ca. 1.5-1.7 × 0.8 cm. (lob. incl.), lobes 0.8 cm. 1. *Corolla* inside creamy, outside rosa-pupureus 6 cm. 1., 2 cm. broad near the limb.

(Type specimen: H. O. Forbes n. 857).

Geogr. distr. British New Guinea —Mt. Gawada, 1700 m. alt.: H. O. Forbes n. 857 — Upper course of the Tami river, ca. 85 m. alt.: K. Gjellerup n. 54 (L, B).

s. sp. parviflora vSts. nov. sub-spec. *Frutex* volubilis; rami circ. 1.5 cm. crassi, spiraliter torti. *Cortice* griseo sparse lenticellato. *Folia* ut in typo sed firmiora apice integra. *Racemi* cauliflori singuli vel 2 superpositi in axillus cicatricium foliorum robustiora. *Calyx* minor ca. 1.5 cm. longus pallide brunneus in sicco. Corolla minor ca. 5 cm. longa angustior, apicem versus puberula.

(Type specimen: Wiesenthal n. 10).

Geogr. distr. New Guinea — Kaiser Wilhelms-Land — Alexishafen, climbing in trees, flowers like those of *Digitalis purpurea* (teste coll.): P. F. Wiesenthal n. 10 (D); on a hill west of Finschhafen: Weinland n. 174 (D).

The new sub-species is founded on a specimen Diels (1922) arranged to *T. dendrophila,* but is certainly another species as to its 2-jugate leaves; it belongs without doubt to *T venusta,* but differing in several characters I believe it represents a marked sub-species. Perhaps it is due to the remark of Scheffer (see p. 883) that *T. dendrophila* is not a true 3-foliolate species, but it is. I never met with 3- and 5-foliolate leaves on the same specimen.

Though I have not seen the original specimen of Forbes, the species is well characterised and though differing in altitude, the remarks of Gjellerup are just conformable to Mr. Moore's description. There are 5 leaflets, which are sometimes gross-dentated at the top. Moreover the lower part of the corolla-tube is very narrow 1.5 cm. l. and stupose inside near the insertions of the stamens. The species is allied with *T. dendrophila.*

The specimen of Gjellerup shows narrow winged lines along the midribs of the calyx-lobes, the latter being triangular acuminate, with short pubescent margin; the stigmatic lobes are spathulate shortly mucronate. Gjellerup notes it as common near the Upper Tami.

From *T. saxosa* it differs in the thinner, different leaves, the much smaller, less loose calyx of firmer structure and the larger corolla.

9. NEOSEPICAEA Diels.

Engl. Jahrb. 57 (1922) 500, fig. 1; S. Moore. Journ. Bot. 61 (1923) 38.

Fig. 5 u; 7 (1); 16.

Glabrous *lian*. *Leaves* opposite, digitate. The *inflorescence* is a corymbiformous panicle, the ultimate stalks being cymes. *Inflorescence* terminal, the lower side-axis in the axils of the leaves. *Calyx* short, cupular-campanulate, subcoriaceous, 4—5-dentated, sub-bilabiate, glabrous, smooth. *Corolla* with a narrow lower tubular part, infundibuliformous, inside the throat dense pilose. *Stamens* 4, didynamous insert, with divaricate cells; disk cupular, covering the ovary. Style filiform, with a bilamellate stigma. *Ovary*

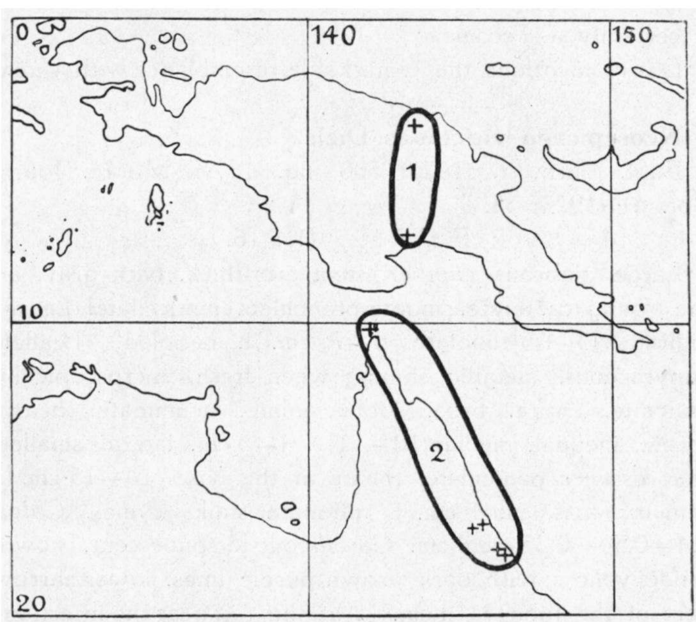

Fig. 7. Geographical distribution of 1. Neosepicaea viticoides Diels. and 2. Hausmannia jucunda F. v. Muell.

bilocular, septum with 2 placenta's in each cell, each placenta with ∞ ovules in several rows. *Fruit* unknown.

(Tribus Tecomeae. Spec. 1.Type: *N. viticoides Diels*).

As Diels remarks the genus is allied with *Pandorea*, with which I fully agree. It differs immediately in the digitate leaves, the irregularly toothed calyx, the actinomorphous corolla and the cupular disk.

I suppose it has been originated from *Pandorea*-like ancestors with actinomorphic corolla's, The digitate leaves may be derived from 1-pinnate leaves, wherein the rhachis is reduced. Indeed several *Pandorea's* show unequal leaflets on one leaf, perhaps a tendency of importance here. In the American *Tecoma's* digitate leaves are common.

Though the fruit is unknown, I suppose the capsule will turn out to be like that of *Pandorea* and *Tecomanthe*. It is certainly a *Tecomeae*.

Diels mentions the remarkable resemblance with *Vitex*.

Neosepicaea viticoides Diels.

Engl. Jahrb. 57 (1922) 500, fig. 1; S. Moore. Journ. Bot. 61 (1923) 38.

Fig. 5 u; 7 (1); 16.

Large glabrous *climber*, stem arm-thick, bark gray, on the young ca. terete, smooth branchlets elenticellate. *Leaves* digitate, (3)-4-5-foliolate, 5—7 cm. l. petioled. Leaflets papyraceous, metallic shining when fresh, microscopically punctate, entire, broad oblanceolate, acuminate, nearly sessile, inequal, median 10—11 × 4—5 cm., laterals smaller. *Inflorescence* paniculate, foliate at the base, 10—15 cm. l., primary axis ca. 4 cm. l., ultimate stalks cymes. *Calyx* 0.4—0.5 × 0.35—0.4 cm. *Corolla* outside pubescent, brown, inside yellow with dark brown-purple lines, lower narrow part of the tube 3—4 cm. l., at the top near the insertions of the filaments annularly stupose; upper part of the tube infundibuliformous, on one side longitudinally stupose

0.6 × 8 cm., lobes ovate-acute, ciliate, inside stupose, outside pubescent. *Ovary* bilocular, with 2 placenta's on the septum in each cell, each placenta with ∞ ovules in several rows. *Fruit* unknown.

(Type specimen: Ledermann n. 8665).

Geogr. distr. New Guinea — Sepik-district, April river, Standlager, ca. 100 m. alt., in well passable, 20—25 m. high primeval forest: Ledermann n. 8665 (D); pr. Sogere; H. O. Forbes n. 437 (S. Moore).

This large lian seems to belong to the *Pandorea-Tecomanthe*-„Sippe", I mentioned already (p. 837).

The colour of the corolla seems to differ a little. S. Moore describes it as pale orange spotted with crimson. As I did not see Forbes' specimen, I do not know whether this specimen represents a variety, or whether it is due to the description. It is also possible that the colour is varying indeed.

10. HAUSMANNIA F. v. Mueller.

= *Campsis F. v. M.* Coll. Fragm. Phytogr. Austr. 4 (1864) 148; Bentham. Fl. Austr. 4 (1869) 539; = *Nyctocalos* (*sub-genus Hausmannia*) *jucundum* Seemann. Journ. Bot. 8 (1870) 149; Benth. & Hook. Gen. Pl. 2 (1876) 104; F. v. Mueller. Sec. Syst. Cens. Austr. Pl. (1889) 167; H. Baillon. Hist. Pl. 10 (1891) 21. note 2; K. Schumann in Engler Prantl. Pfl. Fam. IV. 3b (1895) 223; Bailey Compreh. Catal. Queensl. Pl. (1909) 368, fig. 345; Bailey Bot. Bull. Contr. Queensl. Fl. 13 (1896) 1136.

It is due to lack of materials that Seemann, Bentham and Hooker, Baillon and K. Schumann did not know whether the monotypic genus belonged to the *Bignonieae* or to the *Tecomeae*. They all placed it in the first tribus. Bailey described the fruit (Bot. Bull. 13 (1896) 11) as opening loculicidally and thus it is stated that it belonges to the *Tecomeae*. Its habit and flowering characters show its alliances with *Pandorea*, *Tecomanthe*, *Campsis* and *Campsidium*. It is very well distinguished however by its induplicate-valvate corolla and the exsert stamens.

In the Paris herbarium I found a sterile New Guinean specimen, collected by Hollrung (Augusta river, Kaiser Wilh. Land, 1887), called by K. Schumann: *Hausmannia mollis K. Sch. n. sp.*. There were only a few stalks and some single leaflets. Perhaps the stalks were rhachises. They were ca. 0.3 cm. thick, soft brown-pubescent, hairs patent; internodes ca. 5 cm. l.. On one side between each pair of leafscars (leaflet-scars?) there was a peculiar pezizaeformous gland ca. round 0.2 cm. diam., concave, and placed on small prominent bubble. The leaflets are nearly sessile or 0.3 cm. petiolate (petiolulate ?); the petiole, underside of the leaves and nerves above being all brown pubescent as well as the stalks. Leaf-form oblong rounded at the base, somewhat oblique, entire, acuminate at the top. The nerves 6—7 pairs slightly curved are patent (ca. 45°), prominent and reticulately connected. Reticulations lax. As I do not know whether Schumann has ever published this and I did not see any flowers, I suffice with a description. The leaves are somewhat like those of *Haplophragma*, but such glands I saw never before. I do not believe it to be a *Bignoniaceae*.

Hausmannia jucunda F. v. Mueller.

Fig. 5 s, t; 7 (2); 16.

Tall glabrous woody *lian*, branchlets terete. *Leaves* opposite shining at both sides, digitate 3-foliolate, petiole rather long 4—6 cm. l. slightly striate. Leaflets convex, membranous, entire, articulate at the end of the petiole, oval or elliptical, narrowed into the short lateral 0.5—1 cm. l. petiolules and the 2.5 cm. l. terminal petiolule, 9—11 × 4—4.5 cm.; the terminal leaflet occasionally confluent with one of the lateral ones; sidenerves 8—10, curved, patent, reticulately connected, prominent especially below, reticulations lax. *Inflorescences* cymobotryoid (never racemes), terminal or lateral in the axils of the leaves immediate under the terminal one 5—15 cm. 1. rather few-flowered. *Cymes* 0.6—2 cm. 1., opposite, 2—5-flowered; bracts small, lanceolate; pedicels 0.4—0.6 cm. 1.; bracteoles minute or none. *Calyx* campanulate truncate 5—toothed, 0.4—0.6 cm. 1. (incl. lob.) glabrous, rather thick membranous, lobes 5 subequal or equal, broad triangular, 0.2 cm. 1., minutely acuminate. *Corolla* purple, tubular, incurved, tube 2—2.5 cm. 1. (excl. lob.) slightly dilated upwards above the calyx; lobes 5 broad ovate induplicate-valvate in bud, ca. 0.5 cm. 1., hairy inside, obscurely arranged in 2 lips. *Stamens* 4, didynamous, fifth rudimentary, filaments hairy at their insertions below the middle of the tube, exceeding the corolla ca. 0.7—1 cm., anther-cells diverging or divaricate. *Disk* hypogynous, ca. 0.2 cm. 1. cupular, completely enclosing the ovary when flowering. *Ovary* short, slightly compressed, dissepiment transverse; ovules ∞ in several rows on each placenta; style with 2 ovate stigmatic lobes. *Capsule* loculicidally opening in 2 concave valves as in *Tecoma*., 7.5—11 × 3. 5 cm. acuminate at both ends, smooth; seeds in several rows, overlaying each other, flat, pyriform, wrinkled, ca. 1 cm. broad membranous winged. Dissepiment broad, thick, and firmly attached to the valves or one of them.

(Tribus Tecomeae. 1 species. Queensland).

Geogr. distr. Queensland — Seaview Range, Rockingham Bay: Dallachi, type specimen (P,L sub n. 898, 199... 71); Rockingham Bay: F. v. Mueller (P,L sub n. 898, 199... 70); Stony Creek, Cairns, shoot and loose flowers: L. J. Nugent (Bailey); Thursday Island, large leaf and very young shoot: E. Cowley (Bailey); Freshwater Creek, Cairns, the first time a fruit was gathered: L. J. Nugent (Bailey).

The plant seems to be common in the Queensland tropical shrubs, but fruiting specimens are seldom obtained. Though all authors thought the genus a *Bignoniea*, the celebrated Queensland botanist F. v. Mueller already suggested its alliance with several *Tecomeae*, such as *Tecoma* and *Campsis*, and he was allright herein. Even Bentham says: "I do not see the affinity with the genus (or section of *Tecoma*) *Campsis*, suggested by F. v. Mueller". And Seemann calls it even a *Nyctocalos* and considers the whole genus having an induplicate-valvate corolla, which is absolutely wrong, though he thought it firstly (Journ. Bot. 3 (1865) 93) allied with *Campsis*. Certainly Seemann considered the leaves and the stamens as important characters within the *Bignoniaceae* spoken about, but I am supposing just the contrary.

Its affinities are to be found in *Tecomanthe, Pandorea, Campsis, Campsidium* and *Tecoma*. It is however distinguished by its unique aestivation, certainly an important character and further by its large cupular disk and exsert stamens, this being of little importance.

Without doubt it belongs to the group: *Tecoma, Pandorea, Tecomanthe, Campsis* and *Campsidium*, which is characterized by its climbing habit, *Bignoniaceae*-flowers following the usual scheme, loculicidally dehiscent fruits, a single dissepiment with 2 placenta's on each side and flat winged seeds.

11. STENOLOBIUM D. Don.

Edinb. Philosoph. Soc. (1823) 263; Seemann. Journ. Bot. 1 (1863) 18, 87; — = *Tecomaria Bureau* Monogr. (1864) 47, t. 13; Benth & Hook. Gen. Pl. 2 (1875) 1044; Baillon Hist. Pl. 10 (1891) 41; Engler-Prantl. Pfl. Fam. IV. 3b (1895) 240; Sprague in Dyer Fl. Cap. 4 (1904) 448.

Up till 1904 American species have been arranged in

Tecomaria. Sprague, however, pointed out that this was a confusion. *Stenolobium* has free anther-lobes and only 2 rows of ovules in each cell. Thus *Tecomaria Bur.* = *Stenolobium*; *Tecomaria fulva Seem.* = *Stenolobium fulvum Sprague*; *Tecoma Smithii Bull.* Cat. (1889) 8, a reputed hybrid (*T. velutina* and *T. capensis*. Gard. Chron. (1894) 64 = *Stenolobium alatum Sprague* (= *Tecoma alata D.C.*).

Tecomaria is a South-African genus and *T. capensis* has been introduced into America. *Stenolobium* is an American genus. Evidently the genera are allied with each other.

Stenolobium stans (L) D. Don in Edinb. Phil. Soc. 9 (1823) 88; — = *Tecoma stans (L) Juss.* in D. C. Prod. 9 (1845) 214; Bot. Magaz. t. 3191; Seemann Journ. Bot. 1 (1863) 88; Koorders Exc. Fl. Java. 3 (1912) 184; Merrill Enum. Philip. Pl. 3 (1923) 444:

A many-branched small *tree* or shrub ca. 5 m. high, glabrous throughout, *leaves* opposite, pinnate or (in the *var. castaneaefolium Seem.* ordinarily) 1-foliolate, folioles in 3—4 pairs, lanceolate, serrate ca. 5—10 × 1.2—2.5 cm. *Flowers* yellow in terminal *inflorescences*, the *calyx* small ca. 0.5 cm. l., tubular campanulate with 5 broad triangular short lobes and remarkable glands. The *corolla* is tubular-funnel-shaped with 4 fertile included *stamens*, inserted at the base and 1 staminodium; the thecae are long pubescent (not occurring in the other Malayan species) and divergent. The *capsule* is oblong ca. 10—15 × 0.5—0.6 cm. with many seeds in two rows in each cell, ca. 0.5 × 1.5—2 cm., broad membranous winged.

Geogr. distr. S. E. Asia. Upper Burma — Minbu distr.: A. T. Gage in Rec. Bot. Surv. Ind. 3 (1904) 86 — Br. India — Bombay: Tubbert (L sub n. 898, 196... 301) — *Chutia Nagpur* distr.: Wood in Rec. Bot Surv. Ind. 2 (1902) 125.

Malayan Archipelago. Java — Res. Batavia. Cult. in Hort. Bog. XI. H. 40a. (L sub n. 922, 70... 403);

Buitenzorg pr. Bantar peté: Boerlage (L. sub n. 908, 339... 33, n. 908, 339... 34, n. 908, 343... 639); Buitenzorg: H. Hallier n. 244, in a garden pr. Djembatan Merah (B); Weltevreden: Backer (B) — *Res. Soerabaya* — pr. Prigen: A. Rant (B).

Philippines. Mindanao — Distr. of Zamboanga: R. J. Alvarez. F. B n. 15434 (L) — Rather widely distributed in cultivation (Merrill).

New Caledonia — Ornamental shrub, pr. Prony; Franc n. 1579. Sér. A (P).

var. apiifolia D. C. Prod. 9 (1845) 224; Seemann. Journ. Bot. 1 (1863) 88.

Geogr. distr. S. E. Asia — *Siam* — Bangkok: Zimmermann. Pl. Siam. n. 69 (U).

Malayan Archipelago. — *Java* — Buitenzorg. Cult. in Hort. Bog.: n. 4079 HB (B) — *Ternate* — pr. Doefadoefa: Beguin n. 915 (B).

A native of tropical America from Argent., to Mexico and now widely distributed and cultivated in the tropics. According to Koorders it is in Java very frequently found in parks and gardens as well as in India and Burma (Gage, Wood). On the Philippines Merrill notes that it scarcely naturalises, but in the Malayan Archipelago even this seems never to occur.

The *var. apiifolia D. C.* is most probably a cultivation — form, but no constant heriditary variety. As I stated, it is connected with several intermediate forms to the type.

12. DEPLANCHEA Vieillard.

Bull. Soc. Linn. Normand. 7 (1862) 11; — = *Diplanthera Banks et Soland.* ex. R. Br. Prod. (1810) 448; idem 1 (1827) 304; Endlicher. Gen. Plant. (1836—40) 676; D. C. Prod. 10 (1846) 299; Bureau. Soc. Bot. France 9 (1862) 163; — = *Bulweria F. v. M.* Fragm. Phytogr. Austr. 4 (1864) 147; Bureau. Monogr. (1864) 51; F. v. Mueller. Fragm.

Phytogr. Austr. 5 (1865) 72, 214; Seemann. Journ. Bot. 3 (1865) 93; F. v. Mueller Journ. Bot. 5 (1867) 212; Bentham. Fl. Austr. 4 (1869) 540; Scheffer, Nat. Tijdschr. Ned. Ind. 31 (1870) 332; Seemann. Journ. Bot. 8 (1870) 148, 163; Benth. & Hook. Gen. Plant. 2 (1876) 1048; F. v. Mueller. Sec. System. Cens. Austr. Pl. Part. I. (1889) 167; Baillon. Hist. Pl. 10 (1891) 44; K. Schumann Engler. Prantl. Pfl. Fam. IV. 3b (1895) 235; Boerlage Handl. Fl. Ned. Ind. 2 (1899) 591; — = *Montravelia Montrousier* mss. ex Beauvisage. Ann. Soc. Bot. Lyon. 26 (1901) 89; Ridley. Fl. Mal. Penins. 2 (1923) 552; van Steenis Nova Guinea 14 (1927) 293.

Fig. 8; 9.

Trees with thick branches and large, verticillate or opposite, simple, ovate or oblong *leaves*, mostly with large glands at the base, margin entire, mostly yellow tomentose just as the ultimate branches and the inflorescences, sometimes glabrous. *Thyrses* terminal, large, mostly yellow tomentose. *Flowers* rather large; *calyx* campanulate coriaceous, 3-lobed, valvate in bud, posterior lobe entire, lateral lobes 2-toothed or with 5 subequal lobes, sometimes with glands, hairy or glabrous; *corolla* yellow, sub-bilabiate, 5-lobed, dilated towards the throat, tubular-ventricose, lobes ca. round; *stamens* 4, didynamous, seldom with a fifth rudimentary one, distinctly exsert; anthers with distinct divergent thecae, reflexed in bud; *ovary* sub-sessile, bilocular, with 2 placenta's in each cell, which are sometimes adnate; *ovules* ∞, pluri-seriate; style exsert with a bilamellate stigma. *Capsule* 2-valvate, oblong or lanceolate with strongly-coriaceous or even woody valves; seeds ∞ broad finely membranous winged.

(Type: *Deplanchea tetraphylla* (*R. Br.*) *F.v. M.*)

Robert Brown, who published the genus in his Prodromus (1810), founded on one species *D. tetraphylla R. Br.*, gave it provisionally a place at the end of the

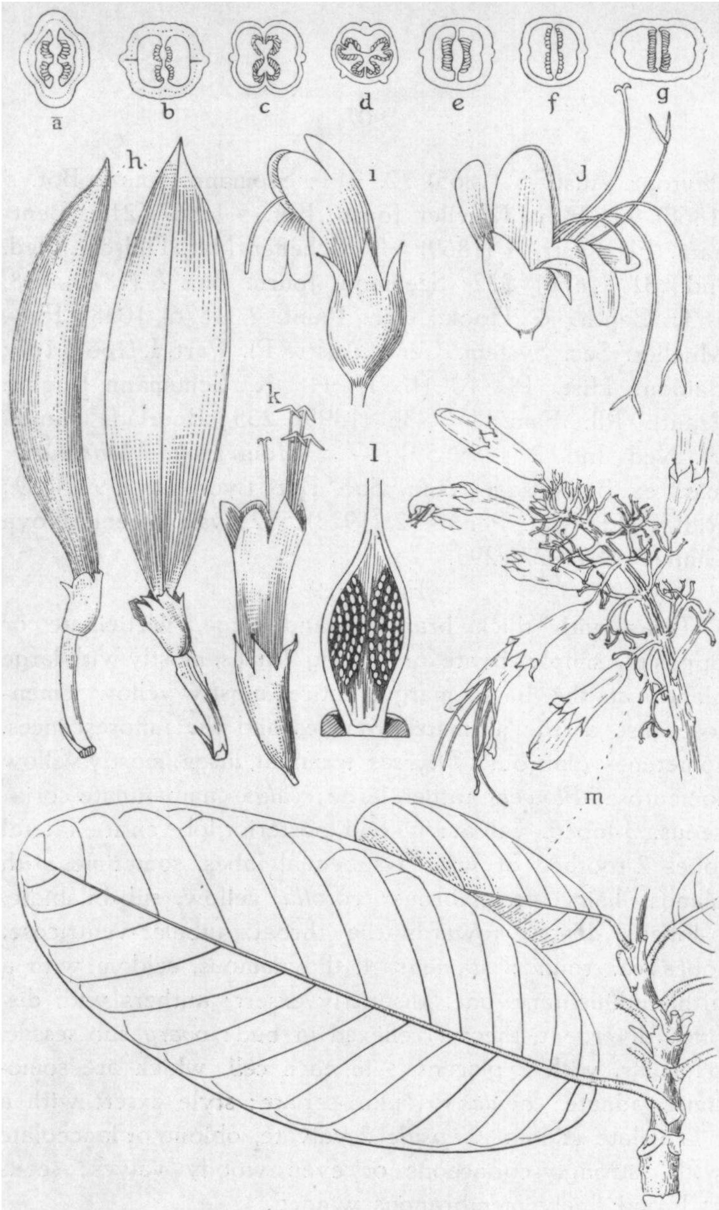

Fig. 8. Deplanchea Vieill. Transverse section of the ovary. a. D. speciosa Vieillard (Vieill. n. 1036). b. D. bancana (Scheff.) vSts. var. glabra vSts. (Lörzing n. 11525) c. D. tetraphylla (R. Br.) F. v. Muell. (U sub n. 001067). d. D. tetraphylla (R. Br.) F. v. Muell., abnormous 3-merous ovary (after Beauvisage in herb. Paris). e. D. sessilifolia Vieill. (Vieillard n. 480). f. D. glabra vSts. (Type specimen). g. D. tubulosa vSts. (Type specimen). h. Capsule of D. speciosa Vieill.. left the lateral side, right the anterior one. (Petit n. 163). i. Flower of D. spesiosa Vieill. (Vieillard n. 1036). j. Flower of D. tetraphylla (R. Br). F. v. Muell. (U. sub n. 001067). k. Flower of D. tubulosa vSts. (Type specimen). l. One opened cell of the ovary with the 2 placenta's and the series of ovules of D. glabra vSts. (Type specimen). m. Habit of D. tubulosa vSts. (Type specimen). Magnif. $^{5}/_{9}$ ×, except a-g, l.

Solanaceae, as he thought it „*Solaneis Scrophulareisque affine*", probably because he had no capsules to his disposition, and supposed its alliances among the *Gesneraceae* and *Sesamae*. Endlicher reckoned it to the *Salpiglossidae* among the *Scrophulariaceae* and so did De Candolle.

Later on Vieillard (1862) described another genus *Deplanchea*, founded on a New-Caledonian species, *D. speciosa Vieill.* He thought it a *Verbenaceae*, but gave a remark of its alliance with the *Bignoniaceae*.

In the same year Bureau (1862) gave a complete description of this species and recognised the genus as a true *Bignoniacea*.

F. von Mueller (Fragm. 4 (1864) 147) described a third genus *Bulweria F. v. M.*, founded on an Australian Bignoniacea from the Rockingham Bay in Queensland, *B. nobilissima F. v. M.* (= *Tecomella Bulweri F. v. M.* in herb.), which Seemann (1865) supposes just to be the same as *Deplanchea Vieill.*

It is curious, indeed, that von Mueller (Fragm. 5 (1865) 72), though he adopted the remark of Seemann, referred *Deplanchea Bulweri* still to the *Verbenaceae*. The same year, however (op. cit. 214), he recognised *Bulweria nobilissima* to be synonymous with *Deplanchea Bulweri*.

At last he suggests (Journ. Bot. 5 (1867) 212) the synonymy of *Diplanthera* and *Deplanchea*, the first being the eldest name, though the fruit was still unknown.

Bentham (Fl. Austr. 4 (1869) 540) does not know, what to say about the identity of the two monotypic genera, but supposes them to be distinct genera, which he based on the structure of the androecium. *Deplanchea speciosa* was described with a fifth rudiment and a bare space between two distinct placenta's, this not being the case with *Diplanthera tetraphylla*.

Seemann (1870), the celebrated monograph of the family, corrected the first point, in saying that this may not be such an important point within the family, the same being the case in *Nyctocalos* and *Newbouldia*.

F. v. Mueller (Sec. Syst. Cens. Austr. Pl. 1 (1889) 167), reduces *Diplanthera* as a synonym of *Deplanchea*. Indeed he is quite right in doing this; there was already described a *Potamogetonacea* called *Diplanthera Thouars* [1]), so that this name is wrong for the *Bignonian* tree in respect to the priority-principles.

Bentham and Hooker (l. c. 1048) do not indicate the fifth rudiment in the generic diagnosis, nor say anything about the placenta's, and so did Baillon and Schumann.

This question remained still unsolved till 1901, when Beauvisage pointed out, that in *D. sessilifolia* and *D. montana* the fifth rudiment occurs in only 20 % of the flowers, but is absent in general. Besides he suggests the existence of two distinct placenta's and I fully agree with his remark. Indeed I never found a rudiment. As to the placenta's, this is a mere question of conception. Most times the septum in the ovary shows 2 enlargements in each cell, but the ovules are also found on the space between now and then. Whether there is a bare space present or not, I do not suppose of high taxonomical importance. The ovary shows the usual *Tecomeae*-scheme. The flowers and the foliage are the main characters for recognizing the species, because the capsules of several species are still lacking up to this moment.

According to Scheffer and Teysmann it seems that at least in *D. bancana*, only the old and full-grown trees produce capsules, this being the case as well on the original habitat as well as in the Hort. Bog., where the three was introduced by the latter.

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[1]) See also Engler-Prantl. Pfl. Fam. Nachträge zum II-IV Teil. (1897) 37.

F. von Mueller described the uppermost leaves of the Queensland species as opposite, whereas Bentham pointed this out to be a mistake, which I can affirm here. Probably this mistake is due to the fact that at the end of a branch there may appear small axillary shoots with opposite leaves, as Bentham adds and which I also saw in the 3-verticillate *D. bancana*.

Scheffer doesn't think the phyllotaxis to be a constant important character to separate the 3-verticillate *D. bancana* and the 4-verticillate *D. tetraphylla*, but I do, as I never saw any variations of this character.

Further I will point to a remarkable parallel in habitus and also in respect to several taxonomical characters with some *Verbenaceae*. For instance with *Faradaya*. This genus was first described by F. von Mueller as a *Bignoniacea* (Fragm. 5 (1865) 21) and based on a species *Faradaya splendida F. v. M.* The points of resemblance are striking, which is also the case with other *Faradaya's*, and very interesting from a biological point of view. Both are trees, possess large, entire, opposite (*Faradaya* and the uppermost young shoots of *Deplanchea* now and then) or verticillate. simple leaves, sometimes with glands at the base; inflorescences and flowers are nearly of the same size, calyx rather irregularly or split (*Faradaya*) and glandular at the base; stamens exsert. Even in geographical distribution they harmonize, *Deplanchea* going much further to the west however. They are, of course, easily recognizable in their gynaecium.

That on the contrary *Deplanchea* has been referred to the *Verbenaceae* I have already mentioned.

Also with *Oxera* (*Verb.*) there are points of resemblance, which Schlechter[1]) mentions. I found in the Paris

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[1]) Schlechter. Die Pflanzengeographische Gliederung der Insel Neu-Caledonien. Inaug. Diss. Engl. Bot. Jahrb. 36 (1905) 1—41.

herbarium a specimen (Schlechter n. 14843), which even he had called *Oxera bignonioides Schltr. n. sp.*, a striking proof for the resemblance.

Another case is that of *Neosepicaea* and *Vitex* (see p. 900).

It is very difficult to explain these parallels. They are truly too striking and especially too common in the vegetable kingdom as to think they form mere examples of accident. I suppose there must be a general rule about it and I do not believe them to be always adaptations to climatic or other conditions, but I suppose them inhaerent to the evolutionary tendencies of the forms themselves. Adaptation can indeed explain much and may be the principal factor that turned the evolution of some forms to xeromorphous plants, etc., here and in many other cases it is another matter. Here is adaptation a hypothesis explaining nothing.

In my opinion there are 2 main points for a distinction of 2 groups. First some species possess a short, rather broad corolla-tube: *D. bancana*, *D. tetraphylla* (Fig. 8 j) and *D. hirsuta*. The other species *D. novocaledonica*, *D. tubulosa* (Fig. 8 k), *D. glabra* and *D. speciosa* (Fig. 8 i) show a tubular tube not concealed in the calyx.

Now there is another systematical character as to the structure of the septum and the placenta's (Fig. 8a—g). Some species show 2 rather pronounced placenta's, thickened as in the first group: *D. bancana*, *D. speciosa* and *D. tetraphylla*; a simple thickened septum (placenta) I have found in *D. tubulosa*, *D. glabra* and *D. sessilifolia*, which species compose a second group.

It is a pity I had no well-preserved materials of D. *novocaledonica*, nor of *D. hirsuta*.

The groups based on the corolla and those based on the placenta's seem to differ, e. g. *D. speciosa* belongs to the group characterized by a long corolla-tube, but has, however, more or less distinguishable placenta's which character the other species with a long corolla-tube do not possess. Thus it seems to me that these characters can be used to distinguish the species, but I do not know, whether they are important in phylogenetical respects.

I have tried to find a rather natural taxonomical character as to the structure of the ovary, especially in regard to the placenta's and the series of ovules. Indeed some species possess a rather constant number of series: *D. glabra* has 10 series, *D. speciosa* and *D. sessilifolia* show 6—8 series, whilst *D. tetraphylla* has 10—12 rows per cell.

However, I cannot base on this a well-defined, satisfactory key.

KEY TO THE SPECIES.

1. Calyx inside yellow-pubescent-tomentose, outside with few craterimorphous glands . 1. *D. novocaledonica.*
   Calyx inside always glabrous 2
2. Leaves 4-verticillate . . . . 2. *D. tetraphylla.*
   Leaves 3-verticillate or opposite 3
3. Leaves sessile, at the base very densely yellow tomentose . . . . 3. *D. sessilifolia.*
   Leaves short or long petioled, not densely tomentose at the base 4
4. Leaves totally glabrous, inflorescence glabrescent, corolla-tube tubular, not concealed in the calyx 4. *D. glabra.*
   Leaves at least at the underside, just as the inflorescence dense yellow pubescent or hirsute 5
5. Leaves narrow-lanceolate in outline, margins repand and irregularly toothed, petioles short 1.5—4 cm., whole plant hirsute, calyx inside with scale-like glands, little tree. . . . . 5. *D. hirsuta.*
   Leaves ovate or obovate to oblong, margins entire, petioles much longer 5—10 cm. l., plants sub-glabrous or tomentose, calyx inside smooth, high trees 6

6. Corolla-tube broad campanulate, short, rather broad, the largest part concealed in the calyx, ca. 1.5 cm. l., inflorescences large, primary axis long, rather multi-flowered. . . . . 6. *D. bancana.*
   Corolla tubular, long, rather narrow, much exceeding the calyx in length, tube ca. 2.5 cm. l., inflorescences rather small, primary axis short, 1-3-flowered . . . 7
7. Calyx 1.75—2 cm. l., rather broad ventricose-campanulate (1.5 cm.) sub-coriaceous, leaves rather long (3.5—7 cm.) petioled, obovate-oblong, sidenerves ca. 8 . . . . 7. *D. speciosa.*
   Calyx 1.5 cm. l. tubular, rather narrow (0.7 cm. diam.), firmly chartaceous, leaves rather short (1.5— 2 cm.) petioled, oblong, sidenerves 13 pairs. . 8. *D. tubulosa.*

1. **Deplanchea novocaledonica** vSts. nov. spec.
Fig. 9 (1).

Cymis 3—5 cm. longe pedunculatis; *pedunculus* teres, breviter luteo-tomentosus, basi et apice contractus, trichotomus; *flores* medianae 1.3—1.7 cm. longe pedicellatae, laterales 1.5—2 cm. l. pedicellatae. *Calyx* coriaceus, tubuloso-campanulatus, extus subglabrescens, glandulis craterimorphis paucis praeditus, intus dense luteo-brunneus pubescenti-tomentosus, ca. 1.5 cm. l., 5-lobatis, lobis subaequalibus, ovato-triangularibus, ciliatis, apice penicillatis. *Corolla* 4 cm. l. tubo anguste cylindraceo, 0.5 cm. lato, fauce dilatato, 5-lobata, bilabiata, lobis orbicularibus, margine ciliatis.

Type specimen: Vieillard n. 2507).

Geogr. distr. New-Caledonia — Vieillard n. 2507 (L).

In Nova Guinea XIV I have mentioned the inside pubescent calyx of *D. sessilifolia*, of which species there is no description, but I have got an original specimen of Vieillard. This remark of mine is a mistake, as I have found that the materials put in the cover on the paper

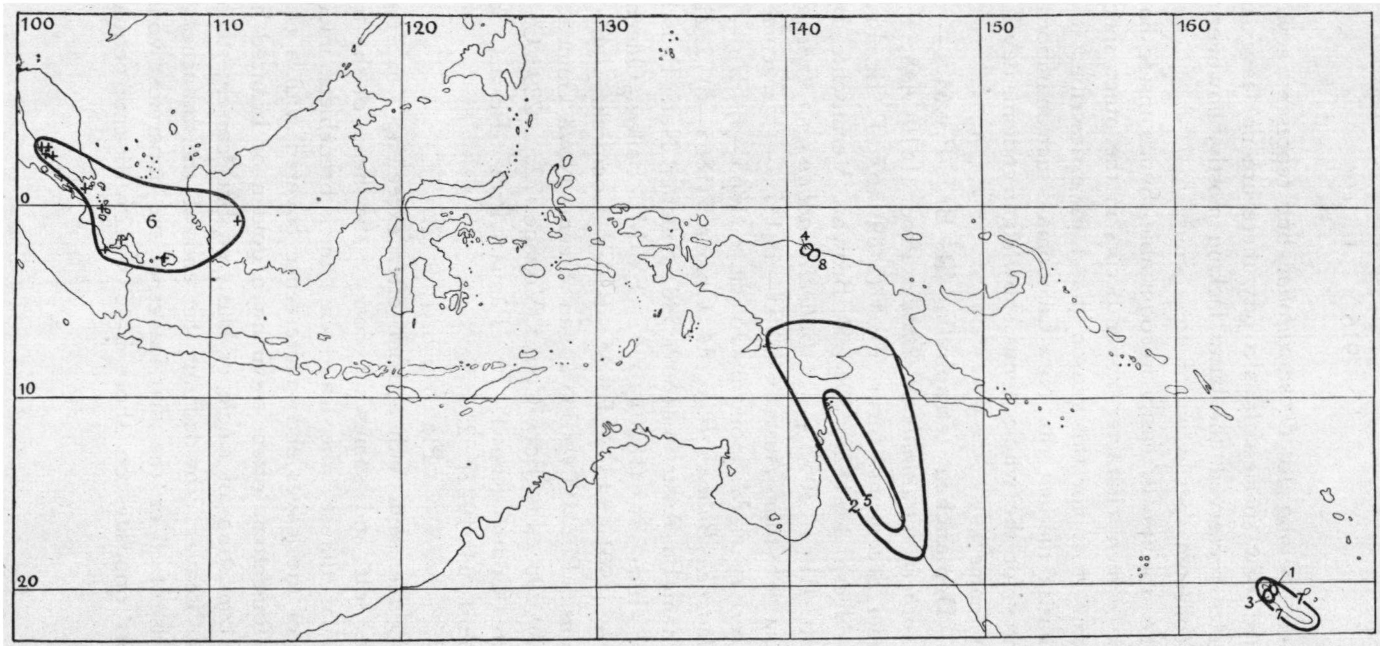

Fig. 9. Geographical distribution of Deplanchea Vieillard. 1. D. novocaledonica vSts. 2. tetraphylla (R. Br.) F. v. Muell. 3. D. sessilifolia Vieill. 4. D. glabra vSts. 5. D. hirsuta (Bailey) vSts. 6. D. bancana (Scheff.) vSts. 7. D. speciosa Vieill. 8. D. tubulosa vSts.

do not belong to *D. sessilifolia*, but represent a well-defined new species. It is a pity there are no leaves nor capsules preserved, the latter lacking mostly, however, in the collected species within this genus.

The species is easily recognizable by its inside hairy calyx, which character never occurs in the other species known. It is for this reason that I have described it, to emphasize the fact, that New Caledonia is such an important country for the whole genus, showing an endemic development (name!).

2. **Deplanchea tetraphylla** (R. Br.) F.v.M. — = *Diplanthera tetraphylla R. Brown* Prod. (1810) 448; F. v. Mueller Sec. Cens. Austr. Pl. 1 (1889) 167: R. Br. Prod. (ed. Nees). 1 (1827) 304; R. Brown's Vermischte Bot. Schrift. III. I. 305; — = *Bulweria nobilissima F. v. M.* Fragm. Phytogr. Austr. 4 (1863—4) 147; — = *Tecomella Bulweri F. v. M.* (nomen) Op. cit. 4 (1863—4) 147; — = *Deplanchea Bulweri F. v. M.* Op. cit. 5 (1865—6) 72, 214; Bentham Fl. Austr. 4 (1869) 540; Scheffer Nat. Tijdschr. Ned. Ind. 31 (1870) 334; F. M. Bailey Queensl. Fl. 4 (1901) 1137; F. M. Bailey Compreh. Catalog. Queensl. Pl. (1909) 368; van Steenis Nova Guinea 14 (1927) 293; Ill. Bot. Cook's Voyage. 72, t. 229; C. T. White Contr. Knowl. Fl. Pápua. Proc. Royal. Soc. Queensl. 34 (1922) 52.

Fig. 8 c, d, j; 9 (2).

Big *tree*, stem with a diam. often exceeding 1 m.; *bark* thick, soft and somewhat corky; the head of the tree irregular diffuse; the (ca. 1 cm.) thick branchlets, underside of the leaves and inflorescence covered with a thick soft tomentum, often assuming a golden or bronzed hue and consisting of single or clustered but scarsely stellate hairs, Leaves crowded at the end of the branches, in whorls of 4 or the first leaves of the uppermost young shoots opposite, on short 3—5 × 0.25-0.4 cm. petioles, which are dilated at the base. *Leaves* ovate, obtuse or obovate-elleptical, entire, very large, 30—60 × 30 cm. or more broad, or those immediately under the thyrse 15—23 × 8—14 cm., the upper surface glabrous or slightly scabrous, basal part of the midrib with 0—3 large, brown, smooth glands, cordate or sub-cordate at the base, firmly membranaceous, at the underside softly dense tomentose, midrib thickened with 7—9 erect patent side-nerves, nerves above not prominent, slightly sunken. Leaf-scars cordate 0.6—0.7 cm. broad. *Thyrses* terminal, dense, sub-globose, 15—20 cm. diam., nearly sessile above the last leaves, common peduncle 5—7 × 0.8—1 cm., primary axis whorled, terete, 4—6 cm. l., 1—5 flowered, each one dichotomously branched with a flower shortly ca. 1 cm. l. pedicellate in each fork. Bracts linear, minute, ca. 0.5 cm. l. Lateral flowers 1,5—2 cm. l. pedicellate. *Calyx* coriaceous ca. 1.3 cm. l., pubescent when young, 3-lobed, lateral lobes 2-toothed, triangular-ovate, acute lobes as long as the tube. Corolla yellow, tube shortly exceeding the calyx, ca. 2.5 cm l. sub-bilabiate, outside glabrous, tubular-campanulate, 5-lobed, lobes as long as the tube, ovate-orbicular, margin ciliate, ca. 1 cm. l.; *stamens* and style exceeding the corolla by 2.5 cm. or more, very divergent, inside above the base slightly pilose. *Disk* hypogyn, rather thick. *Stamens* 4, didynamous at the base of the corolla inserted and pilose there, 3.5 and 4 cm. l., with distinct divergent cells, in bud reflexed. *Capsule* 5—7.5 cm. l., the valves hard and woody, smooth inside with a longitudinal line where the thick dissepiment was attached, the placenta bearing dissepiment not broad and rather thick.

Geogr. distr. Australia — Northern Queensland pr. Rockingham Bay (Dallachi); F. v. Mueller (B, P, U sub n. 001067, n. 001066); Cape York (M. Gillavry, Daemel); Endeavour river (Banks and Solander).

var. novoguineensis vSts. nov. var. *Inflorescentia* magna 20—30 cm. lata, depresso-globosa, multiflora, pedunculo sparse luteo-tomentoso. *Cymi* 7—15-flori, glabrescentes; *folia* supra basin 1—7-glandulosa.

Geogr. distr. New Guinea — pr. Okaba: Branderhorst n. 38 (L, B, D, Kew, U); Thursday Island: Jaheri (B); Astrolabe Range and Sogere, a common tree (C. T. White).

According to Bailey it is a common tree in the tropical scrubs. The wood is of a whitish colour, close-grained and firm.

I now suppose the New Guinean specimen, which I thought slightly different from the Australian materials, to represent a new variety. The cymes are more branched, the leaves possess much more glands at the base and the habit is slightly tomentose with respect to the Australian specimens. *D. tetraphylla* is especially allied to *D. bancana*, with its rather short, broad corolla-tube.

3. **Deplanchea sessilifolia Vieillard** ex Guillaumin nov. spec. Ann. Mus. Col. Marseille (nomen). Ser. II. 9 (1911) 42; 203. Cat. Pl. Phanér. Nouv. Caled. et Dépend.; Beauvisage. Gen. Montrouziana in Ann. Soc. Bot. Lyon. 26 (1901) 89.

Fig. 8 e; 9 (3).

Rami dense luteo-tomentosi; *internodiis* superiis 3 × 1 cm. dense luteo-tomentosis; *folia* 3-verticillata, sessilia, rhomboidea, obovate, utrinque obtusa, vel basi leviter truncato-sub-cordata, 9—19 × 6—11 cm. supra sub-glabra, basi 2-vel multi-glandulosa; glandulis magnis, pezizaeformibus, 0.2—0.3 cm. diam., infima basi utrinque dense luteo-tomentosa, subtus praecipue in nervis primariis nervisque secundariis paululo tomentosa; *thyrsus* terminalis, densus, 3.5 × 7—8 cm., plane globosus, dense luteo-tomentosus, pedunculus 4—5 cm. l., bracteis violaceis lineari-lanceolatis, 0.8—1 cm. l., pedunculi secundarii 1.5—1.8 cm. longi, 3—7 flori, bracteis 0.5—0.6 cm. l., lineari-lanceolatis, pedicellis florum medianorum 0.5—0.7 cm. l., bracteolis 0.3—0.4 cm. l., *Calyx* tubuloso-campanulatus, violaceus, extus sparse luteo-tomentosus, intus glaber, 1.5 cm. l., fauce 0.6 cm. latus, 5-lobatus lobis subaequalibus, triangulari-lanceolatis. *Corolla* tubuloso-campanulata, parte superiore ventricose-dilatata, 4 cm. l., (lob. incl.), fauce. 8—1 cm. diam., omni ex parte glabra, 5-lobata, bilabiata, sub-curvata, intus supra basin 0.5 cm. floccosa, lobis rotundis; *stamina* 4, didynamia, 4 et 4.5 cm. l., thecis hastatis, pendulis in alabastro, divergentibus, quinto rudimento interdum praesente. *Ovarium* oblongum, disco annulari hypogyno, biloculare, placentis in utroque loculo 2, non distincte separatis, ovulis 3—4-seriatis. Fructus mihi ignotus.

(Descr. type specimen: M. Deplanche n. 480).

Geogr. distr. New Caledonia pr. Gomen: M. Deplanche n. 480 (L,P); M. Deplanche n. 132 (P).

So far as I know Vieillard never gave a description of this endemic New Caledonian species; so I give it here from a well-preserved original specimen of his in the Paris herbarium.

The species is very well characterized by its sessile leaves, with remarkable tufts of yellow hairs at the immediate base of the midrib below the glands.

In these characters, the calyx and the tubular corolla, it differs e.g. immediately from *D. tetraphylla.*

Now and then 6-merous flowers occur as abnormal aberrations with a 3-locular ovary.

According to Beauvisage the fifth rudiment is most times absent. The species seems to me mostly allied with *D. speciosa* as to its long, rather tubular corolla and *D. bancana* and *D. tetraphylla,* both possessing however a much shorter corolla.

4. **Deplanchea glabra vSts.** nom. nov. — = *Diplanthera glabra vSts.* in Nova Guinea 14 (1927) 293.

Fig. 8 f, 1; 9 (4).

Tree with terete branches, glabrous throughout; internodes of the ultimate flowering branches 1—1.5 cm. l., 0.8 cm. thick; leaves 3-verticillate, coriaceous, obovate-oblong, 16—19 × 9—11 cm., 2.5—3 cm. l. petioled, rotundate or cuneate-rotundate at the base, midrib at the basal part above with 3—7 glands, with some scattered glands along the remaining part. *Thyrse* terminal, narrow, short ca. 3 cm. l. peduncled, ca. 8 cm. l., 70-flowered, sub-glabrous, primary axis 1.5— 1.7 cm. l., trichotomous, triflorous, pedicels ca. 0.8—1.2 cm. l. rubiginosus. *Calyx* yellow, cyathiformous, 1.5—1.7 cm. l., totally glabrous, lobes 5, triangular, acute, 0.5—0.6 cm. l., 0.5 cm. broad at the base, sub-inequal, at the top short penicillate. *Corolla* sulphureous, 3—4 cm. l., cylindrical at the throat ca. 1.2 cm. br., outside glabrous, inside near the insertions of the stamens pilose, lobes 5, orbicular, 0.7 cm. l., ciliate. *Stamens* 4, exsert, ca. 5 cm. l., yellow, hairy at the base, thecae yellow, divergent, 0.4 cm. l. reflexed in bud. *Ovary* subglobose, bilocular with 2 placenta's per cell. Ovules in 10 rows per cell; style glabrous, ca. 5 cm. l., stigma bilamellate, yellow. *Capsules* unknown.

(Type specimen: Gjellerup n. 136).

Geogr. distr. — *Dutch Northern New Guinea* — pr. Humboldt Bay: Gjellerup n. 136 (L, B, U, Kew, D).

As I mentioned in my original diagnosis, this species is closely allied to *D. speciosa Vieill.*, but differs in the much more narrow thyrses, which do not exceed the leaves; for the rest it is totally glabrous.

5. **Deplanchea hirsuta (Bailey) vSts. nom. nov.** — = *Diplanthera hirsuta Bailey* Depart. Agric. Contrib. Queensl. Fl. Bot. Bull. 14 (1896) 11; Bailey Queensl. Fl. Part. IV. (1901) 1137; Bailey Compreh. Catal. Queensl. Pl. (1909) 368.

Fig. 9 (5).

Small *tree*, branchlets quadrangular and densely hirsute;

leaves opposite or in whorls of three, narrow-lanceolate in outline, but very irregular, the ends of some being broadly truncate, attaining 50 cm. in length with a breadth of 16 cm. about the centre, margins repand, crenulate or deeply and very irregularly toothed, base cordate and much undulate, petioles 1.5—4 cm., hirsute. *Calyx* 1.25 cm. l., campanulate, coriaceous, appearing 3-lobed, the 2 sidelobes emarginate, the inside bearing scale-like glands. *Corolla* yellow, ringent, 2.5 cm. l., spreading to 3.75 cm. wide, the lobes blunt, longer than the tube. *Stamens* 4, exceeding the corolla by about 3.7 cm.; style about the length of the stamens, the stigmatic lobes ovate-apiculate. *Capsules* unknown.

Geogr. distr. Queensland — pr. Cairns, Stony Creek, a shoot and loose flowers collected: L. J. Nugent; Thursday Island, a large leaf and a very young shoot gathered: E. Cowley.

Though I saw no materials of this Queensland-species it seems to me well characterized. Firstly the leaves are much narrower than in all other species, with repand irregularly toothed margins. The habitus is evidently hirsute, and not tomentose. For the rest the calyx bears scale-like glands inside, a character I never saw in the other species. It seems to me most allied to *D. tetraphylla*.

With respect to the other species, I think the opposite leaves belong to the very young shoots, the tree in general bearing 3-verticellate leaves.

6. **Deplanchea bancana (Scheff.) vSts. nom. nov.** — = *Diplanthera bancana Scheffer.* Tijdschr. Ned. Ind. 31 (1870) 334; Hasskarl in Flora 53 (1870) 219; Hooker Fl. Br. Ind. 4 (1885) 385; Boerlage Handl. Fl. Ned. Ind. 2 (1899) 59; Prain Journ. Asiat. Soc. Bengal. 383; Ridley Fl. Malay Penins. 2 (1923) 552.

Fig. 9. (6).

Large *tree* attaining 30 m., bark fuscous, rugose, young parts just as the pedicels and petioles pubescent; *leaves* pubescent, later on glabrous except the nerves, long ca. 4—10 cm. petioled; petiole stout, swollen at the base, cordate and contracted to the base, obovate-oblong, entire or sub-repand, firmly membranaceous, at the base of the midrib with 2—4 concave elliptic glands, midrib strong, prominent beneath, sidenerves 10—12 pairs, distinctly prominent, erect-patent, leaves ca. 45 × 25 cm., the uppermost under the thyrse shorter, 15—25 × 11—17 cm., 5—12 cm. l. petioled, leaves at the underside sparsely yellow-tomentose, the nerves densely tomentose. *Thyrse* terminal 5—10 cm. l., 8—15 cm. l. peduncled, peduncle ca. terete, shortly yellow-tomentose, rather compact, erect with horizontal side-axis of the cymes, which have filiformous bracts, inferior axis remote, superior dense, 2.5—3 cm. l., trichotomous, pedicels ca. 1.25 cm. l. *Flowers* articulated. *Calyx* outside pubescent, mostly with few glands, scarcely shorter than the corolla, as long as the pedicels, above the base slightly contracted, 5-dentated, teeth sub-equal, when fruiting sub-spathaceous split. *Corolla*-tube inside above the base pilose, lobes rotundate, inferior the largest, throat glabrous, filaments inserted near the base of the corolla tube and pilose at their bases; anthers with distinct cells, in bud reflexed, pendent. *Capsule* with 2 thick lanceolate valves, when dry sub-woody ca. 12.5 × 3 cm., with ∞ seeds; seeds flat, obovate, extremely fine membranous winged, 2 cm. l. and 4 cm. br., germ flat, sub-orbicular, ca. 0.7 cm. diam.

Geogr. distr. Malay Peninsula — Woods, not very common (Ridley); Malacca, Bukit Sadanen; Malacca: Maingay n. 1214 (L): Batu Feringhi (Curtis); Sungei Hudang (Derry); Negri Sembilan, Port Dickson (Foxworthy); Selangor, Ginting Bidai (Ridley).

V. n.: kayu chenderu.

Sumatra — *Res. Riouw* — P. Karimoen pr. k. Sangka, tree 28 m. high, alt. 10 m.: n. bb 7362 (B,L); P. Temiang: Teysmann (B).

V.n.: (Mal.) *toei; mangkoebang.*

Res. Palembang — Bay of Banjoeasin: Endert n. 345 (B).

V.n.: laboe.

Banka — pr. Djeboes: Teysmann n. H. B. 9666 (B); Banka: leg.? (B); pr. Djeboes, moist habitat: Teysmann (B), original specimens of Scheffer.

V.n.: mengkoebang or *mangkoebang.*

Billiton — Tandjoeng Pandan: Teysmann n. H. B. 5158 (B,L); van Rossum n. 74 (L).

V.n.: mendjabing or *endjabiengien.*

Borneo — W. Borneo, G. Kelam: Hallier f. n. B 2507 (B,L).

Java — Cultivated in the Hort. Bog. sub n. XIII J. 65 (B).

var. glabra vSts. nov. var. Rami, inflorescentiae, folia glabra.

Fig. 8 b.

Geogr. distr. — *Malay Peninsula* — Penang, Batu Feringhi and Hill (Curtis) — *Sumatra* — *Gouvt. Sumatra's Oostkust* — Bila pr. Aek-boeroe, 80 m. alt. in a young forest, not seldom, tree 8—15 m. high, flowers somewhat fragrant: Lörzing n. 11525 (B,L).

This species is somewhat variable and a glabrous form is mentioned above. This variety is easily recognizable from *D. glabra* at first sight by the long peduncled, multiflorous, much larger inflorescences, which are compactly contracted at the top of the peduncle and the much longer petioled leaves, which have more glands at the base.

The variety showed in the inflorescence leafy bracts, ca. 4 cm. l.

D. bancana is rather closely allied with *D. tetraphylla*, with its short broad corolla-tube, the other species possessing a much longer, tubular one.

D. bancana is also allied with *D. speciosa Vieill.*, but differs by its dense inflorescences, the larger flowers, the glabrate corolla and calyx and the few (1—2) glands at the base of the midrib.

I must refer here to an imperfect specimen (a leaf, a single peduncle and some primary axis of a thyrse with some buds) from Andaj collected by Teysmann and preserved at Buitenzorg. Whether it may belong to *D. bancana* I cannot decide, but it does seem so as far as I can judge. It is a pity the specimen is indeterminable.

7. **Deplanchea speciosa Vieillard.** — Bull. Soc. Linn. Normand. 7 (1862) 96; Bureau in Bull. Soc. Bot. Fr. 9 (1862) 164; — = *Diplanthera Deplanchei F. v. Muell.* Journ. Bot. 5 (1867) 213; — = *Diplanthera speciosa* (*Vieill.*) *K. Sch.* in Engler-Prantl Pfl. Fam. IV. 3b (1895) 235; Beauvisage Gen. Montrouziana. Pl. Nov. Cal. Ann. Soc. Bot. Lyon. 26 (1901) 89; A. Guillaumin Cat. des Pl. Phanérog. de la Nouv. Caléd. et Dépend. Ann. Mus. Colonial. Marseille. Ser. II. 9 (1911) 42.

Fig. 8 a, h, i; 9 (7).

High *tree*, bark smooth, grayish, leaves sub-erect at the apical part of the branches, glabrous, leafscars obcordiformous. *Leaves* 3-verticillate, 3.5—7 cm. l. petioled, petioles dilated at the base, leaves puberulous, entire, obovate, obtuse at both ends, 20—30 × 12—14 cm., primary (8) and secondary nerves puberulous beneath, for the rest leaves glabrous, midrib at the base with ca. 2 glands. *Thyrse* terminal, densely yellow-tomentose, compact, globose, cymes ca. 2 cm. l. peduncled, trichotomous, 1-3-flowered, ca. 8 cm. diam., bracts and bracteoles linear-lanceolate violaceis, peduncle ca. 7.8 cm. l., yellow-tomentose when young. *Flowers* large 0.6—0.8 cm. l. pedicellate, erect, slightly curved, yellow. *Calyx* glabrous, coriaceous, campanulate, tubular-ventricose, 2.5—3 cm. l., 5-lobed, lobes sub-equal, triangular, 0.7—0.8 × 0.5 cm. at the apex slightly carinaeformous contracted, resistent. *Corolla* totally glabrous, bilabiate, sub-carnosous with 5 sub-equal lobes.

Stamens 4, didynamous 3 cm. l. exsert, filaments thick, smooth, twisted, glabrous, truncate at the apex, inserted below the top of the connective; authers 2-celled, cells separate, lanceolate, divergent. Ovary conical-oblong, 2-locular with 2 placenta's per cell; ovules ∞ 6-8-seriate per cell, septum naked at the middle. Style filiformous inflexed in bud. *Capsule* erect, elliptic-oblong, acute, slightly curved 11—14 × 2.5—3 cm., ca. 1.5 cm. thick, slightly carinate, valves woody, septum membranous spongy.

(Type specimen: Vieillard: n. 1036).

Geogr. distr. New Caledonia — pr. Balade (Vieillard); Wagap pr. Bondé in forest at medium altitude, many specimens, also fruiting ones: Vieillard n. 1036 (L, P); Deplanche n. ? (P); pr. Ourai, 400 m. alt.: Lecart n. 65 (P); pr. Ourai, fruiting specimen: Petit n. 163 (P); mountains near Paita, alt. 200 m.: Schlechter n. 14843 (P); pr. Wagap, tree 20 m. high: M. Thiebault n. ? (P); flowers orange, tree 15 m. high: Herb. Pancher (P); South New Caled.: M. Raoul (P); Noumea pr. Prony: M. Franc n. 214 A (P); pr. Koghis: Mr. and Mrs. Le Rat n. 1121 (P); Nouv. Caléd.: Petit n. 74 (Beauvisage); Yate (Vieillard); Baie du Sud: Fournier et Sebert n. 62—1 (Beauvisage); Baie de Prony: Jeauneney in herb. Pancher (P).

In Nova Guinea I made a confusion in saying that the calyx of *D. speciosa* should be pubescent inside, mistaking it for *D. novocaledonica*.

This species is allied with *D. bancana*, but differs in the midrib and primary nerves being sparsely hairy only beneath, further in the small compact inflorescence and the larger flowers, which are totally glabrous.

Now and then there are abnormous flowers, e.g. 6-merous ones, which possess a 3-locular ovary (Beauvisage in herb. Paris).

A fifth rudiment seems to be missing in general.

8. **Deplanchea tubulosa vSts. nov. spec..**
Fig. 8 g, k, m; 9 (8)

Arbor mediocris, fere 7 m. alt.; *cortice* brunneo-griseo; ramulis ultimis fere 1 cm. diam., teretibus; internodiis basi attenuatis, brevibus, ca. 1.5—2 cm. longis; cicatrices foliorum late ovatae. *Folia* 3-verticillata, petioli breviores, sub-teretes, basi dilatati, flavo-tomentosi, 1-1.5 cm. longi; lamina oblonga, integra, basi rotundata vel sub-cordata, apice rotundata, emarginata vel sub-acuta, sub-coriacea, supra nitida, obscure viridia, glabra etiam in nervis, basi glandulis pezizaeformibus praedita; infra glabra, nervis sub-tomentosis; nervi numerosiores, paralleli, fere recti, ca. 13, prominentes, reticulatione distincte prominente. *Thyrsi* terminales, in ramis foliatis. fere 10 cm. longi, sub-tomentosi, densi, oblongi; pedunculo tereti, sub-glabro; axes laterales 1—1.5 cm. longis, 3-flori; pedicelli 0.7 cm. longi; bracteis vel lanceolatis, sub-tomentosis. *Calyx* tubulosus, 1.5—1.6 cm. l. (lob. incl.), tubo angusto, flavescente, 0.6—0.7 cm. lato, intus oculo nudo glabro, dense microscopice glanduloso, extus sparse pubescente, lobis 5 aequalibus, ovatis triangularibus, 0.3 × 0. 25 cm., apice breviter penicillatis. *Corolla* glabra, sufflavescente, paullo odorata, tubulosa, tubo fere recto, 2. 5—3 × 0. 6 cm., 5-lobata; lobis inaequalibus oblongis 0.8 × 0.5 cm., sub-ciliatis; tubo intus apud insertionem staminum dense glanduloso-pubescente. Staminodia nulla; *stamina* 4, lutescentia, 2 et 3 cm. longe exserta, glabra; antheris luteis, filamentis 4 et 4. 5 cm. longis, 0.7 cm. supra basin tubi insertis. *Discus* annularis, carnosus. *Ovarium* glabrum, ovatum, leviter compressum, 2-loculare, placenta in utroque loculo singula integra, omni ex parte ovulis obtecta; ovula ∞, 6—10-seriata. Stylus glaber, filiformis, 4. 5 cm. longus. Capsula ignota.

(Type specimen: Gjellerup n. 583).

Geogr. distr. New. Guinea—pr. Hollandia, Humboldt Bay, N. New Guinea, 700 m. alt., specimen 7 m. high, single specimens at the border of a hilly lawn: K. Gjellerup n. 583 (L, B).

This species is very well distinguishable by its narrow tubular calyx and corolla, the inside microscopically glandular calyx and the large number of nerves of the oblong rather small leaves.

Its nearest affinities are to be found in *D. speciosa*, from which it differs by its much narrower calyx and corolla, the inside glandular calyx and its nerves.

It shows also alliances with *D. sessilifolia*.

Doubtful species.

Beauvisage Gen. Montrouziana.

Pl. Nouv. Caléd. Ann. Soc. Bot. Lyon. 26 (1901) 89).

1. *Montravelia speciosa Montrouzier*. (nomen).

Beauvisage found this species in the herbarium at Lyons (n. 191); one specimen had buds, inflorescence and leaves, another without label showed the same flowers. He thinks it different from *Deplanchea speciosa* and *D. tetraphylla* from which it should differ: "par les fleurs plus petites, qui le rapprochent *D. montana Vieill.* et d'un echantillon anonyme de Balansa n. 3299, dont il paraît différer notablement par ses feuilles".

2. *M. montana Montrouzier* (nomen). Beauvisage supposes this species also to be a distinct one.

It is a pity he did not describe these 2 species, but this is due to his remark „Mr. E. Bureau prépare la révision de ce genre".

I did not see any materials of these 2 species, nor of a specimen (Beccari n. 2085) from Borneo, which Bentham and Hooker suppose to be a distinct species. Perhaps it is *D. bancana*.

3. *Bignonia moluccana D. C.* Prodr. 9 (1845) 144; — = *B. discolor Rich.* Sert. Astrol. p. XXIX, non RBr., Miquel. Fl. Ned. Ind. 2 (1856) 751 —" Folia petiolata opposita

simplicia ex basi attenuata elliptica acuta integerrima, supra glabra, subtus pubescentia, flores terminales lutei bracteis spicatis" — Moluccas.

4. *Bignonia comosa Roxb.* Fl. Ind. 3 (1832) 103; D. C. Prodr. 9 (1845) 144; *Spathodea? comosa G. Don.* Gen. Syst. Dichl. Pl. IV. 222; Miquel. Fl. Ned. Ind. 2 (1856) 751 — „Partes juniores tomentosae, folia opposita cordata, integerrima, corymbi terminales breves foliosi, calyx 5-lobus, corollae tabus longus gracilis, limbus bilabiatus". —Moluccas.

I have not seen these 2 species. The first may be a *Deplanchea*, though *Deplanchea* is not found as yet in the Moluccas. The second I can not identify either. With its entire opposite leaves it may only be a *Deplanchea*.

Both species do not belong perhaps to the *Bignoniaceae* at all.

13. DOLICHANDRONE (Fenzl) Seem.

— = *Dolichandra Sect. B. Dolichandrone Fenzl* in Denkschr. Baier. Bot. Ges. Regensb. 3 (1841) 113, 265; Seemann in Ann. Mag. Nat. Hist. Ser. 3.10 (1862) 31; — = *Spathodea RBr.* Prod. (1802—05) 471; Seemann. Journ. Bot. 1 (1863) 226; ibid. 8 (1870) 379; Bureau. Monogr. (1864) 50, t. 27; Benth. & Hook. Gen. Pl. 2 (1876) 1041 part. (*sect. Markhamia et Muenteria* excl.); Baillon. Hist. Pl. 10 (1891) 48; K. Schumann in Engler-Prantl. Pfl. Fam. IV 3b (1895) 240; Sprague in Kew. Bull. (1919) 303.

[Type: *Dolichandrone spathacea* (*L.f.*) *K. Sch.*]

Fig. 31; 10; 11.

Trees with pinnate or single, opposite or scattered *leaves*, leaflets elliptic to filiform, entire or denticulate flowers in terminal racemes or panicles. *Calyx* spathaceous, almost arcuate. *Flowers* fragrant, white, nocturnal, the lower part of the tube long funnel-shaped, much exceeding the calyx, limb ca. equally 5-lobed, mostly crispate or dentate. *Stamens* 4, didynamous with a fifth rudiment, inserted at the throat; anthers glabrous, bilocular. *Ovary* sessile with ∞ ovules in many rows. *Capsules* sub-cylindric or compressed siliquiform loculicidal, pseudo-quadrilocular owing to an incomplete false septum. Semina ∞ in 4—6 rows pro loculo, corky or corky-membranous winged.

Sprague gives an excellent critical enumeration of the species and also a revision of the essential characters in comparison with *Markhamia*. The distinctions between this two allied genera are to be found in the flowers; the capsules in both genera are pseudo-bilocular.

The flowers of *Dolichandrone* are always nocturnal, pure white, fragant, with a long funnel-shaped tube much exceeding the calyx, the limb being almost actinomorphic; whereas in *Markhamia* the cylindric part of the tube is very short and concealed in the calyx, only the upper part of the funnel being visible and the limb is conspicuously bilabiate; the corolla is yellow, rarely pink or lilac or has a yellowish tube spotted with purple.

I suppose there are 2 groups to be distinguished within the genus, according to those which Sprague calls "species australiae" and "species asiaticae." The former group is composed of 3 allied species, only occurring in N. Australia and Queensland, where none of the other *Dolichandrone's* is found. They are distinguished from the others in the following characters: mostly shrubs or sometimes little trees, leaves possessing a particular type of nervature, being coriaceous with a thick epidermis, whorled, scattered or almost filiform. I propose for this section the name *Coriaceae*, for the other *Membranaceae*.

So I only suggest that these 3 species show peculiar xeromorphous habitus and structure, but I emphasize that I do not take into consideration the physiological question, what xerophytism means for these plants. I feel fully authorized to speak about xeromorphous adaptation, as those structures always and only are found in arid countries, a fact that cannot be denied.

Urban (Ber. Deutsch. Bot. Ges. 34 (1916) 755—6), too, makes a remark on the heterogeneous character of *Dolichandrone* as K. Schumann has limited it. Urban takes *D. spathacea* (*L.f.*) *K. Sch.*, *D. falcata* (*Wall.*) *Seem.*, *D. stipulata* (*Roxb.*) *Benth.* (= *Markhamia stipulata Sprague*), in a group agreeing in some respects with my subgenus of the „*Membranaceae*, and the pollen-grains of all of them showing" 3 Spalten"; whereas the other species (my sub-genus *Coriaceae*) are very much varying with "3—5 Spalten", among which also *D. crispa* (*Ham.*) *Seem.* (=*D. arcuata C. B. Clarke* Sprague Kew Bull. (1919) 307) occurs. For the present the most rational point of view seems to be that of Sprague [1]), which I completed, viz. *Markhamia* and *Dolichandrone*, the latter genus having two sub-genera *Coriaceae* and *Membranaceae* which probably may be of generic rank.

KEY TO THE SPECIES.

1. Leaves pinnate; leaflets long, terete, filiform or lanceolate-oblong 2
   Leaves simple, mostly scattered 3
2. Leaflets almost filiform, terete . . . 1. *D. filiformis*.
   Leaflets broader lanceolate-linear or oblong 4
3. Leaves ovate mostly scattered . . 2. *D. alternifolia*.
   Leaves lanceolate or linear, mostly whorled (also pinnate sometimes) . . . . 3. *D. heterophylla*.
4. Leaves opposite, ca. 30 cm. l., 3—4-jugate, leaflets oblong or ovate, barbate in the axils of the nerves beneath; calyx 3—4 cm. l., along the sea-shore 4. *D. spathacea*.
   Leaves much shorter, mostly whorled lanceolate or linear as well as their leaflets. . 3. *D. heterophylla*.

1) Sprague. Markhamia and Dolichandrone. Kew. Bull. (1919) 303.

Coriaceae vSts. nov. sub-gen.

Fig. 10 a-c, e, f; 11 (1—3).

Frutices vel abores parvi, glabri; *folia* simplicia vel 1-pinnata, varie disposita, sparsa, opposita vel verticillata; *foliola* coriacea, rigida, plerumque lineari-lanceolata vel filiformia; *nervatura* facile recognoscenda, nervis lateralibus sub-parallelis, nervis tertiariis fere aequaliter prominentibus. *Septum* angustum, pseudo-septum latum.

(Species 3, Australiam incolentes).

It would be interesting to know the climatic conditions of the habitat of the 3 species. It is clear that I suppose the origin of the species to be mainly due to xeromorphous adaptation in the arid countries of N. Australia. The reduced leaf-surface and the xeromorphous structure of the segments as well as the shrubby character of the small trees point to this. *D. alternifolia* would be the species of semi-xeromorphic places, perhaps being the eldest of the three. Then follows *D. heterophylla* with already much more reduced laminas and at last *D. filiformis*, representing an undoubtedly true xeromorphous plant.

I do not know, however, whether this forms a case similar to the famous researches of Diels [1]) on the genus *Rhus* § *Gerontogeae*.

The small number of specimens I saw and the lack of any indications as to climatic conditions make it impossible for me to work out precisely the hypothesis. Moreover filiform leaves are not the single indicator for xerophytism. The number of leaves, the structure of the cuticula and the total number of stomata on the plant, together with the moisture of the air are striking proofs with physiological researches on xeromorphous structures.

1. Dolichandrone filiformis F. v. Muell.

Fragm. Phytogr. Austr. 4 (1864) 149, in obs.: — = *Spa-*

[1]) L. Diels. Die Epharmose der Vegetationsorgane bei *Rhus L.* § *Gerontogeae Engl.* Engl. Bot. Jahrb. 24 (1898) 568—647.

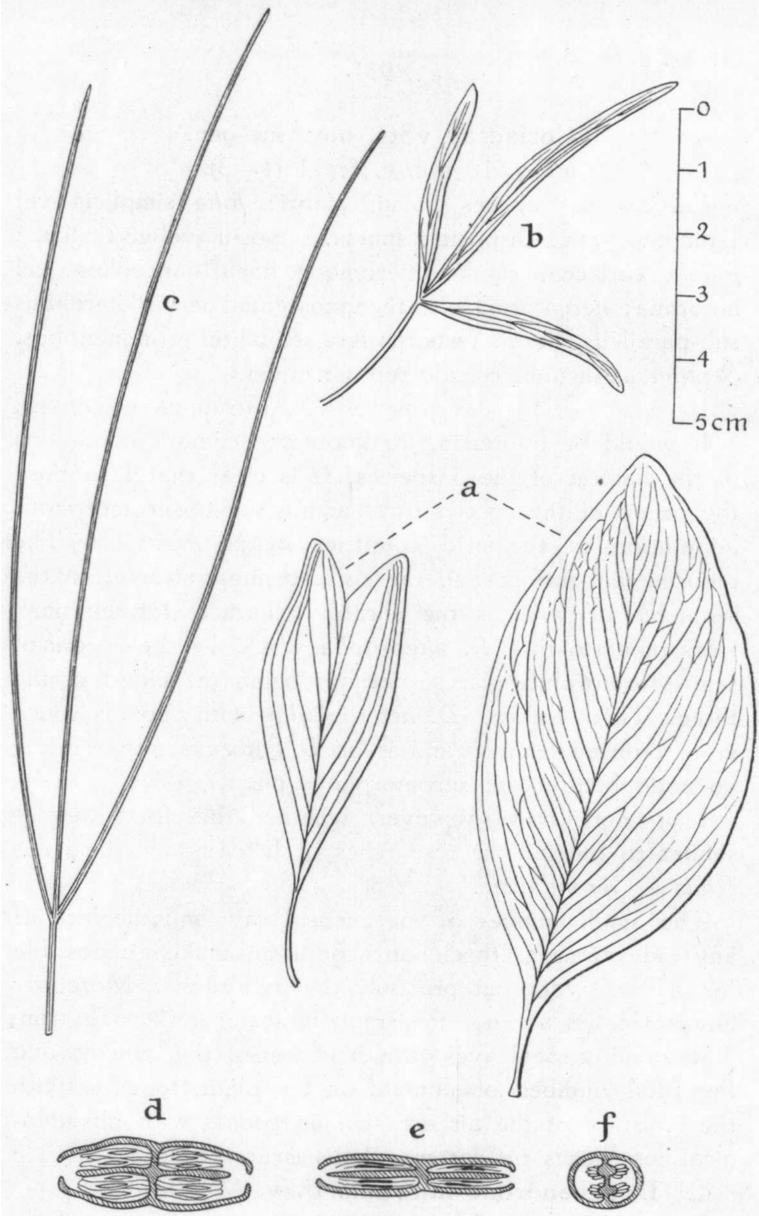

Fig. 10. Dolichandrone (Fenzl.) Seem. a. Leaves of D. alternifolia Seem. Left specimen in herb. P., right specimen in herb. B. ex Thursday Islands) b. Leaf of D. heterophylla F. v. Muell. (specimen in herb. P.). c. Leaf of D. filiformis F. v. Muell. (ex herb. P.). d. Transverse section of the capsule of D. spathacea (L. f.) K. Sch. (after K. Schumann). e. Transverse section of the capsule of D. alternifolia Seem. (specimen ex herb. B.) f. Transverse section of the ovary of D. alternifolia Seem. (specimen ex herb B.). Magnif. 4/5 ×, except d-f.

thodea ? filiformis D. C. Prod. 9 (1845) 249; — = *Stereospermum filiforme D. C.* Rev. in Bibl. Univ. Gen. 1838 sine descript.: — = *Bignonia filiformis A. Cunn.* in Herb. Cook, ex. D. C. Ann. des Sc. Nat. Ser. II. 9 (1839) 286, nomen; Bentham. Fl. Aust. 4 (1869) 539; — = *Dolichandrone filiformis Seem.* Journ. Bot. 8 (1870) 383; F. v. Mueller Sec. Syst. Cens. Austr. Pl. (1889) 167; Ewart and Davies. Pl. North. Terr. 250; Sprague Kew. Bull. (1919) 304.

Fig. 10 c; 11 (3).

Small glabrous *tree; leaves* irregularly 3-verticillate, irregularly opposite or scattered, pinnate, 1—3-jugate; leaflets filiform terete as well as the rhachis, 15—25 cm. l. and distant or in other specimens more crowded and shorter. *Racemes* terminal pauciflorous 5—10 cm. l. shorter than in *D. heterophylla*; pedicels elongate 3—5 cm. l. longer than in *D heterophylla. Calyx* glabrous, smooth, spathaceous, 1.5—2 cm. l. arcuate. *Corolla* white ca. 5 cm. l., glandular, tube narrow, lobes 5, undulate-dentate. *Ovary* glabrous. *Capsule* sub-cylindric when dry, terete when fresh, arcuate ca. 25 cm. l. or much smaller, glabrous. Seeds as in *D. heterophylla*.

Geogr. distr. North Australia — Mt. Essington, N. E. Australia; Leichhardt (P); Victoria river, a fruiting specimen: F. v. Mueller (P); Copeland Island, North coast of New Holland: A. Cunningham in herb. Cook. (Seemann).

This scrubbish tree probably occurs in arid places in a macqui-vegetation and is similarly adapted to a dry climate. It is allied with *D. heterophylla.* It is limited to North Australia and does not occur in Queensland.

2. Dolichandrone alternifolia Seem.

Journ. Bot. 8 (1870) 340; idem 382, partim; Bailey Class. Ind. Pl. Queensl. (1883) 29; Queensl. Fl. 4 (1901) 1135; — = *D. heterophylla* F. v. Muell. Fragm. 4 (1864) 149,

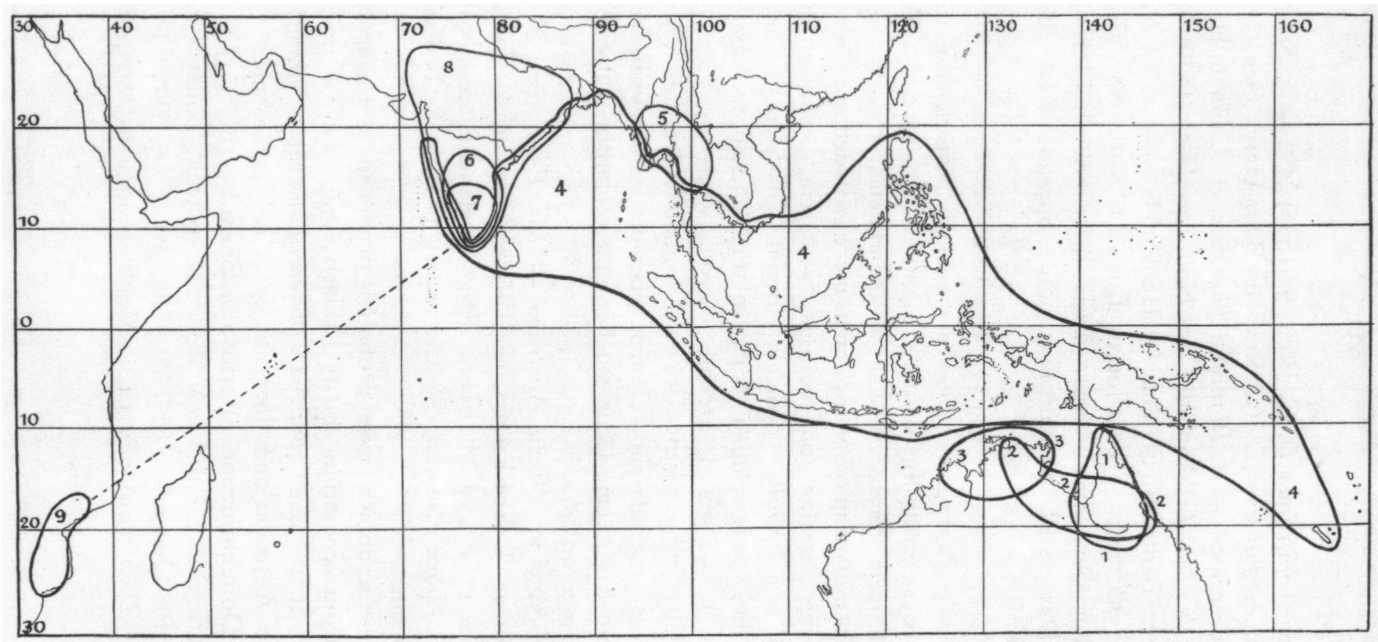

Fig. 11. Geographical distribution of Dolichandrone (Fenzl.) Seem. 1. D. alternifolia Seem. 2. D. heterophylla F. v. Muell. 3. D. filiformis F. v. Muell. 4. D. spathacea (L. f.) K. Sch. A coast-tree!. 5. D. serrulata Seem. 6. D. atrovirens Sprague. 6. D. arcuata C. B. Clarke. 8. D. falcata Seem. 9. D. alba Sprague.

partim; — = *Spathodea alternifolia R. Br.* Prod. (1810) 472; D. C. Prod. 9 (1845) 209; Bentham Fl. Austr. 4 (1869) 538; Bailey Compreh. Catal. Queensl. Pl. (1909) 368; — = *Dolichandrone alternifolia Benth. & Hook.* Gen. Pl. 2 (1876) 1046; Sprague Kew Bull. (1919) 303; — = *Dolichandrone Brunonis F. v. M.* in herb. Paris.

Fig. 10 a, e, f; 11 (1).

Tree, branchlets terete, smooth, with scattered leaves alternate or irregularly opposite, single, ovate or broadly ovate-lanceolate, obtuse or acuminate. (Those of Thursday Island measured 8—9 × 4—5 cm. In some specimens I saw an emarginate top or even leaves with 2 lobes, a link to compound leaves). *Leaves* very coriaceous, obliquely veined, narrowed into a long petiole, never pinnate. *Capsule* arcuate, ca. 30 cm. l. or shorter, flat, smooth, slightly acuminate. *Flowers* unknown. Seeds rather narrow 3 × 0.5 cm. (incl. wings ca. 1 cm. l.).

Geogr. distr. Queensland — Endeavour river: Banks and Solander; Burdekin river; F. v. Mueller; Gulf of Carpentaria (P); Upper Lynd: Leichhardt (P); Rockingham Bay: Dallachy (Sprague); between Cleveland Bay and Rockingham Bay: Hill (Sprague); Thursday Island, fruiting specimen: Jaheri (B).

A species evidently allied to *D. heterophylla,* treated by Seemann as a variety of *D. heterophylla.* Bentham, F. v. Mueller and Bailey mark it a distinct species, and so does Sprague, who, however, supposes some specimens, which Bentham determined as *D. heterophylla,* to belong to *D. alternifolia.*

Without doubt it is a semi-xeromorphous plant, occurring in rather arid vegetation.

3. Dolichandrone heterophylla F. v. M.

Fragm. Phytogr. Austr. 4 (1864) 149 in obs., excl. syn.; Seemann Journ. Bot. 8 (1870) 382; Bailey Queensl. Fl. 4 (1901) 1135; Ewart and Davies Fl. North. Terr.

250; — = *Spathodea heterophylla R. Br.* Prod. (1810) 472; D. C. Prod. 9 (1845) 207; Benth. Fl. Austr. 4 (1869) 538; Sprague. Kew Bull. (1919) 304; Bailey. Compr. Catal. (1919) 364, fig. 344.

Fig. 10 b; 11 (2).

Scrubby glabrous *tree* 3—5 m. high with a rugged bark and *leaves* crowded on the young shoots in dense masses, mostly in whorls of 3, simple or pinnate, 1—3-jugate, rather varying, sometimes 2 leaflets, oblong-lanceolate to linear 2.5—7.5 cm. l., simple leaves mostly lanceolate, 3.5—12 cm. l. narrowed into the petiolule without articulation, both leaves and leaflets thickly coriaceous with very oblique veins ca. parallel to the margin. Flowers white in pauciflorous short terminal racemes 5—10 cm. l., very fragant; pedicels 1—2.5 cm. l. *Calyx* ca. 2.5 cm. l. *Corolla*-tube slender, ca. 3.5 cm. l. dilated only at the top; lobes nearly 0.6 cm. diam. broadly rounded with the margins undulate and crispate. Hypogynous *disk* thick and fleshy, the margin forming a short ring round the base of the ovary. *Capsule* from 5 cm. to above 30 cm. l. compressed when dry; valves slightly concave; dilatations of the dissepiment rather thick and corky, almost reaching the margins of the valves. Seeds transversely oblong, the wing on each side as long as the seed itself, ca. 0.5 × 3 cm.

Geogr. distr. N. Australia and Queensland — Gulf country (Bailey); Islands of the Gulf of Carpentaria: R. Brown, Henne (Bailey); Rockingham Bay: F. v. Mueller (P); Gulf of Carpentaria: F. v. Mueller (P); Mt. Elliott: F. v. Mueller (P); Upper Lynd, frequent from the Upper Lynd to Mt. Essington: Leichhardt (P).

Membranaceae vSts. nov. sub-gen.

Fig. 3 l; 10 d; 11 (4—9).

Arbores altiores, plerumque pilosi; folia 1-pinnata, semper opposita; *foliola* membranacea vel chartacea orbicularia vel oblonga, penninervia, *nervis* primariis distincte prominentibus; *dissepimentum* 4-alatum, pseudo-septo septo sub-aequilato.

(Species 4 mihi cognitae, Africam orientalem, Asiam austro-orientalem usque ad Novo-Caledoniam incolentes).

4. **Dolichandrone spathacea** (L. f.) K. Sch. = *Bignonia spathacea Linn. f.* Suppl. (1781) 283; K. Schumann in Fl. Kais. Wilh. Land. (1889) 123; — = *Niir Pongelion Rheede* Hort. Malab. 6 (1686) 53, t. 29; — = *Lignum equinum Rumph.* Herb. Amboin. 3 (1750) 73, t. 46; — = *Spathodea longiflora Vent.* Choix (1803) 40; — = *Spathodea Rheedii Spreng.* in Syst. 2 (1825) 835 (quoad syn.); Wallich Cat. (1832) n. 6516; Decaisne in Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 380; Blanco Fl. de Filip. (1837) 499; Spanoghe Linnaea 15 (1841) 326; — = *Bignonia longiflora Willd.* ex D. C. Prod. 9 (1845) 206 (in syn); D. C. Prod. 9 (1845) 206; — = *Spathodea rostrata Span.* Linnaea 15 (1841) 326; — = *Spathodea grandiflora Zipp.* ex Spanoghe l. c.; — = *Spathodea Loureiriana D. C. Prod.* 9 (1845) 209; — = *Spathodea luzonica Blanco* Fl. de Filip. ed. II (1845) 350, ed. III. 2 (1878) 284. t. 242; Wight Ic. 4 (1850) t. 1339; — = *Spathodea Diepenhorstii Miquel* Fl. Ned. Ind. 2 (1856-59) 754; — = *Spathodea Rheedii Miq.* Ann. Mus. Lugd. Bat. 1 (1864) 201; — = *Dolichandrone Rheedii Seemann* Journ. of Botany 8 (1870) 380; F. Villar. Nov. App. (1880) 151; Vidal. Synopsis. Atlas (1883) 35, t. 73. f. D.; C. B. Clarke in Hooker f. Fl. Br. Ind. 4 (1885) 379; Warburg Pfl. Papuas. Engl. Bot. Jahrb. 13 (1890) 418; — = *Dolichandrone longissima K. Sch.* Engler-Prantl. Pfl. Fam. IV. 3b (1894) 240; Koorders and Valeton Bijdr. Booms. 1 (1894) 69; Trimen. Fl. Ceylon. 3 (1895) 282; Boerlage Handl. Fl. Ned. Ind. 2 (1899) 600; Schimper Indo-Mal. Strandfl. 129; Ridley Transact. Linn. Soc. 3. 327; Ridley Journ. As. Soc. Straits. n. 33. 120; Gamble Man. Ind. Timb.

ed. 2. 512 (1902); King and Gamble Mat. Fl. Mal. Penins. Gamopet. 377; Brandis. Indian Trees (1906) 494; Watt. Dict. Econ. Prod. Ind. 3 (1891) 174; Koorders. Meded. 's Lands Plantentuin 14 (1897) 552; Bourdillon. For. Trees. Travancore. 275; Retz. Obs. Bot. fasc. 5. 5; Willdenow. Spec. Plant. 3. 304; Beddome. For. Man. 168; Kurz. Repert. Veg. Andaman. Isl. 43; Kurz. Journ. As. Soc. Beng. 45. 142; Kurz. For. Fl. Br. Burma. 2. 234; Pers. Syn. 2. 173; K. Schumann u. Lauterbach. Fl. D. Schutz. Geb. Südsee (1901) 540; Prain. Rec. Bot. Surv. Ind. 2 (1903) 246, 247, 326; Gage. Rec. Bot. Surv. Ind. 3 (1904) 86; Whitford. Philip. Journ. Sc. 1 (1906) 674; Merrill. Philip. Forestry Bur. 1 (1903) 52; Ridley. Kew Bull. (1910) 203; Ridley Journ. As. Soc. Straits. (1911) n. 59. 40, 146; Guillaumin in Ann. Mus. Col. Mars. Ser. II. 9 (1911) 204; Merrill Fl. Manila. (1912) 429; Koorders Exc. Fl. Java. 3 (1912) 184; Koorders-Schumacher Syst. Verzeichn. 1 § 1. Fam. 258. 25; Koorders and Valeton Atlas. Baumart. Java 2 (1914) t. 357; Merrill. Interpr. Rumph. Herb. Amboin. (1917) 469; Foxworthy Indo-Malay. Woods. Philip. J. Sc. 4 (1909) 557-9; Heyne. Nuttige Pl. Ned. Ind. 4 (1917) 166; Merrill Spec. Blancoan. (1918) 349; Sprague Kew Bull. (1919) 304 (excl. syn. *Spathodea macroloba Miq.*); Merrill Journ. Straits Br. Roy. Asiat. Soc. (1921) 525; Diels in Engl. Jahrb. 57 (1922) 500; Merrill. Enum. Philip. Pl. 3 (1923) 444; van Steenis Nova Guinea 14 (1927) 293; A. Guillaumin Catal. de Pl. Phanérog. de la Nouv. Caléd. et Dépend. Ann. Mus. Colonial. Marseille. Ser. II. 9 (1911) 42.

Fig. 31; 10 d; 11 (4).

Tree on the average 15—20 m. high, *leaves* opposite ca. 20—30 cm. l. minutely puberulous or glabrous, imparipinnate, mostly with 3—4 pairs of leaflets, rhomboid 7—16.5 × 4—7 cm. often unequal at the base, petiolulate, ovate-lanceolate, acuminate, entire nigrescent when dry, barbate in the axils of the primary nerves at the underside. *Racemes* terminal, pauci- (2—6) florous, flowers shortly peduncled; *calyx* deciduous with obscure ribs, sub-coriaceous, spathaceous, arcuate, 3—4 cm. l.; corolla fragrant, white ca. 15 cm. l., glabrate, with a long funnel-shaped tube 10—12.5 cm. l. campanulate near the mouth, sub-equally 5-lobed, lobes fimbriate-crispate. *Capsule* sub-cylindric, acute, mostly straight or little arcuate ca. 30—60 × 1.5—3 cm., glabrous, not ribbed; seeds including the wings 0.6—0.8 × 1.8 cm. rectangular, wings and germ corky.

Geogr. distr. S.E. Asia—Br. India: Perrottet n. 35 (P); Br. India: Wight n. 2333 (P) —Malabar (Rheede, Seemann, Beddome); Travancore, banks of rivers (Bourdillon); Madras pr. Pondichery (L); pr. Pondichery: Perrottet? (P); Sundribuns, general but never common from the nothern forests down to the coast (Seemann, Gage); Nwamadaung Hills (Gage) — *Ceylon* — especially in mangrove swamps (Trimen).

V.n.: gorshingioh (Sundribuns: Prain).

Lower Burma (Ridley) — *Bengal* — East Bengal: Herb. Griffith n. 4066 (P); aestuary of the Ganges: Wallich n. 302 (P) — *Andamans* (Ridley); southern Andamans: Kurz (P) — *Nikobars* (Seemann) — *Merqui Archip.* (Seemann) — *Cochin-China* (Loureiro) — *Indo-China* — differing specimen, banks of the Mè-Không (Laos): Harmand n. 3 (P) — *Malay Peninsula* — in tidal swamps common (Ridley); Singapore, Bajon, Malacca, Ayer Panas, Pahang, Kwala Bruas, Perak, Matang Penang, P. Betong, Setul, Perlis, Kanga (Ridley).

V.n.: poko-koelo (Mal. Pen.: Ridley).

Malayan Archipelago. — Ins. Simaloer: Achmad n. 368 (L). — *Sumatra — Gouvt. Atjeh.* — P. Bras pr. Laping: Kds. 10654 β (B); Sumatra (Miquel); Sumatra: Korthals (L). — *Res. Sumatra's Westkust* — Priaman: Diepenhorst (U) — *Res. Sumatra's Oostkust* — pr. Medang: Bruinier n. 116 (B) — *Res. Palembang* — tidal forests pr. Moearabaroe: Scheffer (B).

V.n.: *koedo-koedo-oewi* (Simaloer: Achmad); *koeda koeda* (Priaman: Diepenhorst); *oedjong pangassang* (Korthals); *toewĕ ej* (Atjeh: Koorders); *ki arak* (Scheffer).

Java. — common in *W.,M.* and *E. Java*, sometimes plenty, e.g. in tidal swamps pr. Poeger (Kds. and Val.); Java: Zollinger n. 2905 (P) — *Res. Bantam* — (Kds. and Val.); Tjamara. pr. Tjiringin: Kds. 210 β (L,B). — *Res. Batavia* — Tandjong Priok: Hallier. f. n. 158 (L,B); Batavia: Vorderman (L,B); pr. Antjol near the creeks: Backer (B); Tandjong Priok coast-creek-shore: Backer n. 23153 (B) — *Res. Preanger* — Palaboeanratoe: Kds. 222 β (L,B); pr. Tjiratjap: Backer n. 17366 (B); Tjikadin: Meindersma n. 4 (B) — *Res. Banjoemas* — Noesa Kambangan: Kds. 26855 β (L), Kds. 215 β (L), Kds. 20232 β (L), Kds. 213 β (L), Kds. 214 β (L), Kds. 24565 β (L), Poerwokerto cult.: Kds. 29586 β (L,B); north of the Kinderzee: Backer n. 31484 (B) — *Res. Pekalongan* — Soebah-seashore: Kds. 211 β (B), Kds. 212 β (L,B), Kds. 36791 β (L) — *Res. Semarang* — (Miquel); Waitz (L); pr. Karang Anjar: Docters v. Leeuwen n. 85 (B); Djapara, Pasokan-Doekoseti-seashore: Kds. 35302 β (B), Kds. 35407 β (B) — *Res. Soerabaya* — Boedoeran pr. Sidhoardjo: Jeswiet n. 60 (B) — *Res. Kediri* — pr. Prigi, tidal swamps: Backer n. 11994 (B) — *Res. Besoeki* — Poeger Watangan: Backer n. 17902 (B); Kds. 216 β (P,B), Kds. 217 β (P,L), Kds. 218 β (L), Kds. 30259 β (L), Kds. 39819 β (B); Karimondjawa: Kds. 42197 β (B); Banjoewangi pr. Gradjakan: Zollinger n. 2905 (B); Banjoewangi: Vorderman. n. 133 (B).

V.n.: *kapal* (Kds. Exc. Fl.); (Mal. or Jav.) *djaran* (Preanger, Bantam, Noesa Kambangan, Batavia, Besoeki); (Jav.) *kajoe djaran* (Preanger, Pekalongan, Bantam); (Jav.) *kadjeng kapal* (Banjoemas, Besoeki, Preanger, Bantam); (Jav.) *kajoe pelok* (Pekalongan); (Soend.) *kidjaran* (Bantam); *djaran pelok* (Pekalongan: Kds.); (Mal.) *koeda koeda*

(Batavia: Hallier); (Jav.) *djaranan* (Banjoemas: Kds.); (Mad.) *kadjoe djaran binek* (Besoeki).

Madoera — pr. Bangkalan: Backer n. 19323 (U, L, B,) *Timor* — Timor (Miquel); Spanogue (L); Timor, 6 specimens: Spanoghe n.? (P) — P. Sepandjang: Backer n. 28788 (B); Kali Sangka: Backer n. 26996 (B); Pabean: Beguin n. F. 3 (B).

V. n.: (Mad.) *kadjoe djharan* (Kangean, Madoera).

Borneo — Korthals (L); Plante bornensi: O. Beccari n. 1745 (P.); pr. Pembliangan: Hallier f. n. 805 (L); Labuan (Seemann); Motley (Merrill); Pontianak pr. k. Padang Tikar: de Jong n. bb. 8295 (B); Pembliangan: Amdjah. n. 805 (B); W. Koetei pr. k. Djembajan: Endert n. 1469 (B); Sarawak Mus. n. 188: Foxworthy n. 496 (B).

Ceram: Kornasi n. 436 (L); Agama n. 543 (B).

V. n.: (Mal.) *toewi* (Pontianak); *kelajoe* (Koetei); *pokon kajoe koeda* (Ceram).

Palawan Archip. — (Merrill) — *Sulu Archip.* (Merrill) — *Philippines* — Along the sea-shore and tidal streams from *Union Prov., Luzon, to Mindanao* (Merrill); Malaban, Luzon: Merrill. Spec. Blancoan. n. 514 (L); Lucaena, prov. of Tayabas: Whitford n. 583 (P); Sibuyan Elmer n. 12497 (L).

V. n.: *pata* (Ilk.); *tangas* (Tagb.); *tanhas* (C. Bis.); *tanghas* (P. Bis); *tewi* (Mbo); *tiwi* (Tag., Bik., C. Bis); *tua* (Tag.); *tui* (Tag.).

Talaud Archip. — Ins. Salikaboe pr. Marange: Lam n. 3225 (B) — *Celebes* — Saleyer pr. k. Benteng: Walangitang n. bb. 3683 (B, L); Idem.: Teysmann n. 13861 (B); Menado, sea-shore: Kds. 16250 β (B, L); Minahassa pr. Pokoe oere; Kds. 16252 β (L, B); sea-shore pr. Kajoe watoe: Kds. 16249 β (B); Makassar (Rumphius); pr. k. Panamboengang: Noerkas n. 55 (L, B); Menado: de Vriese (L); Gorontalo: Riedel (B).

V.n.: (Makass.) *djaran* (Makassar); *kajoe pelompong* (Menado); *kajoe djaran* (Minahassa).

Halmaheira — pr. Singanoli: Forsten (L) — *Ternate* pr. Sasa ketjil: Beguin n. 1135 (L) — *Amboina* — common in Amboina (Rumphius); Plant. Rumph. C. B. Robinson n. 68 (L, B); Zippel (L).

V.n.: djamè, kajò koeda, djodjame (Moluccas: Heyne); *ansarangi* (Talaud: Lam); *kati kati* (Amboina: Robinson).

Solomon Archip. — (According to Koorders in Herb. Kew.).

New Guinea. — Loreniz river, pr. Zwaluwbivak: Versteeg n. 1804 (L, B, U, D, Kew); pr. Merauke: Jaheri (B); idem: Branderhorst n. 7 (L, B, D, U, Kew); Mamberamo pr. Teba: Moszkowski n. 32; Constantinhafen (Warburg); Hatzfeldhafen: Hollrung n. 354, 540; Alexishafen: Wiesenthal n. 43; Brit. N. Guin. (Warburg).

New Caledonia — pr. Balade: Vieillard n. 1001 (Seemann, P); tree 5—8 m. high, loosing its foliage in Sept., plain of Naketi, on brookbanks: M. Balansa n. 1836 (P).

This common species is in a flowering state easily recognizable by the pauciflorous (1—8) inflorescences of large fragrant white flowers with a long narrow tube infundibuliformous enlarged into the throat. The sub-coriaceous calyx is in bud already arcuate at the apex and splits at one side; when dry it appears nigrescent.

The narrow capsules ca. 25—50 cm. 1. are generally distinctly arcuate and open first in the middle. The coriaceous or corky septum is narrow with 2 broad secondary perpendicular septa and has a fragil structure easily dropping to pieces.

When sterile the 1-pinnate (2)-3-4-(5) jugate leaves are easily recognizable; the folioles possess an almost oblique base and have short tufts of hairs in the axils of the primary nerves; moreover these are enlarged at their immediate base near these tufts. Very young leaves are seldom 2-jugate. Now and then there are 5 pairs of leaflets.

These latter forms Miquel (l. c. 201) called the *forma c.* "foliolis usque 5-jugatis, acuminatis". — Borneo in distr. Bandjermassing (Korthals). I have seen his original specimens, but I think this of no important difference.

Miquel also described a broad-leaved form as *forma a* "foliolis late ovatis et ovato-oblongis abrupte acuminatis; capsulis pede plerumque brevioribus, arcuatis." This form Miquel first described as a distinct species *Spathodea Diepenhorstii Miq.* on a specimen of Sumatra collected by *Diepenhorst.* I saw his original materials, but I can only see herein an expression of the variability within the species and so I consider the differences as being individual.

The same I think as to the third form of Miquel with narrow leaflets, *forma b.* "foliolis angustioribus, magis oblongis, sensim non abrupte acuminatis; capsulis pede longioribus." The specimen was collected in Amboina by Zippel which the latter called provisionally *Spathodea grandiflora Zipp.* (herb. nom.)

The leaflets are generally very variable, not only in length but also in form. E. g. in the specimen: Kds. 20232 β, some were 16 × 6 cm. with the largest breadth in the middle, others however 8.5 × 5 cm. with the largest breadth ca. $\frac{1}{4}$ above the base.

Probably these variations are due to the age of the tree and the place at the branches. As to the first cause dentate leaflets are but to be found on very young specimens, this being already stated by Koorders and Valeton.

The structure of the leaflets is always papyraceous, wrinkled nigrescent when dry. This was not the case with a specimen from the seashore in the Res. Preanger (Kds. 222 β) which possessed thick-papyraceous, leaves, pale-brown-green when dry,

The slightly arcuate capsules vary in length and the measures of Koorders and Valeton are too small. On the average they are ca. 30 cm. l., sometimes shorter, but often longer ca. 50 cm. l. and 2—2.8 cm. broad; the seeds vary 0.6—0,9 × 1.5—2 cm.

The species is very common and scattered, known from Malabar to the Solomon Arch. and even to New Caledonia. So it is described in the eldest botanical works e. g. by Rheede in the Hort. Malab. and by Rumphius in his Herb. Amboin.

Dolichandrone spathacea is absolutely limited to the sea-coasts in salt or brackish water from the mangrove up to the estuaries of the rivers as far as the flood asserts its influence (See e. g. Linné f. Spec. Plant. ed. 4.3 (1800) 304; "Habitat in Javae, Malabariae, Zeylaniae, sylvis prope aquas". The remark of Kurz from the interior of Burma is a mistake for *D. serrulata Seem.* according to Sprague.

The appearance in the rice-fields naar Kanga-village in Lower Siam explains Ridley (Sprague l. c.) "the tree is about 80 feet tall and the most common one in the paddyfields. Doubtless it is one of the relics of the time when the whole of this country was a tidal swamp, gradually filling up after the disappearance of the sea, which overlay all this area. There are several more seashore-plants still scattered over the paddy-fields such as the sandspunge, *Euphorbia Atoto.*"

The means of spreading, Prain marks in his Flora of the Sundribuns (l. c. 254) as the wind — "the only swamp-forest tree for which introduction by wind seems aequivocal is *Dolichandrone Rheedii*, which has seeds with large membranous marginal wings."

Koorders and Valeton call the wind and the water as being due for spreading. I agree with Sprague when he values the wind as sufficient only for a local spreading, but regards especially the sea-torrents as the most important means by which *Dolichandrone spathacea* obtained its enormous present area. Indeed the seeds do not have a thin membranous margin as usually is the case with the *Bigno-*

niaceae but the wings are of a corky structure and certainly peculiarly fit to float.

I do not agree with Koorders when he indicates it as a salt-plant. As above remarked *Dolichandrone spathacea* is not limited to saltish soil, as Ridley found it in not-saltish paddy-fields.

14. SPATHODEA P. Beauv.

Beauvois Fl. Owar et Ben. (excl. fruct.) 1 (1805) 46; Ventetat Choix. n. 40 (1803); Fenzl Denkschr. Baier. Bot. Ges. Regensb. 3 (1841) 242, 265; Benth. & Hook. Gen. Pl. 2 (1876) 1045; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 240; Baillon Hist. Pl. 10 (1891) 46.

Spathodea campanulata P. Beauvois — Fl. Owar. et Ben. I (1805) 46, t. 27; D. C. Prod. 9 (1845) 208; Hooker's Niger Flora (1849) 461; Seemann Journ. Bot. 3 (1865) 332, t. 40; Bot. Magaz. t. 5091; Benth. & Hook. Gen. Pl. 2 (1876) 1046; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 240, fig. 92E; Treub Ann. Jard. Bot. Buitenz. 8 (1889) 39 (with table); Kds. and Val. Bijdr. Booms. Java. 1. (1894) 65; Koorders Ann. Jard. Bot. Buitenz. 4 (1897) 72, fig. 138, 142-4; Koorders Exc. Fl. 3 (1912) 184; Merrill Fl. Manila (1912) 429; idem Enum. Philip. Pl. 3 (1923) 447.

Tree 15—20 m. tall with opposite, 5—6-jugate *leaves*, leaflets entire, nearly sessile, the younger parts yellow-tomentose, later on glabrous except the calyx; *calyx* large 4—6 cm. l., densely yellow-tomentose, spathaceous, arcuate; *corolla* large 7—8 cm. l., broad ventricose-campanulate, tubular portion short 1—1.5 cm., corolla totally exeeding the oblique calyx; *capsule* oblong 15—20 cm. l. with woody valves.

Geogr. distr. Java — In Java common along allies and in parks, but never spontaneous selfsown (Koorders);

Weltevreden: Backer (B); Cult. in Hort. Bog. sub n. XI H 29b. (B); idem n. C 30b: Hallier. f. (L sub n. 29, 926...193) — *Kangean Archip.* — pr. Pandeman in the garden of a missionary: Dommers n. 251 (B) — *Borneo* — Br. N. Borneo: Agama n. 460 (L) — *Philippines* — cult. in Manila for ornamental purposes (Merrill). *V. n.: djati blanda* (Kangean).

A native of tropical Africa but now cultivated throughout the tropics. Evidently it never occurs selfsown outside its natural area in Africa.

15. STEREOSPERMUM Chamisso

Linnaea. 7 (1832) 720; — = *Dipterosperma Hassk.* Cat. Hort. Bog. (1844) 152; Endlicher Gen. Pl. (1836—40) 4131; D. C. Prod. 9 (1845) 210; Bureau Adansonia. 2 (1861) 191, t. 4; Bureau Monogr. (1864) 50, t. 29; — = sub-genus *Eu-Stereospermum Benth. & Hook.* Gen. Pl. 2 (1876) 1047; Baillon Hist. Pl. 10 (1891) 49; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3*b* (1895). Fig. 131.

Trees, leaves 1—2-pinnate entire or dentated; panicles large, lax, terminal or sometimes lateral; *calyx* ovoid, open or closed in bud, during the bloom mostly truncate or shortly unequally lobed, seldom tubular. *Corolla* tubular-ventricose, white, yellow or pale rose, lobes 5 nearly equal, round, crispate, toothed or laciniate; *capsule* elongate, terete, sub-compressed or obscurely quadrangular, loculicidally 2-valved; septum thickened sub-terete, corky, notched; seeds few in 2 series per cell, trigonous with membranous wings, embedded in the notches of the septum.

(Species ca. 20 in Africa, S. E. Asia and Malaya. Type species: *Stereospermum Kunthianum Chamisso* in Op. cit.).

I agree with Schumann, who states the differences between *Stereospermum* and *Radermachera* of generic rank.

The remarkable structure of the seeds and the notched septum, next to the 2-seriate ovules and few seeds are sufficient to keep the original conception of Chamisso as to the genus, in comparison to the characters of *Radermachera*.

The geographical distribution of *Stereospermum Cham.* is limited to Africa, Madagascar, British India, Indo-China, Burma and Malaya (Malay Peninsula, Borneo).

I did not study many African and Indian species. I know from Africa: *St. Kunthianum Cham.* (common in trop. Africa), *St. acuminatissimum K. Sch.* (Kamerun), *St. cinereo-viride K. Sch.* (White Nile), *St. senegalense Miq.* (perhaps syn. with *St. Kunthianum Cham.*), *St. integrifolium A. Rich.* (Abyssinia), *St. Arguezana A. Rich.* (Abyssinia), *St. molle K. Sch.* (Mittu, White Nile), *St. Harmsianum Sprague* (Angola), *St. Zenkeri K. Sch.* (Africa); from Madagascar the doubtful *St. euphorioides D. C.*; from S. E. Asia: *St. chelonoides D. C.* (common from Br. India to Borneo), *St. neuranthum Kurz* (Burma), *St. fimbriatum D. C.* (Burma to the Malay Peninsula), *St. tetragonum D. C.* (N. Brit. Ind.), *St. suaveolens D. C.* (throughout moister India to Tenasserim), *St. angustifolium Haines* (Br. India), *St. annamense A. Cheval* (Indo-China), *St. grandiflorum Cub. et Smith.* (Burma), *St. cochinchinense Bur.* (Cochin-China), *St. Harmandi Bur.* (Cochin-China) and the doubtful *St. Ghorta C. B. Clarke* (Ind. or.) and *St. Wallichii C. B. Clarke* (Burma); the latter 2 species may belong to other genera, perhaps *Radermachera* or *Haplophragma*.

The distribution states the close affinities of South East Asia (British India) with Madagascar and Africa.

In the Dutch Malayan region only *St. chelonoides D. C.* was gathered by Hasskarl in Borneo, without further indication of finding-place. Perhaps it will be found in N. Sumatra, as it occurs in the Malay Peninsula.

KEY TO THE MALAYAN SPECIES.

Plant hirsute, with glandulous rather densely branched inflorescences; leaves sub-coriaceous, stout, leaflets 7—9, rhomboid acuminate . . . . 1. *St. suaveolens.*
Plant glabrous throughout, except the flowers; inflorescences rather loosely branched, genuine, leaves membranaceous, leaflets 7—11, caudate. . . . 2. *St. chelonoides.*

1. **Stereospermum suaveolens D. C.** Bibl. Univ. Genève 17 (1838) 124; Prod. 9 (1845) 211; — = *Tecoma suaveolens G. Don.* Gen. Syst. 4.244; — = *Bignonia suaveolens Roxb.* Fl. Ind. 3 (1832) 104; Wight. Ic. 4 (1850) t. 1342; Miquel Fl. Ned. Ind. 2 (1856) 756; Beddome For. Man. 196; Brand For. Fl. 351; Kurz For. Fl. 2.231; — = *Heterophragma suaveolens Dalz. & Gibs.* Bomb. Fl. 161; Benth & Hook. Gen. Pl. (Sub. Sect. 1. *Xylocarpeae*) 2 (1875) 1047; C. B. Clarke in Hooker. Fl. Br. Ind. 4 (1885) 382; Trimen. Handb. Fl. Ceylon. 3 (1895) 284; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3 b (1895) 243; J. J. Wood. Rec. Bot., Surv. Ind. 2 (1902) 125; Burkill. Op. cit. 4 (1910) 123; J. G. B. Beumée Florist. Anal. Onderz. Korte flora djati-opstand. Dissertation. Wageningen (Holland) (1922) 33.

Tree 10—20 m. high, innovations viscous-hairy, leaves stout, ovate to oblong 30—50 × 15—25 cm.; petiole 10—20 × 0.2—0.3 cm., terete with obscure ribs and covered with lanceolate whitish lenticels, petiolule short ca. 0.2—0.3 cm. l., rather thick, hairy; *leaflets* 7—9, rough, hirsute when young, later on nearly glabrous, the lowest pair is the smallest ca. 6—7 cm. l., the terminal leaflet the largest ca. 13—15 cm. l., the internodes ca. 5—8 cm. l., leaflets nearly sessile, ovate (the lowest) to rhomboid-oblong, shortly acuminate or acute at the top, cuneate to the base, ca. 20 × 10 cm. entire or a little dentated, little shining grayish green above (when dry) with distinct not-prominent puberulous midrib and 8—9 primary nerves, genuine reticulate, the underside dull-green when dry, with sparsely hirsute strongly prominent midrib, primary nerves and reticulations. *Inflorescence* many-branched, rather dense, viscous-hairy ca. 25 cm. l., the peduncle at the base with some sterile bracts, pedicels knob-like thickened by 2 short bracteoles. *Calyx* viscous-hairy 0.6—0.8 cm. l. campanulate with 3—5 broad triangular lobes which are ciliate apiculate contracted at the top; *corolla* pale or dark purple, tube narrow tubular glabrous below, inside with small glands, towards the limb viscous-hairy, dilatate, 2.5—3 cm. l., lobes obovate, entire, ca. 1.3 cm. l., long pubescent-floccose at the base and inside the throat. *Stamens* 4 with a fifth rudiment, towards the base with small glands, inserted just above the narrow part of the tube; anthers divaricate, obtuse-oblong; ovary 2-celled lanceolate glabrous with 4 ribs, sometimes sparsely glandular, ovules ca. 30—40, 2-seriate in each cell. *Capsule* linear, terete or obscurely 4-costate, 45 × 1.5—1.8 cm., woody, slightly rough with lenticels; septum spongy 0.6—1.2 cm. br.; seeds 0.8 × 3.6 cm. notched at the middle, sub-rectangular.

Geogr. distr. — *India* — Throughout moister India from the Himalayan Terai to Travancore and Tenasserim (Clarke) — *Ceylon* — Occasionally planted (Trimen).

V. n.: (Boedd.) *palol* or *ela palol* (Ceylon: Trimen).

Malayan Archipelago — *Java* — Cultivated in the Botanical Gardens at Buitenzorg — Cult. in Hort. Bog. sub n. XI. H. 14 (B); idem. ex Bengal n. H. B. 6637 (B) — *Res. Rembang* — Forest-district East-Toeban, on red vulcanic soil, only local spreading and then socially on ca. 0.5 H. A.: B. Kruyne n. ? (B) — Res. Soerabaya — Forest-complex Takis, S. Soerabaya, in teakforest on vulcanic soil single groups of shrubs and some trees ca. 15 m. high, locally forming a vegetation: J. G. B. Beumée

n. 2480 (B); idem. some groups in teakforest: C. G. S. Braat n. 2979 (B).

forma verticillata vSts. nov. forma — Folia 3-verticillata.

Geogr. distr. — *Java* — *Res. Soerabaya* — Forest-district Takis, only one specimen: J. G. B. Beumée n. 2480 a (B). *V. n.: kajoe teken* or *djati teken* (Soerabaya).

The specimens found in the East-Javanese teakforests differ a little from the Indian materials I examined.

Tree 8—15 m. high, stem ca. 20 cm. diam., habitus more stout, folioles gray at the upper side and with smaller flowers, the tube ca. 2 cm. l., the limb bilabiate, two posterior lobes ca. orbiculate 0.7—0.8 cm. l., three anterior ones ca. 1.4—1.5 cm. l. irregularly dentated. The sweet-scented flowers appear before the leaves on naked branches, whilst other sterile branches are already leafy. The colour is described as follows: tube inside yellow, limb browny-purple, the tube darker, yellow towards the base.

According to Beumée (l. c. p. 33), Ten Oever and Carthaus, *Tectona grandis* is not endemic in the Malayan Archipelago, but must be considered as introduced by the Hindu's from British India whilst their domination.

In connection with this it may be that *Stereospermum suaveolens* was imported with soil amongst *Tectona*-seeds or the Hindu's perhaps first cultivated the species.

Indeed in other countries it is cultivated, e.g. in Ceylon especially about Buddhist temples (Trimen) and in Chutia Nagpur, where it is a roadside tree (Wood).

It is remarkable that, whereas the species flowers very well in the teakforests, one never found ripe capsules in Java, neither in the teakforests, nor at Buitenzorg.

In East-Java it probably propagates asexual and gives rise to new specimens by means of roots.

At any rate, the spreading, especially in cultivated non-endemic-teakforests, together with the asexual propagation and the very local spreading, show that *Stereospermum suaveolens* is not endemic in Java, buth there represents an anthropochorous species. It is a native in the east as far as Tenasserim; it lacks in the Malay Peninsula.

The bark is used as a favourite tonic medicine on Ceylon (Trimen).

2. **Stereospermum chelonoides D. C.** — Bibl. Univ. Genève 17 (1838) 124; Prod. 9 (1845) 210; *padri*, Rheede. Hort. Malab. 6 (1736) 26; non syn. *Bignonia chelonoides Linn. f.* Suppl. 282; — = *Bignonia caudata Miq.* in Pl. Hohenack. n. 182; Wallich. Cat. n. 6501; — = *Stereospermum caudatum Miq.* Ann. Mus. Lugd. Bat. 1 (1864) 200; — = *Stereospermum Hasskarlii Zoll. et Mor.* Syst. Verzeichn. (1854) 54; — = *Stereospermum Hasskarlii Teysm.* in Miquel Fl. Ned. Ind. 2 (1856) 756; Wight. Ic. t. 1341; — = *Dipterosperma personatum Hassk.* in Cat. Bog.; idem. Flora 25 (1842) II Beibl. I, 28; idem. Pl. Jav. Rar. (1848) 507; idem. Diagn. Nov. 112: — = *Heterophragma chelonoides Dalz. et Gibs.* Bomb. Fl. 160; Kurz For. Fl. 2. 230; Brandis For. Fl. 352; Beddome Fl. Sylv. t. 72; Roxburgh Fl. Ind. 3 (1832) 106; C. B. Clarke in Hook. Fl. Br. Ind. 4 (1885) 382; Gammie Rec. Bot. Surv. Ind. 1 (1895) 63, 83, 72; Gage Op. cit. 3 (1904) 87; Fischer. Op. cit. 9 (1921) 132; Burkill Op. cit. 10 (1925) 331; Trimen Fl. Ceyl. 3 (1895) 283; Haines Kew. Bull. (1922) 121; J. S. Gamble Fl. Madras V. Kew. Bull. (1924) 237.

Tree 10—20 m. high, glabrous except the flowers, *leaves* 30—45 cm. l, leaflets in 3—5 pairs, elliptic, caudate 9—12 × 4—5 cm., petiolule 0.8—1.2 cm., nerves at the underside sometimes scarcely puberulous. *Inflorescences* terminal or sometimes lateral 20—40 cm. l. many-flowered loosely branched, branches glabrous, genuine, main axis with small linear lenticels; *calyx* campanulate ca. 0.6 cm. 1 shortly 3—5-lobed. *Corolla* rose, lobes yellow or pink, crispate; *capsule* 30—50 × 0.8—1.2 cm. obscurely quadrangulate, nearly woody; septum sub-terete ca. 0.4 cm. diam., seeds trigonous 0.5 × 0.5 cm. ca. 0.5 cm. br. membranous winged at both sides, embedded in the notches of the septum.

Geogr. Distr. India — *Throughout moister India*, from the Terai of Oudh and Assam to Ceylon and Pegu and Ava (Clarke) — *Punjab* — Saharanpur: M. Buysman n. 481 (U) — *Bombay* — Bombay Presid.: Gibson (L sub. n. 898, 199 . . 148) — Malabar pr. Mangalore: Hohenacker n. 182 (U,L); Malabar: Stocks, Law & C. (L sub n. 898, 199 . . 145); Malabar, Concan: Hook. & Thomson n. 185 (P); — *Ceylon* — Common (Trimen) — S. Br. India Mt. de Cottalam: Leschenault n. 157 (L, P) — *Madras* — Madras prov. Anaimalai Hills (Fischer) — *Bengal* — Mt. Nilghiri: Thomson (L sub n. 898, 199. . 151); Sikkim: J. D. Hooker (L sub n. 898, 199 . . 150); Cult. in Hort. Calcutt.: Kurz. (B); Cult. in Hort. Calcutt. (L sub n. 898, 199 . . 146, P); Penins. Orient.: Wight n. 2337 (L,P); idem (L sub n. 898, 199 . . 143); India: F. von Mueller (L sub n. 898, 199 . . 141) — *Assam* — Mt. Khasia, 300—1000 m. alt.: J. D. Hooker and Thomson (U,L sub n. 898, 199 . . 147, P); Assam: Dr. Kings collector n.? (U); Sibsagar Assam: S. Peal n. 69 (L) — *Siam* — Siam: A. E. G. Kerr n. 1167 (U,L).

V. n.: (Sanskr.) *lunu-madala* (Ceylon: Trimen); *dunu-madala* (Ceylon: Trimen); *padri* (Trimen, Rheede).

Malayan Peninsula — Woods, not common (Ridley).

Malayan Archipelago — *Java* — Cult. in Hort. Bog. sub XI. I. 4a. (L sub n. 921, 41 . . 227, n. 921, 41 . . 228); ? Cult. Hort. Bog. n. 153 (B,U); From Coromandel, cult. in Hort. Bog. n. 6635 (B); ? Cult. in Hort. Bog. (U sub n. 032845); ? Java cult. in Hort. Bog. (L sub n. 898, 200 . . 5, n. 898, 200 . . 6, n. 898, 200 . . 7) — Borneo — *Korthals* (L sub n. 898, 200 . . 2, n. 898, 200 . . 3, n. 898, 200 . . 4) — Archip. Ind.? (U sub. n. 032849).

V. n.: (Soend.) *kilangier* (Hasskarl).

Haines (1922) supposes *Stereospermum chelonoides Linn. f.* not being identical with that of De Candolle. The first type specimen of the younger Linné was collected by König near Tranquebar in South India. It is a very pubescent, even hirsute plant, with the young leaves tomentose, the petiolules being shorter and rather stout and the panicle being closely pubescent. These are remarkable points of difference so that the specimen of Linné f. may appear to be a distinct species. Those I saw, possessed always the characters belonging to *Stereospermum chelonoides D. C.*

As to the spreading, it occurs through moister India (Clarke). The specimens cited from ? Java are most probably collected in the Gardens at Buitenzorg. However those of Korthals from Borneo are as far as I can judge not cultivated there. One might suppose a mistake could have taken place with the labels, but I do not believe this happened. It is a pity Korthals did not indicate where the material was collected. I accept that indeed *Stereospermum chelonoides D. C.* is found in Borneo, though perhaps very rare. Besides it is remarkable that nothing is known from Sumatra as it occurs in the Malayan Peninsula here and there, though not common.

In the centre of its area, e.g. in Upper Assam, it is a characteristic tree of the evergreen woods (Gammie). The natives there make canoes from the stems and the timber is moderately used for most purposes; so in Bengal (Burkill).

16. RADERMACHERA Zoll. et Mor.

Zoll. et Mor. Syst. Verz. Pfl. Ind. Arch. 3 (1855) 53; Bureau in Adansonia 2 (1862) 192, t. 2; — = *Lagaropyxis*

Miq. Ann. Mus. Lugd. Bat. 1 (1863) 198; Miquel. Op. cit. 3 (1867) 250; Bureau Monogr. t. 28; Seemann Journ. of Botany 8 (1870) 145; Benth. & Hook. Gen. Pl. 2 (1876) 1047; Baillon Hist. Pl. 10 (1891) 49; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 243; Boerlage Handl. Fl. Ned. Ind. 2 (1899) 595; — = *Radermachera Hassk.* Merrill. Philip. Journ. Sci. (1908) 335; Merrill Enum. Bibliogr. Bornean Pl. Journ. Straits Branch Roy. Asiat. Soc. (1921) 525.

Fig. 3 g—k; 12; 13 d.

Descr. emend.. *Frutices* vel *arbores, foliis* oppositis, 1-2-3-pinnatis vel biternatis; inflorescentiae terminales vel axillares paniculiformes vel corymbiformes, e cymis compositis; *calyx* parvus, campanulatus, truncatus vel 2—5-lobatus, saepe glandulosus; corolla vulgo infundibuliformis vel sub-campanulata, 5-lobata, bilabiata, tubo parte inferiore angustato, alba, rosea vel luteo-alba, glabra vel pubescens; *stamina* 4, didynamia cum quinto rudimentario vel 5 fertilia sub-aequilonga, basi saepe pubescentia vel glandulosa; stylus filiformis, stigmate bilamellato; *ovarium* elongatum disco annulari carnoso basi cinctum, 2-loculare, uno loculorum antico, altero postico, placentis in utroque loculo 2, ovulis 3—4-seriatis, id est ovulis in utroque loculo 6—8-seriatis quinconcialibus anatropis horizontalibus, micropyle externa; *capsula* linearis, cylindrica, glabra, 2-valva, saepe spiraliter torta, valvis coriaceis primum medio dein apice dehiscentia, post dehiscentiam complanata, septo demum libero spongioso crasso, capsulam totam implente valvis contrario; semina numerosissima horizontalia parva compressissima lateribus septi in utroque loculo inserta (medio septo nudo), corpora sub-discoidea ala cincta lateraliter producta.

(Species ca. 19. Malayenses, Philippinenses, Chinenses et Asiam austro-orientalem colentes.

Type *R. glandulosa (Bl). Miq.*)

The diagnosis of the genus has been founded on *R. stricta*

Zoll. (= *R. glandulosa (Bl). Miq.)*; Bureau (Adansonia l.c.) did not know the description of Zollinger and Moritzi and gave (1862) a new description of the genus, founded on the same species, a specimen of which he found in the herbarium at Paris from Java: Zollinger n. 3141. At the same time he gave a description of a second species from the Philippines, which he called *R. banaïbana Bur.*: Luzon, prov. Calauan: Callery n. 50. He did not know that Blanco (Fl. de Filip. 501) had already described this species as *Millingtonia pinnata Blanco.*

The next year Miquel described a new genus *Lagaropyxis* (1863) on 2 Malayan species, Blume called *Spathodea: L. gigantea Miq.* and *L. glandulosa Miq.* as he did not yet know the diagnosis of Bureau. In 1867 Miquel had seen the article of Bureau and placed the species in *Radermachera.*

At last it appears that *R. stricta Zoll. et Mor.* and *R. glandulosa (Bl.) Miq.* are identical, which Zollinger already supposed to be the case with *Spathodea glandulosa Bl.*. Miquel added a new species *R. Lobbii Miq.* allied with *R. gigantea Miq.*, wich he had first identified with *Lagaropyxis gigantea Miq.* (1863). So in 1867 there were 4 species known: *R. banaibana Bur.* (Philipp.), *R. gigantea (Bl.) Miq.* (Malaya), *R. glandulosa (Bl.) Miq.* (Malaya) and *R. Lobbii Miq.* (Malaya).

Seemann [1]) remarks that *R. glandulosa Miq.* always possesses 1-pinnate leaves, but that it is said that *Millingtonia pinnata Blanco* has 2—3-pinnate leaves, notwithstanding that Blanco had described it with 1-pinnate leaves.

Seemann considers *R. banaïbana Bur.* manifestly the same as *R. pinnata Blanco.* He transfers *Millingtonia pinnata Blanco* to *R.pinnata (Blanco) Seem.* and reduced

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[1]) Journal of Bot. (1870) 146.

R. banaibana Bur. as a synonym. So he did with the second species of *Blanco* viz. *Millingtonia quadripinnata Blanco,* which he altered into *R. quadripinna Seem.*

The difficulty was, as Merrill remarks, to determine which were the plants, Blanco described, Blanco's descriptions of both being imperfect. For the rest Blanco did not make a herbarium. So it is very difficult, e. g. as to *M. quadripinnata,* none of the Philippine species possessing 4-pinnate leaves.

Later on several botanists have worked on the Philippine *Radermachera's* which have principally given raise to a number of synonyms. F. Villar [1]) transferred the Blancoan species to *Stereospermum*; Rolfe [2]) gave a description of a new species *Stereospermum Seemanni Rolfe,* based on a specimen of Cuming n. 996, a very fragmentary one, which had been referred by Seemann to *R. quadripinna Seem.*

Merrill [3]) gives the history and a review of the Philippine *Radermachera's* and I accept here his interpretations, as his conclusions have been based on considerably field knowledge.

Since his review, a lot of new species have been described by him, Elmer and others, so that I thought it would be interesting to give a review of the whole genus.

Radermachera Zoll. et Mor. is undoubtedly allied with *Haplophragma P. Dop.* and less with *Stereospermum Cham.,* though *Radermachera Zoll. et Mor.* as well as *Stereospermum Cham.* possess a terete septum.

KEY TO THE SPECIES.

1. Leaves 1-pinnate 2
   Leaves 2-3-pinnate, sometimes only the lowest pinnae 2-pinnate, 3-5-foliolate 6

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1) F. Villar. Nov. App. (1883) 151.

2) Rolfe. Journ. Linn. Soc. Bot. 21 (1884) 313—5.

3) Merrill. Philip. Journ. Sci. Bot. 3 (1908) 331.

2. Calyx strongly longitudinally costate. *R. coriacea.*
Calyx not costate 3
3. Inflorescence very short ca. 4 cm. l., leaves delicate, 10—17 cm. l., petiole thickened at the base, capsule minute ca. 6 cm. l. . . . . . . 2. *R. brachybotrys.*
Inflorescence, leaves and capsules larger 4
4. Flowers small, corolla ca. 2.5 cm. l. 3. *R. Whitfordii.*
Flowers larger, 3—5 cm. l. 5
5. Folioles at the underside of the base without glands, corolla ca. 5 cm. l.. . . . . 4. *R. elliptica.*
Folioles glandular at the underside of the base, corolla ca. 3—4 cm. l. . . . . . 5. *R. glandulosa.*
6. Capsule rather sturdy, linear-lanceolate, valves ca. 2.5 cm. broad, rough with large tubercles, woody 6. *R. xylocarpa.*
Capsule rather elegant, linear, at most 1.25 cm. broad, not rough, but smooth, lepidote or lenticellate, sub-coriaceous to coriaceous 7
7. Inflorescence very short ca. 4 cm. l., leaves delicate, 10—17 cm. l., leaflets small 3—5 cm. l., lanceolate-caudate or acuminate, capsule very short ca. 6 cm. l., the upper leaves sometimes 1-pinnate . . . . · 2. *R. brachybotrys.*
Inflorescence, leaves and capsules much larger, leaves 2—3-pinnate 8
8. Leaves biternate, leaflets thick, coriaceous, obtuse or short obtuse-acuminate, inflorescence pauciflorous, to 3 cm. l. peduncled. . . . . . 7. *R. biternata.*
Leaves not biternate, inflorescence longer peduncled and many-flowered, capsules 30—50 cm. l. . . . 9
9. Flowers small 3 cm. l. 10
Flowers larger 4—7.5 cm. l. 14
10. Main-axes of the inflorescences and twigs densely lenticellate. 11
Without or with few lenticels 12

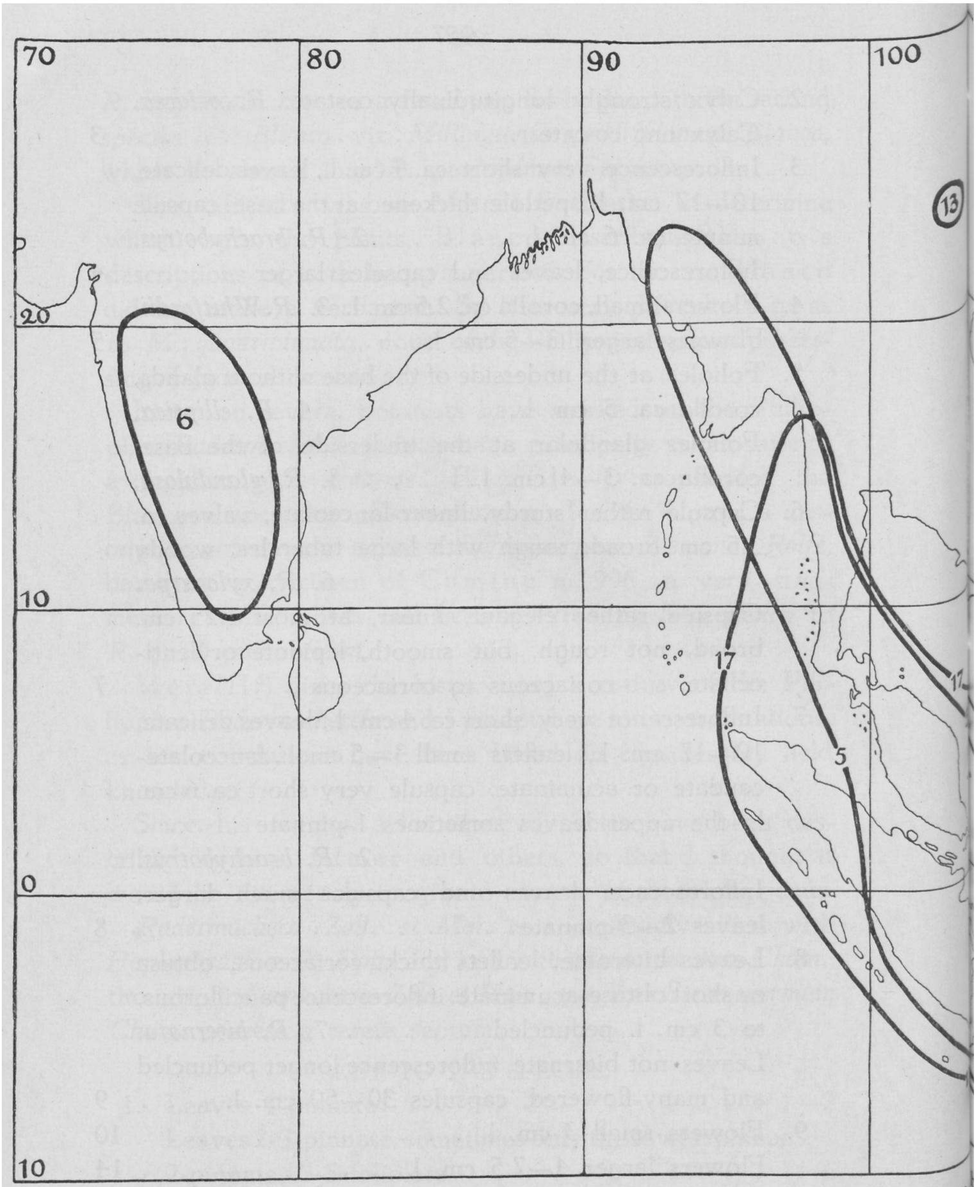
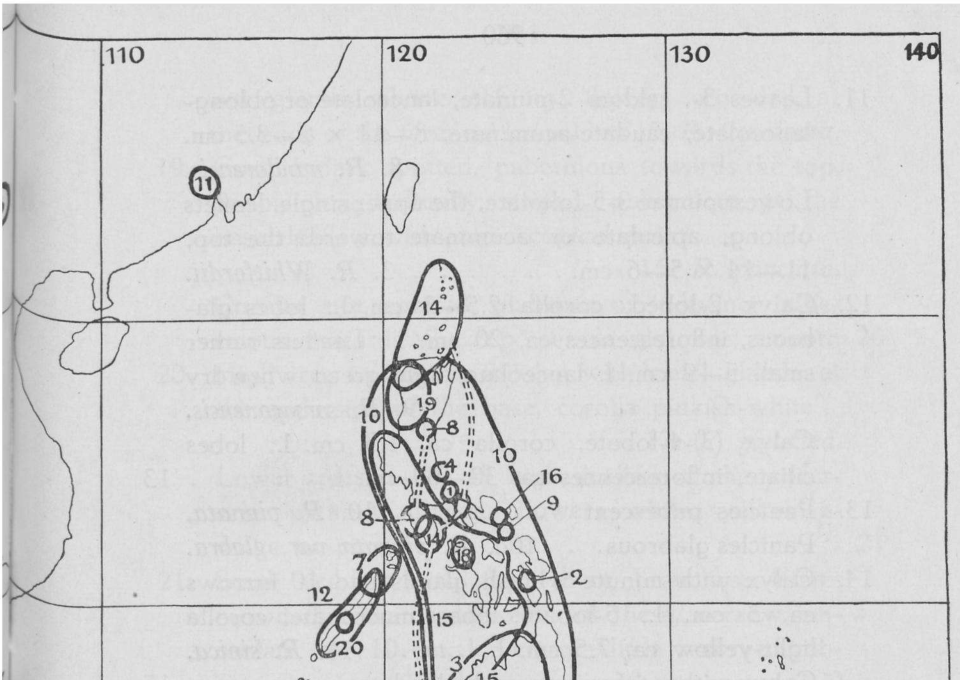


Fig. 12. Geographical distribution of Radermachera Zoll. 1. R. coriacea Merr. 2. R
Miq. 6. R. xylocarpa (Roxb.) K. Sch. 7. R. biternata Merr. 8. R. mindorensis Merr.
12. R. palawanensis Merr. 13. R. pentandra Hemsl. 14. R. fenicis Merr. 15. R
Elm. 19. R. Elmeri Merr. 20. R. fragrans (Elm.



achybotrys Merr. 3. R. Whitfordii Merr. 4. R. elliptica Merr. 5. R. glandulosa (Bl.)
. R. sorsogonensis Flm. 10. R. pinnata (Blanco) Seem. 11. R. sinica (Hance) Hemsl.
uminata Merr. 16. R. punctata Flm. 17. R. gigantea (Bl.) Miq. 18. R. sibuyanensis
Sts. ---- Limit of the area not established yet.

11. Leaves 3-, seldom 2-pinnate, lanceolate or oblong-lanceolate, caudate-acuminate, 8—11 × 2—3.5 cm. 8. *R. mindorensis.*
Lowest pinnae 3-5-foliolate, the upper single, leaflets oblong, apiculate or acuminate towards the top, 11—14 × 5—6 cm. . . . . 3. *R. Whitfordii.*
12. Calyx 2-lobed, corolla 2.5—3 cm. l., lobes glabrous, inflorescences ca. 20 cm. l.. Leaflets rather small 5—9 cm. l. lanceolate, light-green when dry 9. *R. sorsogonensis.*
Calyx (3)-4-lobate, corolla ca. 1.5 cm. l., lobes ciliate, inflorescences ca. 30—60 cm. l. 13
13. Panicles pubescent . . . . 10. *R. pinnata.*
Panicles glabrous. . 10*a. R. pinnata var. glabra.*
14. Calyx with minute whitish glands and 10 furrows ca. 3 cm. l., 5-lobate, lobes mucronate, corolla light-yellow ca. 7.5 cm. l. . . . . . 11. *R. sinica.*
Calyx without furrows and glands 15
15. Corolla-tube sub-cylindrical, 5.5 cm. l., white; shrub, sub-glabrous, leaflets shining, margin curled when dry. . . . . 12. *R. palawanensis.*
Corolla (mostly broad-) campanulate 16
16. Stamens 5 fertile, flowers yellow, leaves great to 1 m. l., capsule ca. 1 m. l. . . 13. *R. pentandra.*
Stamens 4 fertile, fifth rudimentary, leaves much smaller 17
17. Corolla 4—4.5 cm. l. 18
Corolla 5—6 cm. l. 19
18. Leaflets obtuse, obovate-elliptic, 4—7 cm. l., at the base puberulous and glandulous ca. 8 pairs of nerves . . . . 14. *R. fenicis.*
Leaflets lanceolate acuminate, ca. 6 pairs of nerves 14*a. R. fenicis var. acuminata.*
Leaflets oblong-lanceolate or lanceolate, short to long acuminate, 8—13 cm. l., glabrous and with-

out glands, above shining, flowers crowded at the ends of the terminal branchlets 15. *R. acuminata.*

19. Corolla dark spotted, puberulous towards the top, petiole longitudinally striped, puberulous at the base, leaflets with microscopical points 16. *R. punctata.*

Corolla not spotted, glabrous or indistinct puberulous towards the top, petiole glabrous, smooth 20

20. High tree to 35 m., folioles with small glands at the underside of the base, corolla pinkish-white 17. *R. gigantea.*

Lower trees 6—12 m. high, leaflets at the underside without glands, flowers white, yellowish-white or pink 21

21. Stem slender with few short branches, leaves crowded towards the ends of these, narrow lanceolate ca. 10 cm. l., margin little recurved, obtuse-acuminate; inflorescence rather short ca. 20 cm. l. few-branched, corolla pink or whitish, deep yellow near the throat . . . 18. *R. sibuyanensis.*

Many-branched trees, branches in dense masses; leaflets longer and acute acuminate. 21

22. Little tree ca. 6 m. high, leaflets with 10—12 straight parallel side-nerves; petioles and main-axe of the inflorescence densely lenticellate, corolla large ca. 6 cm. l. pink, not fragrant . . 19. *R.elmeri.*

Tall tree 12 m. or higher, many-branched, petioles and peduncle with few lenticels, folioles sharp arcuate-acuminate with 7—9 curved sidenerves. corolla yellowish-white, fragrant, 5—6 cm. l. 20. *R. fragrans.*

1. **Radermachera coriacea Merr.** in Philip. Journ. Sci. Bot. 3 (1908) 333; Enum. 3 (1923) 445.

Fig. 12 (1).

A *tree* glabrous throughout; branches terete, brown, densely lenticellate; *leaves* 1-pinnate ca. 20—30 cm. l., leaflets 5, oblong or elliptical-oblong, firmly coriaceous, 7—14 × 3—4 cm., very shining above; the lower surface slightly paler and somewhat shining, densely punctate-glandular, the base acute, the apex obtuse or shortly and obscurely blunt-acuminate the margins rather strongly recurved; nerves about 13 on each side of the midrib, anastomosing, slightly more distinct than the rather lax reticulations; petiolules of the lateral leaflets about 1 cm. l., that of the terminal leaflet 2.5 cm. l.; *panicles* at least 15 cm. l.; *calyx* 1.8 cm. l., narrow, strongly longitudinally costate with 5 or 6 ridges, cleft down at one side nearly to the middle, 3-toothed at the apex; *corolla* 4 cm. l., the tube rather narrow, slightly enlarged above, the lobes about 1 cm. l., obtuse; *capsules* ca. 16 cm. l., the valves ca. 0.5—0.7 cm. wide, shining, coriaceous, glabrous, blunt or acuminate at the apex; seeds unknown.

Geogr. distr. — *Philippines* — *Luzon* — Prov. of Tayabas (east-coast) (Principe), Baler, Merrill n. 1099 (B).

V.n.: bitbit párang (Tag.).

A very characteristic species, not only in its simply pinnate leaves and very coriaceous leaflets, but also in its clieft and strongly ridged calyx. It is the only known Philippine species possessing the latter character. In forests at low altitudes (Merrill).

2. **Radermachera brachybotrys Merr.** — Philip. Journ. Sci. 26 (1923) 489.

Fig. 12 (2).

Little *tree,* branchlets terete, 0.35 cm. diam., bark grayish, rugose, puberulous. *Leaves* opposite, crowded at the end of the branchlets, 2-pinnate and immediately below the inflorescence 1-pinnate, glabrous, 10—17 cm. l., slender; petiole, rhachis and petiolules elegant; petiole 3.5—4 cm. l., incrassate at the base, sub-sulcate above; leaflets lanceolate, caudate-acuminate 3.5—5 cm. l., acumen obtuse, ca. 1 cm. l.; lateral petiolules 0.3—0.4 cm. l., terminal ca. 1 cm. l.; *lamina* narrow cuneate, sub-glabrous and opaque above, midrib distinctly prominent beneath, primary nerves 5—7 slightly prominent. *Inflorescences* thyrsiformous, very small 4—5 cm. l.; peduncle very short, 1.5 cm. l., pauciflorous, side-axes puberulous, trichotomous. *Capsule* short 6 × 0.4 cm., glabrous, terete, obtuse; valves sub-coriaceous; septum ca. 0.2 cm. thick, terete. *Seeds* minute, 0.15 × 0.3 cm., at both sides 0.25 cm. broad membranously-winged.

(Type specimen: Edano n. B. S. 41688).

Geogr. distr. — *Philippines* — *Leyte* — Mt. Abucayan: Edano n. B. S. 41688 (L, B).

This dwarf species is very well characterized by its genuine habitus, showing in many respects nana-characters in regard to the other species within the genus.

It is endemic in Leyte.

3. **Radermachera Whitfordii Merr.** — Philip. Journ. Sci. Bot. 7 (1912) 352; Enumer. 3 (1923) 447.

Fig. 12 (3).

A small *tree* glabrous throughout, the young parts more or less resinous; ultimate branches somewhat compressed with few scattered lenticels; *leaves* 1—2-pinnate, 25—35 cm. l., the basal part of the petiole more or less lenticellate; leaflets 5—7 on the simple leaves, when 2-pinnate the lower jugae have 3—5 leaflets, oblong-elliptic, subcoriaceous, sub-equally narrowed at both ends, the base acute, apex acuminate, 11—15 × 3.5—6 cm., the underside of the base with small glands, lateral nerves spreading, about 12 on each side, the reticulations lax; petiolules of the lower leaflets 1—2 cm. l., the upper ones half as long or shorter; *panicles* longer than the leaves, up to 40 cm. in length, rather lax, the branches distant, spreading, the lower ones up to 15 cm. l.; *flowers* rather few, 2.5 cm. l., the *corolla* slightly pubescent externally in the upper part; *stamens* 4 didynamous with a fifth rudiment, glandular-hairy at the base; calyx 0.8—0.9 cm. not ribbed; immature *follicles* 25 × 0.4 m., somewhat compressed.

(Type specimen: Whitford n. F. B. 11817).

*Geogr. distr.—Philippines—Mindanao—*Distr. of Cotabato—Lebak, in dry river-bottoms at low altitudes: Whitford n. F. B. 11817 (D) — Distr. Lanao—Ponce n. F. B. 23367 (D); Mt. Urdaneta: Elmer n. 13975 (L,U) — *Camaguin Island* — Mambajao: Elmer n. 14213 (L,U) — Bukidnon, Davao, Cotabato, Lanao, Zomboanga: Somonte n. 25686, Ramos and Edano n. B. S. 37386, Wester n. 112 (Merrill).

V.n.: banoi-banoi (Bag.); *bunglai* (Buk.); *hali-hali* (Sul.); *kutokong* (Sub.); *labayanan* (C. Bis).

This endemic species of Mindanao occurs in thickets, borders of forests, etc. at low and medium altitudes.

The leaves are not always simply pinnate as I saw in the type specimen of Whitford. The species is most closelv allied with *R. elliptica Merr.*, but with very different leaves and inflorescence and smaller flowers (Merrill). For the rest the leaflets show another nervature and form, and the inflorescences are more lax and not so many-flowered.

Merrill has the two numbers collected by Elmer, referred to *R. pinnata* (*Blanco*) *Seem.*, but after a close study of these specimens I suppose Merrill to be mistaken.

4. **Radermachera elliptica Merrill.** Philip. Journ. Sci. Bot. 3 (1908) 334; Enumer. 3 (1923) 445.

Fig. 12 (4).

A *tree* glabrous throughout; branches terete, brown, strongly lenticellate; *leaves* simply pinnate, about 35 cm. l.; leaflets 5 elliptical or obovate-elliptical, 12—15 × 7—9 cm. coriaceous, shining, the base acute or somewhat acuminate, the apex broad, rounded short acute-acuminate, or very shortly and broadly obtusely acuminate; nerves about 9 on each side of the midrib, distinctly anastomosing, the reticulations lax, petiolules about 1.5 cm. l., that of the terminal leaflet short, but the rhachis produced about 5 cm. beyond the upper pair of leaflets; *panicles* axillary, about 10—15 cm. l., peduncled, densely flowered more or less resinous and shining; *flowers* white; *calyx* about 2 cm. l., closed in bud, obliquely split in anthesis, not toothed, sub-membranaceous, smooth; *corolla* 5 cm. l. the tube somewhat abruptly enlarged where it emerges from the calyx, about 1.5 cm. in diam. above, the lobes broadly ovate, rounded, 1 cm. l., somewhat hairy inside near the insertions of the anthers; filaments glabrous; *capsules* 20—25 c.m. l., nearly cylindrical, slightly compressed, glabrous, shining, 0.7—0.8 cm. in diam., the apex somewhat acuminate; seeds numerous, including the wings 1.3 cm. broad.

(Type specimen: Aguilar n. F. B. 11141).

Geogr. distr. — *Philippines* — *Luzon* — Prov. of Bulacan, Angat: Aguilar n. F. B. 11141—Prov. of Rizal (Merrill) —Merrill n. 9823 (B); Ramos n. B. S. 29412.

This endemic species of Luzon is well characterized by its pinnate leaves, its large elliptical, coriaceous leaflets and large flowers; not closely allied to any other known Philippine species (Merrill).

It occurs on and about cliffs at low altitudes.

5. **Radermachera glandulosa (Bl.) Miq.** — = *Spathodea glandulosa Bl.* Bijdr. Fl. Ned. Ind. (1825) 763; D. C. Prod. 9 (1845) 207; — = *Bignonia Porteriana Wall.* Cat. 6509; Miquel. Fl. Ned. Ind. 2 (1856) 751; D. C. Prodr. 9 (1845) 165; — = *Radermachera stricta Zoll. et Mor.* Syst. Verzeichn. 3 (1854) 53; Miquel. Fl. Ned. Ind. 2 (1856) 755; — = *Stereospermum glandulosum Miq.* Fl. Ned. Ind. Suppl. (1860) 240, 565; — = *Lagaropyxis glandulosa Miq.* Ann.

Mus. Lugd. Bat. 1 (1863) 199; Bureau sub *R. stricta Zoll. et Mor.* Adansonia 2 (1861) 193; Bureau. Monogr. (1864) t. 28; Miquel. Ann. Mus. Lugd. Bat. 3 (1867) 250; Seemann. Journ. Bot. 8 (1870) 147; Clarke in Hook. Fl. Br. Ind. 4 (1885) 383; Kds. and Val. Bijdr. Booms. Java. 1 (1894) 74; idem. Atlas. 2 (1914) fig. 356 L-M; Koorders Exc. Fl. 3 (1912) 185; Koorders—Koorders-Schumacher. Syst. Verz. Fam. 258. 28; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 243; Heyne. Nuttige Planten Ned. Ind. 4 (1917) 167; Ridley. Fl. Malay Penins. 2 (1923) 550; Merrill. Journ. Straits Branch. Roy. Asiat. Soc. (1921) 525; A. T. Gage. Bot. South Lushai Hills. Rec. Bot. Surv. Ind. 1 (1901) 352.

Fig. 3 k; 11 (5).

Small crooked *tree* 10—12 m. high, ca. 25—30 cm. diam. glabrous throughout; *stem* disorderly branched already ± immediate above the surface of the soil; bark light-gray, terminal branchlets thin; leaves 1-pinnate, 3—4-jugate; *leaflets* entire, puberulous when young, distictly glandular at the mostly convex basal part of the underside, elliptic-acute or -acuminate with acute acumen 15—30 × 7—17 cm., lateral nerves 6—8 (—10), prominent, sometimes lanceolate short acuminate 42 × 13.5 cm.; *inflorescence* pauciflorous to rather many-flowered 10—15 (—20) cm. l.; *calyx* pale purple, truncate, persistent; *corolla* white with pale rosa 3—4 cm. l.; buds dark purple; pedicels ca. 0.8 cm. l.; *capsules* on ca. 1 cm. l. pedicels, pendulous, linear 15—25 × 0.5 cm., valves coriaceous, septum terete 0.3—0.4 cm. thick, thinly wrinkled; many minute seeds, flat, orbicular, ca. 0.18 cm. diam. at both sides 0.6 cm. br. winged.

Geogr. distr. — *Burma* — pr. Ft. Lungleh, Lushai Hills (Gage) — *Tenasserim* — Moulmein: Lobb (Clarke in Hook. Fl. Br. Ind.) — *Malay Peninsula* — Malacca (Maingay); Forests often on stream banks (Ridley); Batang Malacca (Derry); Negri Sembilan, Tampin; Bukit Payong and Bukit

Kandang (Cantley); State of Pahang pr. Bentong: Burkill & Haniff n. 16600 (B); Kwala Tenok, Tahanriver (Ridley); Selangor: H. N. Ridley n. 8537 (B); Ulu Gomba; Batu Caves; Perak, Temengoh; Tapak (Wray); Penang (Wallich); Sungei Penang, Curtis (Wallich); Fl. of Pahang: H. N. Ridley n. 189 (P).

V. n.: *bunga pawang.*

Malayan Archipelago—Sumatra—Sumatra: Korthals (L sub n. 898, 199...180, n. 898, 199...178, n. 898, 199...182); Sumatra: H. O. Forbes n. 2663 (L); pr. Siboelangit: Lörzing n. 5545 (L); Priaman; Diepenhorst n. 2920 H. B. (U); Padang pr. Ajer Mantjoer: O. Beccari n. 811 (L).

V. n.: (Mal.) *toewie gadang* (Diepenhorst).

Krakatau — (Docters van Leeuwen in Ann. Jard. Bot. Buitenzorg 31 (1921) 126, 138. A tree scattered in the ravines from 50—500 m. above the level of the sea.)

Java — Zollinger Pl. Javan. n. 3141, perhaps type specimen of *R. stricta Zoll.* (P) — Java: van Hasselt (L sub n. 898, 199...177); Java: Herb. Dr. Blume n. 1365 (L sub n. 898, 199 ... 176, n. 898, 199 ... 175); Java: Teysmann (U sub n. 032846); W. Java pr. Tjitjaringin: Hasskarl (L sub n. 908, 332... 1031); Java: ? (L sub 898, 199... 183, n. 898, 199... 184); primary forest pr. Oengaran: Junghuhn (L sub n. 898, 199...191 — *Res. Bantam* — pr. Pandeglang, 1 specimen on a riverbank: Backer n. 7396 (B); Loehoer Tjaja pr. Tjipanas south of Sadjira: Backer n. 1966 (B) — *Res. Batavia* — G. Radnararang pr. Djasinga on a brookbank: Backer n. 10156 (B); Cult. in Hort. Bog. sub XI. I: Backer (B); G. Salak ca. 600—1000 m. alt.: Kds. 24174 β (L) — *Res. Preanger* — Palaboeanratoe; Kds. 33046 β (B), Kds. 261 β (L, B), Kds. 259 β (L), Kds. 260 β (L, P); pr. Tjisolok: Kds. 262 β (L), Kds. 12259 β (L); Kds. 13250 β (L); Mt. Gede: timber-species from the Gede n. 336 (L) — *Res.*

Cheribon — Cheribon: ? (L subn. 898, 199...192, n. 898, 199... 190) — *Res. Banjoemas* — Forest-distr. Noesakambangan on loam upon sandstone: Kds. 269 β (B, L); Forest-distr. Pringombo 700—1000 m. alt.: Kds. 266 β (L), Kds. 267 β (L), Kds. 268 β (L) — *Res. Pekalongan* — G. Slamat-Simpar: Kds. 263 β (L); Soebah-distr. pr. Soerdjo, G. Praoe on vulcanic soil: Kds. 264 β (B), Kds. 36767 β (L), pr. Gringsing: Kds. 265 β (B, L), Kds. 13434 β (B, L) — Kds. 13435 (B, L) — *Res. Madioen* — Ngebel-distr. 800 m. alt.: Kds. 29689 β (L) — *Res. Kediri* — pr. Gadoengan Pare: Kds. 22786 β (L); Forest-distr. Tjoeramanis: Kds. 12833 β (L, B), Kds. 270 β (L, B, P) — *Res. Besoeki* — Banderan pr. Bondowoso: Backer n. 9547 (B).

V. n.: (Soend.) *kihapit* (Preanger, Banjoemas); (Jav.) *bedali, pedali, padali* (Pekalongan, Banjoemas, Preanger); *poedang* (Kediri); (Jav.) *ambal* (Pekalongan); (Jav.) *godong ambal* (Junghuhn); (Jav.) *lambal* (Preanger); *klajoe* (Madioen); *kibako* (Preanger); (Soend.) *kisikap* (W. Java); (Jav.) *bangkongan* (Pekalongan); (Jav.) *bangkong* (Pekalongan); (Mad.) *sekar potè* (Besoeki): *kilanghit* (Cheribon).

Borneo—Borneo: Korthals (L sub n. 898, 199... 181); Sarawak: Beccari n. 811 (Merrill).

This species is easily recognizable by the large 1-pinnate leaves, the leaflets of which are remarkably glandular at the base. The leaflets vary much in form and length. In this characters it differs totally from the other common Malayan *Radermachera gigantea (Bl.) Miq.;* for the rest the seeds of *R. glandulosa (Bl.) Miq.* are smaller and more genuine than those of the other species. Indeed the leaflets of *R. gigantea (Bl.) Miq.* are also sometimes a little glandular at the underside, but never possess such characteristic crowded pezizaeformous often dark glands. On this glands I saw often a black layer which is caused by a fungus I couldn't determine, because only a mycelium was present.

R. glandulosa (Bl.) Miq. occurs in thickets and forests at low and medium altitudes up to ca. 900 m.; it is often found on riverbanks; it is never mentioned as a social species as far as I know. It is ecpecially found in close-shadowy forests. The wood is only used as small timber in S. W. Preanger.

It produces a lot of minute seeds, which are easily spread by the wind. This is well demonstrated by the fact that Docters van Leeuwen found the plant in Krakatau (1919); this is undoubtedly due to wind-spreading.

The vernacular names are not always to be trusted as Koorders and Valeton remark. As I cannot judge this, I mentioned the names I found on the labels.

6. **Radermachera xylocarpa (Roxb.) K. Sch.** — = *Bignonia xylocarpa Roxb.* Hort. Bengal. 47; Fl. Ind. 3 111 (1832) 108; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3 b (1895) 243; — = *Stereospermum xylocarpum Wight.* Ic. (1850) t. 1335—6; Wallich Cat. 6511; D. C. Prod. 9 (1845) 169; Beddome Fl. Sylv. t. 70; Dalz. and Gibs. Bomb. Fl. 159; — = *Tecoma xylocarpa G. Don.* Gen. Syst. 4,225; — = *Spathodea xylocarpa Brand.* For. Fl. 349, t. 43; Clarke in Hook. f. Fl. Br. Ind. 4 (1885) 383; Bentham and Hooker. Gen. Pl. 2 (1876) 1047.

Fig. 12 (6); 13 d.

Tall elegant *tree*, 10—20 m. high; bark tuberculate-lenticellate, rather spongy, brown when dry. Innovations pubescent, mature glabrous. Leaves opposite, 2-pinnate, glabrous, crowded at the end of the branchlets, ca. 30—100 cm. l., rhachis minutely lenticellate. *Leaflets* short ca. 0.2—0.7 cm. l. petiolulate, entire, base oblique, rounded or cuneate, ovate to elliptic-oblong, acute or acuminate 9—12 × 3—6.5 cm.; nerves 4—6, reticulations lax. *Flowers* in rigid terminal ovate *thyrses*, totally yellowish-brown-pubescent, small, when young ca. 3—4 cm. l., later on ca. 15 cm. l.; common peduncle short, erect, firm. *Calyx*

1.2—1.6 cm. l., pubescent, mature glabrous, lobes 3—5, short, broad. *Corolla* much like that of *H. macroloba*, ventricose from near the base, sub-glabrous, fragrant, ca. 3.7—5 cm. l., white, tinged yellow; lobes rounded, crispate, nearly equal. Filaments hairy below. *Capsule* linear-lanceolate, stout, sub-terete, sub-straight or strongly curved, rugged, 25—75 × 2.5—3.7 cm., ca. 2.5 cm. thick; septum terete, 0.7 cm. diam. shining-yellow, corky, bubbled, perpendicularly to the woody valves. Seeds (incl. wings) 0.6 × 3 cm. thinly discoid; germ orbicular, broader than the wings.

Geogr. distr. Deccan Peninsula — Common, extending to Sarpura Range (Brandis); Calcutta: Cult. in Hort. Calc. (P, L sub n. 898.200 ...49); Cult. in Hort. Calc.: Wallich n. 299 (P); Concan: Hook. f. & Thomson (P); Prov. of Madras, Neelgherry Hills, fruiting spec.: Herb. Wight. n. 3342 (Kew); Santavery Ghat Bobab, ca. 1200 m. high: A. Meebold n. 9444 (P); Anaimalai Hills, Prov. of Madras (Fischer. Rec. Bot. Surv. Ind. 9 (1921) 132).

7. **Radermachera biternata Merrill.** — Philip. Journ. Sci. 1 (1906) Supp. 3. 238; ibid. 3 (1908) Bot. 334; Enumer. 3 (1923) 445.

Fig. 12 (7).

Descr. emend. A small *tree* about 8 m. high, quite glabrous throughout with biternate leaves, elliptical ovate, usually obtuse leaflets and few-flowered panicles much shorter than the leaves, the flowers about 5.5 cm. l.. Branches gray or brownish, the younger parts black when dry. *Leaves* 20 cm. l. or less, opposite biternate; leaflets 5—9 × 2.5—5 cm., coriaceous, shining, the apex rounded obtuse or broadly acute, the margins revolute, sometimes with little glands at the base; midrib strongly prominent, primary nerves about 10 on each side rather distinct beneath, the reticulations netted, rather close; petiolules of the lateral leaflets 1.5 cm. l. or less, of the terminal ones about 3 cm. l.; *inflorescence* much reduced, the rhachis 3 cm. l. or less, the branches very short or none at all, or sometimes (in a fructiferous state) longer, rhachis 15—20 cm. l.; side-branches 3-florous, 3—4 cm. l. always few flowers; *calyx* about 1 cm. l., closed in bud, in anthesis unequally 3-lobed, the lobes short, acute; *corolla* 5—5.5 cm. l., the tubular portion less than 1 cm. l. about 3.5 cm. in diam., enlarged-ventricose above, the lobes about 1.5 cm. l.; style 2 cm. l.; *capsules* 10—18 cm. l., not pendulous, ca. 0.5 cm. br. terete, narrowed at both ends acuminate to the apex, valves coriaceous, smooth, indistinctly ribbed in the middle, seeds numerous kidney-shaped pointed above ca. 0.6 cm. br. and 0.2 cm. l. at both sides 0.6 cm. br. winged, flat.

(Description of the capsules and seeds of Elmer n. 12836 (U); type specimen; Merrill n. 568 from Culion (D)).

Geogr. distr. Philippines. — *Culion*: E. D. Merrill n. 568 (D); Merrill n. 9602 — *Palawan* — Mt. Pulgar: Elmer n. 12836 (D,L,U,B) — *Busuanga* — Curran n. F. B. 3491.

This endemic species of the Palawan-group grows in open grassy valleys slightly above the sea-level and in secondary forests at low altitudes ascending to 500 m. and is well characterized by its biternate, coriaceous leaves. The inflorescence is reduced, though not so much reduced as Merrill states.

8. **Radermachera mindorensis Merr.** — Philip. Journ. Sci. 3 (1908) Bot. 338; non *Millingtonia pinnata Blanco*; = *Stereospermum pinnatum Rolfe* Journ. Linn. Soc. Bot. 21 (1884) 314; Vidal. Rev. Pl. Vasc. Filip. (1856) 203; — = ? *Stereospermum quadripinnatum Naves* in Fl. Filip. ed. 3. t, 252; Merrill. Enum. 3 (1923) 446.

Fig. 12 (8).

A *tree* glabrous throughout, about 20 m. high; branches terete, brown or gray, lenticellate; *leaves* 3-pinnate rarely 2-pinnate, 40—50 cm. l., rhachis lenticellate; leaflets lanceolate or oblong-lanceolate, chartaceous, somewhat shining, 8—11 × 2—3.5 cm., the base acute or somewhat acuminate, acumen about 2 cm. l., acute; nerves 12 on each side of the midrib, anastomosing, slightly more distinct than the secondary ones and reticulations; petiolules of the lateral leaflets about 0.5 cm. l., those of the terminal leaflets 1—2 cm. l.; *panicles* terminal, glabrous, diffuse, equalling or longer than the leaves, the rhachis frequently lenticellate; flowers light purple; *calyx* somewhat campanulate 0.4—0.5 cm. l., closed in bud, in anthesis shortly and irregularly 3—5 toothed; *corolla* 1.5—1.8 cm. l. the portion within the calyx slender, tubular, then abruptly enlarged and tubular-campanulate, somewhat pubescent on the outside, irregularly lobed; capsules 45 cm. l., 0,4—0.5 cm. in diam., somewhat compressed; seeds, including the wings, about 1.3 cm. br.

(Type specimen: Merrill 893).

Geogr. distr. — *Philippines* — *Mindoro* — pr. Calapan; Merrill 893; Pola: Merrill 2240, 2473; Bongabong river; Whitford n. 1387; Baco river: Mc. Gregor, 257; Cuming 1517; Fenix n. B. S. 15166; Ramos n. 39650; Merritt F. B. 3731; Merrill—*Luzon*—Prov. of Nueva Vizcaya: R. J. Alvarez. F. B. 18402 (L.).

V. n.: banai banai (Tag., P. Bis.).

Allied to *R. pinnata (Blanco) Seem.* but with more diffuse panicles and much smaller flowers. In his Enum. Merrill remarks that this species of secondary forests at low altitudes is perhaps better to be reduced to *R. pinnata*. Indeed a specimen collected by R. J. Alvarez, by Merrill determined as *R. pinnata* I am obliged to refer here.

For the present I think it better to keep both species, however, I consider *R. mindorensis* not only limited to Mindoro.

9. **Radermachera sorsogonensis Elmer. nov. spec.** (mss. in herb.).

Fig. 12 (9).

Folia 2-3-pinnata, subviridia (in sicc.), glabra, firmiter papyracea; petiolus insignis ad 20 cm. l., 0.3 cm. crassus basi et apice incrassatus, basi articulatus, lamina ca. 20 cm. longa, late triangularis, rhaches laterales anguste sulcatae; foliola lateralia fere sessilia, terminalia ca. 0.5—1 cm. longe petiolulata; *foliola* lanceolata 5—9 × 1,6—3.2 cm., integerrima, basi cuneata sensim in petiolos angustata, margine subrecurvata, acumine 1—2 cm. longo acuto vel obtuso, nervo mediano subtus valde prominente, nervis lateralibus vix prominentibus, reticulatione indistincta; *inflorescentia* terminalis, glabra, 20 × 6—10 cm., pedunculo ca. 8—10 cm. l. ca. nonnisi basi paulo lenticellato, axibus lateralibus 2.5—4 cm. l. trichotomis; *flores* modesti 2.5—3 cm. l.; *calyx* ca. 1 cm. l., 2-lobatus, microscopice albido-lepidotus praesertim ad basin, ceterum laevis, glaber, campanulatus, lobis ca. 0.5 cm. l. inaequalibus altero integerrimo, late ovato, altero 2—lobato: *corolla* tubuloso-infundibuliformis, 2.5—3 cm. l., glabra vel apice puberula; *ovarium* griseum, lineari-lanceolatum 2-loculare, glabrum vel apice puberulum, ovula ∞, 8-seriata in utroque loculo; *capsula* ca. 20 cm. l. anguste linearius 0.4 cm. lata, glabra, septo subtereti.

(Type specimen: E l m e r n. 15337).

Geogr. distr. Philippines — Luzon — Mt. Bulusan pr. Irosin: E l m e r n. 15337 (L, B, U).

10. **Radermachera pinnata (Blanco) Seem.** — = *Millingtonia pinnata Blanco.* Fl. de Filip. (1837) 501; ed. 2 (1845) 351; ed. 3. 2 (1878) 285; Seemann. Journ. Bot. 8 (1870) 147; Merrill. Philip. Journ. Sc. 3 (1908) Bot. 336; D. C. Prod. 9 (1845) 182; Miquel. Fl. Ned. Ind. 2 (1856)

753; — = *Millingtonia quadripinnata Blanco* l. c. c. 501, 351, 2.286; Miquel. Fl. Ned. Ind. 2 (1856) 753; — = *Radermachera banaïbana Bureau* Adansonia 2 (1861) 194; Seemann. Journ. Bot. 8 (1870) 147; Merrill. Philip. Journ. Sc. 1 (1908) Suppl. 124; — = *Stereospermum banaïbana Rolfe* Journ. Linn. Soc. 21 (1884) 314; Rolfe Rev. Pl. Vasc. Filip. (1886) 203; Vidal Ph. Cuming. Philip. (1885) 132; — = *Stereospermum Seemanni Rolfe.* 'Journ. Linn. Soc. Bot. 21 (1884) 314; Vidal. Phan. Cuming. Philip. (1885) 132; Vidal. Rev. Pl. Vasc. Filip. (1886) 203; — = *Stereospermum quadripinnatum F. Vill.* Novis. App. (1880) 151; Vidal. Sinopsis. Atlas. (1883) 35, t. 73. fig. A; Rolfe in Journ. Linn. Soc. Bot. 21 (1884) 313; Vidal. Phan. Cuming. Philip. (1885) 132; Vidal. Rev. Pl. Vasc. Filip. (1886) 202; — = *Radermachera quadripinna Seem.* Journ. Bot. 8 (1870) 147; — = *Stereospermum pinnatum F. Vill.* Nov. App. (1880) 151; Rolfe. Journ. Linn. Soc. 21 (1884) 314; Vidal. Phan. Cuming. Philip. (1885) 132; Vidal Pl. Vasc. Filip. (1886) 203; Merrill. Philip. Journ. Sc. 3 (1908) Bot. 336; idem. Spec. Blancoan. (1918) 350; idem. Enum. 3 (1923) 446.

Fig. 12 (10).

Leaves 25—40 cm. l., 2—3-pinnate, rhachis not lenticellate, pinnae with 2—3 pairs of leaflets, leaflets lanceolate narrowed into an acute or sub-obtuse acumen, 6—10 × 2.5—3.5 cm., smooth and glabrous above, the underside with distinct midrib, sidenerves indistinct just as the reticulations. *Thyrses* 30—60 cm. l. rather dense, main axis ca. 0.25—0.4 cm. thick, without lenticels, terete, shortly tomentose, especially near the base more densely pubescent, secondary axis thin 3—4 cm. l. *Calyx* mostly 4-(2-3-) lobed, ca. 0.6 cm. l., lobes short, obtusely rounded, tube sometimes a little glandular; *corolla* pink or pale purple and marked with yellow inside infundibuliformous, the inferior part ca. 0.5 cm. l. narrow cylindrical then enlarged tubular-campanulate, ca. 2 cm. l. as the lobes to the apex puberulous; lobes ca. orbicular, ciliate, ca. 0.5 cm. l.; stamens mostly 4 with a fifth rudiment or 5 fertile ones inserted ca. 0.5 cm. above the base, in the basal part glandular-hairy, ca. 1.5 cm. l., thecae divergent, connective elongate. *Capsule* ca. 60 cm. l., seeds imbricate, winged.

(Description of Merrill spec. Blancoan. n. 834).

Geogr. distr. Philippines — Luzon — Cagayan to Camarines (Merrill); Calauan: Mc. Gregor n. B. S. 12399 (L); Prov. Laguna: F. M. Amarillas n. F. B. 24674 (L); Rizal Prov.: Merrill. spec. Blancoan. n. 834 (L, B); Aroroy, Prov. Masbate: Whitford n. 1696 (B); Luzon: G. P. Ahern n. 61 (B) — *Mindoro* (Merrill) — *Mindanao* (Merrill) — *Samar* (Merrill) — *Biliran* (Merrill) — *Negros* (Merrill) — Philippines without number, etc. — Plant. Cumingian. (L sub n. 27, 926...194, n. 27, 926...195, n. 27, 926...196(; pr. Samar: Rosenbluth n. F. B. 12848 (P).

V. n.: anagep (Ibn.); *ansohan* (Bis.); *atiatip* (Ig.); *badlan* (Bis.); *banai-bánai* (Tag., Bik., S. L. Bis.); *banai-banai-laláki* (Tag.); *banaïbayan* (Pang.); *bani-báni* (Tag., Sbl.); *barangauan* (Ilk); *bunlai* (Mbo.); *kalapuing* (Tag.); *lanunisi* (Ibn.); *lasilak* (Ibn.); *pagalayan* (Bon.); *paiton* (Pang.); *paling-uák* (Bik.); *pata* (Pang.); *salai* (Tag.); *tuing-húlo* (Tag.); *yaban-yábang* (Tag.).

var. glabra Merrill. Differs from the type by its total glabrity.

Geogr. distr. Philippines — Range and habit of the species; endemic in the *Philippines* (Merrill) — *Luzon — Mindanao.*

Merrill remarks in his revision of the genus *Radermachera* in the Philippines (1908) that it is the most common species of the genus in the Philippines, being somewhat variable and its synonomy rather complicated, primarily due to Blanco's imperfect descriptions and to several later interpretations of these. The leaves are never simply pinnate, but 2- and 3-pinnate, frequently on the same specimen. No one of Blanco's imperfect descriptions corresponds with this common species, but Merrill states that this becomes comprehensible, as it seems very evident that Blanco had no herbarium, and so the probability of repetition increased. The flowers vary in size from 2.5—3 cm., but on all the specimens cited by Merrill (1908) the flowers are uniformly described by the collectors.

It occurs in primary and secondary forests at low and medium altitudes.

As I consider some specimens, cited by Merrill as *R. pinnata*, as belonging to *R. mindorensis*, I did not note the cited specimens in his revision (1908), from which I did not see any materials.

I examined several flowers and discovered the remarkable fact, that here within one inflorescence occurred flowers with 4 and 5 stamens.

11. **Radermachera sinica (Hance) Hemsley** — = *Stereospermum sinicum Hance.* Journ. Bot. 20 (1882) 16; Hemsley in Hooker. Icones Pl. 2728.

Fig. 12 (11).

Small *tree, leaves* opposite, 2-pinnate, with 4 pairs of pinnae, leaflets ovate-lanceolate, entire, rounded at the base, obtusely acuminate to the top, membranaceous, pale beneath, at both sides minute impressed-punctate, ca. 5 × 2—2.5 cm. lateral petiolules 0.25 cm. l., terminal 1.5 cm. l. *Thyrse* terminal, erect, lax; pedicels 0.75—1 cm. l.; *calyx* cupular-campanulate with minute whitish glands ca. 3 cm. l. slightly 10-sulcate; lobes 5 triangular, mucronate sub-equal ca. 0.75 cm. l.; *corolla* glabrescent pale sulphureous, infundibuliformous, ca. 7.5 cm. l., lobes rotundate crispate ca. 2.5 cm. l.; *stamens* 4 didynamous, glabrescent, hardly exsert, with a fifth rudiment; ovary bilocular with 2 placenta's in each cell and 8-seriate ovules; *capsule* pendent, subterete, pluri-sulcate, acuminate ca. 40 × 1—1.25 cm. minute whitish-glandular; seeds 0.5 × 1.4 cm. inclosed the acute wings, cotyles flat.

(Type specimen: Dr. C. Gerlach n. 20797).

Geogr. distr. China. — *Canton* — near the river Lien-Chan: C. Gerlach n. 20797.

Hance considers the species to belong to the sub-genus *Radermachera* of Hooker and to be especially allied to *R. banaibana Bur.* (= *R. pinnata (Blanco) Seem.)* Though I have not seen any specimen it seems to me rather isolated in taxonomic respect. The seeds are sown by Dr. Gerlach in the Botanical gardens at Hongkong; after 2 years and a half the specimens attained 3 m. in height and flowered already.

12. **Radermachera palawanensis Merrill** — Philip. Journ. Sc. 3 (1908) Bot. 336; idem. Enumer. 3 (1923).

Fig. 12 (12).

A *shrub* nearly glabrous, or the branches, rhachises of the leaves and panicles slightly pubescent; *leaves* about 20 cm. l., bipinnate, the lowest pair of pinnae with 5 leaflets, the next with 3 leaflets, the upper ones single; leaflets oblong-elliptical or lanceolate-elliptical 3.5—8 × 1—2.5 cm., coriaceous, glabrous, shining on both surfaces, the margins rather strongly recurved, the base acute, the apex more or less acuminate, sometimes apiculate and rarely with one or two irregular teeth at the apex; lateral nerves about 8 on each side of the midrib, not very distinctly anastomosing; petiolules of the lateral leaflets 0.3—0.8 cm. l., that of the terminal one longer. *Panicles* as long as the leaves, lax, sparely flowered; *calyx* subcylindrical, narrowed below, obscurely lobed, about 1 cm. l.; *corolla* white, 5—5.5 cm. l. the portion within the calyx very slender, tubular, then abruptly enlarged forming a broadened tubular portion 2—2.5 cm. l., the limb spreading, about 3 cm. in diam., the lobes broad, rounded; *capsules* very slender, about 20 cm. l., the valves at least 0.3 cm. wide, seeds unknown.

(Type specimen: Foxworthy n. B.S. 699).

Geogr. distr. Philippines—Palawan—Victoria Peak; Foxworthy n. B.S. 699.

Species evidently endemic on Palawan occurring on rocky slopes along streams about 1000 m. high.

13. **Radermachera pentandra Hemsley** in Hooker Icones t. 2728.

Fig. 12 (13).

Tree ca. 9 m. high, ultimate branches thick, densely lenticellate; *leaves* very great ca. 1 m. l., or perhaps longer, with a firm petiole, 2-pinnate or sometimes 3-pinnate at the basal part, pinnae circ. 4, remote, with 3—7 leaflets; leaflets petiolutate, coriaceous, ovate-lanceolate, without the petiolules 10—15 (—22) cm. l., entire, acute-acuminate, cuneate or rounded at the base, glabrous, subshining above, pallid beneath, with 8—10 primary nerves on each side. *Flowers* yellow ca. 6.25—7.5 cm. in diam. in terminal, ca. 30 cm. l. rigid, lax thyrses, flowers on short slender pedicels; *calyx* campanulate circ. 2.5 cm. l. and br., irregularly lobed, lobes acute; *corolla* broad campanulate glabrous except near the insertions of the stamens; 5-lobed, lobes subequal broad, entire, rounded, reflexed; perfect *stamens* 5, nearly equal, hardly longer than the corolla-tube; *disk* thick fleshy cupuliformous shortly lobed, when fruiting enlarged; *ovary* glabrous, narrow cylindrical ca. 1.25 cm. l.; ovules ∞ in many rows; *capsule* sub-terete ca. 1 m. l. primarily lepidote, valves sub-coriaceous 0.6—0.8 cm. br.; seeds 1—1.4 cm. br. with flat cotyles.

(Type specimen: A. Henry n. 10909).

Geogr. distr. China—Mengtze, Yunnan: A. Henry n. 10909. Alt. ca. 1700 m.

Allied to *R. sinica* (*Hance*) *Hemsley* but much larger in all parts and further differing in the broader corolla and the 5 perfect stamens.

Though I have not seen this Chinese plant it represents a well-marked species after the excellent description.

14. **Radermachera fenicis Merrill.** Philip. Journ. Sc. 3 (1908) 335, 434; idem. Enumer. 3 (1923) 446.

Fig. 3 h, 12 (14)

A small *tree* 3—5 m. high, glabrous throughout; *branches* terete, grayish-brown; *leaves* opposite, about 20 cm. l., the lowest pinnae 3-foliolate, the others of single leaflets; leaflets oblong-elliptical to obovate-elliptical, 4—7 × 1.5—4 cm. rather thin, shining, the apex obtuse, acute or somewhat acuminate, the base cuneate, the lower surface minutely punctate with few little glands, margin sub-recurved; lateral primary nerves about 7—9 on each side of the midrib, anastomosing, scarcely more distinct than the secondary nerves and reticulations; petiolules 0.5 cm. l. or less, that of the terminal leaflet 1—1.5 cm. l. *Panicles* terminal, narrow, about as long as the leaves, the bracteoles linear-setaceus, about 0.4 cm. l.; *calyx* somewhat campanulate, epunctate with microscopical glands, 1 cm. l., 2-lobed, one lobe with 2, the other with 3 small teeth; *corolla* white about 4 cm. l. the first 0.5 cm. slender tubular, then abruptly enlarged and campanulate, 3 cm. br. above, the lobes broad rounded; *stamens* 4 glabrous except near the glandular-hairy base; *capsules* somewhat compressed, about 11 cm. l. and 0.6 cm. thick, glabrous; seeds including the wings 1 × 0.3 cm., apiculate.

(Type specimen Batanas Islands: Fenix n. B. S. 3583).

Geogr. distr. Philippines — *Batanas Islands* — Santo Domingo de Basco: Fenix n. B. S. 3583 — *Babuyan Islands* — pr. Dalupiri: R. C. Mc. Gregor n. B. S. 10124 (D), n. 10194 — *Luzon* — Prov. of Ilolocos, N. Luzon: M. Ramos n. B. S. 27510 (B), n. 32868;

Prov. of Tayabas, Mt. Binuang: Ramos and Edano n. B. S. 28696 (B).

V. n.: pamayubayen (Ilk.); *valavavan* (Iv.); *balaybayan.*

var. acuminata vSts. nov. var. *Foliola* lanceolata, non oblanceolata aut obovata, acuminata, nervi laterales 6; *juga* inferiora 7-foliolata; *foliola* papyracea; *inflorescentia* brevis (an semper?) ca. 7 cm. l.

(Type specimen: Merritt n. F. B. 9750).

Geogr. distr. Philippines — Mindoro — M. L. Merritt n. F. B. 9750 (D).

Malayan Archipelago — Celebes — Makassar, pr. Pangkadjene: Teysmann n. 12160 (B); pr. Balchangia: Teysmann n. 12750 (B); Boeton, P. Moena pr. Wangkolo, 20 m. alt.; n. bb. 3925 (L, U); Minahassa: Kds. 16256 β (L).

V. n.: ririh (P. Moena).

A species well characterized by its small obovate-obtuse or short obtuse-acuminate leaflets, greatest breadth above the middle, its comparitively short capsules and its blunt-acute or only shortly acuminate leaflets.

Merrill notes already the Mindoro-specimen as a separate form and though the materials of this one are rather imperfect I think it a distinct variety, the differing characters not being sufficient as to a diagnosis of a new species.

15. **Radermachera acuminata Merrill** — Philip. Journ. Sc. 3 (1908) 335; — = *Radermachera quadripinnata Rolfe.* Journ. Linn. Soc. Bot. 21 (1884) 313 nec *Millingtonia quadripinnata Blanco* nec *Radermachera quadripinna Seem.;* Merrill. Enumer. 3 (1923) 445.

Fig. 12 (15).

A *tree* glabrous throughout or the *inflorescence* obscurely puberulent; *leaves* 2-pinnate, about 40 cm. l., the lowermost pinnae with 5 leaflets, the next with 3 leaflets and the upper ones simple; leaflets oblong-lanceolate or lanceolate, 8—13 × 2.5—4 cm., the base acute, the apex slenderly long-acuminate, coriaceous, the margin recurved (when dry), beneath at the base and towards the apex with little glands, slightly shining, lateral nerves about 12 on each side of the midrib, not prominent, anastomosing, the reticulations fine, indistinct; petiolules 0.8—1.2 cm. l., that of the terminal leaflet 2.5 cm. l., many-flowered; *thyrses* terminal about 25 cm. l., the primary branches ca. 5 cm. l. many-flowered; *flowers* crowded at the ends of the branches; *calyx* closed in bud, in anthesis campanulate, about 1 cm. l., sometimes 2-lobed (Ramos n. 11029) with minute glands; *corolla* 4 cm. l., the portion within the calyx slender tubular, then abruptly enlarged and campanulate, about 2 cm. br., the lobes rounded, broad; *capsules* ca. 40 cm. l., 0.5 cm. thick, cylindrical, spirally twisted, ca. straight, 2-valved, valves coriaceous nigrescent when dry; seeds minute including the thin membranous wings (0.4 cm. br.) 0.2 × 1 cm..

(Type specimen: Gammill n. F. B. 277; description of the capsule and seeds after Mc. Gregor n. B. S. 32586).

Geogr. distr. Philippines — *Luzon* — Prov. Pangasinan, Prov. Pampanga (Merrill); Prov. Zambales: V. Elgincolin n. F. B. 28305 (L) — *Guimaras:* Gammill n. F. B. 277 — *Masbate* (Merrill) — *Panay* — Prov. Antigue: R. C. Mc. Gregor n. B. S. 32586 (L) — *Cebu* — Ramos n. B. S. 11029 (D) — *Mindanao* — *Camaguin:* M. Ramos n. B. S. 14464 (D), Exscritor n. 2495, Mc. Gregor n. 32367 — *Basilan* — D. P. Miranda n. F. B. 18966 (L,B).

Merrill refers also 3 fragmentary specimens, namely: Cuming n. 1003 from Luzon, Whitford n. 1696 from Masbate and Foxworthy n. 1949 from Luzon.

V.n.: banai-banai (C. Bis.).

This endemic species occurs on forested slopes at low and medium altitudes, according to Merrill.

16. **Radermachera punctata Elmer.** nov. spec. (mss. in herb.).

Fig. 12 (16).

Arbor; rami ca. 0.6 cm. cr. *cortice* subfusco puberulo, dense lenticellis orbicularibus 0.05—0.1 cm. diam. obtecto; *folia* 2—3-pinnata; petiolus teres 8—12 × 0.2—0.3 cm. sparse lenticellatus, fuscus, indistincte longitudinaliter striatus, basi puberulus, interdum ut inflorescentia et foliola microscopice griseo-lepidotus; *foliola* elliptico-lanceolata, 8—12 × 3—4 cm., integerrima, laevia, glabra, opaca, utrinque praesertim subtus ad basin subtiliter glanduloso-punctata, longe obtuse vel subacute acuminata, acumine 1—2.5 cm. l., sensim in petiolos cuneato-attenuata, lateralia 0.5 cm. terminale 1.5—2 cm. longe petiolulata, petiolulo supra sulcato; nervi laterales 11—13, indistincte prominentes, nervatione grosse areolata absolute prominente; *thyrsus* terminalis, firmus, sublaxiflorus, 25—40 cm. l., pedunculo 7—8 × 0.25 —0.3 cm., sparse lenticellato, ramis primariis 7—8 cm. l. ut pedunculo, calyceque grisee (microscopice) lepidotis; *flores* in apice ramulorum conferti; *calyx* 2—lobatus ca. 1.5 cm. l. (incl. lob.), laevis, glaber, lobis ca. 0.5 cm. l., late rotundatis; *corolla* ca. 5 cm. l., basi 0.5—0.6 cm. anguste cylindracea, intus glanduloso-pubescens, subito dilatata ventricoso-infundibuliformis, fauce ca. 2.5 cm. lata, ubique punctata, extus apicem versus pubescens lobis rotundatis 1.5—1.8 cm. diam. ciliatis; *stamina* fertilia 4, didynamia, 1.5—1.8 cm. l. quinto sterile, basi pubescentia; thecis divergentibus, connectivo elongato; *ovarium* 2-loculare, ovulis ∞, 6—8-seriatis in utroque loculo; *capsula* mihi ignota. (Description of the specimens Elmer n. 16066 and Elmer n. 14817.)

Geogr. distr. Philippines — Luzon — pr. Irosin: Elmer n. 14817 (L,U); idem: Elmer n. 16066 (L,U,B).

This endemic species of Luzon is nearly allied to *R.*

acuminata, but differs in the fine grayish lepidote leaves, inflorescences, etc. and the dark-spotted corolla, which is even to be seen when dry.

17. **Radermachera gigantea (Bl.) Miquel.** — = *Spathodea gigantea Blume* Bijdr. (1825) 761; Miquel Ann. Mus. Lugd. Bat. 3 (1867) 250; — = *Bignonia amoena Wallich* Pl. Asiat. Rar. 2 (1831) 78, t. 183; D. C. Prod. 9 (1845) 207; Miquel. Fl. Ned. Ind. 2 (1856) 755; — = *Stereospermum hypostictum Miq.* Fl. Ned. Ind. Supp. I (1860) 240, 565; — = *Lagaropyxis gigantea (Bl.) Miq.* Ann. Mus. Lugd. Bat. 1 (1863) 198; — = *Radermachera Lobbii Miq.* Op. cit. 3 (1867) 250; Clarke in Hook. Fl. Br. Ind. 4 (1885) 384; — = *Stereospermum amoena A.D.C.* Prod. 9 (1845) 208; — = *Spathodea Lobbii Teysm. et Binnend.* Nat. Tijdschr. Ned. Ind. 25 (1863) 413; — = *Bignonia amoena Wallich* Cat. n. 6512; — = *Radermachera amoena Seem.* Journ. Bot. 8 (1870) 146; Brand. For. Fl. 349: Kurz For. Fl. 2. 232; Koorders and Valeton. Bijdr. Booms. Java. 1 (1894) 72; idem. Atlas Baumart. Java. 2 (1914) t. 356 A—K; Koorders. Exc. Fl. Java. 3 (1912) 185; Koorders-Schumacher. Verzeichn. 1 § 1 Fam. 258 (1913) 26; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 243; Koorders. Bot. Tabellen Djatibosschen Java. ed. 2 (1908); Heyne. Nuttige Pl. Ned. Ind. 4 (1917) 167.

Fig. 12 (17).

High *tree*, full grown 40 m. high and 80 cm. diam., in some countries trees, 20—25 m. high are common (Kds. and Val.); *stem* straight, mostly terete, first branches ca. 6—15 m. above the surface of the soil; *bark* 1.5—2 cm. thick, dark-gray, ultimate branches slender; *leaves* 2-pinnate (on very young and young specimens the leaves are 1- resp. 2-pinnate with sharply serrate leaflets) ca. 35 cm. l., shining above, opaque beneath; *leaflets* membranaceous to sub-coriaceous, entire, lanceolate, base and apex acuminate ca. 8—11.5 × 3—4.5 cm. (5.5 × 1.5 cm. on young leaves), at the basal part of the underside mostly with few scattered or dense small glands, midrib prominent at the underside, sidenerves indistinct. *Thyrses* many-flowered, terminal, erect, ca. 20—40 × 10—20 cm., bracts and bracteoles deciduous; *calyx* pale green, ca. 2—2.5 cm. 2-labiate with 3—5 short teeth, deciduous; *corolla* infundibuliformous, 5—6 cm. l. (incl. the lobes), fragrant, whitish with pale rosa or sub-purple, lobes unequal, crispate, ciliate, narrow tubular portion near the insertions of the stamens dense glandular-hairy; *stamens* 4, didynamous, with a fifth rudiment, filaments at the base dense-glandular-hairy, white; anthers yellow, thecae divergent, connective apiculate; *ovary* with ∞ ovules, 6-seriate in each cell; *capsules* pendulous 20—60 cm. l., green when young, later on gray; seeds ∞, 0.85—1.1 × 0.25—0.3 cm., sometimes narrower 1.05 × 0.25 cm..

(Descriptions of Miquel's specimens from Java in the herbarium at Leiden).

This common Malayan *Radermachera* differs at first sight from the other common Malayan species *R. glandulosa (Bl.) Miq.* by its 2-pinnate leaves, the leaflets of which are never remarkably glandular at the base and are much smaller and lanceolate, the tree attaining a greater height. For the rest the seeds are distinctly larger, as well the germ as the wings, which vary little, perhaps due to the place in the capsules.

Junghuhn (Java. I. 352) says of it: "this tree raises its top far above the forests, so that one is hardly able to distinguish with the naked eye its long siliquiformous fruits and flowers, howsoever magnificent and handsome coloured the latter may be".

In Java it occurs from the seashore up to 1500 m. and in some districts of Java it is very common. According to Heyne, Koorders and several collectors it gives a good timber, which is used for houses and bridges.

As to the variability Miquel, who did not dispose of such a lot of materials as I studied, already mentions the rather large variability.

First there is *R. Lobbii Miq.* this being synonymous to *Spathodea Lobbii,* founded by Teysmann and Binnendijk on a cultivated specimen from the botanical gardens at Buitenzorg, they received from Th. Lobb of Singapore.

Later on Miquel joined *R. gigantea* and *R. Lobbii,* the latter being a synonym. The botanists at Buitenzorg however, meaning this being wrong, wrote to Miquel, that indeed *R. Lobbii* represented a distinct species and gave him the principal differences (Miquel. 1867 l. c.), these being the following: „small tree ca. 7 m., firm leaflets which are obtuse-apiculate, small flowers ca. 2.5 cm. l., the limb being not crispate, the tube white with 9 yolk-yellow stripes inside, the white lobes yellow spotted near the base, capsule long, ca. 50 cm.."

It is a pity that flowers fail on Miquel's original specimens from Buitenzorg in the Leiden herbarium, so that I was not able to examine this important point.

Before I am going to write about the value of the species, I must refer here to two other varieties Miquel distinguishes of *R. gigantea,* namely:

f. sumatrana Miq. — foliolis plerisque sublanceolatis, capsulis plerumque ultrapedalibus.

f. borneensis Miq. — foliis saepe totis fere bipinnatis, foliolis crassioribus.

The first form he had four years ago described as *Stereospermum hypostictum Miq.* on an imperfect specimen of Teysmann from W. Sumatra near Padang.

Further we have to deal with *R. amoena Seem.,* which C. B. Clarke calls synonymous to *St. hypostictum.* This species was first described by Wallich; the author says it must have been introduced (1818) by C. Telfair as a native of the Mauritius and that it even should be endemic in Madagascar, thriving luxuriantly in Bengal, forming a small but truly ornamental tree on account of its flowers and foliage, the former of which being exquisite fragrant. That *R. amoena* should be indigenous in Mauritius or Madagascar I ignore, fully agreeing with Seemann (l. c. 146). The latter supposes, it was introduced from Ava, as Wallich notes in his Catalogue. The excellent table and description of this botanist show that the flowers are ca. 5 cm. l. with a large 2-labiate calyx, the corolla being not crispate, the white ciliate lobes and tube being striped with yellow, the tube outside subrosa and the leaflets lanceolate, acuminate, coriaceous, 7.5—12.5 cm. l.

From the Malayan Archipelago Ridley only notes *R. amoena*, synonymous to *St. hypostictum;* therefore I think he does not consider *R. gigantea* and *R. amoena* being the same.

Howsoever I have tried to come to a conclusion about the value of these five species and varieties, I have not been able to solve the question.

Indeed I have found one Sumatranan specimen (Lörzing n. 11238) justly conformable to *R. Lobbii.*

As to the *f. sumatrana* and *f. borneensis*, of which I saw Miquel's original specimens, these always possess coriaceous leaflets, but much larger flowers than *R. Lobbii.*

As to *R. amoena*, of which I saw some materials from Malacca, this species has larger flowers than *R. Lobbii*, but also coriaceous leaflets, however, this is a much larger tree (up to 27 m., Ridley), but corresponds with *R. Lobbii* by its yellow-striped corolla, this character as far as I know never occurring in *R. gigantea.*

Besides, I examined a lot of materials from Sumatra, Borneo and Celebes, collected in order of the Forestral Experiment-station at Buitenzorg. This extensive collection is without a single exception badly collected, the specimens being nearly always sterile and also very incomplete as to the notes on flowers and fruit, so it did not help me, but did make the question only more troublesome. I must add here that for the genus *Radermachera* the leaves are often of little value as to principally specific characters.

I have come to the following poor preliminary conclusion: *R. amoena Seem.* and *R. gigantea (Bl.) Miq.* are perhaps not synonymous with each other. *R. Lobbii*, *R. amoena Seem.*, *St. hypostictum Miq.*, *R. gigantea (Bl.) Miq. f. sumatrana* and *f. borneensis* form in many respects a distinct group, perhaps a distinct species, not only in phytographical respects, but also in geographical distribution, as I never saw such specimens from Java.

Nevertheless I hesitate to come to a conclusion for the present, as I have never seen any *Radermachera* alive, though I studied a considerable collection herbarium materials. The exact conclusion I leave to the future, as I have seen the trouble which Merrill had with *R. pinnata* and *R. quadripinnata*, owing to conformable conditions. Boerlage (Handl. Fl. Ned. Ind. 2 (1899) 600) supposes all the species mentioned above to be synonymous with *R. gigantea (Bl.) Miq.*

The specimens I preliminary refer to the above mentioned group I suppose existing, I have marked with a note of interrogation.

For the rest another question may be discussed here, namely that possibly *R. gigantea* may occur in the Philippines. Though Merrill described a lot of species from this Archipelago he does not mention this one. Only one specimen (Ahern n. 61) was first determined as *R. gigantea*, this being later on reduced to *R. pinnata*, a truly distinct species, though very variable in habit and certainly not the same as *R. gigantea*. In geographical respect it would be peculiar, that whereas *R. gigantea* shows such a large area and represents a common Malayan species it would not occur in the Philippines, in which country the

Radermachera's show an intensive endemic development. Moreover the Philippine *Rademachera's* have most probably originated from Malayan species. (p. ...).

Prof. E. D. Merrill wrote me dd. 30 Juli 1927 that he also met with many puzzling points as to some species. In the future it will be necessary to make an extensive study about *Radermachera*.

Geogr. distr. India—Tenasserim—? Tavoy (Wallich) — *Malay Peninsula*—? Malacca and Singapore, common in woods (Griffith, Maingay, Ridley); Singapore: A. C. Maingay n. 1212 (B); ? cult. in Hort. Calc. (P).

V. n.: bunga pawang (Malacca).

Malayan Archipelago—Sumatra—Gouvt. Atjeh — P. Waj: Kds. 10656 β (B), Kds. 10655 β (B); Gajoe and Alaslanden pr. Tampang: v. Daalen n. 316 (L, B)—*Res. Tapanoeli*—? W. Karolanden pr. Laoe Balang, 250—500 m. alt., tree 6—10 m. high, flowers white inside with several yolk-yellow stripes, calyx purple, in secondary forests; Lörzing n. 11238 (B); N. Bataklanden, 1000 m. alt.: Junghuhn (L sub n. 898, 200...17); ? Batang Toroe, type specimens of Miquel's *f. sumatrana:* Teysmann n. H. B. 1177 (B, U); — *Simaloer*—Achmad n. 164 (L), Achmad n. 811 (L, U)—*Gouvt. Sumatra's Oostkust*—Semeloengan pr. Masekat Hoeba, 700 m. alt.: n. bb 4882 (L); Karolanden pr. Simboekan Goenoeng: Galoengi n. 466 (B); ? Karolanden pr. k. Lao Soloe 2—300 m. alt.: n. bb 9300 (L); Wampoe valley pr. k. Pajangpen Goenoeng 500 m. alt.:. Galoengi n. 442 (B); Simeloengan n. bb 3088 (L); ? Karolanden, 900 m. alt.: n. bb 6253 (L); ? Karolanden pr. k. Tongkoh, 1500 m. alt.: n. bb 6632 (B) — *Res. Sumatra's Westkust*—? Fort de Kock, 920 m. alt.: A. V. Theunissen n. 6 (L); ? Pajacombo pr. d. Moenggoeng, 1320 m. alt.: n. bb 6620 (B); Padang Pandjang pr. k. Tambangan; n. bb 6697 (B); Priaman: Diepenhorst n. H.B. 2084 (B) — *Riouw en Onderhoorigheden*—? P. Soekoe pr. Tandjoeng Binang: Korthals (P, L sub n. 908, 266... 127) — *Res. Bengkoelen* —? Kroë pr. d. Wai Goenoeng Kemala alt. 700 m.: n. bb 7844 (B) — *Res. Palembang*—250 m. alt.: W. Greshoff n. 278 (B) — *Res. Lampongsche Distr.* — Kalianda pr. Tetaän, 60 m. alt.: n. bb 9322 (L); ? Telokbetong pr. Redjosari 100 m. alt.: M. J. Dirksen n. bb 1789 (L, B); ? Kalianda, forest-reserve, way Pirong in a primary forest: De Witt n. bb 1753 (L, B); ? pr. Tandjong Karang: Endert n. E 1309 (L) — *Banka* —? Blinjoe distr. on dry clay-soil: Greshoff n. 37 (B) — *Billiton*—Tandjong Pandan: Teysmann n? (B); Sumatra: Korthals (L sub n. 898, 200...31); in sylvis pr. Gudarim Baru: Junghuhn (L sub n. 898, 200...18).

V. n.: (Mal.) *toewi* (Sum. W. K., Palembang); (Mal.) *toewi batoe* (Heyne); (Mal. or Minangkab.) *toei* (Sum. W. K.); *koedo koedo, koedo koedoe pajo* (Simaloer); *toewik* (Banka); *kajoe lallah, kajoe deling* (Karolanden;) (Batak.) *sandoerlangit, sindoerlangit* or *soendarlangit* (Karolanden); *kekapoeng, kapoeng toewi, talas* (Lampong. Distr.); *djamatan simaisaloedang* (Sum. O. K.); *koetang* (Atjeh).

Java—Java (L sub n. 898, 200...29, n. 898, 200...26, n. 898, 200... 24); Zollinger Pl. Javan. n. 2229 (P); Java; Zippel (L sub n. 898, 200...30, n. 898, 200...25); Java: v. Hasselt (L sub. n. 898, 200...32, n. 898, 200...33, n. 898, 200...34); Java in Mt. Muroh: Waitz (L sub n. 898, 200...23); Java: Reinwardt (L sub n. 898, 200...27, n. 898, 200...22, n. 898, 200...28); Ungarang, north inclination primary forest 1000—1600 m. alt. (L sub n. 898, 200...20, n. 898, 200...16); Java (U. sub n. 032851, n. 032852) — *Res. Bantam* — G. Poelosari pr. Pandeglang: Kds. 236 β (L); Tjimara distr. pr. Batoehideung: Kds. 237 β (L).

V. n.: (Soend.) *ki padali;* (Jav.) *pedalie.*

Res. Batavia — Buitenzorg: Boerlage (L sub n. 908, 352... 629, n. 908, 352... 642); ? Cult. in Hort. Bog.

ex Singapore *(R. Lobbii Miq.?)* L sub n. 898, 200... 42, n. 898, 200... 43, n. 898, 200... 44); Buitenzorg pr. k. Babatlan, Tjiliwoeng: Hallier (B): Buitenzorg: Arsin n.? (B); G. Salak: Kds. 24155 β (B).

Res. Preanger — Garoet pr. Wanaradja: Kds. 235 β (L); Palaboeanratoe pr. Soekaboemi: Kds. 232 β (L), Kds. 34308 β (B), Kds. 38493 β (B); G. Gedeh: timber-species from the Gedeh n. 93 (L); Tjadasmalang pr. Tjidadap, 1000 m. alt.: Winckel n. 1840 β (U, L), n. 1753 β (L); pr. Tjiratjap, Djompong Koelon: Kds. 234 β (L, B); pr. Sanggrawa: Kds. 233 β (B); P. Noesagede in the lake of Pendjaloe, Kds. 276 β (B); pr. Tjidadap: Tjibeber: R. C. Bakhuizen v. d. Brink n. 2601 (B); pr. Batoe Karoet-Tjidadap: W. F. Winckel n. (B); Tjiloeloempang pr. Tjadasmalang: W. F. Winckel n., 1268 β (B); Indihiang: C. A. Backer n. 8536 (B).

V. n.: (Soend.) *ki padali* or *ki padali betoel.*

Res. Banjoemas — Pringombo, Bandjernagara 700—900 m. alt.: Kds. 11162 β (L), Kds. 27096 β (L), Kds. 34065 β (L, B), Kds. 37049 β (L), Kds. 249 β (B); Tjiratjap pr. Djampang Koelon, 50 m. alt.: Backer n. 17390 (B); Noesa Kambangan: Kds. 40250 β (B), Kds. 251 β (B, L).

V. n.: (Jav.) *bedali = kedali.*

Res. Pekalongan — Soerdja distr. G. Prahoe, primary forest, 800 m. alt.: Kds. 246 β (L, B), Kds. 247 β (L); Soebah distr.: Kds. 248 β (B, L).

V. n.: (Jav.) *padali = kedali.*

Res. Kedoe — G. Andong, young secondary forest, 1200 m. alt.: Kds. 36606 β (B); G. Oengarang, rest of a primary forest, 1200 m. alt.: Kds. 36633 β (B); Keditan, S. of Telamaya: Docters van Leeuwen n. 202 (B).

V. n.: (Jav.) *kedali = bedali.*

Res. Semarang — G. Telemojo, Oengaran pr. Ambarawa: Kds. 245 β (L): Kedoengdjati: Kds. 243 β (L), Kds.

238 β (L, B), Kds. 10127 β (L, B), Kds. 24989 β (L, B), Kds. 239 β (L), Kds. 240 β (B, L), Kds. 10128 β (L); Karangasem, teakforest: Kds. 34141 β (L), Kds. 244 β (B); N. of Wirosari: Kds. 250 β (B), in teakforest Kds. 252 β (B, L); pr. Sagoong: Docters van Leeuwen n. 1064 β (B); W. Moeria, 700 m. alt., dry slope: Docters van Leeuwen n. 872 (B).

V. n.: (Jav.) *bedali, kedali, kajoe poetih, kokok kejok.*

Res. Soerakarta — Wonogiri pr. Djanglot, planted by the natives: H. Burger n. 5614 (B); Wonogiri pr. forest-complex Eromoko-Pratje, 400 m. alt.: H. Burger n. 2196 (B).

V. n.: berdali.

Res. Rembang — Ngandang Sedan, 150 m. alt.: Kds. 36387 β (L); Ngandang, G. Boetah: Kds. 36415 β (B); pr. Getas, Randoe Blatoeng in teakforest: L. Kalshoven n. 1623 (L, B); Tjabak: Kds. 42353 β (B); G. Pandan pr. Djatiswara in a teakforest: A. Thorenaar n. 167 (B).

V. n.: sekar petak; (Jav.) *dali.*

Res. Madioen — Ngebel — Ponorogo, 1275 m. alt.: Kds. 241 β (L), Kds. 34162 β (L), Kds. 38625 β (L), Kds. 29175 β (L), Kds. 29174 β (L), Kds. 242 β (L); G. Pandan, pr. Saradan, 500 m. alt.: Kds. 12417 β (L); Patjitan-Toelahan: Backer n. 2969 (B); Lawoe Sido Ramping, Gandong Valley, 13—1400 m. alt.: Elbert n. 9 (L sub n. 908, 307... 174, n. 908, 307... 173); Ponorogo: Heringa n. 6527 (B); pr. Djågårågå, 900 m. alt., G. Lawoe, alang-vegetation and bushes: C. A. Backer n. 6709 (B); forestcomplex Ngidjo, P. Laosan, forest-distr. Ponorogo.

V. n.: (Jav.) *bĕdali, dali.*

Res. Kediri — Gadoengan-Pare pr. Soekaradja: Kds. 23030 β (L), Kds. n. 22787 β (L).

V. n.: (Jav.) *dali, bĕdali.*

Res. Pasoeroean — G. Ardjoeno, 800 m. alt.: Kds.

38162 β (L); G. Saower Waderan pr. Loemadjang: Kds. 257 β (B); pr. Prigĕn, forest: Dr. A. Rant (B).

V. n.: (Jav.) *bedali, gedali.*

Res. Besoeki — Rogodjampi pr. Banjoewangi: Kds. 28876 β (L); Pantjoer-Idjen pr. Sitobondo: Kds. 20525 β (L), Kds. 28520 β (L), Kds. 20524 β (L), Kds. 14900 β (L), Kds. 253 β (L); pr. Pradjekan; Kds. 12838 β (L, B, P), 1000 m. alt. Kds. 14361 β (B); Tjoeramanis-forest-complex pr. Simpolan: Kds. 12705 β (L, B), Kds. 256 β (B); Poeger Watangan pr. Djember: Kds. 258 β (L), Kds. 254 β (L), Kds. 12845 β (L), Kds. 281 β (L), Kds. 255 β (L); G. Idjen pr. Kajoemas: Backer n. 30715 (L); Banderan pr. Bondowoso, dry alang-alang vegetation, 700 m. alt.: C. A. Backer n. 9549 (B).

V. n.: (Mad.) *potian, poetian;* (Mal.) *kar poteh;* (Mad.) *sekar poteh;* (Jav.) *dali, bedali;* (Mad.) *kadjoe raras.*

Bali — G. Pale, 540 m. alt.: Sarip n. 270 (L).

Flores — pr. Larantoeka: Teysmann n. 8816 (B).

Borneo — ? G. Pamatton, type specimen of Miquel's *f. borneensis:* Korthals (L sub n. 898, 200...39, n. 898, 200...40, n. 898, 200...41); ? pr. Tewingan, S. E. Borneo n. bb 382 (B); ? Ben Dajak pr. k. Teroesan, S. E. Borneo, stem 42 m. high: n. bb 9889 (B); ? Martapoera pr. k. Dajak Moerai, white flowers, fragrant: n. bb 2490 (B).

V. n.: boenglai goenoeng; (Dajak.) *koedjoek langit;* (Mal.) *boenglai batoe.*

Celebes — pr. Tjamba: Teysmann n. H. B. 12757 (B); Menado, primeval forest pr. Kajoewatoe: Kds. 16257 β (B); Minahassa: Kds. n. 16255 β (L), Kds. 16254 β (L).

V. n.: kajoe ma ätoes; (Alf. Minah.) *koetoe-koetoe, maätas, mahatoes, wowohan.*

18. **Radermachera sibuyanensis** Elmer — Leaflets of Philip. Bot. 4 (1912) 1485; Merrill. Enumer. 3 (1923) 447.

Fig. 3 g; 12 (18).

An ascending *tree,* stem 10 m. high, 20 cm. diam., its main branches arising from below the middle, ultimately slender; *twigs* relatively short, few, thick, yellowish gray lenticellate; whood odorless, very bitter, moderately soft, reddish-white; bark brown, checked longitudinally, that on the branches yellowish brown. *Leaves* crowded towards the ends, ascending, alternate, 2-to 3-pinnate, 20—40 cm. l., petiole properly 10 cm. l., swollen at the base, terete, glabrous, the first internode about as long, the second one shorter and grooved along the upperside; petiolules of the 2 lateral leaflets 0.5—3 cm. l., glabrous, grooved, the terminal one also greatly varying in length but relatively longer; limbs 10 × 3 cm., the entire margins sub-involute, flat, ascending, sub-coriaceous, deep green above, paler green beneath, glabrous, fusiform or gradually tapering from the middle towards both ends, obtuse-acuminate at the apex, curing dull brown on both surfaces; the terminal usually the largest, midrib nearly black when dry, bold beneath, canaliculate above, glabrous, lateral leaflets from 5—7 pairs, strictly oblique, tips united, very fine, usually with alternating secondary nerves, extending from the sub-marginal line towards the midrib, reticulations very few, the total underside fine microscopically punctated, towards the base mostly with few small scattered glands. *Inflorescence* terminal or sub-lateral 20 cm. l., sparingly paniculate; pedicels few to several cm. l., slender as are all other stalks; *calyx* 1.25 cm. l., glabrous, whitish, split one half down on one side, the 2 or 3 other lobes obtuse or rounded, 0.5 cm. across at the base, gradually expanding; *corolla* constricted towards the base and striate, nearly 5 cm. l., the saccate portion somewhat flattened and strigosely hairy on the inside, the tubular portion white, the 5 lobes pink or whitish, deep yellow about the throat, the lobes broadly rounded and sub-ovately spreading, 1.5 cm. across, the saccate tubular portion 1.5 cm. thick; *stamens* 4 in 2 unequal pairs with a fifth rudiment, all included in the second portion and inserted upon the shoulder of the constricted portion; filaments whitish, curved, sub-terete, the longer ones 2 cm., the shorter 0.5 cm. less in length, glandular-hairy at the base; anthers divaricate 0.3 cm. l. laterally dehiscent; *ovary* 0.3 cm. l., glabrous but giving a grayish impression, sub-cylindric; at the base surrounded by a glabrous *disk,* gradually tapering into the slender glabrous 2.5 cm. l. style; stigma dilated into 2 lobes.

(Type specimen: Elmer n. 12060).

*Geogr. distr.—Philippines—Sibuyan—*Mt. Giting-Giting, Magellanes, Prov. of Capiz: Elmer n. 12060 (L,B).

V. n.: lanite.

This endemic species of Sibuyan is rather well distinguished by its leaflets; it is very closely allied with *R. palawanensis.* It occurs on fertile wooded banks of the Patoo-river at 170 m. alt.

19. **Radermachera Elmeri Merrill.** Govt. Lab. Public. Philip. 29 (1905) 48; idem. Philip. Journ. Sc. Bot. 3 (1908) 334; idem. Enumer. 3 (1923) 445.

Fig. 3 j; 12 (19).

A small *tree* about 6 m. high, with 2-pinnate glabrous leaves, and pendent paniculate *inflorescence,* the pink *flowers* ca. 6 cm. l., the branchlets, axis of the inflorescence and the leaf-rhachis glabrous, usually with many small white excrescences. Leaves about 35 cm. l., the *leaflets* elliptical-lanceolate, glabrous, long acuminate, the base acute at the underside with small glands, 6—10 × 3—5.5 cm., nerves ca. straight, about 10 pairs, not prominent, the reticulations lax, obscure; petiolules 0.5—1 cm. l., glabrous. *Panicles* about 30 cm. l., the branches spreading, 5—6 cm. l., dichotomously branching, few-flowered; pedicels slender, about 1.5 cm. l.; *calyx* campanulate, glabrous 1.5—1.8 cm. l., 3—4-toothed, the teeth broadly ovate, acute or sub-obtuse or sometimes rounded 0.4—0.5 cm. l., 0.5—1 cm.

wide. *Corolla* 6 cm. l., pink, sub-campanulate the portion included in the calyx tubular, 1 cm. l., then dilated, the mouth 5—6 cm. wide, entirely glabrous except near the insertions of the stamens where it is more or less ferrugineous pubescent inside, the margins minutely ciliate, 5-lobed, the lobes rounded, about 2 cm. wide, 1.5 cm. l., sub-equal. *Stamens* inserted in the tube near the top of the tubular portion of the corolla, the filaments about 2 cm. l., glabrous above, more or less ferrugineous pubescent below with capitate hairs. *Ovary* glabrous, narrow lanceolate, the disk annular, thickened, the style glabrous 2.5 cm. l.; ovules ∞ in 6 rows. *Capsule* (immature) cylindrical, ca. 40 × 0.4 cm., glabrous, seeds including the wings 0.8 × 0.2 cm.

(Type specimen: Elmer n. 6179).

Geogr. distr. Philippines—Luzon—Prov. of Benguet pr. Sablan: Elmer n. 6179 (D); Prov. of Benguet: M. Ramos n. B. S. 5370 (L); pr. Baguio, prov. of Benguet: S. Laraya n. F. B. 27954 (D,L); idem: Elmer n. 8940 (L,B) — Bontoc — Mt. Masapilid: Ramos and Edano n. B. S. 37903 (D); Prov. of Ilocos: Paraiso n. F. B. 25454 (B).

According to Merrill this Luzonan species occurs in forested ravines ca. 400—1600 m. alt. It is closely allied with *R. acuminata* and *R. fragrans*. As to the former it differs by its dense lenticellate branchlets, petioles and inflorescences, its smaller leaflets, its rather pauciflorous inflorescences and its larger flowers. As to the latter it differs by its not fragrant, pink flowers, the different nervature of the leaflets, the little height of the tree, and the leaflets, which are not crowded towards the ends of the ultimate branchlets. Further the inflorescence is pendent and the leaves are ordinarily shorter.

The Palawan specimens, Merrill gives in his revision, differ from the type as he remarks. First they possess somewhat smaller flowers, described by Foxworthy as white and fragrant. He arranged them in the *var. fragrans,* as he could not find any valid characters to warrant the separation as distinct species in the material, he had at hand. I have found however some additional differences which might justify the separation.

20. **Radermachera fragrans (Elm.) vSts.** nov. spec. — = *Radermachera Elmeri Merrill. var. fragrans Elmer* Leafl. of Philip. Bot. 3 (1915) 2561; Merrill Enumer. 3 (1923) 446.

Fig. 3 i; 12 (20)

Sub-erect *tree,* stem ascending 45 cm. diam., 12 m. high or higher, crooked; main branches erect, arising from above the middle, ultimately rebranched and forming dense masses, bark quite thick, brown on the stem, gray on the branches, the epidermis flaking into small pieces; branchlets yellowish and brown lenticellate, the young apical portions green and glabrous. *Leaves* opposite ascending, ternately compound, all the stalks green except the swollen purple joints, varying from 30—80 cm. l., *leaflets* flat, smooth and glabrous, sub-coriaceous, much darker green on the upper side,. grayish brown on both sides when dry, variable in size from 6—15 × 2.5—5 cm., elliptic, but with abruptly caudate-acuminate and strongly recurved points, base obtuse to cuneate, entire; petiolules 1 cm. l. or considerably shorter, canaliculate, appearing articulate or glandularly swollen at their distal ends, the terminal one, when solitary much longer; midrib sunken along the upper side, rather conspicuous beneath; lateral nerves 6—8 on each side of the midrib, curved, divaricate faint tips reticulately united, reticulations evident under a hand lens; thyrse as long as the leaves, terminal, ascending, glabrous, green except the sweetly fragrant *flowers;* pedicels 1 cm. l. and usually provided towards the base by one or more very minute bracts; *calyx* stipitate towards the green base and falsely articulate there, whitish above the middle, 2 cm. l. and

1.5 cm. br. across the irregularly short lobed top, turbinate greenish towards the base, where it seems to separate transversely when mature, the lobed portion thinner in texture and whitish; *corolla* 5—6 cm. l., glabrous except the minutely puberulent upper portion, 5 cm. wide across the throat, the basal 1 cm. constricted and 0.6 cm. wide, otherwise campanulate and finely veined, pendent, caducous, light creamy white except the yellowish red inside, somewhat compressed; the 5 lobes on the average 1.5 cm. l., and as wide across the base, broadly rounded at the apex; *stamens* 4 included of 2 slightly unequal parts; filaments nearly white, inserted upon the throat of the constricted portion of the corolla or 1 cm. from the base, the shorter pair at least 2 cm. l., the longer pair almost 1 cm. longer, gracefully curved towards each other, all towards the base flattened and glandularly hairy along the upper side, otherwise slender and glabrous; anthers similar to a spear head when in anthesis, brownish tinged, 0.4 cm. l., the apical point blunt and membranous, attached at the distal angle of the divergent cells, laterally dehiscent; *ovary* green.

(Type specimen: Elmer n. 12681).

Geogr. distr. Philippines — Palawan — Prov. of Palawan, Brooks Point: Elmer n. 12681 (U, L, D, B); Palawan: A. Manalon F. B. 5190 (D); Palawan: Foxworthy n. B. S. 584 (D).

V. n.: *agtap* (Tagb.); *barangau-a-nolobaga* (Ilk.); *pamayabayen* (Ilk.); *sayo* (Ig.); *tantangan* (Tagb.).

The main differences with the nearly allied preceding species are: higher tree, the leaves crowded towards the ends of the ultimate branchlets, white fragrant flowers, the leaflets usually narrower and caudate, recurved at the top, with curved side-nerves, inflorescence not pendently elongated. It occurs in forests along streams and swamps at low altitudes, and along the sea-shore.

17. HAPLOPHRAGMA P. Dop

Contrib. à l'étude des Bignon. Bull. Soc. Bot. Fr. 72 (1925) 887.

Fig. 13 a, b; 14; 15.

P. Dop has made an interesting study on this genus, whilst he was working out the Indo-Chinese *Bignoniaceae*. He discusses the false septum of the capsule, which he mentions as the main character in dividing the genus *Heterophragma* into *Heterophragma* and *Haplophragma*.

For the same reason Clarke (Hook. Fl. Br. Ind. 4. 379) joined *Markhamia* and *Dolichandrone*, both possessing a false septum. The main problem is, what is the systematical value of that septum. Sprague (Kew Bull. 1919. 302)

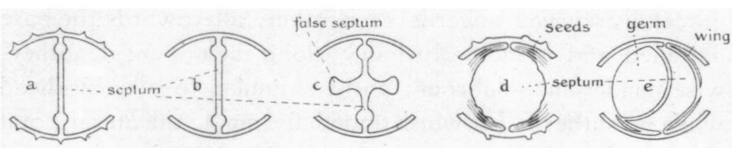


Fig. 13. Schemes of transverse sections of the capsules of a. Haplophragma adenophylla (Wall) P. Dop. (after P. Dop.) b. Haplophragma macroloba (Miq.) vSts. c. Heterophragma vestitum P. Dop. (after P. Dop.) d. Radermachera xylocarpa (Roxb.) K. Sch. e. Stereospermum spec. (one germ has been cut, of the other seeds only a wing has been cut.)

says, that whereas *Markhamia* and *Dolichandrone* both possess a false septum, more external characters exist, which oblige him to separate these genera. In both the corolla-tube is more or less funnel-shaped; in *Dolichandrone*, however, the lower and cylindric part of the tube is greatly developed and much exceeds the calyx and the limb is almost actinomorphic; whereas in *Markhamia* the cylindric part of the tube is very short and concealed in the calyx, only the upper part of the funnel being visible, and the limb is conspiciously bilabiate. In addition *Dolichandrone* has pure white, fragrant nocturnal flowers, whilst those of *Markhamia* are yellow, pink or lilac, etc. and expand in the day-time. It is probable that *Dolichandrone* has a pollination by moths. Thus Sprague.

These external morphological characters and also the biological ones seem to me indeed sufficient and of principal rank together to justify the separation Sprague undertook.

Now about *Heterophragma* (Fig. 13c). This genus is founded on *H. Roxburghii D. C.*, an Indian species. The others have been *H. sulfureum Kurz, H. vestitum Dop* and *H. adenophylla Seem.*

Dop remarks in general as to the classification of the *Bignoniaceae*-genera: „ces genres sont classés par la plupart des auteurs... d'après le calyce. Ce caractère ne m'a pas paru tenir compte des affinités réelles, qui ne peuvent être basées que sur la structure d'un organe plus central, l'ovaire et le fruit qui en dérive."

I cannot agree wit this remark. Seemann, Bentham, Hooker, Kurz, Clarke and Schumann indeed supposed several external characters, such as the calyx, etc. of importance, which they have expressed in their keys, but at the same time they used ovary, etc. as well for the great divisions as for generic separations. *Radermachera* and *Stereospermum* are principally separated by the fruit. That they are treated as sub-genera in the Genera Plantarum is explained by the fact that Bentham and Hooker usually considered more or less large generic diagnosis, whereas nowadays mostly much more narrow ones are distinguished. It is therefore that they treated the concerning groups as genera, certainly a matter of conception. The differences between the two are not altered. For the rest agreeing with Sprague, I also think that one should have a general outlook at the external morphological and biological characters. Besides Dop in his key of the Indo-Chinese genera also makes use of the external characters. So e.g. in *Ferdinandia* and *Haplophragma*, the first possessing a cupuliformous disk and axillar inflorescences, the latter having an annular disk and terminal thyrses.

With the foundation of *Haplophragma* I fully agree. Clarke gives in the diagnosis of *Heterophragma*: „septum flat or 4-angular." The 4-angular septa are found in the type *H. Roxburghii* and other species; a flat septum is only present in *H. adenophyllum.* In this respect Schumann made a mistake in his key (Pfl. Fam. IV. 3b. 229). Boerlage (Handb. Fl. Ned. Ind. 2 (1899) 596) already notes that it seems rational to him to separate *Het. adenophylla Seem.* from the other *Heterophragma's.*

Now there is an other Sumatranan species, described by Miquel as *Spathodea macroloba,* which Sprague (Kew Bull. (1919 305) calls synonyms to *Dolichandrnone spathacea.* I am sure he has not seen the original specimen of Miquel. Indeed it is the second species which is to be arranged in *Haplophragma.* The septum is as flat as that of *Hapl. adenophylla,* of a shining yellow, slightly bubbled, the seeds having the same structure, that is to say they are also flat, have a shining yellow relatively large germ and narrow membranous wings. The capsule of *Hapl. adenophylla* is linear, strongly curved and ribbed, that of *Hapl. macroloba* is slightly smooth and sub-straight.

The inflorescenses however differ totally; that of *Hapl. adenophylla* being very stout and terminal, whereas *Hapl. macroloba* possesses small lateral ones.

As to the affinities of *Haplophragma,* Dop indicates the African genus *Ferdinandia,* which some authors suppose to be synonymous with *Heterophragma.* As I have mentioned above, Dop marks the difference between *Haplophragma* and *Ferdinandia,* the former possessing terminal inflorescences and an annular disk, the latter showing axillar inflorescences and a cupuliformous disk. Whereas I have already said that *Hapl. macroloba* is undoubtedly a *Haplophragma* and has axillar inflorescences; the only difference remaining is the form of the disk, certainly not an important point. As I did not study any African species I am not competent to judge in this question.

It is a remarkable fact that *Haplophragma macroloba* reminds of *Radermachera xylocarpa*. The thyrses show a striking resemblance, and the capsule is much like that of *H. adenophylla*. It is rough with tubercules, curved or sub-straight, and much broader than that of most of the *Radermachera's*, which possess a linear, terete, smooth capsule. The septum, however, is the terete one, as usual in *Radermachera*, though the structure is the same, it is bubbled (caused by the press of the seeds), shining, yellow and corky like that of *Haplophragma*, but terete. The seeds of *R. xylocarpa* are also differing from those of *Haplophragma*, are broader, membranously winged, and thinner than those of *Haplophragma*. I suppose *Radermachera* and *Haplophragma* to be allied with each other, especially with respect to *R. xylocarpa*, the latter being more or less isolated in *Radermachera*.

Descr. emend. Arbores, folia magna opposita, 1-pinnata. *Thyrsi* terminales vel axillares, multiflori, flavescenti vel fuscescenti, pubescentes vel tomentosi. *Calyx* campanulatus, irregulariter 3-4-5-lobatus. *Corolla* campanulata-infundibuliforma, tubo angusto apicem versus dilatata, extus pubescente, lobis 5, sub-aequalibus, undulatis vel crenulatis. *Stamina* 4, didynamia sub-exserta, antheris divaricatis, quinto rudimentario. *Discus* annularis. *Capsula* magna, cylindrica, leviter vel valde curvata, costata vel laevis, bilocularis, septum planum, latius, pseudo-septum abest. *Ovula* ∞, multi-seriata in placentis pro loculo 2, marginalibus. Semina ∞, applanata, anguste membranaceo-alata.

(Tribus Tecomeae. Species 2, Indo-Malayan.
Type species: *Hapl. adenophylla P. Dop)*.

KEY TO THE SPECIES.

Inflorescences lateral rather small, pubescent when young, capsule sub-straight, smooth, lenticellate.. 1. *H. macroloba.*
Inflorescences terminal, rather large, stout, brown-tomentose when young, capsules curved with stout ribs ......
2. *H. adenophylla.*

1. **Haplophragma macroloba (Miq.) vSts. nom. nov.** — = *Heterophragma macroloba (Miq.) Backer* in Herb. Bog. Nomen — = *Spathodea macroloba Miq.* Fl. Ned. Ind. Eerste Bijvoegsel (1860) 565; Heyne Nuttige Plant. Ned. Ind. 4 (1917) 167, 2 (1927) 1371; Cordes Tijdschr. Ind. Mij. van Nijverh. & Landb. 14. 193.

Fig. 13 b; 14 a-d; 15 (1).

Descr. emend. Arbor procera 25—40 m. alta parte inferiore ca. 15—20 m. ebranchiata; *rami* teretes, cortice tenuissimo glabro griseo tenuiter costulato demum ramas agens longitudinales; *folia* opposita imparipinnata, 3—5-jugata 30—40 cm. longa, petiolus ca. 5—9 cm. l. supra plana vel subconcava margine acuto; foliola integerrima subsessilia vel 0.3—0.5 cm. longe petiolulata obovata-oblonga vel oblanceolato-oblonga apice breviter vel mediocriter acuminata basi cuneata 14—18 × 5.5—6.5 cm., juvenulia parviora, nervis lateralibus 8—11; jugis inferioribus minoribus, foliolis ca. 4 cm. longis ovatis vel ovato-orbicularibus; *inflorescentiae* laterales (an semper?) in ramis junioribus, cymis in racemos dispositis, parvae compactae pauciflorae 4—7 cm. longae 3—4 cm. latae fusco-tomentosae, pedunculis brevibus 0.5—1 cm. longis, pedicellis ca. 0.5 cm. l.; *calyx* campanulatus extus sparse pubescens (lobis incl.) ca. 1.2 cm. l., 2-lobatus, lobis ovatis, altero bifido, altero bilobo, apice ciliatis. *Corolla* lutea ca. 3—3.5 cm. l. hypocraterimorpha tubo angusto, extus sparse pubescente, limbo 5-lobato, lobis fere glabris crispus; *stamina* 4 fertilia quinto sterile, fere 0.75 cm. supra basin

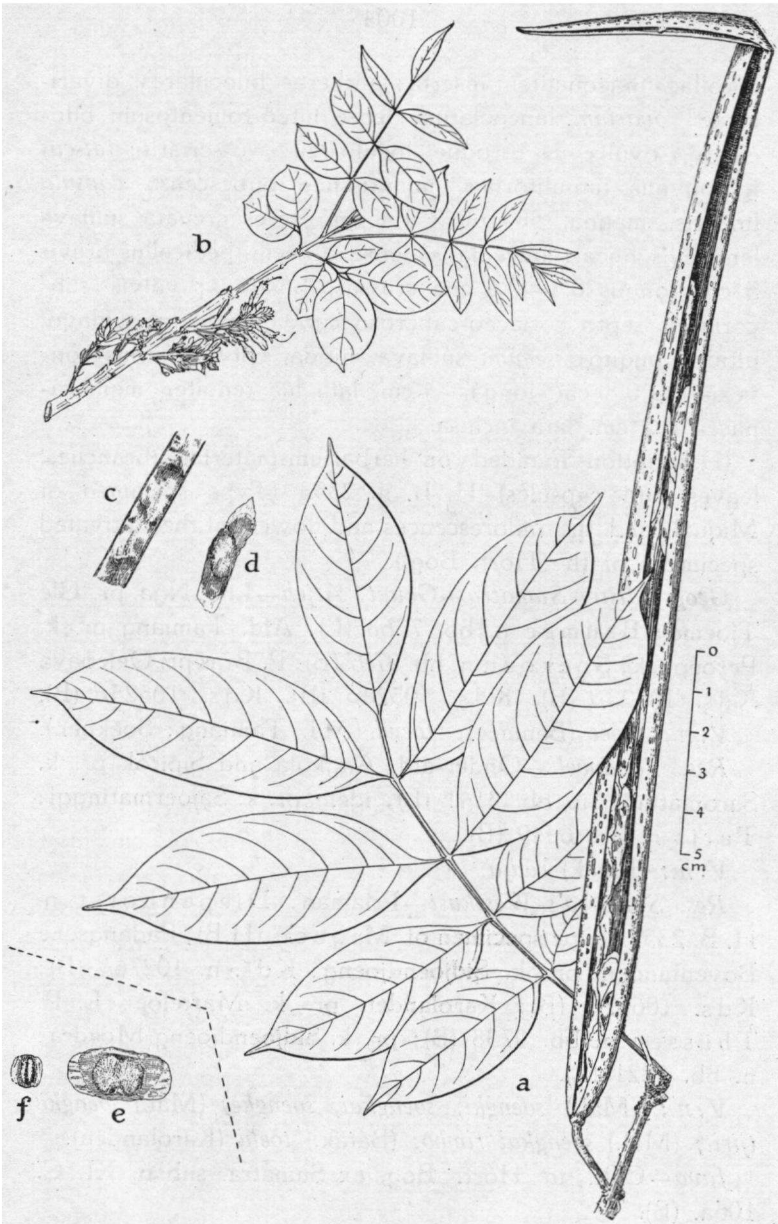


Fig. 14. Haplophragma P. Dop. H. macroloba (Miq.) vSts. a. Type specimen of Miquel (U). b. Flowering specimen (B. cult. sub n. XI c. 106a). c. Part of the septum (U). d. Seed. (U) H. adenophylla (Wall.) P. Dop. e. and f. Seeds out of the same capsule (Wallich n. 298). Magnif. 1/3 ×.

corollae inaequaliter inserta; antherae biloculares, divaricatae; *ovarium* lanceolatum dense luteo-tomentosum biloculare, ovulis in utroque loculo circ. 6-seriatis; *discus* hypogynus annuliformis, minutissime pubescens; *capsula* linearis, magna, 50—60 × 1.4 cm., teres arcuata sufflava lenticellis lineari-lanceolatis dense obtecta, pedicellus brevis 3 cm. longus 0.4—0.5 cm. crassus, bivalvus; valvis subcoriaceis septo coriaceo-suberoso ca. 0.8 cm. lato, sufflavo, nitido, iniquo; *semina* sufflava, nitida, cotyledonibus convexis ca. 0.8 cm. longa, 2 cm. lata ala tenuiter membranacea 0.2 cm. lata inclusa.

(Description founded on herbarium-materials (branches, leaves and capsules) H. B. n. 2353 (Type specimen of Miquel) and the inflorescences and flowers of the cultivated specimens of the Hort. Bog.).

Geogr. distr. Sumatra—Gouvt. Atjeh—Lho Nga pr. Glé Tjoemo: Beumée n. bb. 7368 (L); Afd. Tamiang pr. k. Peroepoek: Soekoen n. bb. 9797 (B); P. Bras pr. Oelepaya Kds. 10523β (B), Kds. 10524β (B), Kds. 10525β (B).

V. n.: thoée (Beumée); *toewi* (Afd. Tamiang: Soekoen).

Res. Tapanoeli—Onder-afd. Angkola and Sipirok pr. k. Saromatingi: n. bb. 3141 (L); idem pr. k. Sajoermatinggi: Taris n. bb. 6449 (B).

V. n.: (Batak) *radja.*

Res. Sumatra's Westkust—Priaman: Diepenhorst n. H. B. 2353 (Type specimen of Miquel) (U,B); Padangsche Bovenlanden pr. k. Sidjoendjoeng: Kds. n. 10276β (B); Kds. 10657β (B); Karolanden pr. k. Marteloe: L. P. Thijssen n. bb. 9738 (B); pr. k. Sidjoendjoeng Moedra: n. bb. 5821 (L).

V. n.: (Mal.) *soengki, soengkai, soengkè;* (Mal.) *soengkè tjirit;* (Mal.) *soengkai rimbo;* (Batak.) *toehi* (Karolanden).

Java—Cult. in Hort. Bog. ex Sumatra. sub n. XI. C. 106a. (B).

As the description of Miquel was incomplete, I des-

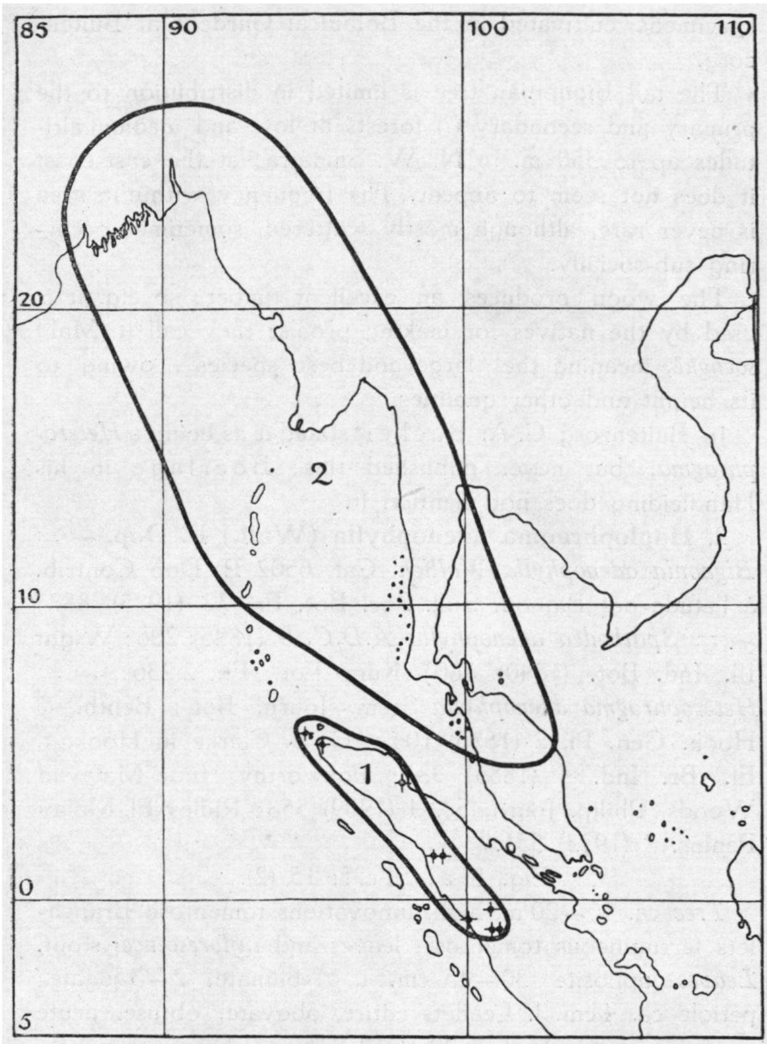


Fig. 15. Geographical distribution of Haplophragma P. Dop.
1. H. macroloba (Miq.) vSts., marked where specimens have been gathered.
2. H. adenophylla (Wall.) P. Dop.

cribed the inflorescences and the flowers of the flowering specimens cultivated in the Botanical Gardens at Buitenzorg.

The tall Bignonian tree is limited in distribution to the primary and secondary (?) forests at low and medium altitudes up to 350 m. in N. W. Sumatra; at the east-coast it does not seem to appear. The frequency within its area is never rare, although mostly scattered, sometimes occurring sub-socially.

The wood produces an excellent timber; so e.g. it is used by the natives for making proa's; they call it (Mal.) *soengkè*, meaning the "large and best species", owing to its height and other qualities.

In Buitenzorg C. A. Backer stated it as being a *Heterophragma*, but never published this; Boerlage in his Handleiding does not mention it.

2. **Haplophragma adenophylla (Wall.) P. Dop.** — = *Bignonia adenophylla Wallich* Cat. 6502 P. Dop Contrib. à l'étude des Bignon. Bull. Soc. Bot. Fr. 72 (1925) 887; — = *Spathodea adenophylla A.D.C.* 9 (1845) 206; Wight Ill. Ind. Bot. (1840) 160; Kurz For. Fl. 2.236; — = *Heterophragma adenophylla* Seem. Journ. Bot.; Benth. & Hook. Gen. Pl. 2 (1876) 1047; C. B. Clarke in Hook. f. Fl. Br. Ind. 4 (1885) 381; Foxworthy Indo-Malayan Woods. Philip. Journ. Sc. 4 (1909) 558; Ridley Fl. Malay Penins. 2 (1923) 551.

Fig. 13 a; 14 e, f; 15 (2).

Tree ca. 10—20 m. high, innovations tomentose. Branchlets ferrugineous tomentose, leaves and *inflorescences* stout. *Leaves* opposite 30—45 cm. l., 1-pinnate, 2—3-jugate; petiole ca. 4 cm. l. Leaflets entire, obovate, obtuse, acute or even acuminate 17—20 × 12—15 cm., brownish pubescent beneath, glabrous above except on the 9—11 pairs of nerves, lateral leaflets sub-sessile, rhachis stout, sub-terete, striate, brown-tomentose. Leaves immediately under the inflorescence single, entire, sessile, sub-orbicular ca. 4 cm. diam. *Calyx* ventricose-campanulate, rusty-tomentose, 2—2.5 × 1.5 cm. (incl. lob.); lobes ovale, subequal ca. 0.6 cm. l.. *Thyrse* stout, lax-flowered, totally ferrugineous tomentose, erect, terminal; peduncle ca. 8 cm. l., flowering part ca. 10—12 cm. l.; cymes 3—7-flowered, bracts narrowly lanceolate or triangular, decideous, ca. 1 cm. l.. *Corolla* brown-yellow, darkest inside, densely woolly-tomentose, when expanded, ca. 5 cm. diam. at the mouth, lobes hardly crispate or crenate. Anther-cells nearly separate, pendulous. *Capsule* very large sub-terete 50—100 × 2.5 cm., cylindric, cork-screw-like, on a 0.7 cm. thick pedicel, not hairy, strongly curved, rough with lenticels and with several strong ribs on each valve. *Septum* flat, shining yellow, slightly bubbled, ca. 1.4 cm. broad with corky opaque margin (placenta) ca. 0.15 cm. broad. Seeds 0.8—1.2 × 3.7 cm.

Geogr. distr. India — from *Assam* and *E. Bengal* to *Tenasserim* and *Andamans* frequent (C. B. Clarke); Ava (C. B. Clarke); Ripoe Irawadi: Wallich n. 6502a, type specimen? (P); Assam: Jenkins (P); Tenasserim and Andamans: Herb. of the latest E. I. Comp. ex herb. Helfer n. 4067 (P,U);?: Gaudichaud n. 289 (P).

Malay Peninsula — Open country in the north, Kedah, Alor Sta, Perlis, Chupeng (Ridley).

Malayan Archipelago — Cult. in Hort. Bog. sub. XI. I. 7 (B); Cult. Hort. Bog. sub. n. 6603 (B).

The tree is only endemic on the continent of E. Asia and does not occur in the Malayan Archipelago. In the Malay Peninsula it is found only in the northern parts and so it is not probable the species will be later on found in Sumatra or elsewhere in the Mal. Archipelago.

In the area it seems to be a common species.

TRIBUS III. CRESCENTIEAE.

18. PARMENTIERA D. C.

Bibl. Univ. Genève 17 (1838); Prodr. 9 (1845) 244; Bureau Monogr. (1854) 57; Miers Transact. Linn. Soc. 26 (1868) 166; Baillon Bull. Soc. Linn. Paris. 693; Seemann Transact. Linn. Soc. 28. 17.; Benth. & Hook. Gen. Pl. 2 (1875) 1051; Baillon Hist. Pl. 10 (1891) 55; K. Schumann Engler-Prantl Pfl. Fam. IV. 3b (1895) 247.

Parmentiera cerifera Seem. in Bot. Voy. Herald. 182. t. 32; K. Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) 247. fig. 94; Koorders Exc. Fl. 3 (1912) 185.

Shrub or *shrubbish tree* ca. 3 m., *leaves* opposite 3-foliolate, 7—8 cm. l. with a petiole 2.5—3 cm. a little ca. 0.1 cm. br. alate, cuneate to the base; folioles sessile ovate mostly shortly acuminate on the elder branches the leaves are fasciculated by 2 or 3 on lumplike short branches as in *Crescentia*. The *flowers* are cauliflorous; the *calyx* ca. 2.5 cm. is closed in bud and splits open afterwards as in a spatha on one side. The *corolla* ca. 5 cm. is ± regular campanulate-funnel-shaped, the 5 fertile *stamens* reaching the throat; disk indistinct. The *ovary* is 1-celled or at base 2-celled with many ovules on each placenta in several rows. The *fruit* on the old wood is very remarkable (name!) 0.5—1 m., ca. straight, linear-cylindric.

Geogr. distr. Malayan Archipelago. Java — Res. Batavia — Meester Cornelis: Weehuizen cult. in garden (B); Cult. in Hort. Bog.: Hallier f. (L. sub n. 910, 192...346) — *Res. Cheribon* — Indramajoe cult. on a churchyard: Backer n. 16679 (B) — *Res. Soerakarta* — Solo: Hemken cult. in garden (B).

This native of Panama is not so generally cultivated in the Malayan Archipelago as for instance *Crescentia;* so in Java, according to Koorders, the "candle-tree" is sometimes found in gardens as an ornamental shrub. I also saw specimens from Africa, but nothing, nor literature about the cultivation in the Philippines and in S. E. Asia.

Koorders [1]) made a research upon the buds, which contain water, a secretion of hydathodes.

Perhaps it would be better to refer also *Crescentia alata H. B. K.* 2) 3) to this genus, though K. Schumann arranges it in *Crescentia.* Urban [3]) states the differences of the pollen between *Crescentia* and *Parmentiera.*

19. CRESCENTIA Linn.

Gen. n. 762; D. C. Prod. 9 (1845) 246; Miers Transact. Linn. Soc. 26 (1868) 167, t. 7—9; Bureau Monogr. (1864) 55; Benth. & Hook. Gen. Pl. 2 (1876) 1053; Baillon. Hist. Pl. 10 (1891) 17, 54; Schumann in Engler-Prantl Pfl. Fam. IV. 3b. (1895) 248; Urban Ber. Deutsche Bot. Ges. 34 (1916) 757.

This genus is endemic in the neo-tropical region, but several species are for centuries ago introduced in the whole tropical region and cultivated there for ornamental purposes.

K. Schumann arranges in this genus also *C. alata H. B. K.* which Miers thinks to be a *Parmentiera,* on account of its 3-foliolate leaves and the alate rhachis. Urban is of the same opinion because of the pollen, which seems to be differing; *C. Cujete L.* has "furchenlosen sehr feinnetzigen Pollen" whereas *C. alata H. B. K.* possesses "3-furchigen Pollen mit schön netziger Exine". As I did not study many species of both genera, I agree for the present with K. Schumann in this point and arrange *C. alata H.B.K.* in *Crescentia.*

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[1]) S. H. Koorders. Uber die Blüthenknospen-Hydathoden einiger tropischen Pflanzen. Ann. Jard. Buitenzorg 14 (1897) 354—469.

[2]) Miers. Transact. Linn. Soc. 26 (1868).

[3]) I. Urban. Ber. Deutsche Bot. Ges. 34 (1916) 757.

KEY TO THE SPECIES.

Leaves simple, scattered . . . . 1. *C. Cujete.*
Leaves 3-foliolate . . . . 2. *C. alata.*

1. **Crescentia Cujete Linn.** Sp. Pl. (1753) 626; Lamarck. Ill. t. 547; Seemann Journ. Bot. 6 (1854) 269, 275; Seemann Transact. Linn. Soc. 23 (1860) 20; Miers Op. cit. 26 (1868) 167; Bot. Mag. t. 3430; Baillon Hist. Pl. 10 (1891) t. 44, 45; Schumann in Engler-Prantl. Pfl. Fam. IV. 3b (1895) fig. 93 E; Boerlage Handl. Fl. Ned. Ind. 2 (1899) 597; Merrill Fl. Manila (1912) 430; Koorders Exc. Fl. 3 (1912) 185; Merrill Enum. 3 (1923) 447; Heyne Nuttige Pl. Ned. Ind. 4 (1917) 167.

This small *tree* attaining ca. 8 m. has simple, scattered, lanceolate-spatula-shaped ca. 10—20 cm. l. *leaves*, mostly obtuse, but often shortly apiculate or acuminate at the top and always cuneate at the base, in sicco showing sometimes a metal-luminous surface; they are fasciculated on very short lumplike side-branches. The *flowers* ca. 5 cm. l. are few and placed on these short branches or or they are cauliflorus on thin or thick other branches. The *calyx* ca. 1 cm. l. remains long closed in bud and splits irregularly. The *corolla* is ventricose-campanulate with a transversal plait at the front, and is ivory towards lightgreen with purple inside. There are 4 *stamens* and a staminodium, the *ovary* has many ovules on 2 broad 2-lobed placentas: the *fruit* is head-shaped, the seeds are imbedded in a juicy fleshy hollow.

Geogr. distr. Sumatra. — Gouvt. Lampongsche Distr. — P. Sĕbĕsi: Docters van Leeuwen n. 5427 (B); pr. Monggala: Gusdorf n. 27 (B) — *Gouvt. Palembang* — pr. Moearodoa: Greshoff n. 431 (B).

V. n.: taboe kajoe (Mal.)

Java — Res. Batavia — Buitenzorg pr. Kotoparis: Bakh. v. d. Brink. f. n. 1621 (B); Krĕtĕk pr. Tji Omas: Bakh.

v. d. Brink. f. n. 522 (B); Weltevreden: Backer (B); Buitenzorg on the way Gardoe: Hallier f. n. 245 (B); Buitenzorg: Boerlage (L sub n. 908, 352...616); Cult. Hort. Bog.: Boerlage? (L sub n. 908, 337,..868); Cult. Hort. Bog. XI. H. 25 (L sub n. 922, 66... 449) — *Res. Preanger* — pr. Tjitjalenka: Wisse n. 869 (B) — *Res. Soerakarta* — pr. Tlawa: Kds. 209 β (L); pr. Passangrahan: Kds. 209 β (B).

V. n.: sikadel (Jav.); *sepokal* (Jav.); *bila balandha* (Mad.); *kalebasboom*; *bĕrnoek* (Soend.).

Kangean Arch. — P. Kangean: Backer n. 27022 (B); P. Kangean pr. Ardjasi: Backer n. 27363 (B).

V. n.: bila rhadja.

Halmaheira. — pr. Galĕla: Beguin n. 1854 (B, L).

V. n.: boewa.

Ambon: — Amboina: B. Robinson n. 1780 (L); P. Kelang pr. Ceram: Kornasi n. 1328 (L).

V. n.: kalabassa.

Philippines — cf. Merrill Enum.

The calabash-tree is recently introduced in the Malayan Archipelago and the Philippines and is now for ornamental purposes often cultivated; e. g. very often in Java (Koorders). It is also used as a "pager"-plant (Heyne). However, it seems that nevertheless this species does not run wild. The woody shell of the fruit, the true "calabash", is used by the natives.

Koorders [1]) made a research upon the remarkable buds of *Crescentia.*

Burman [2]) described another species *Crescentia ovata Burm.* from Java, which seems to be identical with *Crescentia cucurbitina Linn.*. I have not seen it among the

[1]) Uber die Blüthenknospen-Hydathoden einiger tropischen Pflanzen. Ann. Jard. Buitenzorg. 14 (1897) 354—469.

[2]) Burmannus Fl. Ind. 132; D. C. Prod. 9 (1845) 247.

herbarium-materials I studied. It seems that *C. cucurbitina* is no longer cultivated in the Malayan region.

2. **Crescentia alata H. B. K.** Nov. Gen. Sp. 3 (1818) 158; — *Crescentia trifolia Blanco* Fl. Filip. (1837) 489, ed 2 (1845) 343, ed. 3, 2. (1878) 271, t. 327; D. C. Prod. 9 (1845) 247; Miquel Fl. Ned. Ind. 2 (1856) 759; — = *Otophora paradoxa Blume* Rumphia. 3 (1847) 146; Seemann Journ. Bot. 6 (1854) 269, 275; ibid. Transact. Linn. Soc. 23 (1860) 21; F. Vill. Novis. App. (1880) 151; Vidal Sinopsis. Atlas (1883) 35, t. 73. fig. C; Merrill Fl. Manila. (1912) 430; Merrill Philip Journ. Sc. Bot. 9 (1914) 141; ibid. Spec. Blancoanae (1918) 350; ibid. Enum. 3 (1923) 447.

This small *tree* has 3-foliolate opposite ca. 10—12 cm. long *leaves*, with a long 6—7 cm., broad ca. 0.2—0.3 cm. winged petiole, single or fasciculated on lumps as in *Parmentiera cerifera Seem.*. The *folioles* are long-spatula-shaped to narrow oblanceolate. The *flowers* are cauliflorous, great ca. 7 cm., broad campanulate; the coriaceous *calyx* splits into 2 lobes.

*Geogr. distr. Philippines—Luzon—*Rizal prov. pr. Malaban: Merrill. spec. Blancoanae n. 515 (L); Manila (type spec. of *Otophora? paradoxa Bl.*): Herb. Perrottet n. 95 (L, P).

V. n.: cruz-cruran, hikara (a corruption of its ancient Mexican name).

South America — pr. Grenada, Plantae Nicaraguyenses: P. Levy n. 153 (P), n. 1383 (P); pr. Acapuleo, Am. equator.: M. A. Bonpland n. 3858 (P).

According to Merrill this West-Mexican native was introduced into Guam and into the Philippines by the Spaniards and still persists in cultivation in both, although now very rare in the Philippines.

Whether *C. alata* was naturalised in early times in the Philippines and has later on disappeared, I cannot tell, but in relation to *C. Cujete* this is not probable.

According to Merrill[1]) it is probably of comperatively recent introduction in Amboina.

CHAPTER II.

ORIGIN AND GEOGRAPHICAL DISTRIBUTION.

The main problem of plant-taxonomy is still the understanding of the ways along which evolution takes place, that is to say, the rational relation between a new originated species and its immediate ancestor. At least if one is convinced, as the present author is, that the acceptance of the evolution-theory is necessary for the modern student of biology with respect to the state of science nowadays.

There are, indeed, two opinions about the course of evolution.

The first is that evolution is determined by adaptation to external factors, whatever qualities these may be. (Inorganic ones as well as organic (biological) ones). This standpoint does not include the unscientific teleological hypothesis.

The second opinion is that of a not-tendenced unfolding in many directions, not influenced by external factors. One may think of a law, inherent in the organism itself, eventually caused by the structure of the protoplasm, the main substance of all organic life. But this law is not necessary for the acceptance of the opinion.

It is very difficult, perhaps impossible, to say which of the two opinions is the right one. Indeed, the second opinion combined with the rational thesis of the "survival of the fittest" has the same result as the first opinion, namely that "all organisms are in agreement with their neighbourhood" or at least are "not in contradiction" with it, which seems to be a fact a priori.

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[1]) Reliquiae Robinsonianae in Philip. Journ. Sc. 11 (1916) 312.

It cannot be the intention of the present author to bring this fundamental problem nearer to its explanation, though he believes that the second opinion will appear to be the right one in the future.

He intends with this treatise to throw some light upon the problem of the origin, geographical distribution and affinities of the Malagan *Bignoniaceae*.

Manner of spreading in Bignoniaceae. This manner is a very characteristic one in the family. The bulk of the species possess more or less broad membranously winged seeds, often with a small germ, representing a more or less perfect structure for wind-spreading. Notwithstanding this they show the same general characters of geographical distribution [1]) of many families which do not possess seeds which are easily removed by means of the wind. Thus they possess many genera with limited areas and many endemic species. The morphological structure of the seeds (or fruits) thus seems not to be the prime cause, determining the distribution as one would think at first sight and this character is not as profitable for the plants as it ought to be theoretically. J. C. Willis [2]) has been the first to emphasize this. Indeed we must accept that the enlarging of the area per year is rather small. To be sure each individual takes a part in the surrounding associations sens. lat. and it will be very difficult for its descendants to get place in these authochthonous vegetation.

The first difficulty met with is the concurrence, with which I indicate the complex of difficulties to which a seed is exposed before it has grown up a fruiting individual (germination-conditions, quickness of growth, life-form, etc.). Further its dependence on other external influences, organic ones, e.g. dependence on pollination

[1]) See Introduction p. 790.

[2]) Age and Area.

by insects, etc., as well as inorganic ones, e.g. soil, light, climate, etc.

I fully agree with Willis, when be ascribes the opinion that plant-spreading should be unlimited as to its rapidity, to the attention that was paid on the fabulous rapidity with which adventiva enlarge their area throughout the world.

It is probable that plants in natural conditions, that is to say individuals of an authochthonous vegetation but slowly enlarge their area. Further that different plants possess a different unit of enlarging the area (enlargement of the radius per year). Willis [1], however, supposes that allied species on the average possess nearly the same unit of enlarging the area. The morphological characters of spreading will be the same on the average, he says. I do not accept this supposition. The possibilities for spreading may be variable, even with allied species of the same genus. This is the case e.g. with *Dolichandrone (Fenzl) Seem.*. *D. spathacea (L. f.) K. Sch.* is a litoral species, which spreads by means of sea-drifts and possesses thick corky wings in this respect. The other *Dolichandrone's* spread by means of wind. Certainly there are more examples to be found in this respect.

Moreover, allied species often are in different respects dependent on climatical or edaphical factors; perhaps they have different germination-conditions or are in other respects dependent from the surrounding nature.

It seems to me that the hypothesis, allied species should have — probably — the same unit of enlarging their areas has not been established as yet, and is by no means probable.

Further one should have an eye upon accident, which plays an unknown part in our knowledge about the possi-

[1]) Age and Area 1922.

bilities of spreading. (Hurricanes with respect to wind-spreading, etc.).

For the rest there exists that strange phenomenon of becoming extinct, and on the other hand the sudden enlargement of the area.

A few examples may illustrate this. It is a pity — but it seems rational — that we know only few examples that have taken place in recent times.

How is it that *Trapa natans L.* has disappeared in the course of a few centuries out of Western Europe, except in some isolated spots?

How is it that the black rat (*Mus rattus L.*) disappears in Europe, now nearly ousted by the common or brown rat (*Mus decumanus Pall.*), which has migrated from Russia into Europe?

It is the same case with the crested lark (*Galerida cristata viarum Br.*), which has migrated from Russia into Europe in a hundred years or less.

These examples of recent date cannot be explained as due to human influence, because human influence in Europe has been acting rather intensely already almost during ten centuries.

Endemism. As to this there are two cases: firstly one may distinguish relic-endemism and secondly there exist progressive endemics.

Relic-endemics are species, which have possessed a larger area in earlier times and are found nowadays in rather isolated small area's. (e.g. *Taxodium, Sequoia, Ginkgo*).

Relic-finding-places we call the spots where a species was able to maintain itself. (*Trapa natans L.* and *Betula nana L.* in W. Europe). Relics are mostly characterized by continuous, sometimes very small areas or by disjunct areas. The latter is more especially the case with genera.

A. Engler [1]) is the man, who defends the theory of

[1]) Versuch einer Entwickelungs-Geschichte der Pflanzenwelt. Theil I—II. Leipzig 1879—1882.

the recent flora as composed of the results of earlier flora's and flora-removals. Thus he accepts the main spreading of plants being of relic-nature, only few plants representing progressive endemism and he understands the floras basing on geology and palaeo-climatology.

On the other hand one may consider the recent vegetable kingdom as the result of recent progressive development, the recent flora being composed of many progressive endemics and only rather few relics. In recent times this is especially paid attention to by J. C. Willis. He especially studied tropical flora's probably because he thinks to have eliminated the influence if the Glacial-Period in this manner [1]).

We are to test the spreading of the Malayan *Bignoniaceae* to both theories.

Geographical distribution of the Bignoniaceae. In fossil state the family is only known in a few fragmentary specimens [2]), which I shall not mention here with a view to the extraordinary difficulties met in determining sterile specimens or leaf-fragments from recent *Bignoniaceae*, apart from fossil ones, with which the difficulties of determining are the larger. It is certain that in the Tertiary Period *Bignoniaceae* existed already. The enormous spreading of the family throughout the world also points to this.

A remarkable fact is the existence of a high percent of monotypic or small genera, which cannot be referred to the interpretation of the generic rank. Indeed the *Bignoniaceae* represent a multiform and highly differentiated family in many respects. The following table may illustrate this. The number of genera I obtained with the study of K. Schumann in *Engler-Prantl* together with the publications in Just's *Botanische Jahresberichte* 1893—1923.

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1) Age and Area.

2) K. Schumann in Engler—Prantl. Pfl. Fam. IV 3b (1895) 208.

Thus in general the comparison will be a right one, though the *Bignoniaceae* often alter as to their genus.

	Number of Genera	Genera with 1—2 species	Genera with 1—5 species	Genera with 6—50 or more species
Bignonieae . . .	56	36	47	9
Tecomeae. . . .	47	28	38	9
Tourretieae . . .	1	1	1	—
Crescentieae . . .	14	7	13	1
Eccremocarpeae .	1	—	1	—
Bignoniaceae . .	119	72	100	19

Whether this is a proof, however, for the rather large age of a family or perhaps of its prosperity I do not know. Which factor is the proof for the prosperity of a family? Is it determined by the number of large genera, the number of genera, the number of species, the total number of individuals or perhaps by the morphological multiformity?

The recent distribution extends over the palaeo- and neo-tropics, some genera also occur in sub-tropical or even in the temperate regions (Japan, North America, Andine South America).

As to their altitude they occur in general at low and medium altitudes up to 1000—1500 m. Montane and alpine species are found indeed in some genera, e.g. in *Pandorea (Fenzl.) Spach, Tecomanthe H. Bn.* in New Guinea and in *Argylia D. Don* and *Campsidium Seem. et Reiss* in South America. So e.g. *Tecomanthe arfaki vSts.* attains 2500 m., *T. volubilis Gibbs.* 3100 m. and *T. nitida vSts.* 3000 m.

The largest number of genera is found in America, as may be seen in the following table.

	America	Asia	Australia	Africa
Bignonieae . . .	52	3	—	—
Tecomeae. . . .	22	17	4	12
Tourretieae . . .	1	—	—	—
Crescentieae. . .	7	—	—	6
Eccremocarpeae .	1	—	—	—
Total . . .	83	20	4	18

It is remarkable that many *Tecomeae* are found in America, whereas Asia only possesses 3 genera, viz. *Oroxylum, Millingtonia* and *Nyctocalos.*

The genera which occur on 2 continents are not separately inserted in the table. They are few and all *Tecomeae:*
in Asia and America: *Campsis Lour., Catalpa Juss.*
in Asia and Australia: *Pandorea (Endl.) Spach., Deplanchea Vieill., Dolichandrone (Fenzl.) Seem.*
in Asia and Africa: *Stereospermum Cham., Markhamia Seem., Dolichandrone* (Fenzl.) *Seem.*

It is peculiar that the Hawai Archipelago and New Zealand are not inhabited by *Bignoniaceae.* In the Fiji Archipelago one species occurs, viz. *Tecoma filicifolia Nichols.* (Dict. Gard. 4 (1887)13), but I do not know this species.

Affinities of the genera. I will mention several affinities which seem to be of importance for an explanation as to the origin of the African, Asiatic and Australian *Bignoniaceae.* Though this hypothesis is most plausible, a monographic study ought to be done, as I do not know many African and American genera.

a. Affinities of E. African and Madagascarian genera with S. E. Asiatic and Malayan genera.
Stereospermum Cham. — Africa, S. E. Asia to Borneo.
Markhamia Seem. — E. Africa, India.

Dolichandrone (*Fenzl.*) *Seem.* — E. Africa, India, Malaya, Australia. Closely allied to *Markhamia.*

Heterophragma D.C. — Africa, India.

Ferdinandia Seem. (Africa) allied with *Haplophragma P. Dop.* (India, Malaya).

Podranea Sprague, Perichlaena H.Bn. and *Kigelianthe H.Bn.* (S. and. S. E. Africa and Madagascar) allied with genera of the *Pandorea*-group.

Tecomaria Fenzl. (S. Africa) allied with the *Pandorea*-group.

b. Affinities of African and Madagascarian genera with American ones.

Tecomaria Fenzl. (S. Africa) allied with *Stenolobium D. Don* (Argent. to Mexico).

Many *Crescentieae, Kigelia D.C.* (Africa), *Paracolea H.Bn., Rhodocolea H.Bn., Siphocolea H.Bn., Phylloctenium H.Bn.* (all of Madagascar), *Colea Baj., Phyllarthron D. C.* (Madagascar, Seychelles and Mascarenes); for the rest the tribus only occurs in America.

Perichlaena H.Bn. (Madagascar), according to Sprague (Hook. Icon. pl. 2749), allied with *Tynnanthus Miers* from tropical America.

c. Affinities of Malayan and Australian genera with S. E. Asiatic ones.

Deplanchea Vieill. occurs from Malacca to New Caledonia.

Pandorea (*Endl.*) *Spach.* occurs from Malacca to New Caledonia.

Stereospermum Cham. occurs in both countries.

Oroxylum Vent. ,, ,, ,, ,,

Dolichondrone (*Fenzl*) *Seem..* occurs in both countries.

Nyctocalos T. et B. ,, ,, ,, ,,

Haplophragma P. Dop. ,, ,, ,, ,,

Radermachera Zoll. ,, ,, ,, ,,

d. Affinities of all Malayan and all Australian genera (Incl. New. Caled.)

Dolichondrone (Fenzl.) Seem. occurs in both countries.
Tecomanthe H.Bn. „ „ „ „
Deplanchea Vieill. „ „ „ „
Pandorea (Endl.) Spach. „ „ „ „
Neosepicaea Diels (New Guinea) is allied with *Pandorea.*
Hausmannia F.v.Muell. „ „ „ „

e. Affinities of Malayan and Australian genera with E. Asiatic ones.

Campsis Lour. is closely allied with *Pandorea* and *Tecomanthe.*

Incarvillea Juss. is perhaps also allied with the *Pandorea*-group.

Radermachera Zoll. occurs in both countries.

f. Affinities of Malayan and Australian genera with S. American ones.

Deplanchea Vieill. allied with *Delostoma D.Don.* (Andine S. America.

Nvctocalos T. et B. (Malaya, Br. India) probably allied with *Tanaecium Sw.;* not allied with *Rhigozum Burch.,* as Bureau (Monogr. (1864)52) remarks.

Campsidium Seem. et Reiss. (Chili) allied with the *Pandorea*-group.

Argylia D. Don. allied with the *Pandorea*-group.

g. Affinities of N. E. Asiatic and N. American Bignoniaceae.

Campsis Lour. occurs in both countries.
Catalpa Juss.

Genetic phytogeography of the Bignoniaceae.

Though this enumeration may be incomplete, I am convinced, that these affinities force the acceptance of the hypothesis that the *Bignoniaceae* of Australia, Africa and Asia have found their origin in America and that the *Bignoniaceae* have developed in America, most probably in tropical America.

All affinities point to the east, so that I suppose that the palaeo-tropical species participated in a flora-migration along the West-coast of the Pacific, to China and India and that this migration went further on in 2 directions, viz. a first group along Malacca and the Malayan Archipelago to New Guinea and Australia, the other group going to the west to British India, the Mascarenes, Seychelles, Madagascar and E. Africa.

There are 2 books I have paid especially attention to, as to the genetic-phytogeographical relations, viz. the excellent foundation of genetic-plantgeography "Versuch einer Entwickelungsgeschichte der Pflanzenwelt seit der Tertiar-Periode" of A. Engler (1879—82) and the work of I. H. Burkill[1]) on the flora of Upper Assam and its relations.

In general the relations of the *Bignoniaceae* mentioned are in agreement with the indications of these two authors.

I used the ingenious theory about modern geology of A. Wegener[2]), which seems to be of high interest for plantgeography.

First we have to deal with the question about the Behring-Straits Bridge, a necessarity of prime importance.

Since the beginning of the Tertiary Period, N. Amerika and N. E. Asia were connected with each other. In the Pliocene Period or probably in the beginning of the Quaternairy-Period this bridge has definitively broken down. Engler and Burkill both are in full agreement with this geologic date. Thus the *Bignoniaceae* may have gone in the Tertiary Period from America to Asia; probably not in the beginning of it, but perhaps in the Miocene (Burkill), as the Tertiair-arctic-pole must have

1) I. H. Burkill. The botany of the Abor Expedition. Rec. Bot. Surv. Ind. 10 (1924-5) 1-420.

2) A. Wegener. Die Entstehung der Kontinente und Oceane. Dritte Auflage. Hamburg 1922.

been then near the Alutian Islands, but has gone to Greenland. We do not know whether the Tertiary Bignoniaceae were all tropical plants or also sub-temperate genera, such as *Catalpa* and *Campsis,* but probably they were sub-tropical or tropical.

On the other hand Engler and Wegener (l.c. 53) point also to a connection of South America, the Antarctic Region, New Zealand and Australia. It is probable that the *Bignoniaceae* do not have migrated along this route, in earlier times belonging to one continental "Scholle". The Australian *Bignoniaceae* are allied with Malayan and Chinese ones, and in New Zealand no Bignonian species is found.

Thus the connection with the neo-tropical region must be found in the recent-arctic region.

Burkill (l.c. 187) gives an account of several genera, now extending as well in America, as well as in India, which have migrated east- or westwards, but all of them using the Behring-Straits Bridge in some warm period. When they crossed the bridge its climate must have been sub-tropical and fairly humid. He mentions the following genera of several families, not occurring in Africa, but extending from Abor-Land to N. America: *Magnolia, Dicentra, Cedrela, Leucaena, Polygonatum, Disporum, Spiranthes, Microtropis, Meliosma, Gymnocladus, Pachyrrhizus, Hydrangea, Pentapanax, Pratia, Symplocos, Callicarpa, Arundinaria, Podocarpus* and *Lindera;* the first seven genera of which have probably come from America.

Burkill says (lc. 193): "A period when a Rain-forest-flora could pass north of an Arabian sea seems to have been Miocene; geologists tell us that the union of Madagascar to Africa become broken during the Miocene age and it would appear that the Miocene-Rain-forest in Asia spread northwards over the whole of the then existing India, so as to pass round the seas that bounded the Deccan both east and west, i.e., to the north of latitude 20° N. It may also be said that at one period it went yet much further north; for genera, such as *Gordonia* including *Haemocharis* (now found in the West Indies, in Venezuela and in contiguous parts of S. America as well as is. Malaysia), and *Eurya* (just a little less wide), and other forest plants appear to have been able to cross the Behring-Straits Bridge in latitude of 60° N., together with various forest animals, such as the early apes of the *Prosimüdae*, and this in the Miocene Period.

It is remembered, that humidity as well as warmth, is necessary for the Rain-forest, and a drying of the climate is as fatal to it as a lowering of temperature. It is most likely, that want of humidity limited the Miocene Rain-forest before want of warmth and that it was an extension of an adjoining dry climate that cut the route between Africa and India. I offer no opinion upon the possibility of the spread forthwith into Miocene India, but there seems to be good reason, as has been already mentioned, to think that a dry climate ruled in north-western India towards the end of the Pliocene, and at that time, the dry conditions may have been so wide spread in Asia, on the north side of the tropics as to extend to the Behring-Straits Bridge. However, as Engler showed forty years ago (l.c. 26) woodland species seem to have been among the last wanderers across the bridge, which broke down in the Pleistocene Period at a time when it was temperate to arctic." And on p. 194: "The dry conditions, which I assume to have cut the Miocene Rain-forest of Africa, apart from the Miocene Rain-forest of Asia, persisted until the Glacier Period produced a new and intenser barrier by the descent of the cold to the shores of the Arabian sea, the cold bringing down temperate genera, giving them access to aequatorial mountains, and compressing that flora, which needed a dry heat, between its invading temperate plants and the fringe of tropical Rain-forest which clung to the Southern End of India and Ceylon. That this Rain-forest survived, we know; its survival makes us to assume, that the effect of the glaciation in the north was rapidly lost towards the equator; for, if it were otherwise, by what means could the Rain-forest have held on?"

Campsis and *Catalpa* may be of relative young age in the sub-temperate regions of E. Asia and North America. The disjunct area may have been originated in the Quaternary Period, when (Wegener) the Behring-Straits Bridge was broken. Whether some *Bignoniaceae* have gone along the Alutian Islands I do not know.

Burkill says (lc. 180): "The Glacial Period seems not to have had such an influence upon the Indian and Malaysian Rain-forests, at least did not act destructively upon the Malayan flora, though it may be asserted to have compressed it from the north, when it let in the chief part if not all the northern Spermatophytes found upon the tropical mountains of both worlds," with which remark I am in full agreement. Only two genera, viz. *Campsis* and *Catalpa* with sub-temperate species reach $\pm$ 40° N.L. the recent northern frontier of the *Bignoniaceae*.

The migration southwards to Japan, China and S.E. Asia must have taken place in the Tertiairy Period. Perhaps the bulk of them were *Tecomeae* and only few *Bignonieae;* but also there were *Crescentieae,* as these plants have reached the Seychelles, and even Madagascar. Most of them took part in tropical forest-vegetation. Even in the Tertiary Period (Miocene) these forests extended over a great deal of India, in those times united with E. Africa by Ceylon, the Seychelles, the Mascarenes and Madagascar, all of them forming a coherent geological unit, *„Scholle"* (Wegener), before the „Lemurian Zusammenschub." In this way the *Crescentieae* and the ancestors of other endemic Madagascarian genera have come in their recent places, and must have become extinct in the areas between. Burkill (l.c. 190) also mentions the close affinities of S. E. Asia with the Malagassian Region, Madagascar and E. Africa. The Lemurs occur in Africa, Ceylon and Malaya. He says: "The Sclaters in their geography of Animals (1899—104, 108, 151) suggest that between Madagascar and Ceylon they passed via the north side of the Arabian Sea, via Africa whence Madagascar obtained its mammal fauna. We must assume this that at one date there existed a Rain-forest climate around the north side of the Arabian Sea. If the Rain-forest conditions be held as allowing the *Lemuridae* to attain their Malagassy-Malaysian distribution, the occurrence of quite a considerable series of genera, such as, *Nepenthes, Tamtourrissia, Erythrospermum*, etc. in Madagascar as in Malaysia, seems to require no further explanation," and further on p. 192: "The Rain-forest areas in Africa may at one time have been extensive and must have been more extensive than now; but from very far back in the history of the Spermatophytes, it, in general, has had a dry climate: wherein apparently it evolved its numerous genera of terrestrial orchids, now so characteristic, and in the possession of which it is such a contrast to Malaysia and South America."

Engler (l.c. 289—297) and Burkill (l.c. 191) give several remarks on the alliance of the Mascarenes, Seychelles and Madagascar with Malayan, Australian and Pacific forms. Of this examples I will mention: *Weihea, Memecylon, Woodfordia, Parapsia, Pipturus, Thesperia, Evodia, Polyscias, Geniostema, Cerbera, Ochrosia, Alyxia, Exocarpus, Trichodesma, Medinilla, Oberonia, Dillenia, Pothos, Melostoma*, etc.. *Weimannia* his especially developed in Madagascar, the Mascarenes, Java, the Fiji Island and South America; the same with *Nepenthes, Rubus moluccanus, Nesogenes* (Rodriguez and Pacific Islands) and the allied genus *Acha-*

ratea (Madagascar), whilst other allied genera of *Chloantheae* are limited to Australia; the same with *Acacia heterophylla* (Madagascar) showing affinities wich those of the Sandwich Islands and of S. America. *Pisonia* and *Ocotea* (§ *Mespilodaphne), Omphalea, Milla* and the *Turneraceae* show the same relations.

Madagascar and the whole Malagassian Region show a high percent of endemism, due to their high age and in early times already isolated position. Certainly Wegener's theory about the existence of a united Africa, Madagascar, Malagassy, Ceylon and Deccan makes it easy to understand the phytogeographical relations, which were already established by Engler.

Whether Africa has got American *Bignoniaceae* from the west I do not know, as I did not study all African genera, but I do not think this to be probable, as all those I know, are closely allied with Indian or Malayan genera and much less with American ones.

The same is to be found in Europe, which does not possess any *Bignoniaceae* though the eastern United States are inhabited by three genera with 4 species and an exchange of this sub-temperate species has not taken place evidently before the Quaternary Period, when the Atlantic breaking up between Africa and South America, extended northwards, and separated Europe and North America from each other.

As to the relations of India, the Malayan Archipelago and Australia, the *Bignoniaceae* must have reached Australia in the Tertiary Period; they are known in New Caledonia and the Fiji Archipelago, where occur few, but endemic species.

The general relations I mentioned already are so striking that I give up attempts to illustrate these nearer, but I will pay attention to some peculiar ones within the Malayan Archipelago. The Philippines got their genera most probably from the other Malayan Islands and not along Korea, Japan and Formosa. No Japanese species is found here. Probably the Philippine *Bignoniaceae* migrated along the Malay Peninsula and Borneo to Palawan, etc., but perhaps also over Celebes and the Talaud Archipelago. *Radermachera* and *Nyctocalos* show resemblance with each other in this respect. *Nyctocalos* shows perhaps the route along Sumatra→Java and Celebes. The two other Philippine genera viz. *Oroxylum* and *Dolichandrone* possess a very large area and are common within their areas, but have certainly migrated along Borneo and Celebes to the Philippines. The only indication for a migration from China and Formosa to the Philippines may be found in *Radermachera* also occurring in China near Kanton, but it seems more rational to accept the first route, because the Chinese species is not immediately allied with Philippine ones.

How it is that *Pandorea* occurs in Malacca and further in Ceram, Ambon and the Key Islands I do know, but it is very peculiar. *Deplanchea* shows the same, having one species in the Malay Peninsula, Sumatra and W. Borneo and the islands between, whilst the others are found in New Guinea and further in Australia. *Tecomanthe* occurs in Ternate, Ambon, Ceram, New Guinea and Australia.

For this we can accept the route Malacca→Sumatra→Java→external Sunda-Islands-garland→New Guinea. In this respect and according to Wegener's hypothesis, this route may be understood, these islands forming a straight bridge in earlier times. How it is that no *Deplanchea*, *Pandorea* or *Tecomanthe* is found in the areas between W. Borneo and Malacca and Ambon and Ternate on the other side, I cannot understand. Certainly they became extinct on their route, but for what reason one cannot say. It is shown that ± all Malayan *Bignoniaceae* show rather strongly pronounced disjunct areas.

Polyphyletic and monophyletic origin. As to polyphyletic (polytope origin of species) development, the present author does not accept this for the following reasons.

Firstly he does not know any well-argued example. The fact that *Oenothera Lamarckiana* of H. de Vries gave several times raise to the mutant *O. gigas* and other mutants, does not say anything about this question; whereas it is established that *O. Lamarckiana* shows hybride-characters.

Moreover the examples given by Briquet and others are based on indications about former climates and geological arguments, which are not sufficiently proved. Thereabove they often studied vicarious species, which may be parallely developed ones.

The natural system of historic geology and the palaeontology give no indications in this direction either. The fossil species and genera, which characterize certain geological strata, on which even the division of strata has been based in a lot of cases, are certainly of the same origin, which has been proved by the other strata immediately above and beneath, showing always the same series.

Large groups may be composed of phylogenetically heterogeneous elements as for instance may be the case with the *Sympetalae*. As to the tribi of *Bignoniaceae* there seems to me no reason at hand to consider them as a result of polyphyletic development. They are truly too closely allied with each other and rather too sharply separated from the allied families.

Age and Area. It seems to me that the "*Age and Area*" hypothesis of J. C. Willis is in contradiction with what I found when studying the *Bignoniaceae*.

The first argument I will give is the fact of the enormous, but disjunct areas.

Striking examples are: *Nyctocalos T. et B.* (Fig. 1. p. 806), *Dolichandrone* (*Fenzl.*) *Seem.* (Fig. 11. p. 934), *Pandorea* (*Endl.*) *Spach.* (Fig. 4. p. 847), *Radermachera Zoll. et Mor.*

(Fig. 12. p. 954-5) and *Deplanchea Vieill.* (Fig. 9. p. 915).

One cannot say that this is due to the fact that these regions have not been worked out nowadays. Though Borneo, Celebes and New Guinea are more a less unknown, considerable collections have been made during the last few decennies in these countries.

Secondly the *Bignoniaceae* show a striking endemic development and many local spread species. So e.g. in *Tecomanthe H.Bn.* (Fig. 6. p. 885), *Deplanchea Vieill.* (Fig. 9. p. 915), *Radermachera Zoll. et Mor.* (Fig. 12. p. 954-5), *Dolichandrone (Fenzl.) Seem.* (Fig. 11. p. 934), *Pandorea (Endl.) Spach.* (Fig. 4. p. 847) and *Nyctocalos T. et B.* (Fig. 1. p. 806).

This cannot be denied even in New Guinea. What might be the reason that *Tecomanthe dendrophila (Bl.) K. Sch.* is found throughout New Guinea and even in the Solomon Archipelago, whereas many other species have a local spreading?

The most striking example is the case with *Nyctocalos T. et B.;* the four well-defined, though closely allied species known, are found in four different countries and separated by enormous distances. And *Nyctocalos* must have an origin of its own as it represents an absolutely isolated *Bignoniea* in Asia. It is neither allied with *Oroxylum* nor with *Millingtonia*, the two other *Bignonieae*-genera not occurring in America. *Oroxylum* on the contrary shows a well-defined continuous area.

As to *Radermachera*, the Indian species *R. xylocarpa (Roxb.) K. Sch.* (Fig. 12 (6). p. 954-5) and the Chinese species *R. pentandra Hemsl.* (Fig. 12 (13). p. 954-5) and *R. sinica (Hance) Hemsl.* (Fig. 12 (11). p. 954-5) are entirely isolated. The other 17 species are chiefly found in the Philippines, except the two common Malayan species viz. *R. gigantea (Bl.) Miq.* (Fig. 12 (17). p. 954-5) and *R. glandulosa (Bl.) Miq.* (Fig. 11 (5). p. 954-5). In the Philippines there are few species with a greater spreading, the bulk being endemic in different islands. Only *R. pinnata* (*Blanco*) *Seem.* (Fig. 12 (10). p. 954-5), *R. fenicis Merr.* (Fig. 12 (14). p. 954-5) and *R. acuminata Merr.* (Fig. 12 (15). p. 954-5) are more common species in the Philippines.

With *Tecomanthe* it is the same case. *T. ternatensis vSts.* (Fig. 6 (12). p. 885), *T. Hillii* (*F. v. Muell.*) *vSts.* (Fig. 6 (13). p. 885) and *T. amboinensis* (*Bl.*) *Boerl.* (Fig. 6 (11). p. 885) are rather isolated, especially the second rare one; but there are also 2 more common species, viz. *T. dendrophila* (*Bl.*) *K. Sch.* (Fig. 6 (5). p. 885) and *T. venusta S. Moore* (Fig. 6 (16). p. 885). The others are local spreaded species—endemics.

Deplanchea Vieill. (Fig. 9. p. 915) and *Pandorea* (*Endl.*) *Spach.* (Fig. 4. p. 847) show a striking resemblance. Of both genera, which are not in the least allied with each other, one species is found in Malacca (*P. Curtisii Ridl.*, strongly endemic) or Malacca and surrounding countries (*D. bancana* (*Scheff.*) *vSts.*, Malacca, Riouw Archipelago, Banka, Billiton, W. Borneo and S. E. Sumatra). Further both genera occur in New Guinea (distance ca. 3000 km!) and surrounding countries and at last some species are inhabitants of Australia and New Caledonia.

Of *Dolichandrone* (*Fenzl.*) *Seem.* (Fig. 11. p. 934) one species is found in E. Africa, also at a distance of about 3000 km from the allied Brit. Indian species.

The theory of "*Age and Area*" is principally based on progressive endemism. A species slowly enlarges its area; it produces new species from time to time (mutation-periods); the new species do the same, and so on. Thus the eldest species must show the largest areas, the youngest will be highly endemic.

It is a well-known fact that several *Gymnosperms*, which in earlier periods extended over very large areas (paleontology) are now limited to local countries (*Sequoia*, *Ginkgo*, *Taxodium.*). Willis does know these facts, but he considers this relic-endemism as an exceptional case. Besides, he considers especially tropical areas and thus thinks to avoid the difficulties with glacial relics.

In my opinion there are not only such apparent relics as mentioned above, but relic-endemism is also to be found in the tropical primeval forests. Why not? They also are composed of members of earlier floras and not only the result of progressive-endemic development.

My main argument against Willis is that generally one is unable to distinguish at first sight the difference between a progressive- and a relic-endemic.

This can only be made by a close study of the geographical distribution of all the species of a genus; of the affinities of the genera and of all species of a genus. E. g. in *Deplanchea Vieill.* the New Caledonian species are more closely allied with those of New Guinea than with those of Queensland and the Queensland species *D. hirsuta* (*Bailey*) *vSts.* and *D. tetraphylla* (*R. Br.*) *F. v. Muell.* show most affinities with *D. bancana* (*Scheff.*) *vSts.* at a distance of about 3500—4000 km! No species has been found in the area between them, though the trees are rather conspicuous as to their habit.

In my opinion the geographical distribution of the *Bignoniaceae* points to relic-endemism, the only manner in which the difficulties may be cleared up, though I consider some species of *Radermachera* in the Philippines and of *Tecomanthe* in New Guinea as the result of a progressive-endemic development.

Willis treats the age of a flora by means of adding all species, each with a number as to its rarity. His results are almost too good; he obtains 90 % and more the same as the results which could be obtained from a theoretical point of view. But if it will appear — and I am sure of that — that more families in the tropics exist with a high grade of relic-endemism, then it will be clear that his ingenious theory is unsound. Especially this will be the case in my opinion with his statistical researches. Statistics are always a dangerous means for such researches.

At last one does not known any longer the object one studies, but chiefly gives attention to the curves. And curves also are very difficult to interprete.

Burkill (l.c. 198) does not accept "*Age and Area*" as an explanation for the origin of tropical flora's. He says: "but the reason which he gives for endemics being found over narrower areas in Ceylon than species widely spread beyond Ceylon, namely that the endemics are new species which have not had time to spread, will not in his simplicity satisfy me at all.... On his own showing his figures for endemics are figures for Rain-forest, and, though he does not bring the point out, his figures for wides, are a mixture of species of all sorts of conditions, dry and wet, agrestal and forest so that he has contrasted species for which the area suited is obviously limited with species for which the area suited is wide, and therefrom comes the obvious order in his results."

Of course I fully agree with Burkill, who studied the Indian Rain-forest-flora just as Willis did.

Indeed only the most simple case: a newly originated species spreads from a centre, gives raise to new species, etc., the new species being similar as to their manner of spreading, their resistence against external factors, etc.; only this can be explained with Willis' theory, but also without it.

But if the case is more complicated, "*Age and Area*" cannot explain anything, as this hypothesis does not take account of the earlier flora's which are certainly for a great deal extinct nowadays, nor of the biology of the species.

Sunda- and Sahul-shelf. (Fig. 18). Upon the importance of these biological data which are based on geological ones and concern the origin and explanation of the distributions of animals and plants in Malaya, Merrill[1][2] has recently written some excellent papers. Also H. J. Lam[3] and others are interested in this problem, which was put forward by Wallace, and later on by P. Pelseneer[4] and was established by G. A. Molengraaff[5].

First I will deal with the limits of the Sunda-shelf to its north. Merrill[1] has pointed out that Formosa belongs in plant-geographical respect to the China-shelf. It possesses many Himalayan and Chinese continental temperate genera and even families, which do not occur in the Philippines.

The Philippines on the other side possess a lot of especially tropical-forest-genera, which do not occur in Formosa (Merrill l.c. p. 600). Though one can see Formosa from L'Yami, the most northern island of the Philippine Archipelago, a deep separates the regions since the beginning of the Tertiary Period. The most striking example of the extremely sharp separation is that of the *Dipterocarpaceae*[6], a relatively newly originated family, the bulk of which has been found in Borneo, but has certainly gone along the Sulu- and Palawan Archipelago to the Philippines. Notwithstanding the fact, that fossil *Dipterocarpaceae* have been found in the Pliocene of Luzon, no species

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1) E. D. Merrill. Die Pflanzen-geographische Scheiding von Formosa und der Philippinen. Engl. Bot. Jahrb. 58 (1923) 599—604.

2) E. D. Merrill. The correlation of biological distribution with the geologic history of Malaysia. Proc. Pan-Pacific Sci. Congress. Australia. (1923) 1148—55.

3) H. J. Lam. Remarks on the genetic-phytogeography Malayan Archipelago. Ann. Jard. Buitenzorg 37 (1927) 33—48.

4) R. Pelseneer. La ligne de Weber, limite zoologique de l'Asie et d'Australie. Bull. Acad. Belg. (1904) 1001—1022.

5) G. A. F. Molengraaff. Modern deep-sea research in the East-Indian Achipelago. Geogr. Journ. 57 (1921) 95—121, fig. 1—9, map.

6) E. D. Merrill. Distribution of the Dipterocarpaceae. Philip. Journ. Sci. 23 (1923) 1—33. t. 8.

occurs in Formosa and only few have been found in Celebes, the Moluccas and New Guinea.

The *Bignoniaceae* show the same relations in this case; as I above pointed out the route over China, Malacca and Borneo to the Philippines and not over Formosa. So e.g. *Oroxylum Vent.* (Fig. 2), *Dolichondrone (Fenzl) Seem.* (Fig. 11), *Radermachera Zoll.* (Fig. 12) and *Nyctocalos T. et B.* (Fig. 1) the only Philippine *Bignoniaceae.*

The limits of the northern part of the Sunda-shelf are geologically and botanically undoubtedly established.

Merrill (l. c. 603) says: "Der Philippinen Archipel zeigt hauptsächlich eine malayische Flora, und diese malayischen Elemente sind abzuleiten im Südwesten von den Sunda-Inseln, im Süden und Osten von Celebes, der Molukken und Neu-Guinea", and I give up further botanical illustration of this fact by means of Merrill's most interesting examples.

A more troublesome matter is that of the limits of the Sunda-shelf to the east and the Sahul-shelf to the west.

A first line has been drawn by Wallace between the Philippines, Borneo and Bali on one side and Celebes and Lombok on the other side, along the Makassar Strait and the Lombok Passage.

The second line has been called Weber's Line by Pelseneer and has been drawn more eastwards; it extends east of Timor, west of Buru and Halmaheira and east of the Philippines.

The Sahul-shelf is constituted of Australia and New Guinea: an elevation of 20 metres of the shelf would connect Australia and New Guinea with each other. Both shelf-regions have been stable at least since the close of the Pliocene. During Pleistocene Ice-Ages New Guinea was alternately connected and disconnected from the Asiatic continent.

The stable character of these two ancient areas, now approximately delimited by the present of the 200 m. isobath, probably persisted to a greater or less degree in the preceding geological periods.

The break between Australia and Asia probably came in the late Cretaceous or in the Epi-Mesozoic-interval, and since that time it seems to be evident that intermigrations of plants and animals between Australia and Asia, and between eastern and western Malaya, have been interrupted or inhibited by the constant archipelagic condition of this intermediate unstable area "Wallacea" (Merrill).

So Wallace's Line is the place where the unstable Wallacea impinges to the west on the stable Asiatic continental area, Weber's Line where it impinges to the east on the Papuan — Australian Pliocene — Pleistocene continent.

Merrill and others suggest that both continental areas represent both centres of origin and distribution, the interchanges of which have taken place over "Wallacea". Thus in "Wallacea" a mixture of Asiatic and Papuan (and Australian) forms has been found. The bulk of them can be explained by the two lines mentioned. But I fully agree with Merrill (l. c. 1155) where he says: "In summarizing I would emphasize the conclusion that Wallace's Line cannot be abandoned in favour of Weber's Line, nor *vice versa*. Both are important, although neither is an absolute boundary between Asia and Australia, when all groups of plants and animals are taken in consideration. Both are due to fundamental geological causes, one being the western, the other being the eastern boundary of a long-continued insular unstable region situated between the two ancient stable continents. No matter how much more convenient a simple line of demarcation would be from the stand-point of delimiting bio-geographical areas, I believe that we must be forced to abandon the idea of a simple boundary line, and accept a region of transition as separating Australia and Asia, and this transition zone is the area between Wallace's and Weber's Line".

Let us have a look upon the relations of the *Bignoniaceae* in this respect.

Though the number of genera is relatively small, they are to divide in some groups.

The first group, is characterized by a continental Asiatic character, viz. *Haplophragma P. Dop.* (Fig. 15. p. 1005) from Burma to Malacca and N. Sumatra and the allied *Heterophragma D. C.* (p. 999) not found as yet in the Malayan Archipelago: *Stereospermum Cham.* (p. 947) extending from Africa to India, Burma, Malacca and Borneo and several S. E. Asiatic genera, such as *Tecomella Seem.*, *Pajanelia D. C.*, etc.

Secondly one genus extends throughout the palaeotropics, viz. *Dolichandrone (Fenzl.) Seem.* (Fig. 11. p. 934) from E. Africa to New Caledonia. Especially *D. spathacea (L. f.) K. Sch.* (Fig. 11 (4). p. 934), a distinctly distinguishable coastal tree occurs from Malabar to New Caledonia, but is not known from Australia, a problem in itself in regard to the relative easily spreading of its corky seeds by sea-currents. The genus is represented in N. Australia with a sub-genus *Coriaceae vSts.*, which is limited to that region. Thus *Dolichandrone (Fenzl.) Seem.*, most probably of high age in the branch of the *Bignoniaceae*, is not interrupted by any of the lines of Weber or Wallace.

Thirdly there are 3 genera which are only known from the regions west of Weber's Line, viz. *Radermachera Zoll.* (Fig. 12. p. 954-5), *Oroxylum Vent.* (Fig. 2. p. 817) and *Nyctocalos T. et B.* (Fig. 1. p. 806).

The first two have perhaps gone to the Philippines along Borneo, though *R. fenicis Merr.* points also to Celebes as a probable route. *Nyctocalos T. et B.* shows the close alliance of Celebes with the Philippines; *N. cuspidatum (Bl) Miq.* has been found throughout the Philippines and is known also from the Minahassa.

The **fourth group** is that of the genera belonging to the Papuan-Australian continent east of Weber's Line, viz. *Tecomanthe H. Bn.* (Ternate, Ceram and Ambon, N. Guinea and Queensland) (Fig. 6. p. 885) with 16 species, *Neosepicaea Diels* (E. N. Guinea) (Fig. 7 (1). p. 899) monotypic, and *Hausmannia* (Queensland) (Fig. 7 (2). p. 899) monotypic.

All of these three are allied and belong to the *Pandorea*-group (p. 837). Perhaps one would believe the 2 monotypic genera to be more or less differentiated, younger ones. But in morphological respect they show the (perhaps) primitive actinomorphic *Tecoma*-flower, whilst *Tecomanthe* is mostly distinctly zygomorphic, so that the case may be justly the contrary.

The **fifth group** includes still 2 genera, which cannot be explained by Weber's Line, viz. *Pandorea* (*Endl.*) *Spach.* and *Deplanchea Vieill.* Both genera belong principally to the Papuan-Australian continent following Weber's Line, but each of them is represented by one species in the western part of Malaya. *Pandorea Curtisii Ridl.* is a strongly endemic species in Malacca, and *Deplanchea bancana* (*Scheff.*) *vSts.* is a rather common spread species in Malacca, S.E. Sumatra, the Riouw Archipelago, Banka, Billiton and W. Borneo. This may be understood, if we suppose that both genera possessed much larger areas in earlier times, Pliocene or Miocene perhaps and that both have partly become extinct.

Perhaps later on the Papuan species have again enlarged their area and may have produced new species, extending the area again westwards, but was limited there by Weber's Line which had become a real barrier in the meantime and thus *P. ceramensis* may be interpreted (or the ancestors of this species).

In general we can say that the geographical distribution of the Malayan *Bignoniaceae* may be explained by the unmodified line of Weber, though they existed already in Malaya and Australia before Weber's Line was a real barrier for distribution.

CHAPTER III.

UTILITY OF MALAYAN BIGNONIACEAE FOR HUMAN AIMS.

Though in chapter II I have mentioned already something about the use made of Malayan *Bignoniaceae*, I intend to give an enumeration here.

Generally speaking, the species do not give a good timber. *Oroxylum indicum (L) Vent., Dolichandrone spathacea (L. f.) K.Sch., Radermachera glandulosa (Bl) Miq.* and *Crescentia Cujete L.* are small trees, mostly with a crooked main stem and of a crowded habitus.

Lians, such as *Nyctocalos T. et B., Pandorea (Endl.) Spach.* and *Tecomanthe H.Bn.* cannot be used as timber either.

Deplanchea bancana (Scheff.) vSts. and all other *Deplanchea's* possess a very soft wood, not fit for timber.

The only species which produce a good timber are the large trees (30—50 m.): *Haplophragma macroloba (Miq.) vSts.* (= *Heterophragma macrolobum Backer* in Heyne Nuttige Planten Ned. Ind. 2. (1927) 1371) and *Radermachera gigantea (Bl.) Miq.*

The first species only occurs in N. W. Sumatra (1006); rather frequent in the "Padangsche Bovenlanden" (Res. Sumatra's Westkust) and less frequent at lower altitudes in Priaman and moreover spread to Atjeh. It gives an excellent timber, solid and delicately fibrous; the natives use it often for proa's. Perhaps it would be interesting to cultivate the gigantic tree elsewhere in the Malayan Archipelago. In the Hort. Bogor. the species is cultivated and seems to prosper pretty well, though it never produces capsules there, but only flowers.

The second species: *Radermachera gigantea (Bl) Miq.*, is also useful for its timber; it is a tree of 25 m. high on the average. It occurs in the entire Malayan Archipelago and is often frequently found up to 1500 m. altitude. The wood is just as that of *Haplophragma macroloba (Miq). vSts.* useful for building-purposes; the structure is durable and the timber rather large. Nevertheless the use of it is only local.

It would be of interest to make experiments with the cultivation of both species.

The wood and bark of *Oroxylum indicum (L) Vent.*, *Dolichandrone spathacea (L.f.) K.Sch.*, *Radermachera gigantea (Bl.) Miq.*, *Radermachera glandulosa (Bl.) Miq.*, *Haplophragma macroloba (Miq.) vSts.* and *Cresentia Cujete L.* is further used for several officinal and other purposed. See for this Heyne: Nuttige Planten Ned. Indië. 2 (1927) 1370—2.

Summary.

1. An outline of the taxonomy is given, together with the geographical distribution.
2. It has turned out that the monotypic genus *Haplophragma P. Dop.* (1925) possesses a second species in Sumatra, viz. *H. macroloba (Miq.) vSts.*
3. To emphasize the fact that the Australian *Dolichandrone's* are separated from the other species, it is suggested that *Dolichandrone (Fenzl.) Seem* is constituted of 2 sub-genera, viz. *Coriaceae vSts.* (Australia) and *Membranaceae vSts.* (Africa, S. E. Asia, Malaya, New Guinea, New Caledonia).
4. A scheme of the phylogenetic relations within *Tecomanthe H.Bn.* is made, based on the structure of the ovary, together with the habitus and geographical distribution. (Fig. 16.)
5. There are striking indications that within *Tecomanthe*

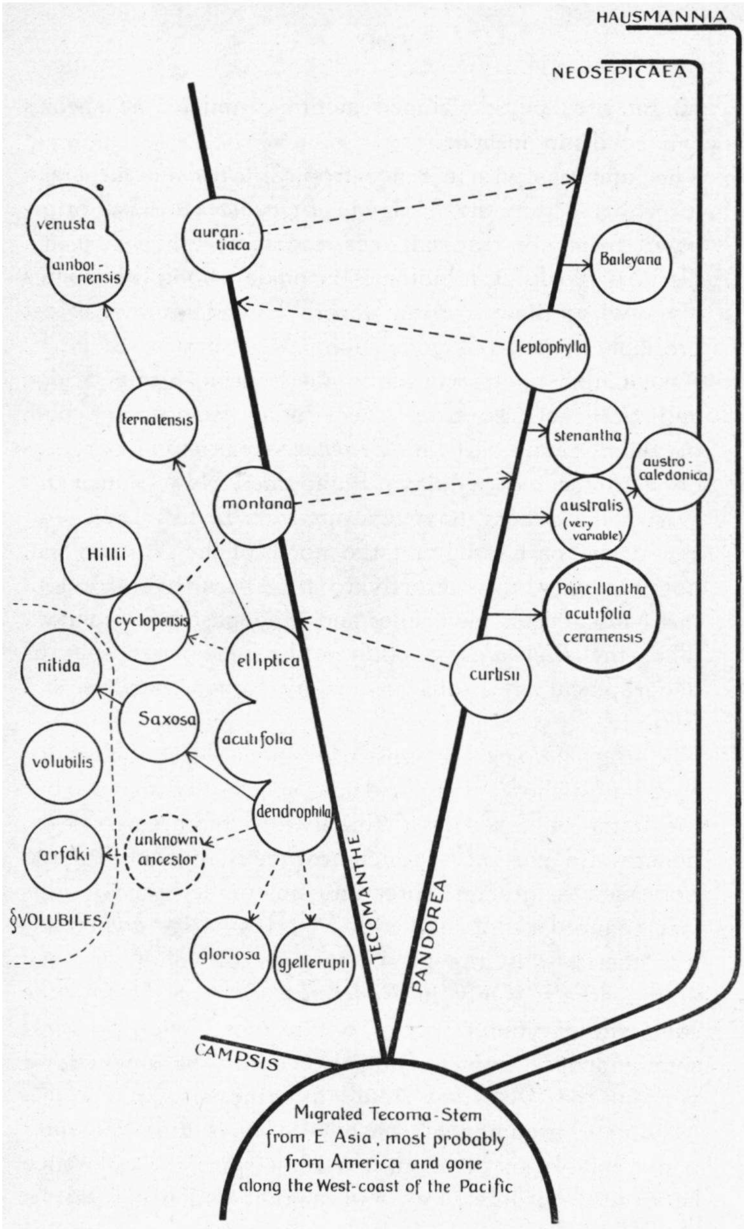

Fig. 16. Scheme of the phylogenetic relations in the Pandorea-group. Pandorea (Fenzl.) Spach., Tecomanthe H. Bn., Hausmannia F. v. Muell. Neosepicaea Diels, Campsis Lour.
(———— relations established, - - - - - - - - - - relations doubtful).

H. Bn. parallelly developed montane and alpine species can be distinguished.

6. The affinities with the neo-tropical *Bignoniaceae* make it probable that the Malayan *Bignoniaceae* have originated from neo-tropical ones and have taken part in a Tertiary flora. A hypothesis is made about the routes along which these tropical genera have migrated. Most probably they have gone along N. America, to N. E. Asia, China and Japan along the Behring-Straits Bridge and perhaps also along the Alutian Islands; the bulk of them belong to the *Tecomeae*-stem. One part has gone to the east: Malaya, Philippines, New Guinea and Australia. Others have migrated to British India and E. Africa, perhaps along the north of the Arabian Sea, but certainly also directly to E. Africa over Ceylon, the Mascarenes, Seychelles and Madagascar (Wegener). Thus the *Bignoniaceae* point to the same genetic-phytogeographical relations as many other families do. (Fig. 17).
7. The *Bignoniaceae* are most probably at least of Tertiary age. They show many endemic species and genera, but the latter often also with highly disjunct area's. These genera are partially extinct nowadays, but must have possessed a greater spreading in earlier times. This fact cannot be explained with Willis' *"Age and Area"* hypothesis, this theory being only of value for very young flora's. Only in *Radermachera* and *Tecomanthe* some rather young species occur, these being progressive endemics, which can also easily be understood without the *"Age and Area"* hypothesis.

   My main argument against Willis is that generally one is unable to distinguish at first sight the difference between a progressive- and a relic-endemic. Only a close monographical study may clear up the phylogenetic relations.

Relic-endemism is not rare in the *Angiosperms* and is not only due to Ice-ages, but relic-endemism is also to be found in the tropical primeval forests (and Rain-forests), which also are composed of members of earlier floras and are not only the result of progressive-endemic development in agreement with the ingenious outline of genetic-phytogeography of A. Engler.
Moreover *"Age and Area"* is a statistical (mathemathical) theory, not keeping account with the biological peculiarities of the species.

8. The geographical distribution of the Malayan *Bignoniaceae* may be explained by Weber's Line, though some of them existed already in Malaya before this line represented a real barrier for biological distribution. Fig. 18.

The present work has been made in the Botanical Laboratory of the University at Utrecht.

The author wishes to express especially his sincere thanks to Professor Dr. A. Pulle, Director of the „Botanisch Museum en Herbarium", who enabled him to work out the present publication under his authority and kindly put his most valuable help in all respects at his disposal.

Contents.

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Synonyms are printed in italics.

New species, varieties, forms, etc. and descriptions are marked with: nov. spec., nov. var., descr. emend., etc. behind the name.

Figures are cited in the text under the enumeration of the literature.

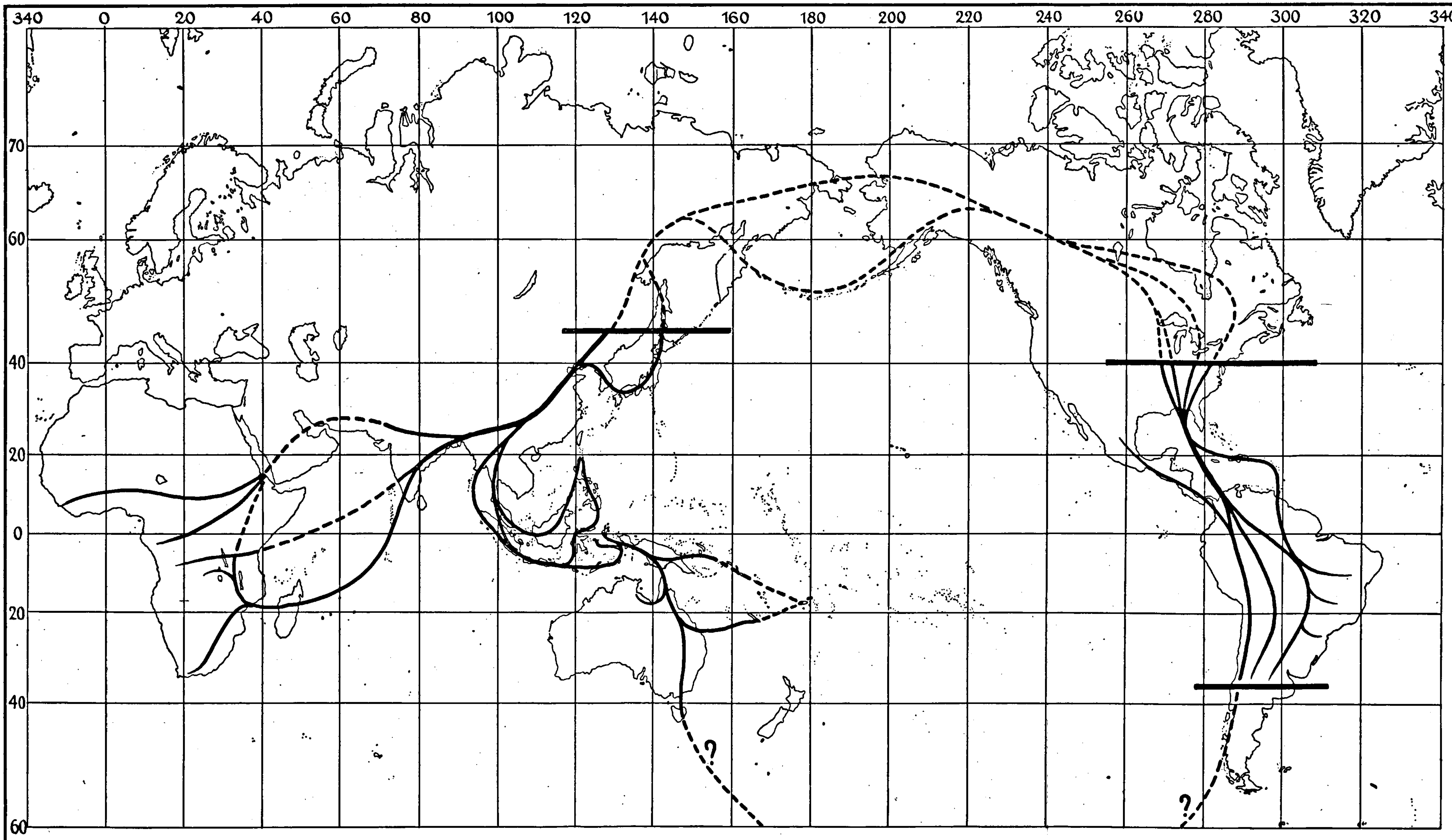

Fig. 17. Scheme of phylogenetic relations of Bignoniaceae in recent and earlier times.
- - - - - - - - Hypothetical routes. ———— Recent relations etablished.

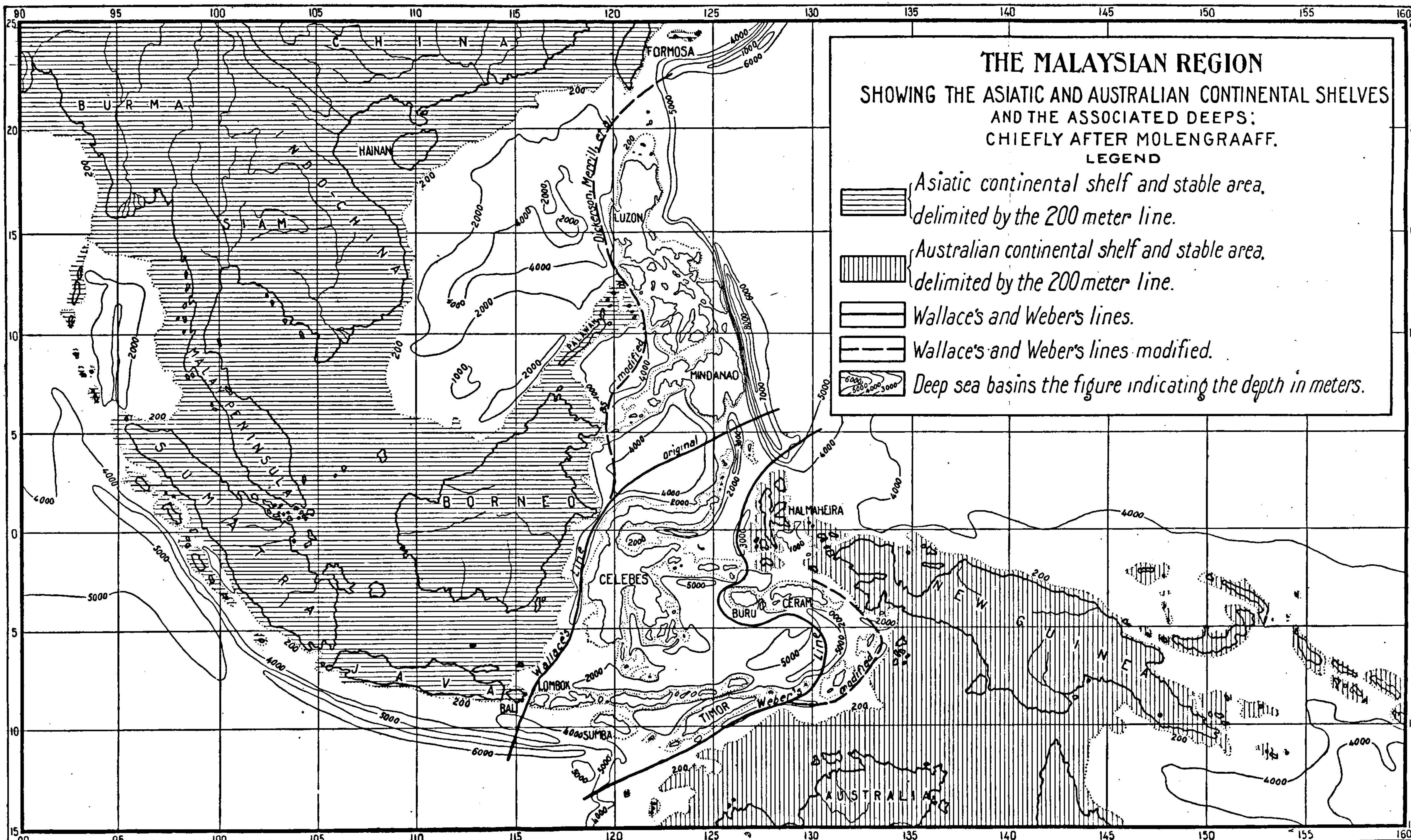

Fig. 18. Sunda- and Sahul-shelf after Merrill.