



# A monograph of the Burmanniaceae

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A MONOGRAPH OF THE  
BURMANNIACEAE

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BIBLIOTHEEK DER  
RIJKSUNIVERSITEIT  
UTRECHT.







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BURMANNIACEAE

BY  
J. H. BURMAN

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UNIVERSITEITSBIBLIOTHEEK UTRECHT



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# A MONOGRAPH OF THE BURMANNIACEAE

PROEFSCHRIFT

TER VERKRIJGING VAN DEN GRAAD VAN  
DOCTOR IN DE WIS- EN NATUURKUNDE  
AAN DE RIJKS-UNIVERSITEIT TE UTRECHT,  
OP GEZAG VAN DEN RECTOR-MAGNIFICUS  
Dr. Th. M. VAN LEEUWEN, HOOGLEERAAR  
IN DE FACULTEIT DER GENEESKUNDE, VOL-  
GENS BESLUIT VAN DEN SENAAAT DER UNI-  
VERSITEIT TEGEN DE BEDENKINGEN VAN  
DE FACULTEIT DER WIS- EN NATUURKUN-  
DE TE VERDEDIGEN OP MAANDAG 16 DE  
DECEMBER 1939, DES NAMIDDAGS TE DRIE UUR

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FREDRIK PIETER JONKER  
GEBOREN TE STAD-ALMELO

KEMINK EN ZOON N.V. - OVER DEN DOM - UTRECHT - 1938







*AAN MIJN OUDERS*



Nu dit proefschrift een afsluiting vormt van mijn officiële academische studie, wens ik op deze plaats tot allen, die bijdroegen aan mijn wetenschappelijke vorming, een woord van dank te spreken, speciaal tot de hoogleraren en andere docenten in de biologische vakken aan de Utrechtse Universiteit.

Een extra woord van dank richt ik gaarne tot mijn promotor, prof. dr. A. A. PULLE, die mij door zijn belangstelling in mijn werk en vooral door het feit, dat hij mij als assistent verbond aan de staf van zijn laboratorium, de gelegenheid schonk, dieper in de plantensystematiek door te dringen dan anders het geval zou zijn geweest.

Het bestuur van het Miquelfonds, dat reeds zoveel studiereizen van Utrechtse botanici mogelijk maakte, stelde ook mij in staat enige weken te werken in de herbaria te Londen en Kew, hiervoor betuig ik mijn grote erkentelijkheid.



## CONTENTS.

	Page
<b>I. Introduction</b> .....	1
<b>II. General Part</b> .....	4
History of the Family .....	4
Place of the Family in the System of Monocotyledons .....	4
Subdivision of the Family .....	7
Geographical Distribution .....	10
Habitat and Plant-Community .....	12
Use .....	14
<b>III. Critical Part</b> .....	15
Tribus I, Burmannieae .....	17
Subtribus 1, Euburmannieae .....	17
1. Campylosiphon Benth. ....	17
2. Hexapterella Urb. ....	17
3. Burmannia L. ....	18
Taxonomy .....	18
Sect. 1, Foliosa Jonk. ....	20
Sect. 2, Euburmannia Malme .....	21
Geography .....	25
Subtribus 2, Apterieae .....	26
4. Cymbocarpa Miers .....	26
5. Gymnosiphon Bl. ....	27
Limits of the Genus .....	27
Taxonomy .....	30
Sect. I, Eugymnosiphon Urb. ....	30
Sect. II, Ptychomeria (Benth.) Urb. ....	31
Subsect. 1, Inappendiculati Jonk. ....	32
Subsect. 2, Appendiculati Jonk. ....	32

	Page
6. Apterina Nutt. ....	35
Taxonomy .....	35
Geography .....	36
7. Marthella Urb. ....	36
8. Dictyostega Miers .....	38
Taxonomy .....	38
Geography .....	38
9. Miersiella Urb. ....	40
Tribus II, Thismieae .....	41
Subtribus 1, Euthismieae .....	41
10. Afrothismia Schltr. ....	41
11. Triscyphus Taub. ....	42
12. Glaziocharis Taub. ....	42
13. Thismia Griff. ....	42
14. Geomitra Becc. ....	46
15. Scaphiophora Schltr. ....	46
Subtribus 2, Oxygyneae .....	47
16. Oxygyne Schltr. ....	47
<b>IV. Taxonomical Part.</b> .....	49
Burmanniaceae .....	51
Key to the tribes .....	52
Tribus I, Burmannieae Miers .....	52
Subtribus 1, Euburmannieae Benth. et Hook. ....	53
1. Campylosiphon Benth. ....	53
2. Hexapterella Urb. ....	55
3. Burmannia L. ....	57
Sect. I, Foliosa Jonk. ....	58
Sect. II, Euburmannia Malme .....	67
Subtribus 2, Apterieae Miers .....	164
4. Cymbocarpa Miers .....	165
5. Gymnosiphon Bl. ....	168
Sect. I, Eugymnosiphon Urb. ....	169
Sect. II, Ptychomeria (Benth.) Urb. ....	177
Subsect. 1, Inappendiculati Jonk. ....	177

	Page
Subsect. 2, Appendiculati Jonk. ....	184
Appendix .....	202
6. Apterina Nutt. ....	203
7. Marthella Urb. ....	212
8. Dictyostega Miers .....	213
9. Miersiella Urb. ....	218
Tribus II, Thismieae Miers .....	221
Subtribus 1, Euthismieae Jonk. ....	222
10. Afrothismia Schltr. ....	222
11. Triscyphus Taub. ex Warm. ....	225
12. Glaziocharis Taub. ex Warm. ....	226
13. Thismia Griff. ....	227
Sect. I, Myostoma (Miers) Jonk. ....	231
Sect. II, Ophiomeris (Miers) Jonk. ....	232
Sect. III, Euthismia Schltr. ....	237
Subsect. Odoaroda Schltr. ....	237
Subsect. Brunonithismia Jonk. ....	242
Sect. IV, Rodwaya Schltr. ....	248
Sect. V, Sarcosiphon (Bl.) Jonk. ....	251
14. Geomitra Becc. ....	254
15. Scaphiophora Schltr. ....	256
Subtribus 2, Oxygyneae Jonk. ....	260
16. Oxygyne Schltr. ....	260
List of collectors' numbers .....	263
Index .....	275





## I. INTRODUCTION.

The present publication is intended to be a monograph on the family of *Burmanniaceae*. It is divided into three parts: General Part, Critical Part and Taxonomical Part.

The first part, General Part, contains general remarks on the taxonomy, distribution and use of the family. The second part, Critical Part, contains general and geobotanical remarks on the genera of the family, whereas the third part, the Taxonomical Part, gives the determination keys to the tribes, subtribes, genera, sections, subsections and species, the description of these groups with literature, distribution and the indications of the types. New varieties, species and larger groups are described in the taxonomical part in foot-notes.

All mentioned specimens and literature have been personally studied unless further particulars are given. Remarks about colour, odour etc. and vernacular names are from collector's notes on labels or from the literature. The author's work was made possible by studying the materials of the following herbaria, these herbaria are indicated in this monograph by the following abbreviations, proposed by the Standing Committee for Urgent Taxonomic Needs of the International Botanical Congresses for the planned Index Herbariorum. As this work is still in preparation and not yet all the herbaria have agreed with their proposed abbreviation, the list of abbreviations given below will possibly be changed.

1. Botanischer Garten und Botanisches Museum,  
Berlin-Dahlem. B
2. British Museum (Natural History), London. BM
3. Jardin Botanique de l'Etat, Bruxelles. BR
4. Botanisches Museum der Universität, Breslau. BRSL
5. 's Lands Plantentuin, Herbarium, Buitenzorg. BZ
6. Universitetets Botaniske Museum, Copenhagen. C

- |  |        |
|--|--------|
| 7. Royal Botanic Gardens, Sibpur, Calcutta.  | CA     |
| 8. Field Museum of Natural History, Department of Botany, Chicago.                   | F      |
| 9. Istituto Botanico dell' Università e R. Erbario Coloniale, Firenze.               | FI     |
| 10. Institut de Botanique Systématique de l'Université, Herbarium Boissier, Genève.  | G-BOIS |
| 11. Institut de Botanique Systématique de l'Université, Herbarium Delessert, Genève. | G-DEL  |
| 12. Gray Herbarium, Harvard University, Cambridge (Mass.), U.S.A.                    | GH     |
| 13. Botanisches Institut und Botanischer Garten der Universität, Göttingen.          | GÖTT   |
| 14. Hortus Botanicus en Botanisch Laboratorium van de Rijksuniversiteit, Groningen.  | GRO    |
| 15. Royal Botanic Gardens, Kew.  | K      |
| 16. Rijksherbarium, Leiden.  | L      |
| 17. Laboratoire de Botanique de la Faculté des Sciences, Lyon.                       | LY     |
| 18. Botanisches Museum, München.   | M      |
| 19. Missouri Botanical Garden, St. Louis (Mo.), U.S.A.                               | MIS    |
| 20. New York Botanical Garden, New York (NY.), U.S.A.                                | NY     |
| 21. Muséum d'Histoire Naturelle, Phanérogamie, Paris.                                | P      |
| 22. id., Herbarium Drake.  | P-DR   |
| 23. Jardim Botânico, Rio de Janeiro.   | R      |
| 24. Naturhistoriska Riksmuseet, Botaniska Avdelningen, Stockholm.                    | S      |
| 25. Botanisch Museum en Herbarium van de Rijksuniversiteit, Utrecht.                 | U      |
| 26. United States National Museum, Herbarium, Washington (DC.), U.S.A.               | US     |
| 27. Naturhistorisches Museum, Botanische Abteilung, Wien.                            | W      |

Here I wish to express my grateful thanks to the directors of these herbaria for their generous help. Especially am I indebted to the directors and staff of the herbaria and libraries which I have personally visited, for the hospitality and great assistance given during my stay, viz. the herbaria of Brussels, Kew, Leyden, British Museum (Natural History) London, the Linnean Society of London, and Paris.

I am also highly indebted to the „Prof. Dr. F. A. W. Miquelfonds” which enabled me to stay in London for three weeks.

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## II. GENERAL PART.

### HISTORY OF THE FAMILY.

The genus *Burmannia* is founded by *Linnaeus* and inserted by later authors in different places in Monocotyledons e.g. by *Jussieu* in *Bromeliaceae* and by *Rob. Brown* in *Juncaceae*. *Sprengel* in *Syst. Veg. I* (1825) for the first time distinguished a group of *Burmanniae*, related with *Sonerila* (*Melastomataceae*).

*Blume*, *Enum. Pl. Jav.* (1830) for the first time called the family *Burmanniaceae*, he knew 3 genera: *Burmannia*, *Gonyanthes* and *Gymnosiphon*.

*Miers* in 1841 also inserted *Thismia* and *Ophiomeris* into *Burmanniaceae*, he divided the family into 2 tribes. The family of *Corsiaceae*, founded in 1877 by *Beccari* had been transferred by *Bentham* and *Hooker* also to *Burmanniaceae* as a third tribe. A number of authors however continued to consider this group as a separate family.

Fossil *Burmanniaceae* are unknown. The family however is very old, according to the occurrence of closely related species in America, Africa and Asia as *Malmé* (1896) has already pointed out. Of the uniform section *Foliosa* of the genus *Burmannia*, 4 species are South-American and 1 Asiatic. The American *Burmannia bicolor* is hardly distinguishable from the African *B. latialata* and the Asiatic *B. coelestis*, while the saprophytic South-American *Burmannia tenella* finds its closest relative in the Malayan *Burmannia lutescens*.

### PLACE OF THE FAMILY IN THE SYSTEM OF MONOCOTYLEDONS.

As *Burmanniaceae* are a somewhat derived and undoubtedly very old group, its place in the system always gave difficulties.

All authors agree in the opinion that it is a monocotyledonous family but within this classis the family is classified in different places. Lindley in his *Introd. Nat. Syst.* (1830) considered the genus *Burmattia* to be related to *Haemodoraceae*, just as Bartling in his *Ord. Nat. Plant.* (1830) who placed it in his order *Ensatae*. Endlicher, *Gen.* (1837), placed the genus between *Hydrocharidaceae* and *Iridaceae* in his classis *Ensatae*. In his *Enchiridion* (1841) he pointed out relationship with *Iridaceae* and *Haemodoraceae*. Lindley, *Veg. Kingd.* (1846) on the other hand placed it in the order *Orchidales* in which he distinguished the series *Apostasiaceae* — *Burmanniaceae* — *Orchidaceae*, he too pointed out a relationship to *Iridaceae*.

The problem grew still more difficult after the discovery of the saprophytic, more reduced species of the genus and other saprophytic genera of the family. The genera of *Thismieae* especially made the question more complicated. Yet older authors nearly always accepted relationship to *Hydrocharidaceae*: Baillon still said: "Les *Hydrocharidacées* qu'on pourrait considérer comme une forme aquatique des *Burmanniées* . . . etc."

Karsten in *Nov. Act. Leopold.-Carol.* XXVI (1858) examined some American species of the genera *Gymnosiphon* and *Dictyostega*. He could not find any endosperm and thus classified the family in the endospermless Monocotyledons with inferior ovary. In this group he distinguished 3 classis: *Gynandrae* (fam. *Orchidaceae* and *Apostasiaceae*), *Burmannieae* (fam. *Burmanniaceae*) and *Limnobiae* (fam. *Hydrocharidaceae*).

Eichler (1875) united *Burmanniaceae*, *Triuridaceae*, *Orchidaceae* and *Apostasiaceae* together into the order *Gynandrae*.

Bentham und Hooker (1883) placed *Hydrocharidaceae*, *Burmanniaceae* and *Orchidaceae* together into the series *Microspermae*, characterized by the corolline perianth, inferior, usually 1-celled ovary and numerous, minute seeds without endosperm.

Baillon (1895) dealt with *Burmanniaceae* between *Taccaeeae* and *Hydrocharidaceae*.

Engler in Engler und Prantl and his *Syllabus* inserted the family in his "Reihe" *Microspermae*. This "Reihe" he divided

into two "Unterreihen": *Burmanniineae* with one family *Burmanniaceae* and *Gynandrae* with one family *Orchidaceae*. The *Hydrocharidaceae* are placed in Engler's system in the *Helobiae* and thus no longer considered to be related to *Burmanniaceae*. In the system of von Wettstein the *Burmanniaceae* were given a place at the end of the *Liliiflorae* as a much derived family. He dismissed relationship to *Orchidaceae*, founded on the small seeds and the shape of the embryo; according to him the actinomorphic flowers and the presence of an endosperm indicated relationship to *Liliiflorae*.

Lotsy too considered *Burmanniaceae* as derived *Liliiflorae*, related by the *Thismiaceae* to *Taccaceae* (1911).

Pulle (1938) too placed *Burmanniaceae* and *Corsiaceae* at the end of *Liliiflorae*.

On the other hand Hutchinson (1934) distinguished in his Division *Corolliferae* an Order *Burmanniales* (*Burmanniaceae*, *Thismiaceae* and *Corsiaceae*). He was of the opinion that this order and the connecting order *Orchidales* (*Orchidaceae* only) developed on parallel lines from his order *Haemodiales*. He thought these lines of development taking their rise from the family *Apostasiaceae* of the *Haemodiales*. With the genus *Apostasia* of this family the genus *Campylosiphon* of *Burmanniaceae* should show the nearest relationship. The *Thismiaceae* he considered much more modified from the orthodox type of Monocotyledon than the *Burmanniaceae*.

The present author's opinion is that the pretended relationship to *Orchidaceae* is founded only on the resemblance of the seeds of Orchids and some genera of *Burmanniaceae*. This resemblance (loose, reticulate testa) is superficial as *Orchidaceae* possess no endosperm whereas especially Ernst and Bernard and also Pfeiffer indicated an endosperm in a number of *Burmanniaceae*. No great value can be given to the seed resemblance, this proves the fact that e.g. *Parnassia palustris* has seeds of absolutely the same shape but a little larger.

The presence of endosperm and the construction of the flower makes relationship with the *Liliiflorae* highly probable. Of this

order *Amaryllidaceae*, *Iridaceae* and *Taccaceae* seem to be the most closely related. If one compares the construction of the flower of one of these families with that of a primitive *Burmanniaceae*, then a large agreement exists. The most original *Burmanniaceae* in my opinion are the non-saprophytical species, especially those species which do not possess reduced leaves. The section *Foliosa* of the genus *Burmannia* thus can compare with it.

In *Iridaceae* the inner whorl of stamens is lacking however, whereas in *Burmanniaceae* the outer one can be missing.

The inflorescence, more and more admitted as an important indicator of natural relationship, is as a rule cymose in *Burmanniaceae*. Usually the flowers are placed in cincinni or double cincinni, also in the section *Foliosa* of *Burmannia*. Most of the *Liliiflorae* have racemose inflorescences, but cymose ones can occur, e.g. in *Iridaceae*. The inflorescence of *Freesia* for instance completely agrees with those of *Burmanniaceae*.

#### SUBDIVISION OF THE FAMILY.

Several American species of the genus *Burmannia* have been discovered among Martius's Brazilian material, described by him in his *Nov. Gen. et Spec.* (1824). The American *Vogelia* (*Tripterella*) *capitata* seemed to belong to this genus too.

Miers went on and collected in Rio de Janeiro representatives of the new genera *Dictyostega* and *Cymbocarpa* which he compared with the already known genera *Gymnosiphon* and *Apteria*. Later he collected two species of his new genus *Ophiomeris*, considered by him to be closely related to the Indian genus *Thismia*, described by Griffith as an intermediate genus between *Taccaceae* and *Burmanniaceae*. According to Miers *Thismia* and *Ophiomeris* belong to the family *Burmanniaceae* but form a separate tribe. So he proposed the following subdivision:

- I. BURMANNIEAE: 3 stamens, ovary 3-celled, "central placenta".  
(*Burmannia* and *Gonyanthes*).



- II. APTERIEAE: 3 stamens, ovary 1-celled, 3 parietal placentas.  
(*Apteria*, *Cymbocarpa*, *Dictyostega*, *Gymnosiphon*).
- III. THISMIEAE: 6 stamens, ovary 1-celled, 3 parietal placentas, perianth circumcissile.  
(*Thismia* and *Ophiomeris*).

To this classification Karsten (1858) subscribed.

In 1875 Beccari collected in New Guinea the genus *Corsia* with very zygomorphic flowers, 6 stamens with extrorse anthers and a 1-celled ovary. This genus he put into a new family *Corsiaceae*. *Corsia* seemed to be a good match to Philippi's *Arachnites uniflora*, collected in Chili and described in 1865 as an Orchid(?).

Beccari considered *Corsiaceae* to be related to *Burmanniaceae* and *Hypoxidaceae*.

Bentham and Hooker however considered *Corsiaceae* as a separate tribe of *Burmanniaceae* and classified the family as follows:

- TRIBUS I. EUBURMANNIEAE: 3 stamens, perianth-tube cylindrical.  
(*Apteria*, *Burmannia*, *Campylosiphon*, *Dictyostega*, *Gymnosiphon*).
- TRIBUS II, THISMIEAE: 6 hanging stamens, perianth-tube obovoid or oblong. Connectives connate.  
(*Bagnisia*, *Geomitra*, *Thismia*).
- TRIBUS III, CORSIEAE: 6 stamens, 6 perianth-lobes of which one being much larger.  
(*Arachnites* and *Corsia*).

This classification has been accepted for a long time by all taxonomists, one finds it among others with Baillon (1895), Engler in Engler und Prantl (1889), Diels in Engler's Syllabus (1936) and Lotsy (1911).

In 1905 Schlechter again pointed out that *Corsia* and *Arachnites* had to be considered as a separate family, more closely related to *Orchidaceae*. This opinion found more followers e.g. J. J. Smith (1907) and Pulle (1938). Both Schlechter

and Smith classified *Thismieae* to *Burmanniaceae*, because Schlechter too described the African genus *Oxygyne* with flowers, closely resembling those of *Thismia* (circumcissile and urceolate) but possessing only 3 stamens as *Burmannieae*. By the discovery of this remarkable genus the most important distinguishing feature between the two tribes was lost.

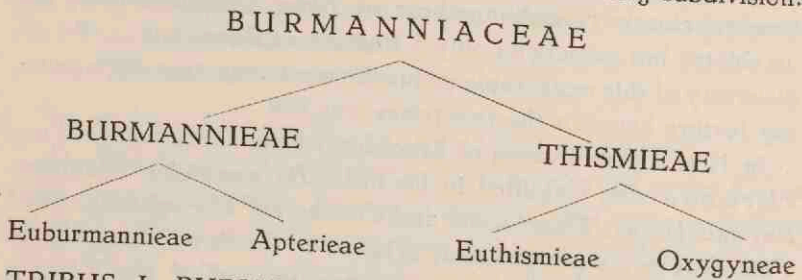
In 1934 a new revision of Monocotyledons appeared by Hutchinson who classified in his order *Burmanniales* 3 families: *Burmanniaceae*, *Thismiaceae* and *Corsiaceae*. The splitting off of *Thismieae* as a separate family is based on the flower-construction and the lack of endosperm; the specialization of the *Thismia* flowers gives quite another impression than the rather primitive flowers of *Burmannia* or *Apteria*. Hutchinson however has not been able to examine the *Thismieae* material owing to its rareness.

The present author is of the opinion that the *Corsiaceae* indeed differ too much in flower-construction to be classified with the *Burmanniaceae* into one family (epigynous, extrorse stamens, strong zygomorphy). Also the genus *Geosiris* from Madagascar, described by Baillon in *Iridaceae* but transferred by Engler to *Burmanniaceae*, is deviating too much to be classified in *Burmanniaceae*. A later publication will deal with this genus and its place in the classification of Monocotyledons.

In my opinion the family of *Burmanniaceae* should be divided into two tribes: *Burmannieae* and *Thismieae* because of the flower construction. The construction of the flowers is much more important than the number of cells of the ovary, in the genus *Campylsiphon* the young flowers have one-celled ovaries with prominent placentas. During the development these placentas grow together in the centre so that a 3-celled ovary arises with axial placentation.

The *Thismieae* cannot be distinguished as a separate family as accepted by Hutchinson, in the genus *Oxygyne* with 3 stamens and a flower-construction of *Thismieae* an intermediate *Burmannieae* exists. Moreover Ernst and Bernard have shown in *Thismia javanica* and *Thismia clandestina* a distinct endosperm, so that Hutchinson's differences: *Burmanniaceae*,

scanty endosperm; *Thismiaceae*, without endosperm, cannot be accepted. The present author proposes the following subdivision:



TRIBUS I, BURMANNIEAE: Ovary 1-celled or 3-celled. Perianth persistent on the capsule. Style of equal length as the perianth-tube. Anthers sessile or with short filaments inserted in the perianth-throat.

Subtribus 1, Euburmannieae: Capsule and mostly the ovary 3-celled with axile placentation.

(*Burmannia*, *Campylosiphon*, *Hexapterella*).

Subtribus 2, Apterieae: Capsule and ovary 1-celled with 3 parietal placentas.

(*Apteria*, *Cymbocarpa*, *Dictyostega*, *Gymnosiphon*, *Marthella*, *Miersiella*).

TRIBUS II, THISMIEAE: Ovary 1-celled with 3 placentas. Perianth circumcissile. Style short and thick. Stamens hanging, 3 or 6.

Subtribus 1, Euthismieae: 6 stamens inserted at an annulus in the perianth-mouth or perianth-tube.

(*Afrothismia*, *Geomitra*, *Glaziocharis*, *Scaphiophora*, *Thismia*, *Triscyphus*).

Subtribus 2, Oxygyneae: Stamens 3.

(*Oxygyne*).

### GEOGRAPHICAL DISTRIBUTION.

(See map, fig. 1).

The *Burmanniaceae* enclose  $\pm$  125 species chiefly occurring in the tropics of both hemispheres.

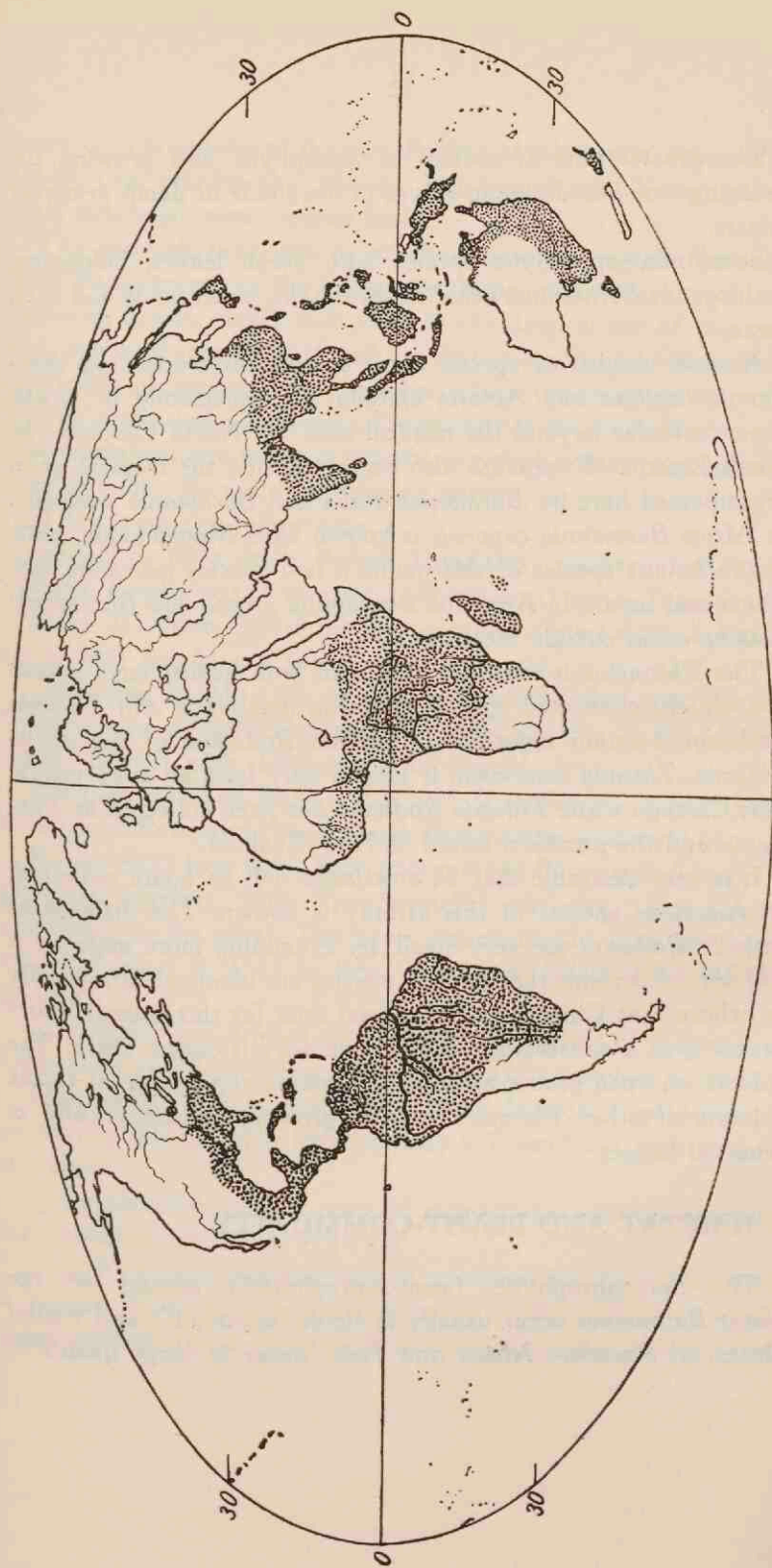


Fig. 1. Map, showing the distribution of the family.

The greater part of species is saprophytic and growing on decaying wood or decaying leaves in the shade of damp primeval forests.

Some non-saprophytic species with green leaves, belonging to the genus *Burmannia*, occur in savannahs, grass fields and such areas.

A small number of species occur outside the tropics e.g. *Burmannia capitata* and *Apteria aphylla* are penetrating in North America to far beyond the tropical area, till North Carolina. In South America *B. capitata* also occurs outside the tropical area, accompanied here by *Burmannia flava* and *Burmannia australis*. In Africa *Burmannia capensis* is known from Mozambique while of the Asiatic species of this genus a few species penetrate into China and Japan. In Australia *Burmannia juncea* and *Burmannia disticha* occur outside the tropics.

The *Thismieae* inhabit the tropics of both hemispheres except two closely connected species: *Thismia americana* and *Thismia Rodwayi*, forming together the section *Rodwaya* of the genus *Thismia*. *Thismia americana* is known only from an open prairie near Chicago while *Thismia Rodwayi* has been collected in Tasmania and the northern island of New Zealand.

It is very desirable that *T. americana* will be again collected, no American species of this affinity is known. The differences with *T. Rodwayi* are very small, by examining more material it will appear perhaps that the two species are identical. It is hardly to believe that Chicago is the normal area for this species, but I cannot give a satisfactory explanation why it occurs there. The habitat, an open prairie among the moss, is very different to the habitats of other *Thismias*, usually growing saprophytically in primeval forests.

#### HABITAT AND PLANT-COMMUNITY.

The non-saprophytic (semi-saprophytic?) species of the genus *Burmannia* occur usually in fields, savannah's and similar places, in America, Africa and Asia, never in large quantities

together. The species of the sect. *Foliosa* of this genus, non-saprophytic too, inhabit also forests, brushwood etc., being rather high, perennial, many-leaved herbs.

The saprophytical species on the contrary, as well from the tribe *Burmannieae* as the *Thismieae*, occur almost exclusively on decaying leaves, wood and roots in the deep shade of tropical, wet, primeval forests. It is striking that at a certain habitat often a number of species grow together, often too in company with *Triuridaceae* and saprophytic *Gentianaceae* or *Polygalaceae*, so that one sometimes meets in a herbarium with several saprophytic species under the same collector's number.

A few examples follow here:

Schipp S. 667a from British Honduras consists of *Apteria aphylla*, *Leiphaimos* cf. *mexicana* (*Gentianac.*) and a *Triuridaceae*.

Leng 311 from British Guiana contains *Gymnosiphon breviflorus* and *Leiphaimos* spec.

According to Miers, on the label of the type-specimen of *Cymbocarpa refracta*, this species grows together on Mt. Corcovado (Brazil) with *Dictyostega orobanchioides*.

Buchtien 459 and Bang 1563, both from Bolivia, consist of a mixture of *Burmattia tenella* and *Dictyostega orobanchioides*.

Eacker 6277 from Java, Buitenzorg, holds *Burmattia lutescens*, growing together with *Epirrhizanthes elongata* (*Polygalac.*) according to the label. The same community in Java has been recorded by v. d. Pijl in Rec. Trav. Bot. Néerl. XXI (1934) p. 761.

v. Slooten s.n. from Java, Semarang, consists of *Burmattia lutescens* mixed with a few specimens of *Gymnosiphon neglectus*.

Ledermann 14453, from the Palau Islands, *Gymnosiphon papuanus*, was growing together with a *Triuridaceae* according to the label.

In the literature several cases of saprophytes growing together are described, see v. d. Pijl l.c.

v. d. Pijl presumes that this is produced by the presence of a fungus. However it is not yet known if the endophyte of all these saprophytes is identical, it is quite likely that it is in every

case a *Phycomycete*, probably belonging to the *Peronosporaceae*. A similar endophyte also occurs in *Lycopodium*, in this connection it is perhaps of importance that Crueger collected in Trinidad specimens of *Apteria aphylla* var. *hymenanthera* growing in dense cushions of *Lycopodium* (Crueger s.n. [GÖTT]).

An exception concerning the habitat of the saprophytes is made by the puzzling *Thismia americana*. Except for the occurrence outside the tropics and in another part of the world than the connected species, this species has been collected in an open prairie among the moss (and *Selaginella*) and not in decaying vegetable material in the shade of the forest.

### USE.

Economically the *Burmanniaceae* are of no account.

According to Nuttall, Lindley and Baillon, *Burmannia biflora* and *Apteria aphylla* are used for the composition of the green tea.

According to a label in herb. Calcutta on a sheet with *Burmannia coelestis*, collected by Campbell, this plant is given in Bengal by the Santals medicinally.

Other cases in which *Burmanniaceae* can be of use are unknown to me.

# THE LIFE OF SAMUEL JOHNSON

BY MISS HANNAH BARCLAY

LONDON: RICHARD CLAY AND COMPANY, LTD.

The first volume of the life of Samuel Johnson is published by the publishers of the *Life of Samuel Johnson*, and is the first of a series of volumes which will give a full and complete account of the life of the great English writer and scholar. The first volume is devoted to the early years of his life, from his birth in 1709 to his death in 1794. The second volume will deal with his education and his early career, and the third volume will deal with his later years and his death.

## III. CRITICAL PART.

The critical part of the life of Samuel Johnson is the part which deals with his work as a writer and scholar. It is the part which shows us the man as he is, and not as he would like to be seen. It is the part which shows us the man who was a great English writer and scholar, and who was one of the greatest of his age. It is the part which shows us the man who was a great English writer and scholar, and who was one of the greatest of his age.

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## TRIBUS I, BURMANNIEAE.

### SUBTRIBUS 1, EUBURMANNIEAE.

#### 1. CAMPYLOSIPHON Benth.

The genus *Campylosiphon* is always considered to be related to *Burmannia* on account of its 3-celled ovary and the shape of the stamens, differing from *Burmannia* by its inner perianth-lobes being of equal length as the outer ones and the somewhat Orchid-like facies. The curved perianth-tube also was given as a point of difference. This last mentioned feature seems to be of no value as often the young flowers are straight and sometimes curving later on.

The ovary however appears to be 1-celled in young flowers with prominent parietal placentas, growing together in the older ovary and forming a 3-celled capsule with axile placentation.

H u b e r's *Dipterosiphon spelacicola* is now to be classed also with *Campylosiphon purpurascens*. The plant of H u b e r is not distinguishable from B e n t h a m's plants, the genus *Dipterosiphon* was founded next to *Campylosiphon* only on account of its 1-celled ovary. The genus has been removed by the present author and placed into the synonymy of *Campylosiphon* Benth.

#### 2. HEXAPTERELLA Urb.

This genus is also related to *Burmannia* on account of its 3-celled ovary and correctly separated from that genus by U r b a n because of:

1. 6 small, narrow wings at the ovary and the basal part of the tube,
2. the peculiar hammer-shaped stamens, the connective tapering at its base into a thick filament,
3. the rather long inner perianth-lobes.

Singular too is the shape of the placentas. (See fig. 5).

To this genus belongs one species, *Hexapterella gentianoides* Urb., collected by P o e p p i g in Amazonian Brazil. Later on the species has also been collected in British Guiana by A l t s o n and S a n d w i t h. G l e a s o n studied the material of A l t s o n and overlooked the 3-celled ovary describing it as 1-celled. He placed the plant with restriction into the genus *Gymnosiphon* in which it was described as a new species: *G. Altsoni* Gleas.

Besides the 3-celled ovary the plant also differs strongly from *Gymnosiphon* by the lack of glands in the ovary, the limb being not ring-shaped deciduous and the shape of the placentas, stamens and the 6-winged ovary. S a n d w i t h also calls his plant *G. Altsoni* without questioning if this is the right genus or not.

Both authors have evidently overlooked the 3-celled ovary of which the septa are very thin indeed, while the placentas are attached only to the roof and the bottom of the ovary.

On the other hand the descriptions and figures of Urban give the genus a good characterization.

### 3. BURMANNIA L.

#### Taxonomy.

A satisfactory subdivision of this genus, the largest of the family, has not been given up to now.

Only E n g l e r (1889) in Engl. u. Prantl, Nat. Pfl. Fam. and M a l m e (1896) made attempts to it.

In E n g l e r's opinion it was too early to give a natural classification of the genus, he gave therefore a provisional survey, dividing the genus into 2 groups: green-leaved, thus non-saprophytic species and saprophytic ones. The green-leaved *Burmannias* he again divided into a group with wingless or only ribbed flowers and a group with winged flowers.

M a l m e (Bih. K. Sv. Vet. Ak. Handl. 22, Afd. III (1896)) based his classification on the American species only. These in his opinion could easily be classified into 3 subgenera or sections. The first subgenus he called *Euburmannia*, characterized by the 3-

winged flowers. The second was monotypic, this he called *Vogelia*, based on the only wingless American *Burmannia*: *B. capitata*.

From the 2 species *B. alba* Mart. and *B. grandiflora* Malme was formed the third subgenus *Astroburmannia*, characterized by the patent outer perianth-lobes, which in other *Burmannias* are always erect. Moreover the roots were dimorphic in this section, one being tuberous.

In the present author's opinion the existence of saprophytic and non-saprophytic species is not sufficient to base sections on it. Of two closely related species one can be saprophytic and colourless, the other non-saprophytic and green while practically no difference exists in facies and flower-construction. Fischer, in Gamble's Flora of Madras, went so far as to take the species so large that the same species could be saprophytic or autotrophic. Under *Burmannia coelestis* he placed the green *B. coelestis* and *B. pusillus*, but also the saprophytic *B. candida* and *B. candelabrum*.

The shape of the wings too is in my opinion of no real value for the classification. All intermediaries occur between species with quite wingless flowers and prominently 3-winged flowers: there are species with 3-costate or 6-costate flowers, species in which the flowers have linear, narrow wings, narrow or broader half-elliptical wings to half-(ob)ovate and half-orbiculate wings. Moreover the shape of wings can also strongly differ in one species: besides the South-American *B. flava* with narrow wings a variety with broad wings occurs. In the Malayan *B. lutescens* Becc. (= *Gonyanthes candida* Bl.) the wings can vary from narrow and linear to broadly half-obovate. This fact also makes the shape of the wings a useless feature.

In the size and insertion of the leaves I found a good characteristic to divide the genus as follows.

Section 1: *Foliosa*. Perennial, non-saprophytic herbs, of which the whole stem or the lower part of the stem is beset with a large number of long, linear or ensiform, parallel-veined, green, grass-like, often imbricate and decurrent leaves. This section contains only 5 species but forms a unit within the genus *Burmannia* by its

characteristic facies. Probably these species represent the most primitive *Burmanniaceae*.

Section 2: *Euburmannia*. Annual or perennial, saprophytic or autotrophic herbs. Stem beset with few, very small, often more or less appressed scales. The non-saprophytical species also have a few-leaved radical rosette of small, linear leaves, often reduced to 2 or 3 leaves. In the saprophytic species the rosette is always lacking.

Sect. 1, *Foliosa* Jonk.

This new section includes a number of perennial plants with a rhizome. Most of the *Burmannia*-species are annuals, rhizomes or tubers sometimes occurring.

The section is characterized by numerous large, parallel-veined, more or less ensiform green leaves, besetting the lower part of the stem. Towards the upper part the leaves are growing smaller and finally scalelike. All species of this section are many-flowered, often the flowers are placed in dense inflorescences at the top of the stem and are wingless or possess rather narrow wings.

Four of the five species belonging to this group are known from tropical America viz. *B. Kalbreyeri* Benth., *B. Wercklei* Schltr., *B. polygaloides* Schltr. and *B. foliosa* Gleas. All four are rare species only once or twice collected.

The fifth species, *B. longifolia* Becc. has a large area in tropical Asia and is often collected.

In 1913 Schlechter described a sixth species of *Foliosa* of Nw. Guinea, viz. *B. leucantha*. This species agrees in facies with *B. longifolia* occurring also in New Guinea, but is more robust and differs only from *B. longifolia* by the short, 2-lobed inner perianth-lobes, being entire in *B. longifolia*. Indeed this seems to be the case in the type of *B. leucantha* and other specimens from New Guinea while others show a conversion in the shape of retuse inner lobes (e.g. Ledermann 12379 [B]). Finally there is still the case of Ledermann 11132e [B], where in the same flower the inner perianth-lobes are partly entire as in *B. longifolia* and partly bilobed as described for *B. leucantha*.

Besides this feature no differences exist between *B. leucantha* and *B. longifolia* and this feature has no value on account of the above described intermediates. *B. leucantha* is placed by the present author into the synonymy of *B. longifolia* Becc.

Sect. 2, *Euburmannia* Malme.

America.

Of the American species belonging to this section, only one is saprophytic viz. *Burmannia tenella* Benth. Schlechter's *B. amazonica* seems to be identical with it. Of the non-saprophytic species I cannot affirm Malme's *B. grandiflora*. This species differs only from *B. alba* Mart. in size of the flowers, as Malme himself also saw later on. The number of veins of the outer perianth-lobes is not constant, even not in the same plant and thus of no value as a distinguishing feature. The present author distinguishes the large-flowered specimens as a separate and new variety of *B. alba*.

Malme distinguished 3 varieties of *Burmannia bicolor* Mart. In my opinion his variety *subcoelestis* does not differ from the species, it only represents a robust form with a large number of intermediaries to the species. His two other varieties, var. *tenera* and var. *aprica* deviate in flower-construction and shape of the wings so strongly from *B. bicolor*, that I wish to consider them as separate species (*B. tenera* Jonk. and *B. aprica* Jonk.). Amongst the material of Regnell are specimens from Minas Geraes, Brazil, possessing the flower-construction of *B. aprica* but of quite other facies. On these specimens I base the new variety *pusilla* of *B. aprica*.

The present author could state the occurrence of *Burmannia flava* Mart. in Southern Florida, while he describes a new variety of this species with broader wings. (*B. flava* Mart. var. *macroptera* Jonk.). Malme already drew the attention to the existence of broad-winged specimens.

Finally Gleason described in 1931 as a new species *B. bracteosa* from Venezuela, closely connected to *B. capitata* and growing mixed with this species. In my opinion this is only a form of

*B. capitata* of which the axis of the inflorescences are more strongly developed. In place of the usual capitate inflorescence a many-flowered, bifid cincinnus results, thus an inflorescence as in other *Burmanniaceae*. This form seems to be not rare, apparently it can appear amongst normal *B. capitata*. A great number of intermediaries exist between typical *B. capitata* and this forma *bracteosa* (Gleas.) Jonk. (fig. 6).

#### Africa.

In tropical Africa 3 saprophytic, at the same time wingless species occur. Of these three Schlechter's *B. aptera* has formerly been described by Wright as *Gymnosiphon congestus* Wright. Therefore the correct name is now *Burmannia congesta* (Wright) Jonk. This species is closely related with Schlechter's *B. densiflora*, after collecting more material perhaps it will appear that it is not possible to separate the two species. The also related *B. hexaptera* Schltr. differs more by its 6-costate flowers.

Of the non-saprophytic species the interpretation of *B. capensis* Mart. and *B. inhambanensis* Schltr. gave difficulties.

Schlechter described *B. inhambanensis* in 1912 and stated that this was the first African *Burmannia* outside the tropics. *B. capensis* of which he had not seen the type, would be identical in his opinion with the asiatic *B. coelestis*. His hypothesis was that the plant was brought from India or Ceylon by a traveller (Bruguières), who called at South Africa too, this might be the reason of the mistake in habitats.

The type of *B. capensis* in the Paris herbarium (Herbier Jussieu) however is not identical with *B. coelestis*, the latter moreover does not occur in Ceylon.

In a later publication (1925) Schlechter considered *B. capensis* as a synonym of *B. madagascariensis* without further argument.

My examination of the type proved however that this type absolutely agrees with Schlechter's *B. inhambanensis* so *B. inhambanensis* Schltr. is to be considered as a synonym of *B. capensis* Mart.

The closely connected *B. madagascariensis* has a complicated synonymy. The species was described by Martius in 1824. In 1884 Baker also described a *B. madagascariensis* without mentioning Martius's species. Therefore Hochreutner renamed Baker's species in *B. Bakeri*.

After examining the type-material it is my opinion that Baker's species is identical with the species of Martius, the correct name is then *B. madagascariensis* Mart.

In 1925 Schlechter described 5 new species of this genus from tropical Africa. Quite rightly he considered *B. bicolor* Mart. var. *africana* Ridl. as a new species, named by him *B. Welwitschii*. This species is not closely related to the American *B. bicolor* Mart., at any rate it is not a variety of it.

In my opinion Schlechter's *B. Le-Testui* is synonym with the *B. latialata* Hua, described by Pobéguin in 1906 and his *B. chariensis* with Engler's *B. liberica*, described in 1913.

*B. bicolor* Mart., var. *micrantha*, described by Engler and Gilg is, as was to be expected, not a variety of the American *B. bicolor*, it is identical with *B. liberica* Engl. All these species, with *B. blanda* Gilg, are closely related, they can only be distinguished after dissecting and examination of the shape of the perianth-lobes and stamens.

#### Asia - Australia.

The non-saprophytic species gave in my revision few difficulties. I describe in this monograph two new species: *B. Ledermannii* from New Guinea and *B. connata* from Sumatra. The latter is related to *B. luteo-alba* Gagnep. but differs by the typical shape of the stamens. Contrary to a number of authors I maintain *B. pusilla* as a good species. In several floras this species is considered as a small form of *B. coelestis* Don, Trimén in his Flora of Ceylon based a variety of *B. coelestis* on it. The typical double margin of the outer perianth-lobes by which *B. coelestis* is easily recognisable, is lacking here. Together with the deviating shape of the flower-wings I have sufficient argument to uphold this species. A new variety of *B. pusilla* is described with narrow wings



and a slender, longer stem. This variety, *B. pusilla* (Wall. ex Miers) Thw., var. *hongkongensis* Jonk., is known only from Hongkong. I also maintain *B. bancana* Miq. though this species in the opinion of many botanists should belong to *B. disticha*. The narrow wings, the typical radical rosette and the fleshy veins of the outer perianth-lobes are characteristics which make it possible to separate this species from *B. disticha*. *B. graminifolia* Stapf is apparently identical with *B. bancana*.

The four *Burmannia* species described by G a n d o g e r (*B. borneensis*, *B. chinensis*, *B. malaccensis* and *B. rigida*) all seem to be identical with *B. coelestis* Don, just as *B. azurea* Griff., *B. javanica* Bl., *B. selebica* Becc., *B. triflora* Roxb. and *Cryptonema malaccensis* Turcz.

Many more difficulties were given by the saprophytic species. One of the problems was to decide which species should be called *B. candida*. In 1827, B l u m e described his *Gonyanthes candida* from Java, later on (1889) named by E n g l e r *B. candida* (Bl.) Engl. In H o o k e r's Flora of British India V (1888) is described however a species called after a manuscript name of G r i f f i t h : *B. candida* Griff.

A number of authors assumed that these two species were identical.

H o o k e r cited in his description as a queried synonym *Gonyanthes candida* Bl. After having examined the types of both species, respectively in the Leyden and Kew herbarium, it appeared to me that G r i f f i t h and H o o k e r's species was quite different from that of B l u m e. The correct name of H o o k e r's species is: *Burmannia candida* Griff. ex Hook., it is a rare species with a limited area.

*Gonyanthes candida* Bl., transmitted into the genus *Burmannia* thus cannot keep the specific epitheton *candida*. This species, occurring in the Malay Peninsula, the Malayan Archipelago and New Guinea is extremely variable in the shape of the flower-wings. Sometimes the species are almost wingless, the wings then are narrow and linear, sometimes the wings are broadly ovate and truncate. These extremes are connected by intermediaries, it even

appeared to be impossible to distinguish forms or varieties. Also in the same plant the shape of the wings can vary. Consequently in my opinion belong to the same species: *B. Gjellerupii* J. J. S.; *B. gracillis* Ridl.; *B. lutescens* Becc.; *B. novae-hiberniae* Schltr. and *B. papillosa* Stapf. Moreover Hochreutiner had already discovered that the name *candida* for this species was illegitimate, he proposed the name *Burmannia gonyantha* Hochr. The oldest specific epitheton in the genus *Burmannia* however is *lutescens* (1877), the correct name is *Burmannia lutescens* Becc.; the species of Griffith and Hooker retains the name *Burmannia candida*.

To the latter species *B. oblonga* Ridl. is closely connected and with this species *B. bifida* Gagnep. is identical. The difference being that the inner perianth-lobes are lacking in *B. oblonga* while they are present in *B. candida*. Perhaps after examination of living material it will appear that the species are identical. Also *B. candelabrum* Gagnep. is related to these two species. *Burmannia Clementis* Schltr. cannot be kept apart from *B. nepalensis*. All other saprophytic, winged *Burmannias* can be maintained, the present author describes in this monograph 4 new species: *B. stricta* and *B. indica*, both from India and *B. Steenisii* and *B. malasica*, both from the Malayan area. Of the wingless saprophytic species I can maintain first *B. sphagnoides* Becc. and *B. micropetala* Ridl. — *B. capitata* Mak., *B. chionantha* Schltr., *B. Dalzieli* Rendle, *B. japonica* Maxim. and *B. tuberosa* Becc. seem to be synonyms of *B. Championii* Thw. Besides by its inflorescence this species is characterized by its small apical point on the connective, which is however often directed inwards and therefore only with difficulty visible in herbarium material.

### Geography.

The genus *Burmannia* chiefly determines the geography of the family. It is mainly a tropical genus, occurring in both hemispheres with spurs outside the tropics to the North and South. The map of the geographical distribution of the family (fig. 1) consequently holds too for the distribution of this genus, except the isolated

habitats of the *Thismia*-species near Chicago, in New Zealand and Tasmania.

The species are always limited to one part of the world: American species are not known from the other continents, African species do not occur outside Africa while the Asiatic-Australian species also only occur in Asia and Australia. Yet these species are often closely related and distinguishable with great difficulty. The rather common American *B. bicolor* Mart. is represented in Africa by *B. latialata* Hua ap. Pobég. and in Asia by *B. coelestis* Don. Both species are rather like *B. bicolor*.

*B. longifolia* is the only Asiatic species of the section *Foliosa* and yet closely related to the American species of the section.

*B. tenella* Benth., the only American saprophytic *Burmannia* finds its closest relative in the Malayan *B. lutescens* Becc.

The wingless, saprophytic African *B. congesta*, *B. densiflora* and *B. hexaptera* have close relationship to the Indian and Malayan *B. Championii*, *B. bifaria* and *B. engganensis*.

This all can point to *Burmannia* being an old genus, an opinion too already expressed by Malmé (1896).

## SUBTRIBUS 2, APTERIEAE.

### 4. CYMBOCARPA Miers.

This genus, with one species: *C. refracta*, founded by Miers, was united with *Gymnosiphon* by Bentham and Hooker. Indeed it is very closely related to this genus, according to the construction of the flowers, the deciduous perianth-limb and the glands in the ovary.

Urban quite rightly again separated *Cymbocarpa* from *Gymnosiphon* on account of its peculiar manner of dehiscing of the capsule and the very long funiculi.

In 1929, Sandwith moreover discovered a second species, *C. saccata*, differing with the same characteristics from the genus *Gymnosiphon*. *C. Urbani*, described by Goebel and Suesse ng u t h seems to be identical with *C. refracta*. Goebel and

Suessenguth described erroneously a 3-lobed perianth, apparently the very small inner perianth-lobes were overlooked by them.

The designs of the stigma as shown by Miers as well as by Goebel and Suessenguth are incorrect, each stigma has 4 small horns, 2 long and 2 shorter ones. The breadth of the connective, mentioned by Goebel and Suessenguth as differing from *C. refracta* in *C. Urbani*, varies much according to the age of the flowers. As suspected already by Urban, the species *C. Urbani* cannot be maintained. The *C. saccata* described by Sandwith is distinguished immediately by the ring of saggings at the base of the perianth-tube. For the rest this species agrees with *C. refracta* in facies and construction of the flower.

## 5. GYMNOSIPHON Bl.

### I. Limits of the genus.

The genus *Gymnosiphon* is founded by Blume in 1827 with one species, *G. aphyllus* Bl. from Java. Beccari (1877) described two other species, of which one however seems to be identical with *G. aphyllus*. He also remarked that the Brazil genus *Ptychomeria*, founded by Bentham in 1858 with 7 species, probably was identical with *Gymnosiphon*. In Bentham and Hooker's *Genera Plantarum* (1883) *Ptychomeria* was indeed united with *Gymnosiphon* and also the genus *Benitzia*, founded by Karsten in 1856 and the genus *Cymbocarpa* of Miers. In 1903 Urban made a more exact revision of the genus in the *Symb. Ant.* He again separated *Cymbocarpa* Miers from *Gymnosiphon* as well as *G. trinitatis* Johow, placed now into a new genus *Marthella* Urb. He also drew attention to the glands in the ovary on both sides of each placenta, seen in all American species investigated by him. These glands had already been described by Karsten (1858) in his genus *Benitzia*, apparently identical with *Gymnosiphon*.

Urban who only investigated American species, divided the genus into two sections: *Eugymnosiphon* with a capsule dehiscing

at the apex. The wall of the ovary is here reticulate-thickened, at least the wall of the capsule is reticulate-perforated. This section contains the Asiatic species. The other section: *Ptychomeria* has a membranous fruit, dehiscing with three irregular clefts and contains the American and African species.

Schlechter in 1921 objected to this classification. In his opinion, *Gymnosiphon* and *Ptychomeria* are two distinctly separated genera. He found besides the difference in fruit-wall, that the ovary-glands, first described by Karsten and later on by Urban, only occur in American species, thus in *Ptychomeria*. The anthers of *Gymnosiphon* would be dehiscing with a lateral, longitudinal cleft and those of *Ptychomeria* by a transverse cleft. Finally *Gymnosiphon* would have hollow stigmas and *Ptychomeria* flat ones, furnished with teeth or filiform appendages. Schlechter after his collecting-trips described several new species from the Moluccas and New Guinea, which were analysed by him on the spot.

I cannot confirm Schlechter's investigations. The Malayan species (*Gymnosiphon* Bl. emend. Schltr. = *Eugymnosiphon* Urb.), also the same material investigated by Schlechter, possess quite the same glands as the American species and just as large. Often the ovaries are strongly swollen by the bulging glands, it is a puzzle to me how Schlechter could state deficiencies. There is no foundation for Schlechter's main-argument for the separation of the two genera.

The stigmas of Asiatic species are somewhat hollow or funnel-shaped and hollowed out. In American species they are usually flat, sometimes somewhat hollow (*G. fimbriatus*, *G. capitatus*, *G. tenellus* and the African *G. usambaricus*). Besides sometimes they are furnished with small, short horns, at times with long, filiform appendages or not appendaged. The stigmas are unsuitable thus to base a separation into two genera on it. Schlechter had seen all Asiatic *Gymnosiphon*-species in living state, if he also had had an occasion to see living American and African species perhaps he would have seen hollow stigmas in many species in which now it is unknown.

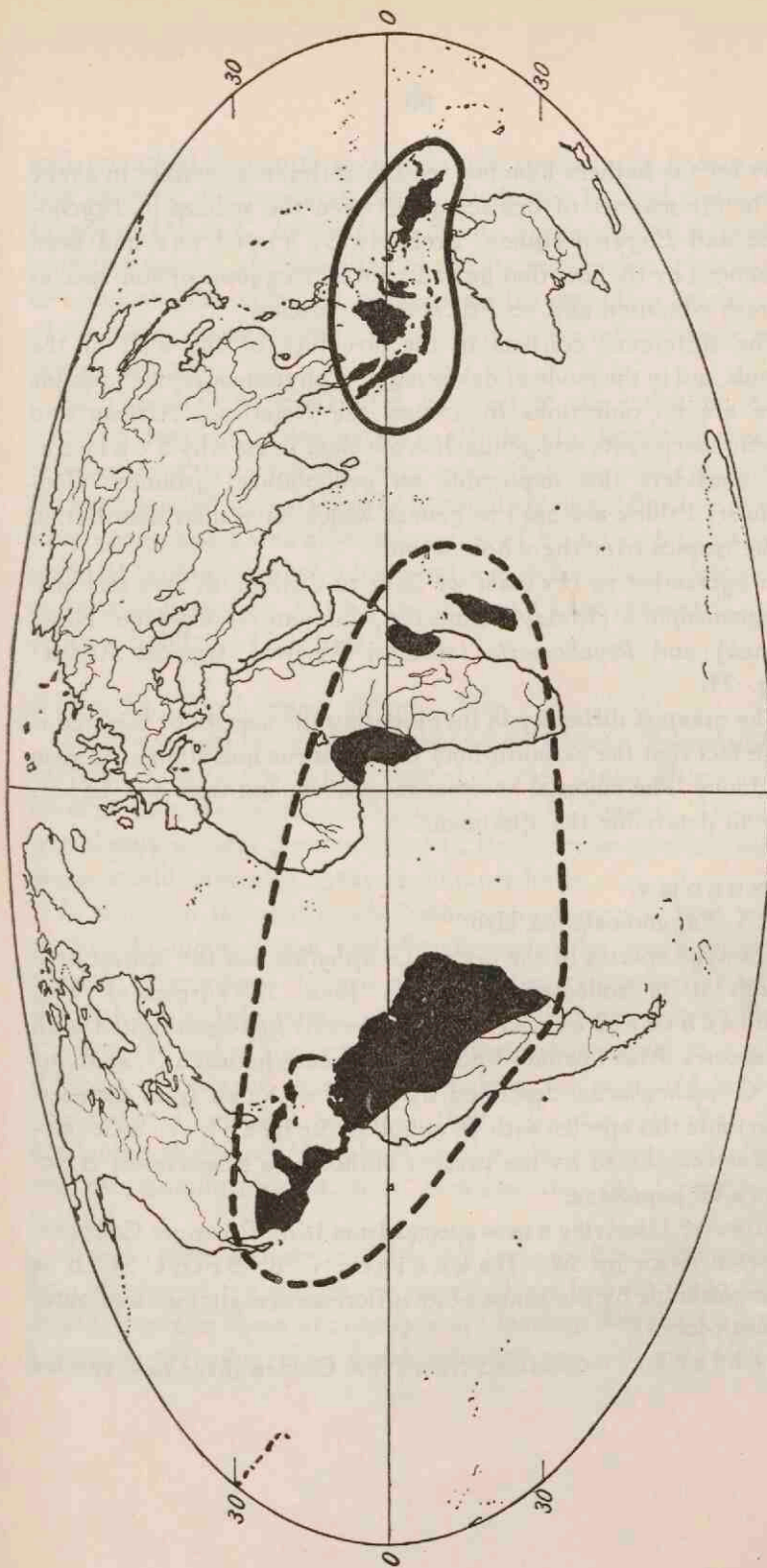


Fig. 2. Map, showing the distribution of the genus *Gymnosiphon*.  
— Sect. *Eugymnosiphon*.  
- - - Sect. *Ptychomeria*.

As for the anthers I cannot see any difference, neither in shape nor in the manner of dehiscing, between the species of *Ptychomeria* and *Eugymnosiphon*. Probably Schlechter had been influenced by the fact that he had seen all *Eugymnosiphon*-species in fresh condition and no *Ptychomeria*-species.

The difference consists in the structure of the wall of the capsule and in the mode of dehiscing. On phytogeographic grounds there are no objections to uniting the American, African and Asiatic species into one genus. It is not clear to me why Schlechter considers this impossible on geobotanical grounds. Geobotanists I think are used to genera which have their distribution in the tropics over the whole world.

In agreement to Urban we have to distinguish two sections: *Eugymnosiphon* (Malay Peninsula, Malayan Archipelago, New-Guinea) and *Ptychomeria* (tropical America, tropical Africa) (Fig. 2).

The greatest difficulty in investigating the species of this genus is the fact that the perianth-limb with stamens and stigmas is soon deciduous. The material becomes incomplete and then it is impossible to determine the specimens.

#### Taxonomy.

##### Sect. I, *Eugymnosiphon* Urb.

The type species of the genus, *G. aphyllus* has the largest area though it is collected mostly in Java. In agreement with Schlechter, Beccari's *B. borneensis* has been united with this species. Also I cannot find any difference between *G. aphyllus* and *G. pedicellatus*, described by Schlechter from Celebes. I also unite this species with *G. aphyllus*. Schlechter's *G. celebicus* is considered by the present author as a synonym of Beccari's *G. papuanus*.

However I describe a new species from Java, Preanger Counties, collected twice by Mr. Bakhuizen v. d. Brink Sr. It is distinguishable by the shape of its inflorescence, stigmas and outer perianth-lobes.

Schlechter described from New Guinea three new species

and remarked that until then only one species was known from this country: *G. papuanus* Becc. Evidently he had overlooked *G. affinis* J. J. S. *G. torricellensis* Schltr. very probable is identical with this species, the condition of the material makes it impossible to establish. The apiculate connectives, the crenulate lateral lobes of the outer perianth-lobes and the shape of the inflorescence make it very probable.

Schlechter's description however of the insertion of the stamens does not agree with *G. affinis*. He described them as inserted directly below the inner perianth-lobes, while *G. affinis* is characterized by very lowly inserted stamens. But in the only very young bud I was able to examine of Schlechter's type-material I could establish a low insertion. Before ascertaining more material is necessary, but for the present I have classed *G. torricellense* Schltr. to *G. affinis* J.J.S.

#### Sect. II, *Ptychomeria* (Benth.) Urb.

To this section belong all American and African *Gymnosiphon*-species. Benthams who established the genus *Ptychomeria*, divided it into two sections: *Aplomeria* and *Diplomeria*. *Aplomeria* would only possess 3 perianth-lobes, the outer ones; while *Diplomeria* would have also 3 very small inner lobes.

It seems to me that in all *Gymnosiphon*-species, both in the section *Eugymnosiphon* and *Ptychomeria*, the inner lobes are present. I managed to see them in the type-material of all Benthams' *Aplomeria*-species. Usually they are very small and stuck to the rest of the perianth in herbarium-material, it is rather difficult to examine them. After soaking for about 24 hours in concentrated ammonia generally they will come off. Then after hardening the flower for about one day in concentrated alcohol one can usually observe them, provided that the flower is not too old.

A much better feature to divide this section I find in the stigmas. In a number of the species the stigmas have filiform appendages, in other species these appendages are lacking. From this feature I propose the subsections *Inappendiculati* and *Appendiculati*.



Subsect. 1, *Inappendiculati* Jonk.

This subsection consists of one species of tropical East-Africa, one of Madagascar and 4 American species: *G. fimbriatus* (Benth.) Urb., *G. divaricatus* (Benth.) Benth. et Hook., *G. sphaerocarpus* Urb. and *G. tenellus* (Benth.) Urb.

*G. sphaerocarpus* occurs in the West-Indian Islands, the other three are Brazilian species. The type of *G. sphaerocarpus* is much branched, this branching usually occurs in the species, but I found also specimens with a normal *Gymnosiphon*-facies. *G. Glaziovii* seems to be identical with *G. tenellus* (Benth.) Urb.

Of most of the species of this subsection, very few specimens are known, and then mostly of very incomplete material. Of almost all species the construction of the flower is insufficiently known. *G. pusillus*, described by Urban from very incomplete material, is similar to *G. tenellus* (Benth.) Urb. but differs by the very short persistent part of the perianth-tube. As limb, anthers and stigmas are unknown however, it is impossible to decide in what subsection the species belongs.

Subsect. 2, *Appendiculati* Jonk.

To this subsection the greater part of the American *Gymnosiphon*-species belongs. Two new species are described by the present author: *G. panamensis* from Panama and *G. Tuerckheimii*, known from Honduras, Guatemala and British Honduras. The type of the last mentioned species, von Tuerckheim II. 475, was distributed at the time as *G. tenellus* Benth. It can be directly distinguished from that species by its more robust facies, the more-flowered inflorescences, the shorter perianth-tube and the filiform stigma-appendages.

*Gymnosiphon arcuatus* Urb., described in 1903 in a note together with the description of *G. sphaerocarpus* and therefore overlooked and also taken up only in the last (8th) supplement of the Index Kewensis, seems to be a rather common species in Amazonas, Guiana and Trinidad. To this species belong also the specimens, called by Benth. *Ptychomeria tenella* var. *minor*. These specimens do not belong to *G. tenellus* and are not a variety of this species, for they possess long stigma-appendages.

The geographical distribution of this species coincides with those of *Dictyostega orobanchioides* var. *parviflora* and *Apteria aphylla* var. *hymenantha*, all small-flowered plants with their main-distribution in Guiana.

*Gymnosiphon mattogrossensis* (Malme) Jonk., described by Malme in 1934 from Matto Grosso seems to occur also in Trinidad. The species is not yet known from the intervening territories.

I can find no difference between *G. cornutus* (Benth.) Benth. et Hook. and *G. muticus* (Benth.) Urb. Benth's remarks in his description of *G. muticus*: „With the *P. cornuta*, from which it scarcely differs, except in colour and the want of appendages to the lobe of the style." As however the present author could observe the appendages in many of the specimens, belonging to Benth's type-material (in older flowers they are sometimes lacking) and the colour of the perianth in *Gymnosiphon*-species seems to be not constant, he can find no objection in uniting *G. muticus* and *G. cornutus*.

Another difficulty is found in interpreting *Benitzia Poeppigiana* Karst. (*Ptychomeria Poeppigiana* (Karst.) Schltr.). Poeppig collected on the isle of Colares two species of *Gymnosiphon*: *G. cymosus* to be found in the herbaria W and P, both numbered 3013 and *G. cornutus*, specimens very similar to the type-material of *G. muticus*, also present in the herbaria W and P, numbered in herb. W 3013, in herb. P 2967.

According to the description it is my conclusion that Karsten described the *G. cornutus* as *Benitzia Poeppigiana*, because he mentions the erect flowers and the resemblance to *Benitzia suaveolens* Karst. (*Gymnosiphon suaveolens* (Karst.) Urb.) and he speaks of "cyma bicrura". Therefore I consider *B. Poeppigiana* to be a synonym of *G. cornutus*. If this idea however is correct, the label with "*Benitzia Poeppigiana* Karst., Act. Leopold." in the Vienna herbarium is stuck on the wrong sheet, for it is to be found on the sheet with *G. cymosus*. In case however the label is correctly placed, although one would not think so after the description, *B. Poeppigiana* is not to be considered as a synonym of *G. cornutus*

but of *G. cymosus*. Urban, Symb. Ant. III (1903) p. 438 considers *B. Poeppigiana* as identical or nearly identical with *G. muticus*, but does not say on what foundation his opinion is based.

The West-Indian species belonging to this subsection are very difficult to distinguish. According to Urban (1903) *G. portoricensis* Urb. can be distinguished by the entire outer perianth-lobes, while *G. parviflorus* was characterized by the very small flowers. Further on he described *G. Germaini*, which is distinguishable from the already known *G. niveus* (Gris.) Urb. by the dentate outer lobes, which in *G. niveus* would be 3-lobed. Four years later he described *G. Fawcetti* and *G. jamaicensis*, of the latter he had seen only incomplete material. It seems to me that *G. parviflorus* is not well separated from *G. niveus*: in the same number one meets often very small-flowered specimens, e.g. Shafer 8356, Wright s.n. (partly type of *G. parviflorus*), Wright 3285 (type of *G. niveus*). The outer perianth-lobes of *G. portoricensis* seem truly 3-lobed, the lateral lobes are hardly visible but after about one day's soaking in ammonia they come off. *G. portoricensis* therefore is to be considered as a synonym of *G. Germaini*. This species also scarcely differs from *G. niveus*, but *G. niveus* as a rule is more robust and has longer outer perianth-lobes in proportion to the tube. The tube is cylindrical in *G. niveus* and constricted in *G. Germaini*. The ovary of *G. niveus* is obovoid and of *G. Germaini* obconical, top-shaped. The lateral lobes of the 3-lobed outer perianth-lobes are longer in *G. niveus*, in *G. Germaini* only the apex of the outer lobes is 3-lobate. *G. Fawcetti* is characterized by the sessile stigmas, each provided with long hairs, 3 saggings at the throat of the perianth and the top-shaped ovary, the 3 placentas bending inward, loosely enclosed by the ovary-wall. The connective is triangular and runs into a basal, median acumen. As in the material of *G. jamaicensis* the limb, with anthers and stigmas is lacking, it is impossible to decide in which subsection the species belongs. Very probably it is a separate species, the globose capsule with the very long persistent tube-part does not occur in any other species of the West-Indian Islands. Also *G. pusillus* from Brazil is described by Urban from very incomplete material, it is im-

possible to decide whether this species is identical with another species and in what subsection it belongs.

## 6. APTERIA Nutt.

### Taxonomy.

In this genus 6 species were originally described. One of them, *A. orobanchioides*, was already established together with some other species into a new genus *Dictyostega*. The recently described *A. Ullei* Schltr. and *A. boliviana* Rusby seem to be absolutely identical in respect to *A. hymenanthera* Miq. and *A. aphylla* (Nutt.) Barnh., up to now better known as *A. setacea* Nutt. According to Bentham the three remaining species (*A. aphylla*, *A. lilacina* and *A. hymenanthera*) are to be united into one species. Bentham could not observe any difference in flower-morphology, only a difference in size of flowers. I cannot share this opinion. *A. lilacina* Miers is extremely well characterized by its large, hypocaterimorphous flowers (hypocaterimorphous flowers do not otherwise occur in this genus) and its broad filaments, just as broad as the two connective-branches. In several herbariums I also found other large-flowered *Apterias*, always determined as *A. lilacina*. Warming has already suggested that in these specimens the typical constriction is lacking. Moreover the specimens, which I saw from Brazil, Paraguay, and Bolivia, possess spatulate inner perianth-lobes, typical *A. lilacina* has linear to lanceolate lobes. The connective-branches are broader than the filaments and the connective is medially acute-caudate at the base. The stem-scales are much larger than in the typical *A. lilacina*. Therefore I describe these specimens as a new species: *A. gentianoides* Jonk.

I cannot maintain *A. hymenanthera* Miq. as a distinct species. There is no difference from the main species *A. aphylla* (Nutt.) Barnh. except the usually smaller flowers, *A. hymenanthera* is therefore described as a variety of this species: *A. aphylla* (Nutt.) Barnh., var. *hymenanthera* (Miq.) Jonk. Intermediate forms occur between the species and its variety especially in the West-Indian Islands.

### Geography.

*A. aphylla* (Nutt.) Barnh. has the largest area, it extends from the Southern United States over Mexico, Central America and the West Indies to Northern Brazil and Bolivia. It is very curious that the species is lacking in Guiana and Trinidad, its place is taken by the small-flowered variety *hymenantha*. The area of this variety stretches southward in Brazil and northward over the West Indies to Haiti, it is overlapping the area of the species in the north and south (fig. 3). In the northern West Indies and in Amazonas many intermediaries are found between the species and its variety. The specimens from Cuba, called by Urban *A. hymenantha*, agree in size and form with the specimens from Florida. I put them therefore in the species.

It is very peculiar that besides another Burmanniaceae: *Dictyostega orobanchioides* (Hook.) Miers, having about the same distribution as *Apteria aphylla*, also a small-flowered variety occurs in Guiana, Northern Brazil and Trinidad (*D. orobanchioides* (Hook.) Miers, var. *parviflora* (Benth.) Jonk.).

Very few specimens of *A. lilacina* are known, this species is collected in Brazil (Rio de Janeiro and Amazonas). One specimen, collected in Colombia (New Granada) by Purdie agrees perfectly with the Brazilian specimens. Probably the species will also be found in the intervening territories.

*Apteria gentianoides* Jonk. is collected now in Paraguay, Bolivia and eastern Brazil (Rio de Janeiro and Minas Geraes) but not yet in the intervening districts.

## 7. MARTHELLA Urb.

I absolutely agree with Urban in making *Gymnosiphon trinitatis* Johow the type of a new genus *Marthella*. Having the facies of *Gymnosiphon*, the species differs from this genus by lacking placenta-glands in the ovary, the deficient inner perianth-lobes, the none-deciduous perianth-limb, the crescent-shaped sacks below the stamens (as in *Apteria*) and the 3 short-stipitated

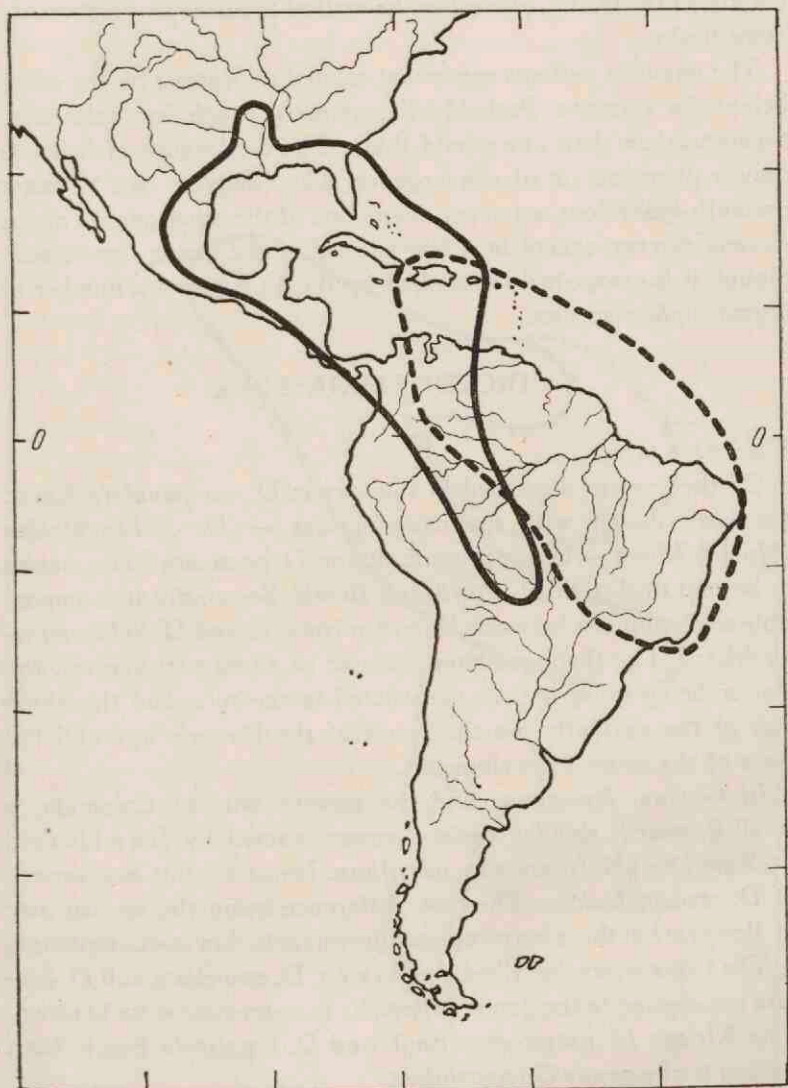


Fig. 3. Map, showing the distribution of *Apteris aphylla* and its variety.

— *Apteris aphylla* (Nutt.) Barnh.

- - - *Apteris aphylla* var. *hymenantha* (Miq.) Jonk.

glands on the ovary. Moreover the wall of the ovary is thicker and more fleshy.

The genus is perhaps somewhat related to *Apteria* by the sacks below the stamens. Probably the genus is much less related to *Gymnosiphon* than one would think. The conformity in facies is only a phenomenon of convergence. The complete lack of inner perianth-lobes does not occur in any one of the other genera of the *Burmanniaceae* except in a few species of the genus *Burmannia*, though it is erroneously described by Benth in a number of *Gymnosiphon*-species.

## 8. DICTYOSTEGA Miers.

### Taxonomy.

Of the species described in this genus *D. campanulata* Karst. has been united with the main species — *D. orobanchioides* (Hook.) Miers — by the present author. *D. pectinata* Karst. seems to be identical with *D. Purdieana* Benth. Seemingly it is impossible to distinguish between *D. orobanchioides* and *D. Schomburgkii* Miers. The distinguishing features of these two species: the flower being more or less constricted in the tube and the allied size of the perianth, are the result of the flower's age and the state of the ovary's development.

In Guiana, Amazonas and the eastern part of Colombia, a small-flowered, slender variety occurs, named by Benth: *D. Schomburgkii* Miers, var. *parviflora*. I consider this as a variety of *D. orobanchioides*. The only difference being the smaller size of flowers, but there is a complete agreement in flower-construction.

The two species described by Miers, *D. umbellata* and *D. costata* are classed to the genus *Miersiella* in agreement with Urban. The African *D. usambarica* Engl. and *D. longistyla* Benth. both belong to the genus *Gymnosiphon*.

### Geography.

*D. campanulata*, *D. Schomburgkii* and *Gymnosiphon orobanchioides* have been united with *D. orobanchioides*, forming a species



Fig. 4. Map, showing the distribution of *Dictyostega orobanchioides* and its variety.

— *Dictyostega orobanchioides* (Hook.) Miers.

- - - *Dictyostega orobanchioides* (Hook.) Miers var. *parviflora* (Benth.) Jonk.



of which the area stretches from Mexico to Southern Brazil, Bolivia and Peru.

The species is however lacking in Netherlands and French Guiana and Amazonas, substituted there by the small-flowered variety *parviflora* (Benth.) Jonk. Besides the species this variety occurs also in British Guiana, Venezuela, Colombia (Santander) and Trinidad (Fig. 4).

The distribution of *D. orobanchioides* and its variety agrees in a peculiar way with the distribution of *Apteria aphylla* and the variety *hymenanthera*. Here also the species and variety are almost vicaral. Intermediate forms occur in the overlapping districts of both areas. Consequently it is very difficult to decide in plants of British Guiana and Trinidad whether they belong to the species or the variety. These more or less intermediate and dubious forms have been described as *D. Schomburgkiana* Miers.

The second species belonging to this genus, *D. Purdieana* Benth., is limited to the NW and Western part of South-America, from Colombia to Peru.

## 9. MIERSIELLA Urb.

Quite correctly Urban based the new genus *Miersiella* on *Dictyostega umbellata*, described by Miers. The genus is differing from *Dictyostega* by its inflorescence and its large, subglobose glands on the ovary. Sandwith discovered in 1931 that *Dictyostega costata* too belonged to this genus. This species would differ from *M. umbellata* by the ovary, being 6-costate in *M. costata*, and the presence of an involucre, consisting of bracts in *M. umbellata*, lacking in *M. costata*.

After examining the type material in the herbarium of the British Museum (Nat. Hist.) in London, it appeared to me that the material of *M. costata* is very scanty. Probably the involucre has been lost in the type material, remains can be found.

No difference exists in the ovaries, the type of *M. costata* is represented only by somewhat older material than that of *M. umbellata*, containing rather young flowers and flower-buds.

In my opinion *M. costata* thus is a synonym of *M. umbellata*, just as *M. aristata*, described by Sandwith from British Guiana, characterized by its long-aristate scales. This feature often occurs however in the Brazilian material too. The only species remaining in this genus is consequently *Miersiella umbellata* (Miers) Urb.

## TRIBUS II, THISMIEAE.

### SUBTRIBUS 1, EUTHISMIEAE.

#### 10. AFROTHISMIA Schltr.

This genus is founded by Schlechter with *Thismia Winkleri* Engl. as type-species. Engler did not agree with this circumscription of the genus: "Mir scheint die Abtrennung dieser Formen innerhalb der Gattung *Thismia* ausreichend für die Unterscheidung". Though Schlechter's circumscription of the genera in the tribe of *Thismieae* to me also seems to be very artificial and his genera are often based on incorrect and insufficient features, the splitting off of the genus *Afrothismia* is quite correct. For both known *Afrothismia* species have their stamens inserted in the basal part of the perianth-tube, while the connective is connected with the margin of the stigma by a thick appendage at the apex. The stamens of *Thismia* however are hanging at the annulus in the mouth of the perianth-tube. In the cavity of the *Thismia*-tube they are more or less stuck together to a cylindrical ring. Another very important difference between the two genera is shown in the ovary. The 3 placentas of the *Thismieae* are inserted here on the bottom of the ovary and are only fertile in the upper part, just as in *Thismia* and *Scaphiophora*. The 3 sterile stalks however are grown together here into a thick central column, in the upper fertile part they are free. The fruit at least is quite different from that of *Thismia*. While *Thismia* and *Scaphiophora* possess thick, fleshy fruits, produced by the ovary and the basal ring of the perianth-tube, here the whole perianth and even the wall of the

ovary is decidous. The naked placentas are persistent and are like a globule, bearing the seeds in the upper part. These three points of difference quite justify the keeping up of the genus *Afrothismia*.

11. **TRISCYPUS** Taub. and 12. **GLAZIOCHARIS** Taub.

These two genera in comparison with most of the genera of the *Thismieae* have no stalked placentas but three parietal placentas as in the genera of the *Apterieae*. They are sufficiently characterized by the deviating construction of the perianth. Very peculiar too is the low insertion of the outer perianth-lobes of *Glaziocharis*. In this genus the inner segments of the perianth are connate to a mitre. Therefore the construction of the perianth is like that of *Thismia-Sarcosiphon* and *Scaphiophora*, and especially *Geomitra* by its filiform appendages.

13. **THISMIA** Griff.

The limits of this rather large genus are drawn by Schlechter quite otherwise than by me. The old-world species together with the North-American *T. americana* Pfeiff. are distributed by Schlechter over two genera: *Thismia* Griff. and *Sarcosiphon* Bl. The American species, except *T. americana*, then belong to other genera: *Myostoma* Miers, *Triuricodon* Schltr. and *Ophiomeris* Miers. As for the old world species the genus *Thismia* sensu Schltr. would be characterized by free perianth-lobes, while in *Sarcosiphon* Bl. the inner perianth-lobes would be connate to a mitre. In the genus *Sarcosiphon* however a section is classed by Schlechter, called by him *Rodwaya*, with 3 (now 2) species standing quite outside the normal geographical distribution of *Sarcosiphon*. They are collected in Tasmania, New Zealand and near Chicago, thus outside the tropics. In these 3 species the inner lobes are not connate to a mitre. In *T. americana* only they bend towards each other at the apex, the 3 tops touching, in *T. Rodwaya* (incl. *Bagnisia Hillii*) the tops of the inner lobes are stuck together or perhaps slightly connate. In the true *Sarcosiphon*-species they

are connate in the upper part to a mitre with 3 holes. The section *Rodwaya* thus unites *Thismia* and *Sarcosiphon* (with *Bagnisia*) for the 2 species of this section show only a beginning of connate inner lobes. Furthermore *Thismia* and *Sarcosiphon* with regard to fruit, placentas, style, stigmas and stamens completely agree. Therefore I again unite these two genera in agreement with F e r d. v. M u e l l e r and J. J. S m i t h, notwithstanding S c h l e c h t e r who argues: "Es ist der systematischen Botanik damit ganz und gar nicht gedient, wenn wir alle diese, durch merkwürdige Blütenformen gut charakterisierten Typen zu einer groszen Gattung *Thismia* vereinigen". The old world species with *T. americana* are to be put into three sections:

1. *Euthismia* Schltr. emend. Jonk.: inner perianth-lobes free, outer ones of equal length and size or smaller. Root-system vermiform.
2. *Rodwaya* Schltr.: inner perianth-lobes bent inwards so that the tops are touching, tops of inner lobes sometimes slightly connate. Outer lobes free, as large as the inner ones. Root-system vermiform.
3. *Sarcosiphon* (Bl.) Jonk.: Outer perianth-lobes suppressed, inner ones connate to an erect mitre with 3 holes. Root-system coralline.

The present author divides the section *Euthismia* due to the perianth-lobes into two subsections: *Odoardoa* Schltr. and *Brunonithismia* Jonk.

The subsection *Odoardoa* is characterized by the possession of 6 equal perianth-lobes, the species occur only on the Malay Peninsula.

The subsection *Brunonithismia*, with unequal perianth-lobes, in the first place holds 3 closely connected species: *T. Brunonis*, *T. javanica* and *T. arachnites*. I have not been able to examine material of *T. Brunonis* and *T. arachnites*, it is possible that they are identical or that one of them is identical with *T. javanica*.

*T. Gardneriana* is endemic in Ceylon. For *T. Neptunis* S c h l e c h t e r established a separate section: *Sarawakia*. In my opinion the somewhat deviating shape of the inner lobes is not

sufficient to base a section on it. On the peculiar *T. labiata* has been based the new section *Labiorthismia* by J. J. S m i t h. As zygomorphy is apparently not of primary importance in this genus, and the species agrees with the subsection *Brunonithismia* except in its being bilabiate, I have also put it in this section.

In the section *Sarcosiphon* it is very probable that *T. Versteegii* J.J.S. is identical with *T. crocea*. Though the type-material of *T. crocea* cannot be found, I feel in a position to consider the two species as identical on account of the good drawings of B e c c a r i. J. J. S m i t h states that his *T. Versteegii* is closely related with B e c c a r i's *T. crocea* from Borneo, but here he committed an error for B e c c a r i's type material is from New Guinea just as the type material of S m i t h's *T. Versteegii*.

In the section *Rodwaya* *T. Rodwayi* from Tasmania and *Bagnisia Hillii* from New Zealand seem to be identical. See for this section also the General Part, Geographical Distribution, p. 12.

Schlechter put the *Thismias* of the new world into the genera *Myostoma*, *Triuricodon* and *Ophiomeris*. The genus *Ophiomeris* should be characterized by its zygomorphic flowers, of this genus he knew 2 species: *O. macahensis* Miers and *O. iguassensis* Miers, both from Brazil. Later Standley described a third species *O. panamensis* from Panama. *O. iguassensis* has been described by Miers from a fruiting specimen, completely identical with fruiting specimens of *O. macahensis*. Presumably this species is thus identical to *O. macahensis* or another Brazilian *Thismia*e. Schlechter considered *Thismia Luetzelburgii*, described by Goebel and Suessenguth as being identical with *O. macahensis*, without however having seen any material. To the genus *Myostoma* Schlechter computed 2 species: *M. hyalinum* Miers and *M. janeirensis* (Warm.) Schltr., both with actinomorphic flowers. With this classification I do not agree. Schlechter's species of *Ophiomeris* and Standley's *O. panamensis*, all zygomorphic, agree completely in their characteristic flower-construction with the actinomorphic *Thismia janeirensis* Warm. (= *Myostoma janeirensis* (Warm.) Schltr.) and *Thismia Luetzelburgii* Goeb. et Suessg. The last species is by

no means identical with *Ophiomeris macahensis* as presumed by Schlechter. All these species in my opinion should be united in the section *Ophiomeris* of the genus *Thismia*, characterized by the outstanding stamens (anthers bifid at the base and the top), the connate thecae and the hanging, triangular lobes between the stamens. The zygomorphy of *T. macahensis* and *T. panamensis* is then of no importance; except the zygomorphy, no difference in flower-construction exists between the zygomorphic *T. panamensis* and the actinomorphic *T. janeirensis*, considered by Schlechter as belonging to different genera.

In the section *Ophiomeris* also can be classified *T. Glaziovii* Pouls., classified by Schlechter in his new genus *Triuricodon*, based on the broad-campanulate perianth, however in my opinion the deviations are not sufficient to base a new genus on them. Though the triangular hanging lobes between the stamens are lacking in this species, the stamens generally correspond with those of the section *Ophiomeris*, so *T. Glaziovii* also can be classified in this section.

Of the American species is left then *Myostoma hyalinum* Miers = *Thismia hyalina* (Miers) Benth., showing quite a different flower-construction. In contradistinction to the section *Ophiomeris* the stamens are quite free here, the filaments are filiform, not ribbon-shaped, and the anthers sagittate. The triangular, small, hanging lobes are lacking, the outer perianth-lobes are erect and the flowers are actinomorphic. The stamens in no other *Thismia* occur in this way, this quite justifies the existence of a separate section *Myostoma*, of which *T. hyalina* is the only species. *T. janeirensis*, classified by Schlechter with *T. hyalina* in the genus *Myostoma* Miers, thus does not belong to this section, this species possesses all characteristics of the section *Ophiomeris*, with the section *Myostoma* it has only the actinomorphic flowers in common.

With the 3 Asiatic sections of the genus *Thismia* these two American ones can be joined, viz.:

4. *Ophiomeris* (Miers) Jonk.: anthers bifid at the apex and mostly also at the base. Filaments ribbon-shaped. Thecae connate.

Outer perianth lobes ovate, patent or reflexed, inner ones filiform. Underground part tuberous.

5. *Myostoma* (Miers) Jonk.: anthers sagittate. Filaments filiform. Outer perianth-lobes erect. Inner ones filiform. Underground part tuberous.

#### 14. GEOMITRA Becc.

Beccari described this genus in 1877 with 2 species: *G. episcopalis* Becc. and *G. clavigera* Becc. *G. episcopalis* is a real *Thismia*-species of which the inner perianth-lobes are connate to a mitre, and thus belonging to the section *Sarcosiphon*. In *G. clavigera* the inner lobes are also connate to a mitre but on the top of this mitre are inserted 3 thick, filiform, erect appendages, clavately swollen at their tops. By this feature a striking resemblance to the Brazilian *Glaziocharis macahensis* exists, showing the same peculiar flower-construction. The species also is connected with the genus *Scaphiophora*, here is inserted on the top of the mitre a column, bearing 3 free lobes at its top. *Geomitra clavigera* differs however from *Glaziocharis* by the length of the filiform appendages, the shape of the outer perianth-lobes and especially the construction of style and stigmas.

As I consider *Glaziocharis* and *Scaphiophora* as separate genera on account of their appendages of the mitre, also *Geomitra clavigera* is not to be considered as forming a section of the genus *Thismia* but as belonging to a separate genus. For this genus I use Beccari's name *Geomitra* although he described *Geomitra episcopalis* as the first species of this genus and this species I consider as a real *Thismia*.

Beccari's original description of the genus *Geomitra* however says: Perigonium campanulatum, apice 3-appendiculatum . . . ., having thus reference only to his *G. clavigera* and not to his *G. episcopalis*. Consequently I feel entitled to use for this genus Beccari's old name *Geomitra*.

#### 15. SCAPHIOPHORA Schltr.

In construction of the perianth, stamen-tube, style, stigmas, fruit and roots this genus is closely related to *Thismia-Sarcosiphon*.

Also because Lohrer collected a second, much larger-flowered species (*S. gigantea* Jonk.) I still uphold the genus. The new species shows the same peculiar column on the top of the perianth-mitre. This column bears 3 small cups at the apex in *S. appendiculata*, in *S. gigantea* it bears 3 connate fleshy lobes. Further the genus is characterized by the placentas. The placenta-stalks are free, the placentas however are connate at the apex in opposition to *Afrothismia*. This feature quite justifies the maintenance of the genus, which however is closely related to *Thismia*. The cup-shaped glands on the perianth-lobes recall those of *Triscyphus*, they are described by Schlechter for *S. appendiculata* and are reduced in *S. gigantea* to indistinct but somewhat hollow glands, just like the cups at the top of the column on the perianth.

## SUBTRIBUS 2, OXYGYNEAE.

### 16. OXYGYNE Schltr.

This important genus, of which unfortunately only one species and one specimen is collected by Schlechter in the Cameroons, has been described several times by Schlechter and Engler. The species, *O. triandra* Schltr. shows the normal flower-construction of the *Thismieae*: perianth urceolate to campanulate, style short and thick with 3 stigmas, ovary with 3 free, stalked placentas (as in *Thismia*), but only has 3 stamens, while all other genera of *Thismieae* possess six. A one-celled ovary and 3 stamens are the characters of the tribe of *Apterieae*, but that tribe always shows quite another construction of the flower. The genus *Oxygyne* is therefore a link between the somewhat isolated *Thismieae* and the other tribes of *Burmanniaceae*. For this reason I do not agree with Hutchinson's view to class the *Thismieae* as a separate family besides *Burmanniaceae* and *Corsiaceae*. By the discovery of the genus *Oxygyne*, the limits between *Apterieae* and *Thismieae* have grown much less sharp. The *Thismieae* are characterized now by introrse anthers and the shape of perianth and style. These features are in my opinion not sufficient to base a family on them.

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## PERMANIACHA

### IV. TAXONOMICAL PART.



## BURMANNIACEAE.

Annual or perennial, saprophytic, semi-saprophytic? or autotrophic herbs, the autotrophic species green, the saprophytic ones often colourless. Leaves alternate, entire, simple, without stipules, mostly reduced to small scales, the non-saprophytic species with a basal, radical rosette of linear leaves, sometimes the basal part of stem beset with many decurrent, grasslike, green leaves. Flowers hermaphrodite, sometimes zygomorphic, usually actinomorphic, rarely bilabiate. Stem bearing at its top 1 flower or a usually monochasial, sometimes dichasial or capitate inflorescence, inflorescence mostly a simple or bifid cincinnus. Perianth corolline. Limb consisting of 2 whorls of 3 lobes. In the tribe of *Burmanniaceae* inner lobes usually smaller than the outer ones, often minute, rarely lacking. In the tribe of *Thismiaceae* outer lobes often smaller than the inner ones, often almost lacking. Perianth-tube cylindrical or trigonous, often 3-winged or 3- or 6-costate. Anthers usually 3, in *Thismiaceae-Euthismiaceae* 6, (sub)sessile in the perianth-throat or hanging down in the perianth with short filaments, dehiscing laterally with horizontal splits or at the inner side with longitudinal splits. Connective broad, various, often appendiculate at the base or the top, sometimes forked. Style filiform in *Burmanniaceae*, shortly cylindrical or conical in *Thismiaceae*, branching at its apex into 3 short branches, each bearing a stigma or bearing at its apex 3 sessile stigmas or 1 stigma, consisting of 3 connate ones. Stigmas sometimes appendiculate. Ovary inferior, 1-celled, with axile placentation, sometimes with rather large glands at the top. In some genera inside the ovary at both sides of the top of each placenta a rather large, globose gland. Ovules numerous, anatropous with 2 integuments, funicle often long. In some genera of *Burmanniaceae* perianth-limb with anthers and stigmas deciduous, lower part of perianth always persistent, in other genera of this tribe whole perianth persistent on the

fruit. In *Thismieae* perianth circumcissile, only the basal, thickened perianth ring persistent. Fruit usually capsular, sometimes fleshy in *Thismieae*, dehiscent irregularly or with transverse splits or at the top, seldom with valves. Seeds numerous small, with endosperm, subglobose, linear or ellipsoid, often slightly curved, sometimes with loose, reticulate testa.

Type-species: *Burmannia disticha* L.

Distribution: About 125 species, widely distributed in the tropics of both hemispheres, also in the Southern United States, Chicago area, Southern Brazil and Bolivia, Moçambique, Southern China, Japan, Southern Australia, New Zealand and Tasmania (fig. 1, pag. 11).

Key to the tribes.

1. a. Perianth persistent or for the greater part persistent on the capsule. Style of equal length as the perianth-tube. Anthers 3, (sub)sessile in the perianth-throat, thecae dehiscent with transverse splits .....  
..... Tribus I, **Burmannieae**.
- b. Perianth circumcissile, only a small basal ring sometimes persistent on the fruit. Style very short, cylindrical or conical. Stamens usually 6, rarely 3, hanging down in the perianth-tube. Thecae dehiscent longitudinally ..... Tribus II, **Thismieae**, p. 221

### TRIBUS I, BURMANNIEAE Miers.

Saprophytic or green herbs, annual or perennial. Flowers actinomorphic. Perianth-lobes 3 or 6, stamens 3. Thecae dehiscent transversally. Style filiform, as long as the perianth-tube. Ovary 1-celled with 3 parietal placentas or 3-celled with axial placentation. Perianth persistent or partly persistent on the capsule.

Key to the subtribes.

1. a. Capsule 3-celled with axile placentation .....  
..... Subtribus 1, **Euburmannieae**.

- b.* Capsule 1-celled with parietal placentation.....  
 ..... Subtribus 2. **Apterieae**, p. 164

**Subtribus 1, EUBURMANNIEAE** Benth. et Hook.

Capsule 3-celled with axile placentation. Ovary also usually 3-celled, sometimes the young ovary 1-celled with 3 prominent parietal placentas.

Key to the genera.

1. *a.* Inner perianth-lobes as long as the outer ones. Ovary 1-celled when young ..... 1. **Campylosiphon**.
- b.* Inner perianth-lobes much shorter than the outer ones. Ovary always 3-celled. .... 2
2. *a.* Placentas broadened, inserted with apical and basal, sterile stalks. Fertile part free. Stamens with thick, rather long filaments, hammer-shaped. Ovary and basal part of the perianth-tube narrowly 6-winged, only the wings persistent on the capsule .....  
 ..... 2. **Hexapterella**, p. 55
- b.* Placentas axile, without broadened fertile part and sterile stalks. Stamens (sub)sessile in the perianth-throat. Ovary and perianth often prominently 3-winged, sometimes 3- or 6-costate or wingless. Perianth as a whole persistent on the capsule .....  
 ..... 3. **Burmannia**, p. 57

1. **CAMPYLOSIPHON** Benth.

Erect, saprophytic herbs, succulent. Stem usually simple, sometimes forked at the base into two branches, glabrous. Leaves scalelike, stem without basal rosulate leaves. Inflorescences simple or bifid cymes, many-flowered. Flowers rather large, perianth-tube of the older flowers curved. Perianth-lobes 6, erect, inner lobes of equal length as the outer ones, slightly narrower. Stamens 3, inserted in the upper part of the tube below the inner perianth-lobes. Connective broad with short apical appendages, tapering towards the base into a very short, broad

filament. Style thick-filiform, branching at the apex into 3 short branches, each bearing a stigma. Ovary 1-celled with 3 parietal prominent placentas, placentas later on growing together in the centre of the ovary. Fruit 3-celled with axile placentation of the seeds. Seeds numerous, testa appressed.

Type-species: *Campylosiphon purpurascens* Benth.

Distribution: 1 species, collected in Venezuela, northern Brazil and British Guiana.

1. *Campylosiphon purpurascens* Benth. in Hook., Ic. Pl. LXV (1882) pl. 1384; Sandwith in Kew Bull. (1931) p. 60; — *Dipterosiphon spelacicola* Huber in Bol. Mus. Para. II (1898) p. 502.

Plants 10–30 cm high. Stem usually simple, succulent, dirty white or purplish, terete, slightly sulcate, bearing at the top a simple or bifid cymous inflorescence. Inflorescence to 7.5 cm long, to 15-flowered, stem rarely 1-flowered. Leaves 1–16 mm long, up to 4 mm broad, ovate to lanceolate, acuminate, brownish with a dark midnerve, rather small in the lower part of stem, growing larger towards the top, imbricate in the upper part. Flowers subsessile, 20–22 mm long, white or sometimes purplish, occasionally perianth-limb pale-blue, tube violet, or inner perianth-lobes mauve and rest of the flower white. Perianth-lobes usually 5–6 mm long, lanceolate, acute or acuminate, inner lobes of equal length as the outer ones but slightly narrower, base of the outer lobes much broader than that of the inner ones. Perianth-tube 8–9 mm long, cylindrical, with 2 very narrow wings, in older flowers often curved. Connective with two apical, lateral crests and one apical, median, acute point, directed inwards or downwards in bud. Filament broad, very short. Stigmas 3, at the top of short style-branches, dish-to funnel-shaped, hollow, with two small horns and without filiform appendages. Ovary 8–10 mm long, ellipsoid, slightly 6-costate with 2 very narrow wings, 1-celled when young, later

on 3-celled, without glands. Fruit ellipsoid, often curved, crowned by the dried perianth, perianth-limb not deciduous. Seeds rounded.

Type: Spruce 2492 from Amazonas in herb. K, duplicates in herb. BM; BR; P-DR and W.

Distribution: Venezuela (Rio Negro); Brazil (Amazonas, Maranhao); British and French Guiana.

#### VENEZUELA.

Amazonas, Rio Negro near San Carlos (Spruce 2492a, fl. Aug. [K]).

#### BRAZIL.

Amazonas, Uaupès Riv. near Panuré (Spruce 2492, fl. Oct. [BM; BR; K; P-DR; W]); Maraca Riv., Serro do Laranjal, Buracao (Guedes 604 [Mus. Para; G-BOIS], type of *Dipterosiphon spelacicola* Hub.); Serra do Paraguaró (Ducke 111539, fl. Oct. [R; U]); near Manaos (Traill 1130, fl. Aug. [K]).

Maranhao, Alto do Alegria, Tury-Assu (Snethlage 329, fl. Nov. [B]).

#### BRITISH GUIANA.

Essequibo Riv., Moraballi Creek, near Bartica (Sandwith 383, coll. Davis, fl. Oct. [K]; Sandwith 553, fl. Nov. [K; NY]); Potaro Riv., Amutis (Im Thurn s.n., fl. Nov. [K]); Aruka Riv., Edu swamp (Im Thurn 226, fl. Sept. [K]); Mazaruni Station (Sandwith 1064, fl. Aug. and Sept. [K]).

#### FRENCH GUIANA.

Without precise locality (van Rohr 159 [BM]).

## 2. HEXAPTERELLA Urb.

Small, saprophytic, erect herbs. Stem simple, bearing at the top one to three flowers. Rhizome beset with imbricate scales. Leaves small, sessile, scalelike. Flowers erect. Outer perianth-lobes 3-lobate, inner ones smaller and narrower, perianth-tube as long as the outer lobes. Stamens inserted at the base of the inner lobes, formed like hammers; filaments thick, bearing at the top the two thecae. Connective not broadened. Lower part of the perianth-tube and the obovoid ovary winged by 6 narrow wings. Ovary without glands, 3-celled, with very thin membranous septa. Placentas 3, axillar, only fertile in the middle, the fertile placenta-part broad, at both ends suddenly narrowed into the filliform sterile parts, attached to the ovary-wall by



the ends of the sterile parts. Perianth-limb just above the insertion of the stamens deciduous, but the ripe capsule crowned only by the 6 wings of the perianth-tube. Capsule obovoid or ovoid, seeds ovoid to nearly globose.

Type-species: *Hexapterella gentianoides* Urb.

Distribution: 1 species, known from British Guiana and Brazil (Amazonas).

1. *Hexapterella gentianoides* Urb. in Symb. Antill. III (1903) p. 451 — *Gymnosiphon Altsoni* Gleas. in Bull. Torr. Bot. Cl. LVI (1929) p. 23; Sandwith in Kew Bull. (1931) p. 60.

Plants 6.5–14 cm high. Stem mauve or violet, erect. Scales ovate, acuminate, in the lower part appressed against the stem,

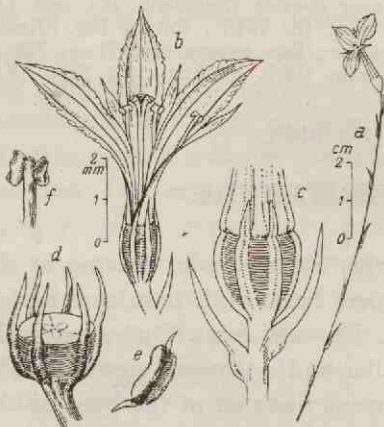


Fig. 5. *Hexapterella gentianoides* Urb.

- a. flowering plant.
- b. dissected flower.
- c. ovary and lower part of perianth-tube with wings.
- d. capsule with the persistent wings.
- e. placenta.
- f. stamen.

1–3 mm long, the upper stem-part spaced with rather long intervals, in the lower part the intervals much shorter. Radical, rosulate leaves absent. Scales of the rhizome inbricate. Flowers 10–15 mm long, flowerbuds brown lilac (according to Altson), flowers white, tinged with mauve at the tip. Outer perianth-lobes with a central ridge of creamy biscuit-colour (Sandwith), three-lobed, acute, up to 5 mm long, midlobe ovate, lateral lobes lanceolate, margin crenulate. Inner lobes lanceolate, acuminate, reaching to about half the length of

the outer lobes. Filaments about half as long as the inner lobes. Tube of the perianth about 5 mm long, constricted. Style thick-filiform, branched at the apex into three short branches, each bearing a flattened stigma. Ovary up to 4 mm long, lower part of the perianth-tube and ovary winged by 6 linear-lanceolate, persistent wings. Capsule about 3,5 mm long, crowned by the 6 wings, wings appearing like a calyx. Seeds ovoid to nearly globose, reticulate, funicle short.

Type: Poeppig 3005, from Brazil, Amazonas in herb. B, duplicates in herb. G-BOIS and W.

Distribution: known from Amazonian Brazil and British Guiana.

#### BRAZIL.

Amazonas, Amazonas Riv., Isle of Colares (Poeppig 3005, fl. May [B; G-BOIS; W]).

#### BRITISH GUIANA.

Kurupung Riv., Macreba falls (Altson 364, fl. Aug. [K], type of *Gymnosiphon Altsoni* Gleas.); Essequibo Riv., Moraballi Creek, near Bartica (Sandwith 130, fl. Aug. [K]; Martyn 222, fl. Aug. [K]); Mazaruni Riv., near Kabawain fall (Altson 305, fl. Aug. [K]); Bartica-Potaro road, near Barbara Creek (Sandwith 1097, fl. Aug. [K]).

### 3. BURMANNIA L.

Annual or perennial, saprophytic and colourless or green herbs. Stems simple or branched. In the saprophytical species leaves reduced to small, usually lanceolate scales, in the non-saprophytical species sometimes the lower part of the stem beset with many, rather large, grasslike, linear, imbricate, decurrent leaves or stem beset with few, small, scalelike leaves, at the base with a rosette of linear leaves. Basal rosette sometimes reduced to 2 or 3 leaves. Flowers solitary or in groups at the top of the stem or in dense terminal cymose or headlike inflorescences. Perianth-limb usually consisting of 6 lobes, the 3 outer being much larger, inner ones often minute, sometimes lacking. Perianth-tube cylindrical-trigonus. Anthers 3, (sub)

sessile in the perianth-throat below the inner perianth-lobes. Style filiform, branching at the top into 3 short branches, each bearing a stigma or 3 sessile stigmas at the top of the style. Ovary trigonous, 3-celled, placentas axillar. Capsule crowned by the persistent, dried perianth, dehiscing irregularly. Seeds many, oblong or ellipsoid.

Type-species: *Burmannia disticha* L.

Distribution: Tropics of both hemispheres, also in the Southern United States, Southern Brazil, Bolivia, Moçambique, Southern China, Japan and Southern Australia.

Key to the sections:

1. *a.* Perennial, leafy green herbs, greater (lower) part of the stem beset with rather long, grass-like, linear or ensiform, decurrent, imbricate leaves. Flowers wingless or narrowly 3-winged. Inflorescence usually many-flowered ..... Sect. I. **Foliosa** Jonk.
- b.* Annual or perennial, saprophytical or green herbs. Stem-leaves reduced to few small scales, the non-saprophytical species also with a radical rosette of linear leaves. Flowers wingless or 3-winged. Stem mostly 1—few-flowered .....  
..... Sect. II. **Euburmannia** Malme, p. 67

### SECT. I. FOLIOSA Jonk. <sup>1)</sup>

Perennial, non-saprophytic herbs. Whole stem or only the lower part beset with a large number of long, linear or ensiform, parallel-veined, grasslike, often imbricate and decurrent leaves. Flowers in many-flowered inflorescences, wingless or narrowly 3-winged.

<sup>1)</sup> **Foliosa** Jonk., nov. sect. e genere *Burmannia*. Herbae perennes non-saprophyticae. Caulis erectis, robustis, parte inferiore bene foliosis, foliis erectis vel erecto-patentibus, longis, linearibus, saepe imbricatis, decurrentibus. Inflorescentia dichotoma vel contracta, pluriflora. Alae perianthii angustissimae vel nullae.

## Key to the species.

1. *a.* Flowers hanging. Anthers inserted on very short, broad filaments. Malay Peninsula and Malay Archipelago ..... 1. **B. longifolia** Becc.
- b.* Flowers erect. Anthers sessile in the perianth-throat. American species ..... 2
2. *a.* Flowers wingless ..... 3
- b.* Flowers narrowly 3-winged ..... 4
3. *a.* Inflorescences appearing as headlike clusters. Inserted on the basal part of the outer perianth-lobes 2 triangular sacks, outer lobes with broad involute, lateral lobes. Connective with two small crests at the apex. Venezuela ..... 2. **B. foliosa** Gleas.
- b.* Inflorescence much-branched, more or less umbelliform. Outer perianth-lobes without sacks and broad lateral lobes, margin involute. Connective without crests. Colombia ..... 3. **B. Kalbreyeri** Oliv.
4. *a.* Inflorescence many-flowered, bifid, inflorescence-branches 8—15 cm long. Bracts broad, ovate, imbricate. Costa Rica ..... 4. **B. Wercklei** Schltr.
- b.* Inflorescence headlike, at the top of the stem. Bracts small, linear-lanceolate. Amazonian Brazil ..... 5. **B. polygaloides** Schltr.

1. **Burmannia longifolia** Becc., Malesia I (1877) p. 244 and tav. XIII; Hooker, Fl. Br. Ind. V (1888) p. 664; Ridley in Journ. Str. Br. Roy. As. Soc. 22 (1890) p. 332; Rendle in Journ. Bot. 34 (1896) p. 355; Ridley, Mat. Fl. Mal. Penins. II (1907) p. 70; J. J. Smith in Nov. Guin. VIII (1907) p. 195; Ridley, Fl. Mal. Penins. IV (1924) p. 304; Bartlett in Pap. Mich. Ac. Sc. Arts Lett. VI (1927) p. 47; — *Burmannia leucantha* Schltr. in Engl., Bot. Jahrb. XLIX (1913) p. 107.

Perennial herbs, 12—50 cm high. Stem usually simple, sometimes branched, forked at the top into the bifid inflorescence or

bearing a simple cincinnus at the top. Leaves many, long, linear, sometimes keeled, 4—20 cm long and 2—9 mm broad, decurrent, stem-clasping, growing smaller towards the apex. Leaves acute, sometimes subulate, parallel-nerved but mid-nerve more prominent. Upper part of the stem beset with few, appressed, scattered, lanceolate, acute, scale-like leaves, 5—33 mm long. Basal part of the stem beset with brownish, dried, frayed leaves and leaf-sheaths. Inflorescence 3—21-flowered, sometimes 2—4 flowers at the top of the stem, mostly a simple or bifid cincinnus, bearing hanging flowers; inflorescence-branches up to 4 cm long. Bracts scalelike, linear-lanceolate, acute, 5—10 mm long. Flowers 8—16 mm long, white with pale-violet perianth-limb, subsessile. Outer perianth-lobes deltoid, acute, with a thick, somewhat fleshy margin in the basal part, 2—4.5 mm long. Inner perianth-lobes 1.5—2 mm long, broad-obovate to orbiculate, sometimes entire and rounded at the apex, sometimes bilobate at the apex or only more or less retuse. In the same flower the inner perianth-lobes sometimes partly entire or partly 2-lobed at the apex. Perianth-tube cylindrical, sometimes swollen in the upper part, 3—5 mm long, lower tube-part and ovary very narrowly 3-winged. Stamens inserted just below the inner perianth-lobes. Connective broad, oblong, fleshy with two, rather broad crests at the top and a short broad filament at the base. Style thick, branching at the apex into 3 very short branches, each bearing a curved, funnel-shaped stigma. Style with stigmas 3.5—4 mm long. Ovary obovoid, 4—7 mm long, narrowly 3-winged. Capsule obovoid, dehiscent transversally, irregularly. Seeds small, oblong to scobiform, appendaged at both sides, with loose, reticulate testa.

**Type:** Beccari 1687, from Borneo, Sarawak, Mt. Mattang, in herb. FI, duplicate in herb. K.

**Distribution:** Malay Peninsula and Malayan Archipelago, not in Java.

## MALAY PENINSULA.

Pahang, Rhododendron's hill (Henderson 11060, fl. Jun. [BZ]); Fraser Hill, upon the Selangor border (Burkill and Holttum 8510, fl. Sept. [BM; BZ]); Mt. Benom (Henderson s.n., fl. Aug. [BZ; K]; Henderson s.n., fl. Jul. [K]); Mt. Tahan (Haniff and Nur 7873, fl. Jun. [BZ]; Wray and Robinson 5230, fl. May [BM; CA]); Mt. Berunlu (Ridley 13800, fl. Nov. [BM]); Kluang Terbang (Barnes s.n., ex Ridley 1924).

Selangor, Mt. Semangok (Curtis 3731, fl. May [K]); Bukit Hilai (unknown collector 7653, fl. May [BM]); Bukit Hitam (Ridley s.n., ex Ridley 1924); without locality (unknown collector 12028, fl. Aug. [CA]).

Perak, Mt. Inas (Yapp 423 [CA; K]); Mt. Batu (Wray 213 [CA; K]; Kunstler (King's collector) 8040, fl. Aug. [BM; BZ; CA; G-BOIS; K; L]); Iopof, Mt. Hyon (King's collector 5039, fl. Oct. [CA]); Mt. Kerbau (Robinson s.n., fl. March [K]; Ridley s.n., fl. Aug. [K]); Thaiping Hills (Ridley s.n., ex Ridley 1924).

Kedah, Mt. Bintang (unknown collector s.n., fl. Jun. [K]; Kloss s.n., ex Ridley 1924).

Singapore (Meyer s.n. [B]).

Locality unknown, Mt. Bubu (Wray 3888, fl. March [CA; G-DEL]; Scortechini 768, fl. May [CA; K]).

## SUMATRA.

Atjeh, Gajo en Alaslanden (v. Daalen 171, fl. March [BZ]); Gajolanden, Lau Alas, Bivak 8 (v. Steenis 8728, fl. Feb. [BZ]); id., Mt. Kemiri (v. Steenis 9546, fl. March [BZ]); id., Mt. Goh Lemboek (v. Steenis 8944, fl. Feb. [BZ]).

East coast, Penghoeloe Bao (Frey Wyssling 39(2), fl. Apr. [BZ]); Asahan (Bartlett and La Rue 304, fl. Jul. [GH; L; US]); near Bandarbaroe (Lörzing 7261, fl. March [BZ; L]); Mt. Sinaboeng (Lörzing 8191, fl. Jan. [BZ]); without precise locality (Forbes 2000 [CA]).

West coast, Mt. Sago (Bünnemeyer 3981, fl. Jul. [BZ]; Bünnemeyer 4353, fl. Aug. [BZ]; Bünnemeyer 4365a [BZ]; Mt. Malintang (Bünnemeyer 3916, fl. Jul. [BZ]; Bünnemeyer 4058, fl. Jul. [BZ]; Bünnemeyer 4183, fl. Aug. [BZ]); Padangse Bovenlanden, Bt. Gombah, Laras Talang (Bünnemeyer 5463, fl. Nov. [BZ; L]; Bünnemeyer 5728, fl. Nov. [BZ; L]); Agam, Brani (Bünnemeyer 3331, fl. Jun. [BZ]); Ophir distr., Tadamau (Bünnemeyer 278, fl. Dec. [BZ]); Bukit Batu Banting (Jacobson s.n., fl. Feb. [BM]); Loeboek Aloeng, watershed between Asan Poelau and the lake of Singkarak (Latif 14, fl. Jul. [BZ]).

Riouw Arch., Lingga, P. Singkep (Bünnemeyer 39663b [BZ]).

Palembang, South Semendo (de Voogd 1500, fl. Sept. [BZ]); Mt. Pesagi, SSE of Ranau Lake (v. Steenis 3681, fl. Nov. [BZ; L; U]); Summit of Mt. Raja, ENE of Ranau Lake (v. Steenis 3512, fl. Nov. [BZ]).

Benkoelen, Liwa (de Voogd 130, fl. Feb. [BZ]); Mt. Semendeng (de Voogd 1465, fl. Jul. [BZ]).

Lampongs, Mt. Tanggamoos (Lieftinck 16, fl. Dec.—Jan. [BZ]).

## BORNEO.

British N. Borneo, Penibukan (Clemens s.n., fl. Jan. [BZ]); Serapi (Haviland 456 [K]); Mt. Nunkok (Clemens 327522, fl. Apr. [G-DEL; NY]); Mt. Kinabalu, Marai Parai (Clemens s.n., fl. March [BZ]; Clemens 32389, fl. March [L; NY]); id., Silau Basin (Clemens 29713, fl. May [BZ; G-DEL]); id., Maraiparai spur (Gibbs 4033, fl. Feb. [BM; K]); id., Lumu (Clemens s.n., fl. Jan. [BM]); without locality (Burbridge s.n. [K]).

Sarawak, Mt. Poi (Beccari 2427, fl. Aug. [FI]; Hewitt s.n. [BM; BZ; K]; Clemens 20065 [B; BZ; MIS; NY]; Unknown collector s.n. [B]); Mt. Mattang (Andersen 21 and 227, fl. Aug. [K]; Beccari 1687, fl. May [FI; K]; unknown collector s.n., fl. Jun. [B]); Without locality (Coll. indig. 1611 [NY; US]; coll. indig. 636 [B; NY; P]).

Netherl. Borneo, Amai Ambit (Hallier 3396 [BZ; L]); Liang gagan (Hallier 2717 [BZ]).

Without locality, Long Dett (Schlechter s.n. [B]).

#### CELEBES.

Selewao, Preho (Kjellberg 2496, fl. Oct. [BZ]); Sibaronga Mts. (Sarasin 2140, fl. Jul. [B]); Topapu Mts. (Sarasin II. 2099, fl. Sept. [B]); Mt. Boeroe (Lanschot 577, fl. Aug. [L]); Masamba Limboeng (Steup 209, fl. Aug. [BZ]); without locality (Rachmat 597 [BZ]).

#### PHILIPPINE ISLANDS.

Mindoro, Mt. Holcon (Merrill 5741, fl. Nov. [B; NY; US]); Mt. Dulangan (Whitehead s.n. [BM]).

Mindanao, Todaya, distr. of Davao (Elmer 11843, fl. Sept. [B]); Cudbaran, Mt. Urdanetz, prov. of Agusan (Elmer 13690, fl. Jul. [BM; BZ; CA; F; G-DEL; L; MIS; NY; W]); Camahuin de Mindanao (Ramos 14428, fl. March-Apr. [L]).

Negros, Mt. Marapara (Curran and Foxworthy 13611, fl. Sept. [B; US]).

#### MOLUCCAS.

Ambon, Telaga Radja (Brooks 17781, fl. Oct. [BZ; L]); Mt. Salahoe-toe (Rant 652, fl. Nov. [BZ; GRO; L; U]); Teysmann s.n. [BZ]; Beccari s.n., ex Beccari l.c.); Mt. Toina (Teymann s.n. [BZ]); Hila (Boerlage 275, fl. Jul. [BZ]); Without locality (Robinson 1849 [B; BM; BZ; CA; F; GH; K; L; MIS; NY; P; US]).

Ceram, SW of Walokene (Rutten 2199, fl. May [BZ]); Way to Lautabi (Kormassi (Exped. Rutten) 1243, fl. May [BZ; L; U]).

Boeroe, S of Muyes Waen, way to Leksoela (Toxopeus 123, fl. Apr. [BZ; L]); Nol Besi (Toxopeus 208, fl. Jun. [L]).

Soela Isles, Isle of Taliaboe, Mt. Rapengkaja (Hulstijn 258 [BZ; L]).

#### NEW GUINEA.

British New Guinea, Kaiserin Augusta Riv., Hunstein Mts. (Ledermann 11132e, fl. March [B]; Ledermann 8404, fl. Aug. [B]); id., Felspitze (Ledermann 123776, fl. Aug. [B]; Ledermann 13115a, fl. Aug. [B]; Ledermann 12379, fl. Jul. [B]); id., Graslager (Ledermann 10920a, fl. Feb. [B]); Torricelli Mts. (Schlechter 20072, fl. Sept. [B]); near Dschischugari (Schlechter 19602, fl. May [B; BR; K; P], type of *B. leucantha* Schltr.); Mafulu (Brass 5353 [NY]); Sogeri Region, S Cape (Forbes s.n. [BM]).

Netherl. New Guinea, Arfak Mts. (Gibbs 5657, fl. Dec. [BM; K]; Gjellerup 1053, fl. Apr. [BZ; L]; Beccari s.n., ex Beccari l.c.); id., Mt. Wondiwoi, Wanndammen (Mayr 348, fl. Jul. [BZ]); Cycloop Mts. (Gjellerup 523, fl. Jun. [B; BZ; K; L; P; U]); Johannes Keyts Mts. (Le Coq d'Armandville 251 [BZ]); Lorentz Riv., Resi ridge (Versteeg 1633 [B; BZ; CA; K; L; U]); id., Mt. Perameles, (Pulle 476, fl. Nov. [U]); Mt. Dromedaris (Pulle 603, fl. Dec. [U]; Pulle 618, fl. Dec. [U]); Gauttier Mts. (Gjellerup 873, fl. Nov. [BZ; L]); Mt. Goliath (de Kock 24, fl. March [BZ]); Mt. Carstenz (Boden Kloss s.n., fl. Feb. [BM; K]); id., id., fl. Jan. [BM; K]; id., id., fl. Dec. [BM; K]); Alkmaar, Hellwig Mts. (v. Römer 808, [BZ]; v. Römer 778 [BZ]); without locality (Mayr 471 [BZ]).

2. *Burmannia foliosa* Gleas. in Bull. Torr. Bot. Cl. 58 (1931) p. 343.

Perennial, erect herbs, 15—35 cm high. Stem simple, bearing at the top a headlike inflorescence. Leaves many, ensiform, linear or linear-lanceolate, 3—5,5 cm long, 4—7 mm broad, decurrent and stem-clasping at the base, with peculiarly curled tops. Leaves growing smaller towards the top, upper part of stem (7—14 cm) beset with few, lanceolate, appressed, scale-like leaves, 1—2 cm long. Inflorescences appearing as headlike clusters, about 0,5—1,5 cm broad, consisting of contracted cymes of subsessile flowers. Below the inflorescence a lanceolate bract, 5—6 mm long. Flowers numerous, about 4,5 mm long, apparently blue. Outer perianth-lobes about 1,5 mm long, deltoid, at both sides a right-angled deltoid lateral lobe. Lateral lobes folded inwards, about 0,5 mm long and 0,5 mm broad.

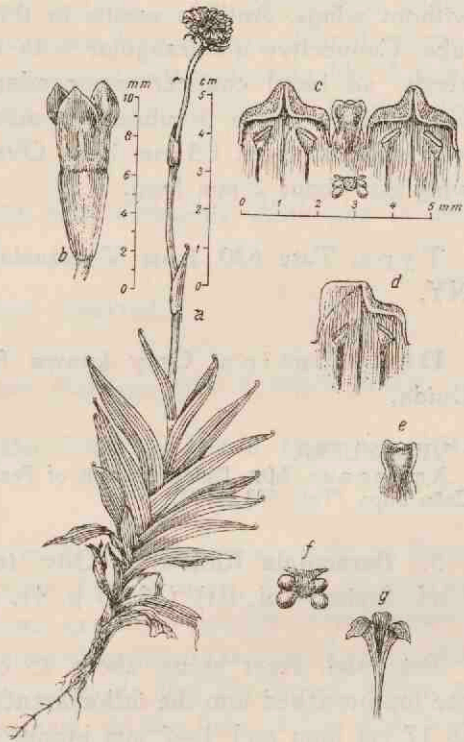


Fig. 6. *Burmannia foliosa* Gleas.

- a. flowering plant.
- b. flower.
- c. part of flower-limb, showing sacs and one anther.
- d. outer perianth-lobe.
- e. inner perianth-lobe.
- f. stamen.
- g. style with stigmas.



Just below the lateral lobes, inserted on the basal part of the outer perianth-lobes two curious, small, triangular sacks. Inner perianth-lobes quadrate-obovate to spatulate, truncate, about 1 mm long. Outer perianth-lobes, lateral lobes, sacks of the outer perianth-lobes and inner perianth-lobes all with white, thick margin. Perianth-tube cylindrical, short, about 1 mm long, without wings. Anthers sessile in the mouth of the perianth-tube. Connective quadrangular with two small, curved, apical crests, no basal connective-appendage. Style thick, filiform, bearing at its apex 3 subsessile, curved, fleshy stigmas; style with stigmas about 1.5 mm long. Ovary obovoid to obconical, wingless, about 2 mm long.

Type: Tate 630, from Venezuela, Mount Duida, in herb. NY.

Distribution: Only known from Venezuela, Mount Duida.

VENEZUELA.

Amazonas, Mnt. Duida, Summit of Peak no. 7 (Tate 630 [NY]); id., Caño Sapo (Tate 598 [NY]).

3. *Burmannia Kalbreyeri* Oliv. in Hook., Ic. Plant. XIII (3rd. Series, Vol. III) (1881) p. 41, pl. 1357.

Perennial, erect herbs, about 25 cm high. Stem simple, at the top branched into the inflorescence. Leaves many, about up to 17 cm long and 4–7 mm broad, linear, grasslike, parallel-veined, acute, imbricate, basal part decurrent. Base of the stem beset with brownish leaf-sheaths. Leaves growing smaller towards the top of the stem. Inflorescences much branched, more or less umbelliform. Bracts lanceolate or ovate-lanceolate, acuminate, 8–15 mm long. Flowers about 11–12 mm long, violet, lobes white, pedicels up to 1 cm long. Outer perianth-lobes about 3 mm long, deltoid, obtuse, with swollen margins. Inner lobes about 1 mm long, linear to spatulate, rounded at

the apex. Perianth-tube about 2.5 mm long, not winged, cylindrical in the basal part, suddenly swollen at the top. Stamens 3, sessile in the swollen tube part. Connective broad, rhomboid, with two small, basal, pointed appendages and without apical appendages. Connective with two lateral arms, bearing the thecae. Style thick-filiform, branching at the apex into 3 very short style-branches, each bearing a trumpet-shaped stigma. Style with stigmas about 3 mm long. Ovary deltoid, about 6 mm long, the 3 angles prominent and appearing like 3 wings of the ovary. Seeds small, without appendages, oblong, fusi-form or dumb-bell-shaped.

Type: Kalbreyer 1503, from Colombia, Antioquia, in herb. K; duplicate in herb. B.

Distribution: Once collected.

COLOMBIA.

Antioquia, near San José (Kalbreyer 1503, fl. March [B; K]).

4. *Burmannia Wercklei* Schltr. in Fedde, Rep. XII (1913) p. 35.

Perennial, erect herbs, to 30 cm high. Stem simple, at the top forked into the inflorescence. Leaves many, 2—14 cm long and about 0.5 cm broad, linear, grasslike, parallel-veined, acute or acuminate, more or less stem-clasping at the base. Leaves growing smaller and broader towards the top, upper leaves appressed, lanceolate, acuminate. At the base of the stem brownish, frayed leaves and leaf-sheaths. Inflorescences bifid, many-flowered, branches 8—15 cm long. Bracts many, large, distichous, imbricate, broad-ovate or deltoid, 1—1.5 cm long, about 0.5 cm broad. Flowers erect, about 12 mm long, blue, pedicels 0.5—1 cm long. Outer perianth-lobes deltoid, about 2 mm long, obtusiusculous, margins folded inwards. Inner lobes fleshy, nearly 1 mm long, broad, spatulate. Perianth-tube short, cylindrical, about 2 mm long. Ovary and tube narrowly

3-winged, wings about 10 mm long, maximum breadth 1.5 mm. Anthers sessile in the mouth of the tube, connective broad and fleshy, truncate at the apex, acute at the base, with two lateral arms, bearing the thecae. On the top of the connective two small, curved, ear-shaped appendages. Style short, thick, bearing 3 curved, subsessile, trumpet-shaped stigmas at the top. Style with the stigmas about 3 mm long. Ovary elongate, about 6 mm long, narrowly 3-winged. Ovules oblong.

Type: Wercklé 687, from Costa-Rica in herb. B.

Distribution: Only known from Costa-Rica.

COSTA RICA.

La Palma, near San José (Wercklé 687, fl. Apr. [B]); Turrialba (Alfaro 39970, fl. Apr. [US]); La Fuente (Alfaro s.n., fl. Dec. [US]).

5. *Burmannia polygaloides* Schltr. in Verh. Bot. Ver. Brandenb. 47 (1905) p. 103.

Perennial, erect herbs, 8.5–15 cm high. Stem simple, bearing at the top a headlike inflorescence. Leaves many, acute, ensiform, linear or linear-lanceolate, 10–30 mm long and 1–3 mm broad, leaf-base stem-clasping. Leaves growing smaller towards the top, upper part of the stem almost without leaves. Inflorescence consisting of contracted cymes, appearing like head-like clusters, with small, lanceolate bracts, 1–2 mm broad and up to 4 mm long. Pedicels very short or lacking. Flowers about 5 mm long, yellowish-white. Outer perianth-lobes deltoid, about 1.5 mm long, margins folded inwards. Inner lobes small, about 0.5 mm long, linear, truncate. Perianth-tube cylindrical, about 1.5 mm long. Ovary and tube very narrowly 3-winged. Wings about 4 mm long, 0.25 mm broad. Anthers sessile, inserted just below the inner perianth-lobes. Connective thick, fleshy, quadrangular, bearing two apical crests, without appendages at the base or lateral arms. Style thick-filiform, branching at the apex into 3 short branches, each bearing

3 oblong stigmas without appendages. Style with stigmas about 2.5 mm long. Ovary obovoid, narrowly 3-winged, about 2 mm long. Ovules oblong.

Type: Ule 6121, from Brazil, Amazonas, in herb. B; duplicates in herb. K and L.

Distribution: Once collected.

**BRAZIL.**

Amazonas, Marmellos, Rio Madeiro (Ule 6121, fl. March [B; K; L]).

**SECT. II, EUBURMANNIA Malme.**

Annual or perennial, saprophytic or green herbs. Stem usually beset with few, small, scalelike, more or less appressed leaves, in the non-saprophytical species often with a rosette of linear leaves at the base. Flowers in mostly few-flowered inflorescences or a single flower at the top of the stem, wingless or 3-winged.

American species .....	p. 67
African species .....	p. 92
Asiatic and Australian species .....	p. 106

Key to the American species.

1. *a.* Flowers wingless ..... 2
- b.* Flowers 3-winged, wings sometimes rather narrow ..... 3
2. *a.* Inflorescence capitate. Outer perianth-lobes always erect, margin involute. Flowers up to 4 mm long ...  
..... 6. **B. capitata** (Walt.) Mart.
- b.* Inflorescence bifid, contracted, sometimes reduced to 1 or 2 flowers. Outer perianth-lobes spreading in the older flowers, margin not folded inwards. Flowers about 5—7.5 mm long, in var. *grandiflora* up to 20 mm long ..... 7. **B. alba** Mart.

3. *a.* Wings narrower than the perianth-tube. Radical, rosulate leaves many, grasslike ..... 8. **B. dasyantha** Mart.  
*b.* Wings as broad as or broader than the tube ..... 4
4. *a.* Saprophytic herbs without chlorophylli. Wings truncate. Ovary subglobose ..... 9. **B. tenella** Benth.  
*b.* Chlorophyllose plants. Ovary ellipsoid to obovoid ... 5
5. *a.* Radical, rosulate leaves lacking ..... 6  
*b.* Radical, rosulate leaves linear, longer than the stem-scales, rosette sometimes reduced to few scales ..... 7
6. *a.* Ovary as long as the perianth, inner perianth-lobes linear-oblong. (Southern United States) ..... 10. **B. biflora** L.  
*b.* Ovary as long as or shorter than the perianth. Inner perianth-lobes orbiculate (Brazil) ..... 11. **B. Damazii** Beauv.
7. *a.* Flowers yellow ..... 8  
*b.* Flowers blue, purplish or white ..... 9
8. *a.* Wings rather broad, half-obovate, truncate. Base of the connective rounded, not spurred ..... 12. **B. australis** Malme.  
*b.* Wings narrow, half-elliptical, about as broad as the tube (broader in var. *macroptera*). Connective with a hanging, acute, median spur at the base ..... 13. **B. flava** Mart.
9. *a.* Wings half-rhomboid to half-obcordate. Stem usually 1-flowered, slender. Inner perianth-lobes spatulate, fleshy ..... 14. **B. tenera** (Malme) Jonk.  
*b.* Wings half-elliptical to half-obovate ..... 10
10. *a.* Inner perianth-lobes rather broad, rounded. Connective rounded at the base, without hanging spur. Robust herbs with a large rosette at the base (Peru) ... 15. **B. Stuebelii** Hieron. et Schltr.  
*b.* Inner perianth-lobes linear to lanceolate. Connective with a hanging basal spur ..... 11

11. *a.* Wings half-obovate to half-cuneate, continuing as a crest on the back of the outer perianth-lobes. Outer perianth-lobes ovate, obtuse .....  
 ..... 16. **B. aprica** (Malme) Jonk.
- b.* Wings half-elliptical, not continuing as a crest on the limb. Outer perianth-lobes triangular, acute .....  
 ..... 17. **B. bicolor** Mart.

6. **Burmannia capitata** (Walt.) Mart., Nov. Gen. et Spec. Plant. I (1824) p. 12; Schultes, Syst. Veg. VII. 2 (1830) p. LXXIV; Seubert in Mart., Flor. Bras. III. 1 (1847) p. 56; Malme in Bih. K. Sv. Vet. Ak. Handl. 22, Afd. III N. 8 (1896) p. 26; Johow in Pringsh., Jahrb. Wiss. Bot. XX (1889) p. 475, Taf. 19, Fig. 2; Urban in Symb. Antill. III (1903) p. 450; Chapman, Fl. S. Un. St. 3rd. Ed. (1897) p. 477; Pulle, Enum. Sur. (1906) p. 114; Small, Man. S. E. Fl. (1933) p. 362; Benoist in Bull. Soc. Bot. Fr. 69 (1922) p. 22; Malme in Ark. f. Bot. 26A N. 9 (1934) p. 20; Standley in Field Mus. Nat. Hist. XII, Publ. 350 (1936) p. 75; Jonker in Pulle, Fl. Surin. I. 1 (1938) p. 178; — *Anonymos capitatus* Walt., Flor. Carol. (1788) p. 69; — *Vogelia capitata* (Walt.) Gmel., Syst. Nat. II. 1 (1791) p. 107; — *Tripterella capitata* (Walt.) Michx., Flor. Bor. Am. I (1809) p. 19; Schultes in Roem. et Schult., Mant. II, Add. ad Mant. Cl. III (1824) p. 356 (108).

Annual, erect herbs, 3–30 cm high. Stem usually simple, rarely branched, bearing at the apex the capituliform inflorescence. At the base of the stem usually a few, linear or linear-lanceolate, rosulate leaves, up to 4 mm long, subulate. Stem leaves growing upwards smaller and more scalelike, superior leaves appressed, about 2 mm long. Inflorescence consisting of a contracted, 2–many-flowered, bifid cyme, appearing like a capitulum. Bracts lanceolate, acuminate, about 2 mm long. Flowers wingless, erect, subsessile, mostly white, yellowish or pinkish; in a Trinidad specimen, collected by Broadway.

deep-blue; about 3.5 mm long. Outer perianth-lobes triangular with involute margin, acute, about 0.5 mm long, erect. Inner lobes linear or narrowly oblanceolate, obtuse, erect, not much shorter than the outer ones. Tube trigonous, about 1.5 mm long. Anthers sessile in the upper tube-part. Connective broadly triangular, thick and fleshy, with short lateral arms, bearing the thecae, and two obtuse, membranaceous crests at the upper surface. Style thick-filiform, swollen at the base, branching at the top into 3 branches, each bearing a curved, funnel-shaped stigma; simple style-part about 1 mm long. Ovary obovoid, about 1.5 mm long. Capsule obovoid, dehiscing in transverse directions; seeds small, ellipsoid to oblong, acuminate at one side, brownish-yellow, about  $\frac{1}{3}$  mm long.

Type: Martius 2506, from Brazil, Bahia, in herb. M.

Distribution: Widely spread in America: West-Indian Islands; North-, Central- and South-America from North Carolina, to Paraguay.

#### UNITED STATES OF AMERICA.

North Carolina (Curtiss 1847 [MIS]; Curtiss 1848 [MIS]; Curtiss s.n. [G-BOIS; GH; K; MIS; NY]).

South Carolina, Beaufort District, Bluffton (Mellichamp s.n. [US]); Co. Aiken, Graniteville (Eggert s.n., fl. Aug. [MIS; GH]); near Columbia (Donnell Smith s.n. [US]); near Wilmington (Canby s.n., fl. Oct. [F; MIS; NY]; Canby 7922, fl. Oct. [BM]; Williamson s.n. [LY]).

Caroline, without locality (Elliot s.n. [G-DEL]); Michaux s.n., Herbar de Jussieu 3271 + A [P]; Herbar de Jussieu 3271 + C [P]; Michaux s.n. [G-DEL]).

Georgia, near Tifton (Harper 669, fl. Sept. [MIS; NY; US]; without locality (Coaley s.n. [GH]; Gray s.n. [W]).

Florida, near Jacksonville (Curtiss s.n. [MIS; US]; Curtiss 5355, fl. Oct. [F; G-BOIS; GH; K; NY; P; P-DR; US; W]; Britton s.n., fl. Aug. [NY]; Keeler s.n. [NY]; Curtiss 4171, fl. Aug. [B; NY; US]; Curtiss 2753, fl. Sept. [B; BM; F; G-BOIS; GH; K; M; MIS; NY; P; US]); near Fort Myers (J. P. Standley 377, fl. Oct. [F; GH; MIS; NY; US]; P. C. Standley 12839, fl. Feb. [US]; P. C. Standley 18902, fl. Dec. [US]; Drummond 46 [BM]); Lake Co., Eustis (Nash 1081, fl. Jun. [B; CA; F; G-BOIS; G-DEL; GH; MIS; NY; P; P-DR; US]); Walton Co., Argyle (Chapman s.n., fl. Aug. [B]); Brevard Co. (Fredholm 5696, fl. Jan. [GH]); Island NW of Perrine (Small and Carter 2978, fl. Jan. [NY]); near Lemon City (Britton s.n., fl. March [NY]); Tampa (Garber s.n., fl. Sept. [F; GH; MIS; P; US]); St. Augustine (Reynolds s.n. [F; MIS; NY; US]); Orange Co., W of Bithlo (Moldenke 206, fl. Dec. [MIS; NY; S]); Bay Co., Lynn Haven

(Billington s.n., fl. Oct. [US]); Jackson Co., Ocean Springs (Shikan 1346, fl. Sept. [F; GH; MIS; NY; US]); Cypress (Degener 5150, fl. Aug. [NY]); Apalachicola (Herb. Chapman 1697a, fl. Sept. [NY]); without locality (Chapman s.n., [B; BM; G-DEL; K; MIS; NY; US; W]; Palmer 539 [F; GH; MIS; NY]).

Alabama, Mobile (Mohr s.n., fl. Oct. [F; US]); Spring Hill (Bush 373, fl. Aug. [MIS; NY; S; US]).

Louisiana, Covington (Arsène 12419, fl. Oct. [F; US]); without locality (Hale s.n. [G-BOIS; GH]; Gray s.n. [G-DEL]).

Mississippi, Biloxi (Tracy s.n., fl. March [MIS]; Tracy 6488, fl. Oct. [BM; G-DEL; GH; LY; MIS; NY; US; W]; Tracy and Lloyd 326, fl. Apr. [BM; G-DEL; LY; NY; W]); Pass Christians (Langlois s.n., fl. Jul. [F]).

Missouri, Harrison Co., Long Beach (Joor s.n., fl. Sept. [MIS]).

Texas, Houston Co. (Palmer 14396, fl. Sept. [MIS; US]).

Without locality (Michaux s.n. [P]).

#### BRITISH HONDURAS.

All Pines (Schipp 634, fl. Aug.-Sept. [BM; F; G-DEL; GH; K; MIS; NY; S]); Honey Camp (Lundell 628, fl. Oct. [F; MIS]); Manatee Lagoon (Peck 151, fl. Sept. [GH; NY]).

#### PANAMA.

Cockle, Aguadulce (Pittier 4945, fl. Dec. [US]).

Panama, Nuevo San Francisco (Standley 30774, fl. Jan. [US]); near Las Sabanas (Standley 40767, fl. Nov. [US]); near Riv. Azote Caballo (Dodge, Steyermark and Allen 16856, fl. Dec. [MIS; U]).

#### CUBA.

Sta Clara, distr. of Cienfuegos, Cieneguity (Combs 688, fl. Sept. [B; F; GH; MIS; NY; P-DR]); Savannah W of Mouacas (Léon and Caranas 5812, fl. Dec. [NY]).

Isle of Pines, San Francisco (Ekman 11931, fl. Oct. [B; S]); Vi-  
vyagua (Britton, Britton and Wilson 15012, fl. Feb. [F; GH; NY; US]).

Oriente, Serra de Nipe (Ekman II. 6663, fl. Dec. [B; S]; Ekman III. 2650, fl. Aug. [B; S]); Savannah San Filipe, near Bio (Ekman III. 2396, fl. Aug. [S]).

Pinar del Rio, Vicinity of Pinar del Rio (Britton, Britton and Gager 7236, fl. Sept. [B; F; NY; US]; id. 7051, fl. Sept. [NY]); Laguna Santa Maria (Britton, Britton and Gager 7162, fl. Sept. [NY]); Ekman 17233, fl. Aug. [S]); near Herradura (Baker 2137, fl. Sept. [B]; Shafer 11709, fl. Jan. [NY]); Laguna Sante Barbara (Ekman 11477, fl. Jun. [B; S]); Laguna Los Indios (Shafer 10799, fl. Dec. [B; NY]); near Guane (Shafer 10496, fl. Nov. [NY]); San Julian, S of Guane (Léon and Roce 7056, fl. Dec. [NY]); between Laguna Jovero and Laguna del Bufe (Shafer 10994, fl. Dec. [NY]).

Locality unknown (Wright 3281 [B; BM; G-BOIS; G-DEL; GH; GÖTT; K; MIS; NY; P; S; US; W]); Savannah of Sumidero (Poeppig s.n., fl. Jan. [BM; G-BOIS]; Poeppig s.n., fl. Oct. [B; BR; BRSL; G-BOIS; MIS; W]).

#### JAMAICA.

Clarendon, Hollis's Savannah (Harris 12231, fl. Nov. [NY]; Harris 12850, fl. Dec. [NY]).

St. Elisabeth, Lacovia (Wulschlaegel 1076 [M]).



## HAITI.

Dominican Rep., Llano Costero, Cuenova (Ekman H10979, fl. Jan. [B; S]); Prov. La Vega, Cotuy (Abbot 848, fl. Jan.-Feb. [US]).

## PORTO RICO.

Las Marias, near Mayaguez (Holm 31, fl. Nov. [NY]); Laguna Pertuario (Britton and Britton 8744, fl. Feb. [NY]).

## TRINIDAD.

Aripo Savannah (Crueger s.n., fl. Feb. [K]; Britton, Broadway and Hazen s.n., fl. March [NY]; Broadway s.n., fl. Feb. [NY]; Broadway s.n., fl. Nov. [BM]); Piarco Savannah (Broadway 2118, fl. Dec. [B; BM; F; K; MIS; S; US]); O'Meara Savannah (Britton and Britton 2496, fl. March [NY]; Crueger 237, fl. Sept. [B; GÖTT]); Without locality (Othmer s.n., fl. Dec. [B]; Crueger 1608 [B]).

## VENEZUELA.

Bolivar, Esmeralda (Tate 268 pp., fl. Oct. [NY; US]).  
Guarico, Sombrero (Pittier 12228, fl. Oct. [US]).

## COLOMBIA.

Cauca, near Buenaventura (Brenning 219, fl. Dec. [B]; Lehmann K396, fl. Jun. [K]; Lehmann K269, fl. Jul. [K]; Lehmann 4988, fl. Oct.-Nov. [B; F; K]; Pennell and Killip 5315, fl. May [GH; NY; US]); San José, Dagua Valley (Pittier 598, fl. Dec. [US]); Rio Atrato near Quibdo (Archer 1771, fl. Apr.-May [US]).

Tolima, Neiva (Rusby and Pennell 1068, fl. Aug. [NY]).

Bogota, Villa Vicencio (Pennell 1429, fl. Aug.-Sept. [NY]).

## BRITISH GUIANA.

Hoovoobea Savannah (Jenman 3759, fl. Apr. [K]; Epereroe (Pulle II. 494, fl. Sept. [U]); Potaro Riv., Kaietur Savannah (Jenman 1275, fl. Sept.-Oct. [K]); Rupununi Savannah, near Kanarawan (Myers 5524, fl. Nov. [K]); Kaietur fall (Tutin 635, fl. Aug. [BM; U]).

## SURINAME (NETHERL. GUIANA).

Near Paramaribo (Kegel 295, fl. Dec. [GÖTT]; Wullschlaegel 764 [B; BR; GÖTT; W]); Para District, Klein Onoribo (Splitgerber 673, fl. March [L]); id., Onoribo (Focke 405 [L]); Savannah near the railway (Pulle II. 193, fl. Aug. [U]); Suriname Riv., near Victoria (Kappler, ed. Hohenacker 1332, fl. Apr. [U]); Without locality (Hostmann 987 [BM; G-BOIS; G-DEL; K; U; W]); Hostmann and Kappler ed. Hohenacker 425 [S]; Hostmann s.n. [G-BOIS; L]).

## FRENCH GUIANA.

Saint Laurent du Maroni (Benoist 618, fl. Jan. ex Benoist l.c.); Savannahs of Pariacabo (Benoist 1432, fl. Jul. ex Benoist l.c.); Cayenne (Leprieur s.n. [G-DEL; L; P; P-DR]; Poiteau s.n. [B; P; W]; Broadway 490, fl. Jun. [GH; K; NY]); without locality (Poiteau s.n. [G-DEL; K; P]; Richard s.n. [G-DEL; P]; unknown collector 188 [B; L; W]).

## BRAZIL.

Amazonas, Rio Branco, Serra Pellada (Ule 7659, fl. Oct. [B; US]); id., near Boa Vista (Kuhlmann 638, fl. Jun. [R; U]); Roche Mompère (Luetzelburg 20214a [M]); Isle of Colares (Poeppig 2995, fl. May [G-BOIS; W]); Igarapé Riv. (Spruce 676, fl. Feb. [K; PD]).

- Maranhao, without locality (Don 8 [BR]; Gardner 6091 [BM; K]).  
 Piauhy, without precise locality (Gardner 2734 [CA; K]).  
 Pernambuco, near Pernambuco City (Gardner 1173, [BM; K; P-DR; W]); Chase 7726; fl. Nov. [US]); id., near Boa Virgem (Schenck 4290, fl. Jun. [B]); Pombos (Bento Pickel 2575, fl. Jan. [US]); near Coxanga (Ridley, Lea and Ramage s.n., fl. Aug. [BM]).  
 Bahia, Sto. Angelo near Villanova (Glaziou 14334, fl. Nov. [B; K; P]); near Maracais (Ule 6946, fl. Sept. [B; L]); S. Georgi dos Ilheos (Martius 2506 [M]); Salinas (Weddell 2171 [P]); without locality (Glocker 32 [BM; G-BOIS; NY]; Lhotsky s.n. [G-DEL]; Salzmänn 546 [G-DEL]; Salzmänn s.n. [G-DEL; K; MIS; P; P-DR; W]; Blanchet s.n., fl. Aug. [BM; G-BOIS; G-DEL]; Blanchet 685 [G-DEL]).  
 Matto Grosso, Sta. Anna da Chapada (Malme II, 3488, fl. Jun. [B; S]; Malme II, 3488b, fl. Jun. [S]); Cuyaba (Malme II, 1659, fl. Jun. [G-DEL; S; US]; Malme II, 1659a, fl. Jun. [S]); between Capetta da Guia and Cuyaba (Malme I, 1626, fl. May [B; BM; G-BOIS; GH; S]); Santo Antonio near Cuyaba (Malme I, 1568B, fl. Apr. [S]); between Bonito and Rondonopolis (Chase 11908, fl. Apr. [US]).  
 Minas Geraes, Caldas (Widgren s.n. [S]); Diamantina (Schwacke 8397, fl. Apr. [B]); Uberaba (Chase 11257, fl. March [US]).  
 Rio de Janeiro, Villa Nove (Schwacke 4252, fl. Nov. [GÖTT]); near Rio de Janeiro (Weddell 131 [G-DEL; P]; Glaziou 1255 [BR; K; P]); Rio de Janeiro, cult. (Glaziou 10087 [K; P]); near Copacabana (Luschath s.n., fl. Jan. [BR]); Ule 4160, fl. Jun. [B] Glaziou 4101, fl. March [B; K; P]); without precise locality (Gaudichaud 422 [B; P; P-DR]; St. Hilaire 117 [P]; de Moura 923, fl. Juli. [B]; Lund 599, ex Malme l.c.).  
 São Paulo, Butantan (Hoehne 1230, fl. Apr. [BRSL]); Utinga (Brade 5734, fl. Jan. [B; S]); S. Bernardo (Brade 9675, fl. Dec. [B]); Ypiranga (Brade 5735, fl. Jul. [B; S]); Maydas Cruzes (Glaziou 17819, fl. Nov. [B; G-DEL; P]); Banhado Campo, Agua Fria (Toledo 687, fl. May [R; U]); without locality (Sello 5865, fl. Jan. [B; K; NY]; Glaziou s.n. [K]; Gaudichaud 197 [P]; Saint Hilaire 723 pp. [P]).  
 Without locality (Glockse 142 [S]; Schott 4217 [W]; Newman s.n. [G-DEL]; Guillemín 287, fl. Jan. [P]).

## BOLIVIA.

- Para, near Santarem (Spruce s.n., fl. Jan. [K]).  
 Santa Cruz, Prov. Sara, Buena Vista (Steinbach 16112, fl. March [B]; Steinbach 5508, fl. Apr. [F; GH]).

## PARAGUAY.

- Villa Rica (Balansa 2209, fl. March. [B; BM; BR; G-BOIS; G-DEL; K; S]; Hassler 8568, fl. Jan. [B; BM; G-DEL; GH; K; P; W]); Sierra de Maracagu, Yerbales (Hassler 5937, fl. Dec. [BM; G-BOIS; K; P]); Ypacaray (Hassler 12665, fl. May [BM; GH; K; L; MIS]); Cauquazu (Balansa 3208, fl. Jan. [B; BM; BR; G-BOIS; G-DEL; K; L]).

## LOCALITY UNKNOWN.

- Bellemonite (Menke 7 [BR]).

Forma *bracteosa* (Gleas.) Jonk., nov. comb.; — *Burmannia bracteosa* Gleas. in Bull. Torr. Bot. Cl. 58 (1931) p. 343.

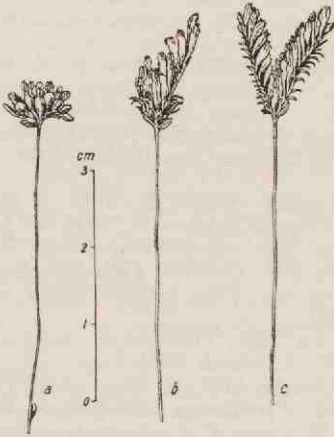


Fig. 7.

- a. *Burmannia capitata* (Walt.) Mart.;  
 b. intermediate form; Mart., f. *bracteosa* (Gleas.)  
 c. *Burmannia capitata* (Walt.) Jonk.

VENEZUELA.

Bolivar, Esmeralda, (Tate 268 pp., fl. Oct. [NY]); Sipao Riv., Mirleo-seum (Selwyn 262, fl. Dec. [B]).

BRAZIL.

Amazonas, Rio Branco, S. Marco (Ule 7659, fl. Dec. [B]).

Bahia, without locality (Blanchet 7 [P-DR]).

Sao Paulo, without precise locality (St. Hilaire 723 pp. [P]).

7. *Burmannia alba* Mart., Nov. Gen. et Spec. Plant. I (1824) p. 12; Schultes, Syst. Veg. VII. 2 (1830) p. LXXIV; Malme in Bih. K. Sv. Vet. Ak Handl. 22, Afd. III N. 8 (1896) p. 28; Malme in Ark. f. Bot. 26A N. 9 (1934) p. 20; — *Burmannia Sellowiana* Seub. in Mart., Flor. Bras. III. 1 (1847) p. 57; — *Burmannia Sellowiana* Seub. var. *violacea* Seub. l.c.; — *Burmannia Sellowiana* Seub. var. *albiflora* Seub. l.c.; — *Tripterella alba* (Mart.) Schult. in Roem. et Schult., Mant. Syst. Veg. II (1824) Add. ad Mant. Cl. III p. 358 (110).

Flowers many, erect, in bifid cymes at the top of the stem. Bracts lanceolate, patent at the ventral side of the inflorescence-branches. Facies and flower-construction as in the species. Usually growing among typical *B. capitata* and gradually merging into the species.

Type: Tate 268 pp. from Esmeralda, Venezuela, in herb. NY.

Distribution: Collected in Venezuela and Brazil, probably the same distribution as the species.

Annual herbs, 10–40 cm high. Stem slender, erect, usually simple, sometimes branched, bearing a bifid, contracted inflorescence at the top, stem sometimes 1- or 2-flowered. Stem sometimes with few radical, more or less rosulate leaves at the base, radical leaves linear to lanceolate or spatulate, to 4 mm long, often lacking or decayed. Stem beset with lanceolate, obtuse, appressed scales 1–2.5 mm long. Inflorescences usually contracted bifid cymes, often appearing headlike, up to 11-flowered, sometimes reduced to 1 or 2 flowers. Bracts lanceolate, about 1.5 mm long. Flowers erect, (sub)sessile, 5–7.5 mm long, white, bluish, purpureous or white with bluish lobes. Outer perianth-lobes ovate to obovate, 1–1.5 mm long, 3-nerved, erect, in older flowers spreading. Inner lobes small, erect, clavate, rounded, about 0.5 mm long. Perianth-tube trigonous to cylindrical, wingless, 2–2.5 mm long. Anthers sessile in the mouth of the perianth, just below the inner perianth-lobes. Connective inverted-deltoid, with two crests at the top and a median, obtuse, hanging appendix at the base. Style thick-filiform, branched at the apex into three short branches, each bearing a bowl-shaped stigma. Ovary trigonous-obovoid, wingless, 2–3.5 mm long. Ovules numerous. Capsule trigonous-ellipsoid, up to 7 mm long, dehiscent by horizontal splits. Seeds small, yellowish to brown, oblong or ellipsoid, slightly curved.

Type: Martius 1327, from Brazil, Minas Geraes, Tejuco, in herb. M.

Distribution: Brazil, Paraguay.

**BRAZIL.**

Goyas, Vinadeiros (Glaziou 17819, fl. Jan. [P]).

Matto Grosso, Santa Anna da Chapada (Malme I. 1434, fl. Feb. [S]).

Minas Geraes, Riacho das Varas (Schwacke 8396, fl. March [B]); Caldas (Regnell II. 135½, fl. Feb. [B; P; S]); Tejuco (Martius 1327, fl. Jun. [M]); without locality (St. Hilaire 563 [P]; St. Hilaire 2398 [P]).

Rio de Janeiro, Sebastianopolis (Lhotsky s.n. [B]).

São Paulo, Olho d'Agua de Saia Velho (Glaziou 17818, fl. Nov. [B; K; P]); Butantan (Hoehne 1229, fl. Apr. [BRSL]; Hoehne 457, fl. Aug. [BM]); St. Anna (Brade 5780, fl. March [B; S]); Campinas (Surrén 82, fl.

Sept. [S]); Magydos Cruz (Glaziou 22150, fl. March [B; BR; K]); without locality (St. Hilaire 1508 [P]); Gaudichaud 196 [P]).

Without locality (Sello 4442 [B]; Sello s.n. [B; BR; BRSL; G-BOIS; G-DEL; K; L; P; W]); Pohl s.n. [W]; Burchell A527 [K]).

#### PARAGUAY.

Serra de Maracayu, near Ipé (Hassler 5326, fl. Nov. [B; G-BOIS; G-DEL; GH; K; P; W]); Central Cordilleras (Hassler 6298 [BM]).

Var. **grandiflora** (Malme) Jonk., nov. comb., — *Burmannia grandiflora* Malme in Bih. K. Sv. Vet. Ak. Hand. 22, Afd. III N. 8 (1896) p. 27; Malme in Ark. f. Bot. 26A N. 9 (1934) p. 20.

Plant and flowers as in the species, but flowers much larger, 9–20 mm long. Outer perianth-lobes 2.5–5 mm long, 5–7-nerved in larger flowers, 3-nerved in smaller flowers of the same inflorescence, as in the species.

Type: Malme I. 1436 from Brazil, Matto Grosso, in herb. S; duplicates in herb. B and G-BOIS.

Distribution: Southern Brazil.

#### BRAZIL.

Rio Grande do Sul, Cruz Alta (Malme II. 1097, fl. Jan. [S]).

Parana, Fernandez Pinheiro (Dusén 4389, fl. March [S]); Denio Ribas (Dusén 11367, fl. Feb. [B; BM; K; NY; S; US]); Lago in „Vanhado” (Dusén 3433, fl. Dec. [S]).

São Paulo, Jabaquara (Brade 7484, fl. March [B]); Villa Emma (Brade 9074, fl. Nov. [B]).

Rio de Janeiro, Itaquera Vargem (de Toledo 7485, fl. Feb. [B]).

Matto Grosso, near Santa Anna da Chapada (Malme I. 1436, fl. Feb. [B; G-BOIS; S]).

8. *Burmannia dasyantha* Mart., Nov. Gen. et Spec. Plant. I (1824) p. 11 and Tab. 5. II; Schultes, Syst. Veg. VII. 2 (1830) p. LXXIV; Seubert in Mart., Flor. Bras. III. 1 (1847) p. 56; — *Tripterella dasyantha* (Mart.) Schult. in Roem. et Schult., Mant. Syst. Veg. II (1824), Add ad. Mant. Cl. III p. 358 (110).

Erect, annual, slender herbs, 17–29 cm high. Stem simple, branching at the top into the bifid, many-flowered inflorescen-

ce or bearing a capitate inflorescence of few sessile flowers at the apex. Radical leaves rosulate, rather large, grasslike, linear, indistinctly veined, acute or acuminate, up to 30 mm long and about 2 mm broad. Stem beset with scattered, appressed, scale-like stem-clasping, acute or acuminate, small leaves, 3—8 mm long. Inflorescence sometimes capitate, usually a bifid, many-flowered cincinnus, inflorescence-branches 8—17 mm long. Bracts linear-lanceolate, acute, 2—3 mm long. Flowers erect, bluish, narrowly 3-winged, about 8 mm long. Outer perianth-lobes erect, triangular, with involute margin, about 1,5 mm long. Inner lobes small, linear-lanceolate, acute, erect, about 0,5 mm long. Perianth-tube cylindrical-trigonous, about 4 mm long. Anthers inserted in the perianth-throat, below the inner perianth-lobes. Connective oblong with two apical crests and a median, basal, acute appendage. Style thick-filiform to cylindrical, branching at the apex into 3 short branches, each bearing a curved, bilabiate stigma. Style with stigmas about 4,5 mm long. Ovary ellipsoid, about 2,5 mm long. Wings of the flowers very narrow, linear to half elliptical, blue, about 6,5 mm long and 0,5—1 mm broad, running from the middle of the limb to the middle of the ovary.

Type: Martius 3146, from Amazonian Brazil, in herb. M.

Distribution: Once collected.

**BRAZIL.**

Amazonas, Rio Negro, Japura Riv., Arara-coara Mts. (Martius 3146, fl. Jan.-Feb. [M]).

9. *Burmannia tenella* Benth. in Hook., Journ. of Bot. VII (1855) p. 12; Malme in Ark. f. Bot. 26A N. 9 (1934) p. 20; — *Burmannia amazonica* Schltr. in Verh. Bot. Ver. Prov. Brandenb. 47 (1905) p. 102.

Annual, saprophytic herbs, 7—20 cm high. Stem simple, slender, colourless, bearing one or two flowers at the top, or

forking into a bifid inflorescence. Radical, rosulate leaves lacking, stem beset with few, lanceolate, acute, small, appressed scales, 1—2.5 mm long. Inflorescence 1—7-flowered, forming a bifid cincinnus, or 1 or 2 flowers at the top of the stem. Inflorescence-branches to 1.5 cm long. Bracts lanceolate or ovate-lanceolate, acute to acuminate, to 1.5 mm long. Flowers erect, 5—5.5 mm long, blue, yellow with blue, or white with yellow lobes, sessile or shortly pedicellate, pedicels 0.5—1 mm long. Outer perianth-lobes about 1—1.5 mm long, ovate to deltoid, obtuse-acuminate, with narrow lateral lobes, lateral lobes folded inwards. Inner perianth-lobes minute, obovate to orbicular, rounded, thick, glandular. Perianth-tube cylindrical, 1.5—2 mm long, slightly widening towards the base and the apex, winged. Stamens 3, sessile just below the inner perianth-lobes in the mouth of the perianth. Connective oblong, thick, bearing two crests at the top, fading at the base into an acute, basal appendix. Style thick-filiform, branching at the apex into 3 very short branches, each bearing a curved, tubular to funnel-shaped stigma. Style with stigmas about 1.5 mm long. Ovary subglobose, 2—3 mm long. Flower 3-winged, wings membranous, white or colourless (sometimes yellow or blue?), truncate at the apex, running from the base of the limb to the middle of the ovary, 2.5—4 mm long, 0.5—1 mm broad. Capsule membranous, globular, dehiscent irregularly with a horizontal split.

**Type:** Spruce 2835 from Amazonian Brazil in herb. K; duplicates in herb. B; BM; BR; C; CA; G-BOIS; G-DEL; GH; NY; W.

**Distribution:** Bolivia; Brazil (Amazonas and Matto Grosso); Venezuela; British Guiana.

#### BOLIVIA.

La Paz, Mapiri (Bang 1563 pp., fl. Jul.—Aug. [B; BRSL; CA; G-BOIS; G-DEL; GH; K; S; US; W]); Rusby 858, fl. May [B; BM; BRSL; G-BOIS; GH; K; MIS; NY; US]); Mapiri region, San Carlos (Buchtien 459 pp., fl. Feb. [NY; US]; Buchtien s.n., fl. March [S]).

## BRAZIL.

Amazonas, Rio Pimichin (Spruce 3733, fl. Jun. [K]); Rio Negro, Manaus (Ule 5212a, fl. Jul. [B]); Marmellos Riv., near the falls (Ule 6124, fl. March [B], type of *B. amazonica* Schltr.); Uaupés Riv. near Panuré (Spruce 2835, fl. Jan. [B; BM; BR; C; CA; G-BOIS; G-DEL; GH; K; NY; W]).

Matto Grosso, Serra da Chapada, near São Jeronymo (Malme II. 3493, fl. Jun. [S]).

## VENEZUELA.

Amazonas, near San Carlos (Spruce 2836 pp. [P-DR]).

## BRITISH GUIANA.

Kaituma (Jenman 7270, fl. Jun. [B; K]; Im Thurn 180, fl. Jun. [K]).

10. *Burmannia biflora* L., Spec. Plant. I (1753) p. 287; Lamarck, Enc. I (1783) p. 521; Willdenow, Spec. Plant. II (1799) p. 16; Schultes, Syst. Veg. VII. 2 (1830) p. LXXV; Gray, Man. Bot., 2nd. Ed. (1856) p. 442; Chapman, Fl. S. Un. St. 3rd. Ed. (1897) p. 477; Morong in Britton and Brown, Fl. N. Un. St. I 2nd. Ed. (1913) p. 547; Small, Man. S. E. Fl. (1933) p. 362; — *Tripterella coerulea* Nutt., Gen. N. Am. Pl. I. (1818) p. 22; — *Tripterella biflora* (L.) Schult. in Roem. et Schult., Mant. Syst. Veg. II (1824) Add. ad. Mant. Cl. III p. 356 (108).

Small, erect, slender herbs, about 3–17 cm high. Stem usually simple, sometimes branched, without rosulate leaves at the base. Stem-leaves small, scattered, scalelike, lanceolate, acute, 1–3 mm long. Flowers solitary at the top of the stem or in bifid cymes; inflorescence 1–15-flowered, inflorescence-branches up to 2.5 cm long. Bracts about 2.5 mm long, lanceolate or oblanceolate, acuminate, often keeled. Flowers erect, about 5 mm long, blue or white, 3-winged. Outer perianth-lobes triangular, about 1–1.5 mm long, obtusiusculous, margin involute. Inner lobes smaller, about 0.5 mm long, linear-oblong to oblanceolate, obtuse, involute over the anthers. Perianth-tube cylindrical-trigonous, about 1–1.5 mm long. Anthers sessile in the mouth of the tube, just below the inner lobes. Connective triangular, thick, a short obtuse appendage at the base. On the upper surface of the connective two obtuse crests. Style



thick-filiform, bearing at the apex three subsessile, slightly curved, funnel-shaped stigmas, funnel-margins thickened. Style with stigmas about 1.25 mm long. Ovary obovoid-trigonous, as long as the perianth, about 2.5 mm long. Capsule up to 5 mm long.

Type: Clayton 248, herb. Gronovii, from Virginia, in herb. BM.

Distribution: Southern United States.

UNITED STATES OF AMERICA.

North Carolina, near Jacksonville (Moldenke 112, fl. Nov. [MIS; NY; S]); near Wilmington (Wherry s.n., fl. Sept. [NY]); without locality (Curtiss s.n. [MIS; P]; unknown collector s.n. [K]).

South Carolina, Santee Canal (Ravenel s.n., fl. Oct. [G-BOIS; GH]); St. Louis near Pinopolis (Porcher s.n. [F]); without locality (Curtiss s.n. [G-BOIS; P-DR]).

Virginia, without precise locality (Clayton 248, ex herb. Gronovii [BM]).

Georgia, Sumter Co. (Harper 615, fl. Sept. [BM; GH; K; MIS; NY; P; US; W]); without locality (Gray s.n. [B; W]; Boot s.n. [BM]; Torrey s.n. [BM; K]).

Alabama, Mobile (Mohr s.n., fl. Jul. [US]).

Mississippi, Harrison Co., Biloxi (Pollard s.n., fl. Aug. [F; MIS; NY; US]; Tracy s.n., fl. Apr. [MIS; NY]; Trécul 898, fl. Sept. [P]).

Louisiana, New Orleans (Allison s.n. [GH]; unknown collector 485, [K]); without locality (Torrey s.n. [G-DEL; GH]; Short s.n. [K]; Hale s.n. [GH; P]; Drummond s.n. [W]; Gray s.n. [G-DEL]).

Texas, Houston Co., Grapeland (Palmer 14395, fl. Sept. [MIS; US]).

Florida, near Jacksonville (Keller s.n. [NY]; Curtiss 2752, fl. Jul. [B; F; G-BOIS; GH; K; M; MIS; NY; P; US]; Curtiss 5354, fl. Nov. [F; G-BOIS; GH; NY; P; P-DR; US; W]; Curtiss 4170, fl. Oct. [B; MIS; NY; US]); Lake County, Eustis (Nash 1060, fl. Jun. [B; CA; F; G-BOIS; G-DEL; GH; K; MIS; NY; P; P-DR; US]; Underwood 1492 [NY]; Hitchcock 1821, fl. Jun.-Jul. [F; MIS]); id., Aster Park (Vesterlund s.n., fl. Oct. [S]); Carrabelle (Chapman s.n., fl. Oct. [MIS]; unknown collector 1616a [GH; NY; US]); Hernando Co., near Brooksville (Jones 67, fl. Oct. [US]); Duval Co. (Fredholm 423, fl. Dec. [US]); Tampa (Garber s.n., fl. Oct. [F; GH; US]); St. Augustine (Reynolds s.n., fl. Nov. [F; MIS; NY]); Madison (Combs s.n., fl. Aug. [US]); Plant City (Blanton 6643, fl. Sept. [F; MIS; US]); Winter Park (Leeds s.n., fl. Nov. [F]); Brevard Co., Okerehoba region (Fredholm 6050, fl. Sept. [GH; NY; US]); Orange City, Blue Springs (Hood s.n., fl. Oct. [GH; MIS]); Brevard Co., Indian Riv. region (Fredholm 5566, fl. Nov. [GH]); Orange Co., Clarcona (Meislahn 150a, fl. Jan. [US]); Manatu (Simpson s.n. [US]); without locality (Gray s.n. [G-BOIS]; Curtiss s.n., fl. Jul. [F]; Chapman s.n. [G-DEL; MIS; US; W]).

Without locality (Chapman 80 [NY]; Chapman herbarium s.n. [MIS; NY]; Nuttall s.n. [MIS]; Lecomte s.n. [P; P-DR]).

11. *Burmannia Damazii* Beauverd in Bull. Herb. Boiss. 2me Sér., V (1905) p. 948; Beauverd l.c. p. 1080.

Erect, slender, annual herbs, 12—19 cm high. Stem usually simple, seldom branched, forking at the top into the inflorescence-branches. Radical, rosulate leaves lacking, stem beset with few (2—5) appressed, lanceolate, acute, sometimes subulate scales, about 1—2 (-6) mm long. Inflorescence a bifid cincinnus, 1—7-flowered. Bracts lanceolate, somewhat obtuse, to 3 mm long. Flowers erect, subsessile or shortly pedicellate, 3-winged, blue, about 8 mm long. Outer perianth-lobes erect, deltoid, with dark-coloured margin, about 1 mm long, papillose at the margin. Inner lobes small, orbiculate, about 0,5 mm long, papillose at the margin. Perianth-tube about 3 mm long, cylindrical-trigonous. Anthers sessile in the upper part of the perianth-tube. Connective rather broad, with two crests at the apex and a median, obtuse, hanging appendage at the base. Style thick-filiform to subtrigonous, branching into 3 style-branches, each bearing a bowl-shaped to funnel-shaped stigma with prominent, erect margin, this margin with two triangular, erect lobes. Style with stigmas about 3 mm long. Ovary obovoid, about 4 mm long. Wings of the flower rather broad, half-obcordate, blue, about 6,5 mm long, up to 4,5 mm broad, running from the base of the limb to the base of the ovary.

Type: Damazio 1777 from Brazil, Minas Geraes, in herb. G-BOIS.

Distribution: Brazil (Matto Grosso and Minas Geraes).

**BRAZIL**

Minas Geraes, Itaculumi-plateau (Damazio 1777, fl. Jul. [G-BOIS]).

Matto Grosso, without precise locality (Dorrien Smith s.n. [K]).

12. *Burmannia australis* Malme in Bih. K. Sv. Vet. Ak. Handl. 22 Afd. III N. 8 (1896) p. 25; Malme in Ark. f. Bot. 26A N. 9 (1934) p. 20.

Erect, annual, slender herbs, 4—21 cm high. Stem simple.

bearing the flowers in few-flowered clusters at the top. Stem with few, linear, sub-rosulate leaves at the base, the greater part of the stem beset with lanceolate-ovate, acute scales. Radical leaves up to 4 mm long and 2 mm broad, stem-scales to 3 mm long. Inflorescences often contracted, few-(1-7-) flowered, bifid cymes, mostly appearing headlike. Bracts about 3 mm long. Flowers erect, yellow with whitish wings, 5-7 mm long. Outer perianth-lobes triangular, obtuse, erect, 1-1.5 mm long, with thick, involute margin. Inner perianth-lobes rather large, erect, oblong, obtuse to rounded, about 1 mm long. Perianth-tube cylindrical-trigonus, 3-winged, 1.5-2.5 mm long. Anthers sessile in the mouth of the perianth. Connective oblong, rounded at the base, bearing at the truncate apex two very small crests, no appendage at the base. Style thick-filiform, branching into three branches, each bearing a slightly curved, funnel-shaped stigma. Style with stigmas about 2 mm long. Ovary obovoid, 2-3 mm long, 3-winged. Wings of the flower half-obovate to half-cuneate, truncate at the apex, 3-5.5 mm long and about 1.5 mm broad, whitish, running from the base of the limb to the base of the ovary.

Type: Malme I. 424, from Brazil, Rio Grande do Sul, in herb. S; duplicates in herb. B; BM and C.

Distribution: Paraguay, Southern Brazil, but also known from Bahia and Venezuela.

PARAGUAY.

Cordillera de Altos (Fiebrig 601, fl. Dec. [B; G-DEL]).

BRAZIL.

Rio Grande do Sul, Ilha dos Marinheiros (Schwacke 2531, fl. Feb. [GÖTT]); Cachoeira (Malme II. 1020, fl. Jan. [S]); Quinta (Malme I. 424, fl. Dec. [B; BM; C; S]); Cruz Alta (Malme II. 1122, fl. Jan. [S]).

Santa Catharina, near São José (Ule 608, fl. Jan. [B]); without locality (St. Hilaire 1775 [P]; unknown collector s.n. [K]).

Bahia, Serra Jacobina (Blanchet 2547 [BM; BRSL; G-BOIS; G-DEL; K; MIS; NY; P; P-DR; W]); near Ilheos (Luschnath s.n. [BR]).

VENEZUELA.

Zamorra, between Puerto Cabello and Valencia (Moritz 420 [B]).

13. *Burmannia flava* Mart., Nov. Gen. et Spec. Plant I (1824) p. 11 and Tab. 5. III; Schultes, Syst. Veg. VII. 2 (1830) p. LXXV; Seubert in Mart., Flor. Bras. III. 1 (1847) p. 56; Malme in Bih. K. Sv. Vet. Ak. Handl. 22 Afd. III N. 8 (1896) p. 24; Pilger in Engl., Bot. Jahrb. XXX (1902) p. 127; Urban in Symb. Ant. III (1903) p. 450; Malme in Ark. f. Bot. N. 9 (1934) p. 20; Jonker in Pulle, Fl. Surin. I. 1 (1938) p. 180; — *Burmannia flavula* Wright in Sauv., Cub. (1871) n. 2482 p. 165; — *Tripterella flava* (Mart.) Schult. in Roem. et Schult., Mant. Syst. Veg. II (1824) Add. ad Mant. Cl. III p. (109) 357.

Erect, slender, annual herbs, 6–27 cm high. Stem usually simple, sometimes branched, bearing 1–9 flowers at the top. Radical, rosulate leaves linear, subulate, up to 7 mm long and 1,5 mm broad, indistinctly 3-nerved. Stem-leaves few, scalelike, linear, acute or acuminate, sometimes more or less subulate, 2–4 mm long. Bracts lanceolate, acute or obtusiusculous, 4–5 mm long, about 2 mm broad. Flowers yellow, erect, sessile or shortly pedicellate, 9–11 mm long, solitary at the top of the stem, or in groups, or in few-flowered (-9), contracted, bifid cymes. Outer perianth-lobes erect, triangular, obtuse, with involute, thick margin, 1,5–2 mm long. Inner lobes 1,5–2 mm long, oblong or somewhat spatulate, involute over the anthers. Perianth-tube trigonous-cylindrical, 3,5–4 mm long. Anthers sessile in the perianth-throat. Connective triangular, broad, with two acute crests at the apex and a hanging, median, acute appendage at the base, apical crests connate at their bases. Style thick-filiform, branching at the apex into three short branches, each bearing a peltate to bowl-shaped stigma; style with stigmas 3,5–4 mm long. Ovary ellipsoid or obovoid, 4–5 mm long. Wings of the perianth narrow, half-elliptic or narrowly half-obovate or half-cuneate, 7,5–9 mm long, running from the base of the limb to the base of the ovary. Capsule obovoid, 4–5,5 mm long, dehiscing irregularly. Seeds numerous, very small, yellowish brown, oblong, sometimes slightly curved.

Type: Martius 1251, from Brazil, Minas Geraes, in herb. M.

Distribution: tropical America, from Paraguay to Costa Rica, Cuba and Southern Florida.

#### PARAGUAY.

Between Rio Apa and Rio Aquidaban (Fiebrig 5263, fl. Dec. [B; BM; G-DEL; GH; K; L]); near Igatini (Hassler 5654, fl. Dec. [B; BM; G-BOIS; K; P]).

#### BOLIVIA.

Santa Cruz, Prov. Sara, near Buena Vista (Steinbach 1614, fl. Apr. [B]; Steinbach 6510, fl. Apr. [F; GH; MIS; US]).

#### BRAZIL.

São Paulo, without precise locality (Sello 793 [B]).

Minas Geraes, Diamantina (Schwacke 8399, fl. Apr. [B]); Caldas, Serra da Geneta (Regnel III. 1775, fl. May. [P; S]); Riacho das Varas (Schwacke 8398, fl. March [B]); near Formiga (Gardner 5211 (5210), fl. Jul. [B; BM; CA; G-DEL; K; W]); Conselheiro Hatta (Brade 13499, fl. Jun. [R; U]); Salinas (Weddell 2172 [P]); without locality (Martius 1251, fl. Jun. [M]; Glaziou 19906 [B; K; P]; St. Hilaire 1763 [P]).

Goyaz, Natividade (Gardner 3448, fl. Jan. [BR]); without locality (Weddell 1998 [P]).

Matto Grosso, Cuyaba (Dorrien Smith 135, fl. May [K]; Malme I. 1488a, fl. March [S]; Malme I. 1488b, fl. Apr. [S]; Malme I. 1568, fl. Apr. [B; G-BOIS; GH; S]; Malme II. 1658, fl. Jun. [S; US]; Malme II. 1658a, fl. Jun. [S]; Malme II. 1658b, fl. Jun. [S]; Malme II. 1658c, fl. Jun. [G-DEL; S]; Malme II. 1658d, fl. Jun. [S]; Malme II. 1658e, fl. Aug. [S]; Malme II. 1658f, fl. Jun. [S]).

Amazonas, Rio Branco, near Boa Vista (Ule 7660 pp., fl. Oct. [B; G-DEL; K; L]).

Without locality (Sello s.n. [BR; BRSL; G-DEL; K; L; W]).

#### SURINAME (NETHERL. GUIANA).

Zanderij I (Pulle II. 27, fl. Jul. [U]; Archer 2832 pp., fl. Nov. [US]).

#### BRITISH GUIANA.

Rupununi Savannah near Wichabai (Myers 5500, fl. Nov. [K]); id., near Konarawan (Myers 5570, fl. Nov. [K]).

#### VENEZUELA.

Bolivar, Santo Rosalia (Selwyn 626 [B]); Sipao (Selwyn 263, fl. Nov. [B]); St. Lucia (Passarge 81b, fl. Dec. [B]); Villa de Sepata (Goursoury 18 [P]).

#### COLOMBIA.

Bogota, Intendencia Meta, Villa Vicencio (Pennell 1416, fl. Aug.-Sept. [GH; NY; US]).

Magdalena, Magdalena Valley, La Jagua (Allen 614, fl. Sept. [MIS; U]).

#### COSTA RICA.

Canton de Osa, Buenos Aires (Valerio 846, fl. Dec. [F]).

## CUBA.

Without locality (Wright s.n. [B; GH; K; NY; P; S; US; W], type of *Burmannia flavula* Wright).

## UNITED STATES OF AMERICA.

Florida. Lee County, Vicinity of Fort Myers (J. P. Standley 376, fl. Oct. [BM; F; GH; MIS; NY; US]).

Var. *macroptera* Jonk.,  
nov. var.<sup>1)</sup> — *Burmannia*  
*flava* forma, Malme  
in Bih. K. Sv. Vet. Ak.  
Handl. 22. Afd. III N. 8  
(1896) p. 25.

Differing from typical  
*B. flava* by the much  
broader flower-wings,  
about 1,5—25 mm broad.  
Otherwise plant and flow-  
ers as in the species.

Type: Lindman A.  
3399, from Brazil, Matto  
Grosso in herb. S.

Distribution:  
Brazil.

## BRAZIL.

Minas Geraes. Salinas (Weddell 2055 [P]).  
Goyaz, without precise locality (Pohl 5092 [W]).  
Matto Grosso. Rosario near Cuyaba (Lindman A3399, fl. May [S];  
Meyer 452, fl. Nov. [B]).  
Amazonas. Rio Branco, near Serra Pellado (Ule 7660 pp. fl. Oct. [L;  
US]); id., Boa Vista (Kuhlmann 3577, fl. Aug. [R; U]).

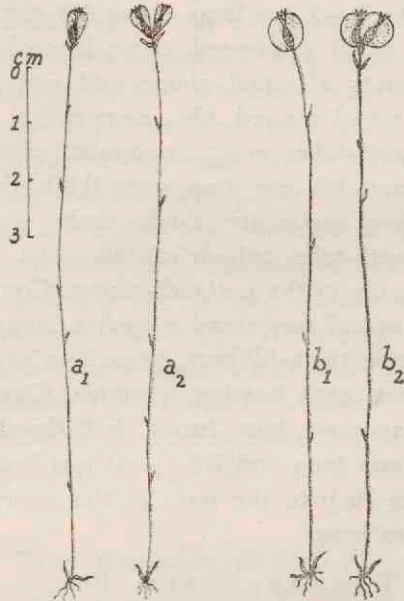


Fig. 8.

a. *Burmannia flava* Mart.  
b. *Burmannia flava* Mart.,  
var. *macroptera* Jonk.

<sup>1)</sup> *Burmannia flava* Mart., var. *macroptera* Jonk., nov. var. — Specimina  
alis perianthii tubo laterioribus.

Hab.: Brasilia. Typus: Lindman A.3399 in herb. Holmiense.

14. **Burmanna tenera** (Malme) Jonk., nov. comb.: — *Burmanna bicolor* Mart., var. *tenera* Malme in Bih. K. Sv. Vet. Akad. Handl. 22 Afd. III n. 8 (1896) p. 23.

Erect, annual, slender herbs, 7—16 cm high. Stem simple, usually 1-flowered, sometimes 3-flowered at the apex. Radical, rosulate leaves linear, indistinctly veined, acuminate or subulate, 2—5 mm long, about 1.5 mm broad. Stem-scales few, 1—3, small, appressed, ovate-lanceolate, acute, about 1 mm long. Bracts of equal shape and size as the stem-scales. Flowers erect, 3-winged, blue or purplish, about 7 mm long. Outer perianth-lobes erect, triangular, obtuse to rounded at the apex, about 1.5 mm long, with thick, fleshy margin. Inner perianth-lobes spatulate, thick, fleshy, erect, almost 1 mm long. Perianth-tube cylindrical-trigonous, about 3 mm long. Anthers sessile in the perianth-throat. Connective broad, truncate, with 2 apical crests and a median, hanging, obtuse spur at the base. Style thick-filiform, branching at the apex into 3 short branches, each bearing a stigma. Ovary ellipsoid to obovoid. Flower-wings blue, broad, half-rhomboid to half-obcordate, about 5 mm long and 2.5 (—4) mm broad, running from the base of the limb to the base of the ovary. Capsule obovoid, about 6 mm long.

Type-specimen: Regnell III. 1238, from Brazil, São Paulo in herb. S.

Distribution: Brazil (São Paulo).

**BRAZIL.**

São Paulo, Serra da Lagem, near the village Mato Grosso (Regnell III. 1238 pp., fl. Feb. [P; S; US;]); without locality (Weir s.n. [K]).

Without locality (Burchell 566A [K]; unknown collector 230 [B]).

15. **Burmanna Stuebelii** Hieron. et Schltr. in Engl. Bot. Jahrb. 54 (1916) Beibl. 117, p. 15; Macbride, Fl. of Peru I. 3, in Field Mus. Nat. Hist. XIII (Publ. 363) (1936) p. 767.

Robust, annual herbs, 20—40 cm high. Stem unbranched, bearing a simple or bifid cyme at the apex. Radical, rosulate

leaves and basal stem-leaves linear, acute or acuminate, parallel-veined, 1.5—3 cm long, to 4 mm broad. Stem beset with scattered, acute or acuminate, linear-lanceolate, scale-like leaves, 1.5—2 cm long and up to 3 mm broad. Inflorescence 2—9-flowered. Bracts elliptical, acute, sometimes acuminate, dark purple, about 1 cm long. Flowers erect, sessile or shortly pedicellate, 3-winged, 13—19 mm long; ovary violet, perianth golden yellow (according to Weberbauer), wings purple(?). Outer perianth-lobes triangular, with involute margin, acute or obtusiusculous, erect, 2—3 mm long. Inner lobes orbiculate, rounded, erect, about 1.5 mm long and almost 1.5 mm broad. Perianth-tube cylindrical-trigonous, about 6 mm long. Anthers sessile below the inner perianth-lobes. Connective large, broad, oblong, truncate at the top, rounded at the base. On the apex a large bifid crest, not appendaged at the base. Style thick-filiform, branching at the top into 3 branches, each bearing a subbilabiate-peltate stigma, style with stigmas 5.5 mm long. Ovary ellipsoid, 5—7 mm long. Wings half-elliptic to half-obovate or half-cuneate, 10—17 mm long, about 4.5 mm broad, running from the base of the limb to below the base of the ovary, continuing as a crest on the back of the outer perianth-lobes.

Type: Stuebel 25b, from Peru, Amazonas, in herb. B.

Distribution: Only known from Peru.

PERU.

Amazonas, Molinopampas, E of Chachapoyas (Weberbauer 4341, fl. Jul. [B; BRSL]); Chachapoyas (Mathews s.n. [BM; G-DEL]); Paroma, between Ventilla and Bagazan (Stuebel 25b, fl. Jun. [B]).

Without locality (Vidal-Senège 4795, fl. Jan. [P]; Vidal-Senège s.n., fl. Jan.-Feb. [P]; Shuttleworth Carder s.n. [K]; Mathews 1607 [BM; G-DEL; K]; Mathews s.n. [CA; NY]).

16. *Burmannia aprica* (Malme) Jonk., nov. comb.: —  
*Burmannia bicolor* Mart., var. *aprica* Malme in Bih. K. Sv. Akad.  
Handl. 22 Afd. III N. 8 (1896) p. 22.

Annual, erect herbs, 8—26 cm high. Stem simple, the upper



part dark purplish, the lower part green, bearing at the apex 1—5 flowers. Radical rosulate leaves and basal stem-leaves many, linear or oblanceolate, acute or acuminate, parallel-veined, up to 10 mm long and 4 mm broad. Stem-leaves scalelike, elliptic or lanceolate, acute or acuminate, 3—5 mm long. Bracts lanceolate, acute, up to 3 mm long. Flowers erect, subsessile or shortly pedicellate, violet, 7—11 (—13) mm long. Pedicels up to 2 mm long. Outer perianth-lobes ovate, obtuse to rounded, 1—2 mm long. Inner lobes lanceolate or oblanceolate, obtuse, 0,5—1 mm long. Perianth-tube cylindrical-trigonus, 3,5—5 mm long. Anthers sessile in the perianth-throat. Connective thick, obovoid with two apical, acute crests and a hanging basal, median appendage. Style thick-filiform, branching at the apex into 3 short branches, each bearing a thick, trigonus, bowl-shaped stigma. Ovary ellipsoid, 2,5—6 mm long. Flower-wings violet, half-obovate and truncate to half-cuneate, 5—8,5 mm long and 1,5—3 mm broad, running from the base of the limb to the base of the ovary, continuing as a crest on the back of the outer perianth-lobes. Capsule obovoid, about 6 mm long.

Type: Glaziou 4100 from Brazil, Rio de Janeiro in herb. S; duplicates in herb. B, C and K.

Distribution: Brazil (Rio de Janeiro and Minas Geraes).

#### BRAZIL.

Rio de Janeiro, Organ Mts. (Glaziou 16635, fl. Jan. [B; C]; Glaziou 3730, fl. May [P]; Guillemain 898, fl. May [P]; Gardner 706, fl. May [BM; K; NY; P-DR; W]; Glaziou 4100, fl. Apr. [B; C; K; S]; Wilkes s.n. [GH; K; US]; v. Luetzelburg 16038, fl. Feb. [M]); id., Morro Assu (v. Luetzelburg 15591 [M; NY]); id. near Theresopolis (Ule 4115, fl. Dec. [B; S]; de Moura 894, fl. Nov.-Dec. [B]); Mt. Itatiaya (Ule 3467, fl. March [B; S]). Minas Geraes, without precise locality (Saint Hilaire 622 [P]; 1748 [P]; 1819 [P]).

Var. *pusilla* Jonk., nov. var. <sup>1)</sup>.

Small, 1-(rarely 2-) flowered, slender herbs, 4—6,5 cm high.

<sup>1)</sup> *Burmannia aprica* (Malme) Jonk., var. *pusilla* Jonk., nov. var. — Caulis 4—6,5 cm altis; gracilior quam in forma typica, uniflorus, pusillus.

Rosulate leaves 2—6 mm long and 0.5—1 mm broad. Flowers about 8 mm long, construction of the flower and shape of wings as in the species, but facies of the plant quite deviating.

Type: Regnell III. 1238 pp. from Brazil, Minas Geraes, in herb. S.

Distribution: Once collected.

BRAZIL.

Minas Geraes, Caldas, Serra de Geneta (Regnell III. 1238 pp., fl. May [S]).

17. *Burmannia bicolor* Mart., Nov. Gen. et Spec. Plant. I (1824) p. 10; Schultes, Syst. Veg. VII. 2 (1830) p. LXXV; Seubert in Mart., Flor. Bras. III. 1 (1847) p. 55; Malme in Bih. K. Sv. Vet. Ak. Handl. 22, Afd. III, N. 8 (1896) p. 21; Pulle, Enum. Sur. (1906) p. 114; Benoist in Bull. Soc. Bot. Fr. 69 (1922) p. 52; Malme in Ark. f. Bot. 26A N. 9 (1934) p. 19; Jonker in Pulle, Fl. Sur. I. 1 (1938) p. 179 — *Burmannia bicolor* Mart., var. *subcoelestis* Malme in Bih. K. Sv. Vet. Ak. Handl. 22, Afd. III, N. 8 (1896) p. 22; Malme in Bot. Not. (1898) p. 185; Pulle l.c. p. 14; — *Burmannia quadriflora* Willd. mss. ex Schult., Syst. Veg. VII. 2 (1830) p. LXXIV; — *Burmannia brachyphylla* Willd. mss. ex Schult., Syst. Veg. VII. 2. (1830) p. LXXV; — *Burmannia bicolor* Mart., var. *quadriflora* (Willd.) Malme in Bot. Not. (1898) p. 185; — *Burmannia brachystachya* Miq. in Linnaea XIX (1847) p. 141; — *Tripterella bicolor* (Mart.) Schult. in Roem. et Schult., Mant. Syst. Veg. II (1824) Add. ad Mant. Cl. III p. (109) 357.

Plants erect, up to 40 cm high, annual. Stem usually simple, bearing mostly 1—6 flowers at the top, sometimes up to 11 flowers in a bifid cincinnus. Basal, rosulate leaves linear-lanceo-

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Folia basalia rosulata 2—6 mm longa, 0.5—1 mm lata. Flores fere 8 mm longi.

Hab.: Brasilia (Minas Geraes). Typus: Regnell. III. 1238 pp. in herb. Holmiense.

late to broad lanceolate, acute, sometimes subulate, 0,5—2,5 cm long, and 1,5—3 mm broad. Stem-leaves linear-lanceolate, subulate or acute, 4—5 mm long. Flowers erect, blue, purple or white, lobes yellow, 10—17 mm long, 3-winged. Outer perianth-lobes triangular, erect, acute, about 1,5—2 mm long. Inner lobes erect, linear or linear-lanceolate, obtuse, about 0,5 mm long. Perianth-tube cylindrical-trigonous, 5—6 mm long. Anthers sessile in the perianth-throat. Connective broad, quadrangular, with 2 lateral arms, bearing the thecae; 2 slightly curved crests at the apex and a median, hanging, somewhat obtuse appendage at the base. Style thick-filiform, branching at the top into 3 branches, each bearing a bilabiate, somewhat fleshy stigma. Style about 4 mm long, style-branches with stigmas about 1 mm long. Ovary narrowly obovoid-trigonous, 3,5—8 mm long. Perianth-wings half-elliptic, 7—15 mm long and 2—3 mm broad, running from the base of the limb to the base of the ovary. Capsule obovoid, more or less trigonous, dehiscent irregularly. Seeds small, brownish, oblong, reticulate.

Type: Martius 1196, in herb. M, duplicates in herb. B; CA; G-BOIS; G-DEL; K; L; W.

Distribution: Cuba and tropical South America to Paraguay southwards.

#### CUBA.

Pinar del Rio, Herradura (Ekman 10821, fl. Apr. [B; S]; Ekman 11595, fl. Oct. [B; S]; Hermann 895, fl. Sept. [B]); Laguna Santa Martha (Britton, Britton and Gager 7155, fl. Sept. [B; NY; US]; Cuesta 615, fl. Feb. [NY]); between Laguna Jovero and Laguna Herradura (Shafer 10930, fl. Dec. [NY; US]); between Laguna Jovero and Laguna del Bufe (Shafer 11002, fl. Dec. [B; K; NY; U; US]); W of Guane (Shafer 10658, fl. Dec. [B; GH; MIS; NY; US]).

Isle of Pines, Santa Barbara (Ekman 11989, fl. Nov. [B; S]); near San Pedro (Britton, Britton and Wilson 41456, fl. Feb.-March [F; GH; MIS; NY; US]).

Without locality (Wright 3282 [B; BM; G-BOIS; G-DEL; GH; GÖTT; K; MIS; NY; P; S; US]).

#### VENEZUELA.

Bolivar, Orinoco Riv., near Esmeralda (Spruce 3237, fl. Jun. [B; BM; BR; CA; G-BOIS; G-DEL; GH; K; NY; P; P-DR; W]; Tate 264, fl. Oct. [NY; US]).

## BRITISH GUIANA.

Hoorubia Creek, near Georgetown (Hitchcock 16910, fl. Nov. [US]); Mt. Roraima (Im Thurn 58, fl. Dec. [BM; K]; Quelch and Connell 14 [BM; K; NY]); id., Philipp swamp (Tate 344, fl. Nov. [NY]); Berbice (Schomburgk 201 [BM; G-BOIS; GH; K; L; W]); Kane (Rudge s.n. [BM]); Parubara Savannah (Myers 5611, fl. Nov. [K]); without locality (Rich. Schomburgk 148 [B]; Nimmo s.n. [K]; Jenman 907, fl. Feb. [K; NY; US]; Drake s.n., fl. Jun. [K]; Schomburgk 202 (150) [B; BM]; Schomburgk 210 [BM]; Anderson s.n. [BM]).

## SURINAME (NETHERL. GUIANA).

Para district (Splitgerber s.n., fl. Jun. [W]; Splitgerber 980, fl. March [L]); id., near pl. Berlijn (Wullschlaegel 788 [BR; GÖTT; W]; Wullschlaegel 1300 [BR; W]); Zanderij I (Lanjouw 132, fl. Jul. [U]; Lanjouw 298, fl. Jul. [U]; Forestry Bureau s.n., fl. Sept. [U]; Forestry Bureau s.n., fl. Aug. [U]; Samuels 491, fl. May [B; GH; K; L; NY]); near pl. L'Inquiétude (Focke 1024, fl. Sept. [U], type of *B. brachystachya* Miq.); near Republiek (Kuyper 27, fl. Oct. [U]); near Jodensavanne (Kegel 229 [GÖTT]); Sectie O (Pulle II. 196, fl. Aug. [U]); Patrick savannah-Brownsweg (Gonggrijp s.n. [U]; coll. indig. 140, fl. May [U]); Upper Sipaliwini, near Camp IV (Rombouts 212, fl. Oct. [U]); Savannah near the railway (Went 95, fl. Sept. [U]); without locality (Pfeiffer s.n. [DELFT]; Hostmann and Kappler 797 [B; BM; BRSL; G-BOIS; GH; GÖTT; K; MIS; S; U; W]).

## FRENCH GUIANA.

Near Charvei (Benoist 149, fl. Oct., ex Benoist l.c.); Savannahs of Pariacabo (Benoist 1437, fl. Jul., ex Benoist l.c.); without locality (Martin 61 [B; BM; F; P]; Mélinon 95 [L]).

## BRAZIL.

Amazonas, Rio Negro near Manaus (Ule 8829, fl. May [B; G-DEL; K; L]); Rio Branco near S. Marcos (Ule 7757, fl. Dec. [B; G-DEL; K; L; NY; US]); id., Boa Vista (Kuhlmann 637, fl. Jul. [R; U]; Ule 7658, fl. Oct. [B]); Marmellos falls (Ule 6123, fl. March [B]); Amazonas Riv., Isle of Colares (Poeppig s.n. [G-BOIS; W]); Roraima (Ule 8564, fl. Dec. [B; K]); Serra da Lua, Caicara (v. Luetzelburg 20662, fl. Aug. [M]); Frechal (v. Luetzelburg 20857, fl. Sept. [M]); Rio Uraricovera, Serra do Xiriry (v. Luetzelburg 20773, fl. Aug. [M]).

Matto Grosso, Serra da Chapada (Malme II. 3339, fl. May [S; US]); near Santa Anna da Chapada (Malme II. 3339a, fl. Jun. [S]; Malme 1440, fl. March [S]; Malme 1440a, fl. Feb. [S]; Malme 1440b, fl. March [S]); between São Jeronymo and Burita (Malme 1440b, fl. Jun. [S]); Itapirapuan (Lindman A2941, fl. Apr. [GH; S; US]); Paraguay, Rio Amolar (Dorrien Smith 157, fl. May [K]).

Rio de Janeiro, Itatiaya (Schwacke s.n., fl. May [B]); without locality (Glaziou 19907 [B; K; P]).

Bahia, Salinas (Weddell 2154, fl. May [P]).

Minas Geraes, Lagoa Santa (Warming 1039, fl. Jul. [C]; Mendonça 195 [B]); Formiga (Gardner 5212, fl. Jul. [B; BM; CA; G-BOIS; G-DEL; GH; K; P; P-DR; US; W]); Diamantina, Serra de Capao (Ynes Mexia 5874a, fl. May [NY]); Diamantina (Schwacke 8395, fl. March [B]; Martius 1196, fl. Jun. [B; CA; G-BOIS; G-DEL; K; L; M]); Serra do Frio (Vauthier 370 [L; P; P-DR; W]); Batataes (Lund s.n., ex Malme l.c. [S]); Araraquara (Lund s.n., ex Malme l.c. [S]); without locality (St. Hilaire 844 [P]; St. Hilaire s.n. [P]).

Without locality (Rudolph s.n. [W]).

## Key to the African species.

1. *a.* Flowers wingless or almost wingless ..... 2
- b.* Flowers distinctly 3-winged ..... 4
2. *a.* Flowers 6-costate by 6 very narrow wings. Stems  
   1—2-flowered ..... 18. **B. hexaptera** Schltr.
- b.* Flowers without narrow wings, usually 3—many-  
   flowered ..... 3
3. *a.* Stems slender, bearing the clustered flowers at the  
   apex. Margin of the outer perianth-lobes not crenate,  
   inner lobes obovate .....  
   ..... 19. **B. congesta** (Wright) Jonk.
- b.* Stems more robust, flowers many, in a rather long, 1-  
   or 2-branched inflorescence. Margin of the outer pe-  
   rianth-lobes crenate, inner lobes broadly spatulate  
   ..... 20. **B. densiflora** Schltr.
4. *a.* Perianth-lobes papillose at the margin ..... 5
- b.* Perianth-lobes not papillose ..... 6
5. *a.* Perianth-wings half-obcordate, running from the  
   base of the limb to below the base of the ovary,  
   about 3 mm broad. Radical leaves rosulate, few .....  
   ..... 21. **B. madagascariensis** Mart.
- b.* Perianth-wings half-elliptical, running from the base  
   of the limb to the base of the ovary, decurrent along  
   the pedicel, about 1.5 mm broad. Radical rosulate  
   leaves lacking ..... 22. **B. capensis** Mart.
6. *a.* Margin of the outer perianth-lobes thickened and  
   fleshy or involute ..... 7
- b.* Margin of the outer perianth-lobes neither thick and  
   fleshy nor involute ..... 8
7. *a.* Small plants, 2—9 cm high, always 1-flowered. Flo-  
   wer-wings broadly half-obcordate, sometimes trun-  
   cate. Outer perianth-lobes ovate to deltoid, inner  
   ones linear ..... 23. **B. Tisserantii** Schltr.
- b.* Plants usually higher, often more-flowered. Flower-  
   wings half-elliptical. Outer perianth-lobes orbiculate,

- inner ones minute, orbiculate to ovate .....  
 ..... 24. **B. Welwitschii** Schltr.
8. *a.* Stem, leaves and bracts dark-coloured, almost black. Perianth-wings obtuse-triangular, decurrent along the ovary ..... 25. **B. obscurata** Schltr.
- b.* Stem and leaves not dark-coloured ..... 9
9. *a.* Wings half-obovate, truncate. Connective with a rather long, hanging, obtuse spur at the base. Stem filiform, often flexuose ..... 26. **B. liberica** Engl.
- b.* Wings half-obcordate. Connective-spur short ..... 10
10. *a.* Flowers rather large, 7–14 mm long. Inner perianth-lobes linear. Connective-spur acute. Basal leaves rosulate ... 27. **B. latialata** Hua apud Pobég.
- b.* Flowers smaller, about 6.5 mm long. Inner perianth-lobes oblanceolate, obtuse to rounded. Connective-spur very short, obtuse. Radical, rosulate leaves reduced to 1 or 2 leaves ..... 28. **B. blanda** Gilg.

18. **Burmannia hexaptera** Schltr. in Engl., Bot. Jahrb. XXXVIII (1906) p. 143; Engler, Pfl. Welt Afr. II (1908) p. 403

Erect, small, slender, saprophytic herbs, 2–8 cm high. Rhizome decumbent. Stem usually simple, rarely branched, bearing 1 or 2 sessile flowers at the top. Radical, rosulate leaves lacking, stem-leaves reduced to small, ovate, appressed, acuminate scales, 1–3 mm long. Bracts lanceolate to deltoid, acuminate, up to 3 mm long and 1.5 mm broad. Flowers erect, about 8 mm long, white, lower part orange-yellow. Outer perianth-lobes erect, triangular, obtusiusculous, about 1.5 mm long, with double margin, outer margin crenate. Inner lobes broad, orbiculate, rounded or retuse, about 0.5 mm long, fleshy. Perianth-tube about 3.5 mm long. Limb, tube and ovary 6-costate by six very narrow wings. Wings corresponding with the outer perianth-lobes about 6.5 mm long and about  $\frac{1}{3}$  mm

broad, slightly broader than the 5 mm long wings, corresponding with the inner lobes.

Anthers subsessile in the throat of the perianth. Connective broad-triangular, forked at the apex into 2 papillose, obtuse crests, at the base of the connective a short, acute spur. Style filiform, branched at the apex into 3 short branches, each bearing a triangular, funnel-shaped stigma, with a very small basal lobe at the margin. Ovary subglobose to obovoid, 3 mm long and 2 mm broad. Capsule unknown.

Type: Schlechter 15786 from the Cameroons in herb. B, duplicates in herb. BM and BR.

Distribution: only known from the Cameroons.

CAMEROONS.

Kriegsschiffhafen (Schlechter 15786 (15785), fl. Oct. [B: BM; BR]); Ndonge, Nlonako (Ledermann 6367, fl. Nov. [B]).

19. *Burmannia congesta* (Wright) Jonk., nov. comb.; — *Burmannia aptera* Schltr. in Engl., Jahrb. XXXVIII (1906) p. 141; Engl., Pfl. Welt Afr. II (1908) p. 403; — *Gymnosiphon congestus* Wright in Thiselt.-Dyer, Fl. Trop. Afr. VII (1898) p. 12; Hutchinson and Dalziel, Fl. Trop. West Afr. II. 2 (1936) p. 399.

Erect, small, slender, saprophytic, bright yellow herbs, 3—10 cm high. Rhizome tuberous. Stem simple, bearing at the apex 2—7 sessile flowers. Radical, rosulate leaves lacking, stem-leaves reduced to small, lanceolate to ovate, acuminate scales, 1—3 mm long. Bracts lanceolate, acute, about 3.5 mm long. Flowers erect, about 7—8 mm long, white, without wings. Outer perianth-lobes erect, triangular, acute, with involute margin, about 1.5—2 mm long. Inner ones small, obovate to orbiculate, obtuse to rounded, up to 1 mm long. Perianth-tube cylindrical, wingless, about 3.5 mm long. Stamens inserted in the perianth-mouth. Connective truncate, more or less triangu-

lar, slightly obtuse-bilobed at the apex, tapering at the base into the short, thick filament. Style thick-filiform, bearing at the apex 3 subsessile, curved, funnel-shaped stigmas; stigma-margins with a hanging lobe at the base. Style with stigmas about 3,5 mm long. Ovary obovoid, about 2,5 mm long. Capsule unknown.

Type: Mann 515, from S Nigeria, Nun Riv. in herb. K.

Distribution: Tropical West and Central Africa.

CAMEROONS.

Moliwe (Schlechter 15787, fl. Sept. [B; BM; BR; P], type of *B. aptera* Schltr.); Nkolebunde near Molende (Lederemann 990, fl. Oct. [B]).

SOUTH NIGERIA.

Oban (Talbot 716 [BM]); Nun Riv. (Mann 515 pp. [K]).

BELGIAN CONGO.

Near Deurlo (Gillet s.n. [BR]).

ANGOLA.

Caleinda, Zanza Riv., M'Bulu hill, Rio Sufo (Gossweiler 8240, fl. Feb. [BM]).

20. *Burmannia densiflora* Schltr. in Engl., Bot. Jahrb. XXXVIII (1906) p. 141; Engler, Pfl. Welt Afr. II (1908) p. 403; — (?) *Burmannia africana* Braun et Schum., Mitt. Deutsch. Schutzgeb. (1889) p. 162, nomen; — *Gymnosiphon congestus* non Wright, Wright in Thiselt.-Dyer, Fl. Trop. Afr. VII (1898) p. 12.

Erect, saprophytic, rather robust herbs, up to 32 cm high. Rhizome elongate-tuberous, bearing numerous filiform roots. Stem usually simple, bearing at the top a simple or double, sometimes contracted, many-flowered cincinnus, up to 27-flowered. Radical rosulate leaves lacking, stem-leaves reduced to small, lanceolate to ovate, acute or acuminate scales, 2–6 mm long. Bracts of equal length and shape as the stem-scales. Flowers shortly pedicellate, sometimes subsessile, wingless,



white, 8—10 mm long. Outer perianth-lobes broadly triangular, acute, about 1,5 mm long, margin double, outer margin crenate, inner margin involute. Inner perianth-lobes broad-spatulate, truncate, about 0,5—1 mm long and 0,75 mm broad. Perianth-tube cylindrical, often constricted in the basal part, 4—5 mm long, wingless. Stamens inserted in the perianth-throat. Connective thick, oblong, forking at the apex into 2 crests and bearing a median, apical point. Crests often horizontal, apical point directed inwards, stamens often T-shaped by the horizontal crests. Filaments short, thick, swollen. Style filiform, the upper part swollen and narrowly winged, branched at the apex into 3 very short branches, each bearing a bowl-shaped stigma. Style with stigmas 4,5—5 mm long. Ovary obovoid, 2—3 mm long. Capsule obovoid to ellipsoid, crowned by the dried perianth.

Type: Stammler s.n. from the Cameroons in herb. B.

Distribution: Only known from the Cameroons.

#### CAMEROONS.

Gron Batange (Dinklage 848 (847), fl. Dec. [B]; Dinklage 963, fl. Dec. [B]); Bipinde, Mimfia (Zenker 4357, fl. Jan. [B; BM; BR; BRSL; G-DEL; GÖTT; K; L; M; MIS; P; S; W]); Bale country, Efulen (Bates 370, fl. Sept. [BM; G-BOIS; G-DEL; K]); Edea, Sende (Buesgen 467, fl. Jan. [B]); near Moliwe (Stammler s.n. [B]); without locality (Braun s.n., fl. Nov.-Dec. [B; CA; M]).

21. *Burmannia madagascariensis* Mart., Nov. Gen. et Spec. Plant. I (1824) p. 12; Schultes, Syst. Veg. VII. 2 (1830) p. LXXV; Perrier de la Bâthie in Cat. Pl. Madag., Burm. (1934) p. 10; — *Burmannia madagascariensis* Baker in Journ. Linn. Soc. XX (1884) p. 268; — *Burmannia Bakeri* Hochr. in Ann. Cons. Jard. Bot. Gen. (1908) p. 54; — *Burmannia paniculata* Willd. ex Schult., Syst. Veg. VII. 2 (1830) p. LXXIV; — *Maburnia* Du Petit Thouars, Gen. Nov. Madag. (1806) p. 4; Du Petit Thouars in Roemer, Collect. (1809) p. 198.

Erect, slender, annual herbs, up to 30 cm high. Stem fili-

form, usually simple, only forked at the top into the inflorescence-branches. Basal leaves more or less rosulate, linear, parallel-veined, acute, up to 7 mm long. Stem-leaves few, reduced to lanceolate, appressed scales, 3—5 mm long. Stem 1-flowered at the apex or 2—9 subsessile flowers in a bifid cyme. Bracts lanceolate to ovate, acute, about 3 mm long. Flowers erect, about 7.5 mm long, lilac or mauve, according to Bernier yellow, prominently 3-winged. Outer perianth-lobes ovate, obtuse, up to 1.5 mm long, margin thick-fleshy, papillose in the upper half. Inner lobes obovate, truncate, up to 0.5 mm long, distinctly papillose at the margin. Perianth-tube cylindrical-trigonus, 2—3 mm long. Anthers sessile below the inner perianth-lobes. Connective obtriangular, thick, with 2 erect crests on the upper surface, without long hanging spur. Style thick-filiform, branching at the top into 3 very short branches, each bearing a funnel-shaped stigma. Style with stigmas about 3 mm long. Ovary obovoid, about 3 mm long. Flower-wings half-obcordate, about 8 mm long and 3 mm broad, running from the base of the limb to below the abse of the ovary. On the limb the wings continue as narrow crests on the dorsal side of the outer perianth-lobes.

Type: a specimen from the herbarium of Du Petit Thouars, now in herb. P, duplicate in herb. L.

Distribution: collected in Tanganyika Territory and the isles of Madagascar, Sta. Marie and Mauritius.

#### TANGANYIKA TERRITORY.

Rufyi County, Ngonbeni, isle of Mafia (Schlieben 2571, fl. Jul. [B; BM; BR; G-DEL; S]).

#### MADAGASCAR.

Amparafaravola (Decary 614, fl. Jul. [P]); Vondrozo, Prov. de Farafangana (Decary 5019, fl. Aug. [P]); Manantenina, côté SE, au N de Fort Dauphin (Decary 3875, fl. Jun. [P]); Route de Vinanitelo à Ambohimahasina (Dandouau s.n., fl. Jul. [P]); Analatsara, distr. de Vatomandry (Guillot 33, fl. Oct. [B; G-DEL; P]); Tamatave (Hilsenberg and Bojer s.n., fl. May [BM]); Viquier and Humbert 404, fl. Sept. [P]); Kapiloza (Perrier de la Bâthie 1575 [P-DR]); Between Managaza and Banole (Perrier de la Bâthie 7223, fl. Jul. [B; P]); Soalala, Ouest, near Cap St. André (Perrier de

la Bâthie 1575, fl. Aug. [B]); Fianarantsoa (Scott Elliot 2112, fl. Feb. [B; BM; K; P]); Fort Dauphin (Decary 1794, fl. May [P]); Isle of Mahakamby, Bay of Boeni (Waterlot 566, fl. Jul. [P]); Andratamarina (Decary 29, fl. Aug. [P]); Prov. Vakinankaratra, distr. of Ambatolampy, NW of Tsinjoarivo (Viguiet and Humbert 1773, fl. Nov. [P]); Maromandia (Decary 1229, fl. Nov. [P]; Decary 2187, fl. Jun. [P]); id., distr. of Bajofo (Decary 2216, fl. Jun. [P]); Marokitraro, prov. Maromandia (Decary 1662, fl. Apr. [P]); Prov. of Mananjary (Geay 7961, fl. March-Apr. [P]; Geay 7950, fl. March-Apr. [P]); Marais de Masse = Gare du Chemin de Fer T.C.E., Tananarive, cote Est, Ampasimpotsy (Ungemach 21, fl. Jun. [P]); Between Maningoza and le Ranobe (Perrier de la Bâthie 7222, fl. Jan. [B; P]); Masakoamena Boina (Perrier de la Bâthie 7226, fl. Aug. [B; P]); Ambohitiosy or Ambohibenga, near Cape St. André (Perrier de la Bâthie 7225, fl. Apr. [B; P]); E part, without precise locality (Baron 1561 [K]); Sambirano, prov. Maromandia (Perrier de la Bâthie 7224 [B; P]); without locality (Chapelier s.n. [P]; Baron 1049 [P; K]; Lantz s.n., fl. Aug. [P]; Douliot s.n. [P]; Goudot s.n. [G-DEL]; Lindley s.n. [B; BR; M]; Herbar du Petit Thouars s.n. [L; P], type of *Maburnia* Du Pet. Th.; Thompson s.n. [BM]; Gerard 101 [K], type of *B. madagascariensis* Bak.).

#### STE. MARIE.

Amboudijalattre (Boivin s.n., fl. Sept. [P]); without precise locality (Bernier 298, 2e envoi [P]).

#### MAURITIUS.

without precise locality (Lindley s.n. [B]).

22. *Burmannia capensis* Mart., Nov. Gen. et Spec. I (1824) p. 12; Lamarck, Enc. Meth. I (1783) p. 521; Schultes, Syst. Veg. VII. 2 (1830) p. LXXV; — *Burmannia inhambanensis* Schltr. in Fedde, Rep. XI (1912) p. 82; — *Burmannia madagascariensis* non Mart., Schltr. in Fedde, Rep. XXI (1925) p. 81.

Erect, slender, annual herbs, 14–27 cm high. Stem filiform, simple, forked only at the top into the inflorescence-branches. Radical rosette reduced to 1 or 2 linear leaves, up to 6 mm long, sometimes lacking. Stem-leaves reduced to linear, appressed scales, 2.5–6 mm long, up to 1 mm broad. Stem 1-flowered at the apex or 2–5 flowers in a bifid cyme. Inflorescence-branches up to 2 cm long. Bracts lanceolate, acute, about 3 mm long. Flowers erect, about 8 mm long, subsessile, prominently 3-winged. Outer perianth-lobes ovate, obtuse, about 1.5 mm long and up to 1.5 mm broad, margin involute, papillose in the upper part. On the inner side of the outer perianth-lobes, pa-

rallé to the margin, a thick, fleshy, papillose bag. Inner lobes erect, broad-ovate, rounded, about 0.75 mm long and 1 mm broad, margin papillose. Perianth-tube cylindrical-trigonal, about 3 mm long. Anthers sessile below the inner perianth-lobes. Connective oblong, thick, fleshy, with 2 curved, obtuse, short crests on the upper surface, obtuse at the base. Style thick-filiform, bearing at the apex 3 sessile, funnel-shaped stigmas, style with stigmas about 3 mm long. Ovary obovoid to ellipsoid, about 3.5 mm long. Flower-wings half-elliptical, about 5.5 mm long and 1.5 mm broad, running from the base of the limb to the base of the ovary, decurrent along the pedicel. On the limb the wings continue as narrow crests on the dorsal side of the outer perianth-lobes.

**Type:** Bruguières s.n., from the Cape of Good Hope, without precise locality, in herb. de Jussieu [P].

**Distribution:** Besides the type also collected in Moçambique.

**MOÇAMBIQUE (PORTUGUESE EAST AFRICA).**  
Inhambane (Schlechter 12086, fl. Jan.-Feb. [B; BM], type of *B. inhambanensis* Schltr.).

**CAPE OF GOOD HOPE.**  
without locality (Bruguières s.n. [P, herb. Jussieu]).

23. **Burmannia Tisserantii** Schltr. in Fedde. Rep. XXI (1925) p. 84.

Very small, slender, annual, usually 1-flowered herbs, 2–9 cm high. Stem mostly simple, rarely branched, beset with 1–3 scalelike leaves. At the base of the stem 1 or 2 small, linear, acute leaves, up to 6 mm long. Stem-leaves reduced to small, lanceolate, acute scales, up to 2.5 mm long, keeled. Bracts 0.5–2 mm long, lanceolate, acute. Flowers erect, 3–9 mm long, violet or pale blue, prominently 3-winged. Outer perianth-lobes erect, 3-nerved, ovate, acutish, about 0.5–1.5 mm long. Inner

lobes linear, up to 0,5 mm long, obtuse. Perianth-tube cylindrical, about 1,5—3,5 mm long. Anthers sessile in the perianth-throat, connective oblong, bearing two obtuse, divergent crests at the apex and a median, hanging, obtuse spur at the base. Style thick-filiform, bearing at the apex 3 subsessile, funnel-shaped stigmas. Ovary about 1—4 mm long, sometimes slightly longer than the tube, ellipsoid to obovoid, truncate. Ovules numerous, oblong. Flower-wings very broad in the apical part, half obcordate or truncate at the apex, running from the base of the limb to the middle of the ovary, 2—7 mm long and 1—3 mm broad.

Type: Tisserant 1228 from the French Congo, Oubangui-Chari, in herb. P.

Distribution: Twice collected in the French Congo.

FRENCH CONGO.

Oubangui-Chari, Bambaré region, near Kudu Riv., 6 km N of Mouribas (Tisserant 1228, fl. Sept. [P]); Yalinga region (Le Testu 3049, fl. Aug. [P]).

24. *Burmannia Welwitschii* Schltr. in Fedde, Rep. XXI (1925) p. 84; — *Burmannia bicolor* Mart., var. *africana* Ridl. in Journ. Bot. XXV (1887) p. 85; Wright in Thiselton-Dyer, Fl. Trop. Afr. VII (1897) p. 11.

Erect, slender, annual herbs, 6—12 cm high. Stem usually simple, bearing 1 flower at the apex or a 2—7-flowered inflorescence. Basal rosulate leaves linear, acute, up to 6 mm long and 1,5 mm broad. Stem-leaves reduced to small, lanceolate, acute scales, up to 4 mm long. Flowers clustered at the top of the stems or in simple or bifid cincinni or 1 flower. Bracts lanceolate, acute, about 3 mm long and 1 mm broad. Flowers erect, about 8 mm long, violet, blue, white or yellow, prominently 3-winged, wings bluish. Outer perianth-lobes rounded, orbiculate, erect, 3-nerved, about 2 mm long, slightly broader than long.

Inner lobes orbiculate, minute. Perianth-tube cylindrical, about 2.5 mm long. Anthers sessile in the perianth-throat. Connective oblong, with two short lateral arms, bearing the thecae, two long, thin, erect, acute crests at the apex and a median, hanging, obtuse spur at the base. Style thick-filiform, branched at the apex into 3 short branches, each bearing a peltate stigma. Style with stigmas about 2 mm long. Ovary obovoid to broadly ellipsoid, about 3 mm long. Flower-wings half-elliptic, about 6.5 mm long and 1.5 mm broad, running from the base of the limb to below the base of the ovary.

Type: Welwitsch 6474 from Angola, Huilla, in herb. BM.

Distribution: tropical Africa, widely spread.

FRENCH GUINEA.

Near Pita (Pobéguin s.n. [P]).

GABOON.

Plaine de Conando (Duponquet s.n. [P]).

FRENCH CONGO.

Cape Lopez, Akossa (Lecomte F. 32, fl. March [P]); Oubangui, near Dounou Riv., 40 km N of Besson (Tisserant 76, fl. Aug. [P]); id., near Balimbria, 10 km N of Bambari (Tisserant 2061, fl. Oct. [P]).

BELGIAN CONGO.

Kundelunga (Kassner 2597, fl. March [B; BM; F; K]).

ANGOLA.

Huilla, near Lopollo (Welwitsch s.n., fl. Feb.-May [W]; Welwitsch 68, fl. Feb. [BM]; Welwitsch 6473, fl. Feb. [BM]; Welwitsch 6474, fl. Apr. [BM]); Rio Nene, Humpata (Johnston s.n., fl. Sept. [K]); id., Changarala near Humpata (Exell and Mendonça 2980, fl. Jun. [BM]); Mucha Riv. (Dehindt s.n. [BR]).

Loanda, Loanda (Gossweiler 917, fl. May-Aug. [B; P]).

Malange, Malange (Young 862, fl. Sept. [BM]).

Moxico, Riv. Cassai (Exell and Mendonça 1493, fl. May [BM]).

SOUTH RHODESIA.

Matopo hills (Eyles 52, fl. Feb. [BM]).

NORTH RHODESIA.

Loangwa, NE Plateau (Mrs. Philip Jelf 7, fl. Apr. [BM]).

Nudinilunga, near Riv. Darinlolo (Milne-Redhead 854, fl. Aug. [K]).

TANGANYIKA TERRITORY.

Nyassa Highlands, Kyimbala Distr., N of Lake Nyassa, Madehani (Stolz

2320, fl. Jul. [B; BM; BR: F; K; P]); Ubena (Goetze 797, fl. March, ex Schlechter l.c.); N of Lake Nyassa (Thomson s.n., fl. Nov. [K]); Namassi (Cameron s.n., fl. Nov. [K]).

WITHOUT LOCALITY.  
N'gori (Dybowski 106 [P]).

25. **Burmannia obscurata** Schltr. in Fedde, Rep. XXI (1925)  
p. 83.

Erect, slender, annual herbs, 11–22 cm high. Stem filiform, usually simple, dark-coloured, almost black, bearing at the apex 1–5 flowers. Radical rosette lacking, leaves reduced to small, appressed, linear to lanceolate, blackish scales, 2–3 mm long, about 0.5 mm broad. Bracts elliptical to oblanceolate, acute, black with light-coloured margin. Flowers sessile, rather small, about 7 mm long, white to bluish-violet, prominently 3-winged. Outer perianth-lobes triangular, acute, about 1 mm long, margin fleshy. Inner lobes about 0.5 mm long, linear, fleshy. Perianth-tube cylindrical-trigonous, slightly constricted in the middle, 2.5–3 mm long. Anthers sessile in the perianth-throat, connective black, with two curved, obtuse crests at the apex and a hanging spur at the base, connective with appendages Y-shaped. Style thick-filiform, bearing at the apex 3 sessile, funnel-shaped stigmas, style with stigmas black, about 2.5 mm long. Ovary elongate-ellipsoid, blackish, about 3.5 mm long. Perianth-wings obtuse-triangular, about 5 mm long and 1.5 mm broad, running from the base of the limb to the middle of the ovary, decurrent along the lower half of the ovary.

Type: Le Testu 3927 from the French Congo in herb. P, duplicate in herb. B.

Distribution: Once collected.

FRENCH CONGO.  
Oubangui-Chari, 70 km W of Yalinga (Le Testu 3927, fl. Jun. [B; P]).

26. **Burmannia liberica** Engl. in Bot. Jahrb. 48 (1913) p. 505; — *Burmannia bicolor* Mart. var. *micrantha* Engl. et Gilg in Warburg, Kunene-Samb. Exped. (1903) p. 202; — *Burmannia inaequalata* Engl. in Bot. Jahrb. 48 (1913) p. 505, nomen; — *Burmannia chariensis* Schltr. in Fedde, Rep. XXI (1925) p. 82.

Erect, slender, annual herbs, 11–29 cm high. Stem very slender, often sinuous, filiform, usually simple, only forked at the top into the inflorescence, sparsely beset with ovate to lanceolate, acute or acuminate, scalelike leaves of about 2 mm long. Basal rosulate leaves linear or linear-lanceolate, about 1 mm broad and up to 7 mm long, acute, acuminate or subulate. Inflorescence 1–7-flowered, consisting of clusters or contracted bifid cymes. Bracts about 1.5 mm long, ovate-lanceolate. Flowers erect, shortly pedicellate, up to 10 mm (15 mm) long, prominently 3-winged, violet or blue with wings of similar colour, or perianth bluish with whitish wings, or perianth yellow, wings bluish. Outer perianth-lobes erect, triangular, 1–1.5 mm long, acute, with thick, fleshy margin, one midnerve and 2 side-nerves parallel to the margin. Inner lobes linear-lanceolate, often swollen and fleshy, acute, about 0.5 mm long. Perianth-tube cylindrical, about 3 mm long. Anthers sessile in the perianth-mouth, connective quadrangular with 2 broad, curved, obtuse, winglike crests at the apex and a median hanging, rather long, obtuse spur at the base. Style thick-filiform, bearing at its apex 3 funnel-shaped, sessile stigmas, funnel-margin crenate. Ovary obovoid or ellipsoid, 4–4.5 mm long. Capsule obovoid, seeds yellowish-brown, oblong. Flower-wings about 7 mm long and 3 mm broad, half-obovate to half-cuneate, running from the base of the limb to the lower part of the ovary, decurrent along the basal ovary-part and the very short pedicel.

Type: Dinklage 2028, from Liberia, in herb. B.

Distribution: Tropical West-Africa and Congo region.



## LIBERIA.

Monrovia (Dinklage 2831, fl. Aug. [B; GH; K]); Duport (Lindner 1491, fl. Nov. [K]); Mt. Barclay (Bunting 21, fl. Nov. [BM]; Bunting 32, fl. Jun. [BM]); without locality (Dinklage 2028 [B]).

## CAMEROONS.

Between Tapare and Tukurua (Ledermann 5587a [B]); near Garua (Ledermann 4770a, fl. Aug. [B]; Ledermann 3427, fl. Apr. [B]; Ledermann 4521, fl. Jul. [B]); id., Schuari (Ledermann 3552, fl. Apr. [B]).

## SIERRA LEONE.

Near Bumban (Deighton 1305, fl. Aug. [K]); between Juring and Blama (Deighton 298, fl. Dec. [K]).

## GABOON.

Libreville (Mildbread 3329, fl. Jun. [B]).

## FRENCH CONGO.

Oubangui-Chari, 10 km N of Mowubas (Tisserant 1195, fl. Aug. [P]); Yalinga region, marsh of la Pawa, between Yalinga and Aria (Le Testu 3122, fl. Aug. [P]); marsh of la Doungou, 40 km S of Wadda (Le Testu 2914, fl. Jun. [P], type of *B. chariensis* Schltr.); near Brazzaville (Dryowski s.n., fl. Jul. [P]; Savorgan de Brazza 328, fl. Jan. [P]).

## BELGIAN CONGO.

Kindu-Katakokombe (Lebrun 6047, fl. Aug. [BR]); Leopoldville (Gillet 2596, fl. Jul. [BR]).

## ANGOLA.

Bié, Longa Riv. below Chyuja (Baum 619, fl. Jan. [B; BM; BR; G-DEL; K; M; S; W], type of *B. bicolor* Mart., var. *micrantha* Engl. et Gilg).

27. *Burmannia latialata* Hua apud Pobég., Ess. Fl. Guin. Fr. (1906) p. 166; — *Burmannia Le-Testui* Schltr. in Fedde, Rep. XXI (1925) p. 82.

Erect, slender, annual herbs, 9–23 cm high. Stem filiform, mostly simple, bearing one flower or a cluster of few flowers at the top. Basal leaves rosulate, linear to linear-lanceolate, acute or acuminate, up to 11 mm long and 2 mm broad. Stem-leaves small, scalelike, linear to lanceolate, acute or acuminate, 2–4 mm long. Bracts lanceolate, acute, about 2.5 mm long. Flowers erect, subsessile, 7–14 mm long, prominently 3-winged; perianth yellow, wings blue or purplish. Outer perianth-lobes erect, triangular, 1-nerved, acute, about 2 mm long, margin thick and fleshy. Inner lobes linear, acute, about 1 mm long.

fleshy. Perianth-tube cylindrical, 2—3.5 mm long. Anthers sessile in the perianth-throat below the inner lobes. Connective thick, oblong, with short, broad, lateral arms, bearing the thecae. On the upper surface two curved, obtuse, broad crests, at the base a hanging, acute spur. Style thick-filiform, branched at the apex into 3 very short branches, each bearing a curved, funnel-shaped stigma, funnel-margin crenate. Ovary obovoid or ellipsoid, 3—8 mm long. Flower-wings half-elliptical to half-obovate, sometimes half-obcordate, 5—12 mm long and 2—4 mm broad, running from the base of the limb to the base of the ovary. Capsule obovoid, seeds oblong, brownish.

**Type:** Pobéguin 8, from French Guinea, Maneah, in herb. P.

**Distribution:** Tropical West-Africa and Belgian Congo.

**FRENCH GUINEA.**

Maneah (Pobéguin 8 [P]); near Kindia (Pobéguin 1392, fl. Oct. [P]); without locality (Farmar 200 [K]).

**CAMEROONS.**

Baja Highland near Buar (Elbert 422, fl. Jan. [B]; Mildbread 9467, fl. May [B; K]).

**FRENCH CONGO.**

Oubangui-Chari, between le Lubari and la Zaca (Le Testu 4332, fl. Nov. [P], type of *B. Le-Testui* Schltr.); id., marsh of la Boumtala, 35 km SW of Wadda (Le Testu 3512, fl. Dec. [P]); Kaga Biangula, 20 km N of Bambari (Tisserant 1331, fl. Nov. [P]).

**BELGIAN CONGO.**

Uele District, upper Uele Riv., near Amadi (Seret 682, fl. Sept. [BR]); Bambesa (Pittery 111 [BR]).

**NORTH NIGERIA.**

Mada hills (Hepburn 85 [K]); Kontagora (Dalziel 263, fl. Dec. [K]).

**ANGOLA.**

Kulsi (Pockock 261, fl. May [B]).

28. **Burmammia blanda** Gilg in Warburg, Kunene-Sambesi Exped. (1903) p. 203.

Erect, slender, annual herbs, 7—19 cm high. Stem simple, filiform, only forked at the apex into the inflorescence-branches.

Leaves small, scalelike, linear to lanceolate, acute, 1.5–4 mm long. No radical rosette, basal leaves sometimes slightly longer. Inflorescence 1–7-flowered, often a double cincinnus, inflorescence-branches up to 15 mm long. Bracts lanceolate-ovate, acute, purple-coloured when dried. Flowers erect, subsessile, about 6.5 mm long, prominently 3-winged, whitish or pale blue. Outer perianth-lobes erect, broadly triangular, acute, about 1 mm long, margin fleshy, curled inwards. Inner perianth-lobes clavate, almost 1 mm long. Perianth-tube cylindrical, about 2 mm long. Anthers sessile in the perianth-throat; connective oblong with two small, obtuse crests at the apex and a very short, obtuse hanging spur at the base. Style thick-filiform bearing at the apex 3 (sub)sessile, funnel-shaped stigmas. Style with stigmas about 2 mm long. Ovary obovoid, about 3 mm long. Flower-wings broadly half-obovate, emarginate at the apex, about 5.5 mm long and 2 mm broad, running from the base of the limb to below the base of the ovary.

Type: Baum 726 from Angola, Bié in herb. B, duplicates in herb. BM; BRSL; G-DEL; K; M; S; W.

Distribution: Twice collected in Angola.

#### ANGOLA.

Bié, Quiriri Riv., near Sobi brook (Baum 726, fl. Feb. [B; BM; BRSL; G-DEL; K; M; S; W]).

Lunda, Henrique de Cavalho (=Saurimo) (Young 1156, fl. Oct. [BM]).

#### Key to the Asiatic and Australian species.

1. *a.* Non-saprophytic chlorophyllose herbs with a rosette of green, linear leaves at the base. Rosette often consisting of 1–3 leaves, sometimes almost lacking ..... 2
- b.* Saprophytic herbs without chlorophyl. Radical rosette lacking ..... 12
2. *a.* Flower-wings narrower than the perianth-tube or reduced to ribs ..... 3

- b.* Flower-wings as broad as the perianth-tube or broader ..... 5
3. *a.* Anthers with two apical crests and a basal, hanging spur. Ovary shorter than the perianth ..... 4
- b.* Anthers with two apical crests, basal spur lacking. Ovary as long as the perianth or longer. New Guinea ..... 28. **B. geelvinkiana** Becc.
4. *a.* Basal rosette reduced, leaves of the rosette up to 12 mm long. Stem bearing at its apex 1—3 flowers. Perianth-lobes without fleshy veins. Stigmas sessile. Cochin China ... 29. **B. cochinchinensis** Gagnep.
- b.* Basal rosette well developed, leaves of the rosette 2,5—7 cm long and up to 6 mm broad. Stem bearing at its apex an usual bifid inflorescence. Perianth-lobes with prominent, fleshy veins. Stigmas on short style-branches. Malayan Archipelago ..... 30. **B. bancana** Miq.
5. *a.* Margin of the perianth-lobes double ..... 6
- b.* Perianth-lobes with single margin ..... 7
6. *a.* Robust herbs, up to 75 cm long, with a well developed, radical rosette of linear, grass-like leaves, up to 15 cm long and 13 mm broad. Inflorescence usually a bifid, many-flowered cyme, sometimes reduced to a cluster of few flowers. Cyme-branches up to 8 cm long ..... 31. **B. disticha** L.
- b.* Slender herbs, up to 30 cm high. Basal, rosulate leaves about 1 cm long and up to 3 cm broad. Stem bearing at its apex a single flower or a cluster of few flowers ..... 32. **B. coelestis** Don.
7. *a.* Wings about as broad as the perianth-tube. Perianth-limb very short, about 0,5 mm long, inner perianth-lobes not lacking. Anthers triangular, funnel-shaped, inserted on short, thick filaments ..... 33. **B. Ledermannii** Jonk.
- b.* Wings broader than the perianth-tube. Inner

- perianth-lobes not lacking. Anthers sessile, not funnel-shaped ..... 8
8. *a.* Anthers with 2 apical crests and a basal, hanging spur. Thecae separated ..... 9
- b.* Anthers with 2 crests at the apex, basal spur lacking. Thecae appressed against the connective and connate below the basal connective-margin. Sumatra...  
..... 34. **B. connata** Jonk.
9. *a.* Flower-wings half-orbiculate. Stems usually 1-flowered, flowers blue or purplish .....  
..... 35. **B. pusilla** (Wall. ex Miers) Thw.
- b.* Flower-wings half-elliptical to half-obovate, mostly 2—many-flowered ..... 10
10. *a.* 5—10 Flowers in a capitate inflorescence. Flower-wings half-elliptical with crenate margin. Flowers blue. Indo China ..... 36. **B. subcoelestis** Gagnep.
- b.* Inflorescence not capitate, margin of the wings not crenate ..... 11
11. *a.* Stem usually bearing 1 or 2 flowers, white with yellow lobes. Wings half-elliptical. Perianth-lobes with thick, fleshy margin. Indo China .....  
..... 37. **B. luteo-alba** Gagnep.
- b.* Stem filiform, often flexuose, usually bearing a bifid, many-flowered cyme of blue or purple, erect flowers. Perianth-lobes without fleshy margin. Australia ..... 38. **B. juncea** Sol. ex R. Br.
12. *a.* Flowers wingless, 3- or 6-costate ..... 13
- b.* Flowers 3-winged ..... 17
13. *a.* Ovary as long as the perianth or longer. Stem-scales many, imbricate in the lower part of the stem .....  
..... 39. **B. sphagnoides** Becc.
- b.* Ovary shorter than the perianth. Stem-scales not imbricate ..... 14
14. *a.* Perianth-limb thick, fleshy, more or less succulent ... 15
- b.* Perianth-limb not fleshy ..... 16
15. *a.* Stem beset with many, distichous scales. Connective

- with a slightly 2-lobed, papillose crest at the top.  
West Java ..... 40. **B. bifaria** J. J. S.
- b.* Stem-scales not distichous. Connective with two curved, erect, short crests at the top. Enggano Island ..... 41. **B. engganensis** Jonk.
16. *a.* Inflorescence usually capitate. Outer perianth-lobes with long, narrow, involute lateral lobes. Inner perianth-lobes spatulate, sometimes slightly papillose at the margin. Connective apiculate, bearing a broad, obtuse, transparent, hanging spur at the base. Rhizome usually tuberous ... 42. **B. Championii** Thw.
- b.* Inflorescence rather loose. Outer perianth-lobes with small, rounded, crenate, involute lateral lobes. Inner perianth-lobes broadly obovate, distinctly papillose. Connective not apiculate, acute at the base. New Guinea ..... 43. **B. micropetala** Ridl.
17. *a.* Inner perianth-lobes lacking ..... 18
- b.* Inner perianth-lobes not lacking, sometimes minute... 19
18. *a.* Perianth-lobes simple. Connective with a broad, hanging, obtuse lobe at the base and an apical, erect, papillose, obtuse crest. Ovary subglobose. Borneo...  
..... 44. **B. tridentata** Becc.
- b.* Perianth-lobes bifid. Connective without apical crests or basal hanging spur. Ovary subglobose .....  
..... 45. **B. oblonga** Ridl.
19. *a.* Wings very narrow, about as broad as the perianth-tube ..... 20
- b.* Wings usually broader ..... 22
20. *a.* Connective with a basal, hanging spur. Flowers up to 5 mm long ..... 21
- b.* Connective without hanging spur. Flowers 6—10 mm long. Narrowly winged form of .....  
..... 50. **B. lutescens** Becc.
21. *a.* Connective with two divergent crests at the apex. Ovary subglobose. Liu-Kiu Islands and Southern Japan ..... 46. **B. liukuensis** Hayata.

- b.* Connective without crests at the apex. Ovary usually obovoid ..... 47. **B. Wallichii** (Miers) Hook. f.
22. *a.* Connective with a hanging spur at the base ..... 26
- b.* Basal, hanging connective-spur lacking ..... 23
23. *a.* Ovary obovoid, elongate, longer than the perianth. Crests on the connective very short. Inner perianth-lobes minute, almost lacking. Flower-wings half-cuneate. Japan and Hainan ..... 48. **B. cryptopetala** Mak.
- b.* Ovary shorter than the perianth ..... 24
24. *a.* Outer perianth-lobes triangular, obtusely apiculate, with thick, fleshy margin, not fleshy in the upper part ..... 25
- b.* Outer perianth-lobes obovate, obtuse, fleshy in the upper part. Inner lobes linear to oblanceolate, almost 1 mm long. Connective with two apical, divergent, acute crests. Flower-wings broad, half-rhomboid to half-cuneate. Tenasserim and Siam ..... 49. **B. candida** Griff. ex Hook. f.
25. *a.* Inner perianth-lobes minute, orbiculate. Connective broad with 2 very small, almost lacking crests. Ovary subglobose. Flower-wings variable. Stem often robust, succulent, with a many-flowered inflorescence at the top ..... 50. **B. lutescens** Becc.
- b.* Inner perianth-lobes lanceolate. Connective broad with two divergent crests at the apex. Ovary ellipsoid. Flower-wings elliptical. Slender herbs, usually 1-flowered ..... 51. **B. malasica** Jonk.
26. *a.* Connective crowned by a horizontal, retuse to emarginate roof, anther T-shaped. Flower-wings rather narrow, half-spathulate, obcordate. Capsule subglobose. Southern Japanese Islands and Hainan ..... 52. **B. Itoana** Mak.
- b.* Connective with two divergent crests at the top ... 27
27. *a.* Outer perianth-lobes with involute margin or involute lateral lobes ..... 28

- b.* Outer perianth-lobes with a thick, fleshy margin or a thickened bag, parallel to the margin ..... 29
28. *a.* Slender herbs. Flowers 3—6,5 mm long. Outer perianth-lobes 3-lobed, lateral lobes involute. Flower-wings broad, half-orbiculate, truncate to obcordate at the apex ..... 53. **B. nepalensis** (Miers) Hook. f.
- b.* Stiff, erect, small herbs, beset with thornlike scales. Flowers 6—11 mm long. Outer perianth-lobes triangular with involute margin. Flower-wings half-elliptical. India (Cochin) ..... 54. **B. stricta** Jonk.
29. *a.* Ovary subglobose. Connective with a rather broad, obtuse, hanging spur at the base. Small, delicate plants, 3—6 cm high, flowers about 6 mm long. East Java ..... 55. **B. Steenisii** Jonk.
- b.* Ovary ellipsoid, obovoid, obconical or clavate. Connective-spur slender. Plants usually more than 10 cm high ..... 30
30. *a.* Ovary as long as the perianth-tube or longer, obovoid to clavate. Outer perianth-lobes ovate, obtuse to rounded, with a thick, fleshy bag on the inner side, parallel to the margin. Connective-spur acute ..... 56. **B. candelabrum** Gagnep.
- b.* Ovary shorter than the perianth-tube, obovoid or obconical. Outer perianth-lobes triangular, acute, with thick, fleshy margin. Connective-spur obtuse. India (Travancore) ..... 57. **B. indica** Jonk.

Note: I have not been in a position to examine material of *Burmannia Takeoi* Hayata, Ic. Pl. Formos. V (1915) p. 212, from Formosa, Urai; and *Burmannia Urazii* Masam. in Trans. Nat. Hist. Soc. Form. XXIV n. 132 (1934) p. 207, from South Japan, Iriomoto.

28. **Burmannia geelvinkiana** Becc., Malesia I (1877) p. 244, tav. XV, fig. 5—7.

Erect, slender, unbranched, green, non-saprophytic herbs,



7—12 cm high. Stem filiform, simple, bearing 1 or sometimes 2 flowers at its apex. Basal, rosulate leaves few, 2—5, linear, subulate, 3-nerved, 3—5 mm long and about 1 mm broad. Stem-leaves scalelike, appressed, linear-lanceolate, acuminate to subulate, up to 3 mm long. Bracts ovate-lanceolate, long-acuminate, 3-nerved, about 1,5 mm long. Flowers bluish, very narrowly 3-winged, about 7 mm long. Outer perianth-lobes erect, triangular to broadly ovate, apiculate, about 1,5 mm long, margin of the lobe not thickened or involute. Inner perianth-lobes linear, obtuse, erect, 0,5—1 mm long, not fleshy. Perianth-tube very short, cylindrical-trigonous, about 1,5 mm long. Anthers sessile at the base of the inner perianth-lobes. Connective rather thick, triangular, obtuse at the base, bearing at the apex two divergent, slightly papillose crests. Basal, hanging connective-spur lacking. Style short, thick, bearing at its apex 3 subsessile, funnel-shaped, curved stigmas. Style with stigmas about 1,5 mm long. Ovary ellipsoid narrowly obovoid, longer than the perianth, length about 4 mm. Flower-wings linear, very narrow, running from the base of the limb to the base of the ovary, about 5,5 mm long and 0,25 mm broad. Capsule obovoid, bursting with transversal splits. Seeds minute, numerous, ovoid, bright yellow.

Type: Beccari s.n., from New Guinea, Geelvinkbay, in herb. FI.

Distribution: Once collected.

NEW GUINEA.

Netherl. New Guinea, Geelvinkbay, Peninsula of Wandamen, Mandamui (Beccari s.n., fl. Dec. [FI]).

29. *Burmannia cochinchinensis* Gagnep. in Bull. Soc. Bot. Fr. 54 (4me Série T. VII) (1907) p. 463; Gagnepain in Lecomte, Fl. Gén. Ind.-Chin. VI (1908) p. 22.

Erect, slender annual herbs, up to 24 cm high. Roots short, white. Stem filiform, usually simple, bearing 1—3 flowers at the

apex. Radical, rosulate leaves few, linear to lanceolate, subulate, 3—12 mm long. Stem-scales linear to lanceolate, subulate or acuminate, 1-nerved, appressed, 3—7 mm long. Bracts lanceolate, acute, 3-nerved, midnerve thicker and more prominent than the lateral ones. Flowers erect, narrowly 3-winged, brownish when dried, about 8 mm long. Outer perianth-lobes rather broad, ovate, deltoid, obtuse or slightly acute, about 1,5 mm long. Inner lobes obovate, obtuse, often with involute margins and then appearing linear-lanceolate, almost 1 mm long. Perianth-tube cylindrical-trigonous, about 3 mm long. Anthers sessile in the perianth-throat, connective truncate, oblong, bearing an acute, filiform spur at the base and two divergent, obtuse crests at the apex. Thecae white, rest of the anther dark. Style thick-filiform, with 3 curved, funnel-shaped, slightly short-piliferous, sessile stigmas at the apex. Style with stigmas about 3,5 mm long. Ovary ellipsoid to obovoid, about 2,5 mm long. Flower-wings very narrow, linear, running from the top of the limb to below the base of the ovary, about 9 mm long and  $\frac{1}{3}$  mm broad. Capsule obovoid, crowned by the dried perianth.

Type: Thorel s.n., from Cochin-China, in herb. P, duplicate in herb. U.

Distribution: Once collected.

INDO CHINA.

Cochin China, Cay-cong (Thorel s.n. [P:U]).

30. *Burmattia bancana* Miq., Fl. Ind. Bat. Suppl. I (1860) p. 617; — *Burmattia graminifolia* Warb. in Fedde, Rep. XVIII (1922) p. 330.

Erect, annual herbs, 20—37 cm high. Stem simple, terete, forked at the apex into the inflorescence. Basal rosette distinct, consisting of many linear to lanceolate, subulate, parallel-veined leaves, 2,5—7 cm long, up to 6 mm broad. Stem-leaves few,

scaleglike, more or less appressed, lanceolate, subulate, 10—30 mm long. One leaf-rossette sometimes bearing 2 or 3 stems, each with an inflorescence.

Inflorescence usually a double cincinnus, 3—15-flowered, inflorescence-branches up to 3 cm long. Bracts scaleglike, lanceolate, acute or acuminate, 4—7 mm long. Flowers blue or purpureous, erect, narrowly 3-winged, 6—13 mm long. Outer perianth-lobes lanceolate-triangular, acute, with 3 thick, fleshy, prominent nerves inside, up to 3 mm long. Inner lobes rather long, linear-lanceolate, obtuse, up to 2,5 mm long, midnerve prominent, thick, fleshy. Perianth-tube cylindrical-trigonous, up to 4,5 mm long. Anthers sessile in the perianth-throat. Connective oblong with a basal, hanging obtuse spur and two apical, divergent obtuse crests. Style filiform, thick, branching at the apex into 3 short branches, each bearing a slightly curved, more or less funnel-shaped stigma, with a central cleft-shaped opening. Ovary truncate-ellipsoid, 3—7 mm long. Flower-wings linear, up to 11 mm long, 0,5—1 mm broad, running from the base of the limb to the base of the ovary. Capsule ellipsoid to obovoid, crowned by the dried perianth. Seeds many, small, testa elongate.

Type: Teysmann (3334 H. B.) from Banka Island, in herb. U, duplicates in herb. BZ; CA; K; LY.

Distribution: Sumatra, Banka, Billiton and Borneo.

Vernacular Names: roempoet taroem (Billiton, according to Ham); oemboet oemboet (Billiton, according to Teysmann).

#### SUMATRA.

West Coast, Batang Paloepoeh (Jacobson 62, fl. Oct. [BZ]); near Maninjau (Ultee 140 [BZ]).

Without locality (Hagen s.n. [M]).

#### BANKA.

Near Taboali (Kobus s.n. [B; L]); Serdang (de Leeuw 14, fl. Jan. [BZ]); without locality (Teymann (3334 H.B.) [BZ; CA; K; LY; U]).

## BILLITON.

Near Manggar (Ham 31, fl. March [BZ]; Teysmann s.n. [BZ]); near Tandjong Pandan (Teymann 11089 [BZ]); without locality (Teymann 11190 and 11192 [BZ]).

## BORNEO.

Netherl. Borneo, Soengai Kenepai (Teymann 8483 [BZ]; Hallier 2149 [BZ]); Sampit (Hackenberg 140, fl. Oct. [B]); Distr. Duson Timor, Mada near Telang (Grabowsky s.n. [K], type of *B. graminifolia* Warb.); Tame anglaijang-Patai (Grabowsky s.n. [B]); Poeloe Madjang (Teymann 8482 and 8485 [BZ]); without locality (Schlechter s.n. [B]).

Sarawak, Ulu Koyan (Coll. indig., Exp. Richards S. 506, fl. Sept. [K]).

31. *Burmannia disticha* L., Spec. Plant. I (1753) p. 287; Roxburgh, Pl. Coast Corom. III (1819) t. 242; Don, Prod. Fl. Nep. (1825) p. 44; Schultes, Syst. Veg. VII. 2 (1830) p. LXXIV; Roxburgh, Fl. Ind. II (1832) p. 117; Graham, Cat. Pl. Bomb. (1939) p. 223; Bentham, Fl. Austr. VI (1873) p. 397; v. Mueller, 1st. Census (1882) p. 115; Bailey, Syn. Qu. Fl. (1883) p. 534; Woolls, Pl. N.S. Wales (1885) p. 91; Hooker, Fl. Br. Ind. V (1888) p. 664; v. Mueller, 2nd. Census (1889) p. 192; Bailey, Cat. Pl. Qu. (1890) p. 45; Ridley in Journ. Str. Br. Roy. As. Soc. 22 (1890) p. 332; Moore, Handb. Fl. N. S. Wales (1893) p. 408; Hooker in Trimen, Handb. Fl. Ceyl. IV (1898) p. 130; Wright in Journ. Linn. Soc. XXXVI (1903) p. 4; Turner in Proc. Linn. Soc. N. S. Wales 28 (1903) p. 303; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 70; Gagnepain in Lecomte, Fl. Ind.-Chin. VI (1908) p. 25; Koorders, Exk. Fl. Jav. I (1911) p. 344; Domin in Bibl. Bot. XX (1915) p. 538; Ridley in Trans. Linn. Soc. 2nd. Ser. Vol. IX, Bot. (1916) p. 228; Ridl., Fl. Mal. Pen. IV (1924) p. 304; Fischer in Gamble, Fl. Pres. Madr. III. viii (1928) p. 1399; Lam in Nat. Tijdschr. Ned. Ind. 89 (1929) p. 354; Fischer in Rec. Bot. Surv. Ind. XIII (1938) p. 135; — *Burmannia distachya* R. Br., Prod. Fl. Nov. Holl. I (1810) p. 265; id., sec. Ed. (1827) p. 121; Thwaites, Enum. Pl. Zeyl. (1864) p. 325; — *Burmannia sumatrana* Miq., Fl. Ned. Ind. (Fl. Ind. Bat.), Suppl. I (1860) p. 616; — *Burmannia disticha* L., var. *sumatrana* (Miq.) Hook. f., Fl. Br. Ind. V. (1888) p. 664.

*Burmannia spica gemima* L., Burman, Thes. Zeylan. (1737)

p. 50, Tab. 20, fig. 1; Linn., Hort. Cliff. (1737) p. 128; —  
*Jawael, Tsjawael*, Hermann, Mus. Zeylan. (1726) p. 30.

Erect, annual, robust herbs, up to 75 cm high. Roots yellowish-brown, fibrous, rather short. Stem robust, usually simple, bearing at the apex the inflorescence. Radical rosulate leaves linear or lanceolate, acute, up to 15 cm long and 13 mm broad, rosette distinct. Stem-leaves reduced to appressed, lanceolate, acute, sometimes acuminate scales, up to 7 cm long and 7 mm broad, imbricate in the lower part, upper part of stem often leafless. Inflorescence usually a many-flowered, bifid cincinnus, sometimes reduced to a single cincinnus or to a cluster of few flowers, inflorescence-branches up to 8 cm long. Bracts lanceolate, acute, about 5–12 mm long. Flowers sessile or shortly pedicellate, erect, 10–20 mm long, blue or purple, often with yellow tipped greenish lobes, sometimes perhaps quite yellow flowers. Outer perianth-lobes triangular, acute, erect, about 2.5 mm long. Margin thick, fleshy, at the basal part of the lobes a double margin. Inner lobes linear-lanceolate, thick, fleshy, obtuse, about 1–1.5 mm long. Perianth-tube cylindrical-trigonous, about 3–4.5 mm long. Anthers sessile in the perianth-throat.

Connective rather broad with two distinct, acute crests at the apex and a broad, obtuse to rounded, almost truncate hanging spur at the base. Style thick-filiform to cylindrical, bearing 3 sessile, funnel-shaped stigmas at the apex. Style with stigmas about 3 mm long. Ovary ellipsoid to obovoid, truncate, attenuate in the basal part, longer than the tube, up to 10 mm long. Flower-wings elliptical, about 10–18 mm long and 1.5–2.5 mm broad, running from the base of the limb to the base of the ovary, continuing as crests on the back of the outer perianth-lobes and decurrent along the basal part of the perianth and the very short pedicels. Capsule obovoid, truncate, irregularly dehiscent with transversal clefts.

Type: Hermann s.n. from Ceylon, in herb. BM, duplicates in herb. G-DEL and L.

**Distribution:** Widely spread in the tropics of Asia and Australia: Ceylon, India, Malay Peninsula, Siam, China, Indo China, Malayan Archipelago (Sumatra, Borneo and Celebes) and New Guinea.

**Vernacular Names:** Ma-diya-jawala (Ceylon, according to Hooker in Trimen l.c. and de Silva); Si goera goera (Sumatra, according to v. d. Meer Mohr); Caô-Caô; Khan song (Indo China, according to Gagnepain l.c.); Parkheawdur (Lushai, Assam, according to Fischer l.c. (1938)).

#### CEYLON.

Near Colombo (Wichura 2685 [B]; unknown collector 81 [MIS]); id., Negumbo (Thunberg s.n. [BM]); near Karawita (de Silva 106, fl. Oct. [NY]); between Karawita and Niyanowitta (Holtermann s.n.; fl. Dec. [B]); near Galle (unknown collector s.n. [GÖTT]); Caltura (Macrae 95 [BR]); without locality (Hermann s.n. [BM; G-DEL; L]; Fraser 51 and 193 [BM; US]; Heward 51, fl. Nov. [US]; Kelaart s.n. [G-DEL]; Munby s.n. [G-BOIS]; Royle s.n. [GH]; Walker s.n., 132 and 143, [G-DEL; GH; K; L; P; U; W]; Léman s.n. [P]; Leschenault s.n. [G-DEL; P]; Thwaites 2312 [B; BM; BR; BZ; G-BOIS; G-DEL; GH; GÖTT; K; P; P-DR; W]; herb. de Jussieu [P]; Holtermann s.n. [B]; Gardner s.n. [BM]; Macrae 645 [BM]; Macrae 143 [BM; K]; Jenville s.n. [BM]; Koendy s.n. [BM]; Thunberg s.n. [S]).

#### ASSAM.

Khasia hills (Hooker and Thomson s.n. [B; BM; BR; CA; F; G-BOIS; G-DEL; GH; GÖTT; K; L; M; P; P-DR; S; U; W]; Oldham 8 pp. [CA; G-DEL]; Griffith 71 [G-BOIS; K]; Griffith s.n. [G-BOIS; NY]; Mann s.n. [BZ; U]; Kurz 175, fl. May [CA]; Collet s.n., fl. Oct. [CA]); id., near Siwareen (Clarke 45176, fl. Oct. [BM; W]); id., near Nurtiung (Clarke 44795, fl. Sept. [W]); id., near Nairung (Clarke 40244C, fl. Aug. [W]); id., near Shora Reen (Clarke 15269B, fl. Oct. [W]); id., near Gowai (Rita s.n., fl. Jul. [CA]); id., near Nungklao (Clarke 40110, fl. Aug. [BM; CA; M]); id., near Shillang (Clarke 38373, fl. Jul. [K]); Khasia and Jaintea boundary, between Maoryngkueng and Maolamary (Burkill and Banerjee 35265, fl. Jun. [CA]); id., Umdong Valley (Upendranath Kanjilak 4519, fl. Oct. [CA]); Jaintea hills, near Oomacki (Prain's collector s.n. [CA; G-BOIS; G-DEL; US]); Khasia and Jaintea hills (several unknown collectors [CA]); Naya hills, near Puckama (Prain s.n., fl. Aug. [CA; K]); id., near Phesame (Prain s.n., fl. Aug. [CA]); Lushai hills, Champhai (Parry 20, fl. Jul. [K]); id., Diuphai (Parry 209, fl. Jun. [K]); without precise locality (King's collector s.n. [CA; W]; Mack s.n. [K]).

#### NEPAL.

Gurjang (Lall Dhwaï 0558 [BM]); without locality (Wallich 9004 [B; BM; BR; CA; G-DEL; GH; K; P; W]).

## BENGAL.

Darjeeling (Griffith 5599 [B; CA; G-BOIS; G-DEL; GÖTT; K; L; M; NY; P; S; W]).

## BURMA.

Mergui, Myninolekat (Parker 3115, fl. Jan. [NY]).

Without locality (Veitch s.n. [K]).

## SIAM.

Near Bangkok (Kerr s.n., fl. Aug. [P]); near Chiangmai (Kerr 1204, fl. May [B; CA; K; L]); Huey Xheo (Cunniff 91, fl. Aug. [NY]); near B. Baw Saw, Nam Kawng (Smiles s.n. fl. Jun. [K]).

## MADRAS.

A few doubtful specimens in herb K, probably from the Malay Peninsula.

## MALAY PENINSULA.

Pahang, Mt. Tahan (Holtum 20606, fl. Aug. [BZ]; Haniff and Nur 7866, fl. Jun. [BZ]; Wray and Robinson 5449, fl. Jul. [BM; CA]); Mt. Tapir, Kuantan (Symington and Kiah 28859, fl. Jun. [BZ]).

Kedah, Kedah Peak (Robinson and Kloss 5961, fl. Dec. [CA; K]; Ridley 12483 [BM]; unknown collector, fl. March [B]); Mt. Terai (Ridley s.n. fl. Jun. [BM]).

Malacca, Mt. Ophir (Ridley 600 and 3139 [BM; CA]; Maingay 1593 [B; CA; GH; K; L]; id. 2511, fl. Aug. [K]; Schlechter 13134, fl. Jan. [B]; Griffith s.n. [CA]; unknown collector 799, fl. Apr. [CA]; without locality (Griffith s.n. [CA; L; M; NY; P]; Griffith 409 [CA]; Cuming 7371 [BM; K], possibly from the Philippine Isl.).

## PHILLIPPINE ISLANDS.

Without locality (Cuming 7371 [BM; K], possibly from Malacca).

## INDO CHINA.

Cochin China, Isle of Phu-quoc (Pierre s.n., fl. Feb. [B; CA; P]; Contest Lacour s.n., fl. Apr. [P]; Harmand 947 [P]; without precise locality (Talmy s.n. [P]).

Cambodge, Me-kong (Thorel 2794 [P]); Khansong (Hahn s.n. [P]); between Kom Hom and Trassay (Poilane 15024, fl. Apr. [P; U]); Kuang-Krepeuh Mts. (Pierre s.n., fl. May [BZ; K; NY]).

Laos, Prov. Bambo (Spire 175 [P]); near A. Chieng (Poilane 12191, fl. Jul. [P]); without precise locality (Perrot s.n. [P]).

Tonkin, E of Fi-tsi-long Bay (Balansa 320, fl. Dec. [P]), near Mt. Bau (d'Alleizette 220, fl. Apr. [P]).

Annam, Prov. Niuu Thuan, Lang-Bian (Eberhardt 1550 [P]; Chevalier 30725, fl. Feb. [P]; Jacquet 575, fl. Jun. [P; U]; Chevalier 3963, fl. Jun. [P]); Danhia (Evrard 391, fl. Oct. [P]); Nathrang (Poilane 4271, fl. Jul. [P]; Poilane 4074, fl. Jun. [P]); Lang-bian, Lian Khanh Falls (Boden Kloss s.n., fl. Apr. [BM]).

Without locality, Dalat (Evrard 972, fl. Jun. [P]; Evrard 982, fl. Jun. [P]; Hayata s.n., fl. Apr. [P]).

## CHINA.

Kwangtung, Loa Yung Han (Lo Kang Peng 6539, fl. Jul. [NY]); Tso Tou Ping (Sin 9955, fl. Jun. [NY]); Sun-wui distr. (Tso and Tsiang 2002, fl. Apr. [K; P]); Ting Wu Shan (Chun 6317, fl. May [G-DEL; K; NY; P]; Mill 230 [B]); vicinity of Canton (Levine 893, fl. May [F; GH;

MIS; NY; US]); Tsin Leon San, S of Mei-shien (Linsley Gressit 1243, fl. Jun. [BM]); Sun-ui (Lamont 1086, fl. May [BM]).

Yunnan, near Talifu (Schneider 3959, fl. Aug. [B; GH]; distr. Hotha (Anderson s.n., fl. Aug. [CA]); Tengyueh (Schneider 3820, fl. Oct. [GH]; Forrest 3846, fl. Sept.-Oct. [BM; K]; Shweli Valley (Forrest 7104, fl. Sept. [BM; K]; Forrest 4741, fl. Jul.-Aug. [BM]; Forrest 3846, fl. Sept.-Oct. [BM; K]; Forrest 12003, fl. Aug. [BM; K; S; W]); near Lichiang (Schneider 2511, fl. Aug. [K]); Szemoa (Henry 12043 [K; US]); without precise locality (Henry 9444 [B; K; NY; W]; Forrest s.n. [B]; Hancock 370, fl. Sept. [K]).

Fukien, Kuliang Hills, near Foochow (Norton 1233 and 1234, fl. Jul.-Aug. [US]); without precise locality (Dunn 3516 [B; CA; K]; Chung 6805 and 7579 [NY]).

Kweichow, Yunfoushou, Kweiting (Tsiang 5516, fl. Jul. [BM; C; K; NY; S; US]); Dar Young Kiang, border of Kweichow (Ching 6270, fl. Jun. [GH; NY; US]); Wu Min, Min Shan, border of Kweichow (Ching 6179, fl. Jun. [NY; US]); between Tuyun and Patschai, near Niugoutang (Handel Mazzetti 10709, fl. March [W]).

Without locality (Gallery 40 [P]); Prov. Kouy-Tcheou (Esquirol 3603, fl. Jun. [P]); id., near Kouy-yang (Bodinier 221, fl. Aug. [B; BZ; CA; G-BOIS; G-DEL; K; NY; P; U]); Dionghlo City (Chen Pin En 2139, fl. Jul. [M; US]); Wong Ke Prov. (unknown collector s.n., fl. Aug. [CA]).

#### HONGKONG.

(Lamont s.n. [K; L]).

#### SUMATRA.

Tapanoeli, Wilhelmia Falls, near Toba Lake (v. d. Meer Mohr 129, fl. Aug. [BZ]); Huta Gindjane (Ruttner 33, fl. Apr. [BZ]); Doloh Margoe (Polak 103, fl. Sept. [BZ]); between Panapparan and Pagar Batoe, Habinsaran (Bartlett 7926, fl. May [NY]); Danau di atas (Ruttner 32, fl. March [BZ]); Centr. Habinsaran, near Sibosor (Lörzing 8015, fl. Nov. [BZ]).

East Coast, Piso-Piso, NW of Toba Lake (Lörzing 9390, fl. Dec. [BZ]); E of Toba Lake (Bangham 1292, fl. Feb. [NY]); Penghoeloe Bao (Frey Wyssling 45(8), fl. Apr. [BZ]); Medan (Jochems 3172, fl. March [BZ]).

Atjeh, Gajoe and Alaslanden (v. Dealen 529, fl. Jul. [L]).

West Coast, Fort de Kock (Yates 2527, fl. May [BZ; NY; W]); Alahan pandjang (Zollinger 16517 [W]; Teysmann 2015 HB [BZ; K], type of *B. sumatrana* Miq.; Burck s.n. [BZ]); Poear Datar (Bünnemeyer 3291, fl. Jun. [B; BR; BZ; CA; GRO; L; P; U; W]); Pajokoemboek, Pankalan Koto Bahore (Jacobson 2417, fl. Apr. [BZ; L]); Boekit Batoe, Banting (Jacobson s.n., fl. Jun. [BZ]); Air Poetih Cleft (Kleinhoonte 458 and 609, fl. Aug. [BZ]); Padangse Bovenlanden, Laras Talang (Bünnemeyer 5735, fl. Nov. [BZ]; Bünnemeyer 5688, fl. Nov. [BZ]; Bünnemeyer 5504, fl. Nov. [BZ; L; U]; Bünnemeyer 5237, fl. Oct. [BZ]; Bünnemeyer 5136, fl. Oct. [BZ; L; P]; Bernard s.n., fl. Oct. [BZ; L]).

Without locality (Curtis s.n. [K]); Laoe Bedunbo, E of Liosar (Lörzing 8535, fl. Nov. [BZ]).

#### BORNEO.

Without locality (Moulton 6851, fl. Nov. [BM; BZ; CA; NY]).



## CELEBES.

Menado, Poso, Poena bivak (Steup 29, fl. Jun. [BZ]); S of Poso Lake (Sarasin 897, fl. Feb. [B]); Poso Lake (Boschproefstation 5, fl. Nov. [BZ]); Malabo (Rachmat 511, fl. Aug. [BZ]); Masamba, Limboeng (Steup 211, fl. Aug. [BZ]).

## NEW GUINEA.

Netherl. New Guinea, Arfak Mts. (Gibbs 5745, fl. Dec. [BM; K]; Gjellerup 1058, fl. Jul. [BZ; K; L; U]); id., near Ditschi (Mayr 161, fl. Jun. [BZ]); Mt. Carstensz, Camp VIb (Boden Kloss s.n., fl. Jan. [BM; K]); id., Camp VII—VIII (Boden Kloss s.n., fl. Feb. [BM; K]); id., Camp VIc (Boden Kloss s.n., fl. Feb. [BM; K]); Dika Riv. (Lam 2079 [BZ]).

British New Guinea, Felsspitze (Ledermann 12377, fl. Jul. [B]); Mowless distr., Mt. Misim (Stevens s.n. [GH]).

## AUSTRALIA.

Queensland, Port Bowen (Fly 12 [BM]); Stradbroke Is. (Shirley s.n. [BZ]); Texas (Boorman s.n., fl. Jul. [G-DEL]); Brisbane (Bailey s.n. [US]); Tweed Riv. (Moore s.n. [BM; GH]).

New South Wales, Port Stephens (Boorman s.n., fl. May [B; G-DEL; P; S; US]); Boorman s.n., fl. Apr. [MIS; US]); Byron Bay (Baker 1427, fl. Feb. [BR; CA]); unknown collector s.n., fl. Apr. [B]); near Sydney (Vieillard and Deplanche s.n. [P]; unknown collector s.n. [B]); Coffs Harbour (Meebold 3523, fl. May [M]); Trial May (Boorman s.n., fl. Aug. [W]); Hunter Riv. (Brown 5793 [BM]).

Without locality, S. Pine (Statter s.n., fl. Jan. [BM]).

## WITHOUT LOCALITY.

India (Wallich 9004C [B; CA; G-BOIS; L; NY; P-DR; W]; de Hügel s.n. [BR; M]; Brown s.n. [B] Roxburg s.n. [BM; G-DEL]); Asia (de Hügel 3231; 3598; 4491 and 4503 [W]); Ind. orient. (Griffith s.n. [BM]).

32. *Burmattia coelestis* Don, Prod. Fl. Nep. (1825) p. 44; Schultes, Syst. Veg. VII. 2 (1830) p. LXXV; Forbes Royle, III. Bot. Himal. (1839) p. 373, t. 91, f. 1; Hance in Journ. Bot. XVI (1878) p. 111; Hooker f., Fl. Br. Ind. V. (1888) p. 665; Ridley in Journ. Str. Br. Roy. As. Soc. 22 (1890) p. 333; Hook. f. in Trimen, Fl. Ceylon IV (1898) p. 131; Volkens in Engl., Bot. Jahrb. XXXI (1902) p. 461; Wright in Journ. Bot. XXXVI (1903) p. 4; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 71; Ridley, Fl. Mal. Pen. IV (1924) p. 304; Fischer in Gamble, Fl. Pres. Madras III. viii (1928) p. 1399; — *Burmattia azurea* Griff., Not. III (1851) p. 326; Griffith, Ic. Pl. As. III (1851) Pl. 272 f. 1; Beccari, Malesia I (1877) p. 242, tab. XV, f. 1—3; Koor- ders, Exk. Fl. Jav. I (1911) p. 344; — *Burmattia javanica* Bl., Enum. Fl. Jav. I (1827) p. 28; Miquel, Fl. Ind. Bat. III (1855) p. 614; — *Burmattia triflora* Roxb., Fl. Ind. II (1832) p. 117;

— *Burmannia selebica* Becc., Malesia I (1877) p. 243; — *Burmannia chinensis* Gandog. in Bull. Soc. Bot. Fr. 66 (4me Série T. XIX) (1919) p. 290; — *Burmannia malaccensis* Gandog. l.c.; — *Burmannia rigida* Gandog. l.c.; — *Burmannia borneensis* Gandog. l.c.; — *Cryptonema malaccensis* Turcz. in Flora Dah. I (1848) p. 590; Walp., Ann. III (1852) p. 609; — *Nephrocoelium malaccense* Turcz. in Flora Dah. I (1853) p. 287; — *Nephrocodium malaccense* sphalm., Walp., Ann. VI (1861) p. 41.

Erect, annual herbs, up to 30 cm high. Stem simple or sometimes branched, bearing at the apex a single flower or a cluster of few flowers. Roots fibrous, rather short. Basal leaves rosulate, linear or lanceolate, acute or acuminate, 3-nerved, about 1 cm long and up to 3 mm broad. Stem-leaves appressed, rather long, imbricate in the basal part, linear-lanceolate, subulate, up to 2 cm long. Bracts lanceolate, about 4 mm long and 1 mm broad, acute. Flowers blue or purplish with yellow lobes, about 11,5 mm long, prominently 3-winged. Outer perianthlobes erect, ovate, apiculate, about 1,5 mm long, with double margin. Inner lobes membranous, lanceolate, apiculate, about 0,5 mm long, margin double. Perianth-tube cylindrical-trigynous, about 5 mm long. Anthers sessile in the perianth-throat. Connective with two short lateral arms, bearing the thecae, two apical, curved, divergent, obtuse to truncate crests and a basal, hanging, rather long, obtuse spur. Style thick-filiform, bearing at its apex 3 sessile, funnel-shaped stigmas, funnel-margin thick, swollen. Style with stigmas about 4 mm long. Ovary ellipsoid or obovoid, truncate, attenuate in the basal part, about 5 mm long. Flower-wings half-elliptical or slightly half-obovate, about 10 mm long and 2,5 mm broad, running from the base of the limb to below the base of the ovary. Capsule obovoid, truncate, crowned by the dried perianth, dehiscing in transverse direction.

Type: Wallich 9005 from Nepal, in herb. G-BOIS?, duplicates in herb. CA; GH; K; L; NY.

**Distribution:** India, Malay Peninsula, Siam, Indo-China, Philippine Islands, Southern China, Malay Archipelago, Caroline Islands, New Guinea.

**Vernacular Names:** Rumput Sisik Naga; Rumput Jarum (Malay Peninsula, according to Ridley (1924) l.c.); Roempoet djaroem-djaroem (Banka, according to Teysmann).

**Use:** According to Campbell it is given by the Santals (Bengal) medicinally.

#### ASSAM.

Khasia hills (Griffith and Lehmann 72 [K]; Griffith s.n. [S]; Hooker and Thomson s.n. [B; BM; CA; G-BOIS; G-DEL; GH; GÖTT; L; M; NY; P; P-DR; S; U; W]; unknown collector 2477, fl. Oct. [K]); Brahmaputra plains (Kurz s.n. [CA]); East Himalaya (Herb. E. Ind. Comp. (Griffith) 5595 [CA; K; L; M; P-DR; S; W]); Lushai hills, Champgai (Parry 333, fl. Oct. [K]); without locality (Jenkins s.n. [CA]; Maiters s.n. [CA]; Linkunipoor s.n., fl. Nov. [CA]; unknown collector s.n., fl. Jun. [CA]).

#### BENGAL.

Chota Nagpur, near Hazaribagh (Clarke 33918, fl. Oct. [G-BOIS; W]; Clarke 24784, fl. Nov. [BM; CA; K; W]); Dinajpoor (unknown collector s.n. [CA]; Domada (Prain s.n., fl. Nov. [CA]); Palamura (Gamble 8759, fl. Dec. [CA; K]); Manbhum (Campbell 8129 [CA]; Kurz s.n. fl. Nov. [CA]); without precise locality (Prain's collector 58, fl. Feb. [CA; GH; K; P-DR]).

Sikkim, near Titalyah (Kurz s.n., fl. Nov. [CA]; Kurz s.n., fl. Oct. [CA]); Darjeeling (Gamble 1308, fl. Oct. [K]; Griffith s.n. [W]); Silligoree (Kurz s.n., fl. Oct. [CA]; Kunze s.n., fl. Nov. [NY]; Clarke 26562, fl. Dec. [BM]; Clarke 26755, fl. Dec. [K]); Julpaiguri (Hedley Wood 147, fl. Sept. [K]); Dulkajhar (Clarke 36958, fl. Oct. [W]); without locality (Clarke s.n. [W]; Treutler 1124 (1000), fl. Nov. [K]).

Without locality (Kurz s.n., fl. Dec. [CA]; Gill s.n., fl. Oct. [CA]; West Bengal (Ball s.n. [CA]); East Bengal (Cylhet 1072 [CA]).

#### BURMA.

Pegu (Kurz 2641, fl. Dec. [CA]); Putan (Toppin 5002, fl. Jan. [CA]; Ruby Mines Division (Rodger 118, fl. March [CA]); without locality (Griffith s.n. [S]; Herb. E. Ind. Comp. (Griffith) 5594 [B; CA; G-BOIS; G-DEL; GÖTT; K; L; M; NY; P; S; W]).

#### NEPAL.

Sillet (Wallich 9005B [B; BM; G-BOIS; G-DEL; K; P; P-DR; W]; Wallich 1072 [BM]; Wallich 9005D [BM]; Smith s.n. [BR; W]; unknown collector s.n., fl. Dec. [K]); without locality (Lambert s.n. [G-DEL]; Wallich 9005 [CA; G-BOIS; GH; K; L; NY]; Don s.n. [BM]).

#### ORSISSA.

Pari district, Mendkasoe (Lace 2529, fl. Nov. [CA]).

## SOUTH INDIA.

Coimbatore (Fischer 1318, fl. Nov. [CA]); Attakatte, Anaimalai hills (Fischer 3223, fl. Dec. [K]); Pangiri tank (Haines 3591, fl. Dec. [K]).

## SIAM.

Doi Sootep, Chiengmai (Kerr 929, fl. Jan. [B; CA; K; L; P]); Kopah (Haniff and Nur 2083, fl. Dec. [K]); Nong Koh, Ghirbi (unknown collector s.n., fl. Jan. [K]); Wang Djaio (Hosseus 115, fl. Oct. [B; BM; G-DEL; K; M; W]); Ban Jang, prov. Pitsamiloh (Hosseus 710, fl. Nov. [B; M; P]); Mt. Bau (Franck 161, fl. Oct. [US]); Singgora (Annandale s.n., fl. Feb. [BZ; CA; K]); Khaw Poh hill, Khasum (Haniff and Nur 3903, fl. Dec. [BZ; K]).

## MALAY PENINSULA.

Tenasserim (Herb. E. Ind. Comp. (Helfer) 5596 [B; CA; G-BOIS; G-DEL; GÖTT; K; L; M; NY; P; S; W]; Pockman s.n. [BM]).

Tringganu, Labuan (unknown collector 388, fl. Nov. [CA]); without precise locality (Yapp 330 [CA; K]).

Wellesley, Tasek Gelugur (Ridley 6997, fl. Dec. [CA]); Pulu Pinang (Delessert s.n. [G-DEL]; Philips s.n. [K]); without locality (King s.n., fl. Aug. [CA; K]).

Pahang, Kwala Pahang (Ridley 1573, fl. May [CA]).

Kedah, Mt. Raya, Lankawi (Haniff 7158, fl. Nov. [BZ]; Ridley s.n. [BM]).

Malacca, Mt. Bukah Sina (Koenig s.n. [BM]); Sungei Adana (Ridley 1481 [BM]); Ayer Kerik (Ridley s.n. [CA]); Padang Sabang (Nur 2165, fl. Aug. [BZ; K]); Batu Berendam (Burkill 2834, fl. Nov. [CA]); Ayer Panas (Goodenough s.n., ex Ridley 1924); Sungei Hudang (Derry s.n., ex Ridley 1924); without locality (Lemann s.n. [G-BOIS; K]; Griffith s.n. [BM; K]; Hervey s.n. [K]; Maingay 1594 and 2496 [K]; Cuming 2325 [B; BM; BRSL; G-BOIS; G-DEL; GÖTT; K; L; M; P; P-DR; W]).

Johore (Spare F. 707, fl. Jan. [K]).

Selangor, Ampang Reservoir (Brooks s.n. ex Ridley 1924).

Penang, Telok Bahang (Curtis s.n., ex Ridley 1924).

Selitar (Ridley s.n. [BM]).

Singapore, Chamgi (Ridley s.n. [CA]); Botanic Garden (Furtado s.n., fl. Nov. [BZ]; Murton 64, fl. Sept. [K]; Winkler 1702, fl. March [BRSL]); without locality (Walker 113 [BM; G-DEL; K]; Hillebrand s.n. [B]; unknown collector 282, fl. March [BRSL]; Ridley s.n., fl. Nov. [LY], type of *B. malaccensis* Gandoger).

Lankawi Islands, Dayong Bunting (Robinson 6336, fl. Nov. [K]).

## INDO CHINA.

Cambodge, Kampot (Geoffroy 213, fl. Dec. [P]); Pursat (Harmand 520, fl. Jun. [P]; Godefroy 520, fl. Jun. [P]); Kg. Chuang (Smith 307, fl. Jan. [US]); near Battambang, between Tmor Plouk and Beuteai Chkonar (Poilane 14372, fl. Oct. [P]); prov. Shing Treng, between Sleck Kreg and Smack (Poilane 14120, fl. Nov. [P; U]); Ubon Riv. (Thorel s.n. [P]).

Cochin China, near Saigon (Evrard 152, fl. Oct. [P]); Bien-hoa (Thorel 1560 [P]; Godefroy s.n., fl. Juli [P]; Harmand 3330, fl. Sept. [G-DEL]; Pierre 3390, fl. Sept. [P]; Godefroy 878 and 942, fl. Oct. [K]); Buotop, prov. Thudaumota (Poilane 825, fl. Nov. [P]); without locality (Baudouin s.n. [P]; Pierre s.n. [B; BR; BZ; CA; G-BOIS; G-DEL; K; NY; P]; Talmy s.n. [P]).

Laos, without precise locality (Poilane 11419, fl. Jan. [P]; Massie s.n. [P]; Spire 294 [LY], type of *B. rigida* Gandog.).

Tonkin, near Muong Man (Evrard 1556, fl. Oct. [P]); Duc-Phou, NE. of Hong Hoa (Balansa 3120, fl. Nov. [G-BOIS; K; P; P-DR]); Ounonbi (Balansa 318, fl. Sept. [B; BR; G-BOIS; K; L; P; P-DR]); Bay of Kébao (Balansa 319, fl. Sept. [L; P]); Nha Nan (Bois 218, fl. Dec. P; U); without locality (Mouret 426, fl. Sept. [P]; Bon 6122 [BM; P]; Bon 6157 [P]; Bon s.n. [P]).

Without locality (Lecomte et Finet 1873 [P]; Eberhardt 3807 [P]).

#### CHINA.

Kwantung, Macao (Nelson s.n., fl. Jan. [BM]); near Canton (Sampson 7923, fl. Dec. [BM; GÖTT; W]; Sampson 677, fl. Nov. [K]; Hance 7733, fl. Oct. [GH; K; NY; P-DR]; Hillebrand s.n., fl. Oct. [G-DEL]); near Ping Shan (Nin 00527, fl. Dec. [NY]).

Hainan (Liang 66388, fl. Dec. [GH; NY]).

Yunnan, NW part (Forrest 941 [B]).

Chekiang (Tsoong D1025 [NY]).

Kiangsi (Haunton s.n. [BM; W]).

Kouy-Tcheou, Ocha-Keou-Gai (Bodinier and Cavalerie s.n., fl. Jul. [LY], type of *B. chinensis* Gandog.).

#### PHILIPPINE ISLANDS.

Luzon, Pangasinan Prov. (Ramos 4913, fl. Dec. [B; K]).

Without locality (Cuming 2324 [L]; Cuming 2325 [B; BM; BRSL; G-BOIS; G-DEL; GÖTT; K; L; M; P; P-DR; W]).

#### SUMATRA.

East Coast, Laboekan Batoe, distr. Kota Pinang (Si Toroes 4083, fl. Apr.-May [NY]).

West Coast, Pasir Contang (Robinson and Kloss 54, fl. Jun. [BM]).

Tapanoeli, Toba Lake (Ouwehand 158, fl. May [BZ]); Toba Highlands, 10 km N of Siborang (Huitema 126, fl. Sept. [BZ]); Sibolangit, Parsoboeran, Central Habinsara (Lörzing 7862, fl. Nov. [BZ]); id., Asahaldal, near Wilmelmina fall (Lörzing 9982, fl. May [BZ]).

#### RIOUW ARCHIPELAGO.

Poeloe Bintan, S. Poelai (Bünnemeyer 6338, fl. Jun. [B; BZ; L; P; U]); Tg. Pinang (Bünnemeyer 6312, fl. Jun. [BZ]).

#### BANKA.

Muntok (Bünnemeyer 1472, fl. Oct. [BZ; L; U]); Teysmann s.n. [BZ]; v. Nartens 93, fl. March [B]); way to Kimah (v. d. Vecht 12 and 13, fl. Feb. [BZ]).

#### JAVA.

Bantam, Pandeglang (Backer 7417, fl. March [BZ]); without locality (Unknown collector s.n. [BR]).

Preanger Regentschappen, Tji Mapag near Kiara Pajoeng, N of Tjiandjoer (Backer 23869, fl. Apr. [BZ]).

Batavia, near Buitenzorg (Coll. indig. s.n. [B; GRO; L]; v. Harreveld s.n. fl. Aug. [GRO]; Warburg 1243 [B]; Warburg s.n., fl. May [B]; Koorders 42215, fl. Nov. [BZ]; v. Steenis 75, fl. Dec. [BZ]; v. Steenis 1602, fl. Jul. [BZ]; v. Steenis 184, fl. Dec. [BZ]; Backer 32441, fl. Jan. [BZ]; Backer 23156, fl. Dec. [BZ]; Bakhuizen v. d. Brink 3473, fl. Apr. [BZ; L];

U]: Valetton s.n. [BZ]; Bakhuizen v. d. Brink fil. 414. fl. Jun. [BZ; L]; Weeda s.n., fl. Jun. [BZ]; unknown collector s.n., fl. Dec. [BZ]; Hallier s.n., fl. Jan. [BZ]; Lörzing 1551 fl. Apr. [BZ]; unknown collector s.n., fl. May [BZ]; id., Tjiampea (Koorders 696, fl. Apr. [BZ]; Bakhuizen v. d. Brink 29, fl. Feb. [BZ; L; U]; Bakhuizen v. d. Brink fil. 1366(38), fl. May [BZ; L]; Schlechter 15822, fl. Dec. [B; BM; BR; BZ; K; P]); id., Mt. Pantjar (Bakhuizen v. d. Brink 3803, fl. Jul. [BZ]; id. 3796, fl. Jul. [BZ; L]); id., Kota Paris (Bakhuizen v. d. Brink fil. 3376(213), fl. Apr. [BZ]); id., Batoetoelis (Bakhuizen v. d. Brink 3384(22), fl. Apr. [BZ; L]); id., Tjileboet (Bakhuizen v. d. Brink 844, fl. Jul. [BZ]); Kota Batoe (Bakhuizen v. d. Brink 2194, fl. Oct. [BZ]); Pasir Angsana, S of Leuwiliang (Bakhuizen v. d. Brink fil. 3393, fl. Jul. [B]); near Tjilodong, E of Depok (Backer, Bakh. v. d. Brink and Berger 23191 fl. Jan. [BZ]); Bodjong Enjot (Bakhuizen v. d. Brink 6355, fl. Jun. [BZ; L]); Tendjo (Backer 24031, fl. Apr. [BZ]); Tegal Sapi (Bakhuizen v. d. Brink 3590(303), fl. May [BR; BZ; L; U]; Bakh. v. d. Brink fil. 3375 (212), fl. Apr. [BZ; L]); Mt. Boeboet (Bakhuizen v. d. Brink 5439, fl. Apr. [BZ; L]; Bakhuizen v. d. Brink 25, fl. Apr. [BZ]); Tjidjoeng (Backer 22824, fl. Aug. [BZ]); Kalapa Noenggal (Backer 5778, fl. Dec. [BZ]; Backer 23412, fl. Dec. [BZ]); Tanah Sareal (Backer 32443, fl. Jun. [BZ]); Tji Handjawas (Backer 6219, fl. Dec. [BZ]); Tjiograk, S of Batoe Toelis (Backer 32442, fl. Jun. [BZ]); Mt. Tjileueur (Bakhuizen v. d. Brink 5826, fl. Feb. [BZ; L]; Pasir Honje (Bakhuizen v. d. Brink fil. 880, fl. Jun. [BZ; L]) Barengkok, (Bakhuizen v. d. Brink 5148, fl. Jun. [BZ; L; W]); Soekamantri, foot of Mt. Salak (Bakhuizen v. d. Brink 3975, fl. Jun. [BZ]); foot of G. Paniisan (v. Steenis 2432, fl. Oct. [BZ]); Sitoe Telalar near Tjibaroesa (v. Steenis 5288, fl. May [BZ]); without locality (Zollinger 14, fl. March [B; P-DR; W]; Zollinger 1886 [BM; BRSL; G-BOIS; P]; Ploem s.n. [L]; Junghuhn 695 [L]; Blume s.n., type of *B. javanica* Bl. [CA; L; NY; NY; P; W]; Kurz s.n. [M]; Warburg 11 [B]; Teysmann s.n. [B; BZ; K; LY; P-DR; U; W]; Raciborsky s.n. [BZ]).

#### MADOERA.

Near Balega (Zollinger s.n., fl. Jun. [L; W]).

#### BALI.

(Unknown collector s.n. [L]).

#### BORNEO.

British N. Borneo. Mt. Kinabalu, Jesselton (Le Roy Topping 1409, fl. Oct. [US]; Clemens 9590, fl. Oct. [BZ; GH; K; NY]; Clemens 9680, fl. Dec. [CA; GH; K]; Gibbs 3066, fl. Dec. [BM; K]); Sandakan (Rycroft s.n., fl. Jan. [BM]); id., Balam Bangan (Rycroft s.n., fl. Jan. [BM]); Labuan Island (Merrill s.n., fl. Nov. [US]; Schlechter 13211, fl. Apr. [B]; Burbridge s.n. [BM; K]; Hullet 388, fl. Nov. [K]); without locality (Burbridge s.n. [GH; LY; US], type of *B. borneensis* Gandog.; Barber 202 [K]).

Sarawak, Santubong (Brooks 1089, fl. Oct. [B]; Ridley s.n., fl. Jan. [BM]); Baram (Hose 353, fl. Nov. [B; BM; NY]); Upper Ryang Riv., Kapit (Clemens 21124 [B; BZ; K; MIS; NY]); Piringiao hill (Beccari 930 [FI]); Bintulu (Beccari 3692 [FI]); Labuan (Beccari s.n., fl. Aug. [FI]); without locality (Foxworthy 483, fl. May-Jun. [B; BRSL; US]).

Netherl. Borneo, near Pontianak (Administrator of the Kapoea plantation s.n. fl. Jun. [BZ]); near Mandor (Polak 210, fl. Dec. [BZ]; Mondri 277, fl. Apr. [BZ; K; L; P]); Singkawang (Teysmann 7977 [BZ]; v. Nartens 94, fl. March [B]); Seminis (v. Nartens 95, fl. Apr. [B]); Dawak

(Hallier 772 [BZ]; between Dawak and Sanggouw (Hallier 412 [BZ]); Banjarmassin (Motley 55 [K]); Martapoera (Labohm 1947, fl. May [BZ]); Poeloe Lampei (Korthals s.n. [L]); Sintang (Hallier 2544 [BZ]), near Tabalong (Gandrup 14, fl. Apr. [BZ]).

#### CELEBES.

Parangpeda, near Bontoparang (Bünnemeyer 10675, fl. March [BZ; L]); Mt. Galedong (Bünnemeyer 10926 [BZ]); Timanpoe (Kjellberg 3795, fl. Aug. [BZ]); Central Celebes (Kaudern 351, fl. Jun. [S]); SE Peninsula; Lepo-Lepo near Kandari (Beccari s.n., fl. Jul. [FI], type of *B. selebica* Becc.); Without locality (Kjellberg 3101 [BZ]).

#### BOEROE.

Near Kajeli (Teysmann s.n. [BZ]).

#### WESTERN CAROLINE ISLANDS.

Yap (Volkens 236, fl. Dec. [B; P]; Volkens 337, fl. Jan. [B; BZ; US]).

#### NEW GUINEA.

British New Guinea, Lake Daviumbu, Middle Fly Riv. (Brass 7831, fl. Sept. [L]).

#### WITHOUT LOCALITY.

(Vahl s.n. [G-DEL]); Ind. or. (Wallich 354 = 2136, fl. Oct. [G-DEL]; Wight s.n. [W]; Wallich 836, fl. Nov. [G-DEL]; Roxburgh s.n. [BM; G-DEL]); Hindostan (herb. Le Roy s.n. [NY]); Malay Archip. (Burmans s.n. [W]; Beddome 113, fl. Nov. [CA]; Thaipeng (Wray 132 [CA]); Gyra (unknown collector s.n., fl. Nov. [CA]; unknown collector 31, fl. Dec. [M]).

### 33. *Burmattia Ledermannii* Jonk., nov. spec.<sup>1)</sup>

Erect, slender, annual herbs, 7–10 cm high. Roots filiform, rather short. Stem erect, stiff-filiform, simple, with a reduced rosette of 2–4 linear, acute to subulate, pale green leaves at the base. Stem beset with 2–5 linear to lanceolate, obtusiusculous, appressed, reduced, scalelike leaves, basal rosulate leaves 3–4 mm long, stem scales about 2 mm long. Stem-top bearing

<sup>1)</sup> *Burmattia Ledermannii* Jonk., n.sp. — Herba annua, stricta, non-saprophytica, 7–10 cm alta, uniflora. Radices fibrosae. Folia radicalia 2–4, linearia, acuta vel subulata, 3–4 mm longa. Folia caulina 2–5, squamaeformia, adpressa, linearia vel lanceolata, fere 2 mm longa. Flores 5–7 mm longi. Limbus minutus, fere 0.5 mm longus. Lobi perianthii exteriores triangulares, apice acuti, marginibus simplicibus incrassatis, subinvolutis. Lobi interiores 0. Tubus cylindricus, fere 2 mm longus. Stamina 3, filamentis brevioribus. Antherae triangulares, infundibuliformes, inappendiculatae. Stylus cylindricus vel filiformis, apice tribrachiatu. Stigmata disciforma. Ovarium ellipsoideum vel obovoideum, fere 4 mm longum. Alae angustae, semi-ellipticae, 5–5.5 mm longae, ad maximum 1 mm latae.

Hab.: Insulae Palau, Babelthaop. Typus: Ledermann 14486 in herb. Berlinense.

one pale-blue, narrowly 3-winged, erect flower, flowers 5—7 mm long. Perianth-limb very short, outer perianth-lobes about 0.5 mm long, triangular, acute, with thick, fleshy, slightly involute margin. Inner lobes absent(?). Perianth-tube cylindrical,

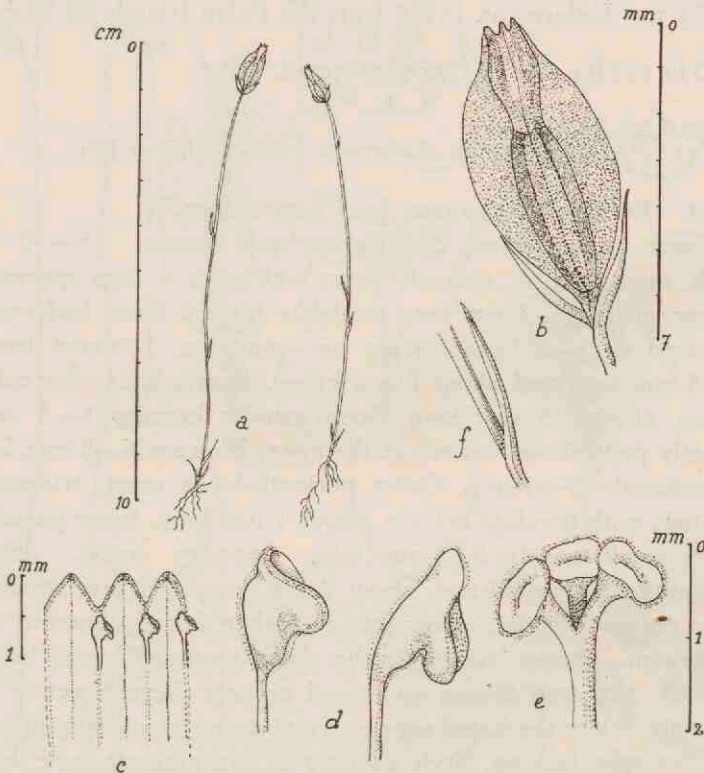


Fig. 9. *Burmannia Ledermannii* Jonk., n. sp. — a. flowering plants; b. flower; c. dissected flower; d. stamens; e. style with stigmas; f. leaf.

swollen towards the limb, about 2.5 mm long. Stamens 3, inserted in the throat between the lobes.

Filaments short, rather thick, anthers triangular, funnel-shaped. Connective elongate into a crest above the thecae. Style thick, filiform, branching at the apex into 3 short branches, each bearing a disciform stigma with a central opening.



Style with stigmas about 2 mm long. Ovary ellipsoid to obovoid, about 4 mm long. Flower-wings rather narrow, half-elliptic, about 5—5,5 mm long and up to 1 mm broad, running from the base of the limb to the base of the ovary.

Type: Ledermann 14486 from the Palau Islands, in herb. B.

Distribution: Once collected.

PAULAU ISLANDS.

Babelthaop, Ngatszip (Ledermann 14486, fl. March [B]).

34. *Burmannia connata* Jonk., nov. spec.<sup>1)</sup>

Erect, unbranched, non-saprophytic herbs, 15—30 cm high. Stem filiform, sparsely beset with more or less appressed, linear, acute, 2—5 mm long, scalelike leaves. Basal leaf-rosette reduced to 3—6 linear, acute or acuminate, 1-veined leaves, 4—8 mm long and about 1 mm broad. Bracts linear-lanceolate, acute, about 1,5 mm long. Stem usually bearing 1—3 erect, shortly pedicellate flowers at the apex. Flowers 6—8 mm long, prominently 3-winged. Outer perianth-lobes erect, triangular, acutish, with involute margin, about 1 mm long. Inner perianth-lobes small, nearly 0,5 mm long, broadly ovate, obtuse. Perianth-tube cylindrical, about 3 mm long. Anthers sessile in the perianth-throat. Connective rather broad, bearing two divergent, obtuse crests at the apex, brown. Thecae bright-yellow, the two thecae appressed against the connective and connate below the basal connective-margin. Basal hanging connective-spur lacking. Style as long as the perianth-tube, branching at the top into 3 short branches, each bearing a peltate,

<sup>1)</sup> *Burmannia connata* Jonk., n.sp. — Herba non-saprophytica, pergracilis, erecta, viridis. Folia basalia rosulata viridia 3—6, lineari-acuminata, uninervia, 4—8 mm longa, folia caulinea sparsa, minora, squamaeformia, linearia, 2—5 mm longa. Flores 1—3 terminales. Lobi perianthii exteriores triangulares, marginibus simplicibus, incrassatis, apice obtusi; lobi exteriores late obovatis, obtusis. Stamina lobos interiores opposita; cristae 2, connectivum basi noncalcaratum, thecae ad connectivum adpressae, basi connatae. Ovarium ellipsoideum vel obconicum. Alae plm. 8 mm longae, 2 mm latae, semioblanceolatae. Semina scobiformia.

Hab.: Sumatra. Typus: Si Toroes 3724 in herb. NY.

dish-shaped stigma. Ovary 2.5–4 mm long, ellipsoid to obconical. Flower-wings about 8 mm long and 2 mm broad, half-oblongate, running from the lower part of the limb to the

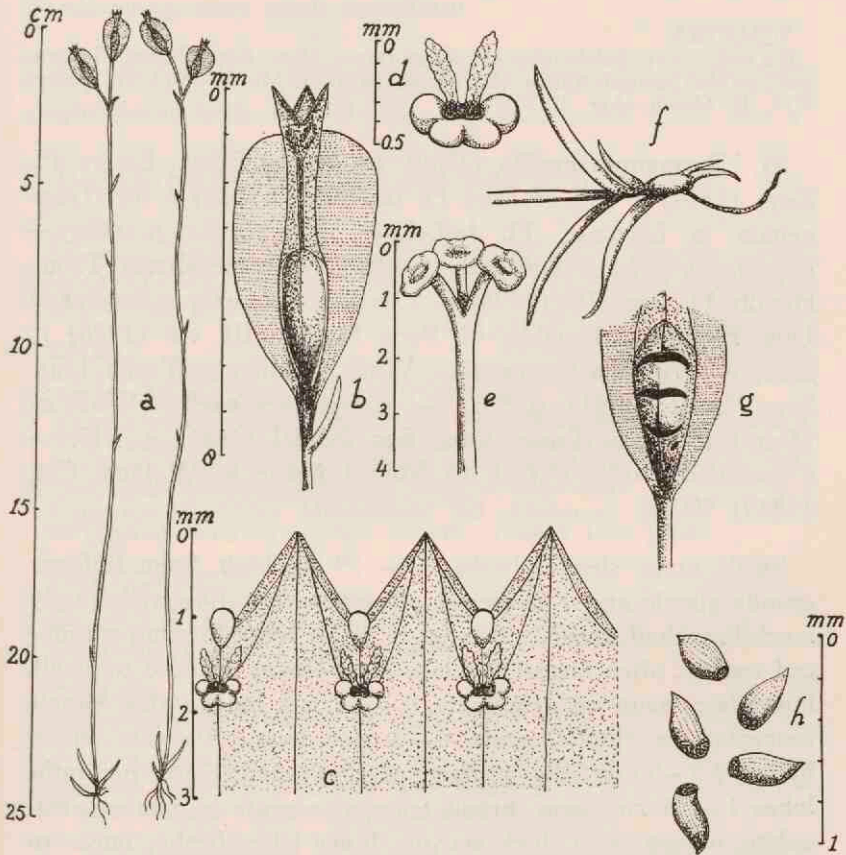


Fig. 10. *Burmannia connata* Jonk. — a. Flowering plants; b. flower; c. dissected flower, showing inner perianth-lobes and stamens; d. stamen; e. style with stigmas; f. radical rosette; g. dehiscent capsule; h. seeds.

base of the ovary, decurrent along the upper part of the pedicel. Capsule 4–6 mm long, ellipsoid, dehiscent with transverse splits. Seeds small, scobiform, yellow.

Type: Si Toroes 3724, from Sumatra, East-coast, in herb. NY.

Distribution: Only known from Sumatra, East-coast.

SUMATRA.

East-Coast, Subdivision Laboehan Batoe, Distr. Kota Pinang, Saboengan, on the Soengei Kanan (Si Toroes 3498, fl. March [NY]; Si Toroes 3724, fl. March—Apr. [NY]).

35. *Burmanna pusilla* (Wall. ex Miers) Thw., Enum. Pl. Zeyl. (1864) p. 325; Hooker, Fl. Br. Ind. V (1888) p. 665; Gagnepain in Lecomte, Fl. Ind.-Chin. VI (1908) p. 22; — *Burmanna coelestis* Don var. *pusilla* (Wall. ex Miers) Trim., Handb. Fl. Ceyl. IV (1898) p. 131; — *Burmanna coelestis* non Don, Fischer in Gamble, Fl. Pres. Madras III. viii (1928) p. 1399; — *Tripteranthus pusilla* Wall. ex Miers in Trans. Linn. Soc. XVIII (1841) p. 537; — *Gonyanthes pusilla* (Wall. ex Miers) Miers in Trans. Linn. Soc. XVIII (1841) p. 537; — *Cyananthus pusilla* (Wall. ex Miers) Miers in Wallich, Cat. (1849) 9008.

Small, erect, slender herbs, 4 — 19 cm high. Stem filiform, usually simple and 1-flowered, sometimes few-flowered, rarely much-branched. Basal leaves up to 5 mm long, forming a reduced rosette, often almost lacking. Stem-leaves reduced to small, lanceolate, acute to acuminate, 1—2.5 mm long scales. Bracts lanceolate or elliptic, acute, 1—2 mm long. Flowers erect, bluish, 4.5—6 mm long, prominently 3-winged. Outer perianthlobes 1—1.5 mm long, broad triangular-ovate to almost orbiculate, obtuse, with thick margin. Inner lobes fleshy, linear to lanceolate, acutish, about 0.5 mm long. Perianth-tube cylindrical-trigonous, 1.5—3 mm long. Stamens sessile in the perianth-throat. Connective oblong with two apical, acute, crests and an obtuse, basal, hanging spur. Thecae inserted on two short, lateral connective-arms. Style thick-filiform, bearing at the apex 3 sessile, funnel-shaped stigmas, with a central cleft. Style with stigmas about 1.5—2.5 mm long. Ovary truncate.

ellipsoid to obovoid, 1,5—2,5 mm long. Flower-wings half-orbicular to broadly half-obovate, 3,5—6 mm long and 2—3 mm broad, running from the base of the limb to below the base of the ovary. Capsule obovoid, crowned by the dried perianth. Seeds many, very small, scobiform.

Type: Wallich 9008 from India, Concan, in herb. BM, duplicates in herb. CA; G-DEL and K.

Distribution: Ceylon and India to Indo-China.

#### ASSAM.

Mt. Khasia (Hooker and Thomson s.n. [B; BR; CA; F; G-BOIS; G-DEL; GH; GÖTT; K; L; M; NY; P; P-DR; S; U; W]); Shillong Hills (Clarke 44653, fl. Aug. [BM; W]).

#### INDIA.

Concan (Law s.n. [B; G-BOIS; GH; GÖTT; K; L; M; NY; P; P-DR; S; U; W]; Wallich 9008 [BM; CA; G-DEL; K]).

Tenasserim, Tavoy (Wallich 241 = 1999, fl. Sept. [BM; G-DEL]).

Travancore, Tenmalai (Calder and Ramaswami 835, fl. Sept. [CA]).

Madras, above Vilagavi, 4 miles below Kodaikanal (Bembower 307a, fl. Jun. [MIS]); Trichoor (Gamble 14839, fl. Sept. [K]).

Gonjam District, Mahendragiri Hill (Fischer s.n. [K]).

Without locality (Vahl s.n. [P]; Wallich 1498 [BM]).

#### INDO CHINA.

Cochin China, Saigon (ex Gagnepain l.c.); without precise locality (Thorel 1369 [P]; Lefèvre 217, fl. Sept. [P]; Thorel 791 [P]).

Cambodge (ex Gagnepain l.c.).

#### CEYLON.

Without locality (Thwaites s.n. [CA; K]).

Obs.: Possibly this species is identical with the doubtful *B. uniflora* Rottl. ex Spreng., Syst. Veg. IV. 2, Cur. post. (1827) p. 23. In that case the correct name would be *Burmattia uniflora* Rottl. ex Spreng.

#### Var. *hongkongensis* Jonk., nov. var.<sup>1)</sup>

Differing from typical *B. pusilla* by its longer, filiform stems.

<sup>1)</sup> *Burmattia pusilla* (Wall. ex Miers) Thw., var. *hongkongensis* Jonk., nov. var. — Planta 9—15 cm alta, 1—3-flora. Alae perianthii semi-oblongolatae vel semi-cuneatae, usque ad 1,5 mm latae. Hab.: prope Hongkong. Typus: Bodinier 924 in herb. Parisiense (herb. Drake), typi dupla in herb. LY et P.

9—15 cm high, bearing 1—3 flowers at the top. Flowers blue as in the species, but flower-wings narrower, up to 1,5 mm broad.

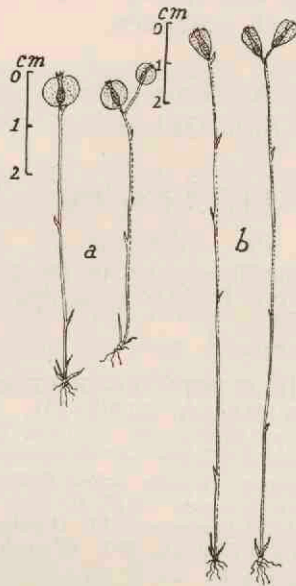


Fig. 11. a. *Burmannia pusilla* (Wall. ex Miers) Thw; b. id., var. *hongkongensis* Jonk.

Type: Bodinier 924, from Hong-Kong, in herb. P-DR, duplicates in herb. LY and P.

Distribution: Twice collected near Hongkong.

HONG-KONG.

Near Pok-fu-lum (Bodinier 924, fl. Nov.-Dec. [LY; P; P-DR]); near Nazareth (Bodinier s.n., fl. Nov. [LY]).

36. *Burmannia subcoelestis* Gagnep. in Bull. Soc. Bot. Fr. 54 (4me Série T.VII) (1907) p. 464; Gagnepain in Lecomte, Fl. Gén. Ind.-Chin. VI (1907) p. 23.

Erect, annual herbs, 33—38 cm high. Roots fibrous, yellowish. Stem usually simple, terete. Basal leaves more or less

rosulate, linear-lanceolate, subulate, 5—23 mm long and about 1 mm broad. Stem beset with scattered, more or less appressed, linear to lanceolate, subulate, rather long, scalelike leaves, 3—16 mm long. At the top of the stem or branches a cluster of 5—15 flowers. Bracts ovate, acute, 1-nerved, about 2,5 mm long. Flowers erect, about 10 mm long, blue. Outer perianthlobes erect, ovate-triangular, obtuse, about 1,5 mm long, margin thick, fleshy. Inner lobes small, obovate-ob lanceolate, obtuse, about 0,5 mm long. Perianth-tube about 4,5 mm long, cylindrical-trigonous. Anthers sessile in the perianth-throat, connective with two apical, divergent crests and a basal, hanging, rather long, filiform, obtuse spur, Y-shaped, with two short lateral arms, bearing the thecae. Style thick-filiform, bearing at the apex 3 subsessile, funnel-shaped, 2-lobed, curved stigmas. Style with stigmas about 4,5 mm long. Ovary truncate, obovoid, about 4 mm long.

Flower-wings half-elliptical, with crenate margin, about 9 mm long and 2,5 mm broad, running from the middle of the limb to below the base of the ovary.

Type: Harmand 255 from Laos, in herb. P, duplicate in herb. U.

Distribution: Indo China (Laos and Cambodge).

INDO CHINA.

Laos, Bassin of Se-moun, near Moulu-prey (Harmand 255, fl. Jan. [P; U]).

Cambodge, locality unknown (ex Gagnepain l.c.).

37. *Burmannia luteo-alba* Gagnep. in Bull. Soc. Bot. Fr. 54 (4me Série, T. VII) (1907) p. 463; Gagnepain in Lecomte, Fl. Gén. Ind.-Chine VI (1908) p. 22.

Erect, unbranched, non-saprophytic herbs, 14—23 cm high. Stem filiform, sparsely beset with linear-lanceolate, acute, 1—5 mm long, scalelike, green leaves. Basal leaf-rosette reduced to few linear, acuminate leaves. Rosette-leaves and basal

stem-leaves up to 10 mm long and about 1 mm broad. Bracts small, linear-lanceolate. Stem usually bearing 2 erect, shortly pedicellate or sessile flowers at the apex, stem seldom 1- or 3-flowered. Flowers 5—7 mm long, greenish-white with yellow limb, prominently 3-winged. Outer perianth-lobes erect, broadly triangular, acute, yellow, with thick or involute margin, about 1.5 mm long. Inner lobes 0.5—1 mm long, erect, sublanceolate or oblong, obtuse. Perianth-tube cylindrical, about 2 mm long. Anthers sessile in the perianth-throat. Connective quadrangular, bearing the thecae on short lateral arms. On the upper surface of the connective two divergent, obtuse crests, basal hanging connective-spur triangular to filiform, obtuse. Style as long as the tube, branching at the apex into 3 short branches, each bearing a dish-shaped stigma. Ovary clavate to obovoid, truncate at the apex, slightly attenuate at the base, about 2.5 mm long. Flower-wings about 5 mm long and 1 mm broad, whitish, half-obovate, running from the base of the limb to below the base of the ovary.

Type: Godefroy 879, from Cambodge, Isle of Phu-quoc, in herb. P.

Distribution: Twice collected on the Isle of Phu-quoc.

INDO-CHINA.

Cambodge, Phu-quoc (Godefroy 879, fl. Jul. [P]; Harmand 3329 [P]).

38. *Burmannia juncea* Sol. ex R. Br., Prod. Fl. Nov. Holl. I (1810) p. 265; id., Ed. sec. (1827) p. 121; Bentham, Fl. austr. VI (1873) p. 397; Bailey, Syn. Qu. Fl. (1883) p. 534; Bailey, Qu. Fl. V (1902) p. 1513; Bailey, Comp. Cat. Qu. Pl. (1909) p. 519; Koorders, Exk. Fl. Jav. I (1911) p. 344.

Erect, slender, annual herbs, 13—40 cm high. Roots filiform, fibrous, short. Stem long, filiform, often flexuose, usually unbranched, sometimes with short branches, forking at the apex into the inflorescence. Radical rosulate leaves few, someti-

mes almost lacking, 3-nerved, linear, subulate, up to 10 mm long. Stem-leaves small, appressed, elliptic, acuminate or subulate, to 4 mm long. Inflorescence a double cincinnus, up to 13-flowered, branches to 4 cm long, sometimes reduced to 1 or 2 flowers. Bracts elliptical, acute, 1.5–2 mm long. Flowers erect, blue or purple, prominently 3-winged, about 8 mm long, shortly pedicellate. Outer perianth-lobes erect, triangular, acute, about 3 mm long. Inner lobes oblong, obtuse, about 0.5 mm long. Perianth-tube cylindrical-trigonous, about 3 mm long. Anthers sessile in the perianth-throat. Connective oblong, obtuse, tapering at the base into a filiform, acute spur and bearing at the apex two curved, divergent, acute crests. Thecae inserted on short lateral connective-arms. Style thick-filiform, bearing at the apex 3 subsessile, funnel-shaped stigmas. Style with stigmas about 3.5 mm long. Ovary obovoid, often longer than the tube, truncate, 3–6.5 mm long. Flower-wings half-obovate, about 6 mm long and 2 mm broad, running from the middle of the limb to below the base of the ovary, decurrent along the pedicel. Capsule obovoid, up to 8 mm long, crowned by the dried perianth, opening by transverse splits.

Type: Banks and Solander s.n. from Northern Queensland, in herb. BM.

Distribution: Known from the Northern and Eastern part of Australia (North Australia and Queensland).

#### AUSTRALIA.

Queensland, Endeavour Riv. (Banks and Solander s.n. [BM]); Moreton, Logan Riv. (Scortechini s.n., ex Benth. l.c.); Temple Bay, Cape York Peninsula (Young s.n., fl. Jul. [BM]); without locality (Banks s.n. [S]).

North Australia, Palmerston, vicinity of Port Darwin (Bleeser 457, fl. Aug. [B]; Holtze 491 [B]; Holtze s.n. [B]; Holtze 41 [BR]; Lea s.n., fl. Jun. [BM]; Praeger 41 [G-BOIS]); Port Essington (Armstrong s.n., ex Benth. l.c.).

#### 39. *Burmannia sphagnoides* Becc., Malesia I (1877) p. 246.

Erect, saprophytic herbs, 45–12 cm high. Stem erect, simple, rather thick, beset with many lanceolate, acute, in the



lower part imbricate, scalelike leaves, 3–6 mm long. Basal leaf-rosette lacking. Inflorescence consisting of 2–5 clustered, subsessile flowers at the top of the stem. Bracts of equal length as the stem-scales but slightly broader, broad-lanceolate to ovate, acute. Flowers white, about 8.5 mm long, 6-costate. Outer perianth-lobes erect, about 2 mm long, broadly triangular, acute, margin thick, fleshy, swollen. Inner ones almost 1 mm long, thick, fleshy, oblong, obtuse to rounded, erect, papillose. Perianth-tube short, cylindrical, about 2 mm long. Anthers sessile in the perianth-throat. Connective oblong, acute at the base, bearing 2 divergent, obtuse crests at the apex. Style thick-filiform, bearing 3 sessile, obconical stigmas at the top. Ovary very large, 4–5 mm long, broadly ellipsoid to subglobose.

Type: Beccari 86 from Borneo, Sarawak, in herb. FI.

Distribution: Known from Sarawak and Malay Peninsula.

BORNEO.

Sarawak, Mt. Mattang (Beccari 1502 pp., fl. Apr. [FI]; Beccari 2426, ex Beccari l.c.); id., Kuting (Beccari 86, fl. Jun. [FI]); Kuching (Haviland 1665, fl. Sept. [K]); without precise locality (Hewitt s.n. [B]).

MALAY PENINSULA.

Selangor, Klang (Kehding 015, fl. Dec. [FI]).

Without locality (Scortechini 271b [CA]).

40. *Burmannia bifaria* J. J. S. in Icon. Bogor. IV (1914) t. 379; v. Steenis in Trop. Nat. XXIII (1934) p. 37.

Erect, saprophytic herbs, 5–13 cm high. Roots unbranched, vermiform. Stem simple or branched, beset with many, distichous, ovate or lanceolate-ovate, acuminate, stem-clasping, scalelike leaves, up to 5 mm long. Basal rosulate leaves lacking. Inflorescence up to 7-flowered, stem sometimes bearing a single flower at the top. Flowers erect, subsessile, 6-costate, 9–13 mm long. Outer perianth-lobes about 1.5 mm long,

fleshy, triangular with involute, crenate margin. Inner lobes orbicular, fleshy, about 1.5 mm long. Perianth-tube 2.5–4.5 mm long, cylindrical-trigonous. Anthers sessile in the perianth-throat, connective obtriangular with a slightly 2-lobed, papillose crest at the top. Style thick-filiform, branching at the top into 3 very short branches, each bearing a curved, funnel-shaped stigma with a rounded, membranous, hanging appendage. Style with stigmas about 4 mm long. Ovary ellipsoid, truncate, 4–6 mm long. Seeds ovoid, brown, striped.

Type: Backer 6285 from Java, near Buitenzorg, in herb. BZ.

Distribution: only known from Western Java, vicinity of Buitenzorg.

JAVA.

Batavia, near Buitenzorg, Mt. Karang Gantoengan (Backer 6285, fl. Dec. [BZ]); id., Mt. Soenarari (Backer 6328, fl. Jan. [BZ]); Mt. Tjipoeti near Tjiampea (Bakhuizen v. d. Brink 4792, fl. Sept. [BZ]).

41. *Burmannia engganensis* Jonk. in *Blumea* III. 1 (1938) p. 108.

Slender, erect, saprophytic herbs, 10–13 cm high. Stem simple, more or less fleshy, beset with 3–8 scalelike, lanceolate to ovate-lanceolate, acute or acuminate, prominently 1-nerved leaves, 2–6 mm long. Basal rosulate leaves lacking. Bracts ovate, acute, about 5 mm long. Stem branching at the top into the bifid 5–9-flowered inflorescence. Flowers erect, shortly pedicellate, pulchish-white, 9–12 mm long. Flower-limb more or less succulent, outer lobes 1.5–2 mm long, obtuse, triangular, with involute margin in younger flowers, orbiculate with evolute margin when older. Inner ones small, erect, fleshy, ovate or obovate to orbiculate, obtuse to rotundate, sometimes retuse, 0.25–1 mm long. Perianth-tube 4–5 mm long, cylindrical-trigonous, 6-nerved. Anthers sessile in the perianth-throat, connective obtriangular, with two curved, divergent crests at the apex.

basal hanging spur lacking. Style thick-filiform, branching at the top into 3 short branches, each bearing a flat, retuse stigma, with a broad, rotundate, hanging, membranous appendage. Style with stigmas 4—4.5 mm long. Ovary ellipsoid to obovoid, 3—4 mm long. Ovules numerous, ovoid to ellipsoid. Flower-wings reduced to 3 very narrow, linear ribs, running from the top of the limb to the base of the ovary.

Type: Lütjeharms 4437 from Enggano Island, near Sumatra, in herb. L, duplicate in herb. BZ.

Distribution: Only known from Enggano Island.

ENGGANO.

Forest near Boea-boea (Lütjeharms 4437, fl. Jun. [BZ; L]; Lütjeharms 4736, fl. Jun. [L]).

42. *Burmannia Championii* Thw., Enum. Pl. Zeyl. (1864) p. 325; Hook. f., Fl. Br. Ind. V (1890) p. 666; Hooker in Trim., Handb. Fl. Ceyl. IV (1898) p. 131, pl. LXXXVII; Ridley, Mat. Fl. Mal. Penins. II (1907) p. 72; J. J. Smith in Ann. Jard. Bot. Buit. XXIV (2me. Serie, Vol. IX) (1911) p. 81; Ernst and Bernard in Ann. l.c. p. 84; Ernst and Bernard in Ann. Jard. Bot. Buit. XXV (2me. Série Vol. x) (1912) p. 161; Ridley, Fl. Mal. Penins. IV (1924) p. 306; van Steenis in Trop. Nat. XXIII (1934) p. 53; — *Burmannia pseudoalata* Champ.mss. ex Thw. l.c.; — *Burmannia tuberosa* Becc., Mal. I (1877) p. 245; Ridley in Journ. Str. Br. Roy. As. Soc. XXII (1890) p. 334; Ridl., Mat. Fl. Mal. Pen. II (1907) p. 72; J. J. Smith in Ann. Jard. Bot. Buit. XXVIII (2me. Série, Vol. XIII) (1914) p. 99, Taf. XIV; Bernard and Ernst in Ann. Jard. Bot. Buit. XXVIII (2me. Série, Vol. XIII) (1919) p. 102 and p. 121; Ridley, Fl. Mal. Pen. IV (1924) p. 306; — *Burmannia capitata* non Mart., Makino in Bot. Mag. Tokyo IV (1890) p. 23; — *Burmannia japonica* Maxim. ex Mak. in Ill. Fl. Jap. I n. 7 (1891) p. 4, pl. XXXV; Ito in Mem. Work. Bot. Zool. I (1893) p. 14; Makino in Bot. Mag. Tokyo XVII (1903) p. 6; — *Burmannia Dalzielii*

Rendle in Journ. Bot. XL (1902) p. 311, pl. 441B; — *Burmannia chionantha* Schltr. in Engl., Bot. Jahrb. XLIX (1913) p. 107.

Erect, slender, white, saprophytic herbs, 2–18 cm high. Rhizome mostly tuberous, up to 2 cm long, sometimes elongate, covered with hairlike roots, producing small, adventitious tubers. Stem simple, erect, beset with lanceolate, acute, appressed, reduced, scalelike leaves, 1.5–4 mm long. Radical, rosulate leaves lacking. Bracts acute, lanceolate, about 3 mm long.

Flowers subsessile, clustered at the top of the stem in a usually capitate inflorescence. Flowers seldom in bifid cymes. Inflorescence 2–12-flowered. Flowers white, wingless, 3-costate, 5–12 mm long. Outer perianth-lobes erect, triangular, acute, 1–2.5 mm long, with narrow, involute lateral lobes in the upper part. Inner lobes erect, spatulate, rounded, slightly papillose at the margin, about  $\frac{3}{4}$  mm long. Anthers sessile in the upper part of the perianth-tube. Connective broadly oblong with a median small point at the apex, apical point usually directed inwards. Apical crests of the connective indistinct, small, obtuse, divergent to horizontal, basal hanging spur absent. Style thick-filiform, bearing at its apex 3 subsessile funnel-shaped stigmas. Style with stigmas about 3 mm long. Ovary elliptical to obovoid, 2–3 mm long.

Type: Thwaites 2735 from Ceylon in herb. Peradynia, duplicates in herb. B; BM; CA; G-BOIS; G-DEL; GÖTT; P; P-DR; W.

Distribution: Ceylon, Malay Peninsula, Southern China, Japan, Malayan Archipelago.

Vernacular Names: Hinano-shakujo (Jap., according to Ito l.c.); Hinanoshakudyo (Jap., according to Makino l.c.).

#### CEYLON.

Karawite Kande (Holtermann s.n., fl. March [B]; Holtermann 767, fl. Jun. [B]); Hewesse distr., Mandagale (Holtermann s.n., fl. March [B]);

without locality (Thwaites 2735 [B; BM; CA; G-BOIS; G-DEL; GÖTT; P; P-DR; W]).

#### MALAY PENINSULA.

Kedah, Kedah Peak (Ridley s.n. [BM]; Bell and Haniff s.n., fl. March [B]).

Johore, N of Mt. Blumut (Holtum 10298, fl. May [K]).

Malacca, Sungei Hudang (Hervey s.n., ex Ridley 1924); Mt. Ophir (Ridley s.n., ex Ridley 1924).

Singapore, Selitar (Ridley s.n. [B; BM; K]; Ridley s.n., fl. Jul. [BM]); Bukit Payang (Ridley s.n. [B; BM]); Bukit Timah (Ridley s.n., ex Ridley 1924); Changi (Ridley s.n., ex Ridley 1924).

Selangor, Petaling (Ridley s.n., ex Ridley 1924).

#### CHINA.

Kwantung, Swatow (Dalziel 33, fl. Jul. [BM], type of *B. Dalzielii* Rendle).

#### JAPAN.

Shiboku Island, prov. Tosa (Makino s.n., ex Makino l.c. and Ito l.c., type of *B. japonica* Maxim. ex Makin.).

#### BATOE ISLANDS.

P. Pini (Raap s.n., fl. Jan. [BZ]).

#### BANKA.

Bentja (Bünnemeyer 2277 [BZ]).

#### JAVA.

Res. Batavia, near Buitenzorg (Koorders 169, fl. Feb. [BZ]; coll. indig. 164 [L]); id., Botanical Garden (Bernard s.n. [BZ]; Docters v. Leeuwen s.n., fl. Aug. [BZ]; Docters v. Leeuwen s.n., fl. Jan. [BZ]; Bakhuizen v. d. Brink fil. 1175, fl. Aug. [L]; Nong Nong s.n., fl. Dec. [BZ]); id., Soekaradja (Bakhuizen v. d. Brink 5403, fl. Feb. [BZ]); id., Tjidjeroek (coll. indig. 89 [L]; coll. indig. s.n., fl. Oct. [BZ; GRO]); Mt. Andam, SW of Leuwiliang (Bakhuizen v. d. Brink 5218, fl. Jun. [BZ]); Pasir Honje, SW of Leuwiliang (Bakhuizen v. d. Brink 7876, fl. Dec. [L]); without locality (Raciborsky s.n. [BZ]; Backer 23498 [BZ]; van Steenis 2728 [BZ]; Koorders 40363b [BZ]; Koorders 41666b, fl. Nov. [BZ]).

#### BORNEO.

Netherl. Borneo, Bandjermasin (Motley 1162 [K]).

Sarawak, Dulit Range (Richards 1744, fl. Sept. [K]); Mt. Mattang (Beccari 1502 pp., fl. Apr. [FI], type of *B. tuberosa* Becc.; Beccari 402 [FI]).

#### NEW GUINEA.

Netherl. New Guinea, Nepenthes hill (Versteeg 1290, fl. Jun. [BZ]); Ramoi (Beccari s.n., ex Beccari l.c.).

British New Guinea, Mt. Gomadjidji (Mt. Gormia), Waria Valley (Schlechter 17387, fl. March [B], type of *B. chionantha* Schltr.).

43. *Burmattia micropetala* Ridl. in Trans. Linn. Soc. 2nd. Ser. Vol. IX, Bot. (1916) p. 228.

Erect, slender, saprophytic herbs, 7.5–15 cm high. Stem

simple, beset with acute or acuminate, 1-nerved, reduced, scale-like leaves, often keeled, 2—5 mm long. Radical rosulate leaves lacking. Inflorescence 3—8-flowered, flowers shortly pedicellate, in contracted, bifid cymes, sometimes simulating umbels. Bracts linear-lanceolate, acute, 1-nerved, about 4 mm long. Pedicels up to 5 mm long, flowers 7—9 mm long, very narrowly 3-winged to 3-costate. Outer perianth-lobes triangular, acute, about 2 mm long, with small, rounded, crenate lateral lobes in the upper part. Inner perianth-lobes rather broad, about 0.5 mm long, broadly obovate, rounded, papillose at the margin. Perianth-tube cylindrical, about 3 mm long. Anthers with oblong connective, acute at the base, with two divergent, acute, apical crests. Style thick-filiform, branching at the apex into 3 very short branches, each bearing a funnel-shaped stigma with two small apical points. Style with stigmas about 3 mm long. Ovary ellipsoid, truncate, about 2.5 mm long. Flower-wings very narrow, less than 0.5 mm broad, running from the upper part of the limb to the base of the ovary.

Type: Boden Kloss s.n. from Netherl. New-Guinea (Camp VIA) in herb, BM, duplicate in herb K.

Distribution: Only known from New-Guinea.

#### NEW GUINEA.

Netherl. New Guinea, Utakwa Exped. (Wollaston Exped.), Camp I (Kloss s.n. [BM]); Camp VIA (Kloss s.n., fl. Jan. [BM; K]); Mt. Carstenz, Canoe Camp (Kloss s.n. [BM]); without precise locality (v. Römer 829, fl. Nov. [BZ]).

British New Guinea, Palmer Riv., 2 miles below junction Black Riv. (Brass 8779, fl. Aug. [Arnold Arbor., Jamaica Plain (Mass.), U.S.A.]).

44. *Burmannia tridentata* Becc, Malesia I (1877) p. 246. tav. 13, fig. 6—10.

Slender, erect, saprophytic herbs, 6—14 cm high. Stem simple or branched, more or less fleshy, beset with appressed, lanceolate, acute, 1-veined, often slightly keeled, scale-like leaves, 1.5—2 mm long. Basal rosulate leaves lacking. Bracts ovate-lanceolate, acuminate, 1-veined, about 1.5 mm long. Stem or

branches 1-flowered or bearing 2—3 flowers at the apex. Flowers about 5—7 mm long, prominently 3-winged. Outer perianth-lobes erect, triangular to ovate, obtuse, 1—1.5 mm long, margin fleshy, swollen. Inner lobes lacking. Perianth-tube short, cylindrical, about 2 mm long. Anthers sessile in the perianth-throat, connective quadrangular with a broad, hanging, basal, swollen, obtuse lobe and an apical, erect, papillose, obtuse crest. Style about as long as the tube, bearing 3 subsessile, funnel-shaped stigmas at the top.

Ovary subglobose, about 2 mm long and 1.5—2 mm broad. Flower-wings half-elliptical to half-orbiculate, about 4 mm long and up to 2 mm broad. Capsule subglobose, about 2.5 mm long. Seeds numerous, minute, scobiform.

Type: Beccari s.n., from Borneo, Sarawak, in herb. FI.

Distribution: Once collected.

BORNEO.

Sarawak, Mt. Mattang (Beccari s.n., fl. May [FI]).

45. *Burmannia oblonga* Ridl. in Journ. Str. Br. Roy. As. Soc. 41 (1904) p. 33; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 72; Ridley, Fl. Mal. Pen. IV (1924) p. 305; — *Burmannia bifida* Gagnep. in Bull. Soc. Bot. Fr. 54 (4me Série T. VII) (1907) p. 462; Gagnepain in Lecomte, Fl. Gén. Ind.-Chine VI (1908) p. 19; Merrill and Chun in Sunyatsenia II (1935) p. 212.

Erect, slender, annual, saprophytic herbs, 7—15 cm high. Roots short, obtuse, swollen. Stem white, without chlorophyll, filiform, simple or sometimes branched, stems or branches, 1—2-flowered at the apex. Stem sparsely beset with small, reduced, scalelike, appressed, ovate to lanceolate, obtuse leaves, about 1.5 mm long. Radical rosulate leaves lacking. Below the flower 2 lanceolate, scalelike bracts, about 2.5 mm long. Flowers white, sometimes with yellow limb, erect, 8—10 mm long. Outer perianth-lobes about 1.5 mm long, obtuse-bifid, margin papillose in the upper half, in the lower half with two yellowish

bags insides; outer perianth-lobes with two involute, narrow, triangular lateral lobes. Inner perianth-lobes lacking (according to Ridley very short, blunt). Perianth-tube conical, 4—4,5 mm long. Anthers sessile in the perianth-throat, between the perianth-lobes, yellow. Connective oblong, without apical crests or basal hanging spur. Style thick-filiform, bearing at the apex 3 sessile, funnel-shaped, curved stigmas, style with stigmas about 4,5 mm long. Ovary subglobose, 2,5—4 mm long. Flower-wings 5—7,5 mm long and 3—4 mm broad, whitish, obovate, truncate, running from the base of the limb to the base of the ovary.

Type: King's collector (Kunstler) 2270 from Penang, in herb. K, duplicate in herb. CA.

Distribution: Malay Peninsula, Indo-China, Hainan and Sumatra.

#### MALAY PENINSULA.

Selangor, Semangkok Pass (Ridley 12108, ex Ridley l.c.; Napier s.n., ex Ridley l.c.); Sempang track (Ridley s.n., fl. Apr. [BM]).

Penang, without precise locality (King's Collector (Kunstler) 2270, fl. Aug. [CA; K]).

#### INDO CHINA.

Annam, prov. Kontum, Mam Ray (Poilane 18214, fl. Sept. [P]); Nhatrang (Poilane 3410, fl. May [P]).

Laos, plateau de Boloven, between Phu Da Phuk and Sê Noi (Poilane 15993, fl. Oct. [P]).

Cambodge, Kam-chay Mts. (Geoffray 187, fl. Nov. [P], type of *B. bifida* Gagnep.); Giaray (Chevalier 36455, fl. Sept. [P]).

Cochin-China, prov. Bien-hoa, China-Xhan Mts. (Pierre s.n., fl. Sept. [K; P; U]).

#### CHINA.

Hainan, Dailand, Ding Ka (Chun and Tso 43867, fl. Sept. [GH; NY]).

#### SUMATRA.

East-Coast, Onderneming Haboko (Docters van Leeuwen 3246, fl. Feb. [BZ]).

Atjeh, Gajolanden, Mt. Kemiri (van Steenis 10294, fl. March [BZ]).

46. *Burmattia liukiensis* Hayata in Ic. Pl. Formos. V (1915) p. 211 — *Burmattia coelestis* non Don, Wright in Journ. Linn. Soc. XXXVI (1903) p. 4; Matsamura, Ind. Pl. Jap. II. 1 (1905)



p. 234; — *Cryptonema malaccensis* non Turcz., Kränzlin in Engl., Bot. Jahrb. VI (1885) p. 55; Matsamura l.c.; — *Burmannia nepalensis* non Hook. f., Ito in Mem. (1893) p. 14, pl. II, t. 3—5; Makino in Bot. Mag. Tokyo XVII (1903) p. 7.

Erect, slender, annual herbs, 6—14 cm high. Stem filiform, usually simple, only forked at the top into the inflorescence. Basal rosulate leaves lacking, stem-leaves reduced to lanceolate, small, acute, appressed scales, 1—2 mm long. Stem sometimes 1-flowered at the apex, usually bearing a 3-flowered inflorescence. Bracts formed as the stem-scales. Flowers erect, about 4—5 mm long, pedicellate, narrowly 3-winged. Outer perianth-lobes short, broadly triangular, obtuse, with thick, swollen margin, 0.5—0.75 mm long. Inner lobes minute, thick, fleshy, swollen, orbiculate. Perianth-tube conical, 1.5—2 mm long. Anthers sessile in the upper part of the tube. Connective oblong, with two short lateral arms, bearing the thecae, two crests at the apex and a hanging, acutish, transparent spur at the base. Connective with crests and spur T- or Y-shaped.

Style thick-filiform, bearing 3 sessile, curved, funnel-shaped stigmas at its apex. Style with stigmas 1.5—2 mm long. Ovary subglobose, 2—2.5 mm long and about 2 mm broad. Flower-wings very narrow, linear, running from the base of the limb to the base of the ovary, decurrent along the basal ovary-half, about 4 mm long and up to 0.5 mm broad. Capsule subglobose, crowned by the persistent perianth. Seeds numerous, linear-fusiform, with a rather long funiculus, acute at the other end.

Type: Teruya s.n., from Tanekoshima, Liu-Kiu Islands, in herb. ?

Distribution: Liu-Kiu Islands and Southern Japan.

Vernacular Name: Sto-yurei-také (Jap., according to Tashiro).

#### LIU-KIU ISLES.

Anami-Osima (Döderlein s.n. [B]).

Tanekoshima (Teruya s.n., fl. Aug. ex Hayata etc.).

## JAPAN.

Kiushiu, prov. Osumi, near village Tashiro (Tashiro s.n., fl. Oct. [W]); prov. Hyuga (Ito s.n. [K]).

47. *Burmattia Wallichii* (Miers) Hook. f., Fl. Br. Ind. V (1888) p. 666; Wright in Journ. Linn. Soc. XXXVI (1903) p. 5; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 71; Gagnepain in Lecomte, Fl. Gén. Ind.-Chin. VI (1908) p. 21; Ridley, Fl. Mal. Pen. IV (1924) p. 305; Merrill and Chun in Sunyatsenia II (1935) p. 212; — *Gonyanthes Wallichii* Miers in Trans. Linn. Soc. XVIII (1841) p. 537; Bentham, Fl. Hongkong. (1861) p. 364; — *Burmattia Griffithii* Becc., Malesia I (1877) p. 254; — *Burmattia* spec., Griffith, Not. Pl. As. III (1851) p. 236; Griffith, Ic. Pl. As. III (1851) pl. 272, f. II.

Small, slender, erect, annual, saprophytic herbs, 5.5–11 cm high, without chlorophyll. Roots short, thick, obtuse. Stem erect, simple, white or bluish, 1–2-flowered at the top. Radical, rosulate leaves lacking, stem sparsely beset with lanceolate-elliptical, acute scales with distinct midnerve, sometimes keeled, about 2 mm long. Bracts lanceolate, acute, about 1.5 mm long and 0.5 mm broad. Flowers erect, shortly pedicellate, narrowly 3-winged, about 6.5 mm long, white or bluish. Outer perianth-lobes obtuse-triangular, slightly 3-topped, erect, about 1 mm long. Inner perianth-lobes minute, orbiculate, rounded. Tube cylindrical, about 3 mm long. Anthers sessile in the perianth-throat below the inner lobes. Connective oblong, without crests at the apex, tapering towards the base into a short, transparent, hanging spur. Style thick-filiform, branching at the apex into 3 very short branches, each bearing a bowl-shaped stigma. Ovary obovoid, length about 2.5 mm. Flower-wings narrow, linear, about 4.5 mm long and 0.5 mm broad.

Type: Wallich 399 = 2137, from Burma, in herb. BM, duplicate in herb. G-DEL.

Distribution: India, Burma, Malay Peninsula, Siam, Indo-China, Hongkong and perhaps Japan.

## BRITISH INDIA.

Madras, Coimbatore distr., Atamalai (Fischer 1460, fl. Dec. [CA]); Nilgherries, Coonoor (Penny 14, fl. Feb. [P]).

## BURMA AND MALAY PENINSULA.

Kilaben (Wallich 399 = 2137, fl. Oct. [BM; G-DEL]); without precise locality (Griffith 5592 [CA; P; W], type of *B. Griffithii* Becc.).

## SIAM.

Doi Sootep, Chiangmai (Kerr 926, fl. Jan. [B; CA; K; P]); Kopah (Burkill 2083 [K]).

## INDO CHINA.

Annam, prov. of Darloc, between „La Poste du Lac” and B. Dié (Poi-lane 18573, fl. Oct. [P]).

Cambodge, Isle of Phu-quoc, Da Buc (Harmand 848, fl. Sept. [P]).

Cochin-China, near Ti-tinh (Thorel 1408 [P]); without locality (Pierre s.n., fl. Sept. [P]).

## HAINAN.

Hung Mo Shan (McClure 18280, fl. Aug. ex Merrill and Chun l.c.).

## HONGKONG.

Mt. Gough (Wilford s.n. [W]; Wilford 1444, fl. Dec. [BM]; Wilford 28 [K]).

## JAPAN.

Kiushiu, Prov. Satsuma, Kanoya (unknown collector s.n., fl. Oct. [S], a doubtful specimen, but probably belonging to this species).

## WITHOUT LOCALITY.

(Scortechini s.n. [CA]).

48. *Burmannia cryptopetala* Mak. in Bot. Mag. Tokyo XXVII (1913) p. 3, fig. IV.

Erect, slender, annual, saprophytic herbs, 6—17 cm high. Roots short, obtuse, swollen. Stem usually simple, sometimes branched, without chlorophyll, white, forking at the apex into the inflorescence. Basal, rosulate leaves lacking, stem beset with reduced, scalelike, lanceolate to ovate, sometimes keeled, acute scales, appressed or erect-patent, up to 4.5 mm long. Inflorescence a double, few-flowered cincinnus, up to 15 mm long. Bracts up to 6 mm long, of the same shape as the stem-scales. Flowers erect, about 10—12 mm long, white, with yellow limb, shortly pedicellate or sessile, 3-winged. Outer perianth-lobes ovate, acute, about 2 mm long. Inner ones almost

lacking. Perianth tube rather short, 2—3 mm long, cylindrical. Anthers sessile in the perianth-mouth, between the perianth-lobes. Connective oblong to quadrangular with two very short, obtuse crests and a small, conical process at the apex, without hanging spur at the base. Style thick-filiform, branching at the apex into 3 very short branches, each bearing a bowl-shaped stigma with prominent margin. Style with stigmas 3—4 mm long, reaching the middle of the limb. Ovary obovoid, longer than the perianth-tube, about 5 mm long. Flower-wings half-cuneate, rather narrow, about 7 mm long and 1.5 mm broad, decurrent along the lower part of the ovary, running from the base of the limb to the base of the ovary. Capsule obovoid, about 6 mm long, crowned by the persistent perianth, dehiscent irregularly. Seeds numerous, fusiform, very small, yellow, ferruginous towards the top.

Type: Makino s.n. from Japan, prov. Yamashiro, Kamigamo, in herb.?

Distribution: Japan to Hainan.

Vernacular Name: Shiro-shakudyo (Jap., ex Makino).

JAPAN (all records according to Makino l.c.).

Yamashiro, Kamigamo (Makino s.n.; S. Ago s.n.).

Ise, Yamada (Makino s.n.).

Hizen, Isahaya (Tashiro s.n., fl. Dec.).

Kii, Mt. Nachi (Minakarta s.n. [Herb. Sc. Coll. Imp. Univ., Tokyo]).

YAKUSIMA.

Without precise locality (Masamune s.n., fl. Aug. [NY]).

HAINAN.

Hung Mo Tung, Mt. Hung Mo, near village Tan ra (Mc. Clure 746, fl. Aug. [NY]).

49. *Burmannia candida* Griff. ex Hook. f., Fl. Br. Ind. V (1888) p. 665; — *Burmannia coelestis* non Don, Fischer in Gamble, Fl. Pres. Madras III. viii (1928) p. 1399.

Erect, slender, annual, saprophytic herbs, 6—16 cm high.

Stem usually simple, only branched at the top into the inflorescence, 1—5-flowered, beset with small, reduced, scalelike, lanceolate, acute leaves, 2—5 mm long. Larger leaves often acuminate or subulate, sometimes imbricate in the lower stem part. Radical, rosulate leaves lacking. Bracts similar to the stem scales, about 3 mm long. Flowers white or white with yellow or blue, 6—10 mm long, prominently 3-winged. Outer perianthlobes about 2 mm long, obovate, obtuse, thick and fleshy in the upper part. Inner lobes erect, linear to oblanceolate, obtuse, almost 1 mm long. Perianth-tube cylindrical, slightly swollen in the upper part, about 4 mm long. Anthers sessile in the perianth-throat below the inner lobes. Connective oblong with two apical, acute, divergent crests, basal hanging spur lacking. Style filiform, bearing at its apex 3 subsessile, obconical to funnel-shaped stigmas. Style with stigmas about 4 mm long. Ovary obconical to obovoid, about 2.5 mm long. Flower-wings 5—8 mm long and up to 4.5 mm broad, half-rhomboid to half-cuneate, running from the base of the limb to below the base of the ovary.

Type: Griffith 5593, from Burma, Mergui, in herb. K.

Distribution: West Coast of Malay Peninsula, Langkawi Islands.

BURMA.

Tenasserim, Amhurst (Wallich 223 [K]); Mergui (Griffith 5593 [K]).

SIAM.

West Coast, Koh Chang (Murton 24, fl. Aug. [K]).

LANGKAWI ISLANDS.

Terutau Island (Robinson 6380, fl. Nov. [K]).

50. *Burmannia lutescens* Becc., Malesia I (1877) p. 246; — *Burmannia candida* (Bl.) Engl. in Engler u. Prantl, Nat. Pfl. Fam. II. 6 (1889) p. 50; J. J. Smith in Ann. Jard. Buit. XXIV (2me. Série, IX) (1911) p. 79; Ernst and Bernard in Ann. Jard. Bot. Buit. XXIV (2me. Série, IX) (1911) p. 84; Koorders, Exk. Fl. Jav. I (1911) p. 344; v. Steenis in Trop. Nat. XXII (1933)

p. 232; v. Steenis in Trop. Nat. XXIII (1934) p. 53; — *Burmannia gracilis* Ridl. in Journ. Str. Br. Roy. As. Soc. XXII (1890) p. 335; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 71; Ridl., Fl. Mal. Pen. IV (1924) p. 305; — *Burmannia papillosa* Stapf in Trans. Linn. Soc. 2nd. Ser., Vol. IV, Bot. (1894) p. 232; — *Burmannia novae-hiberniae* Schltr. in Schum. und Lauterbach, Nachtr. Fl. D. Schutzgeb. (1905) p. 73; Schlechter in Engl., Bot. Jahrb. XLIX (1913) p. 107; — *Burmannia Wallichii* non Hook. f., Ridley, Mat. Fl. Mal. Pen. II (1907) p. 72; Ridley, Fl. Mal. Pen. IV (1924) p. 305; — *Burmannia Gjellerupii* J. J. S. in Fedde, Rep. X (1912) p. 487; — *Burmannia gonyantha* Hochr. in Candollea II (1925) p. 325; — *Gonyanthes candida* Bl., Enum. Pl. Jav. I (1827) p. 29; Blume in Cat. Buitenz. (1823) p. ???; Miers in Trans. Linn. Soc. XVIII (1841) p. 537; Miquel, Fl. Ned. Ind. III (1855) p. 615.

Annual, erect, saprophytic herbs, up to 23 cm high. Stem usually thickly filiform, erect, often rather robust and fleshy, simple or branched, one-flowered or forked at the apex into the inflorescence-branches. Radical rosulate leaves lacking. Stem-leaves scalelike, lanceolate to ovate, acute, 1—3.5 mm long. Bracts lanceolate to ovate, often keeled and carinate, about 2—3 mm long and up to 2 mm broad. Flowers solitary at the top of the stem or in a bifid cincinnus, up to 11-flowered, inflorescence-branches up to 3 cm long. Flowers erect, pedicellate, white, sometimes with yellowish limb, seldom bluish, about 8.5 mm long, 3-winged. Outer perianth-lobes erect, ovate or triangular, obtusely apiculate, margin thickened, fleshy, about 1.5 mm long. Inner lobes minute, fleshy, orbiculate. Perianth-tube trigonous, about 2.5—5 mm long. Anthers sessile in the perianth-throat. Connective truncate, rounded at the base, with two lateral arms, bearing the thecae, slightly 2-lobed at the apex into 2 very short, papillose, sometimes almost lacking crests, basal hanging spur lacking. Style thick, fleshy, bearing 3 subsessile, funnel-shaped to bowl-shaped stigmas at the apex. Style with stigmas about as long as the tube. Ovary subglobose

or truncate-globose, length and breadth about 3—5 mm. Flower-wings very variable in size, often linear, very narrow (*B. lutescens*, *B. novae-herbinae*, *B. Gjellerupii*), or elliptical, or rather broad, half-cuneate or quadrangular (*B. gracilis*), running from the base of the limb to the base of the ovary, sometimes from the base of the limb to the middle of the ovary and narrowly decurrent along the lower part of the ovary. Capsule subglobose, dehiscent with large horizontal splits, crowned by the conical, dried perianth.

Type: Beccari 1505 from Sarawak, Mt. Mattang, in herb. Fl.

Distribution: Malay Peninsula, Sumatra, Java, Borneo, New Guinea, New Ireland (Neu Mecklenburg).

#### MALAY PENINSULA.

Wellesley, Pulu Pinang (Haniff and Nur 4025, fl. Dec. [BZ; CA; K]; Curtis s.n. [B; W]).

Kedah, Langkawi Islands (Curtis 2950, fl. Sept. [BM; CA; K], type of *B. gracilis* Ridl.); id., Pulu Langkawi, Selat Panchor (Henderson 21381, fl. Nov. [K]).

#### SUMATRA.

Atjeh, Gajolanden, Mt. Kemiri (v. Steenis 9770, fl. March [BZ]; v. Steenis 10293, fl. March [BZ]).

West Coast, Ophir Distr., Talamau (Bünnemeyer 468 and 469, fl. Apr. [BZ]; Bünnemeyer s.n., fl. Apr. [BZ]); near Padang (Beccari 794, fl. Aug. [BZ; K; L]); Padangse Bovenlanden (Bernard s.n., fl. Oct. [BZ]; Jacobson s.n., fl. Feb. [BM]); Boekit Batoe (Jacobson s.n., fl. Nov. [BZ]).

Palembang, near Ranau lake, Mt. Pesagi (v. Steenis 3665, fl. Nov. [BZ]); id., Mt. Pahiwang (v. Steenis 3846, fl. Nov. [BZ]); id., W of Ranau lake (v. d. Pijl 352, fl. May [BZ]).

Benkoelen, Liwa (de Voogd 48, fl. Dec. [BZ]).

Lamong District, without precise locality (v. Andel s.n. [BZ]).

Without locality (Burck s.n. [BZ]; Korthals s.n. [L]; Jacobson 88a, fl. Jun. [BZ]; Bünnemeyer s.n. [BZ]); Korinchi, Sandaran Agong (Robinson and Kloss 169, fl. May [BM; K]; id., Siolak Bras (Robinson and Kloss s.n., fl. March [BM]).

#### BATOE ISLANDS.

Tana Masa (Raap 1, fl. Sept. [BZ]; Raap 211, fl. Sept. [BZ]).

#### JAVA.

Bantam, without precise locality (Forbes 121 [BM]).

Batavia, Mt. Salak (Lecomte and Finet 173 [P]; Boedijn s.n., fl. Apr. [BZ]; Bakhuisen v. d. Brink 697, fl. Apr. [BZ]; v. Steenis 138, fl. Dec. [BZ]; Docters v. Leeuwen-Reynvaan 8278, fl. Feb. [BZ]; Giesenhagen s.n., fl.

Jan. [M]; Bernard s.n. [BZ]; Raciborski s.n. [BZ]; Blume s.n. [L], type of *Gonyanthes candida* Bl.; coll. indig. s.n. [BZ; GRO]; coll. indig. 91 [L]; coll. indig. 56 [B]); Mt. Karang Gantoeagan (Backer 6277, fl. Dec. [BZ]); Sitoehiang, S of Leuwiliang (d'Arnaud Gerkens D27, fl. Jun. [BZ]); Mt. Soenarari (Backer 6338, fl. Jan. [BZ]); Wanajasa (Bakhuizen v.d. Brink 4644, fl. Jul. [BZ:L]); Mt. Gedeh near Djasinga (Backer 10126, fl. Nov. [BZ]); S of Djasinga (Backer 10252, fl. Nov. [BZ]); Pasir Koempoel near Nirmala (Backer 11019, fl. Dec. [BZ]); near Buitenzorg (Nongnong s.n., fl. Feb. [BZ]; Sanggaboewana (Backer 23797 [BZ]).

Preanger, Tjikidang (Bakhuizen v.d. Brink 1461, fl. Feb. [BZ; L]; Bakhuizen v.d. Brink 3293, fl. March [BZ]); Mt. Beser (Backer 22694, fl. Jun. [BZ]); id., Tjibeber (Bakhuizen v.d. Brink 1354, fl. Sept. [BZ]; Winckel 906b, fl. Apr. [BZ]; Winckel s.n., fl. Apr. [L]); Mt. Pangerango, Pasir Dator (Bakhuizen v.d. Brink 30, fl. Jun. [BZ; L]); Tjibadak (Bakhuizen v.d. Brink 3126, fl. Jan. [BZ]); Mt. Limo near Poentjak (v. Steenis 5616, fl. Sept. [BZ]); Ondern. Tjigoea (Backer 15130, fl. Jul. [BZ]); Posowahan (Docters v. Leeuwen s.n. [BZ]); Mt. Toegoe near Tjampaka (Smith 875, fl. Jun. [BZ; L]); Soekanegara (v.d. Pijl 506, fl. Jun. [BZ]); Pasir Walang, Mt. Tjikoraj near Nangerang (Backer 8739, fl. Aug. [BZ]); Mt. Tjiparaj, S of Mt. Gedeh (Backer 15036, fl. Jul. [BZ]).

Semarang, Mt. Oengaran (Docters v. Leeuwen-Reynvaan 2189, fl. Jun. [BZ]; v. Slooten s.n., fl. Jun. [BZ]).

Without locality (Korthals s.n. [L]; v. Steenis 2316 [BZ]; Blume s.n. [B; L]; Koorders 39666b, fl. March [BZ]; Backer 6213 [BZ]; Scheffer s.n. [BZ]; Backer 14027 [BZ]; Valetton s.n. [BZ]; Koorders 39663b, fl. March [BZ]; Wanapara, near Tjisarap (v. Slooten 478, fl. Jul. [BZ]).

#### BORNEO.

Sarawak, Sarawak Riv., Santubong (Haviland 168, fl. Jun. [K]); Dulit (Richards 1379, fl. Aug. [K]); Ulu Koyan (Synge S507, fl. Sept. [K]; Mt. Mattang (Beccari 1505, fl. May [FI]); without precise locality (coll. indig. 2509 [NY]; Beccari 17016 [BZ]).

British N. Borneo, Penibuken (Clemens 32192, fl. March [BZ]); Kinabalu (Clemens s.n. [BZ]); id., near Penokok (Haviland 13293 [K], type of *B. papillosa* Stapf).

Netherl. Borneo, B. Batoe Ajoh (Jaheri 1656 [BZ]); Mt. Damoes (Hallier 548 [BZ]); Sedomoem (Hallier 771 [BZ]); Mt. Klam (Hallier 2333 [BZ]); Mt. Kenepai (Hallier 1808 and 1809 [BZ]); Tabalong (Gandrup 27, fl. Apr. [BZ]); Long Sele (Schlechter 13461, fl. Aug. [B]); without locality (Endert 2631 [BZ]).

#### NEW GUINEA.

Netherl. New Guinea, Cycloop Mts. (Gjellerup 479, fl. Jun. [BZ], type of *B. Gjellerupii* J. J. S.).

British New Guinea, Gomadjidji (Schlechter 19345, fl. May [B; BR; K; M; P]; Schlechter 19741, fl. Jun. [B]); Etappenberg (Ledermann 9192, fl. Oct. [B]); Lordberg, camp 19 (Ledermann 9855, fl. Nov. [B]); Fly Riv. (Brass 6803, fl. May [Arnold Arbor., Jamaica Plain (Mass.) U.S.A.]).

#### BISMARCK ARCHIPELAGO.

New Ireland (Neu Mecklenburg), near Punam (Schlechter 14637, fl. Jul. [B], type of *B. novae-hiberniae* Schltr.).



51. *Burmannia malasica* Jonk., nov. spec.<sup>1)</sup>

Erect, slender, annual, saprophytic herbs, 5,8—8 cm high. Stem simple, usually one-flowered, rarely bearing two flowers

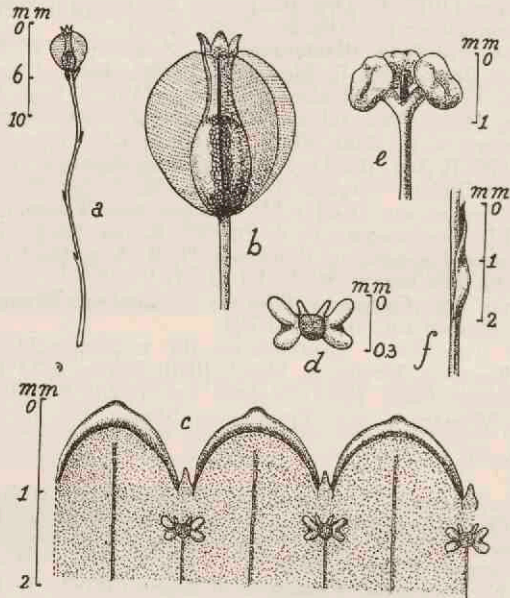


Fig. 12. *Burmannia malasica* Jonk. — a, flowering plant; b, flower; c, upper part of flower, dissected and showing flower-limb and stamens; d, stamen; e, style with stigmata; f, stem-scale.

<sup>1)</sup> *Burmannia malasica* Jonk., n.sp. — Herba annua, saprophytica, simplex vel ramosa, 5,8—8 cm alta. Folia basalia rosulata nulla, folia caulina sparsa, minora, lanceolata, subacuta, subcarinata, uninervia, sqamaeformia, 1,5—2 mm longa. Bracteeae ellipticae, acuminatae, uninerviae, fere 1,5 mm longae. Flores terminales, fere 5 mm longi. Lobi perianthii exteriores triangulares, apiculati vel acuminati, fere 1 mm longi, marginibus incrassatis. Lobi interiores membranacei, lanceolato-ovati, obtusi, fere 0,5 mm longi. Tubus perianthii brevis, cylindricus, fere 1,5 mm longus. Antherae sessiles, lobis interioribus oppositae, connectivo obtriangulare vel subquadrato, basi obtuso ecalcarato, cristis 2. divergentibus, brevibus. Stylus cylindricus, stigmatibus 3. infundibuliformibus, sessilibus. Ovarium subglobosum vel ellipsoideum, fere 2,5 mm longum et 2 mm latum. Alae semi-orbiculae vel late semi-ellipticae, fere 4 mm longae et usque ad 2 mm latae.

Hab.: Borneo et Siam australis. Typus: Winkler 3194 (Borneo neerl.) in herb. Berolinense.

at the apex. Basal, rosulate leaves lacking. Stem beset with few small, scalelike, appressed, subacute, lanceolate leaves, one-veined, more or less keeled, 1.5—2 mm long. Bracts elliptical, acuminate, 1-veined, about 1.5 mm long. Flowers erect, prominently 3-winged, purple or white with yellow limb, about 5 mm long. Outer perianth-lobes triangular with thick, fleshy, swollen margin, acuminate to apiculate at the apex, about 1 mm long. Inner lobes membranous, erect, lanceolate-ovate, obtuse, about 0.5 mm long. Perianth-tube cylindrical, rather short, about 1.5 mm long. Anthers sessile in the perianth-throat. Connective obtriangular, obtuse at the base, bearing two short, divergent crests at the apex. Basal, hanging connective-spur lacking. Style cylindrical to thick-filiform, bearing at its apex 3 sessile, funnel-shaped stigmas with thick margin. Ovary subglobose to elliptical, about 2.5 mm long and 2 mm broad. Flower-wings half-orbiculate to half-elliptical, about 4 mm long and up to 2 mm broad, running from the base of the limb to below the base of the ovary, slightly decurrent. Capsule elliptical to obovoid, dehiscent with a transversal split. Seeds numerous, minute, scobiform to fusiform.

**Type:** Winkler 3194 from Netherl. Borneo, in herb. B.

**Distribution:** Known from Netherl. Borneo and Southern Siam.

**BORNEO.**

Netherl. Borneo, SE Borneo, between Soemo Sibak and Benangin (Winkler 3194, fl. Aug. [B]).

**SIAM.**

Kopah, Jaujau hill (Haniff and Nur 2096, fl. Dec. [BZ; CA]).

52. **Burmattia Itoana** Mak. in Bot. Mag. Tokyo XXVII (1913) p. 1; — *Burmattia Wallichii* non Hook. f., Merrill and Chun in Sunyatsenia II (1935) p. 212.

Erect, slender, annual, saprophytic herbs, 4—13 cm high. Stem simple or branched, purplish, without chlorophyll, bearing

at the apex 1 or 2 shortly pedicellate flowers. Basal, rosulate leaves lacking, stem beset with reduced, lanceolate to ovate, scalelike leaves, up to 2.5 mm long. Bracts of equal length and shape as the leaves. Flowers erect, purplish, about 9—10 mm long, 3-winged. Outer perianth-lobes ovate-triangular, obtuse, erect, with broad, thick fleshy margin, about 1.5 mm long. Inner perianth-lobes minute, orbiculate, fleshy, glandular, papillose at the margin. Perianth-tube cylindrical, 4—5 mm long. Anthers sessile in the perianth-throat below the inner lobes. Connective oblong with 2 short lateral arms, bearing the thecae. A horizontal, retuse to emarginate roof at the connective-apex, as broad as the anther; at the base a median, hanging, obtuse spur. Whole anther T-shaped. Style thick-filiform, bearing at its apex 3 subsessile, curved, funnel-shaped, shortly appendaged stigmas. Style with stigmas about 5 mm long. Ovary subglobose, about 2 mm long. Flower-wings rather narrow, half-spathulate, obcordate, 5—5.5 mm long and about 1 mm broad. Capsule subglobose, dehiscent by a horizontal split. Seeds numerous, minute, oblong, yellow, brownish towards the top.

Type: Tanaka s.n. from the isle of Ishikaki (Yayeyama Islands) in herb.?

Distribution: Known from Yayeyama Islands, Liu-kiu Islands and Hainan.

Vernacular Names: Ruri-shakudyô, Yayeyama-shakudyô (Jap., according to Makino).

#### YAYEYAMA ISLANDS.

Ishikaki, Mt. Fazan in Okawa-mura (Tanaka s.n., fl. June, ex Makino l.c.).

#### LIU KIU ISLANDS.

Okinawa, Nago-mura in Kunchan-gôri (Nakano s.n., fl. Aug., ex Makino l.c.).

#### HAINAN.

Ng Chi Leng, Fân Yah (Chun and Tso 44056, fl. Oct. [NY]).

53. *Burmannia nepalensis* (Miers) Hook. f. in Fl. Br. Ind. V (1888) p. 666; Wright in Journ. Linn. Soc. XXXVI (1903) p. 4; Gagnepain in Lecomte, Fl. Gén. Ind.-Chin. VI (1908) p. 21; — *Burmannia Clementis* Schltr. in Phil. Journ. Sc. I Suppl. (1906) p. 305; — *Gonyanthes nepalensis* Miers in Trans. Linn. Soc. XVIII (1841) p. 537, t. 38, f. 1; — *Cyanotis nepalensis* Miers in Wallich, Cat. (1849) n. 9006.

Small, slender, erect, annual, saprophytic herbs, 3–11 cm high, without chlorophyll. Roots short, obtuse. Stem simple, 1–2-flowered or forking at the apex into a bifid cyme. Radical, rosulate leaves lacking, stem sparsely beset with elliptical, appressed, obtuse or acute scales, up to 3 mm long, with prominent midnerve. Inflorescence sometimes a double cincinnus, up to 5-flowered, stem usually 1–2-flowered at the apex. Below the single flower two opposite, lanceolate bracts, one bearing the flower in its axil, the other bearing a small flower-bud. Flower erect, shortly pedicellate, prominently 3-winged, 3–6,5 mm long, white, often tinged with yellow, rarely bluish. Outer perianth-lobes triangular with involute rounded lateral lobes with thick margin, 0,5–1,5 mm long.

Inner lobes smaller, obovate-rhomboid, up to 0,5 mm long. Perianth-tube conical, 1,5–3 mm long. Anthers sessile in the perianth-throat below the inner lobes. Connective oblong, with two divergent crests at the apex, tapering towards the base into a hanging, subacute spur. Style thick-filiform, bearing at the apex 3 sessile, obconical, funnel-shaped stigmas. Style with stigmas up to 2,5 mm long. Ovary subglobose, 1–2 mm long. Flower-wings rather broad, half-orbiculate, truncate to obcordate at the apex, 2–5 mm long and 1–3 mm broad, running from the base of the limb to the base of the ovary. Capsule subglobose, dehiscing with horizontal splits. Seeds numerous, fusiform.

Type Wallich (9006) from Nepal, in herb. BM, duplicate in herb. CA.

Distribution: Nepal, Assam, Southern China, Indo-China and Philippines.

NEPAL.

Without locality (Wallich 9006 [BM; CA]).

ASSAM.

Khasia hills (Kurz s.n. [CA]; unknown collector 45912, fl. Oct. [W]; Hooker and Thomson s.n. [B; BM; CA; G-BOIS; G-DEL; GH; GÖTT; L; M; P; P-DR; S; U; W]); id., near Laitanghot (Collet 42, fl. Aug. [CA]); Cherra-Punji (unknown collector 55 [CA]).

CHINA.

Kwantung, Loh Fau Mts. (Lohfaushan) (Merrill 10833, fl. Aug. [NY]; Ford 68, fl. Aug. [K]).

INDO CHINA.

Cambodge, Phu-quoc (Godefroy 848, fl. Nov. [K; P]); Cochinchina, Ti-Tinh (Thorel 1409 [P]); Dinh-quan, prov. of Bien-hoa (Poilane 25580, fl. Dec. [P]); Hui-diuh, prov. of Bà-ria (Poilane 648, fl. Oct. [P; U]); without locality (Pierre s.n. [B; BZ; CA; K; NY; P]).

PHILIPPINE ISLANDS.

Mindanao, Lake Lanao, Camp Keithley (Clemens 21, fl. Dec. [B; F]); type of *B. Celementis* Schltr.; Clemens s.n., fl. Nov. [B; F]; without locality (Clemens s.n. [MIS]).

54. *Burmanna stricta* Jonk., nov. spec.<sup>1)</sup>

Erect, unbranched, saprophytic herbs, 5–13,5 cm high. Stem very stiff, rather thick, beset with thornlike leaves, 0,5–1,5 mm long, scalelike, more or less patent, lanceolate, acuminate, with prominent midvein and two weak lateral veins.

<sup>1)</sup> *Burmanna stricta* Jonk., n.sp. — Herba annua, saprophytica, 5–13,5 cm alta, caule stricto, 1–2-floro. Folia basalia rosulata nulla, folia caulina squamaeformia, lanceolata, acuminata, 0,5–1,5 mm longa, prominenter uninervia, nervis lateralibus 2 indistinctis. Flores subsessiles, 6–11 mm longi, basi bibracteati. Bracteeae lanceolatae, obtusae, fere 1 mm longae. Lobi perianthii exteriores triangulares, fere 1 mm longi, apice acuti, marginibus involutis. Lobi interiores lineares, acuti, membranacei, fere 0,5 mm longi. Antherae sessiles ad bases loborum interiorum. Connectivum subquadratum, basi acutum, calcaratum, cristis 2, obtusis, divergentibus. Stylus cylindricofiliformis, stigmatibus 3, sessilibus, subcurvatis, infundibuliformibus, cristatis. Ovarium ellipsoideum, truncatum, 2,5–3,5 mm longum. Alae semi-ellipticae, 5–10 mm longae, usque ad 2 mm latae. Capsula ellipsoidea vel obovoidea, usque ad 5 mm longa. Semina numerosa, minuta, scobiformia.

Hab.: India orientalis australis, Cochinchina. Typus: Meebold 12337 in herb. BRSL, typi dupli in herb. B et Ca.

Bracts lanceolate, obtuse, about 1 mm long. Stem 1- or 2-flowered at the apex. Flowers subsessile, 6–11 mm long, prominently 3-winged. Outer perianth-lobes erect, acute, triangular, margin involute, not fleshy, about 1 mm long. Inner ones linear.

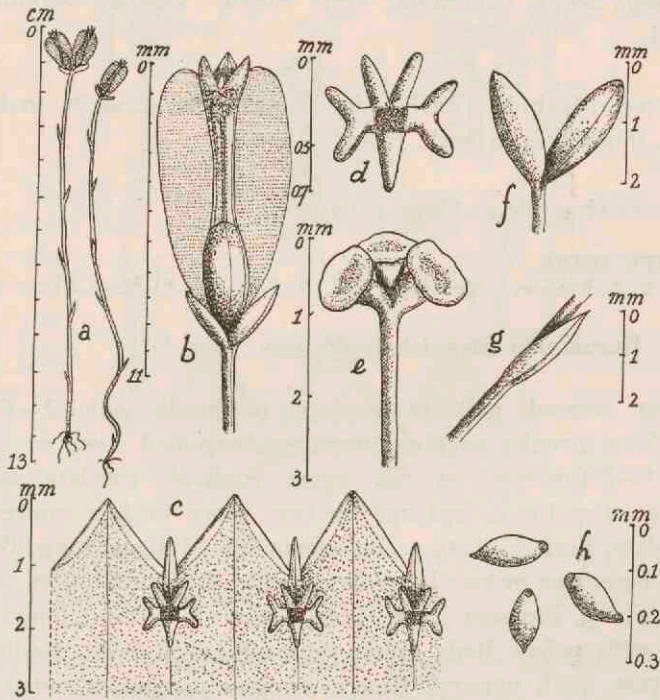


Fig. 13. *Burmannia stricta* Jonk. — a, flowering plants; b, flower; c, upper part of flower, dissected and showing flower-limb and stamens; d, stamen; e, style with stigmas; f, bracts; g, stem-scale; h, seeds.

acute, about 0.5 mm long, not fleshy. Perianth-tube cylindrical, 3–4 mm long. Anthers sessile in the perianth-throat, just below the inner perianth-lobes. Connective with two divergent, obtuse crests at the apex and two short, lateral arms, bearing the thecae, tapering at the base into an acute, hanging spur. Style thick-filiform, as long as the tube, bearing at its apex 3 sessile,

slightly curved, funnel-shaped, cristate stigmas. Ovary ellipsoid, truncate, 2.5—3.5 mm long. Flower-wings half-elliptical, membranous, up to 2 mm broad, 5—10 mm long, running from the base of the limb to the base of the ovary, decurrent along the very short pedicel. Capsule ellipsoid to obovoid, up to 5 mm long. Seeds numerous, very small, yellow, scobiform, curved.

Type: Meebold 12337 from South India, Cochin, in herb. BRSL, duplicates in herb. B and CA.

Distribution: Once collected.

SOUTH INDIA.

Cochin, Kavalay (Meebold 12337, fl. Nov. [B; BRSL; CA]).

55. *Burmanna Steenisii* Jonk., nov. spec.<sup>1)</sup>

Erect, annual, delicate, saprophytic herbs, only 2—6 cm high. Stem usually simple, sometimes branched, stem or branches 1—2-flowered at the apex. Radical, rosulate leaves lacking, stem-leaves reduced to few, more or less appressed, lanceolate, keeled, acute scales, about 0.5—1.5 mm long. Below each flower one or two lanceolate, acute, 1-veined bracts, about 1.5 mm long. Flowers erect, about 6 mm (3—7 mm) long, pure white with yellow limb. Outer perianth-lobes erect, triangular, subobtusate, with narrow, fleshy, swollen margin, about 1 mm

<sup>1)</sup> *Burmanna Steenisii* Jonk., n.sp. — Herba annua, saprophytica, gracillima, 2—6 mm alta, simplex vel ramosa, caulibus vel ramis 1—2-floris. Folia basalia rosulata nulla, folia caulina lanceolata, adpressa, acuta, fere 1 mm longa. Flores terminales, fere 6 mm longi. Lobi perianthii exteriores triangulares, subobtusati, fere 1 mm longi, marginibus incrassatis. Lobi interiores minuti, orbiculati, rotundati. Tubus perianthii trigono-cylindricus vel trigono-conicus, fere 2.5 mm longus. Antherae connectivis quadrangularibus, apice bicristatis, basi calcaratis. Cristae divergentes, obtusae, calcare lato obtuso. Stylus crassus, stigmatibus 3, sessilibus, infundibuliformibus, bilabiatis, labiis bilobulati. Ovarium subglobosum, fere 2 mm longum, alae semi-ellipticae vel semi-quadrangulares, fere 4.5 mm longae et 1.5 mm latae. Capsula subglobosa, transversaliter dehiscens. Semina numerosa, minuta, scobiformia.

Hab.: Java orientalis, Pasoeroean, in monte Lamongan. Typus: van Steedis 10686 in herb. Bogoriense.

long. Inner perianth-lobes minute, orbiculate, rounded. Perianth-tube cylindrical-trigonous to conical-trigonous, about 2,5 mm long. Anthers sessile in the perianth-throat below the inner perianth-lobes. Connective quadrangular with two short,

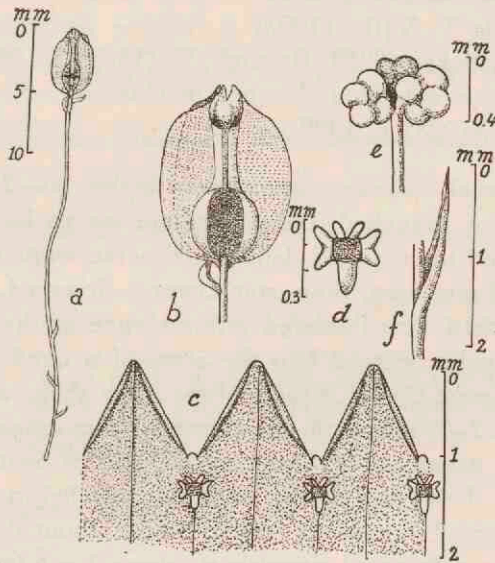


Fig. 14. *Burmannia Steenisii* Jonk. — a. flowering plant; b. flower; c. upper part of perianth, dissected and showing flower-limb and stamens; d. stamen; e. style with stigmas; f. stem-scale.

thick, straight, divergent, obtuse crests at the apex and a rather broad, hanging, obtuse spur at the base. Style thick-filiform, bearing 3 sessile, slightly curved, bilabiate, funnel-shaped stigmas at the top, stigma-lips rounded-bilabiate. Ovary subglobose, about 2 mm long. Flower-wings pure white, half-elliptical or slightly angular, half-quadrangular, about 4.5 mm long and 1.5 mm broad, running from the base of the limb to the base of the ovary. Capsule subglobose, dehiscent with transversal splits. Seeds numerous, minute, scobiform.

Type: van Steenis 10686 from East Java, Pasoeroean, Mt. Lamongan, in herb. BZ.



**Distribution:** Once collected.

JAVA.

Paseroean, Mt. Lamongan (v. Steenis 10686, fl. Jul. [BZ]).

56. *Burmattia candelabrum* Gagnep. in Bull. Soc. Bot. Fr. 54 (4me Série T. VIII) (1907) p. 462; — *Burmattia candida* non Griff., Hooker f., Fl. Br. Ind. V (1888) p. 665; — *Burmattia coelestis* non Don, Fischer in Gamble, Fl. Pres. Madras III. viii (1928) p. 1399.

Erect, annual, slender, saprophytic herbs, 10–25 cm high. Stem simple or branched. Basal, rosulate leaves lacking, stem-leaves reduced to scattered, lanceolate, acute, appressed scales, about 1–3,5 mm long. Stem sometimes 1-flowered, often bearing a branched, few-flowered inflorescence at the top. Inflorescence-branches curved like the arms of a candelabre, each bearing one erect flower. Bracts of the same shape as the stem-scales, about 2–3 mm long. Flowers 6–9 mm long, prominently 3-winged, usually blue. Outer perianth-lobes ovate, rounded, with a thick, fleshy bag on the inner side parallel to the margin. Inner lobes small, lanceolate, thick, fleshy, about 0,5 mm long. Perianth-tube cylindrical, very short, about 2 mm long. Anthers sessile in the perianth-throat, rather small. Connective oblong with two lateral arms, bearing the thecae, two apical, acute, divergent crests and an almost filiform, acute, basal spur. Style short, thick, filiform to cylindrical, bearing at its apex 3 obconical, funnel-shaped, sessile stigmas. Ovary obovoid to clavate, longer than the perianth-tube, 3–6 mm long. Flower-wings rather broad, half-obovate to half-orbicular, 5–10 mm long and 2–3 mm broad, blue, purplish or white, running from the base of the limb to the base of the ovary.

**Type:** Griffith 5598 from East Bengal in herb. P, duplicates in herb. CA; K and W.

**Distribution:** Known from Assam, Bengal and the Southern part of India.

## ASSAM.

Khasia hills (Clarke 15690, fl. Oct. [K]; Oldham 8 pp. [CA]; Oldham s.n. [CA]; Griffith s.n. [BM; CA; G-BOIS; GH; K]); id., near Laitangkot (Collet 47, fl. Aug. [CA]); id., near Maniloo (Clarke 15823, fl. Oct. [BM; W]; Clarke 45427, fl. Oct. [K; W]); id., near Kohong Rock (Clarke 15417, fl. Nov. [CA]); Boga Pani (Clarke 44884, fl. Oct. [K]); Kullong (unknown collector s.n., fl. Oct. [K]); Churra (unknown collector 2114, fl. Aug. [K]).

## BENGAL.

East Bengal, without precise locality (Griffith 5598 [CA; K; P; W]; Griffith 5597 [B; BRSL; G-BOIS; GÖTT; K; L; M; NY; P; S; W]).

## BOMBAY.

Concan. Matheran (Dalzell s.n. [CA]; Unknown collector s.n., fl. Nov. [CA]).

Canara, N Canara (Talbot 800, fl. Dec. [CA]; id., near Soopa (Talbot 1376, fl. Jun. [CA; K]).

Malabar, Karimalai (Fischer 1632, fl. Jan. [K]).

Cochin (Thustone s.n. [K]).

## MYSORE.

Annoor hill (Cleghorn s.n. [CA; BM; K]).

## SOUTHERN INDIA (LOCALITY UNKNOWN).

Annamallay (Wight (2938) fl. Dec. [CA; GH; K; NY; L]); Upper Paluès (Fischer 3032, fl. Sept. [K]); Savantvadi (Dalgado 3, fl. Dec.—Jan. [K]); Ponirang (unknown collector s.n., fl. Sept. [K]); „India” (Ritchie 1464, fl. Dec. [G-BOIS; GH]).

57. *Burmannia indica* Jonk., nov. spec.<sup>1)</sup>.

Erect, slender, saprophytic herbs, 10—23 cm high. Stem filiform, simple, only branching at the top into the inflorescence-branches. Stem-leaves appressed, scalelike, linear-lanceolate, acuminate, 1—4 mm long. Radical leaf-rosette lacking. Bracts

<sup>1)</sup> *Burmannia indica* Jonk., nov. sp. — Herba annua, saprophytica, erecta, 10—23 cm alta, caulibus filiformibus. Folia basalia rosulata nulla, folia caulina squamaeformia, adpressa, lineari-lanceolata, acuminata, 1—4 mm longa. Bracteae lanceolatae, acutae, 1—2,5 mm longae. Flores subsessiles, purpurascens, 9—18 mm longi, basi bibracteati, erecti, in cincinnos geminos paucifloros conferti vel solitarii. Lobi perianthii exteriores triangulares, acuti, 1—2 mm longi, marginibus incrassatis. Lobi interiores lineares, acuti, incrassati, 0,5—1 mm longi. Antherae connectivis trapeziformibus, apice bicristatis, basi calcaratis. Cristae curvatae, divergentes, calcare obtuso. Stylus crassus, stigmatibus 3, sessilibus, curvatis, infundibuliformibus, subbilabiatis. Tubus perianthii trigono-cylindricus. Ovarium ellipsoideum vel obovoideum, truncatum, 1,5—4 mm longum. Alae purpureae, semi-oblancoolatae, 7—17 mm longae et 1,5—4 mm latae.

Hab.: India orientalis australis, Travancore. Typus: Meebold 12915 in herb. Berolinense.

lanceolate, acute, 1—2,5 mm long. Stem 1-flowered at the top or bearing a 3—5-flowered, bifid cincinnus, Flowers subsessile,

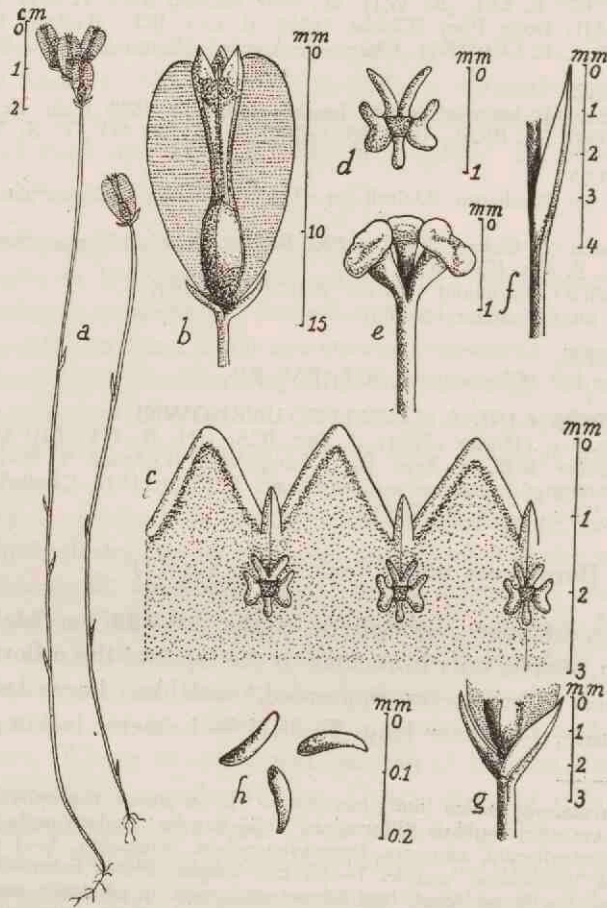


Fig. 15. *Burmannia indica* Jonk. — a, flowering plants; b, flower; c, upper part of perianth, dissected showing limb and stamens; d, stamen; e, style with stigmas; f, stem-scale; g, flower-base with bracts; h, seeds.

purplish, 9—18 mm long, prominently 3-winged. Outer perianth-lobes erect, triangular, acute, 1—2 mm long, with thick, swollen margin. Margin not double and not involute. Inner lobes linear,

acute, 0,5—1 mm long, thick, swollen. Anthers sessile in the perianth-throat, connective trapeziform with two divergent, obtuse, curved, apical crests and a rather thick, basal, hanging, obtuse spur. Style bearing at its apex 3 sessile, curved, funnel-shaped, subbilabiate stigmas. Style with stigmas 5—10 mm long. Ovary ellipsoid to obovoid, truncate, 1,5—4 mm long. Flower-wings purplish, half-elliptical or half-oblancoolate, slightly cordate at the top, running from the base of the limb to the base of the ovary and decurrent along the very short pedicel. Wings 7—17 mm long and 1,5—4 mm broad. Capsule obovoid or obconical, up to 7 mm long, dehiscing with transverse splits. Seeds numerous, very small, scobiform, slightly curved, yellowish.

Type: Meebold 12915, from South India, Travancore, in herb. B.

Distribution: Once collected.

SOUTH INDIA.

Travancore, Peermade (Meebold 12915, fl. Dec. [B]).

Subtribus 2, **APTERIEAE** Miers.

Saprophytic herbs with 3 stamens and a 1-celled ovary with 3 parietal placentas.

Key to the genera.

1. *a.* Perianth-limb deciduous. Seeds subglobose, ovoid or ellipsoid. On both sides of the top of each placenta a gland, inside the ovary ..... 2
- b.* Perianth-limb persistent. Seeds linear or sublinear, seldom ellipsoid. Ovary without placenta-glands... 3
2. *a.* Capsule dehiscent with one longitudinal split. Funicles of the same length or longer than the seeds..... 4. **Cymbocarpa**, p. 165
- b.* Capsule dehiscent irregularly at the top or with irregular transversal splits. Funicles almost lacking..... 5. **Gymnosiphon**, p. 168
3. *a.* Filaments inserted with their bases in crescent-shaped sacks ..... 4
- b.* Filaments and crescent-shaped sacks lacking. Anthers sessile in the perianth-throat ..... 5
4. *a.* Filaments with two broad, rounded wings. Perianth-lobes 6, inner ones narrower. Ovary without glands ..... 6. **Apteria**, p. 203
- b.* Filaments wingless. Perianth-lobes 3, inner ones lacking. Ovary crowned by 3 stipitate glands inside the perianth-tube ..... 7. **Marthella**, p. 212
5. *a.* Flowers constricted, in cincinni. Ovary without glands ..... 8. **Dictyostega**, p. 213
- b.* Flowers not constricted, in umbelliform inflorescences. On the top of the ovary, inside the perianth-tube, 3 sessile, subglobose glands ... 9. **Miersiella**, p. 218

## 4. CYMBOCARPA Miers.

Erect, saprophytic, colourless herbs. Stem glabrous, terete, simple or branched, 1-flowered or bearing a few-flowered bifid inflorescence at the top. Rhizome beset with imbricate scales and short, hairlike rootlets. Leaves scalelike, small. Flowers subsessile. Perianth 6-lobed, outer lobes longer than the inner ones, erect. Stamens sessile below the inner perianth-lobes. Ovary with 3 parietal placentas; in the upper part of the ovary, on both sides of each placenta, a rather large, globular gland. Funicles long, as long as or longer than the seeds. Style filiform, branched in the upper part into 3 short branches, each bearing a stigma without long appendages, but with hornlike processes. Limb of the perianth, after flowering, deciduous just below the stamens. Perianth-tube persistent on the fruit. Capsule triangular in transversal section, dehiscent in longitudinal direction in the upper side of the capsule, dehiscent fruit vessel-shaped. Seeds ovoid, obtuse-acuminate at the side of the funicle, with a loose, reticulate testa.

Type-species: *Cymbocarpa refracta* Miers.

Distribution: 2 species, one of them once collected in British Guiana, the other species known from the West-Indian Islands, Costa Rica, Colombia, Venezuela and Brazil.

Key to the species.

1. *a.* Perianth-tube with a ring of 3 prominent sacks near the base ..... 2. *C. saccata* Sandw.  
*b.* Perianth-tube without sacks..... 1. *C. refracta* Miers.

1. *Cymbocarpa refracta* Miers in Proc. Linn. Soc. I (1840) p. 62; Miers in Trans. Linn. Soc. XVIII (1841) p. 544 and tab. 38 f. 4; Seubert in Mart., Flor. Bras III. 1 (1847) p. 60; Karst. in Linnaea XXVIII (1856) p. 423; Urb. in Symb. Ant. III (1903) p. 446; Schlechter in Fedde, Rep.

XVII (1921) p. 258; Urb. in Fedde, Rep. XVII (1921) p. 258; Urb. in Fedde, Rep. XX (1924) p. 298; Urb. in Ark. f. Bot. 20A n. 15 (1926) p. 14; — *Cymbocarpa Urbani* Goeb. et Suessg. in Flora n. F. XVII (1924) p. 77; v. d. Pijl in Rec. Trav. Bot. Néerl. XXXI (1934) p. 761 etc.; — *Gymnosiphon refractus* (Miers) Benth. et Hook., Gen. Plant. III. 2 (1883) p. 458; Johow in Pringsh., Jahrb. f. Wiss. Bot. XX (1889) p. 475 etc. and Taf. 19, Fig. 3: — *Ptychomeria tenella* non Benth. Gris., Cat. Cub. (1866) p. 257.

Plants 5—16 cm high. Stem erect, glabrous, terete, simple or branched in the upper part, white or yellowish-white, bearing 1—3 flowers or a double cincinnus at the apex. Leaves small, scalelike, ovate, acute, about 1 mm long. Root-scales imbricate, acute or acuminate, 1—2.5 mm long. Flowers sessile or short-pedicellate, white, complete flower about 7 or 8 mm long. Perianth 6-lobed, lobes acute, outer lobes longer, about 2 mm long, inner lobes smaller, about 0.5 mm long. Perianth-tube just below the limb often swollen. Anthers sessile in the swollen part below the inner perianth-lobes. Connective broad. Style filiform, the 3 style-branches short. Stigmas round with lobed margin and on the upper surface two longer and two shorter, slightly curved, acute horns. Ovary deltoid, 1.5—3 mm long. Placentas with large glands. Funicles very long, the same length as the mature seed or longer. Maturing ovary elongate. Capsule rather long, vessel-formed when dehisced. Cleft-margins curled outwards. Seeds with reticulate, elongate testa. — Saprophyte on decaying roots and leaves.

**Type:** Miers s.n. from Brazil (Rio de Janeiro), Corcovado, in herb. BM; duplicates in herb B; G-BOIS; G-DEL and K.

**Distribution:** West-Indian Islands, Costa Rica, Colombia, Venezuela and Brazil.

**CUBA.**

Oriente, near Monteverde (Wright 1470 [GH; GÖTT; K]; Wright 3284, fl. and. fr. Jul. [B; BM; G-BOIS; G-DEL; GH; GÖTT; MIS; K; P;

S; US; W]); Monte Libanon (Wright 29?, fl. Sept. [GÖTT]); Loma Cardero, Pico Turquino [Nucker 31, fl. Oct. [NY]]; without locality (Wright 30? [S]).

Santiago de Cuba, Sierra Maestra, Jaquarito Mts. (Norman Taylor 545, fl. Sept. [NY]).

#### JAMAICA.

Mabers Riv. (Harris 9152, fl. Dec. [NY]).

#### HAITI.

Rep. Haiti, Masif du Nord near St. Louis du Nord, between M. Chavary and Haut-Piton (Ekman H. 4725, fl. Aug. [B]); id., near Bayeux (Ekman H. 2866, fl. Jul. [B]).

San Domingo, Cordillera Central, Prov. de Azua, San Juan, Loma la Vieja, near Arraoya de la Vieja (Ekman H. 13420, fl. Aug. [B]).

#### COSTA RICA.

Talamanca, Haute Talamanca, between Ukatschka and Bruschik (Pittier 12707, fl. Sept. [US]).

San José, near El General (Skutch 2768 [S]).

#### COLOMBIA.

Bogotá, Bogotá (Karsten s.n. [B]).

#### VENEZUELA.

Miranda, Aragua, Las Matas, Valle de Aragua (Karsten s.n. [W]).

Carabobo, San Estaban near Puerto Cubello, road from San Estaban to Cumbre de San Hilaire (Goebel s.n. [M], type of *C. Urbani* Goeb. et Suessg.).

#### BRAZIL.

Rio de Janeiro, Corcovado (Miers s.n., fl. March [B; BM; G-BOIS; G-DEL; K]); Serra do Pamandua, Sta. M. Magdalena (Santos Lima 286, fl. March [R; U]; Tijuca (Ule 4001, fl. March [B]); without locality (Glaziou 18561 [B; K; P]).

São Paulo, Ribeira Riv., Pariqueira Mirim (Brade 5733, fl. Jun. [S]); Alto da Serra, Estação Biologica (Smith 2020, fl. Feb. [GH]).

Sta. Catharina, without precise locality (Mueller 482 [K]).

Without locality, Rio Peronpava, Ignape (Brade s.n., fl. Apr. [B]).

## 2. *Cymbocarpa saccata* Sandw. in Kew Bull. (1931) p. 60.

Plant 6—18 cm high, yellowish-white. Stem simple or branched, bearing at the apex 2 or 3 flowers or a double cincinnus, consisting of 5 or 7 flowers. Leaves, rootstock, root-scales, flower-limb, anthers, style and stigmas as in the preceding species. Perianth-tube with a ring of 3 prominent sacks at the base. Flowers creamy-white, sessile or subsessile. Capsule to 4 mm long, dehiscent as in the preceding species, vessel-formed when dehiscent.



Type: Sandwith 132, from British Guiana, in herb. K.

Distribution: Once collected.

BRITISH GUIANA.

Essequibo Riv., Moraballi Creek, near Bartica (Sandwith 132, fl. Aug. [K]).

5. GYMNOSIPHON Bl.

Annual, erect, saprophytic herbs. Stem simple or branched, 3—many-flowered, mostly bearing at the top a double cincinnus, rarely 1-flowered. Leaves small, sessile, ovate or lanceolate-ovate, scalelike. Flowers sessile or shortly pedicellate, perianth consisting of a tubular part and a 6-lobed limb. Outer perianth-lobes ovate, much larger than the inner lobes. Stamens 3, inserted below the inner perianth-lobes. Anthers sessile, connective rather broad, inappendiculate or mucronulate at the top. Thecae bursting with a median, horizontal cleft. Ovary ovoid or nearly globose. Placentas 3, parietal, each placenta bearing at both sides of the top a large, globose gland. Ovules many, small, funicle shorter than the ovules. Style reaching the insertion of the stamens and then branching off into 3 short branches, each bearing a stigma. Stigmas often appendiculate. Perianth-limb after flowering deciduous below the insertion of the stamens, the upper part of the style also with the stamens deciduous. Perianth-tube persistent on the capsule. Capsule dehiscent at the top or irregularly, in longitudinal direction, with three clefts between the placentas. Seeds ovoid or nearly globose, reticulate.

Type-species: *Gymnosiphon aphyllus* Bl.

Distribution: Widely spread in the Malayan Archipelago, New Guinea, Malay Peninsula, Tropical Africa, Madagascar, Guatemala, Honduras and British Honduras, Panama West-Indian Islands and tropical South-America.

7 Species in Asia and New Guinea, 3 species in Africa and 19 species in America.

Key to the sections:

1. *a.* Capsule dehiscing at the top, reticulate-perforated (Asia, New Guinea) ... Sect. I, **Eugymnosiphon** Urb.
- b.* Capsule dehiscing with 3 longitudinal clefts between the placentas, not perforated (Africa, America) .....  
..... Sect. II, **Ptychomeria** (Benth.) Urb., p. 177

### SECT. I. EUGYMNOSIPHON Urb.

Key to the species.

1. *a.* Anthers inserted above the middle of the perianth... 2
- b.* Anthers inserted in, or below the middle of the perianth ..... 4
2. *a.* Flowers  $\pm$  sessile in a 1- or sparsely-flowered inflorescence at the top of the stem ..... 3
- b.* Flowers pedicellate, in loose, many-flowered cincinni or bifid cincinni ..... 1. **G. aphyllus** Bl.
3. *a.* Capsule  $\pm$  globose. Margin-lobes of the outer perianth-lobes crenate ..... 2. **G. oliganthus** Schltr.
- b.* Capsule conical-ovoid. Margin-lobes of the outer perianth-lobes entire ..... 3. **G. minahassae** Schltr.
4. *a.* Anthers inserted below the middle of the perianth. Connective apiculate at the top. Ovary elongate-conical, tapering into the pedicel... 4. **G. affinis** J. J. S.
- b.* Anthers inserted in the middle of the perianth. Connective not apiculate. Ovary separated from the pedicel ..... 5
5. *a.* Stem 1 or 2-flowered or many sessile flowers in a capitate inflorescence at the top of the stem ..... 6
- b.* Flowers sessile or subsessile in loose cincinni or bifid cincinni ..... 5. **G. papuanus** Becc.
6. *a.* Outer perianth-lobes acuminate, a third of the length of the whole perianth. Connective narrow. Stigmas with dorsal crista. Inflorescence 2—many-flowered...  
..... 6. **G. neglectus** Jonk.

- b. Outer perianth-lobes deltoid, short, a fifth of the whole perianth. Stigmas without crista. Inflorescence 1—3-flowered ..... 7. *G. pauciflorus* Schltr.

1. *Gymnosiphon aphyllus* Bl., Enum. Pl. Jav. I (1827) p. 29; (*G. aphyllum*); Miquel, Fl. Ned. Ind. III (1855) p. 615; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 73; Koorders, Exk. Fl. Jav. I (1911) p. 344; Schlechter in Fedde, Rep. XVII (1921) p. 256; J. J. Smith in Bull. Jard. Bot. Buit., Sér. III, Vol. IV (1922) p. 230; Merrill, Enum. Phil. Fl. Pl. I. 1 (1924) p. 251; Ridley, Fl. Mal. Pen. IV (1924) p. 306; v. Steenis in Trop. Nat. XXIII (1934) p. 53 and fig. 14; — *Gymnosiphon borneense* Becc., Malesia I (1877) p. 241; — *Gymnosiphon pedicellatum* Schltr. in Engl., Jahrb. XLIX (1913) p. 105; Schltr. in Fedde, Rep. XVII (1921) p. 256.

Plants up to 17 cm high. Stem simple or branched, white, yellowish-white, bluish or lilac, at the top forked into a bifid cincinnus or bearing a simple, up to 6 cm long cincinnus. Leaves scalelike, 1—2.5 mm long, acute, often keeled and appressed against the stem, ovate or lanceolate-ovate. Pedicels 1—5 mm long, in the axils of scalelike, ovate, obtuse, small bracts. Flowers many, inflorescence rather loose. Perianth whitish, bluish or lilac, tubular part up to 4 mm long, limb about 2.5 mm long, the upper part of the perianth deciduous just below the anthers, the lower part of the tube, about 2—3.5 mm long, persistent on the capsule. Outer perianth-lobes ovate, obtuse, each with a narrow, crenate margin-lobe at both sides. Inner lobes linear-lanceolate, minute. Stamens inserted just below the inner lobes, connective broad, triangular, not appendiculate. Ovary ovoid, about 2 mm long, style filiform, branched at the apex into three very short branches, each bearing a curved, funnel-shaped, inappendiculate stigma, triangular on transverse section. Placenta-glands well-developed. Capsule about 3 mm long, with reticulate wall-structure, reticulate-perforated when ripened. Seeds elliptic to ovoid, brown, reticulate.

Type: Blume s.n., Java, Mt. Megamendoeng, in herb. L.

Distribution: Malay Archipelago, Malay Peninsula and South Siam.

#### NEW GUINEA.

Netherl. New Guinea, N part. Begowi Riv. (Gjellerup 191, fl. Jun. [BZ]); id., Gauthier Mts. (Gjellerup 862, fl. Nov. [BZ]); S part, Lorentz Riv., Nepenthes hill (Versteeg 1337 pp., fl. Jun. [BZ]); id. Resi top (Versteeg 1630, fl. Aug. [BZ]), Mt. Carstensz, Camp III (Boden Kloss s.n., fl. Dec. [BM]).

British New Guinea, Kaiserin Augusta Riv., Etappenberg (Ledermann 145a, fl. Oct. [B]).

#### JAVA.

Res. Batavia, near Leuwiliang, Pasir Sidjahé (Bakhuizen v. d. Brink 6397, fl. Jun. [BZ]); id., Mt. Tjipoetih (id. 4240, fl. Sept. [BZ]); id., Mt. Mandauh (id. 1738, fl. Feb. [BZ]); id., Mt. Wiroe, near Nangela (id. 7501, fl. Feb. [BZ]); id., Pasir Tjihideung (Bakhuizen v. d. Brink fil. 3323 (3325), fl. Jun. [BZ; U]); Mt. Niroe near Nangela (v. Steenis 2784, fl. Feb. [BZ]); Mt. Gedeh near Djasinga (Backer 10125, fl. Nov. [BZ]); Mt. Gedeh (Backer 10256, fl. Nov. [BZ]; Backer 10326, fl. Nov. [BZ]); Mt. Soenarari (Backer 6322, fl. Jan. [BZ]); Pasir Kempoel near Nirmala (Backer 11018, fl. Dec. [BZ]); Tjibodas (Schlechter 13593, fl. Sept. [B]).

Preanger Regentschappen, Mt. Megamendoeng (Blume s.n. [L]).

#### CELEBES.

Upper Lampasioe (Schlechter 20657, fl. Jan. [B], type of *G. pedicellatum* Schltr.).

#### BORNEO.

British N. Borneo, Mt. Kinabaloë, Marai Porai Spur (Clemens 11029, fl. Dec. [BZ; NY]); id., Mt. Nunkok (Clemens 32757 pp., fl. Apr. [BZ; L; NY]).

Sarawak, Mt. Matang (Beccari s.n., [FI], type of *B. borneense* Becc.); id., Garar (Haviland 1041, fl. Aug. [K]).

Netherl. Borneo, Res. Zuider- en Oosterafdeling, between Simurung and Soengai Tarik (Winkler 3014, fl. Juli [B]); Bandjermasin (Motley 1200 [K]); Longhoet (Endert 2773a, fl. Aug. [BZ]); Res. Westerafdeling, Soengai Kenepai (Hallier 2075, fl. Jan. [BZ]).

#### MENTAWEI ISLANDS.

Isle of Sibéroet, near Sibéroet (Iboet 120, fl. Sept. [BZ]).

#### ANAMBAS AND NATOENA ISLANDS.

Boengoeran Island, Mt. Ranai (v. Steenis 1483, fl. Apr. [BZ]).

#### MALAY PENINSULA.

Singapore, Kranji (Schlechter 13151, fl. March [B]); Bukit Timah (Ridley s.n. [K]).

Johor, Batu Pahat (Kelsall s.n., ex Ridley 1924).

Malacca, Bukit Sadanen (Ridley s.n., ex Ridley 1924).

Pahang, Taka Tahan (Ridley s.n., ex Ridley 1924).

Selangor, Petaling (Ridley s.n., ex Ridley 1924).

Perak, Tapah (Ridley 14116, fl. Nov. [BM; K]); Mt. Batu Putih (Wray 1008 [K]).

Kedah, Kedah Peak (Ridley s.n., ex Ridley 1924).

SIAM.

Klao Nong, Bandon (Robinson 5788, fl. Jun. [K]).

2. **Gymnosiphon oliganthus** Schltr. in Engl., Jahrb. XLIX (1913) p. 101 (*G. oliganthum*); Schltr. in Fedde, Rep. XVII (1921) p. 256.

Small herbs, 4—9.5 cm high. Stem simple or branched in the upper part, very tender, 1 or 2-flowered at the top. Leaves scalelike, acute, minute, to 1 mm long, somewhat keeled, appressed against the stem. Bracts keeled, obtuse, pedicels to 3 mm long. Flowers up to 5 mm long, erect, white to bluish-lilac. Outer perianth-lobes triangular, obtusiuscious, with a crenulate margin-lobe at both sides. Inner lobes small, cuneate, obtuse-truncate. Stamens inserted just below the inner lobes, anthers quadrangular, connective when young, narrow, later on deltoid, not appendiculate. Style filiform, branched in the upper part into 3 short branches, each, bearing a soup-plate-shaped, auriculate stigma. Perianth-limb and stamens deciduous above the stigmas. Ovary ovoid. Capsule globose, reticulate, crowned by the 1—2 mm long persistent part of the perianth-tube. Seeds globose, at one side with elongate testa.

Type: Schlechter 19355 from Br. New Guinea, in herb. B.

Distribution: Once collected in N.E. New Guinea, closely related to the following species.

NEW GUINEA.

British New Guinea, NE part, Gomadjidji, Waria (Schlechter 19355, fl. May [B]).

3. **Gymnosiphon minahassae** Schltr. in Engl., Jahrb. XLIX (1913) p. 104; Schltr. in Fedde, Rep. XVII (1921) p. 256.

Small herbs, 7—12 cm high. Stem simple or rarely branched,

at the top 2—5-flowered. Leaves scalelike, acute, minute, to 1 mm long, appressed against the stem. Bracts keeled, obtusiusculous. Pedicels 1—3 mm long, flowers erect, white, with bluish lobes, to 7 mm long. Outer lobes bluish, obtuse, with an entire margin-lobe at both sides. Inner lobes small, lanceolate. Stamens inserted just below the inner lobes, anthers quadrangular, connective without appendages. Style filiform, branched in the upper part into three branches, each bearing a quadrangular, at the apex truncate, at the base apiculate stigma. Ovary ovoid. Capsule ovoid-conical, to 3 mm long, reticulate, crowned by the 1—2 mm long persistent part of the perianth-tube. Perianth-limb deciduous above the anthers.

Type: Schlechter 20531 from Minahassa, Celebes, in herb. B.

Distribution: Once collected in the Minahassa, the northern part of the Isle of Celebes; closely related to the preceding species.

#### CELEBES.

Res. Menado, Minahassa, Mt. Klabat (Schlechter 20531, fl. Dec. [B]).

4. **Gymnosiphon affinis** J. J. S. in Nov. Guin. VIII (1909) p. 194 (*G. affine*); Schltr. in Fedde, Rep. XVII (1921) p. 256; — *Gymnosiphon torricellense* Schltr. in Engl., Jahrb. XLIX (1913) p. 101; Schltr. in Fedde, Rep. XVII (1921) p. 256.

Plants 7—13 cm high. Stem simple or branched, white, lilac or rose-coloured, at the top forked into a bifid cincinnus or bearing a simple cincinnus or 1—3 flowers. Leaves scalelike, 1—2 mm long, ovate, acuminate. Bracts to 3 mm long, scalelike, acuminate. Pedicels 1—4 mm long, flowers erect or inclined about 6 mm long. Perianth white, tubular part about 1.5 mm long. Limb rather long, about 2.5 mm. Outer lobes ovate, obtuse, with a crenate margin-lobe at both sides. Inner lobes small, rather broad, obovate, obtuse. Stamens inserted below

the middle of the perianth, perianth-tube swollen at the insertion of the stamens. Connective quadrangular, acute-apiculate at the top. Style filiform, branched in the upper part into three branches, each bearing a soup-plate-shaped, rather large stigma. Ovary obconical, swollen in the upper part, tapering towards the pedicels, about 1,5 mm long. Capsule thick-ellipsoid, seeds brownish, reticulate, fusiform. Capsule crowned by the very short persistent part of the perianth-tube, capsule about 3—3,5 mm long, persistent tube-part about 2 mm long, cylindrical to conical.

Type: Versteeg 1425 from Netherlands New Guinea, Lorentz Riv., in herb. BZ.

Distribution: Only known from New Guinea.

#### NEW GUINEA.

Netherl. New Guinea, N part, Idenburg Riv., Prauwenvivak (Lam 1207, fl. Sept. [BZ]); S part, Lorentz Riv., Nepenthes hill (Versteeg 1337 pp., fl. Jun. [BZ]); id., Gelukshill (Versteeg 1425, fl. Jul. [BZ]); Upper v. d. Sande Riv. (=Beaufort Riv.) (Pulle 373, fl. Nov. [U]).

British New Guinea, Torricelli Mts. (Schlechter 20042, fl. Sept. [B], type of *G. torricellensis* Schltr., incomplete material but very probably belonging to this species).

5. ***Gymnosiphon papuanus*** Becc., Malesia I (1877) p. 241 (*G. papuanum*); J. J. Smith in Nova Guinea VIII (1909) p. 194; Ridley in Trans. Linn. Soc. 2nd. Ser. Vol. IX, Bot. (1916) p. 228; Schlechter in Fedde, Rep. XVII (1921) p. 256; — *Gymnosiphon celebicum* Schltr. in Engl., Jahrb. XLIX (1913) p. 104; Schlechter in Fedde, Rep. XVII (1921) p. 256.

Plants 4—14 cm high. Stem branched or simple, colourless, bearing at the top rather loose, simple or bifid cymes of 3-many subsessile flowers. Leaves scalelike, up to 2,5 mm long, acuminate. Bracts ovate, acuminate, to 3,5 mm long. Flowers erect, sessile or subsessile, up to 7 mm long. Perianth whitish-purplish, tubular part up to 4,5 mm long, limb about 1,5 mm long. Outer perianth-lobes ovate, triangular, obtuse, with an entire,

involute lateral lobe at both sides. Inner lobes small, linear. Stamens inserted in the middle of the perianth, connective deltoid, at the top 3-lobed, with a forked thickening (ex *Schlechter*, not seen). Style filiform, bearing at the top 3 subsessile, erect, large soup-plate-shaped stigmas. Stigmas at the top obtuse-cordate, at the base auriculate. Ovary ovoid, about 1.5 mm long, with well-developed placenta-glands. Capsule obovoid to truncate-subglobose, 2.5—5 mm long, crowned by the rather short cylindrical or curved cylindrical, 2—2.5 mm long persistent part of the perianth-tube.

Type: Beccari 627 from New Guinea, Andai, in herb. Fl.

Distribution: Known from Celebes, Palau Islands and New Guinea.

CELEBES.

Upper Lampasioe (Schlechter 20671, fl. Jan. [B]), type of *G. celebicum* Schltr.).

PALAU ISLANDS.

Babelthaop (Ledermann 14539a, fl. March [B]); id., Ngarsul (Ledermann 14453, fl. Feb. [B]).

NEW GUINEA.

Netherl. New Guinea, Andai (Beccari 627 [FI]); Mt. Morait (Beccari s.n., fl. Feb. [FI]).

6. *Gymnosiphon neglectus* Jonk., nov. spec.<sup>1)</sup>.

Plants 7.5—11 cm high. Stems simple or branched, at the top bearing one or few flowers or a capitate inflorescence consisting of contracted cincinni. Leaves 1—2.5 mm long, lanceolate-

<sup>1)</sup> *Gymnosiphon neglectus* Jonk., n. sp. — Herba saprophytica, gracilis, pusilla, 7.5—11 cm alta. Caulis gracilis, plerumque simplex, teres, glaber, inflorescentia subcapitata, pauciflora. Squamae lanceolato-ovatae, acuminatae. Bractae ovatae, acuminatae. Flores subsessiles, fere 6 mm longi. Lobi exteriores ovati, acuminati, margines involuti, crenulati. Lobi interiores minuti lineares. Antherae sessiles, quadrangulares, medio tubo insertae. Stylus filiformis, glaber, apice tripartitus, stigmatibus infundibuliformibus cristatis non-appendiculatis. Ovarium ovoideum. Capsula subglobose, reticulata, perianthii tubo coronata.

Hab.: Java. Typus: Bakhuizen v. d. Brink 2436 in herb. Bogoriense.



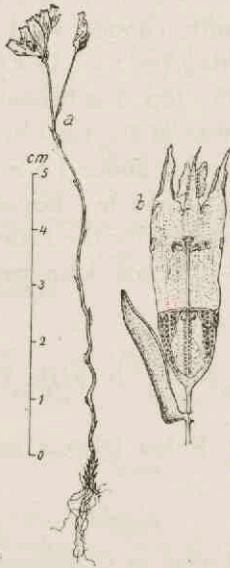


Fig. 16. *Gymnosiphon neglectus* Jonk.  
a. flowering plant.  
b. dissected flower.

ovate, acuminate, keeled. Bracts to 5,5 mm long, ovate, acuminate, keeled. Flowers subsessile, erect, about 6 mm long. Perianth dirty-white, tubular part cylindrical, about 2 mm long, limb about 2 mm long. Outer lobes ovate, acuminate, with a crenate margin-lobe at both sides. Inner lobes small, linear, acute. Stamens inserted in the middle of the perianth, anther quadrangular, connective small, narrow, short. Style filiform, branched in the upper part into 3 short branches, each bearing a curved, funnel-shaped, dorsally cristate stigma. Ovary ovoid, about 2 mm long. Capsule nearly globose, with persistent reticulate wall-structure and crowned by a 2 mm long cylindrical persistent part of the perianth-tube.

Type: Bakhuizen van de Brink 2436, from Java, in herb. BZ.

Distribution: Java.

#### JAVA.

Preanger, Tjadas Malang, Tjidadap, Tjibeber (Bakhuizen v. d. Brink 2436, fl. March [BZ]; Bakhuizen v. d. Brink 2908, fl. Apr. [BZ]).  
Semarang, Mt. Oengaran (v. Slooten s.n., fl. Jun. [BZ]).

7. *Gymnosiphon pauciflorus* Schltr. in Engl., Jahrb. XLIX (1913) p. 102 (*G. pauciflorum*); Schltr. in Fedde, Rep. XVII (1921) p. 256.

Plants 2,5—9,5 cm high. Stem simple, colourless, bearing at the top 1—3 erect flowers. Leaves scalelike, ovate, acuminate, 1—1,5 mm long. Bracts obtuse-acuminate, to 3 mm long. Flowers sessile or subsessile, about 7 mm long. Perianth whitish to purpureous, tubular part about 4 mm long, limb very short.

Outer perianth-lobes ovate, acute, about 1—1.5 mm long, with an entire margin-lobe at both sides. Inner lobes minute. Insertion of the stamens very low, below the middle of the perianth, connective not apiculate, forked at the top (ex Schlechter). Style filiform, forked in the upper part into 3, rather long branches, each bearing an ovoid, in transverse section somewhat triangular stigma. Ovary obovoid, about 2 mm long. Capsule with persistent, reticulate wall-structure, ovoid, to 3.5 mm long, crowned by the, 1.5—2.5 mm long, persistent part of the perianth-tube.

Type: Schlechter 16653 from New Guinea, in herb. B.

Distribution: Once collected in Br. New Guinea.

NEW GUINEA.

British New Guinea, Kani Mts. (Schlechter 16653, fl. Oct. [B]).

## SECT. II PTYCHOMERIA (Benth.) Urb.

Key to the subsections.

1. *a.* Stigmas without long appendages, entire or 2-lobed ..... subject. 1. **Inappendiculati** Jonk.
- b.* Stigmas with long, filiform appendages..... subject. 2. **Appendiculati** Jonk. p. 184

Subject. 1. **Inappendiculati** Jonk.<sup>1)</sup>

Key to the species.

1. *a.* Inflorescence capitate, bracts and leaves rather large. Outer perianth-lobes beset with long hairs ..... 8. **G. fimbriatus** (Benth.) Urb.
- b.* Inflorescence not capitate, bracts and leaves very small, outer perianth-lobes not hairy ..... 2

<sup>1)</sup> **Inappendiculati** Jonk., nov. subsect.—*Gymnosiphonis* species e sectione *Ptychomeriarum* stigmatibus inappendiculatis.

2. *a.* Stigmas 2-lobed, candle-stick-shaped. Bracts peltate, black. Connective not apiculate ..... 9. *G. divaricatus* (Benth.) Benth. et Hook.
- b.* Stigmas entire. Bracts scalelike, colourless. Connective apiculate ..... 3
3. *a.* Flowers very small, up to 5 mm long. Stem often much branched ..... 10. *G. sphaerocarpus* Urb.
- b.* Flowers about 8—15 mm long. Stem simple, only branched at the top into the inflorescence-branches... 4
4. *a.* Insertion of the anthers rather low in the tube. Slender small plants ..... 5
- b.* Insertion of the stamens in the perianth-throat. Plants much larger, stem robust, 3—many-flowered. Tropical East-Africa ..... 11. *G. usambaricus* Engl.
5. *a.* Inner perianth-lobes bifid, inserted just below the outer ones. Stigmas sessile. Madagascar ..... 12. *G. Danguyanus* Perr.
- b.* Inner perianth-lobes lanceolate, inserted in the tube. Stigmas on short style-branches ..... 13. *G. tenellus* (Benth.) Urb.

8. *Gymnosiphon fimbriatus* (Benth.) Urb. in Symb. Ant. III (1903) p. 438; — *Ptychomeria fimbriata* Benth. in Hook., Journ. of Bot. VII (1855) p. 14; Schlechter in Fedde, Rep. XVII (1921) p. 256.

Plants 6—10 cm high. Stem thick, robust, whitish, beset with rather large, ovate, acute or acuminate, concave, sometimes imbricate, scalelike leaves, to 5 mm long and 2 mm broad. Inflorescence at the top of the stem, capitate, consisting of contracted bifid cymes, surrounded by large, ovate, acute or acuminate bracts, up to 8 mm long. Pedicels very short or absent. Flowers (without fringe) 5—8 mm long, limb 1.5—3 mm long, tube 2.5—4 mm long. Perianth whitish. Outer perianth-lobes ovate, obtuse, with lanceolate, entire lateral lobes. The upper third part outside beset with fringe, arranged in two convergent

lines, margin of the upper third part also bearing fringe. Longest fringe about 2 mm long. At the top of the perianth-lobe a long fringe, forked at its top. Inner perianth-lobes small, thick, fleshy, cup-shaped, inserted in the perianth-throat. Stamens inserted below the inner lobes, connective deltoid. Style filiform, branching in the upper part into three branches, each bearing a cup-shaped stigma with a pair of basal and apical mucronations. Perianth-limb perhaps not deciduous. Ovary ovoid to half-globose, tapering towards the pedicel, about 1.5 mm long.

Type: Spruce 2930 from Brazil (Amazonas) Panurê, in herb. K, duplicates in herb. B; BM; BR; G-BOIS; G-DEL; P-DR; W.

Distribution: Only known from Amazonian Brazil.

#### BRAZIL.

Amazonas, Rio Negro, São Gabriel (Spruce 2300, fl. Apr. {K}); Rio Uaupês, Panurê (Spruce 2930, fl. Feb. [B; BM; BR; G-BOIS; G-DEL; K; P-DR; W]).

9. *Gymnosiphon divaricatus* (Benth.) Benth. et Hook., Gen. Plant. III. 2 (1883) p. 458; Urb. in Symb. Ant. III (1903) p. 438; — *Ptychomeria divaricata* Benth. in Hook., Journ. of Bot. VII (1855) p. 16; Schlechter in Fedde, Rep. XVII (1921) p. 256.

Plants 11—30 cm high. Stem simple or branched, forked at the top in a loose, bifid cincinnus. Leaves scalelike, 0.5—1 mm long, ovate, acute. Inflorescence—"branches" 1—5.5 cm long, horizontal, flowers erect. Bracts small, thick, fleshy, black, peltate. Flowers 9—10 mm long, tubular part length about 4 mm, limb length about 4 mm. Outer perianth-lobes ovate, acute, with shorter, lanceolate-ovate, entire lateral lobes. Inner perianth-lobes small, linear. Perianth thin, white, purpureous-pointed, infundibuliform. Stamens inserted in the throat of the perianth, connective broad, quadrangular, without appendages. Style filiform, branching in the upper part into three short bran-

ches, each of them bearing a two-lobed, candle-stick-shaped stigma. Stigma-lobes lanceolate, acute, without filiform appendages. Ovary about 2 mm long, ovoid. Perianth-limb deciduous. Capsule obovoid, to 4 mm long, crowned by a persistent part of the tube. — The flowers emit a very pleasant odour, not unlike that of our Primrose (Spruce).

Type: Spruce 2815, from Brazil (Amazonas) Panuré, in herb. K; duplicates in herb. B; BM; BR; C; G-BOIS; G-DEL; GH; GÖTT; P; P-DR; S; W.

Distribution: Once collected in Amazonian Brazil by Spruce, who remarks however: „This species..... is the most common in the Uaupés, growing everywhere throughout the forest, though in a very scattered manner”.

**BRAZIL.**

Amazonas, Rio Uaupés, Panuré (Spruce 2815, fl. Jan. [B; BM; BR; C; G-BOIS; G-DEL; GH; GÖTT; K; P; P-DR; S; W]).

10. *Gymnosiphon sphaerocarpus* Urb. in Symb. Ant. III (1903) p. 442; — *Ptychomeria sphaerocarpa* (Urb.) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants 6—11,5 cm high. Stem white, simple, at the top forked into two cincinnus-arms, or much-branched and bearing many simple and double, richly flowered cincinni. Inflorescences length to 4 cm. Pedicels to 2,5 mm long, often flowers sessile. Leaves scalelike, about 1 mm long, ovate, acuminate. Flowers rather small, to 5 mm long, limb to 2 mm long, tubular part to 1,5 mm long. Perianth white, outer lobes ovate, obtuse, bearing at both sides ovate to lanceolate lateral lobes. Inner lobes linear-lanceolate, acute, very small. Stamens inserted below the inner lobes in the throat of the perianth. Anthers quadrangular, connective subulate-apiculate. Style thick-filiform, thickened at the base and in the upper part, at the top branched into three very short branches, each bearing a 2-lobed (subsessile)

stigma, without filiform appendages. Ovary to 1 mm long, broad-ovoid. Capsule obovoid to nearly globose, up to 1.5 mm long, crowned by a very short, cylindrical persistent part of the perianth-tube.

Type: L'Herminier s.n., from Guadeloup, in herb. B, duplicate in herb. G-BOIS.

Distribution: West-Indian Islands, known from Jamaica, Porto Rico and Guadeloup.

JAMAICA.

John Crow Mts. (Harris and Britton 10705, fl. March [NY]).

PORTO RICO.

Indiera Fria, near Maricao (Britton, Cowell and Brown 4471, fl. Feb. [F; NY; US]).

GUADELOUP.

Bois des Bains Jaunes (Duss 3942, fl. Oct. [NY]); without locality (L'Herminier s.n. [B; G-BOIS]).

11. *Gymnosiphon usambaricus* Engl. in Engl., Jahrb. XX (1894) p. 138; Wright in Thiselt.-Dyer, Fl. Trop. Afr. VII (1898) p. 12; — *Dictyostega usambarica* Engl. in Abh. Berl. Akad. Wiss. (1894) p. 45 (nomen); — *Ptychomeria usambarica* (Engl.) Schltr. in Fedde, Rep. XVII (1921) p. 258.

Plants 10—30 cm high. Stem simple or branched, ribbed, robust, bearing at the top a 3—many-flowered, bifid cincinnus. Leaves scalelike, lanceolate-ovate or ovate, to 2.5 mm long, obtusiusculous. Inflorescences loose, flowers large, odorous, on 2—5 mm long pedicels. Bracts minute, scalelike. Perianth white, tube 4—6.5 mm long, limb 5—7 mm long. Outer perianth-lobes broad-ovate, obtuse, with lanceolate, obtuse, lateral lobes, about as long as the midlobe. Inner lobes ovate, small, short-stipitate. Stamens inserted in the upper parts of the tube, below the inner perianth-lobes. Connective rectangular, at the top apiculate. Style filiform, branched in the upper part into three short branches, each bearing an inappendiculate, soup-

plate-shaped stigma. Ovary obovoid, 1—1.5 mm long, placenta-glands well-developed. Capsule to 3 mm long, nearly globose, crowned by the 3—4.5 mm long, cylindrical to conical persistent part of the perianth-tube.

Type: Holst 2478, Usambara, in herb. B.

Distribution: Only known from the Tanganyika Territory (tropical East-Africa).

TANGANYIKA TERRITORY.

Usambara, Amani (Engler 842, fl. Sept. [B]; Warnecke 511, fl. Sept. [B; K; P]; herb. Amani, unknown collector 427, fl. Jun. [B]); Bamole (Greenway 871, fl. Oct. [K]); without precise locality (Holst 2478, fl. March [B]). Morogoro, Uluguru Mts., Ukambaku (Schlieben 3578, fl. Feb. [BM; BR; S]).

12. *Gymnosiphon Danguyanus* Perr. in Not. Syst. V. 2 (1936) p. 160 (*G. Danguyanum*); Perrier de la Bâthie in Cat. Pl. Madag. Acad. Malgache (1934) p. 10.

Small plants, 3.5—9 cm high. Rhizome tuberous, beset with ovate scales. Stem white, usually simple, branched at the top into the 1—5 flowered inflorescence up to 15 mm long. Leaves scalelike, obtuse, lanceolate, 0.5 mm long. Flowers 7—10 mm long, white. Pedicels rather long, to 4 mm. Perianth-limb about 2 mm long, outer lobes ovate, obtuse, with oblanceolate, obtuse, lateral lobes. Inner lobes minute, bifid, inserted between the outer lobes, just at the base of these. Perianth-tube about 4.5 mm long, cylindrical in the lower part, suddenly widening above the anthers. Stamens very small, inserted rather lowly in the tube, below the inner perianth-lobes. Connective quadrangular, mucronulate at the top. Style filiform, with the stigmas up to 3.5 mm long, bearing 3 funnel-shaped, sessile stigmas without appendages. Ovary about 1.5 mm long, obovoid, placenta-glands rather small, seen with difficulty. Capsule up to 3 mm long, ellipsoid or obovoid to subglobose, crowned by a 1—2 mm long persistent part of the perianth-tube.

Type: Perrier de la Bâthie 18515 from Madagascar, in herb. P.

Distribution: Only known from Madagascar.

#### MADAGASCAR.

Mt. Tsaratanana (Perrier de la Bâthie 16068, fl. Apr. [P]); Massif d'Andringitra (Perrier de la Bâthie 14476, fl. Feb. [P]); Analabe, N de Tananarive (Perrier de la Bâthie 18515 [P]); Firingalava (Perrier de la Bâthie 343, fl. Apr. [P]); Baie d'Ampasindava near Nosi-Bé (Boivin s.n., fl. March [P]); without locality (Jumelle s.n. [K]).

13. *Gymnosiphon tenellus* (Benth.) Urb. in Symb. Ant. III (1903) p. 438; — *Ptychomeria tenella* Benth. in Hook., Journ. of Bot. VII (1855) p. 17; Schlechter in Fedde, Rep. XVII (1921) p. 257; — *Gymnosiphon Glaziovii* Urb. in Symb. Ant. III (1903) p. 438; — *Ptychomeria Glaziovii* (Urb.) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants 4–15 cm high. Stem white or light-purple, usually simple, bearing at the top 1–5 flowers, arranged in a double cincinnus. Inflorescence to 2 cm long. Leaves many, scalelike, acute, 1–1.5 mm long. Flowers sessile or on short pedicels, 9–14 mm long. Perianth white, bluish or purple, hypocrateriform, tube length 5–7 mm, limb 2.5–5 mm long. Outer perianth-lobes ovate, obtuse, with lanceolate, obtuse lateral lobes. Inner lobes linear, small, inserted in the upper part of the perianth-tube. Stamens inserted below the inner lobes, rather low in the tube. Connective quadrangular, mucronulate at the top. Style filiform, branching in the upper part into three branches, each bearing a soup-plate-shaped stigma, without appendages. Ovary 1.5–2 mm long, ovoid or obovoid, placenta-glands rather small, seen with difficulty. Capsule ovoid, to 2.5 mm long, crowned by a rather long, cylindrical persistent part of the perianth-tube (up to 5 mm long).

Type: Spruce 1224, from Brazil, Amazonas, Rio Negro in herb. K, duplicates in herb. BM; G-BOIS; G-DEL; GH; M; P; P-DR and W.



**Distribution:** known from Brazil, Colombia and Paraguay.

**BRAZIL.**

Amazonas: Rio Negro, Manaus (Ule 5275, fl. Jan. [G-DEL]); id., Sao Gabriel (Spruce 2299, fl. Apr. [BM; BR; C; G-DEL; K; P-DR; W]); id., Barra (Spruce 1224, fl. Jan. [BM; G-BOIS; G-DEL; GH; K; M; P; P-DR; W]); Rio Uaupés, Panuré (Spruce 2931, fl. Feb. [K]).

Rio de Janeiro, Sta. M. Magdalena, Aguas Paradas, Toca (S. Lima and Brade 14174, fl. March [R]); without precise locality (Glaziou 19938 pp. [B; K; P], type of *G. Glaziovii* Urb.).

**COLOMBIA.**

Sur de Santander, Magdalena Valley near Barranca Bermeja (Haught 1434, fl. Dec. [US]).

**PARAGUAY.**

Serra de Maracayú, near Potrella (Rojas 10129, fl. Jan. [B]).

Note: Bentham also described to this species a small-flowered variety, var. *minor*. These specimens however do not belong to this species but to *G. arcuatus* Urb.

Subsect. II. **Appendiculati** Jonk<sup>1)</sup>.

1. *a.* Inflorescences capitate, surrounded by large bracts ..... 14. **G. capitatus** (Benth.) Urb.
- b.* Inflorescences not capitate ..... 2
2. *a.* Inner perianth-lobes broad-obovate, rounded, often folded. Inflorescences contracted, many-flowered. Outer perianth-lobes half the length of the whole perianth ... 15. **G. cymosus** (Benth.) Benth. et Hook.
- b.* Inner perianth-lobes very small, outer ones shorter. Inflorescences not contracted ..... 3
3. *a.* Ovary and lower part of the perianth-tube narrowly 3-winged. Pedicels short ... 16. **G. guianensis** Gleas.
- b.* Ovary not winged ..... 4
4. *a.* Ovary very short, patelliform. Pedicels rather long. Thecae stalked. Bracts dark-coloured ..... 17. **G. breviflorus** Gleas.
- b.* Ovary ovoid or obconic, thecae not stalked ..... 5

<sup>1)</sup> **Appendiculati** Jonk., nov. subsect. — *Gymnosiphonis* species e sectione *Ptychomeriarum* stigmatibus filiformiter appendiculatis.

5. *a.* Flowers large, 8—12 mm long. Stem robust. Connective bilobate at the top ..... 18. *G. suaveolens* (Karst.) Urb.  
*b.* Flowers usually smaller. Plants slender. Connective entire ..... 6
6. *a.* Stigmas on short style-branches ..... 7  
*b.* Stigmas sessile or nearly so ..... 10
7. *a.* Inflorescences 3—(4—) flowered, flowers about 6,5 mm long. Connective apiculate ... 19. *G. arcuatus* Urb.  
*b.* Inflorescences usually many-flowered. Connective not apiculate ..... 8
8. *a.* Capsule globose. Persistent tube-part rather long, length about 3 mm ..... 20. *G. mattogrossensis* (Malme) Jonk.  
*b.* Capsule ovoid or ellipsoid. Persistent tube-part short, about 1 mm long. West-Indian Islands ..... 9
9. *a.* Perianth-tube cylindrical, ovary ovoid. Limb twice as long as the tube. Outer perianth-lobes deeply 3-lobed ..... 21. *G. niveus* (Gris.) Urb.  
*b.* Perianth-tube constricted, ovary obconical. Limb about the same length as the tube. Outer perianth-lobes only at the top 3-lobed ... 21. *G. Germaini* Urb.
10. *a.* Flowers about 5—6 mm long. Ovary obconical. West-Indian Islands ..... 23. *G. Fawcetti* Urb.  
*b.* Flowers larger ..... 11
11. *a.* Perianth-tube longer than the limb ..... 12  
*b.* Limb of equal length as the tube or shorter ..... 13
12. *a.* Ovary and capsule obovoid. Perianth-tube not striped and not constricted ..... 24. *G. cornutus* (Benth.) Benth. et Hook.  
*b.* Ovary patelliform, capsule subglobose. Perianth-tube striped, constricted ..... 25. *G. Tuerckheimii* Jonk.
13. *a.* Ovary and capsule obovoid. Tube shorter than the limb. Inflorescence 3—5-flowered ..... 26. *G. panamensis* Jonk.  
*b.* Ovary obovoid, capsule globose. Tube of equal

length as the limb. Inflorescence 3—many-flowered.  
 (Tropical West Africa) .....  
 ..... 27. *G. longistylus* (Benth.) Hutch.

14. *Gymnosiphon capitatus* (Benth.) Urb. in Symb. Ant.  
 III (1903) p. 439; — *Ptychomeria capitata* Benth. in Hook.,  
 Journ. of Bot. VII (1855) p. 15; Schlechter in Fedde, Rep.  
 XVII (1921) p. 256.

Plants 4—19 cm high. Stem white, simple. Cymes contracted to capitate inflorescences, 0.5—1 cm long and 1—1.5 cm broad, nearly globose. Young inflorescences ovoid, slightly acuminate. Bracts large, ovate, acuminate, to 1 cm broad. Leaves scalelike, ovate, acute, keeled, 1—7 mm long. Flower-buds about 6 mm long. Perianth white, tube length about 2 mm, lobes about 2 mm long. Outer perianth-lobes ovate, obtuse, with rather broad, ovate, crenate lateral lobes. Inner lobes fleshy, cup-shaped, inserted in the mouth of the tube. Inserted inside the perianth-limb, e.g. on both sides of the inner lobes, a couple of long hairs, forming clusters under the inward folded lateral lobes of the outer perianth-lobes. Stamens inserted below the inner lobes, connective inappendiculate. Style filiform, branching into three very short branches, each bearing a funnel-shaped, curved stigma, somewhat triangular on transverse section. Stigma with two filiform appendages on the upper surface. Ovary ovoid, about 2 mm long. Placenta-glands well-developed. Capsule unknown, perianth-limb perhaps not deciduous.

Type: Spruce 2880, from Brazil (Amazonas), Rio Uaupés, in herb. K, duplicates in herb. BM; BR; G-DEL; P-DR; W.

Distribution: Once collected in Amazonian Brazil.

#### BRAZIL.

Amazonas, Rio Uaupés, Panuré (Spruce 2880, fl. Feb. [BM; BR; G-DEL; K; P-DR; W]). Spruce remarked: "The specimens in these papers are gathered miles apart, but I suppose they are all the same species".

15. *Gymnosiphon cymosus* (Benth.) Benth. et Hook., Gen. Pl. II. 2 (1883) p. 458; Urb. in Symb. Ant. III (1903) p. 438; — *Ptychomeria cymosa* Benth. in Hook., Journ. of Bot. VII (1855) p. 15; Schlechter in Fedde, Rep. XVII (1921) p. 256.

Plants 12—29 cm high. Stem violet, sometimes much-branched. Inflorescences contracted, to 14 cm long, 9—many-flowered. Pedicels 0,5—4 mm long. Bracts minute. Leaves ovate, acute, 2—3 mm long. Flowers about 7 mm long. Perianth violet outside, inside white. Tube length about 3,5—4 mm, limb about 2,5 mm long. Outer perianth-lobes long, lanceolate, obtuse, with lanceolate, crenate lateral lobes. Inner perianth-lobes broad, ovate, rounded at the top, in young flowers folded lengthwise. Anthers inserted rather low, in the middle of the flower, perianth-tube swollen at the insertion of the anthers. Connective broad, obtuse, dark-coloured, bearing no appendages at the apex, tapering to the base, short-stipitate. Style filiform, branching in the upper part into three short branches, each bearing a somewhat capitate stigma. Stigma with two long, hairlike appendages at the top. Ovary obovoid, short, about 1 mm long, placenta-glands rather large. Capsule dark bluish-grey, nearly globose, about 2 mm long and 2 mm broad. Persistent part of the perianth-tube cylindrical, 3—4 mm long. Seeds subglobose.

Type: Spruce 2829a, from Amazonian Brazil, in herb. K; duplicates in herb. BM; BR; C; G-BOIS; GH; GÖTT; P; P-DR; W.

Distribution: Brazil.

**BRAZIL.**

Amazonas, Rio Uaupés near Panuré (Spruce 2829a, fl. Jan. [BM; BR; C; G-BOIS; GH; GÖTT; K; P; P-DR; W]); Rio Negro near Sao Carlos (Spruce 2829b, fl. Apr.-May [B; K; P; P-DR; S; W]); Amazone Riv., isle of Colares (Poeppig 3013 pp. [P; W]).

Para, Utinga (Guedes 2007, fl. March [S; U]).

16. *Gymnosiphon guianensis* Gleas. in Bull. Torr. Bot. Cl. LXI (1929) p. 22; Sandwith in Kew Bull. (1931) p. 60.

Plant 15—27 cm high. Stem white, simple or branched, at

the top forked into two cincinnus-arms. Inflorescences 3—many-flowered. Leaves scalelike, ovate, acute, 1—2 mm long. Inflorescence a spreading, double cincinnus, branches 1—16 cm long. Bracts ovate, obtuse, dark-coloured, pedicels 1—2 mm long. Flowers erect, 9—11 mm long. Perianth white, tube 5—6 mm long, constricted, limb 3—4 mm long. Outer perianth-lobes almost acute, with rather broad, entire lateral lobes. Inner lobes small, linear. Anthers inserted below the inner perianth-lobes, quadrangular, connective small, narrow, without appendages. Style filiform, branched in the upper part into three branches, each bearing a stigma. Stigmas in the upper part bilobate, stigma-lobes fading into the long, hairlike stigma-appendages. Ovary small, short, patelliform, lower tube-part and ovary narrowly 3-winged. Placenta-glands large. Capsule subglobose, crowned by the persistent part of the perianth-tube, growing to 6 mm long.

Type. Im Thurn s.n., from British Guiana, Potaro Riv., in herb. K.

Distribution: Hitherto only collected in British Guiana.

#### BRITISH GUIANA.

Mazaruni Riv. (Stockdale 205, fl. Apr. [K]); id., Himarrackbia (Jenman 7191 pp., fl. Dec. [K]); id., Kurupung (Leng 131, fl. Nov. [NY]); id., island near Kabawiru fall (Altson 304, fl. Aug. [K]); Potaro Riv., Tukeit (Im Thurn s.n., fl. Feb. [K]); id., near Tumatumari (Cheong 28 [UIS]); Esse-quiibo Riv., Moraballi Creek, near Bartica (Sandwith 11, fl. Aug. [K]); Sandwith 175, fl. Sept. [K]; Bartica-Potaro road (Sandwith 1096 and 1102, fl. Aug. [K]); Onderneeming (Bartlett s.n. [K], ex Gleason l.c.); Upper Berbice Riv. (Abraham 216 [NY]); Kaietur falls (Appun s.n. [BM]); Cuyuni Supenaam Divide (Davis 1049, D47, fl. March [K]); Essequiibo, Moco Noco path, Breakfast Camp (Anderson s.n., fl. March [K]); id., N of Tinamu falls, Cuyuni Riv. (Martyn 332, fl. March [K]); Waiapi line near Mazaruni Station (Forest Departm. Br. Guian. A71 (2355), fl. March, [K]).

17. *Gymnosiphon breviflorus* Gleas. in Bull. Torr. Bot. Cl. LVI (1929) p. 22; Sandwith in Kew Bull. (1931) p. 60.

Plants 10—30 cm high. Stem white, simple, branching at the top into a bifid cincinnus, inflorescence-branches 1—8 cm long.

Leaves ovate, acute, about 1 mm long. Inflorescence spreading, 3—many-flowered, flowers erect, about 6 mm long. Bracts scallike, ovate, rather acute, dark-coloured. Pedicels much longer than in the preceding species, usually about 4.5 mm long. Perianth white, tube length about 3 mm, somewhat constricted, limb about 2.5 mm long. Outer perianth-lobes ovate, obtuse, with rather broad, entire, lateral lobes. Inner lobes small, lanceolate-ovate. Anthers sessile below the inner lobes. Connective broad, deltoid, obtuse. Thecae stalked, hanging. Style filiform, branching off at the top into three, rather long branches, each bearing a stigma. Stigma intensive orange-coloured, tapering at the base into a spurlike appendage, bilobate at the top. Stigma-lobes fading into long, hairlike appendages, inserted in the middle of the dorsal surface. Ovary patelliform, 1.5—2 mm long, not winged. Placenta-glands rather large, bulging, Capsule 1.5—2 mm long, subglobose, crowned by the, about 4 mm long, persistent part of the perianth-tube.

Type: Hitchcock 17349, from British Guiana, Potaro Riv., in herb. NY; duplicates in herb. K; S; US.

Distribution: Hitherto only collected in British Guiana.

BRITISH GUIANA.

Mazaruni Riv., near Kurupung (Leng 311 pp., fl. Dec. [NY]); id., near Himarrackbia (Jenman 7191 pp., fl. Dec. [B; K]); Potaro Riv., Tumatumari (Hitchcock 17349, fl. Jan. [K; NY; S; US]); Essequibo Riv., Moraballi Creek near Bartica (Sandwith 706, fl. Nov. [K]); Corantyne Riv. (Jenman 501, fl. Sept. [K]); Essequibo, Cuyuni Riv., below Tinamu Falls (Martyn 286, fl. March [K]); Bartica Potaro road, near Barabara Creek (Sandwith 1101; fl. Aug. [K]).

18. *Gymnosiphon suaveolens* (Karst.) Urb. in Symb. Ant. III (1903) p. 438; Knuth in Fedde, Rep. Beih. XLIII (1928) p. 212; — *Benitzia suaveolens* Karst. in Linnaea XXVIII (1856) p. 420; Karst. in Nov. Act. Leop. XXVI (1858) p. 887; — *Ptychomeria suaveolens* (Karst.) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants 8—30 cm high. Stem white, robust, thick, usually sim-

ple, bearing at the top a bifid, 3—17-flowered cincinnus. Stem sometimes single-flowered. Leaves scalelike, 1—3 mm long, ovate or lanceolate, obtuse. Bracts minute, pedicels white or vinous-purple, 2—6 mm long. Flowers 8—12 mm long.

Perianth white or blue, tubular part length 2—3.5 mm, limb 4—5 mm long. Outer perianth-lobes ovate, obtuse, with lanceolate lateral lobes, as long as, or sometimes longer than the mid-lobe. Inner lobes clavate, sometimes rather large and reaching the middle of the outer lobes, often thick and glandular swollen. Anthers inserted in the throat of the perianth, connective split at the top into two lobes, bearing the thecae. Style thick-filiform, branched at the top into three branches, each bearing a stigma with two long, thick-filiform appendages at the top. Ovary 2—3.5 mm long, obovoid. Placenta-glands well-developed. Capsule ellipsoid or obovoid, 3.5—5 mm long, bluish-grey, crowned by a 2—4 mm long, cylindrical persistent part of the perianth-tube. Funicle very short. Seeds ovoid.

Type: Karsten s.n., from Venezuela, Colony Tovar near Caracas, in herb. W; duplicates in herb. B; GÖTT; K.

Distribution: Widely spread from Southern Mexico to Brazil.

#### MEXICO.

Oaxaca, Huatuo (Giesbreght 72, fl. Aug. (Apr.?) [P]).

Chiapas, near Tumbala (Nelson 3344, fl. Oct. [GH; US]).

#### GUATEMALA.

Alta Verapaz, Pansamalá (v. Tuerckheim 1042 pp., fl. Aug. [B; GH; K; P; US]); Coban (v. Tuerckheim II. 1421, fl. Nov. [US]; Lehmann 1305, fl. Apr. [G-BOIS]); without precise locality (v. Tuerckheim II. 1293, fl. Jul. [BR; BRSL; GH; NY; US]).

#### PANAMA.

Chiriqui, Valley of upper Rio Chiriqui Viejo (White 15, fl. Jul.—Aug. [MIS; U]); White 24, fl. Jul.—Aug. [MIS; U]).

#### COSTA RICA.

Custa del Sitio de Eusebio Ortez; also S. of Cartago, S slopes of all the central volcanes (Endres s.n., fl. Jul.—Aug. [W]); Barva Vulc. (Hoffman 68, fl. Aug. [B]); Ronduz 1308, fl. Aug. [US]; La Carpintera (Lankester 35, fl. Sept. [US]); Cemos del Escasú (Brade 17117 [US]); Massif de l'Iscajú (Pittier 13061, fl. Jul. [US]); Forest of La Palma, near San Ramon (Brenes 4049, fl. Aug. [F]); Tablazo (Brade 2077, fl. Aug. [B]).

## COLOMBIA.

Tolima (Linden 966, fl. Jan. [BM; G-BOIS; P; W]); id., Ibaguë (Goudot s.n. [G-BOIS; P; P-DR; W]).

Santander, near Charta (Killip and Smith 19322, fl. Feb. [US]); near Pamplona (Kalbreyer 1211, fl. Apr. [B]).

Magdalena, Sierra Nevada de Sta. Martha, S. Miquel (Karsten s.n. [GÖTT; K?; W]); id., Sierra de Onaca (H. H. Smith 2516, fl. Aug. [F; K; NY; S; U; US]).

Cauca, Munchique (Kjell von Sneidern 709, fl. Jun. [S]).

## VENEZUELA.

Miranda, Caracas (Gollmer s.n., fl. Sept. [B]) Forest of Catuche and Cotiza, near Caracas (Pittier s.n. [US]); Colony Tovar near Caracas (Karsten s.n. [B; GÖTT; K; W]; Fendler 1315 [BR; G-BOIS; GH; K; NY] Moritz 1616 [B; BM]).

## BRAZIL.

Rio de Janeiro, Alto Macahé (Glaziou 18562, fl. Apr. [B; P]).

19. *Gymnosiphon arcuatus* Urb. in *Symb. Ant.* III (1903) p. 443, in obs.; Jonk. in *Pulle, Fl. Sur. I.* 1 (1938) p. 182; — *Ptychomeria tenella* Benth. var. *minor* Benth. in *Hook., Journ. of Bot.* VII (1855) p. 17.

Slender plants, 5–14 cm high. Stem white, thin, rather filiform, simple, bearing at the top an inflorescence, usually consisting of 3 flowers. Inflorescence to 1 cm long. Leaves small, scalelike, ovate, acuminate, about 1 mm long. Flowers rather large, about 6.5 mm long, bracts minute, pedicels about 1.5 mm long. Perianth white, tubular part 2.5–3 mm long, with obtuse, short, entire lateral lobes. Inner lobes rather broad, trigonous, acute. Anthers inserted rather low in the perianth-tube, below the inner lobes. Connective small, apiculate at the top. Style filiform, branched in the upper part into three short branches, each bearing a stigma. Stigma obovate, in the upper part split into two lobes, each lobe fading into a long hairlike appendage. Ovary obconical to obovoid, tapering into the pedicel. Capsule nearly globose, crowned by a 2 mm long persistent part of the perianth-tube. Seeds subglobose, brown, reticulate.

Type: Sagot 1164, pp., from French Guiana, in herb. B; duplicates in herb. K; P-DR; S; U.



Distribution: Brazil, the Guianas, Trinidad, Grenada.

BRAZIL.

Amazonas, Rio Uaupés, Gapó (Spruce s.n. [K; P-DR], type of *Ptychomeria tenella* Benth. var *minor* Benth.); near Panuré (Spruce s.n. [BM; BR; K]); Rio Negro, Serra do Gama (Spruce s.n. [K]).

FRENCH GUIANA.

Karouang (Sagot 1164 pp., fl. May [B; K; P-DR; S; U]).

SURINAME (NETHERL. GUIANA).

Lawa Riv., near Cottica Mts. (Versteeg 304 pp., fl. Oct. [U]).

BRITISH GUIANA.

Potaro Riv., Kaietur Savannah (Jenman 1271, fl. Sept.—Oct. [K]); Essequibo Riv., Moraballi Creek, near Bartica (Sandwith 260, fl. Sept. [K]).

TRINIDAD.

Without precise locality (Fendler 616 [K]).

GRENADA.

Without precise locality (Sherring s.n. [K]).

20. **Gymnosiphon mattogrossensis** (Malme) Jonk. nov. comb.; — *Ptychomeria mattogrossensis* Malme in Ark. for Bot. Bnd. 26A, no. 9 (1934) p. 21 and p. 4.

Plants 7.5–16 cm high. Stem white, simple or branched, sulcate in the lower part, forked at the top into a 5–15-flowered bifid cincinnus. Leaves small, scalelike, ovate, obtuse, to 1 mm long. Bracts minute, pedicels 1–3 mm long. Inflorescence-branches 15–35 mm long, flowers erect, 7–8 mm long. Perianth yellowish or white, tubular part about 3 mm long, limb about 2–3 mm long.

Outer perianth-lobes ovate, obtuse, with entire, shorter lateral lobes. Inner lobes small, linear, inserted in the mouth of the perianth. Anthers inserted in the upper part of the tube, connective small, deltoid, not apiculate above the thecae. Style filiform, branched at the top into three short branches, each bearing a stigma. Stigma 2-lobate at the top, stigma-lobes fading into thick, filiform appendages, reaching the middle of the limb. Ovary obovoid, about 2 mm long. Placenta-glands well-developed. Capsule globose, bluish-grey, length and breadth about 2.5 mm, crowned by the 3 mm long, cylindrical persistent part of the perianth-tube.

Type: Malme II. 3495, from Brazil (Matto Grosso), in herb. S.

Distribution: Known from Brazil, Matto Grosso and Trinidad, never found between these two localities.

BRAZIL.

Matto Grosso, Serra da Chapada, between Biriti and São Jeronyma (Malme II. 3495, fl. Jun. [S]).

TRINIDAD.

Without precise locality (Fendler 505 [BM; K]).

21. *Gymnosiphon niveus* (Gris.) Urb. in Symb. Ant. III (1903) p. 444; — *Ptychomeria nivea* Gris., Cat. Cub. (1866) p. 257; Schltr. in Fedde, Rep. XVII (1921) p. 257; — *Gymnosiphon parviflorus* Urb. in Symb. Ant. III (1903) p. 443; — *Ptychomeria parviflora* (Urb.) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants 8—23 cm high. Stem white, simple or branched, bearing at the top a simple or bifid cincinnus. Leaves scalelike, ovate, acute or acuminate, 1—2 mm long. Inflorescence-branched 1—6.5 cm long, bracts small, ovate, acute, keeled; pedicels 1.5—5 mm long. Flowers to 5 mm long. Perianth white, limb much longer than the tube, tube to 1.5 mm long, limb to 3 mm long. Outer perianth-lobes ovate, obtuse, deeply 3-lobed, with narrow, shorter lateral lobes. Inner lobes very small, inserted between the outer lobes, linear. Anthers inserted below the inner lobes, quadrangular, connective not apiculate. Style filiform, branched at the top into three short branches, each bearing a bilobate stigma. Stigma-lobes obcordate, each bearing a very thin, filiform appendage. Ovary obovoid, to 2 mm long and 1 mm broad. Placenta-glands well developed. Capsule ellipsoid, often bluish-grey, crowned by a rather short persistent part of the perianth-tube, about 1 mm long.

Type: Wright 3285, from Cuba (prov. Oriente), Valparaiso, in herb. GÖTT, duplicates in herb. B; G-BOIS; G-DEL; GH; K; MIS; P; S; W.

**Distribution:** Only known from Cuba.

**CUBA.**

Oriente, Serra Nipa near Rio Piloto (Ekman 2573, fl. Aug. [S]); id., near Woodfred (Shafer 3413, fl. Jan. [NY]); id., base of Loma Mensiera (Ekman 15215, fl. Sept. [S]); Baracoa, N of El Yunque (Ekman 3565, fl. Nov. [S]); Moa Bay, E of Rio Moá (Shafer 8356, fl. Jan. [B; NY]); near Monteverde (Wright 3284 pp., fl. Jul. [P; W]); Wright s.n., fl. Aug. [B], type of *G. parviflorus* Urb.; near Valparaiso (Wright 3285, fl. Nov. [B; BM; G-BOIS; G-DEL; GH; GÖTT; K; MIS; P; S; W]); without precise locality (Wright 7285?, fl. Aug. [GÖTT]).

Pinar del Rio, Panar de Cajalbana, on the edge of a branch of Rio Puercos (Ekman 17332, fl. Aug. [S]).

22. **Gymnosiphon Germaini** Urb. in *Symb. Ant.* III (1903) p. 444; — *Gymnosiphon portoricensis* Urb. in *Symb. Ant.* III (1903) p. 445; — *Ptychomeria portoricensis* (Urb.) Schltr. in Fedde, *Rep.* XVII (1921) p. 257.

Plants 4—26 cm high. Stem white, long, filiform, simple or branched, bearing at the top a 2—11-flowered bifid cincinnus. Inflorescence-branches to 2 cm long. Stem nearly leafless, leaves 1—2 mm long. Flowers small, to 6.5 mm long. Perianth white, tubular part about 2 mm long, limb about 2.5—3 mm long.

Outer perianth-lobes only 3-lobed at the top, whitish short, rather acute, lateral lobes. Inner lobes minute, inserted between the outer lobes. Perianth-tube constricted in the middle. Stamens inserted between the upper part of the perianth-tube. Connective broad, quadrangular, not apiculate. Style filiform, branched at the top into 3 short branches, each bearing an obcordate stigma. Stigmas with 2 filiform appendages, reaching the upper part of the outer perianth-lobes. Ovary obconic, about 1.5 mm long, placentas with rather large, bulging glands. Capsule ellipsoid to globose 1.5—3 mm long, bluish-grey, crowned by a 1—2 mm long, persistent part of the perianth-tube.

**Type:** Germain s.n., Guadeloup, in herb. B, duplicate in herb. G-BOIS.

**Distribution:** West-Indian Islands, collected in Jamaica, Porto Rico, Guadeloup and Dominica.

## JAMAICA.

Trelawny, Troy (Harris 10659, fl. Jan. [F; NY; US]).

## PORTO RICO.

Humacao, near Jabucoa, Guajabota (Sintenis 5170, fl. Sept. [B; BRSL; G-BOIS; G-DEL; GH; GÖTT; K; M; P-DR; S], type of *G. portoricensis* Urb.); near Mt. Piedra azul, Jacana (Sintenis 5259, fl. Oct. [B]).

Aguadilla, Mt. Pedra blanca, near Aguada (Sintenis 5707, fl. Dec. [B]).

## GUADELOUP.

Without precise locality (Germain s.n., fl. Oct. [B; G-BOIS]).

## DOMINICA.

Without precise locality (Fishlock 47 [NY]).

23. *Gymnosiphon Fawcetti* Urb. in Symb. Ant. V (1907) p. 294; — *Ptychomeri Fawcetti* (Urb.) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants 3.5–14 cm high. Stem usually simple, bearing at the top a 2–6-flowered, bifid cincinnus. Leaves and bracts very small, scalelike, 0.5–1 mm long, ovate. Pedicels rather long, 2–5 mm. Flowers erect, about 6 mm long, young buds about 4.5 mm long. Perianth-limb about 1.5 mm long, tube about 2.5 mm long, colour unknown. Outer perianth-lobes ovate, obtuse, with narrow lateral lobes; inner ones small, lanceolate. Perianth 3-saccate at the throat, tube constricted in the middle. Stamens inserted at the base of the perianth-sacks. Connective deltoid, caudate at the base, not apiculate at the top.

Style rather thick, filiform, bearing at the top three sessile, ovate stigmas, each of them with a couple of hairlike appendages at the top. Stigmas often covered with clusters of pollen-tubes, growing directly from the thecae.

Ovary 1.5–2 mm long, obconical, with large, bulging placenta-glands. Wall of the ovary enclosing the placentas and ovules as a loose sack. Capsule about 2 mm long, subglobose to ellipsoid, crowned by the conical, 1.5 mm long, persistent part of the perianth-tube.

Type: Harris 9494, from Jamaica, Troy, in herb. B; duplicate in herb. NY.

Distribution: Only known from Jamaica.

JAMAICA.

Trelawny, Troy (Harris 9494, fl. Sept. [B; NY]; Harris 12596, fl. Oct. [NY]); Tyre near Troy (Harris 12642, fl. Oct. [NY]); Cockpit County near Tyre (Britton 581, fl. Sept. [NY]).  
St. Ann, Mt. Clarendon (Schwartz s.n., fl. Dec. [S]).

24. *Gymnosiphon cornutus* (Benth.) Benth. et Hook., Gen. Pl. III. 2 (1883) p. 458; Urb. in Symb. Ant. III (1903) p. 438; Jonk. in Pulle, Fl. Sur. I. 1 (1938) p. 182; — *Ptychomeria cornuta* Benth. in Hook., Journ. of Bot. VII (1855) p. 16; Schltr. in Fedde, Rep. XVII (1921) p. 16; — *Ptychomeria mutica* Benth. in Hook., Journ. of Bot. VII (1855) p. 16; Schltr. in Fedde, Rep. XVII (1921) p. 257; — *Gymnosiphon muticus* (Benth.) Urb. in Symb. Ant. III (1903) p. 438; — *Benitzia Poeppigiana* Karst. in Linnaea XXVIII (1865) p. 421; Karst. in Nov. Act. Leop. XXVI (1858) p. 888; — *Ptychomeria Poeppigiana* (Karst.) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants 9–17 cm high. Stem slender, simple, sometimes branched, bearing at the top a simple or bifid cincinnus. Inflorescence 1–4 cm long, 3–12-flowered. Leaves and bracts to 1 mm long, ovate, obtuse, often concave or keeled. Pedicels 1–3 mm long, perpendicular on the cyme-branches. Flowers about 9 mm long. Perianth white, scarlet or black-purple, tubular part to 6 mm long, limb to 3 mm long. Outer perianth-lobes ovate, obtuse, with shorter, entire, obtuse lateral lobes. Inner lobes minute. Tube very long, cylindrical. Anthers inserted about 1 mm below the inner lobes; connective small, short. Style long, filiform, bearing at the top three, almost sessile stigmas, each of them with two horn-like processes, fading into filiform appendages. Ovary obovoid, about 2 mm long, with large, often bulging placenta-glands. Capsule about 3 mm long and 1.5 mm broad, obovoid, crowned by a 5 mm long, cylindrical persistent part of the perianth-tube.

Type: Spruce 2846, from Brazil (Amazonas), near Panuré.

in herb. K; duplicates in herb. BM; BR; G-BOIS; GH; GÖTT; K; P-DR; W.

Distribution: Brazil, Netherlands and British Guiana, Venezuela.

#### BRAZIL.

Sta. Catharina, Itajahy (?Ule s.n., fl. Oct. [US]).

Sao Paulo, Ribeira Riv., Paraqueira Mirim (Brade 75732, fl. Jun. [S]).

Rio de Janeiro, Morra de Nova Cintra (Ule 870, fl. Jul. [B; US]); Rio de Janeiro, (Ule s.n. [S]).

Amazonas, Rio Uaupés (Spruce 2836, fl. Jan. [BM; G-BOIS; G-DEL; K; P-DR], type of *Ptychomeria mutica* Benth.); id., near Panuré (Spruce 2816, fl. Jan. [BM; BR; K; P-DR; W]); Spruce 2846, fl. Jan. [BM; BR; G-BOIS; GH; GÖTT; K; P-DR; W]); Amazone Riv., Isle of Colares (Poep-pig s.n. [BRSL; P; W], type of *Benitzia Poeppigiana* Karst.).

#### SURINAME (NETHERL. GUIANA.

Zanderij I (BW 412, fl. Jun. [U]); Guyana goud placer (?coll. indig. 123, fl. Apr. [U]).

#### BRITISH GUIANA.

Essequibo Riv., Moraballi Creek, near Bartica (Sandwith 70, fl. Aug. [K]; Sandwith 175, fl. Sept. [K]; Linder 127, fl. Dec. [GH]); Bartica-Potaro road, near Barabara Creek (Sandwith 1100, fl. Aug. [K]).

#### VENEZUELA.

Trujulo, Rio Loro (Pittier 10952, fl. Dec. [NY]).

Zulia, Rio Loro (Pittier 10451, fl. Dec. [US]); Pittier 10951 [GH]).

#### COLOMBIA.

Sur de Santander, Magdalena Valley, near Bermeja (Haught 1376 pp., fl. Sept. [US]; Haught 1436, fl. Dec. [US]).

Note: The specimens queried are incomplete. I am not quite sure that they really belong to this species.

### 25. *Gymnosiphon Tuerckheimii* Jonk., nov. spec. <sup>1)</sup>, —

<sup>1)</sup> *Gymnosiphon Tuerckheimii* Jonk., n.sp. — Herba saprophytica, 6.5–19 cm alta. Caulis plerumque simplex, nonnunquam uniflorus. Inflorescentia 2 cm longa, bifida, laxa, 3–16-flora. Squamae et bracteae ovatae, adpressae. Flores fere 9 mm longi, pedicellis fere 1 mm longis. Lobi perianthii exteriores 3-lobulati, lobulis lateralibus involutis. Lobi perianthii interiores ovati, acuti, minuti. Perianthii tubus cylindricus fere 4 mm longus, constrictus, striatus. Connectivum quadrangulare, non appendiculatum. Stylus filiformis, stimatibus 3, subsessilibus, longe appendiculatis. Appendices filiformes, crassae. Ovarium patelliforme, fere 1 mm longum, glandulae crassis prominentibus. Capsula subglobosa vel obovoidea, perianthii tubo coronata.

Hab.: Honduras, Guatemala et Br. Honduras. Typus: v. Tuerckheim II. 475 (Guatemala) in herb. Berolinense, typi dupla in herb. GH et US.

*Gymnosiphon tenellus* non Urb., Standley in Standley and Record, For. and Fl. Br. Honduras, Field Mus. publ. 350, Vol. XII (1936) p. 97.

Plants 6.5—9 cm high. Stem simple, pale purple (Standley), rarely branched, sometimes 1-flowered, usually forked at the top into a bifid, 3—16-flowered cincinnus, inflorescence-branches about to 2 cm long. Leaves and bracts small, scalelike,

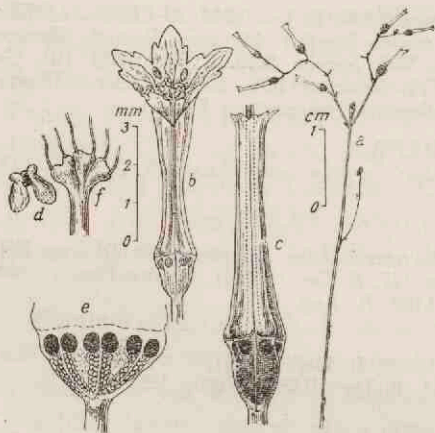


Fig. 17. *Gymnosiphon Tuerckheimii* Jonk.

- a. flowering plant;
- b. dissected flower;
- c. fruit with persistent perianth-part;
- d. stamen;
- e. ovary, opened, showing placentas and placenta-glands;
- f. style with stigmas.

ovate, appressed, 1—1.5 mm long. Flowers about 9 mm long, spaced with 3—5 mm intervals in the inflorescence, pedicels about 1 mm long. Perianth white, tinged yellow, tubular part about 4 mm long, striped, cylindrical, often constricted in the middle, limb up to 4 mm long. Outer perianth-lobes ovate, obtuse, lateral lobes lanceolate, about the same length as the midlobe. Inner perianth-lobes ovate, acute, small, inserted in the mouth of the perianth.

Stamens sessile in the mouth of the perianth-throat, connective small, quadrangular, without appendages. Style filiform, bearing at the top 3 sessile, obcordate stigmas, each with two long, thick, filiform appendages, as long as the perianth-limb. Ovary short, patelliform, about 1 mm long, placenta-glands large, bulging. Capsule subglobose to obovoid, about 1.5 mm long, crowned by the, about 3.5 mm long, cylindrical, constricted persistent part of the perianth-tube.

Type: v. Tuerckheim II. 475, from Guatemala, Cubilquitz, in herb. B, duplicates in herb. GH and US.

Distribution: British Honduras, Guatemala, Honduras.

BRITISH HONDURAS.

Forest Home (Schip 508, fl. Dec. [F]); Temash Riv. (Schip S. 913, fl. Feb. [F; K]).

GUATEMALA.

Alta Verapaz, Cubilquitz (v. Tuerckheim II. 475 (=8311) [B; GH; US]).

HONDURAS.

Atlantida, Lancetilla Valley near Tela (Standley 52879 [F]; Standley 53355 [F]).

26. *Gymnosiphon panamensis* Jonk., nov. spec.<sup>1)</sup>.

Plants 6—15 cm high. Stem white, filiform, usually simple, sometimes shortly branched, bearing at the top a 3- or 5-flowered, bifid cincinnus or a single flower. Inflorescence-branches up to 2 mm long. Stem beset with few, acute, lanceolate, scalelike leaves, about 1 mm long. Bracts lanceolate, about 1 mm long, 1-veined, acute to slightly acuminate. Flowers about 8 mm long. Perianth white, tubular part very short, about 1—2 mm long, limb about 4 mm long. Outer perianth-lobes ovate to triangular, obtusiusculous, margin involute. Inner perianth-lobes minute, hardly visible.

Connective broad, rounded-rhomboid, without appendages.

<sup>1)</sup> *Gymnosiphon panamensis* Jonk., n.sp. — Herba saprophytica, gracilis, pusilla, 6—15 cm alta. Caulis teres, filiformis, glaber, plerumque simplex, nonnunquam uniflorus. Inflorescentia 2 cm longa, bifida, 3-vel 5-flora. Squamae lanceolatae, acutae, uninervae. Flores fere 8 mm longi. Lobi perianthii exteriores ovati vel triangulares, obtusiusculi, marginibus involutis. Lobi perianthii interiores minuti. Tubus perianthii brevis, 1—2 mm longus. Limbus fere 4 mm longus. Connectivum latum, rotundato-rhomboidium, non appendiculatum. Stylus filiformis, crassus, stigmatibus 3, sessilibus, longe appendiculatis. Appendices filiformes. Ovarium ellipsoideum, truncatum, fere 1—2 mm longum. Glandulae crassae. Capsula ellipsoidea vel subglobosa.

Hab.: Panama. Typus: Allen 18 in herb. Rheno-Trajectino, typi duplum in herb. MIS.



Style thick-filiform, bearing at its apex 3 sessile, emarginate stigmas with two hairlike appendages. Ovary ellipsoid, trun-

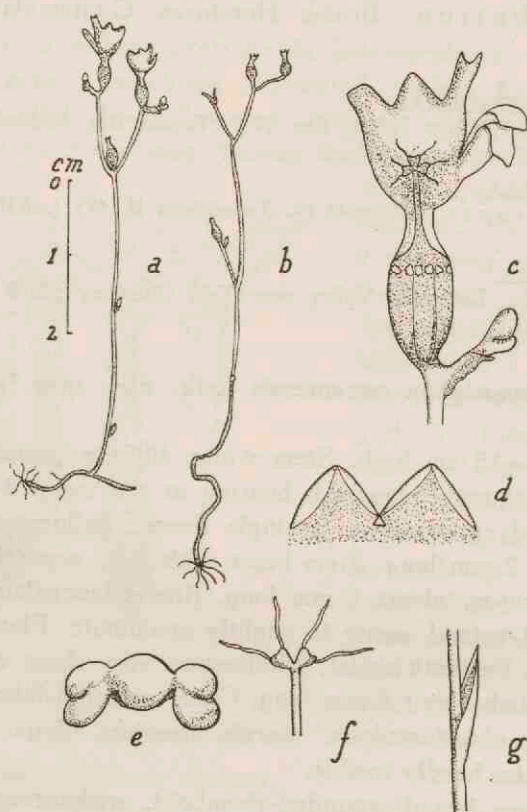


Fig. 18. *Gymnosiphon panamensis* Jonk.  
 a. and b. flowering plants;  
 c. dissected flower;  
 d. part of flower-limb;  
 e. stamen;  
 f. style with 2 stigmas;  
 g. stem-scale.

cate, up to 2 mm long. Placenta-glands bulging. Capsule ellipsoid to subglose, about 2 mm long, crowned by the persistent short, dried perianth-tube.

Type: Allen 18, from Panama, in herb. U, duplicate in herb. MIS.

Distribution: Only known from Panama.

PANAMA.

Prov. Panama, Rio la Maestra (Allen 18, fl. Dec. [MIS; U]).

Prov. Colon, top of Tumba Vieja (Dodge, Steyermark and Allen 16928, fl. Dec. [MIS; U]).

27. *Gymnosiphon longistylus* (Benth.) Hutch. and Dalziel, Fl. W. Trop. Afr. II (1936) p. 399; — *Gymnosiphon squamatus* Wright in Kew Bull. (1897) p. 281; Wright in Thiselton-Dyer, Fl. Trop. Afr. VII (1897) p. 12; — *Ptychomeria squamata* (Wright) Schltr. in Fedde, Rep. XVII (1921) p. 258; — *Dictyostega longistyla* Benth. in Hooker, Niger Flora (1849) p. 528; Wright in Thiselton-Dyer, Fl. Trop. Afr. VII (1897) p. 12.

Plants 3.5–25 cm high. Stem usually simple, rarely branched, white or yellowish white. Leaves and bracts small, scale-like, ovate, acute, about 1–1.5 mm long. Pedicels 1.5–3.5 mm long. Inflorescence a bifid, 3–many-flowered cincinnus. Flowers spaced in the inflorescence with about 5 mm interval, flowers about 6 mm long. Perianth white, top of the lobes sometimes yellowish, tubular part about 2.5 mm long, cylindrical; limb about 2.5 mm long. Outer perianth-lobes ovate, obtuse, with narrow, entire lateral lobes. Inner lobes small, ovate to spatulate, obtuse. Anthers inserted in the perianth-throat, connective broad, truncate, apiculate. Style filiform, bearing at the top 3, nearly sessile, obcordate stigmas, each of them bearing two long, filiform appendages. Ovary obconical to obovoid, about 1 mm long, placenta-glands well-developed. Capsule globose, length and breadth to 2.5 mm, crowned by a conical, 2–3 mm long persistent part of the perianth-tube.

Type: Vogel 37 from South Nigeria, Nun Riv., in herb. K.

Distribution: Tropical West Africa: Liberia, Nigeria, Cameroons, Gaboon, Gold Coast and Belgian Congo.

**NIGERIA.**

North Nigeria, Beli (Jespersen s.n., fl. Nov. [BR]).  
 South Nigeria, Oban (Talbot 700 [BM]; Talbot 715 [BM; K]); Lagos (Dalziel 1277, fl. Jan. [K]); Annye (Unwin 144, fl. Sept. [K]); Nun Riv. (Mann 515 pp., fl. Sept. [K]; Vogel 37, fl. Aug. [K]).

**LIBERIA.**

Cola (Bunting s.n., fl. Jun. [BM]); Banga (Linder 1217, fl. Oct. [K]).

**CAMEROONS.**

Bipindi (Zenker 1884, fl. Aug. [B; BRSL; G-BOIS; G-DEL; K; P-DR; W]); id, Mimfia (Zenker 4239, fl. May [B; P]; Zenker s.n., ed. Weigel [BR; F; G-DEL; GH; MIS; P; U]); Efulen (Bates 311, fl. Jul. [K]); Ndonge, Nlonako (Ledermann 6221, fl. Nov [B]); Nkolebundi, Schutal (Ledermann 889, fl. Oct. [B]); Bitye, Riv. Ja (Bates 1452, fl. Oct. [BM]).

**GABOON.**

Sibange farm (Soyaux 167 and 168, fl. Jan. [K], type of *G. squamatus* Wright); Corisco Bay (Schlechter 12831, fl. Dec. [B; BR]).

**GOLD COAST.**

Anhasa, forest reserve (Vigne 3216, fl. Dec. [K]).

**BELGIAN CONGO.**

Bolafa sur Lopori, between Mongana and Bolafa (Hauman s.n., fl. Sept. [Univ. libre of Brussels; U]).

**Appendix.**

28. *Gymnosiphon pusillus* Urb. in Symb. Ant. III (1903) p. 438; — *Ptychomeria pusilla* (Urb.) Schltr. in Fedde, Rep. XVII (1921) p. 257; — *Gymnosiphon spec.*, Taubert ex Warming in Overs. Kgl. Dansk. Vid. Selsk. Forh. (1901) n. 6 p. 188.

Plants 5—6.5 cm high. Stems simple, bearing at the top one flower or branching off into the inflorescence. Pedicels to 3 mm long. Leaves and bracts small, scalelike, obtuse, about 1 mm long. Inflorescence about 15 mm long, 1—3-flowered. Flower-  
 limb, stamens and stigmas unknown. Ovary obconical to obovoid, 1.5—2 mm long, placenta-glands well-developed. Capsule 2—2.5 mm long, obovoid, crowned by a short, about 1.5 mm long, persistent part of the perianth-tube.

Type: Part of Glaziou 19908, from Brazil (Rio de Janeiro) in herb. B, incomplete material.

Distribution: Once collected.

**BRAZIL.**

Rio de Janeiro, without precise locality (Glaziou 19908 pp. [B]).

29. *Gymnosiphon jamaicensis* Urb. in Symb. Ant. V (1907) p. 293 — *Ptychomeria jamaicensis* (Urb.) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants about 14 cm high. Stem simple, branched at the top into a bifid cyme. Inflorescence about 25 mm long, to 13-flowered. Pedicels about 0.5–0.75 mm long. Leaves and bracts small, scalelike, ovate, 0.5–1 mm long. Distance of the flowers in the inflorescence about 5 mm. Style filiform, perianth-limb, anthers, stigmas etc. unknown. Ovary about 1 mm long, subglobose. Capsule globose, crowned by a rather long, conical part of the perianth-tube (to 3.5 mm long).

Type: Harris s.n., from Jamaica, in herb. B, only incomplete material.

Distribution: Jamaica, once collected.

**JAMAICA.**

Trelawny, near Troy (Harris s.n., fl. and fr. Nov. [B]).

## 6. **APTERIA** Nutt.

Small, saprophytic, annual, erect herbs. Roots short and thin. Stem simple or branched, one- or sparsely flowered. Leaves small, sessile, ovate or lanceolate, scale-like. Flowers rather large, often inclined or nodding. Perianth campanulate or hypocraterimorphous. Perianth-lobes 6, outer lobes ovate, the inner lobes narrower than the outer, but of the same length, linear-lanceolate. Tubular part of the perianth more than three

times the length of the lobes. Stamens inserted in sacks in the perianth-tube below the inner perianth-lobes. Filaments short, thick, the base inserted in the sacks of the perianth, bearing at the external side a large wing. Wings 2-lobed, lobes rounded at the apex. Filaments at the top forked into the broad connective. Thecae bursting in transverse direction. Ovary ovoid, slightly narrowed at the top into the filiform style. Style reaching the insertion of the stamens, and there branching off into three short branches, each bearing a dish-shaped stigma, often beset with germinating pollen-grains. Capsule three-valved, dehiscing between the placentas, crowned by the wholly, persistent, rolled perianth. Seeds numerous, minute, oblong to ovoid or ellipsoid, sometimes slightly curved, with a loose reticulate testa.

Type-species: *Apteria aphylla* (Nutt.) Barnh.

Distribution: Three closely related species and one variety. The genus is only known in the new world, from the Southern United States (Florida, Georgia, Alabama, Mississippi, Louisiana, Texas and Missouri) to Paraguay and Bolivia, also in the West-Indian Islands.

Key to the species.

1. *a.* Perianth campanulate. Flowers about 1 cm long or shorter. Leaves reduced to minute scales (to 2 mm long) ..... 1. **A. aphylla** (Nutt.) Barnh.
- b.* Perianth not campanulate, flowers larger ..... 2
2. *a.* Perianth salver-shaped with a long tube, the upper part suddenly widening. Flowers about 2 cm long. Scales to 3 mm long. Inner perianth-lobes lanceolate. Filaments as broad as the connective. Connective without appendage ..... 2. **A. lilacina** Miers
- b.* Perianth funnel-shaped, not suddenly widened. Inner lobes spatulate. Flowers about 1—1,5 cm long. Connective broader than the filament with a basal, median, hanging appendage... 3. **A. gentianoides** Jonk.

1. *Apteria aphylla* (Nutt.) Barnh. ex Small, Fl. S. E. U. St. 1st. Ed. (1903) p. 309; id. 2nd. Ed. (1913) p. 309; Uphof in Oest. Bot. Zeitschr. 78 (1929) p. 71; Small, Man. S. E. Fl. (1933) p. 363; Standley in Field Mus. Nat. Hist. XII, Publ. 350 (1936) p. 75; Jonker in Pulle, Fl. Sur. I. 1 (1938) p. 186 — *Apteria setacea* Nutt. in Journ. Acad. Nat. Sc. VII, part I (1834) p. 64; Miers in Trans. Linn. Soc. XVIII (1841) p. 546; Benth. in Hook., Journ. of Bot. VII (1855) p. 13; Gris., Fl. Br. W. Ind. Isl. (1864) p. 606; Gris., Cat. Pl. Cub. (1866) p. 257; Cham., Fl. S. E. U. St. 3rd. Ed. (1897) p. 477; Johow in Pringsh., Jahrb. Wiss. Bot. XVI (1865) p. 417 etc. and Taf. XVI, F. 1; Taf. XVII F. 17 and 18; Taf. XVIII, F. 38—42; Engl. in Engl.-Prantl. Nat. Pfl. Fam. II, 6 (1889) F. 39A-C; — *Apteria boliviana* Rusby in Bull. N. Y. Bot. Gard. n. 14 Vol. IV (1907) p. 447; — *Lobelia aphylla* Nutt. in Ann. Journ. Nat. Sc. V. (1822) p. 297.

Plants 5—25 cm high. Stem simple or sometimes branched, glabrous, terete, the overground part purplish, the underground part white. Leaves lanceolate to ovate-lanceolate, acuminate, sessile, purplish, scale-like, about 1.5—3 mm long and 1 mm broad. Stem one- or sparsely flowered, sometimes with few loose-flowered cymes at the top. Flowers nodding or horizontally placed, 8—13 mm long. Perianth campanulate, blue, violet, or purplish, sometimes white, in the ovary and at the tips of the lobes darker coloured; often fading to white towards the base, but with darker longitudinal stripes (honey-guides). Outer lobes ovate, acute, inner lobes lanceolate to linear-lanceolate, as long as the outer lobes, obtuse. Tubular part of the perianth three times the length of the lobes. Stamens inserted in crescent-shaped sacks. Connective-arms broader than the filaments, wings broader than the stamens. Stigmas patelliform, margin papillate, often stuck with clusters of pollen-tubes. Ovary obovoid, reaching a fifth of the length of the whole flower. Capsule ovoid or obovoid, sometimes nearly globose, length to 6 mm, breadth to 4 mm, crowned by the dried perianth. Seeds brown.

reticulate, angulate or acute at both sides, often slightly curved.

Type: Ware s.n. in the herbarium of the Academy of Natural Sciences of Philadelphia, duplicate in herb. BM.

Distribution: Southern United States to Brazil and Bolivia, not in Guiana and Trinidad.

#### UNITED STATES.

Florida, Apalachicola Riv. (Rugel 585, fl. Oct. [BM]); near Jacksonville (Curtiss 4172, fl. Oct. [US; MIS]; Curtiss 2754, fl. Oct. [F; G-BOIS; GH; K; M; MIS; P; US; W]; Curtiss 5283, fl. Nov. [F; G-BOIS; GH; K; P; P-DR; US; W]; Curtiss 6275, fl. Nov. [B; G-DEL; S]); St. Augustine (Reynolds s.n. [F]); Lake City (Bitting 600, fl. Jul. [F; MIS]); Eustis (Nash 1093, fl. Jun. [B; G-BOIS; GH; MIS; US]; Hitchcock 1820, fl. Jun.-Jul. [F; MIS]); Aspalaga (Chapman s.n., fl. Oct. [MIS]; Chapman 1014a, fl. Sept.-Oct. [GH; US]); Oviedo (Rupp s.n., fl. Oct. [GH]); Sulphur Springs (Thaxter s.n. [GH]); Palm Beach (Hitchcock 1819 [F]); Myers (Hitchcock s.n., fl. Jul.-Aug. [F]); Jessamine, Pasco Co. (Barnhart 2621, fl. Dec. [F]); Peace Creek, Polk Co. (Donnell Smith s.n., fl. March [US]); Zuincy (Curtiss s.n., fl. Oct. [US]); Brooksville, Hernando Co. (Jones 63, fl. Aug. [US]); St. Johns Co. (Reynolds s.n., fl. March [F; MIS; US]); Gulf Hammock, Levy Co. (Garber s.n., fl. Nov. [F; GH; MIS; P; US]); Walakulla Co. (Griscom s.n., fl. Sept. [GH]); E. Florida (Ware s.n. [BM]); Without locality (Chapman 21 [US]; Chapman s.n. [BM; G-BOIS; G-DEL; GH; GÖTT; K; MIS; P]; Short 1850 [B]; Donnell Smith s.n. [US]; Torrey s.n. [G-DEL]; Torrey and Gray s.n. [BR; M; L]; Gray s.n. [G-BOIS]).

Georgia, N of Whigham, Decatur Co. (Harper 1187, fl. Aug. [B; BM; GH; MIS; P; US]).

Alabama, Spring Hill (Graves 1279, fl. Sept. [MIS; US]); Mobile (Mohr s.n., fl. Aug. [US]; Mohr s.n., fl. Jun. [F]); Without locality (Torrey s.n. [BM; BR; P]).

Mississippi, Harrison Co., between Golf Port and Long Beach (Joor s.n., fl. Sept. [MIS]); id., Biloxi (Pollard 1053, fl. July [F; GH; MIS; US]).

Louisiana, New Orleans (Allison s.n. [US]); Red Riv. (Hale s.n. [F]); Alexandria (Hale s.n. [F; GH]); Without locality (Chapman s.n. [US]; Hale s.n. [G-BOIS; MIS]; Gray s.n. [M]).

Texas, without locality (Wright s.n. [GH]).

Missouri, Ocean Springs (Seymour 9191, fl. Sept. [F; GH]; Ricker 870, fl. Jul. [US]; Tracy 7010, fl. Apr. [BM; F; G-DEL; GH; MIS; US; W]); Biloxi, Bond's Point (Tracy 5015, fl. Apr. [F; MIS; US]).

#### MEXICO.

Oaxaca (Galeotti 7239 pp. [BR]); id., Cordillera (Galeotti 7179, fl. Aug. [K; P]).

Puebla, Feotolcingo, Chinantha Mts. (Hartweg 495 [B; BM; G-DEL; K; L; P; W]).

Without locality (Liebman s.n. [B]).

## BRITISH HONDURAS.

Manates Lagoon (Peck 163, fl. Oct. [GH; K]); Temash (Schipp S. 667a, fl. Apr. [F]).

## COSTA RICA.

Talamanca, Tesaki (Pittier 9420, fl. March [US]); Between Möthri and Ukatschka (Pittier 12709, fl. Sept. [US]); Between Ukatschka and Bruschik (Pittier 12708, fl. Sept. [US]).

## COLOMBIA.

Cauca, Cordoba, Dagua Valley (Pittier 544, fl. Dec. [US]); Barbacoas (Lehmann s.n., fl. Sept. [W]); Sta. Maria de Timbiqui (Lehmann K. 404, fl. Sept. [K]).

## CUBA.

Oriente, Taco Bay between Sta. Maria Riv. and Jiguani Riv. (Ekman 3774, fl. Aug. [S]), Sierra Nipe near Woodford (Shafer 3411, fl. Jan. [B; US]).

Pinar del Rio, San Diego de las Bañas (Lima s.n., fl. May [P]).

Without locality (Wright 3283 [B; BM; G-BOIS; G-DEL; GH; GÖTT; K; MIS; P; S; W], named by Urban, Symb. Ant. III (1903) p. 449; *A. hymenanthera* Miq.; Wright 2383 [S; US]).

## HAITI.

Santo Domingo, Peninsula de Samano, prov. Samano Savichez, El Gran Estero (Ekman H15938, fl. Aug. [US]).

Rep. Haiti, Massif du Nord near St. Louis du Nord, between M. Charvay and Haut Piton (Ekman H4726, fl. Aug. [B; US], together with the var. *hymenanthera*).

## PORTO RICO.

Guayabota Riv., Iabucoa (Sintenis 5171, fl. Sept. [GH; GÖTT; K; M], named by Urban in Symb. Ant. III (1903) p. 449; *A. hymenanthera* Miq.).

## BRAZIL.

Amazones, Rio Uaupés, Panuré (Spruce 2453 [BM; BR; G-BOIS; G-DEL; GH; K; P; P-DR; W]).

Matto Grosso, Santa Anna do Chapada (Malme 1696, fl. Jun. [S]; named by Malme in Bih. K. Sv. Vet. Ak. Handl. 22. III. 8 (1896) p. 301; *A. lilacina* Miers)

## BOLIVIA.

Without locality (Bang s.n. [NY], type of *A. boliviana* Rusby).

Var. *hymenanthera* (Miq.) Jonk. in Pulle, Fl. Sur. I. 1 (1938) p. 186; — *Apteria hymenanthera* Miq., Stirp. Sur. (1850) p. 216; Urb., Symb. Ant. III (1903) p. 448; Pulle, Enum. (1906) p. 114; Britton, Fl. Port. Ric. V (1924) p. 179; Urb. in Ark. f. Bot. 20A n. 15 (1926) p. 14; Knuth in Fedde, Rep., Beih. XLIII (1928) p. 212; — *Apteria setacea* non Nutt., Benth. in Hook., Journ. of Bot. VII (1855) p. 13; Hook., Ic. II. 3 pl. 660; — *Apteria Ulei* Schltr. in Pilger, Verh. Bot. Ver. Brandb.



XLVII (1905) p. 102; — *Voyria tenella* non Hook., Gris., Veg. Kar. (1895) p. 94.

This variety differs in size of the flowers from the species. Stem erect, 3—22 cm high, simple or branched, sparsely flowered. Flowers blue or purplish, nodding or inclined, 4—8 mm long. Insertion of the stamens somewhat lower than in the species, just above the middle of the perianth-tube. Top of the style reaching the stamens.

Type: Hostmann 959, Suriname (Netherlands Guiana) in herb. U.

Distribution: This small-flowered variety takes completely the place of the species in Guiana and the Southern West-Indian Islands. Also in Brazil and some other West-Indian Islands.

#### BRAZIL.

Amazonas, Rio Branco, Boa Vista (Kuhlmann 639, fl. Jul. [R; U]); Rio Negro, Ouvidor, Manaus (Ule 5274, fl. Jan. [B], type of *A. Ulei* Schltr.).

Pernambuco, Iguarassu (Ridley, Lea and Ramage s.n., fl. Oct. [BM]).

Rio de Janeiro, Copacabana (Ule 4003, fl. May [B]).

Goyaz, without precise locality (Gardner 4006, fl. Apr. [K]).

Minas Geraes, Rodrigo Silva (Thomas and Magalhaes Gomes 371, fl. May [P]).

São Paulo, Botequin, near Butantan (Brade s.n., fl. Feb. [B]).

#### FRENCH GUIANA.

Karouang (Sagot 362, fl. Jun. [BM; BR; GÖTT; K; P; P-DR; S; W]).

#### SURINAME (NETHERL. GUIANA).

Paramaribo (Wulfschlaegel 1301 [GÖTT; W]); near pl. Kwatta (Kegel 153, fl. Jul. [GÖTT; U?]); Lawa Riv., near Cottica Mts. (Versteeg 304 p.p., fl. Oct. [U]); near pl. Bergendal (Focke 1337, fl. May [U]); Without locality (Hostmann 959 [B; BM; G-BOIS; GH; K; U; W]).

#### BRITISH GUIANA.

Corantyne Riv. (Jenman 502, fl. Oct. [K]); Kaietur Savannah between Resthouse and Falls (Sandwith 1352, fl. Sept. [K]).

#### TRINIDAD.

Aripo Savannah (Britton, Coker and Rowland 302, fl. March [GH; NY]); Hights of Las Cueros (Crueger s.n., fl. Feb. [GÖTT]); Mt. Tucucke (Hill and Williams 10698, fl. Jan [K]; Britton, Hazen and Mendelson 1255, fl. Apr. [GH; NY; US]); Blanchisseuse Road (Broadway s.n., fl. Apr. [F; MIS]); without locality (Fendler 546 [K]).

## DOMINICA.

Without locality (Ramage s.n., fl. Aug [K]).

## GUADELOUP.

Bassin Girard (Duss 4061, fl. Feb [B]); Trois Rivières (Duss 2856, fl. Jun. [B]); without locality (L'Herminier s.n. [G-BOIS]).

## PORTO RICO.

Indiera Fria near Maricao (Britton, Cowell and Brown 4472, fl. Feb. [NY]).

## HAITI

Rep. Haiti, Massif du Nord near St. Louis du Nord, between M. Chavary and Haut Piton (Ekman H4726, fl. Aug. [B], together with the species).

## JAMAICA.

John Crow Mts. (Harris and Britton 10704 [NY]); without locality (Purdie s.n. [K; W]; Wilson s.n. [K]).

2. *Apteria lilacina* Miers in Trans. Lin. Soc. XVIII (1841) p. 545; Seubert in Mart., Flor. Bras. III. 1 (1847) p. 57; — *Apteria setacea* non Nutt., Benth. in Hook., Journ. of Bot. VII (1855) p. 13; — *Stemoptera lilacina* Miers in Proc. Linn. Soc. I (1840) p. 62.

Plants 7—17 cm high. Stem simple or sometimes branched, reddish (Spruce), terete, glabrous. Leaves ovate to lanceolate, sessile, small, scale-like, 1—3 mm long. Stem one- or sparsely flowered. Pedicels curved. Flowers 15—20 mm long. Perianth hypocraterimorphous, the rather long tubular part widens suddenly into the funnel-shaped upper part, just below the insertion of the stamens. Tubular part to 10 mm long, white; funnel-shaped part to 7 mm long, violet. Lobes 3—4 mm long, outer lobes broad, ovate, inner lobes lanceolate, as long as the outer ones. Wings of the stamens broader than the stamens, filaments as broad as the connective-arms, inserted in crescent-shaped sacks. Sacks longer than the stamens, lower part of the filaments also disappearing in the sacks. Stigmas asymmetric-patelliform to funnel-shaped, glabrous. Ovary obovoid, reddish-purple, 1—2 mm long, tapering upwards in the form of a cone, bearing the style. Fruit obovoid, 4 mm long, the dried perianth

after flowering rolled up and persistent on the fruit. Seeds ovoid, yellowish, testa reticulate.

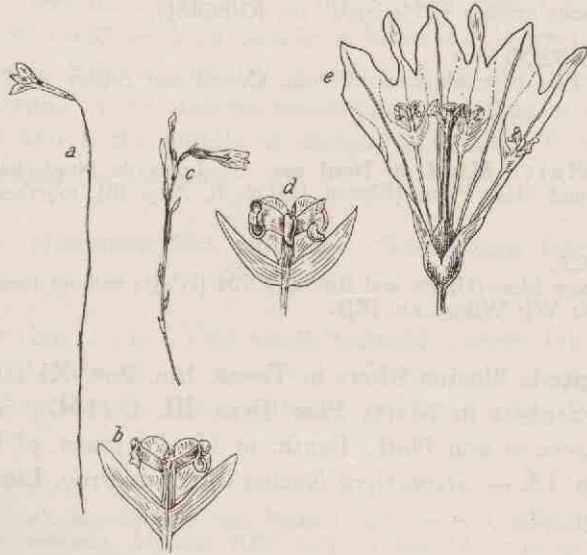


Fig. 19. *Apteria lilacina* Miers.

a. flowering plant;

b. stamen.

*Apteria gentianoides* Jonk.

c. flowering plant;

d. stamen;

e. dissected flower.

Type: Miers s.n., Organ Mountains (Brazil) in herb. BM, duplicates in herb. G-DEL and K.

Distribution: Brazil (Rio de Janeiro and Amazonas) and Colombia.

#### BRAZIL.

Amazonas, Island in Rio Negro near São Gabriel (Spruce 2151, fl. March [BM; G-BOIS; G-DEL; GH; K; P; P-DR; W]).

Rio de Janeiro, Organ Mts. near Quebra frasco (Miers s.n., fl. Feb. [BM; G-DEL; K]; Miers 4652, fl. Feb. [BM]); id., near Petropolis (Wawra and Maly 405 [W], incomplete specimens).

#### COLOMBIA.

Without locality (Purdie s.n. [K]).

3. *Apteria gentianoides* Jonk., n. spec.<sup>1)</sup>; — *Apteria lilacina* non Miers, Warm. in Overs. Dansk. Vid. Selsk. Forh. n. 6 (1901) p. 187.

Plants 3.5–17 cm high. Stem simple or branched, glabrous, terete, purplish, part underground white, 1–6-flowered. Leaves purplish, scalelike, rather large, ovate, acute to acuminate, 7 mm long, breadth to 2.5 mm. Flowers inclined, infundibuliform, not suddenly widened as in the preceding species, 10–18 mm long. Outer lobes ovate, acute, inner lobes the same length as the outer ones, 3–5 mm long, spathulate. Limb of the perianth violet, tubular part fading to white. Basal part of the stamens inserted in crescent-shaped sacks, sacks shorter than the stamens. Wings as broad as the stamens, basal part not disappearing into the sacks. Arms of the connectives broader than the filament, connective with a thick, fleshy, acute, median, basal, hanging appendage. Ovary oblong or obovoid, 2–4 mm long.

Type: Rojas 10076 from Paraguay, Sierra de Amanbay, in herb. B.

Distribution: Brazil, Paraguay, Bolivia.

#### BRAZIL.

Rio de Janeiro, Sta. Magdalena, Pedro Dubois (Santos Lima and Brade 4945, fl. Feb. [R; U]); Alto Macahé, Petropolis (Glaziou 19910 [B; P]); Serro do Macahé (Ule 4945, fl. Feb. [B]).

Minas Geraes, without precise locality (Weddell 955, fl. Nov. [P]).

#### PARAGUAY.

Sierra de Anambay (Rojas 10076, fl. Jan. [B]; Rojas 10879, fl. Jan. [B; BM]; Rojas 10128, fl. Jan. [B; BM; G-DEL; P; W]).

#### BOLIVIA.

Santa Anna (Williams 1615, fl. Jul. [NY]).

<sup>1)</sup> *Apteria gentianoides* Jonk., n.sp. — Herba saprophytica, 3.5–17 cm alta. Caulis teres, glaber, purpureus, simplex vel ramosus, 1–6-florus. Folia squamaeformia, ovata, acuta, fere 7 mm longa et 2 mm lata. Flores inclinati, infundibuliformes, 10–18 mm longi, non constricti. Lobi perianthii exteriores ovati, acuti, interiores spathulati, exterioribus aequilongi. Stamina 3, filamentorum basibus in sacco lunare insertis.

Connectivorum ramis quam filamentum latioribus, connectivia basi appendice brevis succulenta acuta praedita. Ovarium oblongum vel obovoideum, 2–4 mm longum. Perianthium persistens.

Hab.: Brasilia, Paraguay et Bolivia. Typus: Rojas 10076 (Paraguay) in herb. Berolinense.

7. **MARHELLA** Urb.

Small, erect herbs. Stem simple, terete, glabrous. Rhizome beset with imbricate scales. Leaves scalelike, small. Perianth consisting of a tubular part and 3 perianth-lobes, the inner lobes absent. Margin of the perianth-lobes folded inwards. Stamens 3, alternating with the perianth-lobes. Filaments short, inserted in crescent-shaped sacks of the perianth-tube. Connective broad, thecae constricted and dehiscent with a horizontal split. Style filiform, branched in the upper part into 3 short branches, each bearing a small, peltate stigma. Ovary with 3 parietal placentas, placentas without glands. On the top of the ovary 3 short-stipitate, peltate glands. Seeds small.

Type-species: *Marthella trinitatis* (Johow) Urb.

Distribution: 1 species, once collected in Trinidad.

1. *Marthella trinitatis* (Johow) Urb. in Symb. Ant. III (1903) p. 448; Schlechter in Fedde, Rep. XVII (1921) p. 258; — *Gymnosiphon trinitatis* Johow in Pringsh., Jahrb. f. Wiss. Bot. XX (1889) p. 447; — *Burmannia capitata* non Mart., Johow in Pringsh., Jahrb. f. Wiss. Bot. XVI (1865) p. 417, and Taf. 16, Fig. 2.

Stem simple, lilac. Scales appressed against the stem, lanceolate, acute, 2—3 mm long. Flower 1 at the top of the stem or in 2—7-flowered inflorescences. Flowers about 6 mm long, yellowish. Perianth-lobes erect, ovate, acute, about 1.5 mm long, margins folded inwards (cf. the lateral lobes of *Gymnosiphon*). Limb of the perianth not deciduous. Tubular part of the perianth about 3 mm long. Stamens inserted in the upper part of the tube, just reaching the base of the lobes. Base of the stamens inserted in sacks as in the genus *Apteria*, stamens longer than the sacks. Connective broad, short-apiculate at the top. Thecae constricted in the upper half and there horizontally dehiscent. Style filiform, reaching the insertion of the stamens. Ovary

obovoid, about 1,5 mm long, bearing 3 short-stipitate, peltate glands at the top. Capsule obovate-turbinate, about 2 mm long. Seeds small, brownish, reticulate, ovoid, without appendages. Funicle shorter than the ovules and seeds. In decayed leaves and wood in forests.

Type: Johow s.n. from Trinidad, in the botanical institute at Bonn, duplicates in herb. B.

Distribution: Once collected in Trinidad.

TRINIDAD.

Without precise locality (Johow s.n., fl. Feb. [B]).

### 8. *DICTYOSTEGA* Miers.

Erect, saprophytic herbs. Stem colourless, simple, sometimes forked in the upper part into two "inflorescence-branches", rarely branched in the lower part, terete, glabrous. Rootstock beset with ovate, acute to acuminate scales, short hairlike rootlets and longer roots. Leaves reduced to minute, attenuate scales. Inflorescence appearing simple or bifid, flowers in branch-like cincinni. Tubular part of the perianth often constricted, limb 6-lobed. Outer lobes erect, ovate, acute; inner ones smaller and shorter, ovate, obtuse to rounded at the apex, erect or reflexed. Anthers 3, sessile in the upper part of the perianth-tube, below the inner perianth-lobes, not inserted in sacks. Connective broad, without long appendages. Thecae constricted, bursting transversally in the constriction. Style thick-filiform in the lower part, swollen at the top, branched above the swollen part into three branches, each bearing a curved, funnel-shaped stigma without appendages. Top of the style reaching the insertion of the stamens. Ovary 3-sulcate, 1-celled, with 3 parietal placentas, without glands. Perianth persistent on the fruit, perianth-limb not deciduous. Capsule dehiscent by three irregular valves. Seeds numerous, small, linear-lanceolate; testa loose, reticulated, transparent.

Type-species: *Dictyostega orobanchioides* (Hook.) Miers.

Distribution: Widely spread in Central and South-America, from Mexico (Oaxaca) to Southern Brazil, Bolivia and Peru. Not collected in the West-Indies, except Trinidad. Species 2, with one variety.

Key to the species.

1. *a.* Perianth elongate, more than twice the length of the ovary. Perianth-tube not constricted ..... 1. **D. Purdieana** Benth.
- b.* Perianth short, about as long as the ovary. Tube constricted (not always distinct in older and very young flowers)... 2. **D. orobanchioides** (Hook.) Miers

1. *Dictyostega Purdieana* Benth. in Hook., Journ. of Bot. VII (1855) p. 14, in note; — *Dictyostega pectinata* Karst. in Linnaea XXVIII (1856) p. 422; Karst. in Nov. Act. Caes. Leop. Car. XXVI (1858) p. 892; Macbride in Fl. Peru I. 3, Field Mus. Nat. Hist. XIII, Publ. 363 (1936) p. 768.

Plants 12—39 cm high. Stem mostly simple, sometimes branched, bearing at the top a simple cincinnus or forked in a double cincinnus, glabrous, terete, white. Leaves small, scalelike, 1—3.5 mm long, lanceolate-ovate, acuminate. Rhizome beset with imbricate scales, formed like the stem-leaves. Pedicels horizontal or curved, 1—4 mm long, placed in the axils of scale-like bracts. Perianth white or lilac, tubular part 2—5 mm long, lobes 1—2.5 mm long, outer lobes ovate, acute to acuminate, inner ones shorter, ovate, obtuse. Stamens sessile, connective deltoid, apiculate at the angular points. Style filiform, swollen at the apex and then branched in three short, thick branches, each bearing a curved, funnel-shaped stigma, carinate at the upper surface. Ovary obovoid, about 1.5 mm long and 1 mm broad. Capsule nearly globose, length and breadth about 2 mm.

Type: Purdie s.n., from Maracaybo, Colombia, in herb. K.

Distribution: North-Western part of South-America: Colombia, Ecuador and Peru.

#### COLOMBIA.

Magdalena, Sta. Martha (Purdie s.n. [P]); Mts. of Maracaybo (Purdie s.n., fl. Sept. [K]).

Cauca, Upper Rio Dagua, Tocoto (Lehmann 1900, fl. Sept. [B; BM; G-BOIS]; Highland of Papayan (Lehmann K. 395, fl. Oct. [K]; Lehmann K. 271, fl. Nov. [F; K]; Lehmann 6010, fl. Jan. [K]); Morales, Cauca Valley (Pennel and Killip 8300, fl. Jul. [B; GH; K; NY; S; US]; id. 8301, fl. Jul. [GH; NY; US]); Western Cordillera, La Cumbre (Pennel and Killip 5800, fl. May [US]).

Boyaca, near Pamplona (Kalbreyer 420, fl. Dec. [K]).

Bogota, Susumuco (Triana s.n., fl. Jul. [K; US]; Karsten s.n. [B; GOTT; W], type of *D. pectinata* Karst.).

#### ECUADOR.

Without locality (Remy s.n. [P]; Grisar s.n. [P], perhaps collected in Peru).

#### PERU.

Huanuco, Prov. Huamalies, near Monzon (Weberbauer 3570, fl. Aug. [B]).

Without locality (Grisar s.n. [P], perhaps collected in Ecuador).

2. *Dictyostega orobanchioides* (Hook.) Miers in Proc. Linn. Soc. I (1840) p. 61; Miers in Trans. Linn. Soc. XVIII (1841) p. 539 and t. 37, f. 1; Seubert in Mart., Flor. Bras. III. 1 (1845) p. 58; Johow in Pringsh., Jahrb. f. Wiss. Bot. XX (1889) p. 475 etc. and Taf. XIX F. 4 and Taf. XXII Fig. 20; Malme in Bih. Kgl. Sv. Akad. Handl. XXII afd. III (1896) n. 8, p. 30; Warming in Overs. Kgl. Dansk. Vid. Selsk. Forh. (1901) n. 6 p. 186; Urb. in Symb. Ant. III (1903) p. 441 and fig. 1 and 2; Engl. in Engl. u. Prantl, Nat. Pfl. Fam. II. 6 (1889) Fig. 39 D-G; Knuth in Fedde, Rep. Beih. XLIII (1928) p. 212; Jonker in Pulle, Fl. Surin. I. 1 (1938) p. 184; — *Dictyostega Schomburgkii* Miers in Proc. Linn. Soc. I (1840) p. 61; Miers in Trans. Linn. Soc. XVIII (1841) p. 542; — *Dictyostega campanulata* Karst. in Linnaea XXVIII (1856) p. 422; Karst. in Nov. Act. Caes. Leop. Car. XXVI (1858) p. 892; Standley in Field Mus. Nat. Hist. XII, Publ. 350 (1936) p. 75; — *Apteria oroban-*



*chioides* Hook., Ic. Plant. III (1840) tab. 254; — *Gymnosiphon orobanchoides* Rusby in Bull. N. Y. Bot. Gard. VI, n. 22 (1910) p. 496; — *Ptychomeria orobanchoides* (Rusby) Schltr. in Fedde, Rep. XVII (1921) p. 257.

Plants 7–40 cm high. Stem glabrous, terete, colourless, simple or rarely branched, forked at the apex into two cincinni or bearing one cincinnus. Leaves minute, ovate, acute scales, 1–3 mm long, adpressed against the stem. Pedicells 1–4 mm long, curved or horizontal. Flowers 2.5–5 mm long, white or rose-coloured. Outer 3 perianth-lobes erect, ovate, with inflexed margin, about 0.5 mm long; inner lobes smaller, first erect, later on reflexed, oblong, rounded at the top. Perianth-tube often constricted. Stamens inserted below the inner perianth-lobes, connective rather broad, with two small, obtuse appendages at the top and two short lateral arms, bearing the white thecae. Thecae dehiscing in the middle, bursting with a horizontal split. Style thick-filiform broadened towards the base and swollen at the apex, branched into three thick short branches, each bearing a triangular curved funnel-shaped stigma. Stigma apiculate at the upper surface, often beset with clusters of pollen-tubes, directly escaped from the anthers. Capsule obovoid to nearly globose, length to 2.5 mm, crowned by the persistent perianth, dehiscing between the placentas with 3 valves. Seeds yellowish, linear-lanceolate, reticulate.

Type: Miers s.n., Brazil (Rio de Janeiro), Corcovado, in herb. BM; duplicates in herb. G-DEL; GH; K and US.

Distribution: Southern Mexico to Southern Brazil, Bolivia and Peru. Not in Suriname, French Guiana and Amazonian Brazil, not in the West-Indian Islands except Trinidad.

MEXICO.

Oaxaca (Galeotti 723 pp. [BR; F; G-DEL; US]).

GUATEMALA.

Alto Verapaz, Coban (v. Tuerckheim 902 [US]); Pansamalá (v. Tuerckheim 1042 pp., fl. Aug. [B; GH; US]).

## BRITISH HONDURAS.

Stann Creek Valley (Pelly 93 [F]); near Middlesea (Schipp 481, fl. Nov. [B; BM; F; G-DEL; GH; K; MIS; NY; S]).

## COSTA RICA.

Rives (Lankester s.n., fl. May [K]); Between Uruksa and Diban (Pittier 12705, fl. Sept. [US]); San José, near El General (Skutch 2769, fl. Jul. [S]); without locality (Endres s.n. [W]).

## COLOMBIA.

Magdalena, Sta. Martha (Smith 1308, fl. March [K; NY]).

Bogotá, Susumuco (Karsten s.n. [W], type of *D. campanulata* Karst.), Without locality (Mutis 1189 [US]).

## VENEZUELA.

Bolívar, Summit of Mnt. Duida (Tate 722 [NY]).

## TRINIDAD.

Without locality (Fendler 547 [K]).

## BRITISH GUIANA.

Roraima (Im Thurn 121, fl. Dec. [BM; K]; Appun 1116 [K]); near Mazaroni Riv. (Myers 3113 [K]); Serra Mey (Schomburgk 149 [BM; GH; K; L], type of *D. Schomburgkii* Miers).

## BRAZIL.

Rio de Janeiro, Organ Mountains (Gardner 842 [BM; G-DEL; K; NY; P-DR; W]); Guillemín 912, fl. May [P]); Corcovado (Miers s.n. [BM; G-BOIS; G-DEL; GH; K; US]); Schott 4698 [W]), Alto Macahé (Glaziou 18559 [B; K; P]; Glaziou 4886, fl. Feb. [B; P]); Pico da Tijuca (Ule 4002, fl. March [B; S]; Smith 2124 [GH]); Sta. M. Magdalena (Santos Lima and Brade 13247, fl. March [R; U]).

São Paulo, Santos (Mosén 3703, fl. Apr. [P; S]); id., Mt. Espiquão do Curupira (Mosén 3702, fl. March [S]); Col. Pariqueira Assu (Brade 5731, fl. Jun. [S]); Iguapé (Brade 9076, fl. Jun. [B]).

Paraná, Paranagua (Dusén 9807, fl. Apr. [GH; MIS; NY; S; US]); Port Don Pedro II (Dusén 9874, fl. Jun. [B; BM; S]); Iacarehy (Dusén 15253, fl. Jul. [S]).

Sta. Catharina, Garcia Riv. near Blumenau (Ule 877, fl. Apr. [B]; Ule 1000 pp., fl. Nov. [BRSL]); Laranjeira Mts. near San Francisco (Ule 332, fl. Aug. [B; BRSL]); Itayahy (Mueller 481 [K]).

Without locality (Sello s.n. [B]).

## BOLIVIA.

La Paz, near Covado (White 1045, fl. Sept. [NY]); Mapiro (Bang 1563 pp. [BM; BZ; C; CA; F; G-BOIS; GH; LY; MIS; S; US; W]); id., near S. Carlos (Buchtien 459 pp., fl. March [S; US]); near Tipuani (Buchtien 5366, fl. March [US]); Cordillera Real, Ticunhuaya (Tate 1106, fl. Apr. [NY]); near Inglis-Inglis (Williams 1636, fl. Aug. [BM; K; NY; US], type of *Gymnosiphon orobanchoides* Rusby).

## PERU.

Loreto, Tarapoto (Spruce 4458 [BM; G-BOIS; G-DEL; K; P; W]).

Junin, Schunke Hacienda, above San Ramon (Killip and Smith 24834, fl. Jun. [NY; US]).

Salto, Pompeyaca (unknown collector D. 175, fl. Feb. [W]).

Without precise locality, Sandellani, W. Slope of the Andes (Pearce s.n., fl. Apr. [BM; K]).

Var. **parviflora** (Benth.) Jonk. in Pulle, Fl. Sur. I. 1 (1938) p. 185; — *Dictyostegia Schomburgkii* Miers, var. *parviflora* Benth. in Hook., Journ. of Bot. VII (1855) p. 13; Sandwith in Kew Bull. (1931) p. 59; — *Dictyostegia orobanchoides* non Miers, Urb. in Symb. Ant. III (1903) p. 442; Pulle, Enum. (1906) p. 114.

Plant more tender, white, 13–30 cm high. Inflorescence always a loose double cincinnus. Flowers white, much smaller than in the species, about 2 mm long. Pedicels 1–3 mm long, curved or horizontal.

Type: Spruce 2623, Brazil (Amazonas), Rio Uaupés near Panuré, in herb. K; duplicates in herb. BM; BR and P-DR.

Distribution: Venezuela, Guiana, Trinidad, Brazil (Amazonas) and Colombia (Sur de Santander).

VENEZUELA.

Zulia, Rio Lora, Perya (Pittier 10952, fl. Dec. [GH; NY; US]).

BRITISH GUIANA.

Essequibo Riv., Moraballi Creek near Bartica (Sandwith 540, fl. Oct. [K]).

SURINAME (NETHERL. GUIANA).

Upper Gonini Riv. (Versteeg 179, fl. Aug. [U]).

FRENCH GUIANA.

Karouang (Sagot 1164 pp. [B; K; S; U; W]).

TRINIDAD.

Aripo (Crueger 58, fl. Jan. [GÖTT]); Without locality (Crueger 236 [B]; Othmer s.n. [B]).

BRAZIL.

Amazonas, Rio Uaupés (Spruce 2879, fl. Jan [K]); id., near Panuré (Spruce 2623, fl. Oct. [BM; BR; K; P-DR]).

COLOMBIA.

Sur de Santander, near Barrauca Bermeja, Magdalena Valley (Haught 1376 pp., fl. Sept. [US]; Haught 1435, fl. Dec. [U; US]).

## 9. MIERSIELLA Urb.

Erect, saprophytical herbs. Stem simple, bearing at the apex an umbelliform inflorescence. Rootstock beset with ovate-lance-

olate, aristate scales. Leaves reduced to minute, appressed scales. Perianth 6-lobed, outer lobes erect, acute, ovate to deltoid, the inner ones shorter, obtuse to rounded. Anthers 3, sessile below the inner perianth-lobes in the perianth-throat, not inserted in sacks. Connective broad, without long appendages. Style thick-filiform in the lower part, swollen at the top, branched above the swollen part into 3 branches, each bearing a curved, funnel-shaped stigma without appendages. On the top of the ovary, inside the perianth-tube 3 large, globose glands, inserted above the top of the placentas. Ovary 1-celled with 3 parietal placentas. Perianth persistent on the fruit, perianth-limb not deciduous. Capsule dehiscent by 3 irregular valves. Seeds numerous, small, oblong; testa reticulated, not loose.

**Type-species:** *Miersiella umbellata* (Miers) Urb.

**Distribution:** 1 species, known from Brazil and British Guiana.

1. ***Miersiella umbellata*** (Miers) Urb. in *Symb. Ant.* III (1903) p. 439; — *Dictyostega umbellata* Miers in *Proc. Linn. Soc.* I (1840) p. 61; Miers in *Trans. Linn. Soc.* XVIII (1841) p. 541; Seubert in *Mart., Flor. Bras.* III. 1 (1847) p. 59; — *Miersiella costata* (Miers) Sandw. in *Kew Bull.* (1931) p. 59; — *Dictyostega costata* Miers in *Proc. Linn. Soc.* I (1840) p. 61; Miers in *Trans. Linn. Soc.* XVIII (1841) p. 542; Seubert in *Mart., Flor. Bras.* III. 1 (1847) p. 59; — *Miersiella aristata* Sandw. in *Kew Bull.* (1931) p. 59.

Plants 5.5–17 cm high, white or purplish. Stem simple, bearing at its apex an umbelliform, 3–10-flowered inflorescence. Rhizome vermiform, up to 3 cm long, beset with imbricate, ovate-lanceolate, aristate scales. Leaves small, scalelike, appressed, ovate-lanceolate, acute or acuminate to aristate, 1–5 mm long. Bracts ovate, acuminate or aristate, 2–3 mm long and about 1 mm broad, often forming an involucre. Pedicels

2—4 mm long. Flowers 2.5—4 mm long, white, violet or purplish. Outer perianth-lobes erect, ovate to deltoid, acute, 0.5—1 mm long. Inner lobes ovate, rounded, erect, minute. Perianth-tube cylindrical, not constricted, 1—2 mm long. Anthers sessile, connective T-shaped or obtriangular. Style with stigmas as long as the perianth-tube. Glands on the ovary dark-coloured, globose, rather large. Ovary obovoid, 1—2 mm long. Capsule truncate-globose, crowned by the dried perianth.

Type: Miers s.n. from Brazil, Rio de Janeiro, Organ Mountains, in herb. BM.

Distribution: Brazil, British Guiana.

#### BRAZIL.

Rio de Janeiro. Sta. M. Magdalena, Alto do Republica (Santos Lima and Brade 14173, fl. March [R; U]); id., Serra do Tamandua (Santos Lima 287, fl. March [R; U]); Corcovado (Miers s.n. [BM], type of *Dictyostega costata* Miers); Alto Macahé (Glaziou 18560, fl. March [B; K; P]); Organ Mountains (Miers s.n., fl. Feb. [BM]).

Minas Geraes, near Caraca (Ule 2704, fl. March [B]).

Bahia, without precise locality (Blanchet 1528 [G-BOIS]).

#### BRITISH GUIANA.

Essequibo Riv., Moraballi Creek near Bartica (Sandwith 131, fl. Aug. [K], type of *Miersiella aristata* Sandw.).

## TRIBUS II, THISMIEAE Miers.

Saprophytic, succulent herbs. Flowers urceolate to campanulate, usually actinomorphic, sometimes zygomorphic. Perianth circumscissile. Stamens usually 6, seldom 3, hanging. Style short and thick, persistent. Ovary 1-celled with 3 placentas.

### Key to the genera.

1. *a.* Stamens 3. Subtribus *Oxygyneae* (Tropical Africa) ..... 16. **Oxygyne**, p. 260
- b.* Stamens 6. Subtribus *Euthismieae* ..... 2
2. *a.* Perianth geniculate. Stigma funnel-shaped. Stamens hanging, inserted in the middle of the perianth-tube. Filaments filiform, connectives grown together with the margin of the stigma-funnel (Tropical Africa)... ..... 10. **Afrothismia**, p. 222
- b.* Filaments inserted in the perianth-mouth. Stigma(s) not funnel-shaped, connectives not grown together with the stigmas ..... 3
3. *a.* Stigmas 3, free ..... 5
- b.* The 3 stigmas connate to a single body at the top of the style ..... 4
4. *a.* Insertion of the outer perianth-lobes very low. Inner perianth-lobes free, peltate, orbiculate, on their inner surface a glandular, bowl-shaped body (Brazil)..... ..... 11. **Triscyphus**, p. 225
- b.* Outer perianth-lobes inserted between the inner ones. Inner ones connate to an erect mitre with 3 holes, bearing at its apex 3 long, hanging, thick, filiform appendages, clavately swollen at their tops. Stigma 3-winged (Brazil) ..... 12. **Glaziocharis**, p. 226
5. *a.* Inner perianth-lobes free, or converging at their tops or connate to a mitre with 3 holes, the latter without appendages at the apex ..... 13. **Thismia**, p. 227

- b.* Inner perianth-lobes connate to an erect mitre with 3 holes, bearing one or three long appendages at the top ..... 6
6. *a.* Mitre bearing three erect, thick, filiform appendages at the apex, clavately swollen at their tops (Borneo) ..... 14. **Geomitra**, p. 254
- b.* Mitre bearing one long, erect, thick column at the apex. At the top of the column three, more or less connate, glandular lobes (Philippines, New Guinea) ..... 15. **Scaphiophora**, p. 256

**Subtribus 1, EUTHISMIEAE** Jonk. <sup>1)</sup>.

Stamens 6, inserted at an annulus in the perianth-mouth or in the perianth-tube.

**10. AFROTHISMIA** Schltr.

Small, saprophytic herbs. Rootstocks beset with small, peculiar tubers. Stem usually simple with small, scalelike leaves. Flowers rather large. Perianth urceolate, geniculate or zygomorphous. Perianth-lobes 6, inner and outer lobes equal in length and size, or nearly so. Stamens 6, filaments inserted at the basal part of the perianth-wall, curved, swollen at the top. Thecae dehiscing in longitudinal direction. Connective as broad as a theca, with a rather broad, fleshy appendage at the top, grown together with the stigma-margin. Ovary obovoid, 1-celled. Placentas 3, in their basal part connate into a central, sterile column, in the upper part free and bearing the ellipsoid ovules. Funicles filiform, of the same length as, or somewhat longer than the ovules. Style short and rather thick, stigma funnel-shaped. After flowering the whole perianth and ovary-wall deciduous, only the placentas with the seeds remaining. Seeds ellipsoid, with loose, reticulate testa.

<sup>1)</sup> **Euthismieae** Jonk., nov. subtribus e tribu *Thismiae* Jonk. *Thismiearum*. Stamina 6.

Type-species: *Afrothismia Winkleri* (Engl.) Schltr.

Distribution: Species 2, only known from the Cameroons.

Key to the species.

1. *a.* Perianth geniculate, perianth-lobes hastate ..... 1. **A. Winkleri** (Engl.) Schltr.
- b.* Perianth not geniculate but zygomorphous. Perianth-lobes not hastate ..... 2. **A. pachyantha** Schltr.

1. ***Afrothismia Winkleri*** (Engl.) Schltr. in Engl., Jahrb. XXXVIII (1906) p. 139; Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 44; — *Thismia Winkleri* Engl. in Engl., Jahrb. XXXVIII (1905) p. 89, with fig.; Engl., Pfl. Welt Afr. II in Engl.-Drude, Veg. d. Erde IX (1908) p. 403 and fig. 283 p.400.

Plants 2.5–12 cm high, 1 or 2-flowered. Stem usually simple, sometimes with a one-flowered side-branch. Part underground to 4 cm long, rhizome with small tubers or bulbils. Leaves ovate, acute, often keeled about 1.5 mm long and 1 mm broad. Below each flower an ovate, keeled, acute bract, about 5 mm long. Perianth geniculate, urceolate, 6-nerved, the part below the knee 5–7 mm long, wine-red; on the knee colourless, the part above the knee chrome. In the knee a slightly 6-lobed lamella. Perianth-lobes 6, equal in length and size, to 15 mm long, narrowly triangular, hastate at the base, very longly acuminate at the apex. Throat of the corolla with an annulus, a thicker margin. Perianth-lobes inserted on the annulus, just above the side-lobes of the hastate base. Filaments about 1 mm long, curved, inserted at the basal part of the perianth-wall, not at the base. Anthers about 0.5 mm long, connective with a triangular, fleshy appendage at the top. Stigma funnel-shaped with 6 obtuse, small teeth at the margin. Top of the connective-appendages grown together with the margin of the stigma-funnel between the teeth. Style rather short, thick. Ovary 1–2 mm long, obovoid. After flowering, only the placenta-column and



the 3 free, fertile placenta-tops remain as a globular body beset with brown, oblong seeds.

Type: Winkler 225, from New Tegel, Cameroons, in herb. B.

Distribution: Cameroons.

CAMEROONS.

New Tegel, near Buea (Winkler 225, fl. Jul. [B]); near Moliwe (Schlechter 15788, fl. Sept. [B; BM; BR; G-DEL; K; L; P]); Bipindihof, near Kribi (Zenker 3613, fl. Jan. [B]).

2. *Afrothismia pachyantha* Schtr. in Engl., Jahrb. XXXVIII (1906) p. 139, Fig. 1; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 44; — *Thismia pachyantha* (Schtr.) Engl., Pfl. Welt Afr. II (1908) p. 403 and p. 401, Fig. 284.

Plants 2—3 cm high, 1—4-flowered. Stem simple. Underground part of the plant about 3 cm long, rhizome with bulbils as in the preceding species. Leaves ovate, acute, often keeled, scalelike. Below each flower an acute bract, about 4 mm long. Flowers about 1 cm long and 8 mm broad. Perianth urceolate, zygomorphous but not geniculate, brownish. In the middle of the perianth a lamella, this lamella not 6-lobed as in the preceding species. Perianth-lobes 6, linear, up to 2 mm long, perhaps slightly unequal in length. Stamens 6, as in the preceding species, connective-appendages connate with the margin of the stigma. Stigma funnel-shaped, margin of the funnel divided into 6 obtuse lobes, connective-appendages attached between these lobes. In the throat of the flower an annulus. Style short and thick, ovary and placentas as in the preceding species. Whole flower and ovary deciduous after flowering, only the placenta-column with the 3 free, fertile placenta-tops persistent.

Type: Schlechter 15789 from the Cameroons in herb. B.

Distribution: Once collected in the Cameroons.

CAMEROONS.

Moliwe (Schlechter 15789, fl. Sept. [B]).

11. *TRISCYPHUS* Taub. ex Warm.

Saprophytic herbs. Underground part a horizontal, vermiform rootstock (ex Taubert). Stem thick, fleshy. Leaves ovate or lanceolate-ovate, scalelike. Flowers urceolate. Outer perianth-lobes inserted in the basal part of the perianth-tube. Inner ones peltate, on their inner surface a glandular, bowl-shaped body. Anthers 6, hanging with short filaments on a thick annulus in the throat of the perianth. Thecae dehiscing in longitudinal direction. Style short, thick, bearing 3 caterpillar-shaped stigmas, grown together in the middle with the swollen top of the style. Ovary 1-celled with 3 parietal placentas as in the genus *Gymnosiphon*, but without glands. Ovules ovoid, funicles rather long and thick. Capsule unknown.

Type-species: *Triscyphus fungiformis* Taub. ex Warm.

Distribution: Species 1, only known from Brazil, Rio de Janeiro.

1. *Triscyphus fungiformis* Taub. ex Warm. in Overs. Kgl. Dansk. Vid. Selsk. Forh. (1901) n. 6, p. 42; Taub. in Verh. Bot. Ver. Brand., Jahrg. 36 (1894) p. LXVI (nomen); Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 42.

Plant high 9,5 cm. Stem compressed in the upper part, fleshy, to 4 mm broad. Leaves ovate or ovate-lanceolate, erect, to 10 mm long. Flower about 2 cm long. Outer perianth-lobes ovate, rounded at the apex, 9 mm long. Inner lobes peltate, nearly round, 9 mm long. Inserted on the top-part of the inner lobes a bowl-shaped, glandular body, with a diameter of about 6 mm. Annulus thick, fleshy, slightly 6-crenate, a stamen hanging on each annulus-lobe. Filaments very short, anthers oblong, when young shortly obtuse-acuminate at the top. Stamens about 3 mm long. Perianth-tube short, urceolate, 7,5 mm long, wall insides transversally ribbed. Stigmas obtuse, style very short. Ovary 4,5 mm long. The thick funicles about as long as, or slightly longer than the ovules. Below the place where

the 3 caterpillar-shaped stigmas are connate, a hole with prominent basal margin, to receive the pollen-grains.

Type: Glaziou 19909 a, from Brazil (Rio de Janeiro), in herb. C (ex Warm.), duplicate in herb. P.

Distribution: Once collected.

**BRAZIL.**

Rio de Janeiro, Alto Macahé, Nova Friburgo (Glaziou 19909a, fl. Dec. [C (ex Warmin g); P]).

12. **GLAZIOCHARIS** Taub. ex Warm.

Saprophytic herbs. Underground part unknown. Stem simple, with scalelike leaves. Flowers large, with 4 bracts at the base. Tubular part of the perianth urceolate. Perianth-lobes 6, outer three free. Inner three perianth-lobes free at the base and connate at the top, forming a mitre with 3 holes. Inserted at the top of the mitre 3 long, filiform, hanging appendages, clavately swollen at their tops. Basal ring of the perianth-tube thickened, persistent. Throat-margin of the perianth-tube thickened to an annulus. Stamens 6, hanging at the annulus, filaments broad, ribbon-shaped, about as long as the anthers. Anthers cleaved together into a ring, filaments free. Style short, thick, fleshy, swollen at the top. Stigma 3-winged, wings ovate, at the margin beset with short hairs. Ovary with 3 parietal placentas. Funicles short. Capsule unknown.

Type-species: *Glaziocharis macahensis* Taub. ex Warm.

Distribution: 1 species in Brazil (Rio de Janeiro).

1. *Glaziocharis macahensis* Taub. ex Warm. in Overs. Kgl. Dansk. Vid. Selsk. Forh. (1901) n. 6 p. 175 and pl. III; Taub. in Verh. Bot. Ver. Brand. Jahrg. 36 (1894) p. LXVI (nomen); Schltr. in Notizbl. 71 End. VIII) (1921) p. 40.

Plant 5,5 cm high (without perianth-appendages). Stem simple, leaves ovate-lanceolate, obtuse, to 3,5 mm long. Below the

flower 4 lanceolate, obtuse bracts. Flowers actinomorphic. Tubular part of the perianth 9 mm long, constricted in the basal part, broadened in the upper part. Annulus at the upper margin of the perianth-tube crenate. Outer perianth-lobes obtuse, oblanceolate. Mitre, formed by the connate inner perianth-lobes, about 3 mm long. Appendages of these inner lobes inserted on the top of the mitre, filiform, very long, hanging downwards, about 48 mm long, top of the appendages clavately swollen. Basal ring of the perianth-tube probably persistent on the capsule, as in the genus *Thismia*. Style brownish, the swollen top dark-orange in dried material. Placentas short, parietal, e. g. as in the genus *Gymnosiphon*.

Type: Glaziou 19909, from Brazil (Rio de Janeiro) in herb. C, duplicate in herb. K and P.

Distribution: Only once collected.

BRAZIL,  
Rio de Janeiro, Alto Macahé (Glaziou 19909, fl. Dec. [C; K; P]).

### 13. *THISMIA* Griff.

Saprophytic, fleshy herbs. Underground part tuberous (sect. *Myostoma* and *Ophiomeris*), coralline (sect. *Sarcosiphon*) or vermiform, creeping (sect. *Rodwaya* and *Euthismia*). Stems usually short and unbranched, sometimes branched, sparsely beset with small, reduced, scalelike leaves. Below the flowers one or more scalelike, small bracts, often forming an involucre. Flowers erect, usually actinomorphic, urceolate to campanulate, sometimes zygomorphic. Perianth-lobes 6, occasionally free and of equal length and size, or inner ones larger, sometimes inner lobes connivent at the apex or connate in the apical part and forming an erect mitre with 3 holes; in this case outer lobes very small, nearly lacking. Mitre of the perianth without appendages at the apex. Perianth-tube urceolate or campanulate, sometimes geniculate. In the perianth-mouth a prominent

annulus. Anthers 6, hanging at the annulus, free or stuck together to an anther-tube. Filaments short, filiform or ribbon-shaped, anthers sagittate or quadrangular. Sometimes between the stamens short, triangular lobes, hanging at the annulus (sect. *Ophiomeris*). Style thick and short, cylindrical or filiform, persistent, bearing at its apex 3 simple or bilobate stigmas. Ovary obconical or obovoid with 3 stalked placentas, inserted at the bottom or parietally in the basal part of the ovary-wall. Placentas sometimes also attached with apical stalks to the roof of the ovary. Fruit fleshy, cup-shaped, crowned by the persistent thick, fleshy, basal ring of the perianth-tube and the persistent style and stigmas.

Type-species: *Thismia Brunonis* Griff.

Distribution: 23 Species. Tropical America (Panama and Brazil; sect. *Myostoma* and *Ophiomeris*); Tropical Asia (Ceylon, Tenasserim, Malay Peninsula, Malay Archipelago; sect. *Euthismia* and *Sarcosiphon*); Chicago Area, New Zealand and Tasmania (sect. *Rodwaya*).

Key to the species.

1. *a.* Inner perianth-lobes free, spreading or erect ..... 2
  - b.* Inner perianth-lobes connivent at the apex. Underground part vermiform, creeping (Sect. *Rodwaya*) ... 19
  - c.* Inner perianth-lobes connate at the apex to an erect mitre with 3 holes. Underground part coralline. Malayan Archipelago. (Sect. *Sarcosiphon*) ..... 20
2. *a.* Stamens quite free from eachother. Filaments filiform, short. Anthers sagittate. Underground part tuberous. Brazil. (Sect. *Myostoma*) ..... 1. **T. hyalina** (Miers) Benth.
- b.* Stamens broad, touching eachother, often stuck together to an anther-tube ..... 3
3. *a.* Stamens bifid. Thecae connate. Rhizome tuberous. Tropical America. (Sect. *Ophiomeris*) ..... 4

- b.* Thecae not connate. Stamens quadrangular, sometimes toothed. Underground part vermiform, creeping. Tropical Asia. (Sect. *Euthismia*) ..... 8
4. *a.* Between the stamens hanging triangular lobes. Anthers bifid at the base and at the apex ..... 5
- b.* Triangular lobes between the stamens lacking. Anthers bifid at the apex only. Outer perianth-lobes almost lacking, inner ones filiform. Perianth broadly campanulate ..... 2. **T. Glaziovii** Pouls.
5. *a.* Flowers distinctly zygomorphic ..... 6
- b.* Flowers actinomorphic or nearly so ..... 7
6. *a.* Inner perianth-lobes filiform, about 10 mm long ..... 3. **T. macahensis** (Miers) Benth.
- b.* Inner perianth-lobes triangular at the base, tapering into filiform tentacles, about 35–40 mm long ..... 4. **T. panamensis** (Standl.) Jonk.
7. *a.* Inner perianth-lobes filiform, not swollen. Plant up to 5 cm high ..... 5. **T. janeirensis** Warm.
- b.* Inner perianth-lobes filiform, clavately swollen at the apex. Plants 6–12 cm high ..... 6. **T. Luetzelburgii** Goeb. et Suessg.
8. *a.* Perianth-lobes all equal in length and size. (Subsect. *Odoardoa*) ..... 9
- b.* Inner perianth-lobes larger (Subsect. *Brunonithismia*) ..... 14
9. *a.* Flowers zygomorphic, geniculate ..... 7. **T. chrysops** Ridl.
- b.* Flowers actinomorphic ..... 10
10. *a.* Stems several, flowers 4–6 in a raceme ..... 8. **T. racemosa** Ridl.
- b.* Stem simple, flowers 1–2, terminal ..... 11
11. *a.* Stem-scales and bracts beset with distinct, prominent, stiff, blunt processes ..... 9. **T. grandiflora** Ridl.
- b.* Scales and bracts without processes ..... 12
12. *a.* Perianth-lobes lanceolate, acute to acuminate, flat... ..... 10. **T. fumida** Ridl.

- b. Perianth-lobes triangular at the base, tapering into long, filiform tentacles ..... 13
13. a. Perianth-tube with horizontal balks inside. Anthers with 3 teeth at the apical margin. Stigmas narrow, lanceolate ..... 11. **T. Aseroe** Becc.
- b. Perianth-tube without balks. Apical anther-margin with two teeth, each bearing a globose body at the top. Stigmas funnel-shaped with prominent margin ... ..... 12. **T. ophiuris** Becc.
14. a. Perianth very zygomorphic, bilabiate. Upperlip fleshy, bent over the opening of the tube ..... 13. **T. labiata** J. J. S.
- b. Flowers actinomorphic ..... 15
15. a. Inner perianth-lobes consisting of 3 parts. Basal part erect, short, bearing a transverse part, hamate at the base and broadened at the apex. Third part awl-shaped, inserted on the broad apex of the second part ..... 14. **T. Neptunis** Becc.
- b. Inner perianth-lobes simple ..... 16
16. a. Perianth-tube with prominent horizontal bars inside ..... 17
- b. Perianth-tube without bars, stigmas deeply 2-lobed. Anthers with 2 teeth at the apex, each bearing a stiff hair. Ceylon ..... 15. **T. Gardneriana** Hook. f.
17. a. Anthers with 3 teeth at the apical margin, each bearing a stiff hair. Stamens and appendage of the connective ciliate at the margins. Outer perianth-lobes broadly ovate, obtuse ..... 16. **T. javanica** J. J. S.
- b. Anthers dentate at the apical margin ..... 18
18. a. Outer perianth-lobes short, ear-shaped. Stem creeping, bearing 2—3 flowers ... 17. **T. arachnites** Ridl.
- b. Outer perianth-lobes broadly ovate. Stem erect, 3—6-flowered. Stigmas bifid ... .. 18. **T. Brunonis** Griff.
19. a. Anthers with two lateral teeth and a median thick hair at the apical margin (New Zealand and Tasmania) ..... 19. **T. Rodwayi** F. v. Muell.

- b.* Anthers truncate at the apex (Chicago) .....  
 ..... 20. *T. americana* Pfeiff.
20. *a.* Outer perianth-lobes linear, connate at the tips, forming a mitre with large holes. Anthers ciliate at the basal margins and the margins of the appendage, toothed at the apex ..... 21
- b.* Outer perianth-lobes spatulate, connate to a mitre with rather small holes. Anthers not ciliate, truncate at the apex ..... 21. *T. crocea* (Becc.) J. J. S.
21. *a.* Apical anther-margin with two teeth, each bearing a stiff hair. Anthers slightly constricted in the middle, below the thecae ..... 22. *T. clandestina* (Bl.) Miq.
- b.* Apical anther-margin with 3 teeth, each bearing a stiff hair. Anthers constricted at the base, just above the thecae, again broadening below the thecae .....  
 ..... 23. *T. episcopalis* (Becc.) F. v. Muell.

#### SECT. I. MYOSTOMA (Miers) Jonk.

Flowers actinomorphic. Outer perianth-lobes erect, connivent. Stamens free, filaments filiform, anthers sagittate. Underground part tuberous.

1. *Thismia hyalina* (Miers) Benth. ex F. v. Muell. in Bot. Centr. Bl. XLVI (1891) p. 141; — *Myostoma hyalina* Miers in Trans. Linn. Soc. XXV (1866) p. 474, t. 57; Schlechter in Fedde, Rep. 71 (Bnd. VIII) (1921) p. 41.

Saprophytical, leafless herbs, 4–13 cm high. Stem fleshy, simple, 1-flowered at the apex. Underground part tuberous. Bracts lanceolate, acute (acc. to Miers). Flowers up to 18 mm long. Perianth urceolate, inner perianth-lobes linear-filiform, up to 9 mm long. Outer ones about 5 mm long and up to 3.5 mm broad, erect, reniform-cordate, connivent at the apex. Perianth-tube about 7 mm long. Stamens 6, about 2.5 mm long, anthers sagittate, hanging on short, filiform filaments. Anthers



not connate into an anther-tube. Style short, thick, bearing 3 erect, lanceolate stigmas at the apex, style with stigmas 3—4 mm long. Ovary obconical, about 4 mm long. Capsule cup-shaped, 3—5 mm long and 3—8 mm broad (pressed). Seeds ellipsoid with rather loose testa. Funicle about as long as the seed.

Type: Miers fil. s.n., from Brazil, Rio de Janeiro, in herb. BM.

Distribution: Rio de Janeiro.

**BRAZIL.**

Rio de Janeiro, Petropolis (Miers fil. s.n., fl. March [BM]); Alto Macahé (Glaziou s.n., ex Schlechter l.c.).

**SECT. II. OPHIOMERIS (Miers) Jonk.**

Flowers actinomorphic or zygomorphic. Outer perianth-lobes reflexed. Stamens touching each other, often more or less stuck together. Filaments ribbon-shaped, anthers broad, bifid at the apex. Thecae connate. Underground part tuberous.

2. *Thismia Glaziovii* Poul. in Bonnier, Rev. Gén. Bot. I (1889) p. 549; Poul. in Kgl. Dansk. Vid. Selsk. Forh. (1890) p. 24; Warming in K. Dansk. Vid. Selsk. Forh. (1901) p. 183; — *Triuricodon Glaziovii* (Poul.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 41.

Plants 3—10 cm high. Root-system tuberous. Stem erect, simple, leafless, one-flowered. Flowers, with appendages, about 22 mm long, with 3 scalelike, 2 mm long, ovate, acute bracts at the base. Perianth rather broad, campanulate, about 7 mm long. Inner perianth-lobes papillose at the margin, ovate, tapering into filiform appendages, about 13 mm long. Outer perianth-lobes broad, short, rounded, almost lacking. Stamens hanging in the throat of the perianth at a 6-lobed annulus. Filaments as broad as the anthers and connectives. Stamens free in young

flowers (ex Poulsen), but in old dried specimens stuck together to a stamen-tube. Basal part of the connective bifid in two lanceolate lobes. Style short, thick-filiform, fleshy, bearing a 3-lobed to 3-fid stigma. Stigma-lobes broad-obovate, obtuse. Ovary about 2 mm long, with 3 free, stalked placentas, inserted parietal-basally. Fruit fleshy, obconical, ribbed, about 4 mm long, crowned by the persistent style and the persistent basal perianth-ring.

Type: Glaziou 18558, from Rio de Janeiro, in herb. C, duplicates in herb. B, K, P.

Distribution: Once collected.

BRAZIL.

Rio de Janeiro, Alto Macahé, Nova Friburgo (Glaziou 18558 [B; C; K; P]).

3. *Thismia macahensis* (Miers) Benth. ex F. v. Muell. in Bot. Centr. Bl. XLVI (1891) p. 140; Warming in Overs. Kgl. Dansk. Vid. Selsk. Forh. (1901) n. 6, p. 182; — *Ophiomeris macahensis* Miers in Proc. Linn. Soc. I (1847) p. 329; Miers in Trans. Linn. Soc. XX (1851) p. 374, tab. 15; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 43; Schlechter in Fedde, Rep. XX (1924) p. 297.

Erect, saprophytical herb, about 4 cm high. Stem fleshy, simple, 1-flowered at the apex. Underground part tuberous. Tube about 5 mm long and 5 mm broad with hairlike roots, about 10 mm long. Stem leafless, below the flower a lanceolate, acute bract, about 3 mm long. Flower (without tentacles) about 10 mm long. Outer perianth-lobes reniform-cordate, 2—3 mm long, inner ones transformed into long, filiform tentacles, about 10 mm long. Perianth very zygomorphic. Perianth-tube about 6 mm long. Anthers hanging, alternating with short, triangular, hanging lobes. Filaments broad, ribbon-shaped; triangular lobes and filaments connate at the base to a short tube. Connective sagittate at the base, bilobed at the apex. Sagittate lateral lobes and terminal lobes of the connectives stuck together at their margin.

Thecae inserted at the margin of the connective between the two terminal lobes. Ovary very small, obconical to patelliform. Style thick, bearing at the apex 3 lanceolate, acute, papillose stigmas. Style with stigmas about 3 mm long. Capsule cup-shaped, about 4 mm long, up to 5 mm broad (pressed).

Type: Miers fil. s.n. from Brazil, Rio de Janeiro, in herb. BM.

Distribution: Once collected.

BRAZIL.

Rio de Janeiro, Macahé (Miers fil. s.n. [BM]).

3a. *Thismia iguassensis* (Miers) Benth. ex F. v. Muell in Bot. Centr. Bl. XLVI (1891) p. 140; Warming in Overs. Kgl. Dansk. Vid. Selsk. Forh. (1901) n. 6 p. 182; — *Ophiomeris iguassensis* Miers in Proc. Linn. Soc. I (1847) p. 329; Miers in Trans. Linn. Soc. XX (1851) p. 374; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 43.

Described from fruiting material, quite similar to fruiting specimens of *T. macahensis*. Below the fruit 4 lanceolate, acute bracts. Possibly identical with one of the South-American *Thismias*.

Type: Miers s.n., from Brazil, Rio de Janeiro (1841) in herb. BM.

Distribution: Once collected.

BRAZIL.

Rio de Janeiro (Miers s.n. [BM]).

4. *Thismia panamensis* (Standl.) Jonk. nov. comb.; — *Ophiomeris panamensis* Standl. in Journ. Wash. Acad. Sc. XVII n. 7 (1927) p. 163; Standley in Smiths. Misc. Coll. LXXVIII n. 8 (1927) p. 14; Standl. in Contr. U.S. Nat. Herb. XXVII (1928) p. 121.

Plants 3.5—9.5 cm high. Root system tuberous. Stem erect.

fleshy, leafless, one-flowered. Flower erect, about 13 mm long (without appendages), with 4 ovate-lanceolate, up to 4 mm long bracts at the base. Perianth about 9 mm long, equal in length and width, urceolate-campanulate, very zygomorphic; owing to a large one-sided sagging. Inner perianth-lobes ovate, tapering at the apex into filiform appendages, up to 40 mm long. Outer lobes ovate, rounded, reflexed. Annulus prominently 3-lobed, alternating with the inner lobes. Anthers hanging, alternating with small, hanging triangular lobes. Filaments broad, grown together at their insertion with the triangular lobes to a short tube. Thecae oblong, parallel. Connective sagittate above the thecae, bilobate below the anthers, without hairs or filiform appendages. Sagittate lateral lobes and terminal lobes of the connective cleaved together at their margins. Style thick-filiform, conical at the base, bearing at its apex 3 linear stigmas. Style papillose in its lower part, hairy at the apex. Ovary about 2 mm long, obovate. Placentas parietal, inserted on very short stalks. Fruit fleshy, obconical, about 3 mm long, crowned by the persistent basal ring of the perianth-tube and the persistent style. Seeds numerous. Funicles longer than the seeds.

Type: Dodge 3484, from the Canal Zone, Panama, in herb. US, duplicate in herb. GH.

Distribution: This species, though closely related with the preceding and next species, is only known from the Canal Zone in Panama.

#### PANAMA.

Canal Zone, Barro Colorado Island (Zetek s.n. [F]; Kenoyer 247, fl. Jul.—Aug. [US]); id., along Pearson Trail (Dodge 3484, fl. Jul. [GH; US]); id., along Shannon Trail (Dodge 3460, fl. Jul. [GH; US]).

5. *Thismia janeirensis* Warm. in Kgl. Dansk. Vid. Selsk. Forh. (1901) p. 183 and fig. 3; — *Myostoma janeirensis* (Warm.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 41.

Plants about 5 cm high. Root-system tuberous. Stem erect,

rather fleshy, leafless, one-flowered. Flower erect, about 11 mm long (without appendages), with 4 ovate-lanceolate obtuse scales at the base. Perianth about 9 mm long, urceolate, slightly zygomorphic or nearly actinomorphic. Inner perianth-lobes about the same length as the tubular part, filiform, outer lobes ovate, rounded at the apex, reflexed. Annulus prominently 3-lobed. Anthers hanging, alternating with small, hanging, triangular lobes. Filaments broad, connate at their insertion with the triangular lobes to a short tube. Thecae oblong, parallel. Connective sagittate above the thecae, bilobate below the anthers, without hairs or filiform appendages. Sagittate lateral lobes and terminal lobes of the connectives cleaved together with their margins. Style thick-filiform, fleshy, bearing at its apex 3 linear stigmas. Style papillose in its lower part, hairy at the apex. Ovary about 2 mm long, obovate, placentas parietal, inserted on very short stalks. Fruit fleshy, obconical, about 3 mm long, crowned by the 1.5 mm long persistent basal ring of the perianth-tube and the persistent style. Seeds many, ovoid, brown. Funicles longer than the seeds.

Type: Glaziou 19909B from Rio de Janeiro in herb. C, duplicate in herb. P.

Distribution: Once collected.

**BRAZIL.**

Rio de Janeiro, Alto Macahé (Glaziou 19909B [C; P]).

6. *Thismia Luetzelburgii* Goeb. et Suessg. in Flora n. F. XVII (1924) p. 56; — *Ophiomeris macahensis* non Miers, Schltr. in Fedde, Rep. XX (1924) p. 299.

Plants about 6–12 cm high. Stem slender, simple, one-flowered, leafless. Root-system tuberous with small tubers at the end of the roots. Flowers erect, yellowish-white, about 9 mm long, with 4 lanceolate-ovate, about 3 mm long bracts at the base. Perianth urceolate-campanulate, slightly zygomorphic.

about 6 mm long (without the filiform lobes). Outer perianth-lobes ovate, rounded, reflexed, inner ones filiform, about 5 mm long, clavately swollen at the apex. Annulus prominent with 3 large and 3 small lobes. Stamens hanging, sagittate, bilobate at their basal margin, cleaved together with their lateral appendages. Alternating with the anthers triangular, hanging lobes. Anthers grown together at their insertion, forming a short tube with the triangular lobes. Filaments nearly 1 mm broad, broader than in the preceding American species. Style thick-filiform, rather long, about 1.5 mm long. Stigmas 3, linear, papillose in the lower part, long-pilose in the upper part. Ovary about 2.5 mm long, conical, with 3 free, stalked placentas, parietally inserted. Ovules numerous, funicle longer than the ovules. Fruit fleshy, about 4 mm long, obconical, crowned by the persistent basal margin of the perianth-tube and the persistent style. Seeds numerous.

Type: v. Luetzelburg 16040, from Rio Mutum, Brazil (Espírito Santo) in herb. M.

Distribution: Once collected.

**BRAZIL.**

Espírito Santo, Rio Mutum, Branch of Rio Doce (v. Luetzelburg 16040, fl. Feb. [M]).

**SECT. III. EUTHISMIA Schltr.**

Perianth-lobes free. Stamens quadrangular, stuck together to a stamen-tube. Anthers entire or toothed at the apical margin, not bifid. Root-system vermiform.

Subsect. **Odoardoa** Schltr.

Perianth-lobes of equal length and size.

7. **Thismia chrysops** Ridl. in Ann. Bot. IX (1895) p. 323; Ridley in Journ. Str. Br. Roy. As. Soc. 41 (1904) p. 34; Ridl.,

Mat. Fl. Mal. Pen. II (1907) p. 75; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 36; Ridley, Fl. Mal. Pen. IV (1924) p. 308.

Saprophytical herb, about 15 mm high. Root system consisting of rather thick, unbranched roots. Stem colourless, usually simple, mostly 1-flowered at the apex. Leaves scalelike, colourless, linear-lanceolate, acute, up to 4 mm long, sometimes more or less imbricate. Bracts lanceolate, about 4 mm long. Flowers with geniculate tube; lower part of tube, below the knee rose pink with longitudinal striae, limb and upper tube-part chocolate-brown, perianth-mouth yellow. Limb consisting of 6 papillose, equal lobes, about 7 mm long, lanceolate in the lower part, tapering into filiform tails. Annulus prominent, slightly 6-lobed. Perianth-tube geniculate, lower part about 3 mm long, urceolate, upper part about 5 mm long, also urceolate. Anthers quadrangular with a thick hair on both sides of the basal margin and a broad winglike appendage inserted on the midline of the connective. Style cylindrical, very short, bearing 3 erect, oblong, bifid stigmas at its apex. Ovary obconical, about 1 mm long. Capsule cup-shaped, fruit-stalk elongate.

Type: Ridley s.n. from Malacca, Mt. Ophir, in herb. BM.

Distribution: Once collected.

MALAY PENINSULA.

Malacca, Mt. Ophir (Ridley s.n. [BM]).

8. *Thismia racemosa* Ridl. in Journ. Str. Br. Roy. As. Soc. 69 (1915) p. 13; Ridley, Fl. Mal. Pen. (1924) p. 307.

Plants about 5 cm high, stems several together, erect, occasionally branched. Roots numerous. Bracts narrow, linear, acuminate, about 3 mm long. Flowers 4–6 in a raceme, pedicels about 1–1.5 cm long. Perianth-limb about 7 mm wide, perianth-lobes 6, equal in length and size, short, triangular-ovate, blunt. Annulus prominent, large, mouth-opening of the

perianth very small. Perianth-tube about 6 mm long, cylindrical, rather stout, basal ring of the tube thick, fleshy.

Fruit cup-shaped, about 3—4 mm long, crowned by the persistent basal perianth-ring (and the persistent style?).

Type: Burn Murdoch 178, from the Malay Peninsula, Pahang, in herb. Singapore(?).

Distribution: Once collected.

MALAY PENINSULA.

Pahang, near Temerloh (Burn Murdoch 178 [Herb. Singapore, ex Ridley 1915]).

9. *Thismia grandiflora* Ridl. in Ann. Bot. IX (1895) p. 324; Ridley in Journ. Str. Br. Roy. As. Soc. 41 (1904) p. 34; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 74; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 36; Ridley, Fl. Mal. Pen. IV (1924) p. 308.

Saprophytic herb, about 3 cm high. Root-system consisting of thick, vermiform, unbranched roots, about 15 mm long. Stem terete, fleshy, simple, 1-flowered at the apex. At the base of the stem 2 thick, scalelike, acute, lanceolate leaves, about 5 mm long, beset with terete processes on the back. Below the flower 2 bracts of equal length and shape as the leaves, also beset with processes on the back. Flower with its perianth-lobes 21 mm long. Perianth urceolate, tube rose pink with longitudinal striae, limb and ovary brownish. Perianth-lobes 6, of equal length and size, 8 mm long, ovate-triangular in the basal part, tapering at the apex into filiform tails. Annulus prominent, slightly 12-lobed. Anthers hanging, quadrangular, not or scarcely stuck together to a tube. Connective with two lateral teeth at its basal margin and a winglike, broad appendage inserted on the midline of the connective. Style thick, short, fleshy, bearing 3 bifid, erect, papillose stigmas. Ovary about 4 mm long, obovoid and truncate to obconical. Fruit unknown.



Type: Kelsall s.n. from Johore, in herb. BM.

Distribution: Once collected.

MALAY PENINSULA.

Johore, mouth of Sembrong Riv., Tana Abang (Kelsall s.n., fl. Nov. [BM]).

10. *Thismia fumida* Ridl. in Journ. Str. Br. Roy. As. Soc. XXII (1890) p. 338; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 74; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 36; Ridley, Fl. Mal. Pen. IV (1924) p. 307.

Small, succulent, saprophytical, slender, conspicuous herbs, about 10 cm high. Rhizome brownish with 3 or 4 simple, whitish, solitary stems, bearing one or two flowers. Stem-scales appressed, lanceolate, acute to acuminate, very small. Flowers about 0.5—1 cm long, limb consisting of 6 greenish-grey, spreading perianth-lobes, equal in length and size; limb about 1 cm across. Tube almost cylindrical, slightly narrowed above the ovary and broadened towards the limb, white with pink stripes. Annulus prominent. Stamens? Style very short, bearing 3 small, recurved, simple? stigmas. Ovary short, obconical. Capsule cup-shaped, rather broad, the outside scabrid and ribbed, crowned by the crenulate basal ring of the perianth-tube.

Type: Ridley s.n., from Singapore, Chan Chu Kang, in herb.? A good drawing can be found in herb.K.

Distribution: Malay Peninsula, known from Singapore and Selangor.

MALAY PENINSULA.

Singapore, Chan Chu Kang (Ridley s.n., ex Ridley l.c.).  
Selangor, Petaling (Ridley s.n. ex Ridley l.c.).

11. *Thismia Aseroe* Becc., Malesia I (1877) p. 252 and tav. X, fig. 2; Ridley in Journ. Str. Br. Roy. As. Soc. XXII (1890) p. 336; F. v. Muell. in Proc. Roy. Soc. Tasm. (1891)

p. 235; id. in Bot. Centr. Bl. XLVI (1891) p. 141; Groom in Ann. Bot. IX (1895) p. 327 and Pl. XIV, fig. 19 and 20; Ridley Mat. Flor. Mal. Penins. II (1907) p. 74; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 36; Ridley, Fl. Mal. Penins. IV (1924) p. 308.

Plants 3—8,5 cm high, stem rather thick, somewhat fleshy, yellowish, simple or sometimes branched, 1—2-flowered. Roots vermiform, creeping. Leaves few, scalelike, lanceolate, obtuse, to 4 mm long. Flowers with an involucre, consisting of lanceolate bracts. Perianth obconic-campanulate, dirty-yellow in the lower part, bright orange-yellow in the upper tube-part and the limb. Lower part of the wall of the perianth-tube, about 5 mm, with transversal barks, upper 6 mm without barks. Perianth-tube about 11 mm long. Perianth-lobes 6, equal in length and size, triangular, about 1 mm long, terminated by 6 mm long, bright-orange tentacles. Stamens hanging down on a rather broad, prominent annulus in the mouth of the perianth-tube. Thecae oblong, in the upper part of the anthers, in the lower part two nectaries. On the basal margin of each anther 3 filiform appendages. In the lower part of each anther a broad tetragonous wing, inserted on the connective, these wings much broader than the anthers. Anthers connate and forming together an anther-tube. Ovary obovoid to obconical, about 3 mm long. Style short, fleshy, thickened in the basal part, bearing at the top three oblanolate, acute stigmas. Style persistent on the capsule. Capsule fleshy, ribbed, brown, about 5 mm long. After flowering, stalks of the capsule lengthening about 5—7 mm above the involucre. Seeds ellipsoid-oblong, ribbed.

Type: Beccari s.n., from Singapore, in herb. FI.

Distribution: Known from Singapore and Perak.

#### MALAY PENINSULA.

Singapore, Woodlands (Beccari s.n., fl. May [FI]); Bukit-Timah (Ridley s.n., fl. Sept. [BM; K]; Schlechter 15834, fl. Dec. [B]; Winkler 1712, fl. March [BRSL]).

Perak, Upper Perak (Wray 3556, fl. May [K]).

12. *Thismia Ophiuris* Becc., Malesia I (1877) p. 252; F. v. Muell. in Bot. Centr. Bl. XLVI (1891) p. 141; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 36.

Plants about 2—6 cm high, pale-gray. Stems simple or branched, rather thick, fleshy, 1—2-flowered. Leaves scalelike, lanceolate, obtuse, to 4 mm long. Flowers with an involucre of several, lanceolate, obtuse, 3—4 mm long and 1 mm broad scales at the base. Flowers yellowish-brown, perianth urceolate. Tubular part without balks, about 9 mm long. Perianth-lobes 6, equal in length and size, about 13 mm long (with tentacles), triangular, terminated by long, filiform tentacles. Stamens hanging in the perianth-mouth on the rather broad and thick, slightly 6-lobed annulus. Insertion of the stamens broad, then narrowed into the filaments and again broadened into the quadrangular anthers, forming together an anther tube. Basal margin of each anther bearing two teeth, with globose glands at the top. Ovary about 5 mm long, obovoid to obconic, style thick, short, bearing three sessile, funnel-shaped, circumvallated stigmas. Capsule fleshy, ribbed; style, stigmas and the thick, basal perianth-ring persistent on the fruit. Seeds oblong with longitudinal ribs. Funicles about the same length as the seeds.

Type: Beccari s.n., from Borneo (Sarawak) Mt. Mattang, in herb. FI.

Distribution: Only known from Borneo.

BORNEO.

Sarawak, Mt. Mattang (Beccari s.n., fl. Aug. [FI]).  
British N. Borneo, Mt. Kinabalu, Penibukan (Clemens s.n., fl. March [BZ]).

Subsect. *Brunonithismia* Jonk.<sup>1)</sup>

Inner perianth-lobes longer than the outer ones, long-subulate or filiform.

<sup>1)</sup> *Brunonithismia* Jonk., nov. subsect.—Perigonii lobi 3 interiores tantum subulato-producti, exteriores 3 breves triangulo-ovati vel rotundati.

13. *Thismia labiata* J.J.S. in Bull. Jard. Bot. Buit., Sér. 3, IX (1927) p. 220.

Stem simple, about 22 mm long. Stem-scales ovate, acute, appressed, about 1,5 mm long. Root-system vermiform. Flowers with an involucre of 3 ovate-lanceolate, acute scales at the base, about 5,5 mm long.

Perianth urceolate in the basal part, bilabiate-zygomorphous in the upper part. Outer perianth-lobes broad-ovate in their basal part, rounded at the apex, with a subulate appendage inserted below the top, total length about 2,5 mm. Inner lobes linear to filiform, subulate, about 5 mm long. A thick, fleshy upper-lip bent over the opening of the perianth-tube. On the back of the upper-lip one inner and two outer perianth-lobes. Between the two lips the other two inner lobes, one on each side of the flower. The third outer lobe inserted on the middle of the lower lip. Stamens stuck together to a stamen-tube, quadrangular with rounded, ciliate apical margin. Thecae elongate, filaments as broad as the anthers and connectives. Outer side of the stamen-tube beset with short scattered hairs, no appendage. Style rather short, conical, thick, fleshy. The three stigmas connate to a capituliform, 3-lobed stigma. Ovary obconic. Fruit crowned by the persistent style and stigma and the fleshy basal ring of the perianth-tube.

Type: Docters van Leeuwen 3243, from Sumatra, in herb. BZ.

Distribution: Once collected.

SUMATRA.

East-Coast. Onderneming Haboko (Docters van Leeuwen 3243, fl. Feb. [BZ]).

14. *Thismia Neptunis* Becc., Malesia I (1877) p. 251; v. Mueller in Bot. Centr. Bl. XLVI (1891) p. 141; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 36.

Small, erect plants. Roots vermiform, creeping, up to 2 cm

long. Stem 4—25 mm long, simple, rather thick, fleshy, 1-flowered, beset with few, lanceolate, acute, scalelike leaves, about 3 mm long. Flowers with an involucre of 3 lanceolate, acute, 4—6 mm long scales at the base. Flowers about 7.5 mm long without the tentacles. Outer perianth-lobes simple, recurved, filiform with triangular base, about 4.5 mm long. Inner perianth-lobes erect, about 15 mm long, consisting of 3 parts. Basal part erect, very short, inserted at the top of the tube, bearing a transversal, peculiarly shaped part with hamate base and a broadened, rounded apex. Inserted on this apex the erect, long, awl-shaped third part of the lobe. Perianth-tube urceolate, about 6 mm long, with 6 longitudinal stripes. Annulus prominent. Filaments short, ribbon-shaped. Anthers quadrangular, 3-toothed at the base, stuck together to an anther tube. Style very short, cylindrical, conical at the base, bearing at its apex 3 erect, simple, lanceolate, acute stigmas. Style with stigmas about 1.5 mm long. Ovary obovoid and truncate to obconical, about 1.5 mm long.

Type: Beccari 1508, from Sarawak, in herb. FI.

Distribution: Once collected.

BORNEO.

Sarawak, Mt. Mattang (Beccari 1508, fl. Apr. [FI]).

15. *Thismia Gardneriana* Hook. f. in Thw., Enum. Pl. Zeyl. (1864) p. 325; Hook., Fl. Br. Ind. V (1890) p. 666; Trimen, Fl. Ceyl. IV (1898) p. 132; Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 36; — *Tribrachys Gardneriana* Champ. mss., ex Hook., Fl. Br. Ind. V (1890) p. 666; — *Thismia Brunonis* non Griff., Miers in Trans. Linn. Soc. XX (1851) p. 376 and Pl. XV, fig. 20 and 21.

Saprophytic herbs, 2.5—10 cm high. Root-system vermiform. Stem usually simple, 1—5-flowered. Leaves appressed, ovate, acute, about 3 mm long. Flowers about 18 mm long. Perianth-

tube urceolate-campanulate, about 9 mm long. Outer perianthlobes broad, rotundate, about 1.5 mm long. Inner lobes subulate, filiform, about 15 mm long, clavately swollen at the top. Annulus prominent, bearing 6 hanging stamens, together connected into a 4.5 mm long stamen-tube. Filaments about as broad as the anthers and connective. Thecae broad-oblong, parallel. Basal margin of the connective with 2 teeth, each of them tapering into a stiff hair. Lateral margins of the connective with a yellow glandular spot. Connective bearing a large, quadrangular, winglike appendage, inserted at the midline of the connective, broader than the connective. Ovary obovoid to obconical, about 4 mm long. Style thick, fleshy, conical, bearing at the top 3 bifid stigmas. Stigma-lobes ovate-lanceolate, obtuse. Basal part of the style papillose. Style and stigmas together about 4 mm long. Placentas 3, not connate, inserted with 3 free stalks at the bottom of the ovary. From the top of the placentas 3 stalks arising, inserted at the upper surface of the ovary. Fruit fleshy, obconical, about 4 mm long, crowned by a persistent basal perianth-ring and the persistent style with the dried stigmas.

Type: Champion s.n., from Ceylon, in herb. K.

Distribution: Only known from Ceylon.

#### CEYLON.

Narawella, near Galle (Champion s.n. [K]); Hewesse, between Eratne and Palabadala (Trimen s.n. [B]); without locality (Champion s.n. [Peradeniya; W]).

16. *Thismia javanica* J.J.S. in Ann. Jard. Bot. Buit. XXIII (1910) p. 32 and Taf. IX; Bernard u. Ernst in Ann. Jard. Bot. Buit. XXIII (1910) p. 36; Koorders, Exk. Fl. Jav. I (1911) p. 344; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 36; Meyer in Ber. D. Bot. Ges. XLIII (1925) p. 193; v. Steenis in Trop. Nat. XXIII (1934) p. 53 and fig. 13; — *Thismia clandestina* non Miq., Janse in Ann. Jard. Bot. Buit. XIV (1897) p. 82 and pl. IX fig. 17; Meyer in Bull. Soc. Imp. Nat. Mosc. (1909) p. 1.

Plants up to 6 (12) cm high. Stem white, simple or sometimes

branched, 1—5-flowered. Leaves scalelike, simple, ovate or lanceolate-ovate, obtuse, about 3 mm long. One flower, with 3 scalelike bracts at the base, inserted on the same height, one of these bracts sometimes bearing in its axil a short branch with a one-bracted flower. Perianth-tube about 7 mm long, urceolate, whitish, with 12 longitudinal, orange stripes. Wall of the tube inside with longitudinal balks, connected by many transversal balks. Outer perianth-lobes ovate, obtuse, inner ones triangular, terminated in long, filiform tentacles, to 30 mm long. Stamens hanging down on a 6-lobed annulus in the mouth of the perianth-tube. Filaments tapering into the connective; thecae oblong, divergent, in the middle of the stamen. Connective with 3 teeth on its apical margin, each tooth bearing a hair at its top. On the lateral margin of the stamen, in the apical part, a yellow spot (nectary?). At the same height, inserted on the outer side of the stamen, in the middle, a broad quadrangular appendage, broader than the stamen. The 3 free margins of the appendage shortly strigose. Connectives connected to a stamen-tube. Style short, thick, fleshy, orange-coloured. Stigmas sessile, truncate. Ovary obovoid, about 3 mm long. Capsule fleshy, orange-coloured, about 6 mm long, style and basal perianth-ring persistent. Seeds ellipsoid.

Type: Not preserved, from Java, Res. Batavia, Tjibeureum.

Distribution: Western part of Java and Sumatra.

Vernacular Name: Angkrek rambut (Java, ex Koorders l.c.)

Note: Lörzing 4231 from Sumatra, Sibolangit, has stems to 12 cm high, 5-flowered. Flowers also much larger than in other specimens.

#### JAVA.

Batavia, near Buitenzorg (Valeton s.n. [BZ]; Raciborsky s.n. [BZ]; Nongnong s.n., fl. Jan. [BZ]; Unknown collector s.n. [L]); Tjibeureum near Buitenzorg (Nongnong s.n., fl. Dec. [BZ]; Koorders 40361b, fl. March [BZ]); without precise locality (Bernard s.n. [BZ]).

## SUMATRA.

East-Coast, Afd. Deli en Serdang, Onderafd. Boven Deli, Sibolangit (Docters van Leeuwen 7725, fl. Feb. [BZ]; Docters van Leeuwen 12779, fl. Sept. [BZ]; Lörzing 4231, fl. Feb. [BZ]).  
Djambi, Seleniboekoe (Posthumus 784, fl. Aug. [BZ]).

17. *Thismia arachnites* Ridl. in Journ. Str. Br. Roy. As. Soc. 44 (1905) p. 197; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 74; Ridley, Fl. Mal. Pen. IV (1924) p. 307.

Succulent, saprophytic herbs with 2,5—7,5 cm long, creeping stems, bearing 2—3 flowers. Bracts lanceolate, acute, about 6 mm long. Peduncles (in flower) about 12 mm long. Outer perianth-lobes short, rounded, ear-shaped. Inner ones long-caudate by slender white tails, about 37 mm long. Perianth-tube urceolate, narrowed at the base, up to 2 cm long, semitransparent with numerous vertical ribs and numerous alternate transversal bars, whitish with 6 red vertical streaks in the upper part. Stamens about 6 mm long, oblong-quadrangular. Connective with an oval perforation close to the base and numerous short teeth at the apex. Style short and thick, bearing 3 stigmas. Fruit cup-shaped, length and breadth about 6 mm, edges thickened, fleshy.

Type: Ridley s.n., from Perak, in herb.? A drawing can be found in herb. K.

Distribution: Once collected.

## MALAY PENINSULA.

Perak, Thaiping Hills, just above Tea Gardens, Larut Hills (Ridley s.n., fl. Feb., ex Ridley l.c.).

18. *Thismia Brunonis* Griff. in Proc. Linn. Soc. I (1844) p. 221; — *Thismia Brunoniana* Griff. in Trans. Linn. Soc. XIX (1845) p. 341; Miquel, Fl. Ned. Ind. III (1855) p. 616; F. v. Muell. in Bot. Centr. Bl. XLVI (1891) p. 140; Schlechter in Notizbl. 71 (Bnd. VIII) p. 35.

Erect, fleshy, saprophytic herbs. Stem beset with small,



lanceolate, acute, appressed scales. Bracts lanceolate, acute, slightly longer than the stem-scales. Stem bearing 3—8 flowers in an apical raceme. Outer perianth-lobes reflexed, broadly ovate, obtuse. Inner ones triangular at the base, caudate in long, thick, filiform tails. Perianth urceolate, perianth-tube yellowish with 12 longitudinal balks, connected by many transversal balks. Stamens hanging at a 6-lobed annulus in the mouth of the perianth, stuck together to a stamen-tube. Filaments ribbon-shaped, constricted in the middle, forming oval perforations in the stamen-tube. Anthers quadrangular, with numerous teeth at the apical margin. Style short, thick, bearing 3 bifid, papillose stigmas at its apex, stigma-lobes acute. Ovary obconical. Placentas inserted with apical and basal stalks to the roof and the base of the ovary. Ovules with rather long funiculus. Fruit cup-shaped, fleshy, crowned by the persistent, thick, fleshy, basal ring of the perianth-tube and the persistent style and stigmas.

Type: Griffith s.n., from Tenasserim, in herb.?

Distribution: Once collected.

BURMA.

Tenasserim, near Palar Orae (Griffith s.n., ex Griffith l.c.).

#### SECT. IV. RODWAYA Schltr.

Inner perianth-lobes bent inwards so that the tops are touching, tops of the inner lobes sometimes slightly connate. Outer lobes free, reflexed, as large as the inner ones. Root-system vermiform.

19. *Thismia Rodwayi* F. v. Muell. in Vict. Nat. (1890) p. 110; F. v. Muell. in Pap. and Proc. Roy. Soc. Tasm. for 1890 (1891) p. 232, with fig.; F. v. Muell. in Bot. Centr. Bl. XLV (1891) p. 63, 125 and 257; id. XLVI (1891) p. 139; — *Bagnisia Rodwayi* F. v. Muell. in Pap. and Proc. Roy. Soc. Tasm. l.c.; F. v. Muell. in Bot. Centr. Bl. XLV (1891) p. 257; id.

XLVI (1891) p. 139; — *Rodwaya thismiacea* F. v. Muell. in Vict. Nat. (1890) p. 110; F. v. Muell. in Bot. Centr. Bl. XLV (1891) p. 63 and 125; — *Sarcosiphon Rodwayi* (F. v. Muell.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 39; — *Bagnisia Hillii* Cheesem. in Kew Bull. (1908) p. 420; Cheeseman, III. New Zeal. Fl. II (1914) pl. 191; — *Sarcosiphon Hillii* (Cheesem.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 39.

Very small, saprophytic herbs. Stems erect, simple, one-flowered, arising from a creeping, vermiform root-system. Flowers sometimes sessile on the root-system or nearly so. Leaves small, ovate, scalelike, appressed, 2—5 mm long. At the base of the flower 3 scalelike bracts. Flowers about 14 mm long. Perianth-tube about 6 mm long, flesh-coloured with 12 longitudinal coloured stripes, 6 stronger and 6 fainter coloured. Tube urceolate, suddenly narrowed in the lower part, narrow lower part about 2 mm long, upper part about 4 mm.

Perianth-lobes 6, slightly unequal in length, about 5 mm long. Outer lobes recurved, slightly broader and shorter than the inner lobes. Inner lobes lanceolate, converging at the apex, cristate by a prominent midline, slightly connate at the top, easy to separate. Stamens hanging on a prominent 6-lobed annulus. The pale anthers and connective broader than the dark red filaments. Connectives connected to an anther-tube. Thecae oblong, parallel. Inserted between the thecae a winglike anther-appendage, about as broad as the anthers, shortly strigose at its basal margin. Apical margin of the connective with a thick median hair and at both sides two horns. Style with the stigmas about 2 mm long, style thin-cylindrical, fleshy, whitish, stigmas truncate-obovate, shortly 2-lobed. Ovary obovoid, colourless. Ovulus numerous, funicles longer than the ovules.

Type: Rodway s.n., from Tasmania, in herb. Melbourne(?), duplicates in herb. B and K.

Distribution: Tasmania and New Zealand.

## TASMANIA.

Derwent Riv., Derwent (Rodway s.n., fl. Nov. [B; K]); E slope of Mt. Wellington (Rodway s.n., ex Ferd. v. Mueller l.c.).

## NEW ZEALAND.

North Island, County Taupo, Opepe, Lake Taupo (Hill s.n. [BM], type of *Bagnisia Hillii* Cheesem.).

20. *Thismia americana* Pfeiffer in Bot. Gaz. LVII (1914) p. 122 etc. and Pl. VII—XI; Pepon, Fl. Chic. Reg. (1927) p. 231; Fernald in Rhodora XXXIII (1931) p. 58; also in Contr. Gray Herb. XCIII (1931) p. 58; — *Sarcosiphon americanus* (Pfeiff.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 39.

Very small, saprophytic herbs. Stems erect, simple, about 6 mm high, one-flowered, arising from a white, creeping, vermiform root-system. Leaves very small, ovate, acute, scalelike, appressed, one-nerved, not keeled. Bracts at the base of the flowers, to 4 mm long and 2 mm broad. Flowers about 13 mm long. Perianth-tube urceolate-geniculate, about 7 mm long; basal part, below the knee, 2 mm long, upper part, above the knee, 5 mm long. Perianth-lobes 6, equal in length and size, about 7 mm long, lanceolate, cristate. Outer lobes recurved. Inner lobes convergent at the top, slightly connate at the apex, easy to separate. Mouth of the perianth-tube nearly closed by a disk of tissue, the central aperture surrounded by a prominent annulus. Filaments as broad as the anthers and connectives, connective without appendages. Thecae oblong, parallel. Style very short, thick, fleshy; stigmas 3, rather long, erect, lanceolate. Style and stigmas about 2 mm long. Ovary obovoid, about 2 mm long.

Type: Pfeiffer s.n., from U.S.A., Chicago (Ill.), in herb. F?, duplicate in herb. MIS.

Distribution: Once collected near Chicago (Ill.), in open prairie.

## UNITED STATES OF AMERICA.

Illinois, near Chicago (Pfeiffer s.n., fl. Sept. [F(?); MIS]).

Obs.: I only saw one specimen from herb. MIS, in Pfeiffer's description the flower is said to be actinomorphic.

## SECT. V. SARCOSIPHON (Bl.) Jonk.

Outer perianth-lobes suppressed, inner ones connate to an erect mitre with 3 holes. Root-system coralline.

21. *Thismia crocea* (Becc.) J.J.S. in Nov. Guin. VIII.1 (1909) p. 193; J. J. Smith in Ann. Jard. Buit. XXIV (2me Série, Vol. IX) (1911) p. 57; — *Bagnisia crocea* Becc., Malesia I (1877) p. 249, tav. XII; Ridley in Journ. Str. Br. Roy. As. Soc. 41 (1904) p. 34; Ridley, Mat. Fl. Mal. Pen. II (1907) p. 75; Ridley, Fl. Mal. Pen. IV (1924) p. 308; — *Sarcosiphon croceus* (Becc.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 38; — *Thismia Versteegii* J. J. S. in Nov. Guin. VIII.1 (1909) p. 193 and Tab. XLIX; J. J. Smith in Ann. Jard. Bot. Buit. XXIV (1911) p. 58 and pl. IX; — *Sarcosiphon Versteegii* (J. J. S.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 38.

Saprophytic herbs, about 6 cm high. Root-system coralloid. Stem simple, fleshy, 1–3-flowered. Leaves to 6 mm long, appressed in the basal part, lanceolate, acute. Flowers about 10 mm long. At the base of the flowers 3 ovate-lanceolate, acute bracts. Perianth-tube urceolate, ribbed, about 6 mm long, reddish-brown in the upper part, yellowish-orange in the middle and white at the base. Outer perianth-lobes broad, short, rounded. Inner lobes connate to a thick, erect mitre, length about 2 mm, with 3 narrow holes and 3 prominent midribs. Mitre obtuse, not acuminate, dirty reddish-brown. Annulus slightly 12-lobed. Anthers connate to an anther-tube, broader than the filaments. Stamens not hairy, anthers with connective quadrangular. Thecae oblong, parallel. Hanging on the basal part of the connective a short, broad appendage, margins of the appendage curled up. Style short, thick, fleshy, bearing 3 ovoid, obtuse, papillose stigmas. Ovary about 2 mm long, light reddish-brown, ovule ovoid. Funicles about as long as the ovules. Fruit fleshy, ribbed, obovoid to cup-shaped, crowned by the persistent style and the basal, thick, fleshy ring of the perianth-

tube. Fruit-stalk thick, fleshy, thicker than the stem, lengthened after flowering about 16 mm above the bracts.

Type: Beccari s.n., from New Guinea, in herb.?

Distribution: Netherl. New Guinea, perhaps also in Perak (Malay Peninsula).

#### NEW GUINEA.

Netherl. New Guinea, Upper Lorentz Riv., Resi Mts., near Kloof Bivak (Versteeg 1623, fl. Aug. [BZ], type of *Thismia Versteegii* J. J. S.); Mt. Morait, NE coast (Beccari s.n., fl. Apr., ex Beccari l.c.).

#### MALAY PENINSULA.

Perak, Larut Hills, below Mt. Hijau (Thaiping Hills) (observed by Ridley, not preserved).

Obs.: Ridley described this specimen in Mat. Fl. Mal. Pen. II (1907) p. 75 as *Bagnisia crocea* Becc., var. *brunnea* Ridl.

22. *Thismia clandestina* (Bl.) Miq., Fl. Ned. Ind. III (1855) p. 616; F. v. Muell. in Pap. and Proc. Roy. Soc. Tasm. for 1890 (1891) p. 235; F. v. Muell. in Bot. Centr. Bl. XLV (1891) p. 258; id. XLVI (1891) p. 141; J. J. Smith in Ann. Jard. Bot. Buit. XXIV (1911) p. 55; Ernst u. Bernard in Ann. Jard. Bot. Buit. XXIV (1911) p. 61; Koorders, Exk. Fl. Jav. I (1911) p. 343; v. Steenis in Trop. Nat. XXIII (1934) p. 52; — *Sarcosiphon clandestinus* Bl. in Mus. Bot. Lugd.-Bat. I (1849) p. 65 and t. 18; Walp., Ann. III (1852) p. 609; Schlechter in Notizbl. 71 (Bnd. VIII) (1921) p. 38.

Plants about 4 or 5 cm high. Root-system coralloid. Stems 1 or 2-flowered, erect, thick, fleshy. Leaves scalelike, mostly appressed, scalelike, acuminate, to 5 mm long. At the base of the flower 3 scalelike, ovate bracts. Flowers about 10 (13) mm long, erect. Perianth-tube urceolate, about 2.5 (4.5) mm long, greenish-grey, with 12 longitudinal, brownish-black stripes. Almost lacking outer perianth-lobes, inner lobes connate to a 2.5

(4.5) mm long, acuminate mitre with 3 holes. Annulus prominent, 6-lobed. Stamens 6, rectangular, hanging down on the annulus-lobes, connected to a tube with 6 holes in the upper part. Margin of the filaments and upper part of the anthers beset with short hairs. Thecae oblong, inserted on the margin of the anthers.

Connective bearing at its basal margin 2 teeth, tapering into stiff hairs. On the basal part of the connective a large, winglike appendage, inserted on the midline of the connective. Appendage bearing bundles of hairs on the angles and on the median, basal part. Style thick, short, fleshy, bearing 3 ovate, at the apex 2-lobed, papillose, whitish stigmas. Ovary obovoid, about 3 mm long. Style and basal perianth-ring persistent on the fruit. Ovules ovoid, funicle about the same length as the ovule. Capsule about 5 mm long, fleshy, papillose. Seeds numerous.

Type: Blume s.n., a fruit-bearing specimen, from Java, Pangerango, in herb. L.

Distribution: Only known from the western part of Java.

#### JAVA.

Batavia, Pangerango (Blume s.n. [L]; Deistel s.n., fl. Jan. [B]); Depok (Bernard s.n. [BZ]); Pasir Tjhideung, near Leuwiliang (Bakhuizen v. d. Brink fil. 3322 (3324), fl. and fr. Jun. [BZ; U]).

23. *Thismia episcopalis* (Becc.) F. v. Muell in Pap. and Proc. Roy. Soc. Tasm. for 1890 (1891) p. 235; F. v. Muell. in Bot. Centr. Bl. XLV (1891) p. 235; id., XLVI (1891) p. 141; J. J. Smith in Nov. Guin. VIII.1 (1907) p. 193; J. J. Smith in Ann. Jard. Bot. Buit. XXIV (1911) p. 57; — *Geomitra episcopalis* Becc., Malesia I (1877) p. 250 and Tav. XI; — *Bagnisia episcopalis* (Becc.) Engl. in Engl. u. Prantl. Nat. Pfl. Fam. II.6 (1889) p. 48 and Fig. 38; — *Sarcosiphon episcopalis* (Becc.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 38.

Saprophytic herbs, 5—19 cm high. Root-system coralloid.

Stem simple or branched, 1—8-flowered. Leaves mostly appressed, scalelike, ovate, acute, 2—5 mm long. Flowers about 17 mm long. Outer perianth-lobes almost lacking, inner ones connate in their upper part, forming a slightly acuminate mitre, about 5 mm long. Annulus prominent, 6-lobed, each lobe bearing a stamen. Perianth-tube urceolate, about 6—9 mm long, basal tube-part thick, fleshy. Stamens stuck together to a stamen-tube. Filaments suddenly narrowed into the anthers, thecae divergent. Anthers widened again into the connective. Margin of the anthers and the broad, winglike connective-appendage hairy. Basal part of the connective, below the insertion of the winglike appendage darker coloured, with 3 teeth at the basal margin, each bearing a stiff hair. Style with stigmas about 2 mm long, style persistent, cylindrical, whitish-papillose, stigmas 2-lobed at the apex. Ovary obovoid, about 3 mm long. Style and basal perianth-ring persistent on the fruit.

Funicles about as long as the ovules. Capsule fleshy, ribbed, cup-shaped, about 3 mm long, fruit-stalk lengthened.

Type: Beccari 6504, from Sarawak, in herb. FI.

Distribution: Only known from Borneo.

**BORNEO.**

Sarawak, Mt. Mattang (Beccari 6504, fl. Apr. [FI]; Hewitt 1709 [B]).  
British N. Borneo, Mt. Kinabalu, Tenompok (Clemens 29905, fl. Jun. [NY]).

14. **GEOMITRA** Becc.

Saprophytic herbs, underground part unknown. Stem beset with scalelike leaves. Flowers large with a involucre of 2—3 bracts at the base. Tubular part of the perianth urceolate. Perianth-lobes 6, 3 outer ones free, very small. Inner ones connate at the top into a mitre with 3 holes. Inserted on the top of the mitre 3 long, thick-filiform, erect appendages, clavately

swollen at the top. Basal ring of the perianth-tube thickened, persistent. Throat-margin of the perianth-tube thickened to a slightly 6-lobed annulus. Stamens 6, hanging at the annulus, anthers stuck together to an anther-tube. Style short, cylindrical, fleshy, bearing at its top 3 erect stigmas. Ovary with 3 stalked placentas, funicle short. Capsule cup-shaped, crowned by the persistent basal perianth-ring and the persistent style.

Type-species: *Geomitra clavigera* Becc.

Distribution. 1 species, known from Borneo, Sarawak.

1. *Geomitra clavigera* Becc., Malesia I (1877) p. 251; — *Thismia clavigera* (Becc.) F. v. Muell. in Vict. Nat. (1890) p. 235; F. v. Mueller in Bot. Centr. Bl. XLVI (1891) p. 141; — *Sarcosiphon clavigerus* (Becc.) Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 39.

Plants 9—12 cm high. Stem simple, usually bearing 3 flowers. Leaves appressed, scalelike, lanceolate, acuminate or sometimes acute, 2—6 mm long. Bracts of the involucre lanceolate, 6—7 mm long, acuminate. Flowers actinomorphic, tubular part of the perianth about 9 mm long. Outer perianth-lobes very short, erect, broadly triangular, about 1 mm long. Mitre, formed by the inner perianth-lobes about 3,5 mm long, hooked at the apex. Inserted on the top of the mitre three thick, filiform appendages, 8—12 mm long, erect, clavately swollen at their tops, not clasping the mitre as figured by Beccari. Basal ring of the perianth thick, persistent on the capsule. Anthers quadrangular, basal margin with one median tooth and two shorter lateral teeth, each bearing a stiff, transparent hair. Anther-tube about 4 mm long. Style short and thick, cylindrical, bearing 3 linear-lanceolate stigmas, bilobate at the top, stigma-lobes acute. Style with stigmas about 1,5 mm long.

Ovary obovoid and truncate to conical, about 3 mm long. Fruit cup-shaped, fleshy, about 3 mm long, crowned by the



1 mm long basal perianth-ring and the 1.5 mm long persistent style and stigmas.

Type: Beccari 2642, from Borneo, Sarawak, in herb. FI.

Distribution: Once collected.

BORNEO.

Sarawak, Mt. Gadin near Lundu (Beccari 2642 [FI]).

### 15. SCAPHIOPHORA Schltr.

Saprophytic herbs. Roots coralline-branched, thick, obtuse, forming dense balls. Stems short, beset with ovate, scalelike leaves. Flowers with 3 scales at the base inserted at an equal height. Perianth-tube urceolate, perianth-lobes 6. Outer perianth-lobes small, ear-shaped to bowl-shaped. Inner lobes narrow in the basal part, suddenly broadened in the upper part, upper part connate. The 3 inner lobes forming a mitre with 3 holes in the lower part. Mitre crowned at the top by a long, stiff, pillar-like appendage. Pillar bearing at the top 3 lobes, sometimes cup-shaped, more or less connate. Stamens 6, hanging in the perianth-tube, inserted on an annulus in the perianth-throat. Filaments broad, ribbon-shaped. Anthers broad, the lower margin with 1 or more teeth. Anthers cleaved together to an anther-tube. Each anther bearing on its outer surface a large hanging appendage, a lobe inserted in the middle of the anther and broader than the anther. Style very thick and short, bearing three obovate stigmas. Placentas 3, broad, stalked, stalks of the placentas inserted peripherically at the bottom of the ovary. Whole perianth deciduous after flowering, except the thickened basal ring of the perianth-tube. Style also persistent on the fruit.

Type-species: *Scaphiophora appendiculata* Schltr.

Distribution: 2 species, one in New Guinea and one in the Philippines.

## Key to the species.

1. *a.* Flowers about 3—6 cm long. Pillar on the perianth-mitre 1,5—6 cm long, at the top broadened into 3 fleshy lobes, slightly connate ... 1. *S. gigantea* Jonk.
- b.* Flowers about 1 cm long. Pillar on the perianth about 5 mm long, bearing at the top 3 cup-shaped bodies ...  
..... 2. *S. appendiculata* Schltr.

1. *Scaphiophora gigantea* Jonk., nov. spec.<sup>1)</sup>

Stems 4—10,5 cm high, partly subterraneous, usually 1-flowered. Leaves scalelike, lanceolate, acute, 2—4 mm long, lower leaves keeled, higher-inserted leaves keeled only in the basal part. The 3 scales (bracts) at the base of the flower ovate-lanceolate, acute, about 18 mm long. Flowers erect, 3—6,5 cm long (without the pillar). Perianth-tube cylindrical-urceolate, 15—21 mm long, pale rose-coloured, with yellow nerves, reticulate below the inner perianth-lobes, the other part of the tube smooth. Mitre, formed by the inner perianth-lobes 5—9 mm long, orange-coloured to vitellin. Outer perianth-lobes ear-shaped. Pillar on the top of the perianth 2—6 cm long, broadened at the top, bearing 3 thick, fleshy lobes, quite connate. Stamens about 7 mm long. Thecae two, divergent, ovate, at the base of the anther. Over the whole length of the anther a median prominent nerve. Anthers hanging, on the lowest margin 3 median and 2 lateral teeth, each bearing a thick, transparent hair. Appendix of the anther much broader, greenish-blue.

<sup>1)</sup> *Scaphiophora gigantea* Jonk. n. sp. — Herba saprophytica, 4—10,5 cm alta, rhizomate corallino. Caules teretes, glabri, uniflori, apice 3-bracteolati. Squamae lanceolatae, acutae, 2—4 mm longae. Bracteoli ovato-lanceolati, fere 18 mm longi. Perianthium urceolatum, lobis exterioribus auriformibus, lobis interioribus unguiculatis apice connatis in columnam cylindricam apice trilobatam exeuntibus. Flores 25—35 mm longi, columna 15—60 mm longa. Stamina 6, decurva, filamentis liberis, connectivis in tubum connatis, apice 5-dentatis, appendice ciliata quam connectivum multo latiore praeditis. Stylus columnaris, brevis, glaber, stigmatibus 3, obovatis, bilobatis, papillosis. Ovarium conicum, placentis 3, pedunculatis, pedunculis liberis, placentis connatis  
Hab.: Insulae Philippinae. Typus: Loher s.n. in herb. Monacense.

lateral margin bearing 3 bundles of short hairs, lowest margin pilose. On the outer side of the anthers, just below the insertion of the appendix, a yellow, ovate spot on each side of the mid-nerve. Style very short and thick, truncate-conical, with the

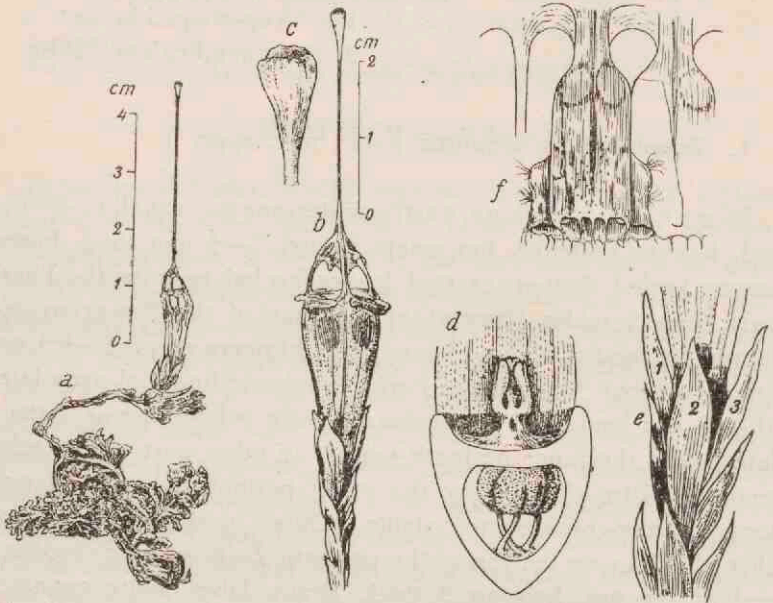


Fig. 20. *Scaphiophora gigantea* Jonk. — a. flowering plant with root-system; b. flower; c. upper part of column; d. lower part of the flower, dissected, showing the placentas, style and stigmas; e. top of the stem, showing the involucre; f. stamen.

stigmas about 3 mm long. Stigmas 3, obovate, erect, sessile, 2-lobed at the top. On the outer side the whole stigma papillose, on the inner side only the upper part. Ovary with 3 broad, thick, fleshy, stalked placentas. Stalks about the same length as the placentas, placentas connate, stalks free.

Type: Loher s.n., Philippine Isles, Luzon, in herb. M.

Distribution: Once collected.

PHILIPPINE ISLANDS.

Luzon, Prov. Laguna, Makiling (Loher s.n., fl. Sept. [M]).

2. *Scaphiophora appendiculata* Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 39; — *Thismia appendiculata* Schltr. in Engl., Bot. Jahrb. LV (1918) p. 202.

Saprophytes, growing in mouldered wood. Stems about 15—20 mm high, partly subterraneous, usually 1-flowered. Leaves scalelike, ovate to lanceolate, 2—3 mm long, sometimes slightly keeled. Involucral bracts 3, lanceolate, acute, about 5 mm long. Flowers erect, about 11 mm long without the pillar.

Perianth-tube cylindrical-urceolate, about 6 mm long, yellowish-white in the lower part. Mitre, formed by the connate inner perianth-lobes 3—6 mm long, orange-coloured. Outer perianth-lobes small, ear-shaped. At the base of each perianth-lobe, on the inner surface, a glandular bowl-shaped body is inserted. Pillar on the top of the perianth 3—5 mm long, slightly broadened towards the apex, bearing 3 thick-fleshy, cupola-shaped lobes. Stamens about 3 mm long. Thecae two, divergent, near the base of the anther. Anther hanging, on the apical margin a thick-filiform, fleshy, median appendage. Anther-appendage broader than the anther, its lowest margin crenulate. Style very short, thick, truncate-conical, about 1.5 mm long. Stigmas 3, obovate, sessile, 2-lobed at the top, almost 1 mm long. Ovary about 3.5 mm long, with 3 stalked, broad placentas. Placenta-stalks filiform, suddenly broadened into the placenta, above the placenta suddenly narrowed again into a filiform apical appendage. Placentas attached at the bottom of the ovary by their stalks and at the roof of the ovary by their apical appendages.

Type: Ledermann 7368, British New Guinea, in herb. B.

Distribution: Once collected.

#### NEW GUINEA.

British New Guinea, Kaiserin Augusta Riv., May Riv., near camp 3 (Ledermann 7368, fl. May [B]).

Subtribus 2, OXYGYNEAE Jonk.<sup>1)</sup>.

Stamens 3, hanging at the annulus in the perianth-throat.

16. OXYGYNE Schltr.

Small, saprophytic herbs, with short stems and scalelike, reduced leaves. Flowers surrounded at the base by several scales, connate to an involucre. In the throat of the perianth-tube a well-developed annulus. Perianth-lobes 6, equal in length and size. Stamens 3, filaments short, inserted on the lobes of the annulus, ascending in the lower part, then recurved. Anthers hanging. Style thick and short, bearing at the top 3 stigma-lobes. Ovary 1-celled with 3 stalked placentas, inserted partially at the bottom of the ovary, stalks attached at the whole dorsal side of the placentas. Whole perianth deciduous, except the thick basal ring of the perianth-tube, with the style crowning the capsule.

Type-species: *Oxygyne triandra* Schltr.

Distribution: 1 species, only known from the Cameroons.

1. *Oxygyne triandra* Schltr. in Engl., Jahrb. XXXVIII (1906) p. 140 and p. 139, Fig. 4; Engl., Pfl. Welt Afr. II in Engl.-Drude, Veg. der Erde IX (1908) p. 403 and p. 401, Fig. 284; Schltr. in Notizbl. 71 (Bnd. VIII) (1921) p. 45.

Plants about 4 cm high. Underground part unknown. Stem short, about 1.5 mm long, 3-flowered. Leaves scalelike, ovate, acute or acuminate, to 3 mm long and 2 mm broad. Scales of

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<sup>1)</sup> *Oxygyneae* Jonk., nov. subtribus e tribu *Thismiearum*. Stamina 3.

the involucre ovate, obtusiusculous, involucre about 8 mm long. Perianth urceolate-campanulate, tubular part about 10 mm long, ribbed, with a thick annulus in the throat. Annulus 3-lobed at the superior margin and 6-lobed at the basal margin. Perianthlobes 10,5 mm long, basal part quadrangular-trapeziform, acute, long-caudate at the top. Filaments short, inserted at the top of the lobes of the upper margin of the annulus. Anthers oblong, dehiscing in longitudinal direction. Style very short, thick, fleshy bearing at the top 3 ovate, acute, stigma-lobes. Ovary about 4 mm long. Placentas about 3 times the length of the placenta-stalks. Ovules numerous, funicle about the same length as the ovule. Fruit truncate-obovoid, bearing on the upper surface the thick, persistent basal ring of the perianth-tube and the persistent style.

Type: Schlechter 15790, from the Cameroons, in herb. B.

Distribution: Once collected.

CAMEROONS.

Moliwe (Schlechter 15790, fl. Sept. [B]).

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## LIST OF COLLECTORS' NUMBERS.

The collectors' numbers are printed in *italics*; the numbers in parentheses are the pages on which the concerning collectors' numbers are cited. *s.n.*: unnumbered specimens.

- Abbot 848 (72).  
 Abraham 216 (188).  
 Administr. Kapoea Plant. *s.n.* (125).  
 Ago *s.n.* (147).  
 d'Alleizette 220 (118).  
 Alfaro *s.n.* (66); 39970 (66).  
 Allen 18 (201); 614 (84).  
 Allison *s.n.* (206).  
 Altson 304 (188); 305 (57); 364 (57).  
 Amani 427 (182).  
 v. Andel *s.n.* (150).  
 Andersen 21 (62); 227 (62).  
 Anderson *s.n.* (91; 119; 188).  
 Annandale *s.n.* (123).  
 Appun *s.n.* (188); 1116 (217).  
 Archer 1771 (72); 2832 pp. (84).  
 d'Armandville 251 (62).  
 Armstrong *s.n.* (135).  
 d'Arnaud Gerkens D27 (151).  
 Arsène 12419 (71).  
 Backer 5778 (125); 6213 (151); 6219 (125); 6277 (13; 151); 6285 (137); 6322 (171); 6328 (137); 6338 (151); 7417 (124); 8739 (151); 10125 (171); 10126 (151); 10252 (151); 10256 (171); 10326 (171); 11018 (171); 11019 (151); 14027 (151); 15036 (151); 15130 (151); 22694 (151); 22824 (125); 23156 (124); 23412 (125); 23797 (151); 23869 (124); 24031 (125); 32441 (124); 32442 (125); 32443 (125).  
 Backer, Bakh. v. d. Brink & Berger 23191 (125).  
 Bailey *s.n.* (120).  
 Baker 1427 (120); 2137 (71); 23498 (140).  
 Bakhuizen v. d. Brink 25 (125); 29 (125); 30 (151); 697 (150); 844 (125); 1354 (151); 1461 (151); 1738 (171); 2194 (125); 2436 (176); 2908 (176); 3126 (151); 3293 (151); 3384 (22; 125); 3473 (124); 3590 (125); 3803 (125); 3975 (125); 4240 (171); 4644 (151); 4792 (137); 5148 (125); 5218 (140); 5403 (140); 5439 (125); 5826 (125); 6355 (125); 6397 (171); 7501 (171); 7867 (140).  
 Bakhuizen v. d. Brink fil. 414 (125); 880 (125); 1175 (140); 1366 (38; 125); 3322 (253); 3323 (171); 3324 (253); 3325 (171); 3375 (212; 125); 3376 (213; 125); 3393 (125).  
 Balansa 318 (124); 319 (124); 320 (118); 2209 (73); 3120 (124); 3208 (73).  
 Ball *s.n.* (122).  
 Bang *s.n.* (207); 1563 pp. (13; 78; 217).  
 Bangham 1292 (119).  
 Banks *s.n.* (135).  
 Banks & Solander *s.n.* (135).  
 Barber 202 (125).  
 Barnes *s.n.* (61).  
 Barnhart 2621 (206).  
 Baron 1561 (98); 1049 (98).  
 Bartlett *s.n.* (188); 7926 (119).  
 Bartlett & La Rue 304 (61).  
 Bates 311 (202); 370 (96); 1452 (202).  
 Baudouin *s.n.* (123).  
 Baum 619 (104); 726 (106).  
 Beccari *s.n.* (62; 112; 125; 126; 140; 142; 171; 175; 241; 242; 252); 86 (136); 402 (140); 627 (175); 794 (150); 930 (125); 1502 (136; 140);



- 1505 (151); 1508 (244); 1687 (62); 2426 (136); 2427 (62); 2642 (256); 3692 (125); 6504 (254); 17016 (151).  
 Beddome 113 (126).  
 Bell & Haniff *s.n.* 140.  
 Bembower 307a (131).  
 Benoist 149 (91); 618 (72); 1432 (72); 1437 (91).  
 Bento Pickel 2575 (73).  
 Bernard *s.n.* (119; 140; 150; 151; 246).  
 Bernier 298 (98).  
 Billington *s.n.* (81).  
 Bitting 600 (206).  
 Blanchet *s.n.* (73); 7 (74); 685 (73); 1528 (220); 2547 (82).  
 Blanton 6643 (80).  
 Bleeser 457 (135).  
 Blume *s.n.* (125; 151; 171; 253).  
 Boden Kloss *s.n.* (62; 118; 120; 141; 171).  
 Bodinier *s.n.* (132); 221 (119); 924 (132).  
 Bodinier & Cavalery *s.n.* (124).  
 Boedijn *s.n.* (150).  
 Boerlage 275 (62).  
 Bois 218 (124).  
 Boivin *s.n.* (98; 183).  
 Bon *s.n.* (124); 6122 (124); 6157 (124).  
 Boorman *s.n.* (120).  
 Boot *s.n.* (80).  
 Boschproefstation 5 (120).  
 Brade *s.n.* (167; 208); 2077 (190); 5731 (217); 5732 (197); 5733 (167); 5734 (73); 5735 (73); 5780 (75); 7484 (76); 9074 (76); 9076 (217); 9675 (73); 13499 (84); 17117 (190).  
 Brass 5353 (62); 6803 (151); 7831 (126); 8779 (141).  
 Braun *s.n.* (96).  
 Brazza 328 (104).  
 Brenes 4049 (190).  
 Brenning 219 (72).  
 Britton *s.n.* (70); 581 (196).  
 Britton & Britton 2496 (72); 8744 (72).  
 Britton, Britton & Gager 7051 (71); 7155 (90); 7162 (71); 7236 (71).  
 Britton, Britton & Wilson 15012 (71); 41456 (90).  
 Britton, Broadway & Hazen *s.n.* (72).  
 Britton, Coker & Rowland 302 (208).  
 Britton, Cowel & Brown 4471 (181); 4472 (209).  
 Britton, Hazen & Mendelson 1255 (208).  
 Broadway *s.n.* (72; 208); 490 (72); 2118 (72).  
 Brooks *s.n.* (123); 1089 (125); 17781 (62).  
 Brown *s.n.* (120); 5793 (120).  
 Bruguères *s.n.* (99).  
 Buchtien *s.n.* (78); 459 (13; 78; 217); 5366 (217).  
 Buesgen 467 (96).  
 Bünemeyer *s.n.* (150); 278 (61); 468 (150); 469 (150); 1472 (124); 2277 (140); 3291 (119); 3331 (61); 3916 (61); 3981 (61); 4058 (61); 4183 (61); 4353 (61); 4365a (61); 5136 (119); 5237 (119); 5463 (61); 5688 (119); 5504 (119); 5728 (61); 5753 (119); 6312 (124); 6338 (124); 10675 (126); 10926 (126); 39663b (61).  
 Bunting *s.n.* (202); 21 (104); 32 (104).  
 Burbridge *s.n.* (61; 125).  
 Burchell A. 527 (76); 566A (86).  
 Burck *s.n.* (119; 150).  
 Burkill 2083 (146); 2834 (123).  
 Burkill & Banerjee 35265 (117).  
 Burkill & Holtum 8510 (61).  
 Burmann *s.n.* (126).  
 Burn Murdoch 178 (239).  
 Bush 373 (71).  
 B.W. *s.n.* (91); 412 (197).  
 Calder & Ramaswami 835 (131).  
 Cameron *s.n.* (102).  
 Campbell 8129 (122).  
 Canby *s.n.* (70); 7922 (70).  
 Carder *s.n.* (87).  
 Chapelier *s.n.* (98).  
 Champion *s.n.* (245).  
 Chapman *s.n.* (70; 71; 80; 206); 21 (206); 80 (80); 1014a (206).  
 herb, Chapman *s.n.* (80); 1697a (71).  
 Chase 7726 (73); 11257 (73); 11908 (73).  
 Chen Pin En 2139 (119).  
 Cheong 28 (188).  
 Chevalier 3963 (118); 30725 (118); 36455 (143).  
 Ching 6179 (118); 6270 (118).  
 Chun 6317 (118).  
 Chun & Tso 43867 (143); 44056 (154).

- Chung 6805 (119); 7579 (119).  
 Clarke *s.n.* (122); 15269B (117);  
 15417 (161); 15690 (161); 15823  
 (161); 24784 (122); 26562 (122);  
 26755 (122); 33981 (122); 36958  
 (122); 38373 (117); 40110 (117);  
 40244C (117); 44653 (131); 44795  
 (117); 44884 (161); 45176 (117);  
 45427 (161).  
 Clayton 248 (80).  
 Clemens *s.n.* (61; 151; 156; 242); 21  
 (156); 9590 (125); 9680 (125);  
 11029 (171); 21124 (125); 20065  
 (62); 29713 (61); 29905 (254);  
 32192 (151); 32389 (61); 32757  
 (171); 327522 (61).  
 Mc. Clure 746 (147); 18280 (146).  
 Coaley *s.n.* (70).  
 coll. indig. *s.n.* (124; 140; 151); 56  
 (151); 89 (140); 91 (151); 123  
 (197); 140 (91); 164 (140); S. 506  
 (115); 636 (62); 1611 (62); 2509  
 (151).  
 Collet *s.n.* (117); 42 (156); 47  
 (161).  
 Combs *s.n.* (80); 688 (71).  
 Contest Lacour *s.n.* (118).  
 Coq d'Armandville 251 (62).  
 Crueger *s.n.* (14; 72; 208); 58  
 (218); 236 (218); 237 (72);  
 1608 (72).  
 Cuesta 615 (90).  
 Cuming 2324 (124); 2325 (123;  
 124); 7371 (118).  
 Cunniff 91 (118).  
 Curran & Foxworthy 13611 (62).  
 Curtis *s.n.* (119; 123; 150); 2950  
 (150); 3731 (61).  
 Curtiss *s.n.* (70; 80; 206); 1847 (70);  
 1848 (70); 2752 (80); 2753 (70);  
 2754 (206); 4170 (80); 4171  
 (70); 4172 (206); 5283 (206);  
 5354 (80); 5355 (70); 6275  
 (206).  
 Cylhet 1072 (122).  
 v. Daalen 171 (61); 529 (119).  
 Dalgado 3 (161).  
 d'Alleizette 220 (118).  
 Dalzell *s.n.* (161).  
 Dalziel 33 (140); 263 (105); 1277  
 (202).  
 Damazio 1777 (81).  
 Dandouau *s.n.* (97).  
 d'Arnaud Gerkens D27 (151).  
 Davis 1049 D47 (188).  
 Decary 29 (98); 614 (97); 1229  
 (98); 1662 (98); 1794 (98);  
 2187 (98); 2216 (98); 3875 (97);  
 5019 (97).  
 Degener 5150 (71).  
 Dehindt *s.n.* (101).  
 de Hügel *s.n.* (120); 3231 (120);  
 3598 (120); 4491 (120); 4503  
 (120).  
 Deighton 298 (104); 1305 (104).  
 Deistel *s.n.* (253).  
 Dhwaj 0558 (117).  
 de Kock 24 (62).  
 Delessert *s.n.* (123).  
 de Leeuw 14 (114).  
 de Moura 894 (88); 923 (73).  
 Derry *s.n.* (123).  
 de Silva 106 (117).  
 de Toledo 7485 (76).  
 de Voogd 48 (150); 130 (61);  
 1465 (61).  
 Dirklage 847 (96); 848 (96); 963  
 (96); 2028 (104); 2831 (104).  
 Docters v. Leeuwen *s.n.* (140; 151);  
 2189 (151); 3243 (243); 3246  
 (143); 7725 (247); 8278 (150);  
 12779 (247).  
 Döderlein *s.n.* (144).  
 Dodge 3460 (235); 3484 (235).  
 Dodge, Steyermark & Allen 16856  
 (71); 16928 (201).  
 Don *s.n.* (122); 8 (73).  
 Donnell Smith *s.n.* (70; 206).  
 Dorrien Smith *s.n.* (81); 135 (84);  
 157 (91).  
 Douliot *s.n.* (98).  
 Drake *s.n.* (91).  
 Drummond *s.n.* (80); 46 (70).  
 Dryowski *s.n.* (104).  
 Ducke 111539 (55).  
 Dunn 3516 (119).  
 Du Petit Thouars *s.n.* (98).  
 Duporquet *s.n.* (101).  
 Dusén 3433 (76); 4389 (76); 9807  
 (217); 9874 (217); 11367 (76);  
 15253 (217).  
 Duss 2856 (209); 3942 (181); 4061  
 (209).  
 Dybowski 106 (102).  
 East Ind. Comp. 5594 (122); 5595  
 (122); 5596 (123).  
 Eberhardt 1550 (118); 3807 (124).  
 Eggert *s.n.* (70).

- Ekman III. 2396 (71); 2573 (194); III. 2650 (71); H. 2866 (167); 3565 (194); 3774 (207); H. 4725 (167); H. 4726 (207; 209); H. 6663 (71); 10821 (90); H. 10979 (72); 11477 (71); 11595 (90); 11931 (71); 11989 (90); H. 13420 (167); 15215 (194); H. 15938 (207); 17233 (71); 17332 (194).
- Elbert 422 (105).
- Eliot s.n. (70); 2112 (98).
- Elmer 11843 (62); 13690 (62).
- En 2139 (119).
- Endert 2631 (151); 2773a (171).
- Endres s.n. (190; 217).
- Engler 842 (182).
- Esquirol 3603 (119).
- Evrard 391 (118); 972 (118); 982 (118); 1556 (124).
- Exell & Mendonça 1493 (101); 2980 (101).
- Eyles 52 (101).
- Farmar 200 (105).
- Fendler 505 (193); 546 (208); 547 (217); 616 (192); 1315 (191).
- Fiebrig 601 (82); 5263 (84).
- Fischer s.n. (131); 1318 (123); 1460 (146); 1632 (161); 3032 (161); 3223 (123).
- Fishlock 47 (195).
- Fly 12 (120).
- Focke 405 (72); 1024 (91); 1337 (208).
- Forbes s.n. (62); 121 (150); 2000 (61).
- Forest Dept. Br. Guian. A 71. 2355 (188).
- Forestry Bureau, Suriname s.n. (91); 412 (197).
- Forrest s.n. (119); 941 (124); 3846 (119); 4741 (119); 7104 (119); 12003 (119).
- Foxworthy 483 (125).
- Franck 161 (123).
- Fraser 51 (117); 193 (117).
- Fredholm 423 (80); 5566 (80); 5696 (70); 6050 (80).
- Frey Wyssling 39(2) (61); 45(8) (119).
- Furtado s.n. (123).
- Galeotti 723 pp. (216); 7179 (206); 7239 (206).
- Gallery 40 (119).
- Gamble 1308 (122); 8759 (122); 14839 (131).
- Gandrup 14 (126); 27 (151).
- Garber s.n. (70; 80; 206).
- Gardner s.n. (117); 706 (88); 842 (217); 1173 (73); 2734 (73); 3484 (84); 4006 (208); 5210 (84); 5211 (84); 5212 (91); 6091 (73).
- Gaudichaud 196 (76); 197 (73); 422 (73).
- Geay 7950 (98); 7961 (98).
- Geoffray 187 (143); 213 (123).
- Gerard 101 (98).
- Gerkens D 27 (151).
- Germain s.n. (195).
- Gibbs 3066 (125); 4033 (61); 5657 (62); 5745 (120).
- Giesbreght 72 (190).
- Giesenhagen s.n. (150).
- Gill s.n. (122).
- Gillet s.n. (95); 2596 (104).
- Gjellerup 191 (171); 497 (151); 523 (62); 862 (171); 873 (62); 1053 (171); 1058 (119).
- Glaziou s.n. (73); 1255 (73); 3730 (88); 4100 (88); 4101 (73); 48886 (217); 10087 (73); 14334 (73); 16635 (88); 17818 (75); 17819 (73; 75); 18558 (233); 188559 (217); 18560 (220); 18561 (167); 18562 (191); 19906 (84); 19907 (91); 19908 (203); 19909 (227); 19909a (226); 19909B (263); 19910 (211); 19938 (184); 22150 (76).
- Glocker 32 (73).
- Glockse 142 (73).
- Godefroy s.n. (123); 520 (123); 848 (156); 878 (123); 879 (134); 942 (123).
- Goebel s.n. (167).
- Goetze 797 (102).
- Gollmer s.n. (191).
- Gongrijp s.n. (91).
- Goodenough s.n. (123).
- Gossweiler 917 (101); 8240 (95).
- Goudot s.n. (98; 191).
- Gousourdy 18 (84).
- Grabowsky s.n. (115).
- Graves 1279 (206).
- Gray s.n. (70; 71; 80; 206).
- Greenway 871 (182).
- Gressit 1243 (118).

- Griffith *s.n.* (117; 118; 120; 122; 123; 161; 248); 71 (117); 409 (118); 5592 (146); 5593 (148); 5594 (122); 5595 (122); 5597 (161); 5598 (161); 5599 (118).  
 Griffith & Lehmann 72 (122).  
 Grisar *s.n.* (215).  
 Griscom *s.n.* (206).  
 Guedes 604 (55); 2007 (187).  
 Guillemain 287 (73); 898 (88); 912 (217).  
 Guillot 33 (97).  
 Hackenberg 140 (115).  
 Hagen *s.n.* (114).  
 Hahn *s.n.* (118).  
 Haines 3591 (123).  
 Hale *s.n.* (71; 80; 206).  
 Hallier *s.n.* (125); 412 (126); 548 (151); 771 (151); 772 (126); 1808 (151); 1809 (151); 2075 (171); 2149 (115); 2333 (151); 2544 (126); 2717 (62); 3396 (62).  
 Ham 31 (115).  
 Hance 7733 (124).  
 Hancock 370 (119).  
 Handel Mazzetti 10709 (119).  
 Haniff 7158 (123).  
 Haniff & Nur 2083 (123); 2096 (153); 3903 (123); 4025 (150); 7866 (118); 7873 (61).  
 Harmand 255 (133); 520 (123); 848 (146); 947 (118); 3329 (134); 3330 (123).  
 Harper 615 (80); 669 (70); 1187 (206).  
 v. Harreveld *s.n.* (124).  
 Harris *s.n.* (203); 9152 (167); 9494 (196); 10659 (195); 12231 (71); 12596 (196); 12642 (196); 12850 (71).  
 Harris & Britton 10704 (209); 10705 (181).  
 Hartweg 495 (206).  
 Hassler 5326 (76); 5654 (84); 5937 (73); 6298 (76); 8568 (73); 12665 (73).  
 Haught 1434 (184); 1436 (197); 1376 *pp.* (197; 218); 1435 (218).  
 Hauman *s.n.* (202).  
 Haunton *s.n.* (124).  
 Haviland 168 (151); 456 (61); 1041 (171); 1665 (136); 13293 (151).  
 Hayata *s.n.* (118).  
 Hedley Wood 147 (122).  
 Helfer 5596 (123).  
 Henderson *s.n.* (61); 11060 (61); 21381 (150).  
 Henry 9444 (119); 12043 (119).  
 Hepburn 85 (105).  
 Herb. Amani 427 (182).  
 herb. Chapman *s.n.* (80); 1697a (71).  
 Herb. de Jussieu 3271 (70).  
 herb. du Petit Thouars *s.n.* (98).  
 Herb. E. Ind. Comp. 5594 (122); 5595 (122); 5596 (123).  
 herb. Le Roy *s.n.* (126).  
 Hermann *s.n.* (117); 895 (90).  
 L'Herminier *s.n.* (181; 209).  
 Hervey *s.n.* (123; 140).  
 Heward 51 (117).  
 Hewitt *s.n.* (136); 1709 (254).  
 Hilaire, St. *s.n.* (91); 117 (73); 563 (75); 622 (88); 723 (73; 74); 844 (91); 1763 (84); 1775 (82); 1819 (88); 2398 (75).  
 Hill *s.n.* (250).  
 Hill & Williams 10698 (208).  
 Hillebrand *s.n.* (123; 124).  
 Hilsenberg & Bojer *s.n.* (97).  
 Hitchcock *s.n.* (206); 1819 (206); 1820 (206); 1821 (80); 16910 (91); 17349 (189).  
 Hoehne 457 (75); 1229 (75); 1230 (73).  
 Hoffman 68 (190).  
 Holm 31 (72).  
 Holst 2478 (182).  
 Holtermann *s.n.* (117; 139); 767 (139).  
 Holtum 10298 (140); 20606 (118).  
 Holtze *s.n.* (135); 41 (135); 491 (135).  
 Hood *s.n.* (80).  
 Hooker & Thomson *s.n.* (117; 122; 131; 156).  
 Hose 353 (125).  
 Hosseus 115 (123); 710 (123).  
 Hostmann *s.n.* (72); 959 (208); 987 (72).  
 Hostmann & Kappler 425 (72); 797 (91).  
 Hügel *s.n.* (120); 3231 (120); 3598 (120); 4491 (120); 4503 (120).  
 Huitema 126 (124).  
 Hullet 388 (125).  
 Hulstijn 258 (62).  
 Iboet 120 (171).

- Im Thurn *s.n.* (55; 188); 58 (91);  
 180 (79); 121 (217); 226 (55).  
 Ito *s.n.* (145).  
 Jacobson *s.n.* (61; 119; 150); 62  
 (114); 88a (150); 2417 (119).  
 Jacquet 575 (118).  
 Jaheri 1656 (151).  
 Jelf 7 (101).  
 Jenkins *s.n.* (122).  
 Jenman 501 (189); 502 (208); 1271  
 (192); 1275 (72); 3759 (72); 7191  
 (188; 189); 7270 (79).  
 Jenville *s.n.* (117).  
 Jespersen *s.n.* (202).  
 Jochems 3172 (119).  
 Johnston *s.n.* (101).  
 Johow *s.n.* (213).  
 Jones 63 (206); 67 (80).  
 Joor *s.n.* (71; 206).  
 Jumelle *s.n.* (183).  
 Junghuhn 695 (125).  
 Jussieu 3271 (70).  
 Kalbreyer 420 (215); 1211 (191);  
 1503 (65).  
 Kanjilak 4519 (117).  
 Kappler 1332 (72).  
 Karsten *s.n.* (167; 191; 215; 217).  
 Kassner 2597 (101).  
 Keeler *s.n.* (70).  
 Kegel 153 (208); 229 (91); 295 (72).  
 Kehding 015 (136).  
 Kelaart *s.n.* (117).  
 Keller *s.n.* (80).  
 Kellsall *s.n.* (171; 240).  
 Kenoyer 247 (235).  
 Kerr *s.n.* (118); 926 (146); 929  
 (123); 1204 (118).  
 Killip & Smith 19322 (191); 24834  
 (217).  
 King *s.n.* (123).  
 King's collector *s.n.* (117); 2270  
 (143); 5039 (61); 8040 (61).  
 Kjellberg 2496 (62); 3101 (126);  
 3795 (126).  
 Kjell von Sneidern 709 (191).  
 Kleinhoonte 458 (119); 609 (119).  
 Kloss *s.n.* (61; 62; 118; 120; 141;  
 171).  
 Kobus *s.n.* (114).  
 de Kock 24 (62).  
 Koendy *s.n.* (117).  
 Koenig *s.n.* (123).  
 Koorders 169 (140); 696 (125);  
 4036b (246); 40363b (140);  
 41666b (140); 42215 (124).  
 Kormassi 1243 (62).  
 Korthals *s.n.* (126; 150; 151).  
 Kuhlmann 637 (91); 638 (72); 639  
 (208); 3577 (85).  
 Kunstler 2270 (143); 5039 (61); 8040  
 (61).  
 Kunze *s.n.* (122).  
 Kurz *s.n.* (122; 125; 156); 175 (117);  
 2641 (122).  
 Kuyper 27 (91).  
 Labohm 1947 (126).  
 Lace 2529 (122).  
 Lacour *s.n.* (118).  
 Lall Dhway 0558 (117).  
 Lam 1207 (174); 2079 (120).  
 Lambert *s.n.* (122).  
 Lamont *s.n.* (118); 1086 (118).  
 Langlois *s.n.* (71).  
 Lanjouw 132 (91); 298 (91).  
 Lankester *s.n.* (217); 35 (190).  
 Lanschot 577 (62).  
 Latif 14 (61).  
 Lantz *s.n.* (98).  
 Law *s.n.* (131).  
 Lea *s.n.* (135).  
 Lebrun 6047 (104).  
 Lecomte *s.n.* (80); F. 32 (101).  
 Lecomte & Finet 173 (150); 1873  
 (124).  
 Le Coq d'Armandville 251 (62).  
 Ledermann 145a (171); 889 (202);  
 990 (95); 3427 (104); 3552 (104);  
 4521 (104); 4770a (104); 5587a  
 (104); 6221 (202); 6367 (94);  
 7368 (259); 8404 (62); 9192 (151);  
 9855 (151); 10920a (62); 11132e  
 (62); 12377 (120); 12379 (62);  
 13115a (62); 14453 (13; 175);  
 14486 (128); 14539a (175); 123776  
 (62).  
 Leeds *s.n.* (80).  
 de Leeuw 14 (114).  
 Lefèvre 217 (131).  
 Lehmann *s.n.* (207); K. 269 (72);  
 K. 271 (215); K. 395 (215); K.  
 396 (72); K. 404 (207); 1305  
 (190); 1900 (215); 4988 (72);  
 6010 (215).  
 Léman *s.n.* (117).  
 Lemann *s.n.* (123).  
 Leng 131 (188); 311 (13; 189).  
 Léon & Caranas 5812 (71).  
 Léon & Roce 7056 (71).  
 Leprieur *s.n.* (72).  
 Le Roy *s.n.* (126).

- Le Roy Topping 1409 (125).  
 Leschenault *s.n.* (117).  
 Le Testu 1331 (105); 2914 (104);  
 3049 (100); 3122 (104); 3512  
 (105); 3927 (102); 4332 (105).  
 Levine 893 (118).  
 L'Herminier *s.n.* (181; 209).  
 Lhotsky *s.n.* (73; 75).  
 Liang 66388 (124).  
 Liebman *s.n.* (206).  
 Liefertinck 16 (61).  
 Lima *s.n.* (207); 286 (167); 287  
 220.  
 Lima & Brade 4945 (211); 13247  
 (217); 14173 (220); 14174 (184).  
 Linden 966 (191).  
 Linder 127 (197); 1217 (202).  
 Lindley *s.n.* (98).  
 Lindmann A. 2941 (91); A. 3399  
 (85).  
 Lindner 1491 (104).  
 Linkunipoor *s.n.* (122).  
 Linsley Gressit 1243 (118).  
 Lohrer *s.n.* (258).  
 Lo Kang Peng 6539 (118).  
 Lörzing 1151 (125); 4231 (247);  
 7261 (61); 7862 (124); 8015  
 (119); 8191 (61); 8535 (119);  
 3990 (119); 9982 (124).  
 v. Luetzelburg 15591 (88); 16038  
 (88); 16040 (237); 20214a (72);  
 20662 (91); 20773 (91); 20857  
 (91).  
 Lund *s.n.* (91); 599 (73).  
 Lundell 628 (71).  
 Luschnath *s.n.* 73; 82).  
 Lütjeharms 4437 (138); 4736 (138).  
 Mc. Clure 746 (147); 18280 (146).  
 Mack *s.n.* (117).  
 Macrae 95 (117); 143 (117); 645  
 (117).  
 Maingay 1593 (118); 1594 (123);  
 2496 (123); 2511 (118).  
 Maiters *s.n.* (122).  
 Makino *s.n.* (140; 147).  
 Malme I. 424 (82); II. 1020 (82);  
 II. 1097 (76); II. 1122 (82); I.  
 1434 (75); I. 1436 (76); 1440  
 (91); 1440a (91); 1440b (91);  
 I. 1488a (84); I. 1488b (84); I.  
 1568 (84); I. 1568B (73); I. 1626  
 (73); II. 1658 (84); II. 1658a (84);  
 II. 1658b (84); II. 1658c (84); II.  
 1658d (84); II. 1658e (84); II.  
 1658f (84); II. 1659 (73); II. 1659a  
 (73); 1696 (207); II. 3339 (91); II.  
 3339a (91); II. 3488 (73); II. 3488b  
 (73); II. 3493 (79); II. 3495 (193).  
 Mann 515 (95; 202).  
 Martin 61 (91).  
 Martius 1196 (91); 1251 (84); 1327  
 (75); 2506 (73); 3146 (77).  
 Martyn 222 (57); 286 (189); 332  
 (188).  
 Masamune *s.n.* (147).  
 Massie *s.n.* (124).  
 Mathews *s.n.* (87); 1607 (87).  
 Mayr 161 (120); 348 (62); 471 (62).  
 Meebold 3523 (120); 12337 (158);  
 12915 (163).  
 v. d. Meer Mohr 129 (119).  
 Meislahn 150a (80).  
 Mellichamp *s.n.* (70).  
 Mendonça 195 (91).  
 Menke 7 (73).  
 Merrill *s.n.* (125); 5741 (62); 10833  
 (156).  
 Mexia 5874a (91).  
 Meyer *s.n.* (61).  
 Michaux *s.n.* (70; 71).  
 Miers *s.n.* (167; 210; 217; 220; 234);  
 4652 (210).  
 Miers fil. *s.n.* (232; 234).  
 Mildbread 3329 (104); 9467 (104).  
 Mill 230 (118).  
 Milne-Redhead 854 (101).  
 Minakarta *s.n.* (147).  
 Mohr *s.n.* (71; 80; 206).  
 Moldenke 112 (70); 206 (80).  
 Mondri 277 (125).  
 Moore *s.n.* (120).  
 Moritz 420 (82); 1616 (191).  
 Mosèn 3702 (217); 3703 (217).  
 Motley 55 (126); 1162 (140); 1200  
 (171).  
 de Moura 894 (88); 923 (73).  
 Mouret 426 (124).  
 Moulton 6851 (119).  
 Mueller 481 (217); 482 (167).  
 Munby *s.n.* (117).  
 Murdoch 178 (239).  
 Murton 24 (148); 64 (123).  
 Mutis 1189 (217).  
 Myers 3113 (217); 5500 (84); 5524  
 (72); 5570 (84); 5611 (91).  
 Nakano *s.n.* (154).  
 Napier *s.n.* (143).  
 Nartens 93 (124); 94 (125).

- Nash 1060 (80); 1081 (70); 1093 (206).  
 native coll. *s.n.* (124; 140; 151); 56 (151); 89 (140); 91 (151); 123 (197); 140 (91); 164 (140); S. 506 (115); 636 (62); 1611 (62); 2509 (151).  
 Nelson *s.n.* (124); 3344 (190).  
 Newman *s.n.* (73).  
 Nin 00527 (124).  
 Nongnong *s.n.* (140; 151; 246).  
 Norman Taylor 545 (167).  
 Norton 1233 (119); 1234 (119).  
 Nucker 31 (167).  
 Nur 2165 (123).  
 Nuttal *s.n.* (80).  
 Oldham *s.n.* (161); 8 (117; 161).  
 Othmer *s.n.* (72; 218).  
 Ouwehand 158 (124).  
 Palmer 539 (71); 14395 (80); 14396 (71).  
 Parker 3115 (118).  
 Parry 20 (117); 209 (117); 333 (122).  
 Passarge 81b (84).  
 Pearce *s.n.* (217).  
 Peck 151 (71); 163 (207).  
 Pelly 93 (217).  
 Peng 6539 (118).  
 Pennell 1416 (84); 1429 (72).  
 Pennell & Killip 3515 (72); 5800 (215); 8300 (215); 8301 (215).  
 Penny 14 (146).  
 Perrier de la Bathie 343 (183); 1575 (97; 98); 7222 (98); 7223 (97); 7224 (98); 7225 (98); 7226 (98); 14476 (183); 16068 (183); 18515 (183).  
 Perrot *s.n.* (118).  
 du Petit Thouars *s.n.* (98).  
 Pfeiffer *s.n.* (91; 250).  
 Phillip Jelf 7 (101).  
 Phillips *s.n.* (123).  
 Pickel 2575 (73).  
 Pierre *s.n.* (118; 123; 143; 146; 156); 3390 (123).  
 v. d. Pijl 352 (150); 506 (151).  
 Pittery 111 (105).  
 Pittier *s.n.* (191); 544 (207); 598 (72); 4945 (71); 9420 (207); 10451 (197); 10951 (197); 10952 (197); 218; 12228 (72); 12705 (217); 12707 (167); 12708 (207); 12709 (207); 13061 (190).  
 Ploem *s.n.* (125).  
 Pobéquin *s.n.* (101); 8 (105); 1392 (105).  
 Pockman *s.n.* (123).  
 Pockock 261 (105).  
 Poeppig *s.n.* (71; 197); 2995 (72); 3005 (57); 3013 (187).  
 Pohl 5092 (85).  
 Poilane 648 (156); 825 (123); 3410 (143); 4074 (118); 4271 (118); 11419 (124); 12191 (118); 14120 (123); 14372 (123); 15024 (118); 15993 (143); 18214 (143); 18573 (146); 25580 (156).  
 Poiteau *s.n.* (72).  
 Polak 103 (119); 210 (125).  
 Pollard *s.n.* (80); 1053 (206).  
 Porcher *s.n.* (80).  
 Posthumus 784 (247).  
 Prager 41 (135).  
 Prain *s.n.* (117; 122).  
 Prain's collector *s.n.* (117); 58 (122).  
 Pulle II. 27 (84); II. 193 (72); II. 196 (91); II. 494 (72); 373 (174); 476 (62); 603 (62); 618 (62).  
 Purdie *s.n.* (209; 210; 215).  
 Quelch & Connell 14 (91).  
 Raap *s.n.* (140); I (150); 211 (150).  
 Rachmat 511 (120); 597 (62).  
 Raciborsky *s.n.* (125; 140; 151; 246).  
 Ramage *s.n.* (209).  
 Ramos 4913 (124); 14428 (62).  
 Rant 652 (62).  
 Ravenel *s.n.* (80).  
 Regnell 135½ (75); III. 1238 (86; 89); III. 1775 (84).  
 Remy *s.n.* (215).  
 Reynolds *s.n.* (70; 80; 206).  
 Richards *s.n.* (72); S. 506 (115); 1379 (151); 1744 (140).  
 Ricker 870 (206).  
 Ridley *s.n.* (61; 118; 123; 140; 143; 171; 172; 238; 240; 241; 247; 252); 600 (118); 1481 (123); 1573 (123); 3139 (118); 6997 (123); 12108 (143); 12483 (118); 13800 (61); 14116 (177).  
 Ridley, Lea & Ramage *s.n.* (73; 208).  
 Rita *s.n.* (117).  
 Ritchie 1464 (161).  
 Robinson *s.n.* (61); 1849 (62); 5788 (172); 6336 (123); 6380 (148).  
 Robinson & Kloss *s.n.* (150); 54 (124); 169 (150); 5961 (118).

- Rodger 118 (122).  
 Rodway *s.n.* (250).  
 van Rohr 159 (55).  
 Rojas 10076 (211); 10128 (211);  
 10129 (184); 10879 (211).  
 Rombouts 212 (91).  
 v. Römer 778 (62); 808 (62); 829  
 (141).  
 Ronduz 1308 (190).  
 Roxburgh *s.n.* (120; 126).  
 Royle *s.n.* (117).  
 Le Roy *s.n.* (126).  
 Le Roy Topping 1409 (125).  
 Rudge *s.n.* (91).  
 Rudolph *s.n.* (91).  
 Rugel 585 (206).  
 Rupp *s.n.* (206).  
 Rusby 858 (78).  
 Rusby & Pennell 1068 (72).  
 Rutten 1243 (62); 2199 (62).  
 Ruttner 32 (119); 33 (119).  
 Rycroft *s.n.* (125).  
 Sagot 362 (208); 1164 *pp.* (192;  
 218).  
 Salzmann *s.n.* (73); 546 (73).  
 Sampson 677 (124); 7923 (124).  
 Samuels 491 (91).  
 Sandwith 11 (188); 70 (197); 130  
 (57); 131 (220); 132 (168); 175  
 (188; 197); 260 (192); 383 (55);  
 540 (218); 553 (55); 706 (189);  
 1064 (55); 1096 (188); 1097 (57);  
 1100 (197); 1101 (189); 1102  
 (188); 1352 (208).  
 Santos Lima 286 (161); 287 (220).  
 Santos Lima & Brade 4945 (211);  
 13247 (217); 14173 (220); 14174  
 (184).  
 Sarasin 897 (120); II. 2099 (62);  
 2140 (62).  
 Savorgan de Brazza 328 (104).  
 Scheffer *s.n.* (151).  
 Schenck 4290 (73).  
 Schipp 481 (217); 508 (199); 634  
 (71); S. 667a (13; 207); S. 913  
 (199).  
 Schlechter *s.n.* (62; 115); 12086 (99);  
 12831 (202); 13134 (118); 13151  
 (171); 13211 (125); 13461 (151);  
 13593 (171); 14637 (151); 15786  
 (94); 15787 (95); 15788 (224);  
 15789 (224); 15790 (261); 15822  
 (125); 15834 (241); 16653 (177);  
 17387 (140); 19345 (151); 19355  
 (172); 19602 (62); 19741 (151);  
 20042 (174); 20072 (62); 20531  
 (173); 20657 (171); 20671 (175).  
 Schlieben 2571 (97); 3578 (182).  
 Schneider 2511 (118); 3820 (118);  
 3959 (118).  
 Schomburgk 148 (91); 149 (217);  
 201 (91); 202 (91); 210 (91).  
 Schott 4217 (73); 4698 (217).  
 Schwacke *s.n.* (91); 2531 (82); 4252  
 (73); 8395 (91); 8396 (75); 8397  
 (73); 8398 (84); 8399 (84).  
 Schwartz *s.n.* (196).  
 Scortechini *s.n.* (135; 146); 271b  
 (136); 768 (61).  
 Scott Elliot 2112 (98).  
 Sello(w) *s.n.* (76; 84; 217); 793 (84);  
 4442 (76); 5865 (73).  
 Selwyn 262 (74); 263 (84); 626 (84).  
 Senège *s.n.* (87); 4795 (87).  
 Seret 682 (105).  
 Seymour 9191 (206).  
 Shafer 3411 (207); 3413 (194); 8356  
 (194); 10496 (71); 10658 (90);  
 10799 (71); 10930 (90); 10994  
 (71); 11002 (90); 11709 (71).  
 Sherring *s.n.* (192).  
 Shikan 1346 (71).  
 Shirley *s.n.* (120).  
 Short *s.n.* (80); 1850 (206).  
 Shuttleworth Carder *s.n.* (87).  
 de Silva 106 (117).  
 Simpson *s.n.* (80).  
 Sin 9955 (118).  
 Sintenis 5170 (195); 5171 (207); 5259  
 (195); 5707 (195).  
 Si Toroës 3498 (130); 3724 (130);  
 4083 (124).  
 Skutch 2768 (167); 2769 (217).  
 v. Slooten *s.n.* (13; 151; 176); 478  
 (151).  
 Small & Carter 2978 (70).  
 Smiles *s.n.* (118).  
 Smith *s.n.* (122); 307 (123); 875  
 (151); 1308 (217); 2020 (167);  
 2124 (217); 2516 (191).  
 v. Sneidern 709 (191).  
 Sneathlage 329 (55).  
 Soyaux 167 (202); 168 (202).  
 Spare F. 707 (123).  
 Spire 175 (118); 294 (124).  
 Splitgerber *s.n.* (91); 673 (72); 980  
 (91).  
 Spruce *s.n.* (73; 192); 676 (72); 1224



- (184); 2299 (184); 2300 (179); 2453 (207); 2492 (55); 2492a (55); 2623 (218); 2815 (180); 2816 (197); 2829 (187); 2835 (79); 2836 (79; 197); 2846 (197); 2879 (218); 2880 (186); 2930 (179); 2931 (184); 3237 (90); 3733 (79); 4458 (217).
- Stammler *s.n.* (96).
- Standley, J. P. 376 (85); 377 (70).
- Standley, P. C. 12839 (70); 18902 (70); 30774 (71); 40767 (71); 53355 (199); 52879 (199).
- Statter *s.n.* (120).
- v. Steenis 75 (124); 138 (150); 184 (124); 1483 (171); 1602 (124); 2432 (125); 2728 (140); 2784 (171); 3512 (61); 3665 (150); 3681 (61); 3846 (150); 5288 (125); 5616 (151); 8728 (61); 8944 (61); 9546 (61); 9770 (150); 10293 (150); 10294 (143); 10686 (160).
- Steinbach 1614 (84); 5508 (73); 6510 (84); 16112 (73).
- Steup 29 (120); 209 (62); 211 (120).
- Stevens *s.n.* (120).
- St. Hilaire *s.n.* (91); 117 (73); 563 (75); 622 (88); 723 (73; 74); 844 (91); 1763 (84); 1775 (82); 1819 (88); 2398 (75).
- Stockdale 205 (188).
- Stolz 2320 (102).
- Stuebel 25b (87).
- Surrèn 82 (75).
- Symington & Kiah 28859 (118).
- Synge S. 507 (151).
- Talbot 700 (202); 715 (202); 716 (95); 800 (161); 1376 (161).
- Talmy *s.n.* (118; 123).
- Tanaka *s.n.* (154).
- Tashiro *s.n.* (145; 147).
- Tate 264 (90); 268 (72; 74); 344 (91); 598 (64); 630 (64); 722 (217); 1106 (217).
- Taylor 545 (167).
- Teruya *s.n.* (144).
- Testu, Le 1331 (105); 2914 (104); 3049 (100); 3122 (104); 3512 (105); 3927 (102); 4332 (105).
- Teysmann *s.n.* (62; 115; 124; 125; 126); 2015 H. B. (119); 3334 H. B. (114); 7977 (125); 8482 (115); 8483 (115); 8485 (115); 11089 (115); 11190 (115); 11192 (115).
- Thaxter *s.n.* (206).
- Thomas & Magelhaes Gomes 371 (208).
- Thomson *s.n.* (102).
- Thompson *s.n.* (98).
- Thorel *s.n.* (113; 124); 791 (131); 1369 (131); 1408 (146); 1409 (156); 1560 (123); 2794 (118).
- Thouars *s.n.* (98).
- Thunberg *s.n.* (117).
- Im Thurn *s.n.* (55; 188); 58 (91); 180 (79); 121 (217); 226 (55).
- Thustone *s.n.* (161).
- Thwaites *s.n.* (131); 2312 (117); 2735 (140).
- Tisserant 76 (101); 1195 (104); 1228 (100); 1331 (105); 2061 (101).
- Toledo 687 (73).
- de Toledo 7485 (76).
- Toppin 5002 (122).
- Topping 1409 (125).
- Si Toroes 3498 (130); 3724 (130); 4083 (124).
- Torrey *s.n.* (80; 206).
- Torrey & Gray *s.n.* (206).
- Toxopeus 123 (62); 208 (62).
- Tracy *s.n.* (71; 80); 5015 (206); 7010 (206); 6488 (71).
- Tracy & Lloyd 326 (71).
- Traill 1130 (55).
- Trécul 898 (80).
- Treutler 1124 (122).
- Triana *s.n.* (215).
- Trimen *s.n.* (245).
- Tsiang 5516 (119).
- Tso & Tsiang 2002 (118).
- Tsoong D. 1025 (124).
- v. Tuerckheim 902 (216); II. 475 (199); 1042 (190); II. 1293 (190); II. 1421 (190); 8311 (199).
- Tutin 635 (72).
- Ulle *s.n.* (197); 332 (217); 608 (82); 870 (197); 877 (217); 1000 pp. (217); 2704 (220); 3467 (88); 4001 (167); 4002 (217); 4003 (208); 4115 (88); 4160 (73); 4945 (211); 5212a (79); 5274 (208); 5275 (184); 6121 (67); 6123 (91); 6124 (79); 6946 (73); 7658 (91); 7659 (72; 74); 7660 (84; 85); 7757 (91); 8564 (91); 8829 (91).
- Ultee 140 (114).
- Underwood 1492 (80).
- Ungemach 21 (98).

- unknown collector *s.n.* (61; 62; 80; 82; 117; 119; 120; 122; 123; 125; 126; 146; 161; 246); 31 (126); 55 (156); 81 (117); *D.* 175 (217); 188 (72); 230 (86); 388 (123); 799 (118); 1616a (80); 2114 (161); 2477 (122); 7653 (61); 12028 (61); 45912 (156).  
 Unwin 144 (202).  
 Upendranath Kanjilik 4519 (117).  
 Vahl *s.n.* (126; 131).  
 Valerio 846 (84).  
 Valeton *s.n.* (125; 151; 246).  
 van Rohr 159 (55).  
 Vauthier 370 (91).  
 v. d. Vecht 12 (124); 13 (124).  
 Veitch *s.n.* (118).  
 Versteeg 179 (218); 304 (192; 208); 1290 (140); 1337 (171; 174); 1425 (174); 1623 (252); 1630 (171); 1633 (62).  
 Vesterlund *s.n.* (80).  
 Vidal-Senège *s.n.* (87); 4795 (87).  
 Vieillard & Deplanche *s.n.* (120).  
 Vigne 3216 (202).  
 Viguier & Humbert 404 (97); 1773 (98).  
 Vogel 37 (202).  
 Volkens 236 (126); 337 (126).  
 de Voogd 48 (150); 130 (61); 1465 (61).  
 Walker *s.n.* (117); 113 (123); 132 (117); 143 (117).  
 Wallich 223 (148); 241=1999 (131); 354=2136 (126); 399=2137 (146); 836 (126); 1072 (122); 1498 (131); 9004B (117); 9004C (120); 9005 (122); 9005B (122); 9005D (122); 9006 (156); 9008 (131).  
 Warburg *s.n.* (124); 11 (125); 1243 (124).  
 Ware *s.n.* (206).  
 Warming 1039 (91).  
 Warnecke 511 (182).  
 Waterlot 566 (98).  
 Wawra & Maly 405 (210).  
 Weberbauer 3570 (215); 4341 (87).  
 Weddell 131 (73); 955 (211); 1998 (84); 2055 (85); 2154 (91); 2171 (73); 2172 (84).  
 Weeda *s.n.* (125).  
 Weir *s.n.* (86).  
 Welwitsch *s.n.* (101); 68 (101); 6473 (101); 6474 (101).  
 Went 95 (91).  
 Wercklé 687 (66).  
 Wherry *s.n.* (80).  
 White 15 (190); 24 (190); 1045 (217).  
 Whitehead *s.n.* (62).  
 Wichura 2685 (117).  
 Widgren *s.n.* (73).  
 Wight *s.n.* (126); 2938 (161).  
 Wilford *s.n.* (146); 28 (146); 1444 (146).  
 Wilkes *s.n.* (88).  
 Williams 1615 (211); 1636 (217).  
 Williamson *s.n.* (70).  
 Wilson *s.n.* (209).  
 Winckel *s.n.* (151); 906b (151).  
 Winkler 225 (224); 1702 (123); 1712 (241); 3014 (171); 3194 (153).  
 Wood 147 (122).  
 Wray 132 (126); 213 (61); 1008 (172); 3556 (241); 3888 (61).  
 Wray & Robinson 5230 (61); 5449 (118).  
 Wright *s.n.* (85; 194; 206); 297 (167); 307 (167); 1470 (166); 2383 (207); 3281 (71); 3282 (90); 3283 (207); 3284 (166; 194); 3285 (194); 7285 (194).  
 Wullschlaegel 764 (72); 788 (91); 1076 (71); 1300 (91); 1301 (208).  
 Wyssling 39(2) (61); 45(8) (119).  
 Yapp 330 (123); 423 (61).  
 Yates 2527 (119).  
 Ynes Mexia 5874a (91).  
 Young *s.n.* (135); 862 (101); 1156 (106).  
 Zenker *s.n.* (202); 1884 (202); 3613 (224); 4239 (202); 4357 (96).  
 Zetek *s.n.* (235).  
 Zollinger *s.n.* (125); 14 (125); 1886 (125); 16517 (119).



## INDEX.

New subtribes, sections, subsections, species, varieties, forms and combinations are printed in **bold face** type; synonyms in *italics*; previously published names in ordinary type.

	Page		Page
Afrothismia Schltr. ....	41; 222	alba Mart. var. <b>grandiflora</b>	
pachyantha Schltr. ....	224	(Malme) Jonk. ....	76
Winkleri (Engl.) Schltr. ....	223	<b>aprica</b> (Malme) Jonk. ...	21; 87
<i>Anonymus capitatus</i> Walt. ....	69	aprica (Malme) Jonk., var.	
<i>Aplomeria</i> Benth. ....	31	<b>pusilla</b> Jonk. ....	21; 88
<b>Appendiculati</b> Jonk. ...	31; 32; 184	<i>aptera</i> Schltr. ....	22; 94
<i>Apteria</i> Nutt. ....	35; 203	<i>australis</i> Malme ....	12; 81
aphylla (Nutt.) Barnh. ....		<i>azurea</i> Griff. ....	24; 120
..... 12; 14; 35; 36; 37; 205		<i>Bakeri</i> Hochr. ....	23; 96
aphylla (Nutt.) Barnh. var.		<i>bancana</i> Miq. ....	24; 113
hymenanthera Jonk. ....		<i>bicolor</i> Mart. ....	21; 26; 89
..... 35; 36; 37; 207		<i>bicolor</i> Mart., var. <i>africana</i>	
<i>boliviana</i> Rusby ....	35; 205	Ridl. ....	23; 100
<b>gentianooides</b> Jonk. 35; 36; 210; 211		<i>bicolor</i> Mart., var. <i>aprica</i>	
<i>hymenanthera</i> Miq. ....	35; 207	Malme ....	21; 87
<i>lilacina</i> auct. ....	35; 211	<i>bicolor</i> Mart., var. <i>micrantha</i>	
<i>lilacina</i> Miers ....	35; 36; 209	Engl. et Gilg ....	23; 103
<i>orobanchioides</i> Hook. ...	35; 215	<i>bicolor</i> Mart., var. <i>quadri-</i>	
<i>setacea</i> auct. ....	207	<i>flora</i> (Willd.) Malme ....	89
<i>setacea</i> Nutt. ....	35; 205	<i>bicolor</i> Mart., var. <i>subcoele-</i>	
<i>Ulei</i> Schltr. ....	35; 207	<i>stis</i> Malme ....	21; 89
Apterieae Miers ....	8; 10; 164	<i>bicolor</i> Mart., var. <i>tenera</i>	
<i>Astroburmannia</i> Malme ....	19	Malme ....	21; 86
<i>Bagnisia crocea</i> Becc. ....	251	<i>bifaria</i> J.J.S. ....	26; 136
<i>crocea</i> Becc. var. <i>brunnea</i>		<i>bifida</i> Gagnep. ....	25; 142
Ridl. ....	252	<i>biflora</i> L. ....	14; 79
<i>episcopalis</i> (Becc.) Engl. ....	253	<i>blanda</i> Gilg ....	23; 105
<i>Hillii</i> Cheesem. ....	42; 249	<i>borneensis</i> Gandog. ....	24; 121
<i>Rodwayi</i> F. v. Muell. ....	248	<i>brachyphylla</i> Willd. ....	89
<i>Benitzia</i> Karst. ....	27	<i>brachystachya</i> Miq. ....	89
<i>Poeppigiana</i> Karst. ....	33; 196	<i>bracteosa</i> Gleas. ....	21; 74
<i>suaveolens</i> Karst. ....	189	<i>candelabrum</i> Gagnep. ....	25; 160
<b>Brunonithismia</b> Jonk. ....	43; 242	<i>candida</i> auct. ....	160
<i>Burmannia</i> L. ....	18; 57	<i>candida</i> (Bl.) Engl. ....	24; 148
<i>africana</i> Braun et Schum. ...	95	<i>candida</i> Griff. ex Hook f.	
<i>alba</i> Mart. ....	21; 74	.....	24; 147
<i>amazonica</i> Schltr. ....	21; 77	<i>capitata</i> auct. ....	212

	Page		Page
<i>capitata</i> Mak. ....	25; 138	<i>iberica</i> Engl. ....	103
<i>capitata</i> (Walt.) Mart. 12; 21: 69		<i>liukiensis</i> Hayata .....	143
<i>capitata</i> (Walt.) Mart. f.		<i>longifolia</i> Becc. .... 20; 26; 59	
<b>bracteosa</b> (Gleas.) Jonk. 21; 74		<i>luteo-alba</i> Gagnep. ....	133
<i>capensis</i> Mart. .... 12; 22; 98		<i>lutescens</i> Becc. .... 25; 26; 148	
<i>Championii</i> Thw. .... 25; 26; 138		<i>madagascariensis</i> auct. ... 23; 98	
<i>chariensis</i> Schltr. .... 23; 103		<i>madagascariensis</i> Baker ... 23; 96	
<i>chinensis</i> Gandog. .... 24; 121		<i>madagascariensis</i> Mart. ... 23; 96	
<i>chionantha</i> Schltr. .... 25; 139		<i>malaccensis</i> Gandog. .... 24; 121	
<i>Clementis</i> Schltr. .... 25; 155		<b>malasica</b> Jonk. .... 25; 152	
<i>cochinchinensis</i> Gagnep. .... 112		<i>micropetala</i> Ridl. .... 25; 140	
<i>coelestis</i> auct. 130; 143; 147; 160		<i>nepalensis</i> auct. ....	144
<i>coelestis</i> Don ... 14; 23; 26; 120		<i>nepalensis</i> (Miers) Hook. f. 25; 155	
<i>coelestis</i> Don. var. <i>pusilla</i>		<i>novae-hiberniae</i> Schltr. ... 25; 149	
(Wall. ex Miers) Trim. ... 130		<i>oblonga</i> Ridl. .... 25; 142	
<b>congesta</b> (Wright) Jonk.		<i>obscurata</i> Schltr. ....	102
..... 22; 26; 94		<i>paniculata</i> Willd. ex Schult. 96	
<b>connata</b> Jonk. .... 23; 128		<i>papillosa</i> Stapf .....	149
<i>cryptopetala</i> Mak. .... 146		<i>polygaloides</i> Schltr. .... 20; 66	
<i>Dalzielii</i> Rendle .... 25; 138		<i>pseudoalata</i> Champ.mss. .... 138	
<i>Damazii</i> Beauverd .....	81	<i>pusilla</i> (Wall. ex Miers) Thw.	
<i>dasyantha</i> Mart. .... 76		..... 23; 130	
<i>densiflora</i> Schltr. ... 22; 26; 95		<i>pusilla</i> (Wall. ex Miers) Thw.	
<i>distachya</i> R. Br. .... 115		var. <b>hongkongensis</b> Jonk. 24; 131	
<i>disticha</i> L. .... 12; 24; 115		<i>quadriflora</i> Willd. .... 89	
<i>disticha</i> L. var. <i>sumatrana</i>		<i>rigida</i> Gandog. .... 24; 121	
(Miq.) Hook. f. .... 115		<i>selebica</i> Becc. .... 24; 121	
<i>engganensis</i> Jonk. .... 26; 137		<i>Sellowiana</i> Seub. .... 74	
<i>flava</i> Mart. .... 12; 21; 83		<i>Sellowiana</i> Seub. var. <i>albi-</i>	
<i>flava</i> Mart., var. <b>macroptera</b>		<i>flora</i> Seub. .... 74	
Jonk. .... 21; 85		<i>Sellowiana</i> Seub. var. <i>viola-</i>	
<i>flavula</i> Wright .....	83	<i>cea</i> Seub. .... 74	
<i>foliosa</i> Gleas. .... 20; 63		<i>sphagnoides</i> Becc. .... 25; 135	
<i>geelvinkiana</i> Becc. .... 111		<i>spica gemini</i> L. .... 115	
<i>Gjellerupii</i> J.J.S. .... 25; 149		<b>Steenisii</b> Jonk. .... 25; 158	
<i>gonyantha</i> Hochr. .... 25; 149		<b>stricta</b> Jonk. .... 25; 156	
<i>gracilis</i> Ridl. .... 25; 149		<i>Stuebelii</i> Hieron. et Schltr. ... 86	
<i>graminifolia</i> Stapf .....	24; 113	<i>subcoelestis</i> Gagnep. .... 132	
<i>grandiflora</i> Malme .... 21; 76		<i>sumatrana</i> Miq. .... 115	
<i>Griffithii</i> Becc. .... 145		<i>Takeoi</i> Hayata .....	111
<i>hexaptera</i> Schltr. ... 22; 26; 93		<i>tenella</i> Benth. .... 21; 26; 77	
<i>inaequialata</i> Engl. .... 103		<b>tenera</b> (Malme) Jonk. ... 21; 86	
<b>indica</b> Jonk. .... 25; 161		<i>Tisserantii</i> Schltr. .... 99	
<i>inhambanensis</i> Schltr. ... 22; 98		<i>tridentata</i> Becc. .... 141	
<i>japonica</i> Maxim. .... 25; 138		<i>triflora</i> Roxb. .... 24; 120	
<i>javanica</i> Bl. .... 24; 120		<i>tuberosa</i> Becc. .... 25; 138	
<i>juncea</i> Sol. ex R. Br. ... 12; 134		<i>uniflora</i> Rottl. ex Spreng. ... 131	
<i>Kalbreyeri</i> Oliv. .... 20; 64		<i>Urazii</i> Masam. .... 111	
<i>latialata</i> Hua ap. Pobég.		<i>Wallichii</i> auct. .... 149	
..... 23; 26; 104		<i>Wallichii</i> (Miers) Hook. f. 145	
<b>Ledermannii</b> Jonk. .... 23; 126		<i>Welwitschii</i> Schltr. .... 23; 100	
<i>Le-Testui</i> Schltr. .... 23; 104		<i>Wercklei</i> Schltr. .... 20; 65	
<i>leucantha</i> Schltr. .... 20; 59		Burmanniaceae .....	51

	Page		Page
Burmannieae Miers .....	7; 10; 52	Gymnosiphon Bl. ....	27; 29; 168
Campylosiphon Benth. ....	17; 53	affinis J.J.S. ....	31; 173
<i>purpurascens</i> Benth. ....	17; 54	<i>Altsoni</i> Gleas. ....	18; 56
caô-caô .....	117	aphyllus Bl. ....	30; 170
<i>Corsieae</i> Benth. et Hook. ....	8	arcuatus Urb. ....	32; 191
<i>Cryptonema malaccensis</i> auct. ....	144	<i>borneense</i> Becc. ....	30; 170
<i>malaccensis</i> Turcz. ....	24; 121	breviflorus Gleas. ....	188
<i>Cyanotis nepalensis</i> Miers .....	155	capitatus (Benth.) Urb. ....	186
Cymbocarpa Miers ... 26; 27; 165		<i>celebicum</i> Schltr. ....	30; 174
<i>refracta</i> Miers .....	26; 165	<i>congestus</i> auct. ....	95
<i>saccata</i> Sandw. ....	26; 167	<i>congestus</i> Wright .....	22; 94
<i>Urbani</i> Goeb. et Suessg. 26; 166		cornutus (Benth.) Benth. et	
Dictyostega Miers .....	38; 213	Hook. ....	33; 196
<i>campanulata</i> Karst. ....	38; 215	cymosus (Benth.) Benth. et	
<i>costata</i> Miers .....	38; 40; 219	Hook. ....	33; 187
<i>longistyla</i> Benth. ....	38; 201	Danguyanus Perr. ....	182
<i>irobranchioides</i> auct. ....	218	divaricatus (Benth.) Benth.	
<i>orobanchioides</i> (Hook.)		et Hook. ....	32; 179
Miers .....	38; 39; 40; 215	Fawcetti Urb. ....	34; 195
<i>orobanchioides</i> (Hook.)		fimbriatus (Benth.) Urb. 32; 178	
Miers, var. <i>parviflora</i>		Germani Urb. ....	34; 194
(Benth.) Jonk. 38; 39; 40; 218		<i>Glaziovii</i> Urb. ....	32; 183
<i>pectinata</i> Karst. ....	38; 214	quianensis Gleas. ....	187
<i>Purdieana</i> Benth. ... 38; 40; 214		jamaicensis Urb. ....	34; 203
<i>Schomburgkii</i> Miers .....	38; 214	longistylus (Benth.) Hutch.	
<i>Schomburgkii</i> Miers, var.		et Dalziel .....	201
<i>parviflora</i> Benth. ....	38; 218	<b>matto-grossensis</b> (Malme)	
<i>umbellata</i> Miers .....	38; 40; 219	Jonk. ....	33; 192
<i>usambarica</i> Engl. ....	38; 181	minahassae Schltr. ....	172
<i>Diplomeria</i> Benth. ....	31	<i>muticus</i> (Benth.) Urb. ... 33; 196	
<i>Dioterosiphon spelacicola</i>		<b>neglectus</b> Jonk. ....	175
Huber .....	17; 54	niveus (Gris.) Urb. ....	34; 193
Euburmannia Malme 18; 20; 21 67		oliganthus Schltr. ....	172
Euburmannieae Benth. et		<i>orobanchoides</i> Rusby ... 38; 216	
Hook. ....	8; 10; 53	<b>panamensis</b> Jonk. ....	32; 199
Eugymnosiphon Urb.		papuanus Becc. ....	30; 174
.....	28; 29; 30; 169	<i>parviflorus</i> Urb. ....	34; 193
Euthismia Schltr. ....	43; 237	pauciflorus Schltr. ....	176
<b>Euthismieae</b> Jonk. ... 10; 41; 222		<i>pedicellatum</i> Schltr. ....	30; 170
<b>Foliosa</b> Jonk. .... 19; 20; 26; 58		<i>portoricensis</i> Urb. ....	34; 194
Geomitra Becc. ....	46; 254	pusillus Urb. ....	32; 34; 202
<i>clavigera</i> Becc. ....	46; 255	<i>refractus</i> (Miers) Benth. et	
<i>episcopalis</i> Becc. ....	46; 253	Hook. ....	166
Glaziocharis Taub. ex		sphaerocarpus Urb. ....	32; 180
Warm. ....	42; 226	<i>squamatus</i> Wright .....	201
<i>macahensis</i> Taub. ex Warm. 226		suaveolens (Karst.) Urb.	
<i>Gonyanthes candida</i> Bl. ... 24; 149		.....	33; 189
<i>nepalensis</i> Miers .....	155	<i>tenellus</i> auct. ....	32
<i>pusilla</i> (Wall. ex Miers)		<i>tenellus</i> (Benth.) Urb. ... 32; 183	
Miers .....	130	<i>torricellense</i> Schltr. ....	31; 173
<i>Wallichii</i> Miers .....	145	<i>trinitatis</i> Johow .....	27; 36
<i>Cyananthus pusilla</i> (Wall.		<b>Tuerckheimii</b> Jonk. ....	32; 197
ex Miers) Miers .....	130	usambaricus Engl. ....	181

	Page		Page
Hexapterella Urb. ....	18;	<i>portoricensis</i> (Urb.) Schltr. ..	194
<i>gentianoides</i> Urb. ....	18;	<i>pusilla</i> (Urb.) Schltr. ....	202
hinanoshakudyo .....	139	<i>sphaerocarpa</i> (Urb.) Schltr. ..	180
hinano-shakujo .....	139	<i>squamata</i> (Wright) Schltr. ..	201
<b>Inappendiculati</b> Jonk. 31; 32;	177	<i>suaveolens</i> (Karst.) Schltr. ..	189
Jawael .....	116	<i>tenella</i> auct. ....	166
khan song .....	117	<i>tenella</i> Benth. ....	183
<i>Labiolithis</i> J.J.S. ....	44	<i>tenella</i> Benth. var. <i>minor</i>	
<i>Lobelia aphylla</i> Nutt. ....	205	Benth. ....	32; 184; 191
<i>Maburnia</i> Du Petit Thouars ...	96	<i>usambarica</i> (Engl.) Schltr. ..	181
Ma-diya-jawala .....	117	Ptychomeria (Benth.) Urb. ....	
Marthella Urb. ....	27; 36; 212	.....	28; 29; 31; 177
<i>trinitatis</i> (Johow) Urb. ...	36; 212	Rodwaya Schltr. ....	42; 43; 44; 248
Miersiella Urb. ....	40; 218	<i>Rodwaya thismiacea</i> F. v. Muell.	249
<i>aristata</i> Sandw. ....	41; 219	roempoet djaroen-djaroen .....	122
<i>costata</i> (Miers) Sandw. ...	40; 219	roempoet taroem .....	114
<i>umbellata</i> (Miers) Urb. ....	40; 219	(see also <i>rumput</i> )	
<i>Myostoma</i> Miers ....	42; 44; 45	rumput jarum .....	122
<i>hyalina</i> Miers .....	45; 231	rumput sisik naga .....	122
<i>janeirensis</i> (Warm.) Schltr. ...		(see also <i>roempoet</i> )	
.....	44; 45; 235	ruri-shakudyô .....	154
<b>Myostoma</b> (Miers) Jonk. 45; 46;	231	<i>Sarawakia</i> Schltr. ....	43
<i>Nephrocodium malaccense</i>		<i>Sarcosiphon</i> Bl. ....	42; 43
<i>sphalm.</i> ....	121	<i>americanus</i> (Pfeiff.) Schltr.	250
<i>Nephrocoelium malaccense</i>		<i>clandestinus</i> Bl. ....	252
Turcz. ....	121	<i>clavigerus</i> (Becc.) Schltr. ...	255
Odoardoa Schltr. ....	43; 237	<i>croceus</i> (Becc.) Schltr. ....	251
oemboet oemboet .....	114	<i>episcopalis</i> (Becc.) Schltr. ..	253
<i>Ophiomeris</i> Miers ....	42; 44; 45	<i>Hillii</i> (Cheesem.) Schltr. ....	249
<i>iguassensis</i> Miers .....	44; 234	<i>Rodwayi</i> (F.v.Muell.) Schltr.	249
<i>macahensis</i> auct. ....	44; 236	<i>Versteegii</i> (J. J. S.) Schltr. ..	251
<i>macahensis</i> Miers ...	44; 45; 233	<b>Sarcosiphon</b> (Bl.) Jonk. 43; 44;	251
<i>panamensis</i> Standl. ....	44; 45; 234	<i>Scaphiophora</i> Schltr. ....	46; 256
<b>Ophiomeris</b> (Miers) Jonk. 45; 232		<i>appendiculata</i> Schltr. ....	47; 259
Oxygyne Schltr. ....	47; 260	<i>gigantea</i> Jonk. ....	47; 257
<i>triandra</i> Schltr. ....	260	<i>shiro-shakudyo</i> .....	147
<b>Oxygyneae</b> Jonk. ....	10; 47; 260	<i>si goeroe goeroe</i> .....	117
<i>parkhewdur</i> .....	117	<i>Stemoptera lilacina</i> Miers .....	209
<i>Ptychomeria</i> Benth. ....	28	<i>sto-yurei-také</i> .....	144
<i>capitata</i> Benth. ....	186	<i>Thismia</i> Griff. ....	42; 227
<i>cornuta</i> Benth. ....	196	<i>americana</i> Pfeiffer ...	12; 14; 42
<i>cymosa</i> Benth. ....	187	<i>appendiculata</i> Schltr. ....	259
<i>divaricata</i> Benth. ....	179	<i>arachnites</i> Ridl. ....	43; 247
<i>Fawcetti</i> (Urb.) Schltr. ....	195	<i>Aseroe</i> Becc. ....	240
<i>fimbriata</i> Benth. ....	178	<i>Brunoniana</i> Griff. ....	247
<i>Glaziovii</i> (Urb.) Schltr. ....	183	<i>Brunonis</i> auct. ....	244
<i>jamaicensis</i> (Urb.) Schltr. ...	203	<i>Brunonis</i> Griff. ....	43; 247
<i>matogrossensis</i> Malme .....	192	<i>chrysops</i> Ridl. ....	237
<i>mutica</i> Benth. ....	196	<i>clandestina</i> auct. ....	245
<i>nivea</i> Gris. ....	193	<i>clandestina</i> (Bl.) Miq. ....	252
<i>orobanchoides</i> (Rusby) Schltr.	216	<i>clavigera</i> (Becc.) F. v. Muell.	255
<i>parviflora</i> (Urb.) Schltr. ...	193	<i>crocea</i> (Becc.) J. J. S. ...	44; 251
<i>Poepigiana</i> (Karst.) Schltr. 196		<i>episcopalis</i> (Becc.) F.v.Muell.	253

	Page		Page
<i>fumida</i> Ridl. ....	240	<i>Winkleri</i> Engl. ....	41; 223
<i>Gardneriana</i> Hook. f. ....	43; 244	<i>Thismieae</i> Miers.....	8; 10; 41; 221
<i>Glaziovii</i> Pouls. ....	45; 232	<i>Tribrachys Gardneriana</i> Champ.	
<i>grandiflora</i> Ridl. ....	239	<i>mss.</i> .....	244
<i>hyalina</i> (Miers) Benth. ....	45; 231	<i>Tripteranthes pusilla</i> Wall. ex	
<i>iguassensis</i> (Miers) Benth. ..	234	Miers .....	130
<i>janeirensis</i> Warm. ....	44; 45; 235	<i>Tripterella alba</i> (Mart.) Schult.	74
<i>javanica</i> J. J. S. ....	43; 245	<i>bicolor</i> (Mart.) Schult. ....	89
<i>labiata</i> J. J. S. ....	44; 243	<i>biflora</i> (L.) Schult. ....	79
<i>Luetzelburgii</i> Goeb. et Suessg.		<i>capitata</i> (Walt.) Michx. ....	69
.....	44; 236	<i>coerulea</i> Nutt. ....	79
<i>macahensis</i> (Miers) Benth.		<i>dasyantha</i> (Mart.) Schult. ..	76
.....	44; 45; 233	<i>flava</i> (Mart.) Schult. ....	83
<i>Neptunis</i> Becc. ....	43; 243	<i>Triscyphus</i> Taub. ex Warm. 42;	225
<i>Ophiuris</i> Becc. ....	242	<i>fungiformis</i> Taub. ex Warm.	225
<i>pachyantha</i> (Schltr.) Engl. ..	224	<i>Triuricodon</i> Schltr. ....	42
<b>panamensis</b> (Standl.) Jonk.		<i>Glaziovii</i> (Pouls.) Schltr. ....	232
.....	45; 234	<i>Tsjawael</i> .....	116
<i>racemosa</i> Ridl. ....	238	<i>Vogelia</i> (Gmel.) Malme .....	19
<i>Rodwayi</i> F. v. Muell. ....		<i>capitata</i> (Walt.) Gmel. ....	69
.....	12; 42; 44; 248	<i>Voyria tenella</i> auct. ....	208
<i>Versteegii</i> J. J. S. ....	44; 251	<i>yayeyama-shakudyô</i> .....	154





## STELLINGEN.

### I.

De Burmanniaceae moeten niet met de Orchidaceae in een orde Microspermae ondergebracht worden, ze behoren tot de orde Liliiflorae.

### II.

De genera *Corsia* en *Arachnites* vormen een afzonderlijke familie Corsiaceae, het is onjuist deze geslachten tot een tribus Corsieae van de Burmanniaceae te brengen.

### III.

Tegen art. 10 van de Internationale Botanische Nomenclatuurregels, dat eist dat iedere individuele plant, soortsbastarden en chimaeren uitgezonderd, tot een soort (species) behoort, zijn bezwaren aan te voeren.

### IV.

Er bestaat geen bezwaar tegen het gebruik van tautoniemen in de botanische naamgeving.

### V.

Het verdient aanbeveling alle soortsaanduidingen met een kleine beginletter te schrijven.

## VI.

Voor de afwijkende pollendiagrammen, verkregen in een aantal Nederlandse holocene kleiafzettingen, die door B. POLAK verklaard worden door het loswoelen van oudere lagen, zijn nog andere en meer waarschijnlijke verklaringen mogelijk.

## VII.

De Nemertini mogen niet tot de Plathelminthes gerekend worden, ze vormen een afzonderlijk Phylum van het Dierenrijk.

## VIII.

Het is niet juist ter verklaring van de aanwezigheid van enkele, zeer gespecialiseerde Muriden op het Australisch Continent, een landbrug aan te nemen die benoorden de Oost-Indische Archipel was gelegen.

## IX.

Op zoölogische gronden kan de vroegere aanwezigheid van woestijnachtige gebieden op Nieuw Guinea aannemelijk gemaakt worden.

## X.

PRATT heeft niet bewezen dat de ademhaling van tarwekiemplantjes door toedienen van groeistof toeneemt.

Am. Journ. of Bot. Vol. 25 N. 6 (1938).

## XI.

Hoewel PEARSE waarschijnlijk gemaakt heeft, dat zijn heteroauxine de vorming van wortels aan Salix-stekken bevordert, zijn tegen zijn methodiek bezwaren aan te voeren en behoeven zijn resultaten op enkele punten opheldering.

Ann. of Bot. Vol. II (n. Ser.) N. 5 (1938).

## XII.

De methode ter bepaling van de isohydrische  $p_H$  waarde van de grond, voorgesteld door PURI en SARUP, verdient navolging.

Soil Science 46 N. 1 (1938).

## XIII.

Bij het bespuiten van bomen, met het doel bepaalde parasieten te doden, bestaat het gevaar dat de gebruikte chemicalien de natuurlijke vijanden van de parasiet meer verzwakken dan de parasiet zelf.

## XIV.

De zuivere proteïne-natuur van virus is nog niet voldoende bewezen.

## XV.

De verklaring welke KUTHY met behulp der coacervatie geeft van de histologische verschijnselen bij de vetresorptie in de darm, is onvoldoende.

Journ. d. Chimie phys. 33 (1936) p. 247.

## XVI.

Daar het Nederlandse lager, middelbaar en voorbereidend hoger onderwijs de karaktervorming en lichamelijke opvoeding niet ter hand genomen heeft, dient het er zorg voor te dragen dat de schoolgaande jeugd buiten de schooltijden in staat is lichaam en karakter te ontwikkelen.

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