Portraits of Non-Tree Families

M. M. J. van Balgooy

CONTENTS

PREFACE

Dissemination of user-friendly botanical information is one of the tasks of institutions like the Nationaal Herbarium Nederland. Yet all too often centres of plant taxonomy are more productive in technical taxonomic revisions full of specialised jargon or other academic pursuits. Max van Balgooy's trilogy on Malesian Seed Plants is a fortunate exception. Based on a lifetime of experience in the field and the herbarium, first as a schoolboy and student in Java, later as a staff member of the Rijksherbarium (now the Universiteit Leiden branch of the Nationaal Herbarium Nederland), the author has now comprehensively recorded his very extensive knowledge of diagnostic characters at the family level for the highly diverse seed plant flora of the Malesian region. Richly illustrated with existing drawings from different, widely dispersed sources, the combined information on diagnostic 'spot' characters and concise family portraits will enable the keen amateur and beginning or experienced plant (para)taxonomist to identify plants down to the family level, often even directly down to a genus. In tropical botany that in itself is a major achievement. For further identification down to the species Malesian botanists need Flora Malesiana treatments (alas only available for about 65% of the plant families occurring in Indonesia, Malaysia, the Phillippines, Papua New Guinea, Brunei and Singapore) or a local flora (such as the Flora of Java and the Tree Floras of Malaya, of Sabah & Sarawak, or of East Kalimantan), or a more specialised taxonomic revision tucked away in a specialised journal such as Blumea, Kew Bulletin, Reinwardtia or other exotically named scientific periodicals. For some areas and plant families (Dipterocarpaceae, Caesalpiniaceae, Orchidaceae) interactive CD-ROMs are now on the market as well. However, for the vast majority of Malesian plants such information is, alas, not yet readily available. This makes ongoing efforts to complete Flora Malesiana and other Flora Projects in the region all the more urgent. That in turn requires an increasing army of well-trained taxonomists dedicated to the formidable task that still lies ahead. I very much hope that books like the three volumes on Malesian Seed Plants will stimulate students, especially in Southeast Asia and the Pacific region to take up the challenge to contribute to the knowledge of their own local and regional flora which, despite major threats to many of its ecosystems, is among the richest in the world.

Meanwhile I congratulate the author with his formidable achievement, carried out as an Honorary Staff Member after his retirement in 1995, and combined with his ongoing voluntary contributions to the scientific collection management of our institute and constant provider of plant identifications for many colleagues in Malesia and beyond. At the end of this preface I want to express our collective and great gratitude for so much disinterested service to Malesian botany.

Pieter Baas, Director
Nationaal Herbarium Nederland

INTRODUCTION

This is the third and final volume of the series 'Malesian Seed Plants'. It contains the 'portraits' of 124 non-tree families, i.e. families which are mainly herbaceous, climbing, shrubby, or trees with a stem diameter at breast height of less than 10 cm or a height of less than 10 m.

Users of the present book are referred to Volume 1 of this series (Van Balgooy 1997) for an explanation of the historical background of the series and a survey of spot-characters, and to Volume 2 (Van Balgooy 1998) for a glossary of terms and instructions how to use the 'portraits'.

In principle, in the 'portraits' only those families represented by native species are treated, but a few families with naturalised species are included also, such as the Cactaceae. Other families with introduced species which never occur in the wild are left out, e. g. Caricaceae.

After publication of Volume 1 so many new spot-characters have been recorded that I decided to include in the present volume two chapters: 'Additional spot-characters' (to Volume 1) and 'New spot-characters'.

One category of plants – rheophytes – has already been well-discussed by Van Steenis (1981, 1987a). Rheophytes are plants confined to and growing in streambeds subjected to rapid floods, and usually have elongated leaves at least in their juvenile phases.

A problem with which I have been faced more seriously in Volume 3 than in Volume 2 is the question of family circumscription. Many of the families treated in Volume 3 belong to the Monocots with notoriously controversial families such as Liliaceae and Amaryllidaceae. I have chosen to follow the family concepts in the Flora of Java (Backer & Bakhuizen van den Brink 1963–1968) which are more or less intermediate between the broad family concepts in the Checklist of Van Steenis (1987b) and the refined modern systems of Dahlgren (1985), Cronquist (1988) and Bremer c. s. (1998); the latter are not in agreement anyway. Thus I treat separately the Agavaceae, Smilacaceae and Xanthorrhoeaceae, but not the Alliaceae, Asparagaceae and Petrosaviaceae (all once included in Liliaceae), although they may have equally valid 'rights' to be treated as separate families.

Writing this final volume has been much more time-consuming than that of Volume 2 containing the tree families, with which I am more familiar. The 'Flora of Java' and the 'Orders and Families of Malayan Seed plants' (Keng 1978) have been a great help.

Once more I want to stress the fact that my books are intended for practical users who want names for their plants and to whom, for instance, it is of minor importance whether a genus such as *Petrosavia* belongs to the Liliaceae, Triuridaceae or to the Petrosaviaceae on theoretical grounds. And again I must point out that this series is to be used as an aid to identify plants in the herbarium, and not in the field.

Finally I want to repeat a caution expressed in the Introduction to Volume 2: the spot-characters as well as the portraits apply to the Malesian members of the concerned family only and may not be true for American and African taxa.

With the publication of Volume 3 my trilogy on Malesian Seed Plants is completed. I realise only too well that this is only a first and incomplete aid towards the identification of Malesian plants. People with the ability to recognise plants of various families at a glance are extremely scarce, whereas there is an increasing demand for quick and reliable identification by students of various walks of scientific life. I am also aware that this series is most useful to those with a reasonably good knowledge of Malesian plants. I am still hopeful that it will form the basis for a user-friendly multiple-entry computer key. And even with such a key available, identification will not be an easy exercise. After so many years experience I have more than once been at a loss to explain how I recognise a family or genus.

When naming newly received material in the herbarium I am often challenged by colleagues to explain my decisions. "Oh, it has got glands on the underside of the leaves" or "when you hold it against strong light you will see reddish dots." Whereupon I get the annoyed comment: "You have not even looked at the plant!"

Obviously there are more features that one unwittingly uses to recognise a plant. I had an interresting experience with the late K.M. Kochummen. Since I first met him at FRIM-Kepong, I was greatly impressed by his ability to name plants even from scraps. In 1989, during a course in tree recognition in East Kalimantan, I had ample opportunity to test our skills. During the day we looked at plants in the field and in the evening at – often scrappy – 'ecological specimens'. We rarely disagreed but apparently looked at different features. Once we came upon a small scrap that we both recognised as *Koilodepas*. "How did you know?" Kochummen asked. "Oh, it has got very funny stipules" I said. 'Koch' was amazed: "I did not know it has stipules, I looked at the venation!"

We decided it would be worthwhile to sit one day together with a competent brain-picker and have our combined knowledge put into writing. Unfortunately this never happened owing to the untimely death of Kochummen in 1999.

At the end of the Introduction to this book, I take the opportunity to answer some of the criticisms expressed in reviews of Volume 1 by some authors. One of these criticisms is that some taxa used to illustrate a particular character are not mentioned by name in the relevant lists of taxa.

> Examples: under 'Fruit ridged', list 99, *Heritiera littoralis* is pictured but it is not mentioned in the list. However, the list contains 'Sterculiaceae p.p.' to which *Heritiera* belongs. Likewise *Astronia spectabilis*, shown to illustrate 'Leaves triplinerved', is not mentioned in list 64 but Melastomataceae p.p. is.

Some reviewers found the explanations too brief, inadequate, or incomplete. As to the latter qualification, I mentioned in the Introduction that some of the lists are "desperately incomplete." In the present volume a number of additions can be found.

As to inadequacy, perhaps I tried to keep the explanations too brief. Not every flat fruit is considered winged, e.g., the pods of *Leucaena* are not included in list 98, those of *Dalbergia* are, since in this genus the wings form an appendage to the fruit.

A deeply dissected leaf, e.g. that of *Manihot*, is not considered palmately compound (list 48). *Dendrocnide* is armed with irritating hairs but not with spines, which is my definition of armed plants (list 12).

Other reviewers regret that so few field characters are used. This was done on purpose, since these books are primarily aimed at herbarium use. Field characters are mostly invisible on a herbarium specimen and often are not mentioned on the labels. For the same reason pollen morphology, chemical composition and chromosome numbers are not mentioned. My approach is practical and often ignores theoretical concepts. To give some examples: the pseudo-stipules in *Canarium* and *Lepisanthes* and the cup-shaped petiole base of *Garcinia* are regarded as stipules although they are not, strictly speaking, stipules.

One criticism with which I fully concur is that the lists should have been arranged alphabetically to family. This would have been more in keeping with my own statement that in plant identification recognition of the family is of prime importance. It also has been noted that 'p.p.' can mean anything between 'in a few' or 'in nearly all' cases. Perhaps 'sometimes' or 'usually' should have been used instead.

One reviewer wrote that with Volume 3 published, Volume 1 would become redundant. This certainly is not true. Several spot-characters in Volume 1 are not mentioned in the family portraits and, conversely, characters used in the 'Portraits' are often not to be found in Volume 1.

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ACKNOWLEDGEMENTS AND DEDICATION

As with the previous two volumes, I have to thank various persons for help in finishing this last volume of the series 'Malesian Seed Plants'.

The unenviable job of typing out the original handwritten manuscript was performed with great accuracy by Bep van Heuven. For the final publication the text layout and digital imaging was done by Emma van Nieuwkoop in the accurate way which is her trademark.

André Schuiteman provided the text of the family *Orchidaceae*. Mark Newman checked the portraits of the *Costaceae* and *Zingiberaceae*, Peter Boyce that of the *Araceae*, Martin Sands the portrait of the *Begoniaceae*, Bill Burtt that of the *Gesneriaceae*, George Argent those of *Musaceae* and *Strelitziaceae*, and Willem de Wilde the *Cucurbitaceae*. Their help is hereby gratefully acknowledged. I thank Pieter Baas for writing the Preface and Mark Coode for correcting the Introduction.

The illustrations were mostly copied from Flora Malesiana (often drawn by Ruth van Crevel) and other in-house publications. Permission for the use of illustrations from outside the institute are acknowledged in the captions. My son Richard designed the cover for this volume, as he did before for Volumes 1 and 2.

This final volume is dedicated with respect to the memory of the late K.M. Kochummen.

LIST OF FAMILIES

Synonyms, inclusive, or alternative names are added in brackets directly under the family name here accepted; numbers refer to page numbers. An asterisk denotes a family only represented by naturalised species.

LIST OF SPOT-CHARACTERS

(Italicised numbers between brackets refer to the page numbers in Volume 1 where the 105 spot-characters have been explained and illustrated)

Habit

1. Cushion plants *(9)*
2. Swollen stems *(11)*
3. Monocarpic plants *(13)*
4. Climbers with hooks / tendrils *(15)*
5. Climbers without hooks / tendrils *(17)*
6. Climbers with opposite leaves *(19)*
7. Echlorophyllose plants *(21)*
8. Leafless when flowering *(23)*
9. Ant plants *(25)*
10. Schopfbäume *(27)*
11. Parasites *(29)*
12. Armed plants *(31)*
13. Bulbils *(32)*

Stem or branch

14. Terminalia branching *(33)*
15. Stem flanged *(35)*
16. Swollen nodes *(37)*
17. Twigs white, petiole black *(39)*
18. Serial buds *(39)*

Exudate

19. White or yellow sap *(40)*
20. Black or brown sap *(41)*
21. Red or orange sap *(41)*
22. Dried plants resinous *(42)*

Smell

23. Fenugreek *(43)*
24. Foetid *(43)*

Indument

25. Stellate hairs *(45)*
26. Scales *(46)*
27. Dendroid hairs *(47)*
28. Balance hairs *(47)*
29. Stinging hairs *(47)*
30. Leaves glaucous *(48)*

Leaves with glands

31. Glands on petiole (p) or lamina (l) *(49)*

Stipules

32. Intrapetiolar stipules *(53)*
33. Stipules clasping *(53)*
34. Stipules pectinate *(54)*
35. Stipules peltate *(54)*
36. Stipules striate *(54)*
37. Stipules foliaceous *(56)*

Petiole / rachis

38. Petiole swollen apically *(57)*
39. Petiole wrinkled *(61)*
40. Winged rachis / petiole *(61)*
41. Free rachis tip *(62)*
42. Rachis with swollen nodes *(63)*
43. Petiole strongly swollen at base *(64)*

Lamina

44. Leaves spiral in opposite-leaved families *(65)*
45. Leaves opposite in spiral-leaved families *(67)*
46. Leaves verticillate *(69)*
47. Leaves anisophyllous *(70)*
48. Leaves palmately compound *(73)*
49. Leaves compound opposite *(75)*
50. Leaves 2-, 3- (or 4-)pinnate *(77)*
51. Leaves peltate *(78)*
52. Leaves bullate *(79)*
53. Dicots with large leaves *(80)*
54. Nigrescence *(81)*
55. Dry leaves yellow *(81)*
56. Young leaves red *(82)*
57. Broken leaves with white threads *(82)*
58. Leaves with domatia *(85)*
59. Leaves with dots *(86)*
60. Leaf surface puncticulate *(88)*
61. Leaf surface pustulate *(88)*
62. Leaf surface rough *(89)*
63. Cystoliths *(89)*
64. Leaves triplinerved *(91)*
65. Intramarginal vein *(93)*
66. Double intramarginal vein *(93)*
67. Parallel secondary venation *(94)*
68. Scalariform venation *(95)*
69. Leaves withering red *(95)*

Inflorescence

70. Cauliflorous plants *(96)*
71. Inflorescence fasciculate, leaves distichous *(99)*
72. Inflorescence leaf-opposed *(101)*
73. Inflorescence supra-axillary *(101)*
74. Inflorescence epiphyllous *(102)*
75. Geocarpous plants *(102)*
76. Inflorescence compact *(104)*
77. Inflorescence a condensed raceme *(105)*
78. Flagelliflory *(107)*

Flower

79. 3-merous dicots *(108)*
80. Calyx accrescent *(108)*
81. Corolla / petals fimbriate / bifid *(111)*
82. Corolla / petals with appendages *(112)*
83. Stamens opposite the petals *(113)*
84. Staminal tube *(114)*
85. Stamens with appendages *(114)*
86. Anthers basifixed, apical pores *(116)*
87. Anthers opening by valves *(116)*
88. Broad sessile stigma *(117)*
89. Long forked style *(118)*
90. Double forked style *(118)*
91. Excentric style *(118)*
92. Ovary inferior *(120)*

Fruit

93. Fruits blue *(122)*
94. Woody fruits, scattered seeds *(122)*
95. Spiny / muricate fruits *(124)*
96. Compound fruits *(127)*
97. Moniliform fruit *(128)*
98. Fruit winged *(128)*
99. Fruit ridges *(131)*
100. Lagerstroemia capsule *(132)*
101. Three-locular capsule *(133)*

Seed

102. Seeds winged *(135)*
103. Seeds comose *(136)*
104. Seeds arillate *(138)*
105. Ruminate endosperm *(138)*

PORTRAITS OF NON-TREE FAMILIES

(alphabetically arranged)

ACANTHACEAE (THUNBERGIACEAE)

Always: Herbaceous; stem thickened at the nodes; leaves simple, decussate, penni-nerved, exstipulate; corolla 2- or 4-lobed, the lobes contorted or imbricate in bud, stamens 2 or 4, epipetalous; ovary superior, 2-locular; seeds few.

Usually/often: Leaves entire, with linear cystoliths; seeds on jaculators (retinacula) and forcibly ejected from the characteristic 2-valved capsule.

Striking features: Climbers, no jaculators (*Thunbergia*); no cystoliths, no jaculators (*Staurogyne*); armed shrubs (*Acanthus, Barleria*); periodical mass-flowering (*Strobilanthes* s.l.).

Different from: *Gesneriaceae, Pedaliaceae* and *Scrophulariaceae* have no cystoliths, no jaculator, no swollen nodes, more numerous seeds.

Distribution: The family worldwide, especially in the tropics, mostly in open places, some genera well represented in, or limited to rain forest. In Malesia c. 40 genera, incl.:
- *Acanthus* (Old World), in Malesia mainly in mangroves;
- *Graptophyllum* (Malesia, Australia, Pacific), lowland rain forest;
- *Hygrophila* (pantropical), mostly wet places, lowland;
- *Pseuderanthemum* (pantropical), lowland and lower montane rain forest;
- *Strobilanthes* (Indo-Malesia), lowland and montane rain forest;
- *Thunbergia* (paleotropics), primary and secondary rain forest.

Notes: Ornamentals: *Graptophyllum, Justicia* (*Beloperone**), *Sanchezia**, *Thunbergia*. — Medicinal plants: *Justicia gendarussa, Strobilanthes*.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 544–593; R.M. Barker, J. Adel. Bot. Gard. 9 (1986) 1–286 (Australia). — Dr. B. Hansen (AAU) is coordinating the revision of Malesian *Acanthaceae*.

Spot-characters: *Acanthaceae* 16, 59, 63 – *Acanthus* 12; *A. ilicifolius* 60 – *Barleria* 12 – *Blepharis* 46 – *Hallieracantha* 47 – *Justicia* 85 – *Ptyssiglottis* 47 – *Stauranthera* 47 – *Strobilanthes* 2, 15, 47 – *Thunbergia* 5, 6, 64; *T. laurifolia* 38.

Illustrations: Fig. 1–4.

Fig. 1. *Asystasia gangetica* (L.) Anderss. (Acanthaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 630.

Fig. 2. *Justicia gendarussa* Burm. f. (Acanthaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 640.

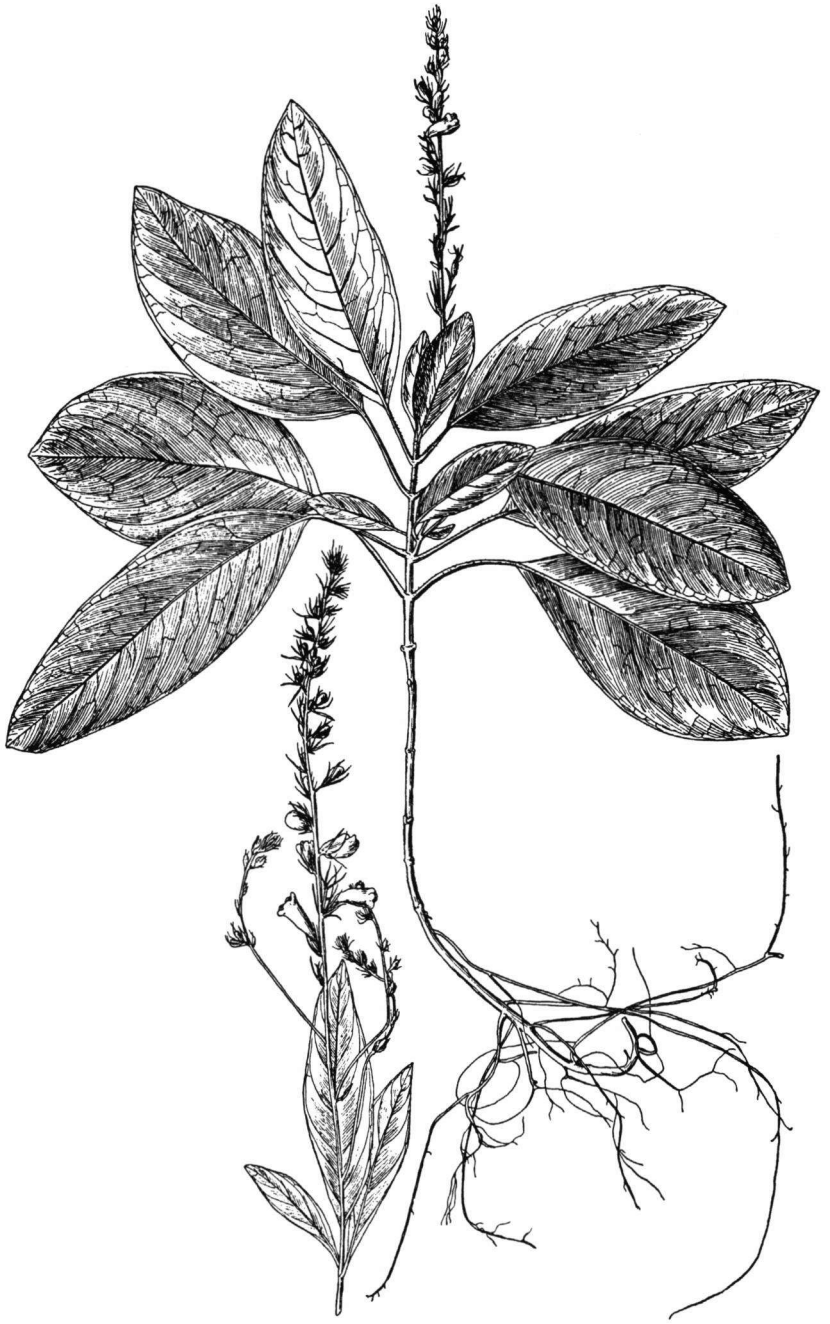

Fig. 3. *Staurogyne elongata* (Blume) O. Ktze (Acanthaceae).

Reproduced from J. J. Ochse & R. C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 2.

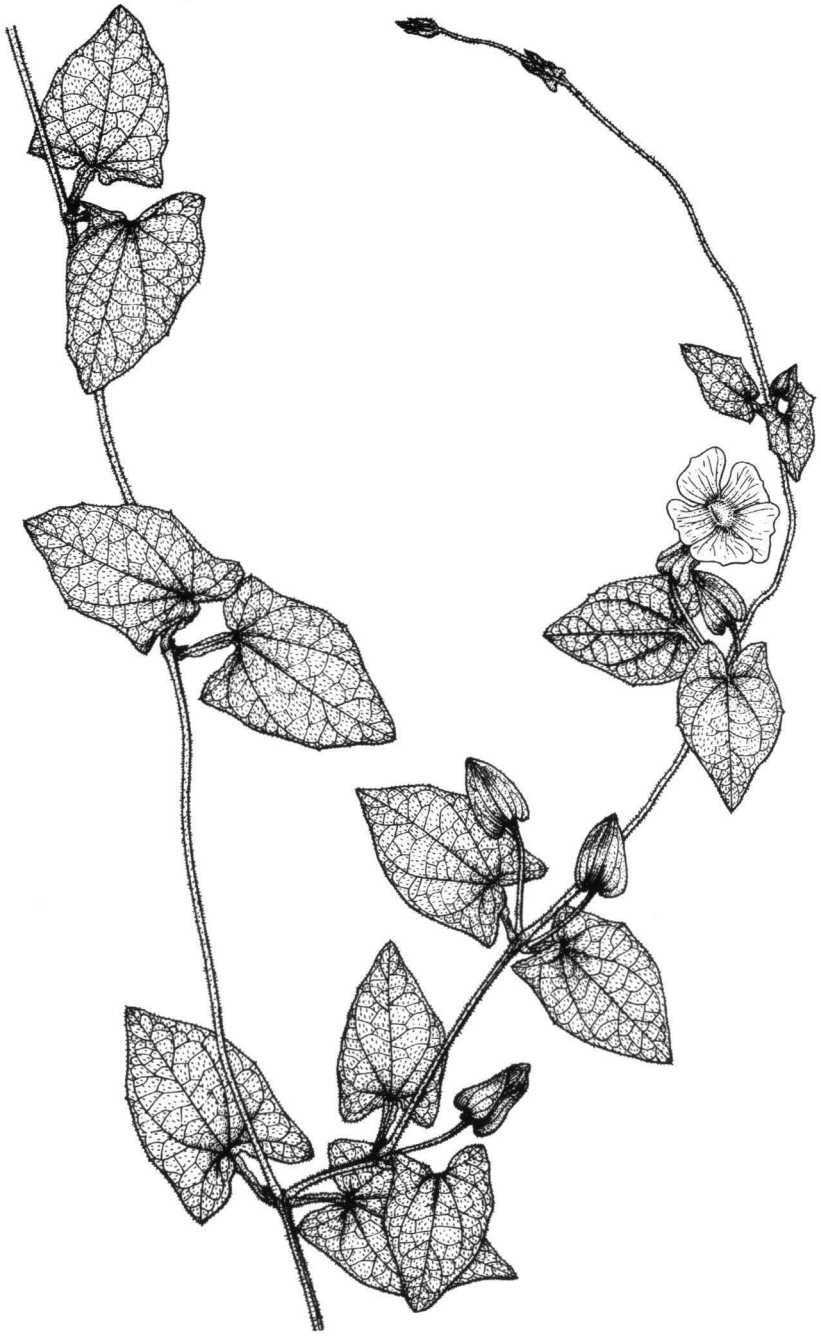

Fig. 4. *Thunbergia alata* Bojer ex Sims (Acanthaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 609.

AGAVACEAE (DRACAENACEAE, HANGUANACEAE)

Always: Leaves simple, entire, parallel veined; flowers bisexual, actinomorphic; tepals 6, stamens 6, free; ovary 3-locular.

Usually/often: Woody; leaves linear, crowded at the end of the stem.

Striking features: Leaves spine-tipped (*Yucca**).

Different from: *Liliaceae:* not woody, leaves rarely crowded.

Distribution: The family widespread. In Malesia only 3 native genera, incl.:
- *Dracaena* (Pleomele) with several species in secondary and primary forest mainly in the lowland. Several genera represented by introduced species.

Notes: Several species cultivated as ornamentals belonging to: *Agave**, *Aloë**, *Cordyline, Dracaena, Polianthes** and *Yucca**. — *Hanguana* is treated under *Flagellariaceae* by Backer in Fl. Males. I, 4 (1951) 245–250; it is also regarded as a member of *Xanthorrhoeaceae* or as a separate family, *Hanguanaceae*.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 3 (1968) 157–165; L. Pedley & P.I. Forster, Fl. Austral. 46 (1986) 71–88.

Spot-characters: *Agave* 3 – *Cordyline* 10 – *Dracaena* 10 – *Yucca* 13.

Illustration: Fig. 5.

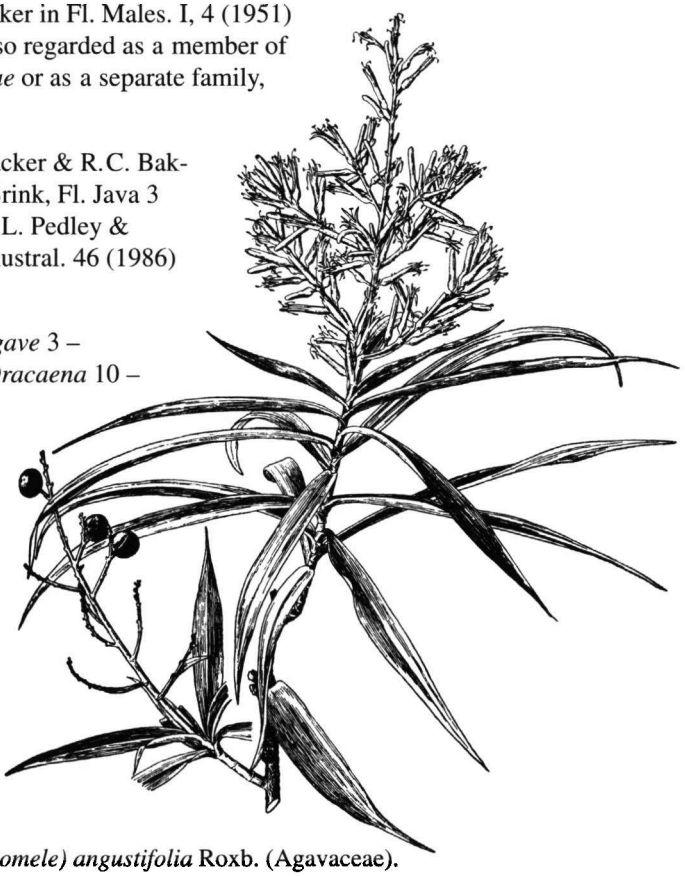

Fig. 5. *Dracaena (Pleomele) angustifolia* Roxb. (Agavaceae).

Reproduced from J. J. Ochse & R. C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 285.

AIZOACEAE (FICOIDACEAE, MOLLUGINACEAE)

Always: Herbs; leaves simple, entire; flowers hermaphrodite, actinomorphic; fruit a capsule with numerous seeds.

Usually/often: Leaves decussate (incl. verticillate); stipules small; tepals 5, free; ovary superior, styles 2.

Striking features: Creeping herb, leaves fleshy (*Sesuvium*); pedicel fused with petiole (*Trianthema*).

Different from: *Boerhavia* (*Nyctaginaceae*): ovary inferior, fruit 1-seeded. — *Portulacaceae:* flowers with sepals and petals, style branched.

Distribution: The family worldwide, best developed in South Africa. In Malesia 4 genera, incl.:
- *Sesuvium*, creeper, common on sandy beaches.

Notes: Species of *Mesembryanthemum** are cultivated as ornamentals; leaves of *Tetragonia tetragonoides** are eaten as a vegetable.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 267–275.

Spot-characters: *Aizoaceae* 32 – *Tetragonia* 92 – *Trianthema portulacastrum* 74.

Illustrations: Fig. 6 & 7.

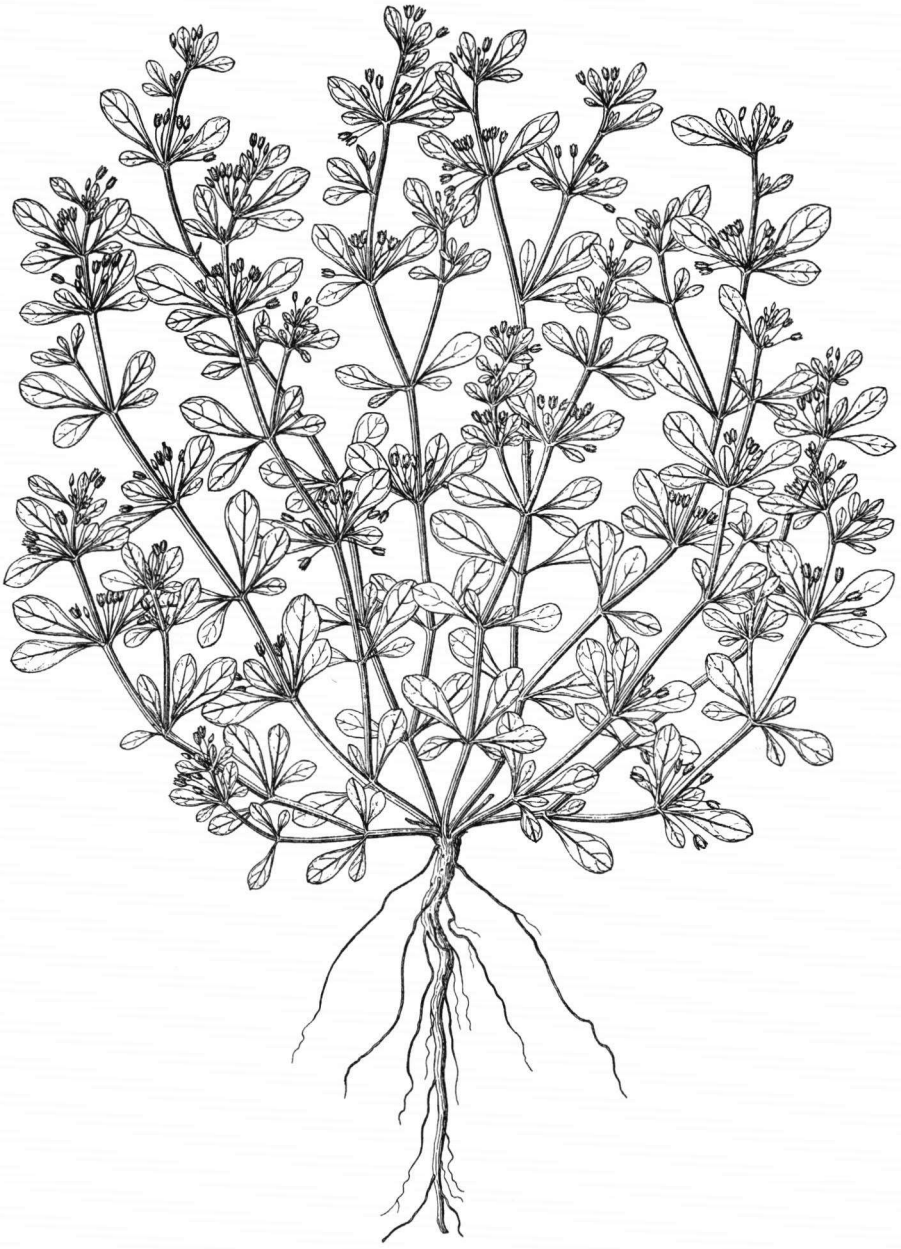

Fig. 6. *Glinus oppositifolius* (L.) DC. (Aizoaceae).

Reproduced from Flora Malesiana I, 4 (1951) 271, fig. 1.

Fig. 7. *Sesuvium portulacastrum* L. (Aizoaceae).

Reproduced from C. A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 8 (1935) t. 251.

ALISMATACEAE

Always: Rhizomatous herbs; leaves simple on long petioles, entire, exstipulate; flowers actinomorphic, tepals 6 in two rows of 3; ovary superior; fruit an achene.

Usually/often: Leaves crowded, laticiferous, flowers unisexual, stamens many, carpels many.

Striking features: Flowers bisexual, achene with a long beak (*Echinodorus*).

Different from: *Hydrocharitaceae:* ovary inferior.

Distribution: The family is best represented in the northern hemisphere. In Malesia 4 genera, incl.:
- *Sagittaria*, (mainly America, few in Old World) marshy places in lowland.

Notes: Members of the family are always found in marshy places. The corms of *Sagittaria sagittifolia* are edible.

Literature: C. den Hartog, Fl. Males. I, 5 (1957) 317–334.

Spot-characters: *Alismataceae* 19 – *Caldesia* 13, 95 – *Sagittaria* 95.

Illustration: Fig. 8.

Fig. 8. *Sagittaria sagittifolia* L. subsp. *leucopetala* (Miq.) Hartog (Alismataceae). Habit; enlarged fruit.

Reproduced from Flora Malesiana I, 5 (1957) 333, fig. 11.

ALSEUOSMIACEAE

Always: Shrubs; leaves simple, alternate, exstipulate; flowers actinomorphic, sympetalous; ovary inferior; fruit a few-seeded berry.

Usually/often: Leaves crowded; flowers 5-merous; stamens 5, alternipetalous.

Different from: *Gesneriaceae:* leaves opposite, flowers usually zygomorphic, ovary superior. — *Caprifoliaceae:* leaves opposite.

Distribution: The family is Australasian: New Zealand, New Caledonia, Australia, New Guinea. In Malesia only one rare species of *Wittsteinia.*

Notes: The family is probably closest to *Escalloniaceae.* — *Wittsteinia papuana* often has cleistogamic flowers.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 10 (1986) 335–336.

Spot-characters: *Wittsteinia* 46, 92.

Illustration: Fig. 9.

Fig. 9. *Wittsteinia papuana* (Steen.) Steen. (Alseuosmiaceae).

Reproduced from Flora Malesiana I, 10 (1986) 336, fig. 1.

AMARANTHACEAE

Always: Leaves simple, exstipulate; tepals 3–5, scarious, stamens as many as tepals and opposite to the latter; ovary superior, 1-celled.

Usually/often: Herbaceous, leaves entire, fruit thin-walled.

Striking features: More or less woody climbers (*Deeringia*) fruit covered by sharp (hooked) tepals and bracteoles (*Achyranthes, Cyathula, Pupalia*).

Different from: *Chenopodiaceae:* perianth rarely scarious.

Distribution: The family worldwide. In Malesia 12 native genera, mostly in open places, incl.:
- *Alternanthera*, mostly creeping herbs, open places;
- *Amaranthus*, herbs, open places, often cultivated;
- *Deeringia*, climbers, lowland secondary and primary forest.

Notes: Several species useful for man. — Vegetable: *Amaranthus*. — Ornamentals: *Alternanthera, Celosia, Gomphrena, Iresine**. — Medicinal: *Aerva, Deeringia*.

Literature: C.A. Backer, Fl. Males. I, 4 (1949) 69–98; ibid. I, 6 (1972) 915–917.

Spot-characters: *Amaranthaceae* 83, 95 – *Allmannia* 72 – *Alternanthera* 12 – *Amaranthus* 12 – *Celosia* 76 – *Deeringia* 5 – *Gomphrena* 16, 76 – *Iresine* 16 – *Ptilotus* 76.

Illustrations: Fig. 10–12.

Fig. 10. *Amaranthus tricolor* L. (Amaranthaceae).
Reproduced from Flora Malesiana I, 4 (1949) 78, fig. 2.

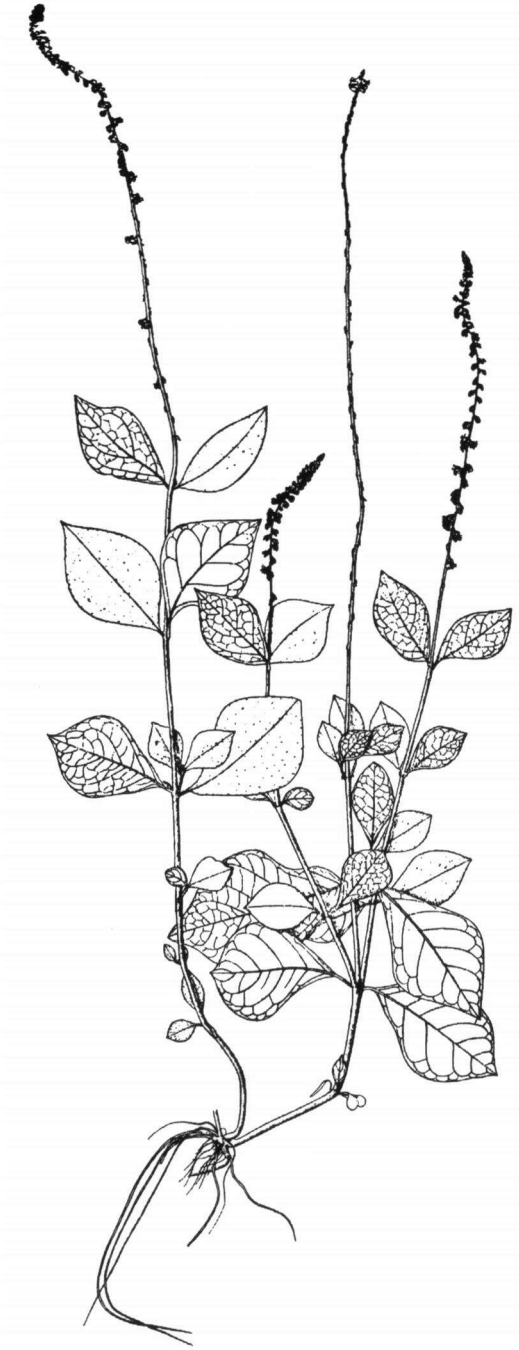

Fig. 11. *Cyathula prostrata* (L.) Blume (Amaranthaceae).

Reproduced from Flora Malesiana I, 4 (1949) 82, fig. 4.

Fig. 12. *Deeringia amaranthoides* (Lam.) Merr. (Amaranthaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 19.

AMARYLLIDACEAE (HYPOXIDACEAE)

Always: Herbs with bulbs or rhizomes; leaves simple, crowded, entire, exstipulate, nerves parallel; flowers bisexual, 3-merous, tepals in 2 rows of 3, ovary inferior.

Usually/often: Inflorescence compound umbelliform; stamens 6, free, fruit a 3-locular fleshy capsule.

Striking features: Flowers solitary, yellow (*Curculigo orchidioides*).

Different from: *Liliaceae* s.l.: ovary superior. — *Iridaceae:* leaves distichous.

Distribution: The family worldwide. In Malesia 18 genera, of which only 5 with native species, incl.:
- *Curculigo* (*Molineria*) (pantropical), lowland rain forest, secondary forest, some in monsoonal forest.

Notes: Ornamental plants: *Hippeastrum**, *Proiphys*.

Literature: D.J.L. Geerinck, Fl. Males. I, 11 (1993) 353–373.

Spot-characters: *Amaryllidaceae* 92, 101, 102.

Illustrations: Fig. 13 & 14.

Fig. 13. *Curculigo latifolia* Dryander (Amaryllidaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 167. With kind permission of the Malaysian Nature Society.

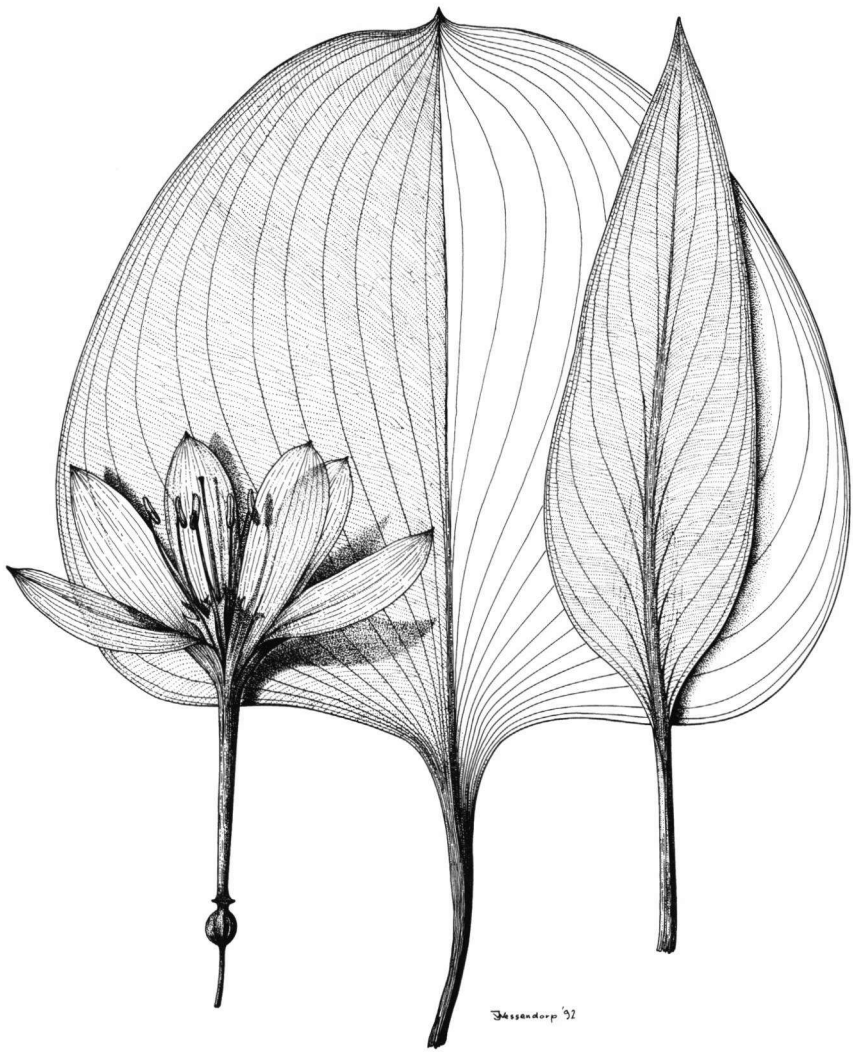

Fig. 14. *Proiphys amboinensis* (L.) Herbert (Amaryllidaceae). Leaf and enlarged flower; on the right a leaf of *Proiphys alba* (R. Br.) Mabberley.

Reproduced from Flora Malesiana I, 11 (1993) 365, fig. 4.

ANCISTROCLADACEAE

Always: Woody climber, (erect in youth); tendril with curved hooks; leaves simple, spiral, penninerved, exstipulate; flowers bisexual, actinomorphic, 5-merous, ovary superior, calyx enlarged and wing-like in fruit.

Usually/often: Leaves crowded, stamens 10.

Different from: *Hugonia* and *Indorouchera* (*Linaceae*): hooks simple, calyx not enlarged in fruit.

Distribution: The only genus of the family, *Ancistrocladus*, has a disjunct distribution: W Africa and SE Asia + West Malesia, mostly in lowland rain forest.

Notes: The family has been placed near *Dipterocarpaceae*, but differs in its climbing habit, lack of resin and of stipules.

Literature: C. G. G. J. van Steenis, Fl. Males. I, 4 (1948) 8–10.

Spot-characters: *Ancistrocladus* 4, 26, 31, 80, 98.

Illustration: Fig. 15.

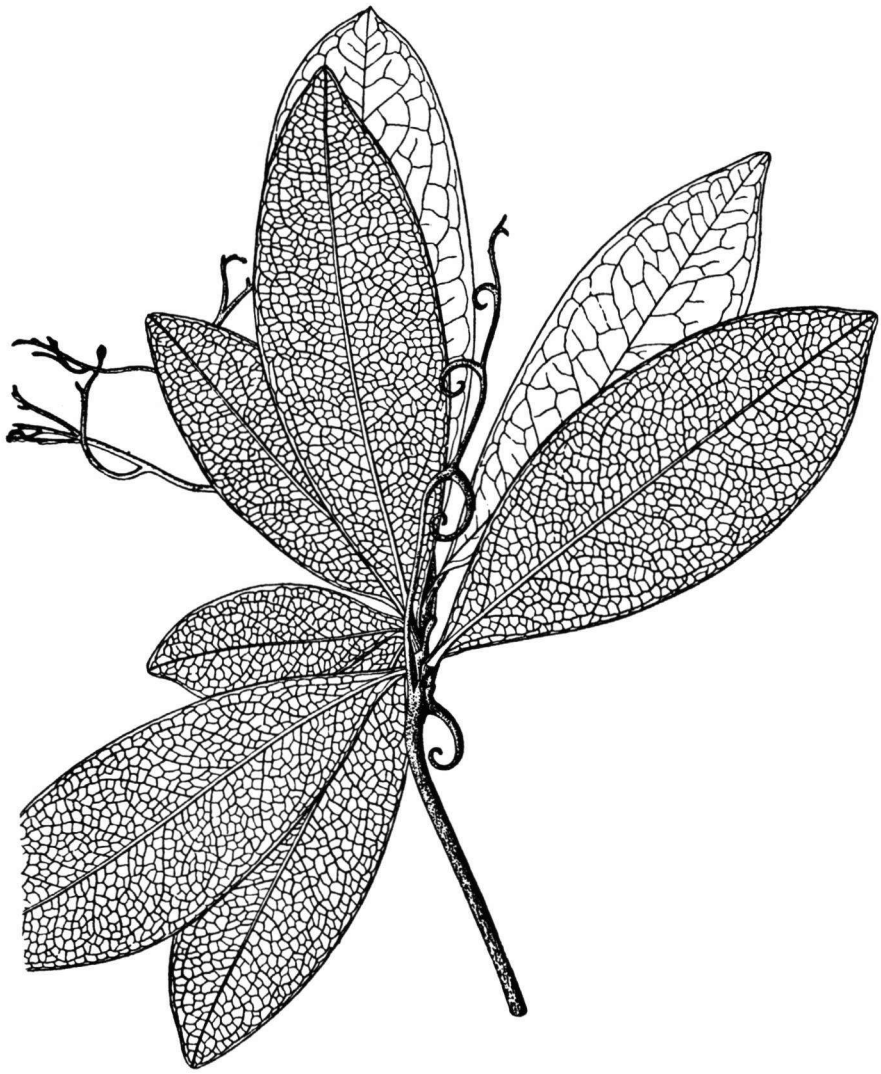

Fig. 15. *Ancistrocladus tectorius* (Lour.) Merr. (Ancistrocladaceae).

Reproduced from Flora Malesiana I, 4 (1948) 9, fig. 1.

APONOGETONACEAE

Always: Aquatic herbs, laticiferous; leaves oblong, basally crowded, exstipulate, venation parallel; ovary superior, apocarpous.

Usually/often: Flowers bisexual, perianth segments 2.

Different from: *Hydrocharitaceae*, not laticiferous, ovary inferior. — *Potamogetonaceae*, not laticiferous.

Distribution: The only genus of the family is confined to the Old World, best represented in Africa and Madagascar. In Malesia 4 native species.

Notes: *Aponogeton fenestralis** is cultivated as an ornamental.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1948) 11–12; H.W.E. van Bruggen, Fl. Males. I, 7 (1971) 213–218.

Spot-characters: *Aponogeton* 19.

Illustration: Fig. 16.

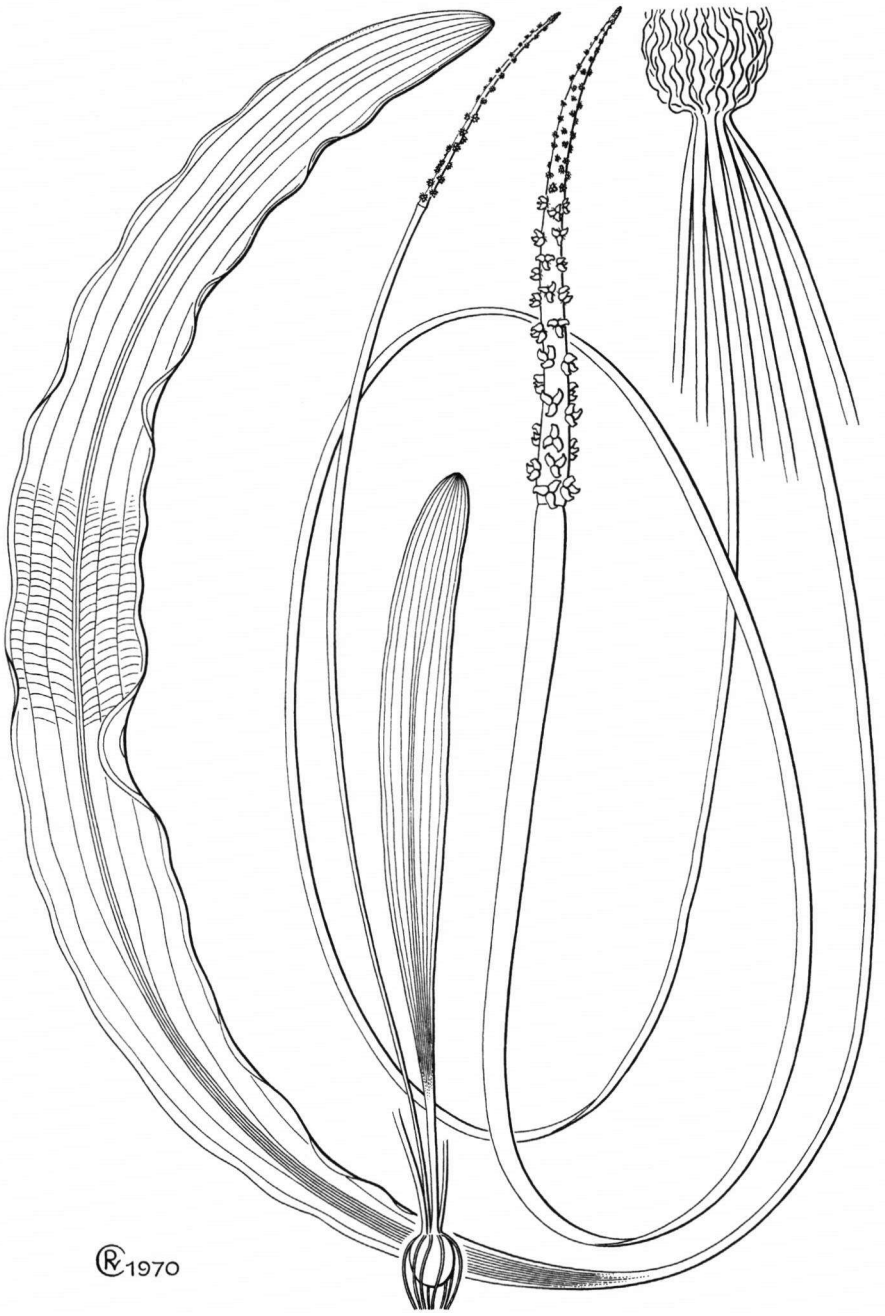

Fig. 16. *Aponogeton womersleyi* Bruggen (Aponogetonaceae).

Reproduced from Flora Malesiana I, 7 (1971) 217, fig. 4a.

ARACEAE

Always: Herbaceous, leaves alternate or spiral, simple but sometimes deeply lobed. Inflorescence a fleshy spadix covered by a spathe, individual flowers small sessile.

Usually/often: Rhizomatous or tuberous stem, or climbing; leaves hastate, irritating sap; spadix consisting of barren top, male flowers in the middle and female flowers at base.

Striking features: Floating herb (*Pistia**); spiny (*Lasia*, some *Cyrtosperma*); spathe breaking off in the middle (most *Schismatoglottis*); single deeply dissected leaf (*Amorphophallus*); winged petiole (some *Pothos*); leaves aromatic when crushed (*Homalomena*); cut surfaces turning orange-brown (*Colocasia*).

Different from: *Lemnaceae:* tiny floating herbs. — *Taccaceae:* inflorescence umbellate, flowers pedicelled. — *Zingiberaceae:* aromatic, inflorescence not covered by a spathe, individual flowers large.

Distribution: The family widespread, mainly tropical. In Malesia 35 genera, incl.:
- *Aglaonema* (Indo-Malesia), shrubby herbs, lowland rain forest;
- *Alocasia* (Indo-Malesia), tuberous herb;
- *Colocasia* (Asia–Pacific), tuberous herb; wet places in forest;
- *Homalomena* (pantropical), rain forest, often along streams;
- *Pothos* (paleotropical), climber, rain forest;
- *Rhaphidophora* (paleotropical), climber, rain forest and monsoon forest.

Notes: Pollination mainly by beetles and flies, fruits of several species eaten by birds. — Edible plants: *Alocasia* (tubers), *Colocasia* (tuber, leaves). — Ornamental plants: *Aglaonema, Alocasia, Caladium**, *Cryptocoryne, Philodendron**, *Spathiphyllum*.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 3 (1968) 100–126; S.J. Mayo, J. Bogner & P.C. Boyce, The genera of Araceae, Roy. Bot. Gard. Kew (1997). — Dr. A. Hay (NSW) is coordinating the revision of the family for Flora Malesiana.

Spot-characters: *Araceae* 5, 19, 24, 38, 76, 96 – *Alocasia* 51 – *Amorphophallus* 8, 13 – *Arisaema* 63 – *Colocasia* 51 – *Cryptocoryne* 63 – *Homalomena* 51; *H. asperifolia* 62 – *Pedicellarum* 66 – *Pothos* 66 – *Remusatia* 8, 13 – *Rhaphidophora* 63 – *Schismatoglottis bulbifera* 13 – *Typhonium* 85.

Illustrations: Fig. 17–20.

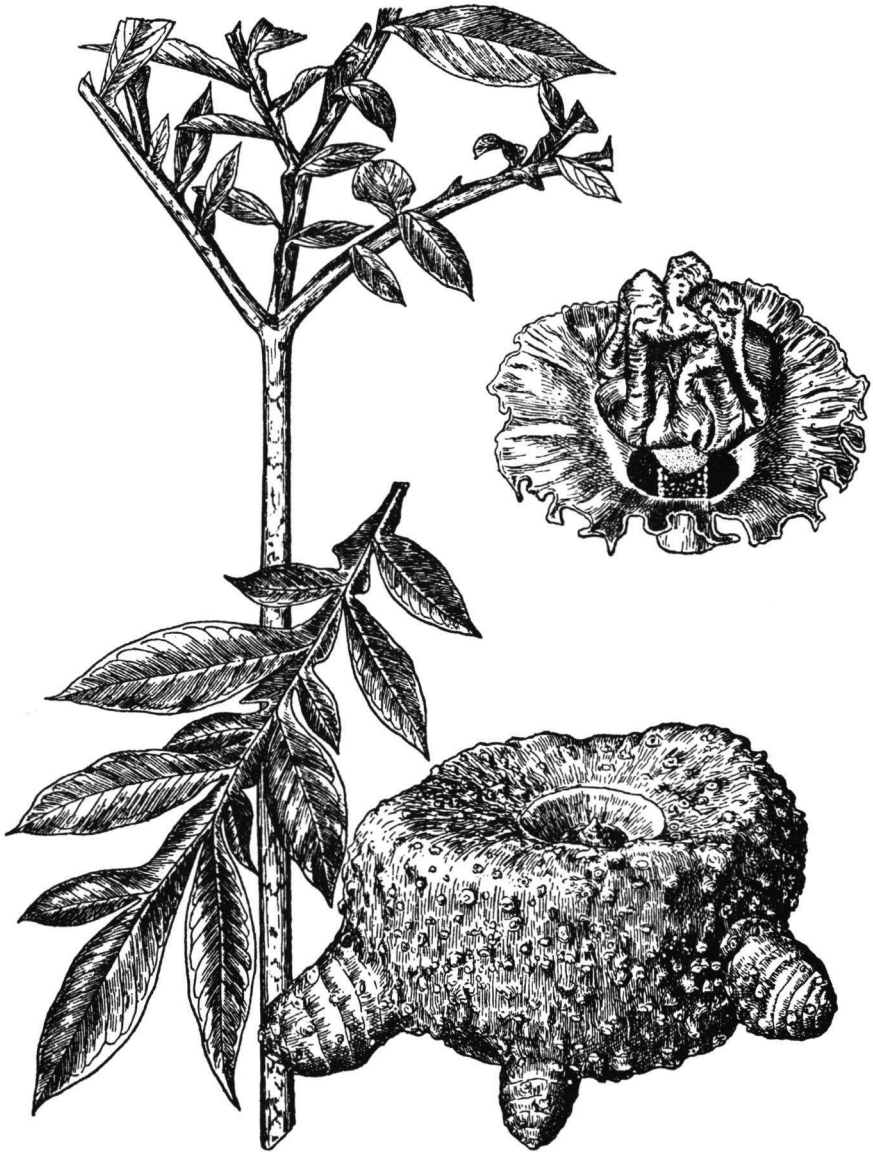

Fig. 17. *Amorphophallus campanulatus* (Roxb.) Blume (Araceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 30.

Fig. 18. *Colocasia esculenta* (L.) Schott (Araceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 223. With kind permission of the Malaysian Nature Society.

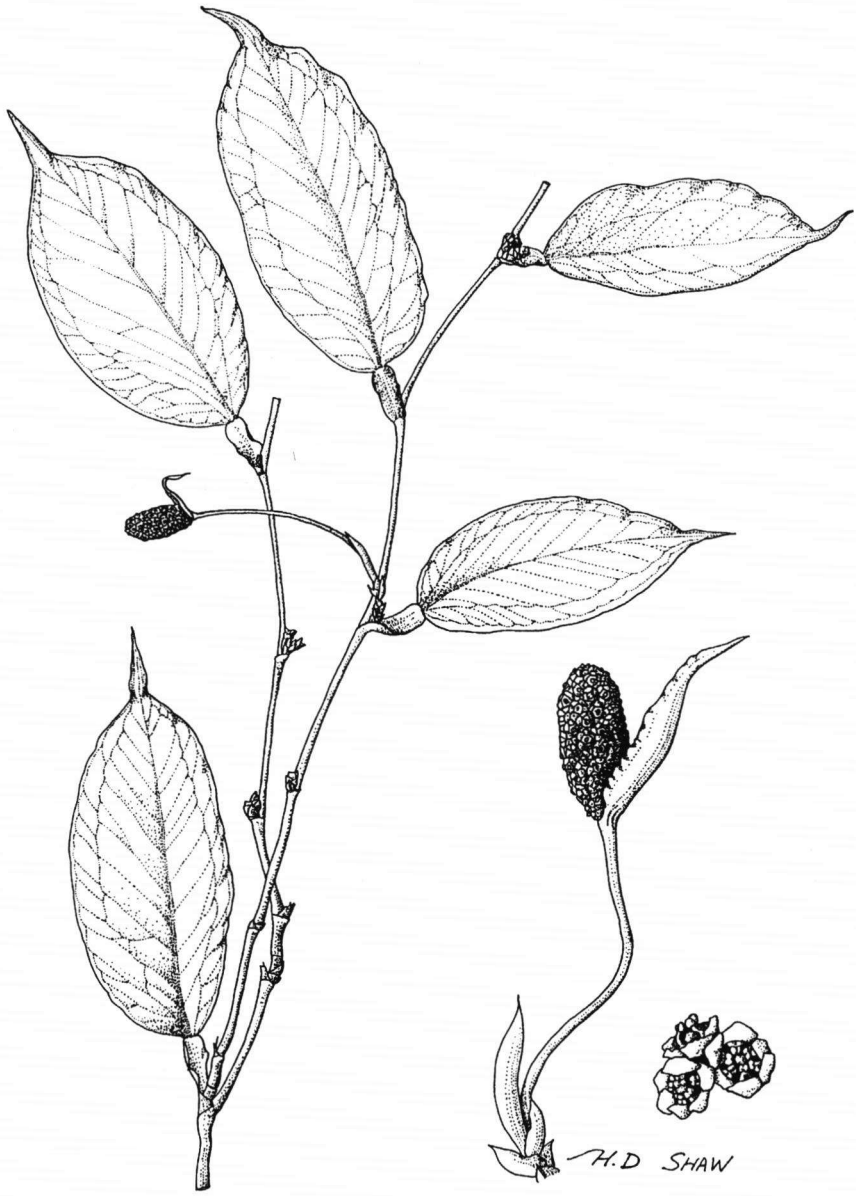

Fig. 19. *Pothos versteegii* Engl. (Araceae).

Reproduced from Blumea 40 (1995) 410.

Fig. 20. *Rhaphidophora korthalsii* Schott (Araceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 239. With kind permission of the Malaysian Nature Society.

ARISTOLOCHIACEAE

Always: Leaves simple, spiral, exstipulate; petiole without abscission zone; flowers bisexual; calyx petaloid, corolla + disk absent, stamens 6, ovary inferior, placentation parietal, fruits capsular.

Usually/often: Woody, climbing; leaves entire, venation palmate, flower zygomorphic; ovules many.

Striking features: Flowers actinomorphic (*Thottea*).

Different from: *Menispermaceae:* petiole with abscission zone; flowers small, unisexual, actinomorphic.

Distribution: The family worldwide. In Malesia only:
- *Aristolochia* (worldwide), climbers, lowland rain forest and monsoon forest;
- *Thottea* (SE Asia, Malesia), mostly shrubs, lowland rain forest.

Notes: Several species, mostly introduced, are planted as ornamentals. Many native species are host plants for commercially kept butterflies.

Literature: Ding Hou, Fl. Males. I, 10 (1984) 53–108.

Spot-characters: *Aristolochiaceae* 79, 92 – *Aristolochia* 5, 24, 102; *A. crassinervia* 15 – *Thottea* 16, 64.

Illustration: Fig. 21.

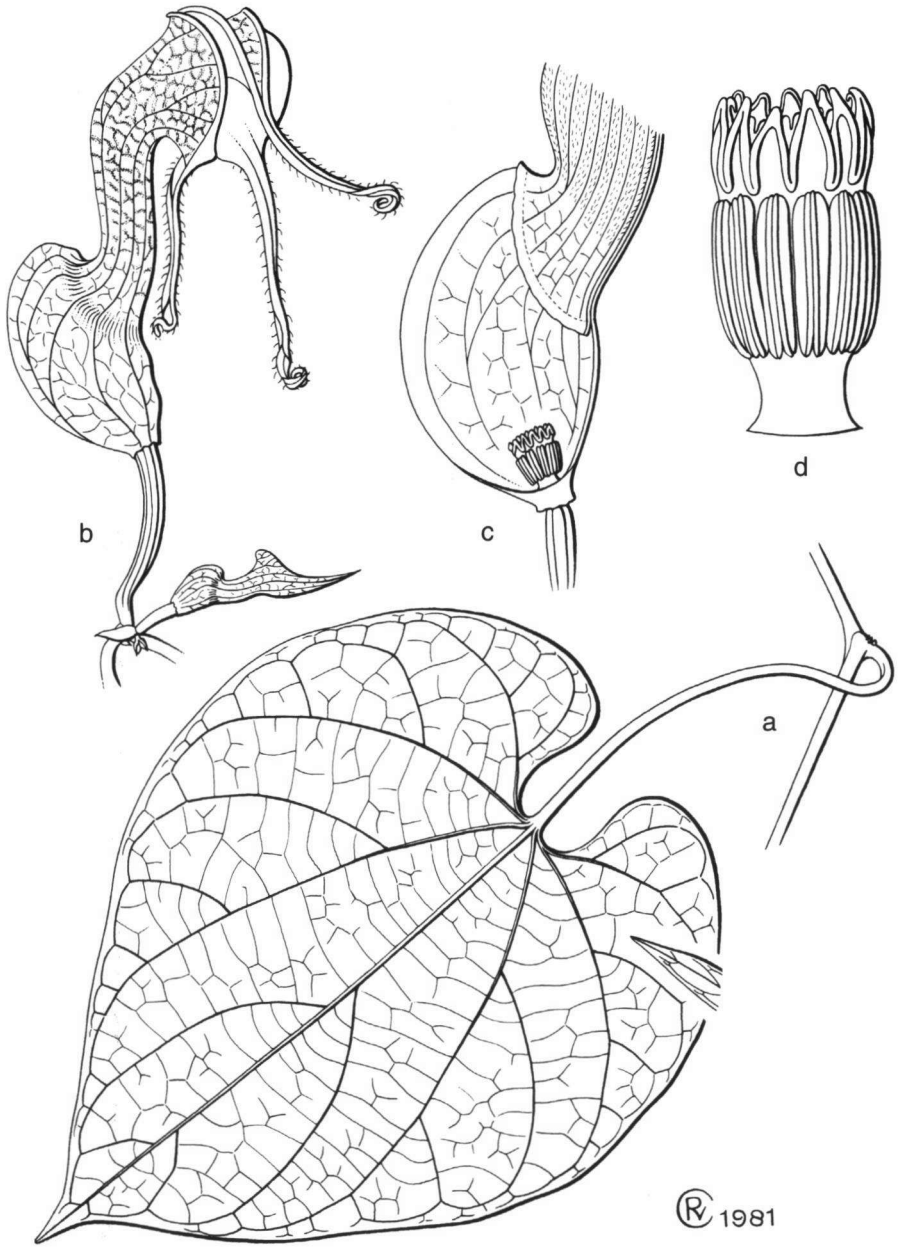

Fig. 21. *Aristolochia decandra* Ding Hou (Aristolochiaceae). a. Leafy twig; b. young bud and open flower; c. LS of lower part of perianth showing the gynostemium inside the utricle and the base of the tube slightly elongating and projecting into the utricular cavity; d. gynostemium, enlarged.

Reproduced from Flora Malesiana I, 10 (1984) 101, fig. 15a–d.

ASCLEPIADACEAE (PERIPLOCACEAE)

Always: Leaves simple, entire, decussate, exstipulate; pollen in waxy masses (pollinia); ovary superior; fruit 2-locular, many-seeded.

Usually/often: Milky sap, climbing or epiphytic, leaves with a tuft of trichomes at base of leaf blade; flowers small, corolla tube short with appendages forming a corona, stamens 5 united with style to form a gynostegium, fruit apocarpous, seeds hairy.

Striking features: Leafless (*Sarcostemma*); epiphyte with scale-like leaves (*Absolmsia*); corolla tube long, curved (*Ceropegia*); rheophytic shrub (*Dorystephania*); large shrub with white felty leaves (*Calotropis*); leaves transformed to pitchers (some *Dischidia*); pseudostipulae (*Cynanchum*); fruit with many ridges (*Myriopteron*).

Different from: *Apocynaceae:* mostly woody, no trichomes, no gynostegium, no corona, corolla usually large, pollen free.

Distribution: The family widespread. In Malesia c. 50 genera in rain forest as well as in mangrove, monsoon and secondary forest.
- *Dischidia* (Indo-Australia), lowland and montane rain forest;
- *Hoya* (Indo-Australia), mostly lowland rain forest;
- *Marsdenia* (pantropical), lowland rain forest, secondary forest.

Notes: Many species are wind dispersed. — Ornamental plants: *Asclepias*, Dischidia, Hoya.* — Medicinal: *Calotropis.*

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 244–274.

Spot-characters: *Asclepiadaceae* 5, 6, 19, 46, 85 – *Asclepias* 103 – *Asterostemma* 95 – *Atherandra* 103 – *Calotropis* 103 – *Ceropegia* 103 – *Cryptolepis* 103 – *Cryptostegia* 103 – *Cynanchum* 32, 95, 103 – *Dischidia* 9, 103 – *Dregea* 99, 103 – *Finlaysonia* 99, 103 – *Genianthus* 103 – *Gomphocarpus* 95 – *Gymnanthera* 103 – *Gymnema* 103 – *Heterostemma* 103; *H. cuspidatum* 15 – *Hoya* 9, 76, 103 – *Ischnostemma* 103 – *Marsdenia* 98, 103 – *Microstemma* 103 – *Myriopteron* 32, 98 – *Phyllanthera* 103 – *Physostelma* 103 – *Raphistemma* 103 – *Sarcostemma* 8, 103 – *Secamone* 103; *S. elliptica* 15 – *Stephanotis* 103 – *Streptocaulon* 103 – *Telosma* 103 – *Toxocarpus* 103 – *Tylophora* 102, 103; *T. cissoides* 23.

Illustrations: Fig. 22–25.

Fig. 22. *Dischidia subulata* Warb. subsp. *angustata* Rintz (Asclepiadaceae). Habit.

Reproduced from Blumea 26 (1980) 116, fig. 14.

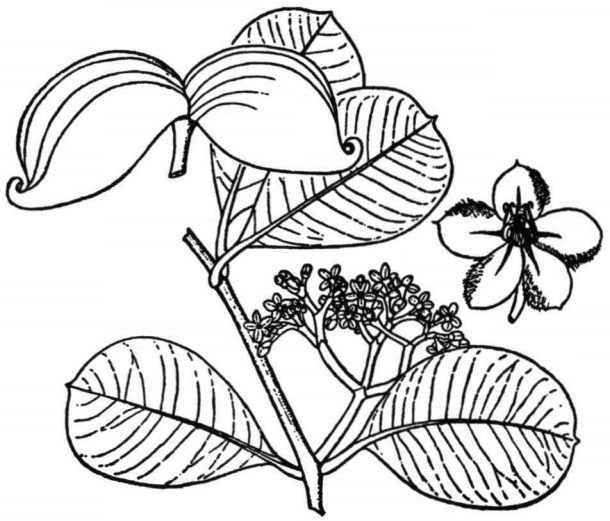

Fig. 23. *Finlaysonia obovata* Wall. (Asclepiadaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 289. With kind permission of the Malaysian Nature Society.

Fig. 24. *Hoya multiflora* Blume (Asclepiadaceae). Branch and fruit.

Reproduced from Malayan Nature Journal 30 (1978) 494, fig. 12a, b. With kind permission of the Malaysian Nature Society.

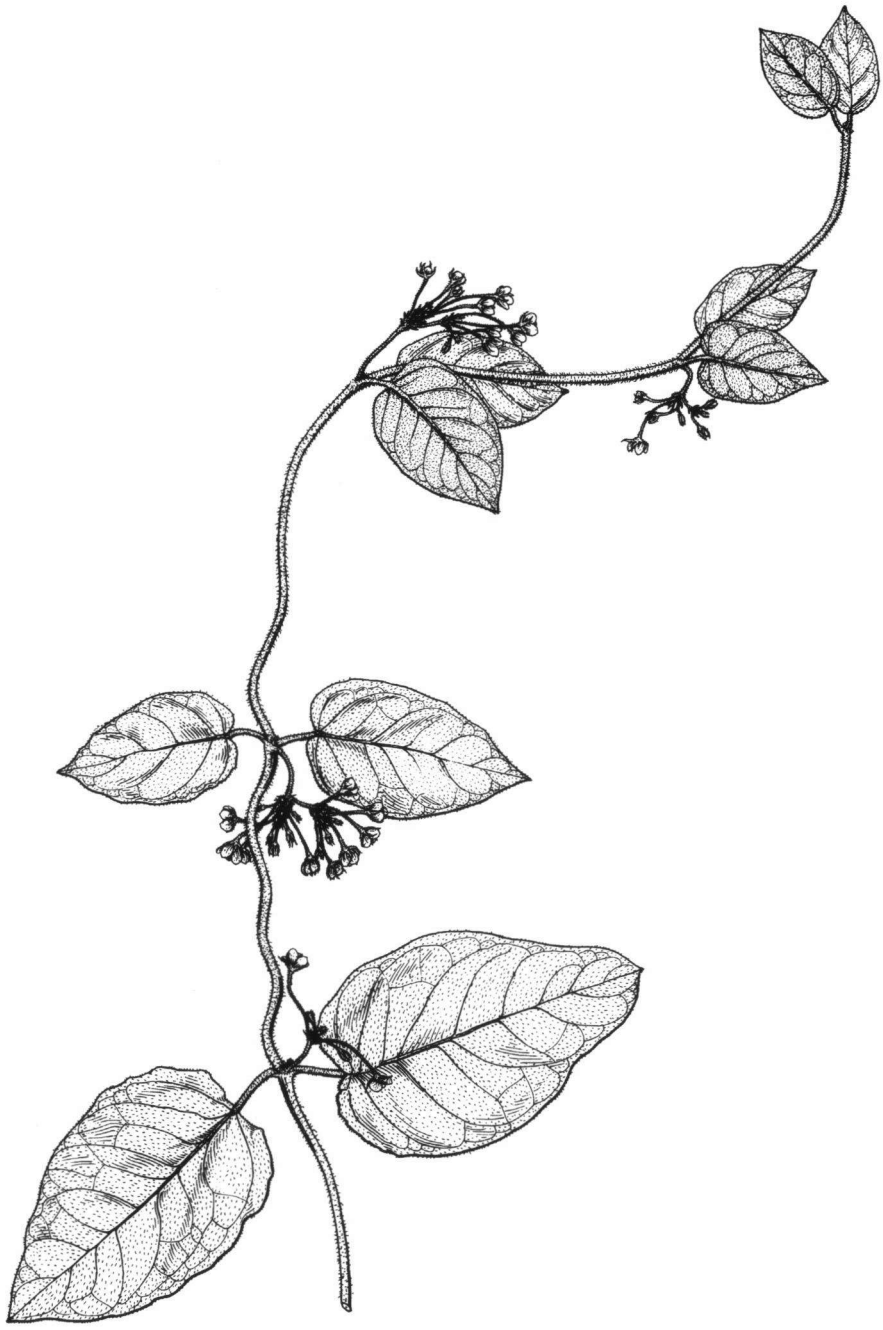

Fig. 25. *Tylophora villosa* Blume (Asclepiadaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 482.

BALANOPHORACEAE

Always: Herbaceous root parasites, without chlorophyll or roots; flowers minute, unisexual, in an unbranched spadix.

Usually/often: Leaves, if present, scaly; plants dioecious.

Different from: *Rafflesiaceae:* stem parasites, flowers large.

Distribution: The family pantropical, in Malesia 4 genera, all of (montane) rain forest. The largest genus is *Balanophora*, widespread especially in montane rain forest.

Notes: Next to nothing is known about pollination and dispersal.

Literature: B. Hansen, Fl. Males. I, 7 (1976) 783–805.

Spot-characters: *Balanophoraceae* 8, 92 – *Balanophora* 7, 11, 79 – *Exorhopala* 7, 11 – *Langsdorffia* 7, 11 – *Rhopalocnemis* 7, 11.

Illustration: Fig. 26.

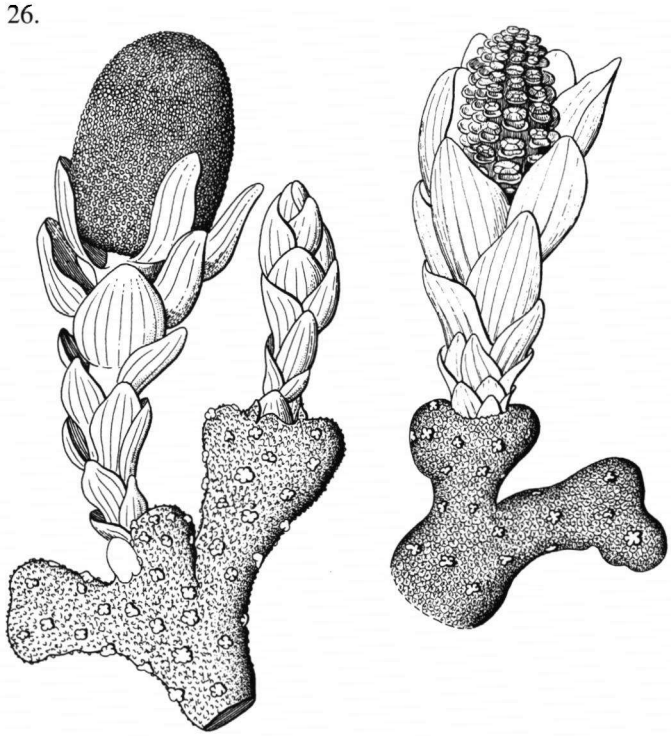

Fig. 26. *Balanophora elongata* Blume var. *elongata* (Balanophoraceae). Habit of female specimen (left) and habit of male specimen (right).

Reproduced from Flora Malesiana I, 7 (1976) 797, fig. 12a, b.

BALSAMINACEAE

Always: Fleshy herbs; leaves simple, penninerved, exstipulate; flowers bisexual zygomorphic, posterior sepal spurred; ovary superior, 5-locular, ovules many.

Usually/often: Stem with swollen nodes, leaves spiral, dentate, fruit a fleshy explosively dehiscing capsule.

Different from: Sterile *Balsaminaceae* may be mistaken for *Begoniaceae* but these are stipulate, the leaves usually strongly asymmetric.

Striking features: Fruit a non dehiscent berry (*Hydrocera*).

Distribution: The family is confined to Asia and Africa. In Malesia 3 genera, incl.:
- *Impatiens* (Old World, widespread), herbs of lowland and montane rain forest, often on limestone.

Notes: Several exotic species of *Impatiens* are cultivated as ornamentals. Some of the indigenous species also have ornamental potential.

Literature: Ch. Grey-Wilson, Kew Bull. 34 (1980) 661–688; 44 (1989) 67–106; T. Shimizu, S.E. As. Stud. 8 (1970) 187–217.

Spot-characters: *Impatiens* 2, 16, 46.

Illustrations: Fig. 27 & 28.

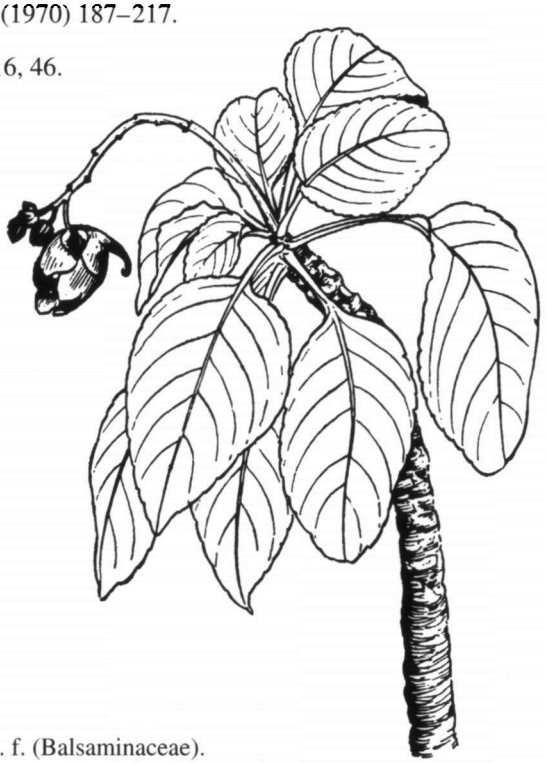

Fig. 27. *Impatiens mirabilis* Hook. f. (Balsaminaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 52. With kind permission of the Malaysian Nature Society.

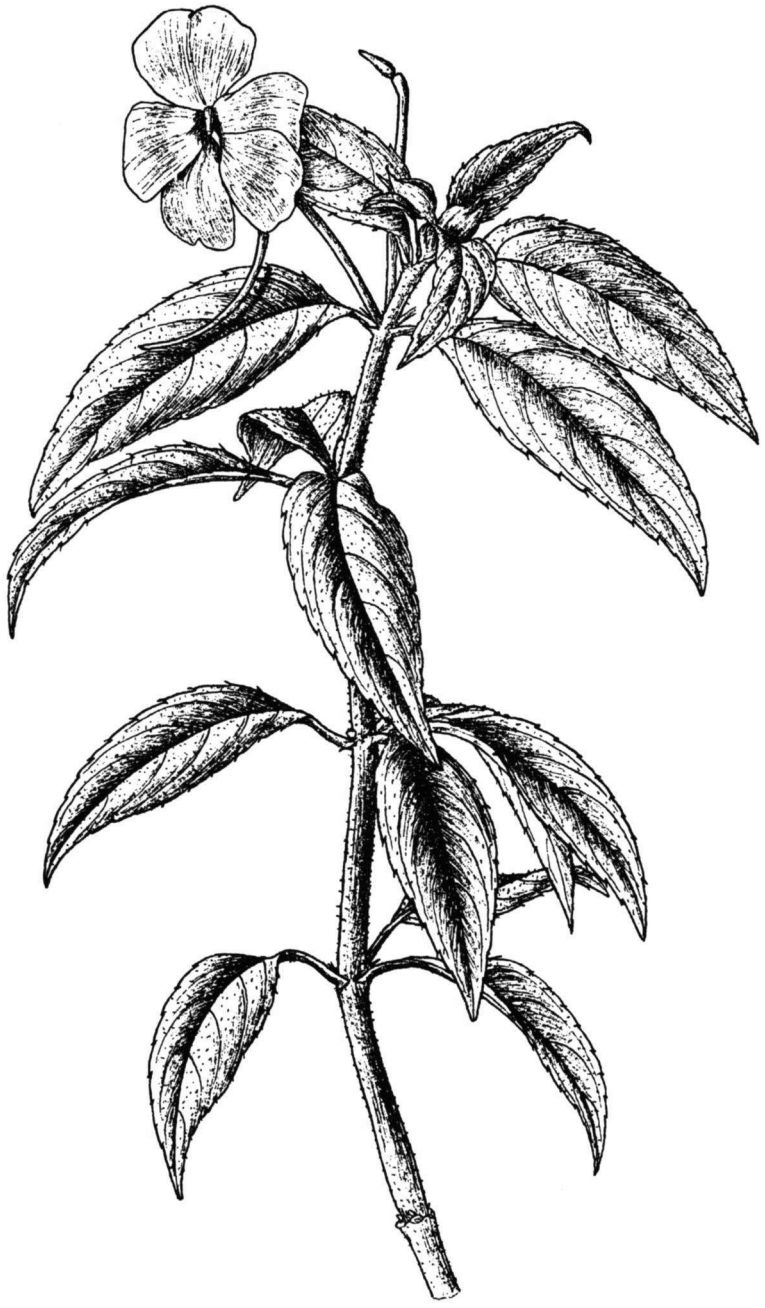

Fig. 28. *Impatiens platypetala* Lindl. (Balsaminaceae).

Reproduced from C.A. Backer & D.F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) t. 168.

BASELLACEAE*

Always: Herbaceous climbers; leaves simple, spiral, entire, penninerved, exstipulate; flowers actinomorphic, tepals connate at base; ovary superior, 1-locular, 1 ovule, styles 3.

Usually/often: Rhizome or tuberous root present.

Different from: *Amaranthaceae* (*Deeringia*): more or less woody, tepals scarious.

Distribution: The family native in America, some species cultivated and naturalized elsewhere. In Malesia 2 genera: *Anredera* and *Basella.*

Notes: Cultivated as an ornamental: *Anredera* (2 spp.). — Leaves eaten as a vegetable, also used medicinally: *Basella.*

Literature: C.G.G.J. van Steenis, Fl. Males. I, 5 (1957) 300–304.

Spot-characters: *Basellaceae* 83 – *Anredera* 5 – *Basella* 5.

Illustration: Fig. 29.

Fig. 29. *Anredera cordifolia* (Tenore) Steen. (Basellaceae).

Reproduced from Flora Malesiana I, 5 (1957) 303, fig. 2a.

BATIDACEAE

Always: Shrublets, leaves simple, opposite, entire, stipules minute; flowers unisexual, male flowers with 4 tepals and 4 stamens alternate with tepals, female flowers consisting of a naked superior ovary.

Different from: *Chenopodiaceae:* tepals usually 5, stamens opposite the tepals, tepals present in female flower.

Distribution: A family of one genus (*Batis*) with two species, one in the Neotropics, another in North Australia and S. New Guinea, in littoral clay plains.

Literature: P. van Royen, Fl. Males. I, 5 (1957) 414–415.

Illustration: Fig. 30.

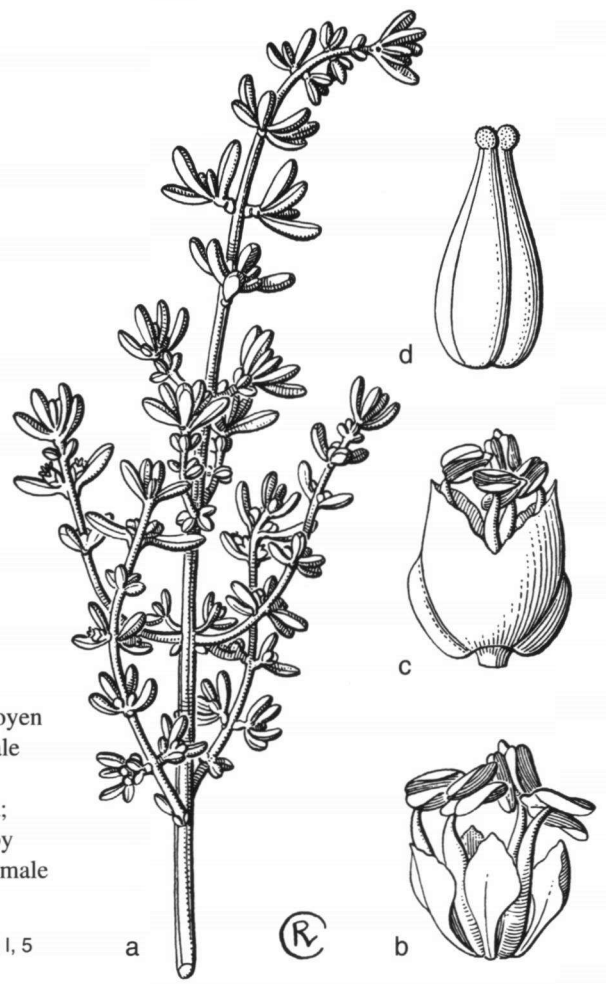

Fig. 30. *Batis argillicola* P. Royen (Batidaceae). a. Twig with male flowers; b. male flower after removing bracts and spathella; c. male flower still enclosed by two bracts and spathella; d. female flower; b–d enlarged.

Reproduced from Flora Malesiana I, 5 (1957) 415, fig. 1a, c–d.

BEGONIACEAE

Always: Herbs, stem succulent, sometimes woody at base; leaves simple, alternate, asymmetrical, stipulate; flowers unisexual (plants monoecious), stamens many; ovary inferior, 3-locular, ovules numerous.

Usually/often: Sepals and petals free, fruit 3-winged.

Different from: The family is allied to the *Datiscaceae* (huge trees in Malesia); sterile *Begoniaceae* might be mistaken for *Balsaminaceae* (exstipulate, symmetric leaves). — *Gesneriaceae* (*Cyrtandra*): leaves opposite. — *Urticaceae* (*Elatostema*): cystoliths.

Distribution: The family pantropical. In Malesia 2 genera:
- *Begonia* (pantropical), lowland and montane forest on various substrates, often on limestone;
- *Symbegonia* (New Guinea), mostly mid-montane forest.

Notes: The stems and leaves of some species are used in cooking. Several species (mostly exotic) are cultivated as ornamentals.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 1 (1963) 307–313; H. Irmscher, Mitt. Inst. Alg. Bot. Hamburg 8 (1929) 86–160. H.N. Ridley, Fl. Malay Pen. 1 (1922); M.J. Sands, Checklist Brunei (1996) 38–40. — Mr. M.J. Sands (K) is revising the family for Flora Malesiana.

Spot-characters: *Begoniaceae* 92 – *Begonia* 45; *B. bipinnatifida* 50.

Illustration: Fig. 31.

Fig. 31. *Begonia cucculata* Willd. (Begoniaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 45. With kind permission of Prof. and Mrs. Keng.

BERBERIDACEAE

Always: Woody; leaves spiral, exstipulate; flowers bisexual, actinomorphic; perianth of 4–9 free segments; stamens 4–6, free, anthers opening with valves; ovary superior 1-celled.

Usually/often: Armed shrubs, wood yellow; flowers yellow.

Different from: *Menispermaceae:* unarmed climbers, flowers unisexual.

Distribution: A mainly northern hemisphere family. In Malesia only *Berberis* and *Mahonia* each with one species.

Notes: Cultivated ornamental shrubs: *Berberis* and *Nandina**.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 1 (1965) 149–151; C.G.G.J. van Steenis, Mountain Flora Java (1972) Pl. 7, explanation.

Spot-characters: *Berberidaceae* 12, 79, 83, 87 – *Berberis* 69.

Illustration: Fig. 32.

Fig. 32. *Berberis morrisonensis* Hay. (Berberidaceae). Twigs; enlarged flower.

Reproduced from R. Kanehira, Formosan Trees (1936) 182, fig. 132.

BURMANNIACEAE

Always: Herbs; leaves simple, entire, spirally arranged, exstipulate; flowers bisexual, 3-merous; ovary inferior.

Usually/often: Colourless saprophytes, leaves reduced to scales; flowers actinomorphic; fruit a capsule with numerous tiny seeds.

Striking features: Grass-like non-saprophytic herbs (some species of *Burmannia).*

Different from: *Orchidaceae:* flowers zygomorphic.

Distribution: The family worldwide. In Malesia 5 genera, incl.:
- *Burmannia* (pantropical), lowland and lower montane forest floor.
- *Thismia* (tropical Asia, America), lowland and lower montane forest floor.

Notes: Most of the saprophytic species are very inconspicuous and apparently very rare. They are often found in association with saprophytes belonging to other families, such as *Orchidaceae, Polygalaceae,* and *Triuridaceae.*

Literature: F.P. Jonker, Fl. Males. I, 4 (1948) 13–26.

Spot-characters: *Burmanniaceae* 92 – *Burmannia* 7 – *Gymnosiphon* 7 – *Thismia* 7.

Illustrations: Fig. 33 & 34.

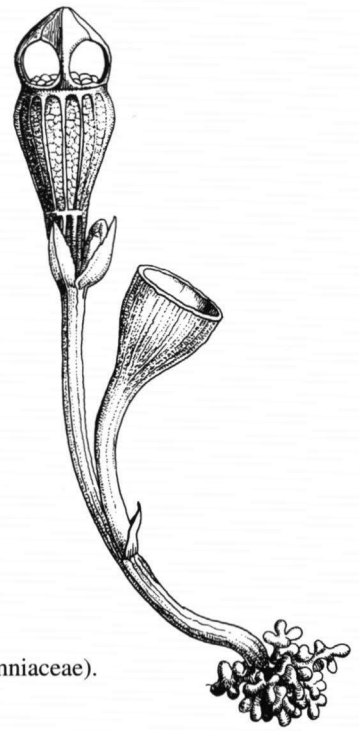

Fig. 33. *Thismia episcopalis* (Becc.) F. Muell. (Burmanniaceae).

Reproduced from Flora Malesiana I, 4 (1948) 15, fig. 1: 4.

Fig. 34. *Burmannia longifolia* Becc. (Burmanniaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 171. With kind permission of the Malaysian Nature Society.

BUTOMACEAE

Always: Laticiferous herbs, leaves simple, entire, crowded, curvinerved; flowers bisexual, actinomorphic, sepals 3, petals 3, free; ovary superior, apocarpous, seeds many.

Different from: *Alismataceae:* fruit a 1-seeded achene. — *Hydrocharitaceae:* not laticiferous, ovary inferior.

Distribution: A small widespread family. In Malesia only 2 monotypic genera:
- *Limnocharis**, planted in sawahs and other wet places;
- *Tenagocharis*, very rare, wet places.

Notes: *Limnocharis flava* is a wellknown vegetable.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 5 (1954) 118–120.

Spot-characters: *Limnocharis* 19 – *Tenagocharis* 19.

Illustration: Fig. 35.

Fig. 35. *Limnocharis flava* (L.) Buch. (Butomaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 51.

BUXACEAE

Always: Woody; leaves simple, penninerved, exstipulate; flowers unisexual, actinomorphic, corolla and disk absent, ovary superior, 2–3-locular; ovules pendent with dorsal raphe; fruit a capsule.

Usually/often: Shrubs, sepals 4, free, stamens 4 opposite sepals, seed with a caruncle.

Different from: *Euphorbiaceae:* raphe on ventral surface.

Distribution: The family is confined to the tropics and subtropics of the Old World. In Malesia only:
- *Buxus* (northern hemisphere), limestone;
- *Sarcococca* (Southeast Asia, West Malesia), rain forest.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 1 (1965) 646–647; H. Keng, Orders and Families of Malaysian seed plants (1978) 211.

Spot-characters: *Buxaceae* 65, 79 – *Buxus* 59, 66, 89 – *Sarcococca* 64, 89, 101.

Illustration: Fig. 36.

Fig. 36. *Sarcococca saligna* (D. Don) Müll. Arg. (Buxaceae). Twigs; enlarged female inflorescence.

Reproduced from R. Kanehira, Formosan Trees (1936) 361, fig. 316.

BYBLIDACEAE

Always: Herbs, glandular hairy (insectivorous); leaves linear, spiral, exstipulate; flowers solitary, axillary, 5-merous, actinomorphic; sepals and petals connate at base, petals contorted; disk absent; ovary superior, 2-celled.

Different from: *Droseraceae:* usually stipulate, flowers in a raceme. — *Lentibulariaceae:* leafless plants, provided with bladders.

Distribution: A monotypic family. The only genus of the family, *Byblis*, has only two species in Australia of which one also occurs in South New Guinea.

Notes: The family is probably closest to *Lentibulariaceae*, another family of insectivorous plants.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 7 (1971) 135–137.

Illustration: Fig. 37.

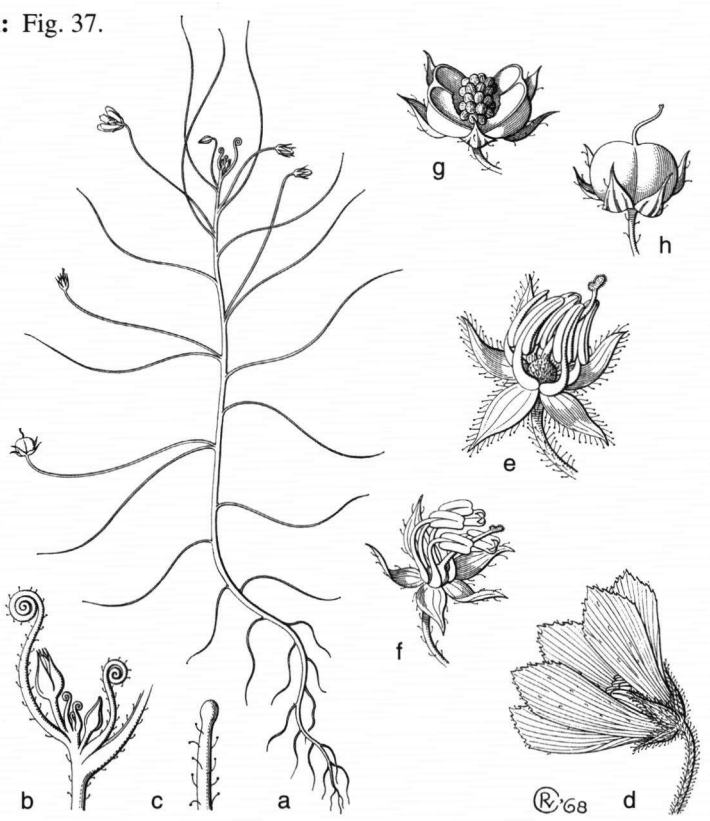

Fig. 37. *Byblis liniflora* Salisb. (Byblidaceae). a. Habit; b. stem tip; c. leaf tip; d. flower; e & f. flower, corolla removed; g & h. fruit.

Reproduced from Flora Malesiana I, 7 (1971) 137, fig. 1.

CACTACEAE*

Always: Succulent, more or less woody plants; flowers bisexual; perianth of many undifferentiated parts; stamens many; ovary inferior, 1-locular, ovules many; fruit a berry.

Usually/often: Leafless, spiny; flowers actinomorphic.

Different from: *Aizoaceae:* unarmed, perianth 4- or 5-lobed, fruit capsular.

Distribution: The family is almost confined to America; several species introduced and some naturalized in Malesia.

Notes: Ornamentals: *Cereus, Epiphyllum, Pereskia, Zygocactus.* — Edible fruit: *Opuntia.*

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 1 (1963) 315–318.

Spot-characters: *Cactaceae* 12, 92 – *Opuntia* 70, 95.

Illustration: Fig. 38.

Fig. 38. *Epiphyllum oxypetalum* Haw. (Cactaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 58. With kind permission of Prof. and Mrs. Keng.

CALLITRICHACEAE

Always: Herbs, leaves simple, opposite, entire, triplinerved, exstipulate; flowers unisexual, calyx + corolla absent, ovary superior; fruit winged.

Usually/often: Flowers solitary, axillary.

Different from: Aquatic *Scrophulariaceae:* leaves penninerved, flowers with calyx and corolla.

Distribution: The only genus of the family, *Callitriche* is widespread, always in wet localities. In Malesia very rare.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 251–252; P. van Royen, Alp. Fl. New Guinea 7 (1983) 3129–3132.

Spot-characters: *Callitriche* 64, 98.

Illustration: Fig. 39.

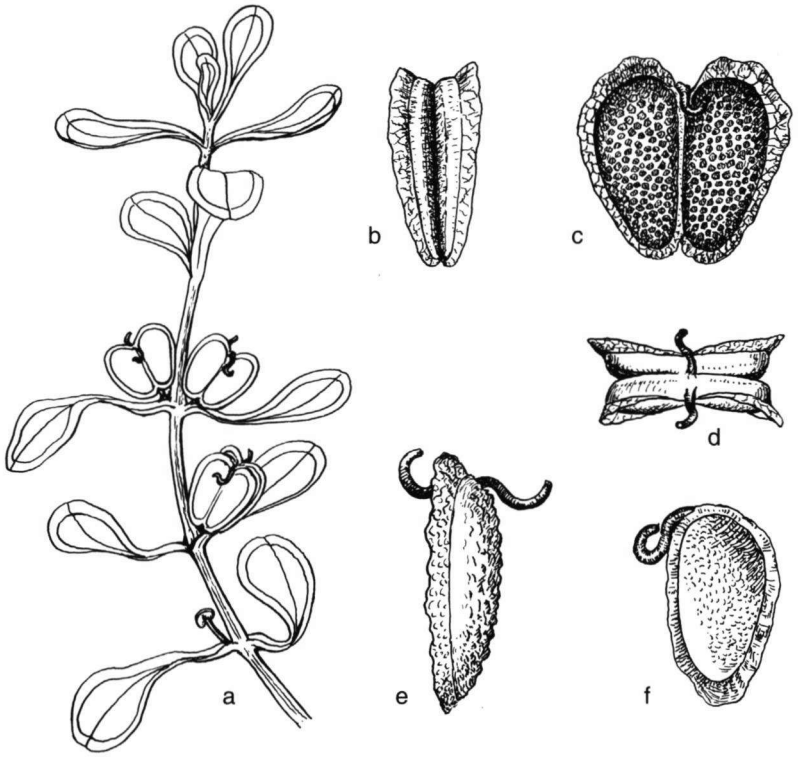

Fig. 39. *Callitriche verna* L. (Callitrichaceae). a. Tip of a stem; b–f. ripe fruit (b, c, lateral; d, seen on top; e, f, detached segments; b–f enlarged).

Reproduced from Flora Malesiana I, 4 (1951) 252, fig. 1.

CAMPANULACEAE (LOBELIACEAE)

Always: Leaves simple, exstipulate; calyx segments free, petals connate, disk present, ovules numerous.

Usually/often: Erect herbs, laticiferous; leaves spiral, dentate; flowers bisexual; 5-merous, ovary inferior, fruit a capsule.

Different from: *Goodeniaceae:* not laticiferous, stigma indusiate, ovules few.

Striking features: Flowers epiphyllous (*Ruthiella*); climber (*Codonopsis javanica*).

Distribution: The family worldwide, some 70 genera of which 6 in Malesia, incl.:
- *Lobelia* (worldwide), herbs or shrubs, mainly montane;
- *Wahlenbergia* (mainly southern hemisphere), herbs of open places.

Notes: Some species of *Lobelia* are (potential) ornamentals.

Literature: B. Moeliono & P. Tuyn, Fl. Males. I, 6 (1960) 107–141.

Spot-characters: *Campanulaceae* 99 – *Codonopsis* 19, 92 – *Laurentia* 19, 92 – *Lobelia* 19, 92 – *Ruthiella* 74, 92 – *Wahlenbergia* 92.

Illustrations: Fig. 40–42.

Fig. 40. *Ruthiella subcordata* (Merr. & Perry) Steen. (Campanulaceae). Habit; flower and fruit enlarged.

Reproduced from Flora Malesiana I, 6 (1960) 139, fig. 22a–c.

Fig. 41. *Lobelia montana* Reinw. ex Blume (Campanulaceae). Apex of flowering stem and ripe fruit in natural poise.

Reproduced from Flora Malesiana I, 6 (1960) 132, fig. 17.

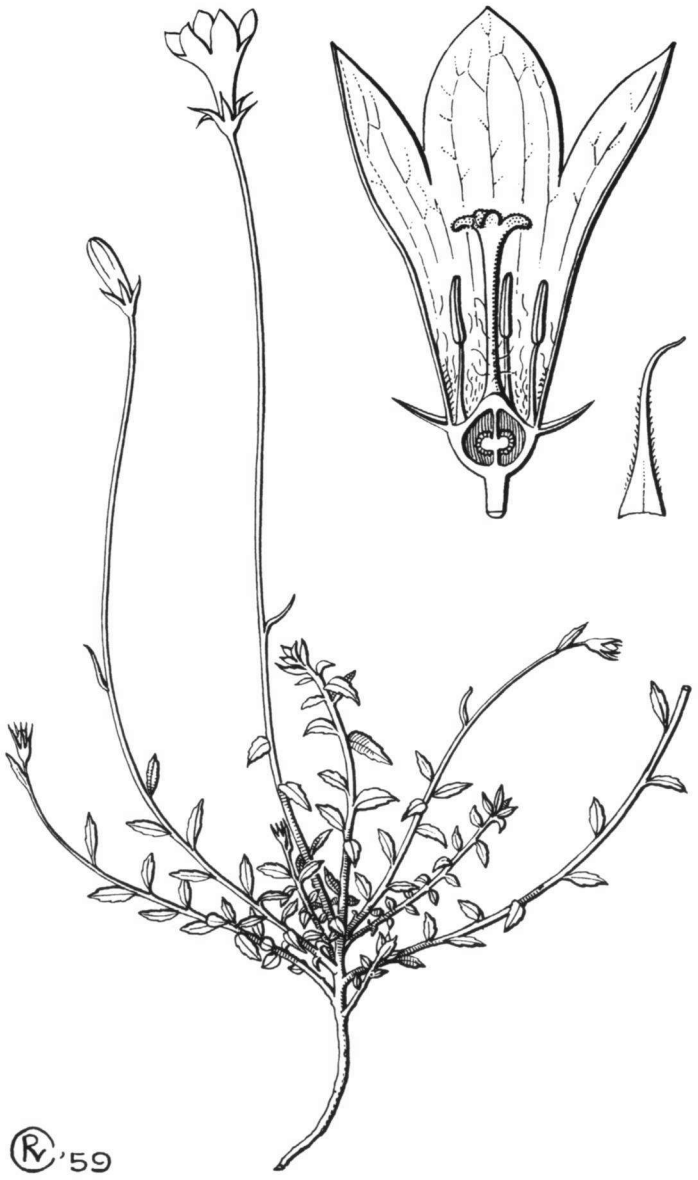

Fig. 42. *Wahlenbergia confusa* Merr. & Perry (Campanulaceae). Habit; longitudinal section of flower and filament, enlarged.

Reproduced from Flora Malesiana I, 6 (1960) 115, fig. 2.

CANNACEAE*

Always: Erect, rhizomatous herbs; leaves simple, spiral, entire; petioles sheathing; flowers bisexual; perianth in 2 rows of 3, free; 5 petaloid staminodes and one with a 1-locular anther; ovary inferior, 3-locular, ovules many.

Different from: *Marantaceae:* petioles swollen apically, ovules one per cell. — *Zingiberaceae:* aromatic, perianth united, anther 2-locular.

Distribution: The only genus, *Canna*, is native in America; some species are widespread through cultivation.

Notes: Some species are cultivated as ornamentals, one for its edible rhizomes.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 3 (1968) 76–77.

Spot-characters: *Canna* 92, 95, 101.

Illustration: Fig. 43.

Fig. 43. *Canna edulis* Ker. (Cannaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 56.

CARDIOPTERIDACEAE (PERIPTERYGIACEAE)

Always: Climbers with milky sap; leaves simple, spiral, palminerved, exstipulate; flowers actinomorphic, disk absent, ovary superior, fruit indehiscent with two wings.

Usually/often: Flowers bisexual, 5-merous.

Different from: *Combretaceae:* leaves opposite, venation pinnate (*Combretum*). — *Lophopyxidaceae:* no sap, fruit 5-winged.

Distribution: The only genus, *Cardiopteris*, consists of two species, in SE Asia and Malesia, in edges of lowland forest.

Notes: The leaves are edible.

Literature: H. Sleumer, Fl. Males. I, 7 (1971) 93–96.

Spot-characters: *Cardiopteris* 5, 19, 98.

Illustration: Fig. 44.

Fig. 44. *Cardiopteris moluccana* Blume (Cardiopteridaceae).
Habit; infructescence enlarged.

Reproduced from Flora Malesiana I, 7 (1971) 95, fig. 1a, f.

CARTONEMACEAE

Always: Herbaceous; leaves linear, spiral, glandular hairy, base sheathing; inflorescence a terminal spike; flowers bisexual, actinomorphic; sepals 3, petals 3, free; stamens 6; ovary superior, fruit a 3-locular capsule.

Different from: *Commelinaceae:* not glandular hairy, inflorescence cymose.

Distribution: The only genus of the family, *Cartonema*, is almost confined to Australia, one species also in South New Guinea and Aru.

Notes: Formerly included in *Commelinaceae*.

Literature: M. Pichon, Sur les Commelinacées, Not. Syst. 12 (1946) 217–242.

Illustration: Fig. 45.

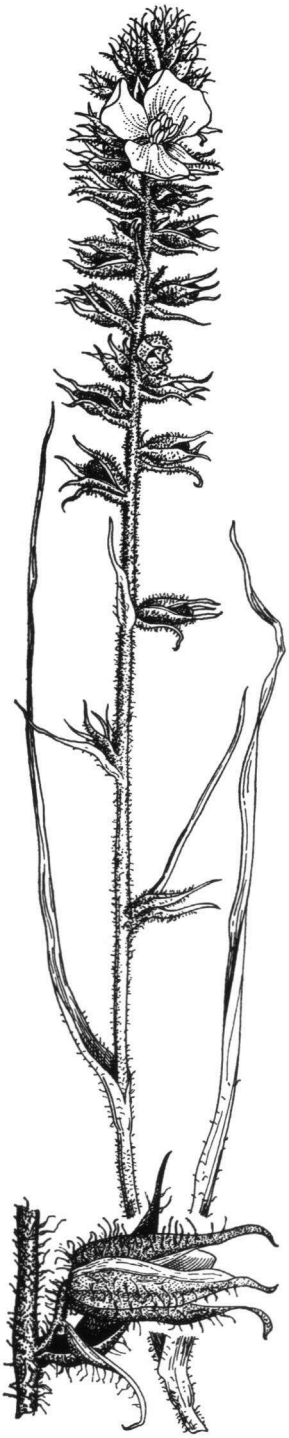

Fig. 45. *Cartonema spicatum* R.Br. (Cartonemaceae). Inflorescence; enlarged flower.

Reproduced from J. Linn. Soc. London, Bot. 59 (1966) 359, fig. 11, 12.

CARYOPHYLLACEAE

Always: Herbaceous, leaves simple; flowers bisexual, actinomorphic, ovary superior.

Usually/often: Leaves opposite, entire, flowers 5-merous, sepals free, petals bifid.

Different from: *Aizoaceae:* no petals, tepals entire.

Distribution: The family widespread, especially in the northern hemisphere. In Malesia 8 native genera, incl.:
– *Cerastium*, herbs of alpine habitats.

Notes: *Drymaria* is a widespread weed. — Planted as ornamentals: species of *Dianthus**.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 1 (1963) 206–214; J. Mattfeld, Bot. Jahrb. 69 (1938) 267–273.

Spot-characters: *Caryophyllaceae* 81 – *Cerastium* 1 – *Drymaria* 64 – *Sagina* 1.

Illustration: Fig. 46.

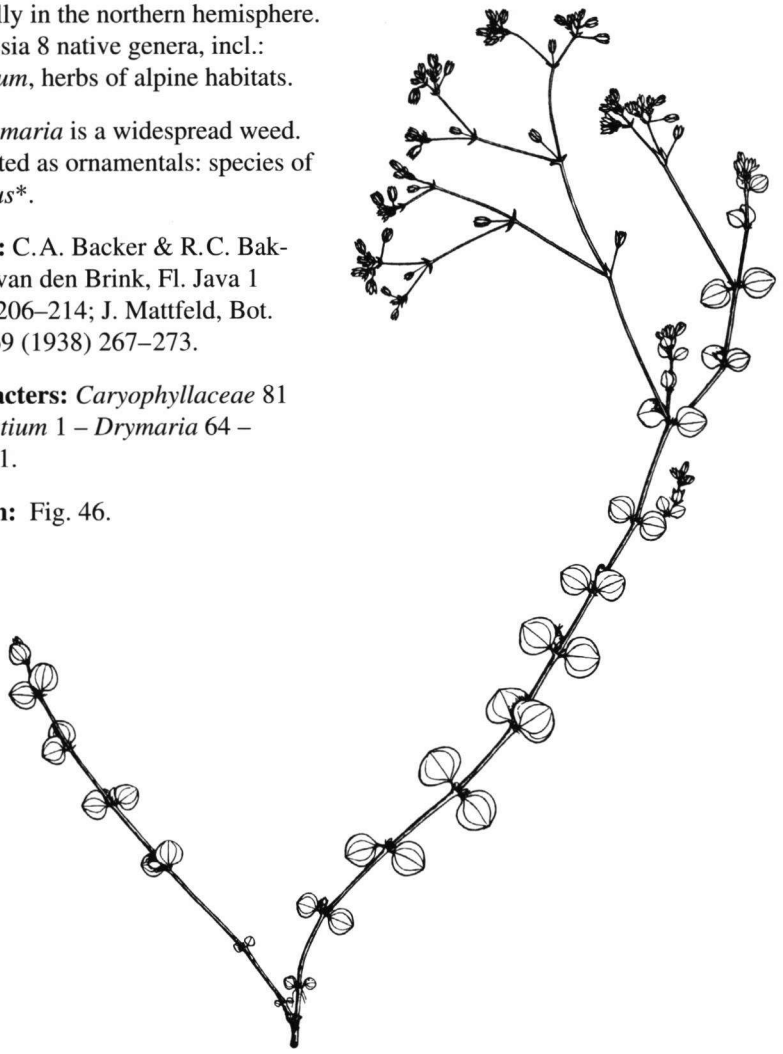

Fig. 46. *Drymaria cordata* (L.) Roem. & Schult. (Caryophyllaceae).

Reproduced from C.A. Backer & D.F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) t. 111.

CENTROLEPIDACEAE

Always: Small herbs, leaves simple, linear, densely packed; flowers without perianth, ovary superior, inflorescence terminal, spikelet-like.

Usually/often: Forming cushions.

Different from: *Cyperaceae:* perianth present. — *Eriocaulaceae:* perianth present, inflorescence capitate.

Distribution: A southern hemisphere family, best represented in Australia. In Malesia 2 genera:
- *Centrolepis*, mostly in alpine areas, one species in lowland savannah;
- *Gaimardia*, in alpine vegetation.

Literature: Ding Hou, Fl. Males. I, 5 (1957) 421–428.

Spot-characters: *Centrolepis* 1 – *Gaimardia* 1.

Illustration: Fig. 47.

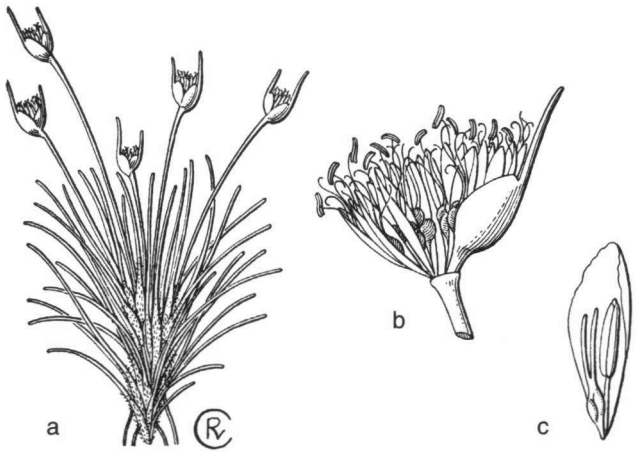

Fig. 47. *Centrolepis fascicularis* Labill. (Centrolepidaceae). a. Habit; b. head with outer bract removed; c. young flower.

Reproduced from Flora Malesiana I, 5 (1957) 421, fig. 1a–c.

CERATOPHYLLACEAE

Always: Aquatic, rootless herbs; leaves verticillate, forked, dentate; flowers unisexual, actinomorphic (plants monoecious), perianth valvate, ovary superior, fruit with spines.

Different from: *Hydrocharitaceae:* roots present, leaves simple. — *Najadaceae:* leaves linear, sheathing.

Distribution: The family consists of one genus, *Ceratophyllum*, with two widespread species, both in Malesia.

Notes: Sometimes used as aquarium plants.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1949) 41–42; M. Wilmot Dear, Ceratophyllum revised, Kew Bull. 40 (1985) 243–271.

Spot-characters: *Ceratophyllum* 46, 95.

Illustration: Fig. 48.

Fig. 48. *Ceratophyllum demersum* L. (Ceratophyllaceae). Habit, detached leaves; fruit enlarged.

Reproduced from Flora Malesiana I, 4 (1949) 41, fig. 1.

CHENOPODIACEAE

Always: Herbaceous, leaves simple, exstipulate; tepals 5, fleshy, stamens 5 opposite the tepals, ovary superior.

Usually/often: Erect, leaves alternate, fleshy.

Striking features: Leaves spine-tipped (*Salsola*).

Different from: *Amaranthaceae:* tepals scarious, flowers surrounded by scarious bracts.

Distribution: The family worldwide. In Malesia 7 genera of which 5 with native, mostly weedy, species, incl.:
- *Chenopodium* (temperate northern & southern hemisphere), montane weed;
- *Suaeda* (worldwide), lowland.

Notes: Vegetable: *Beta**, *Rumex**, *Spinacia** and *Suaeda*.

Literature: C.A. Backer, Fl. Males. I, 4 (1949) 99–106.

Spot-characters: *Chenopodiaceae* 83 – *Salsola* 12.

Illustration: Fig. 49.

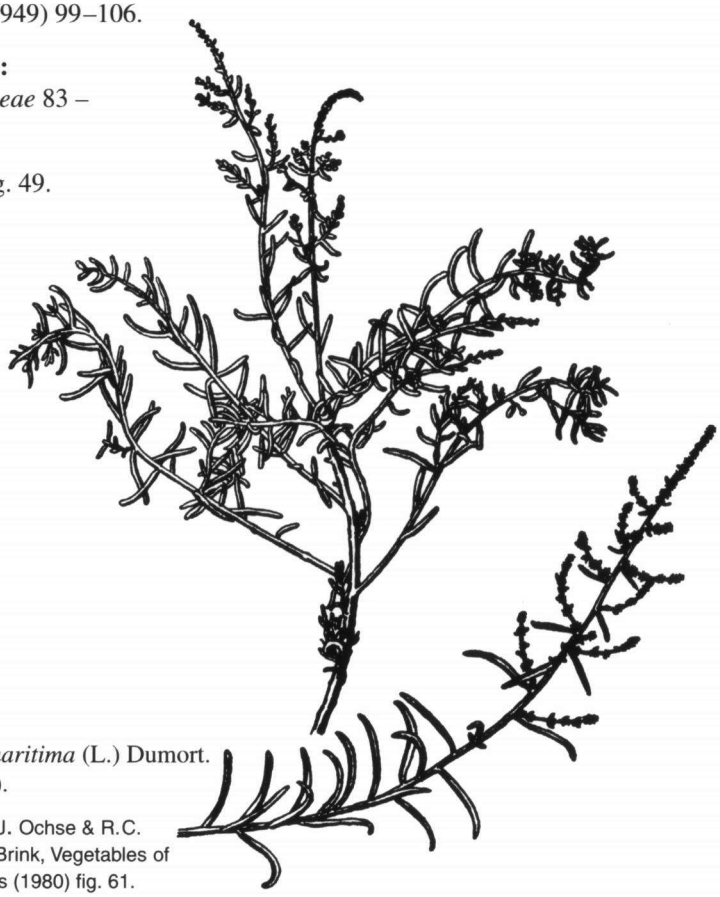

Fig. 49. *Suaeda maritima* (L.) Dumort. (Chenopodiaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 61.

COMMELINACEAE

Always: Herbs; leaves simple, spiral, entire, sheathing at base; inflorescence cymose; ovary superior, fruit a few-seeded capsule.

Usually/often: Creeping stem, flowers actinomorphic, stamens 6, filaments hairy.

Different from: *Gramineae:* leaves ligulate, perianth of bristles and scales.

Striking features: Inflorescence opposite leaf base (*Amischotolype*); fruits blue shining (*Aclisia*); climber (*Spatholirion*).

Distribution: The family worldwide. In Malesia 10 native genera and several with naturalized species only. *Commelina* (pantropical), creeping herbs of usually wet places; *Amischotolype* (paleotropical), creeping herbs, forest floor.

Notes: Several species cultivated as ornamentals: *Rhoeo** and *Zebrina**.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 3 (1968) 12–22; J.P.M. Brennan, Bot. J. Linn. Soc. 59 (1966) 349–370.

Spot-characters: *Commelinaceae* 72, 91, 104 – *Aclisia* (*Pollia*) 93 – *Amischotolype* (*Forrestia*) 70 – *Commelina benghalensis* 75 – *Spatholirion* 5.

Illustrations: Fig. 50 & 51.

Fig. 50. *Amischotolype marginata* (Blume) Hassk. (Commelinaceae).

Reproduced from J. J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 69.

Fig. 51. *Murdannia nudiflora* (L.) Brenan (Commelinaceae).

Reproduced from C.A. Backer & D.F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) t. 88.

CONVOLVULACEAE

Always: Leaves simple, spiral, exstipulate; flowers actinomorphic, sepals free, corolla tubular, ovary superior.

Usually/often: Climbers with milky sap, leaves palminerved, entire, flowers large, 5-merous with mid petaline band; ovary 2-celled, 2 ovules per cell, fruit a capsule.

Striking features: Echlorophyllose, parasitic climber (*Cuscuta*); leaves densely silky or brown pubescent (*Argyreia*); shrubs or trees (some *Ipomoea* and some *Erycibe*); herbaceous annuals (*Cressa, Dichondra, Evolvulus*); flowers yellow (*Merremia*); fruit winged (by accrescent bract) (*Neuropeltis, Neuropeltopsis*), (by accrescent sepals) (*Porana*); fruit a berry (*Argyreia, Erycibe*); endosperm ruminate (*Erycibe*).

Different from: *Apocynaceae:* leaves usually opposite.

Distribution: The family worldwide. In Malesia c. 20 genera, most species in open places, disturbed forest, road sides, abandoned gardens, incl.:
- *Argyreia* (Indo-Malesia), climbers, primary + secondary forest;
- *Erycibe* (Indo-Malesia), predominantly climbers, mostly lowland rain forest;
- *Ipomoea* (pantropical), nearly all climbers, mostly disturbed lowland rain forest;
- *Merremia* (pantropical), climbers, mostly disturbed lowland rain forest.

Notes: Many useful plants; ornamentals: *Ipomoea, Porana.* — Edible tubers or leaves: *Ipomoea.* — Medicinal plants: *Merremia.*

Literature: S.J. van Ooststroom, Fl. Males. I, 4 (1953) 388–512; ibid. I, 5 (1958) 558–564; ibid. I, 7 (1972) 936–941.

Spot-characters: *Convolvulaceae* 19 – *Cuscuta* 5, 7, 11, 82 – *Dichondra* 51, 91 – *Erycibe* 5, 17, 25, 27, 39, 81, 88, 105 – *Ipomoea* 5, 25 – *Jacquemontia* 5, 25, 59 – *Merremia* 5, 48; *M. peltata* 51 – *Neuropeltis* 98 – *Neuropeltopsis* 74, 98 – *Operculina* 5 – *Porana* 5, 98 – *Stictocardia* 31.

Illustrations: Fig. 52–56.

Fig. 52. *Ipomoea alba* L. (Convolvulaceae). Flowering branch and unripe capsule (enlarged).

Reproduced from Flora Malesiana I, 4 (1953) 480, fig. 53.

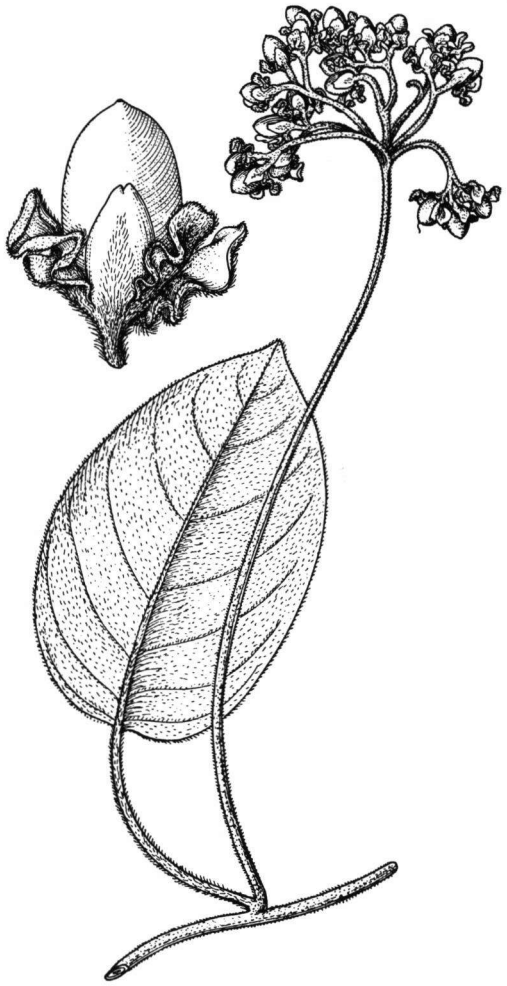

Fig. 53. *Argyreia crispa* Ooststr. (Convolvulaceae). Fruiting branch and fruit.

Reproduced from Flora Malesiana I, 4 (1953) 511, fig. 1a.

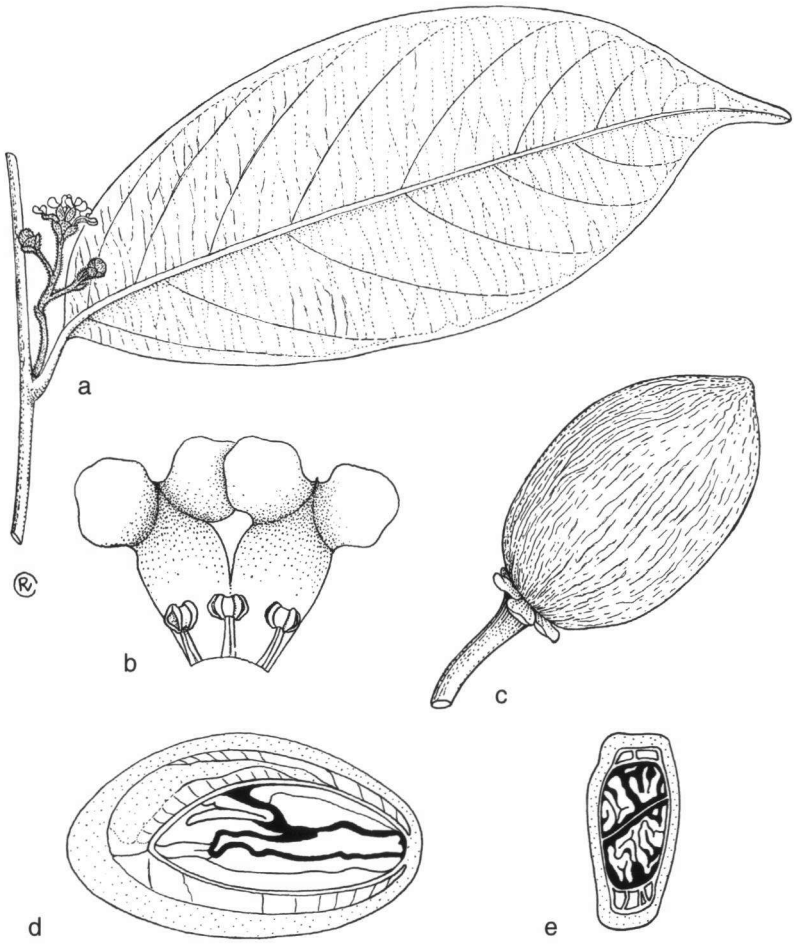

Fig. 54. *Erycibe griffithii* Clarke (Convolvulaceae). a. Flowering branch, × 1; b. corolla lobes from inside, × 5; c. fruit, × 1.5; d. fruit in longitudinal section; e. idem in transverse section, × 2.

Reproduced from Flora Malesiana I, 4 (1953) 411, fig. 13.

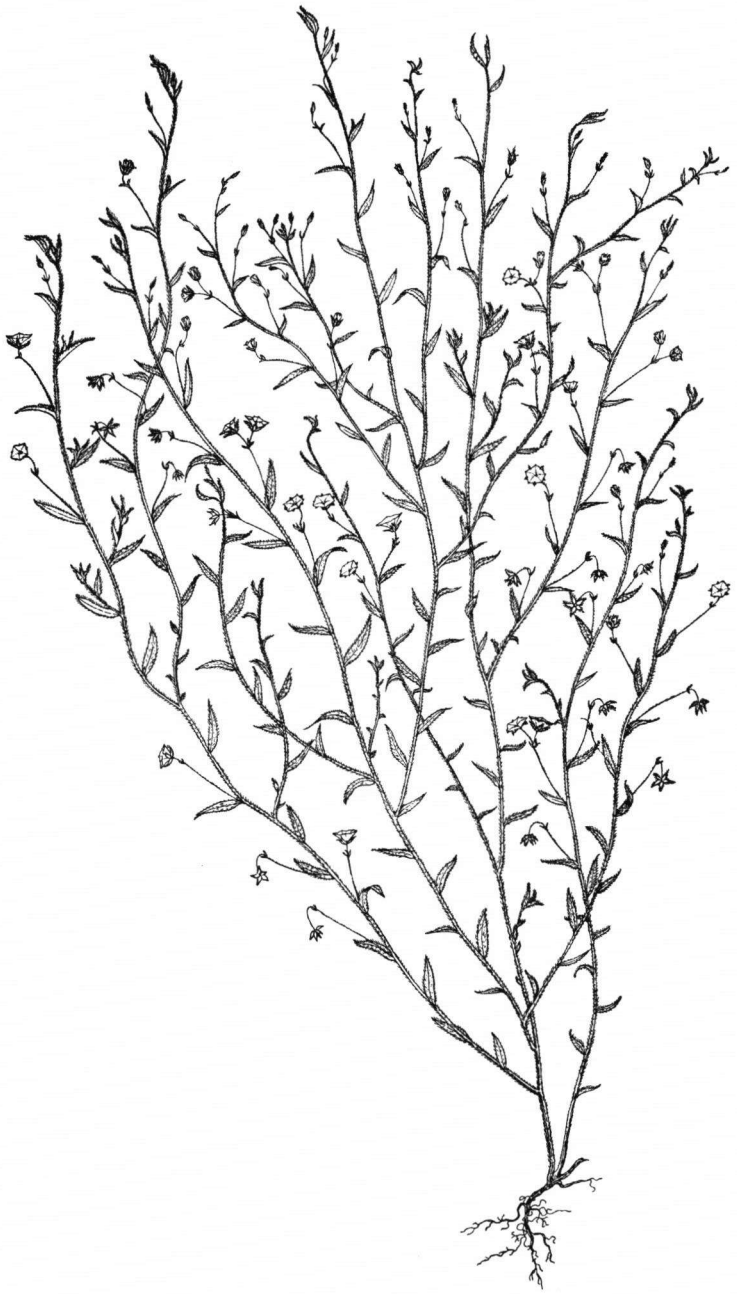

Fig. 55. *Evolvulus alsinoides* (L.) L. var. *decumbens* (R. Br.) Ooststr. (Convolvulaceae). Habit.

Reproduced from Flora Malesiana I, 4 (1953) 397, fig. 5.

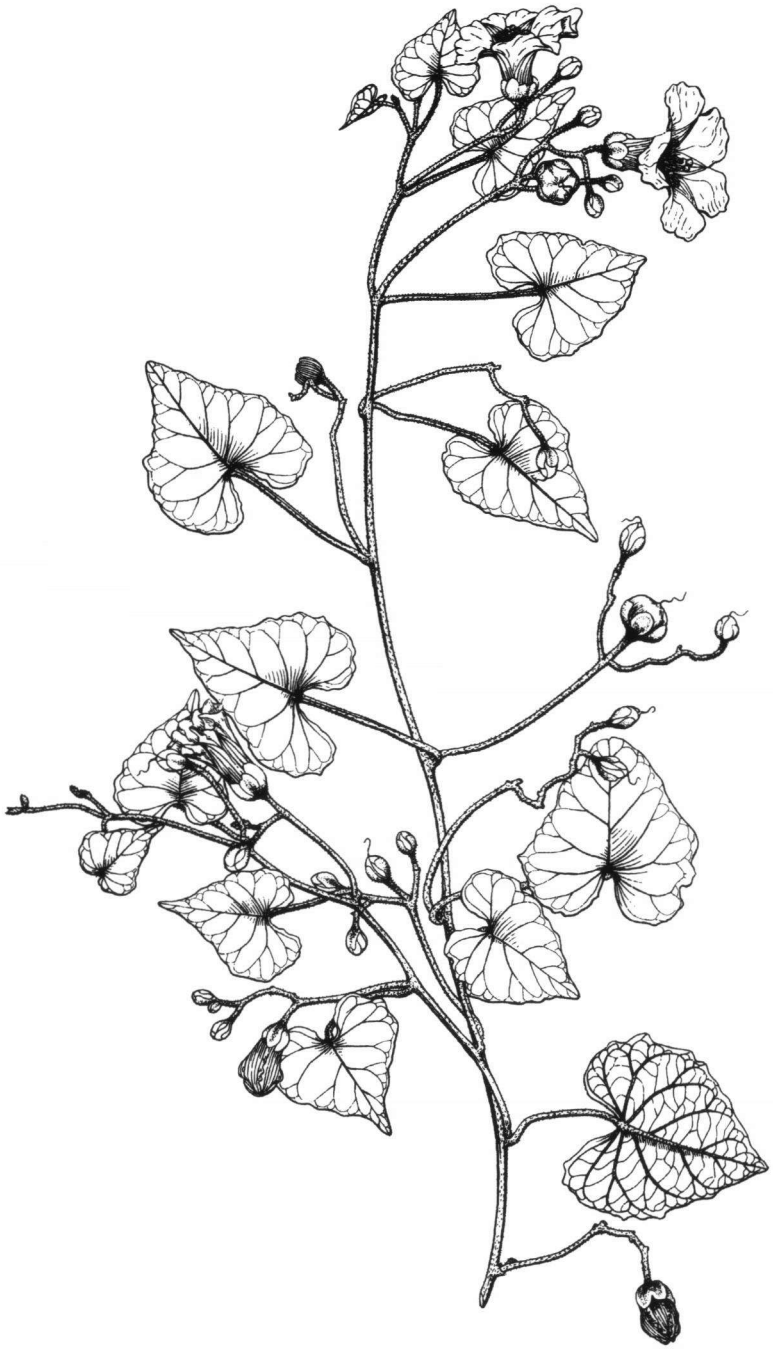

Fig. 56. *Merremia gemella* (Burm. f.) Hall. f. (Convolvulaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 494.

CORIARIACEAE

Always: Woody; roots with nodules containing nitrogen-fixing bacteria; leaves simple, entire, opposite, palminerved, exstipulate; inflorescence a raceme; flowers polygamous, actinomorphic, 5-merous, sepals 5, petals 5, stamens 10, carpels 5–10 free.

Usually/often: Leaves seemingly distichous.

Different from: *Ericaceae:* leaves spiral; sympetalous.

Distribution: The only genus in the family, *Coriaria*, has a remarkably disjunct, widespread distribution (see map in Van Balgooy, 1966). In Malesia two species, one in Luzon, the other in Papua New Guinea, both in montane rain forest, often near streams.

Notes: The mature carpels are partly covered by the fleshy petals.

Literature: M.M.J. van Balgooy, Pacific Plant Areas 2 (1966) 123, map 67; B.E.E. Duyfjes, Fl. Males. I, 11 (1993) 385–391.

Spot-characters: *Coriaria* 15, 64.

Illustration: Fig. 57.

Fig. 57. *Coriaria papuana* Warburg (Coriariaceae). Part of branch and apical part with inflorescences; flowers enlarged.

Reproduced from Flora Malesiana I, 11 (1993) 390, fig. 1a–c.

CORSIACEAE

Always: Small saprophytic herbs; leaves reduced to 3–5 nerved sheaths; flowers single, zygomorphic, bisexual; median sepal (labellum) enlarged, covering the other flower parts, 2 lateral sepals and 3 petals linear, free, stamens 6; ovary inferior, 1-celled; fruit a capsule.

Usually/often: Underground horizontal stems present, emergent parts purplish.

Different from: *Burmanniaceae:* flowers actinomorphic, flower parts fused. — *Orchidaceae:* usually 1, rarely 2 or 3 stamen(s).

Distribution: The family consists of two genera, one in Chile, the other mainly in New Guinea, with a few species in the Solomons and Australia.

Notes: Most species are found in lower montane forest, often together with other saprophytes.

Literature: P. van Royen, Webbia 27 (1972) 223–255; R. Schlechter, Bot. Jahrb. 49 (1913) 109–112.

Spot-characters: *Corsia* 7, 92.

Illustration: Fig. 58.

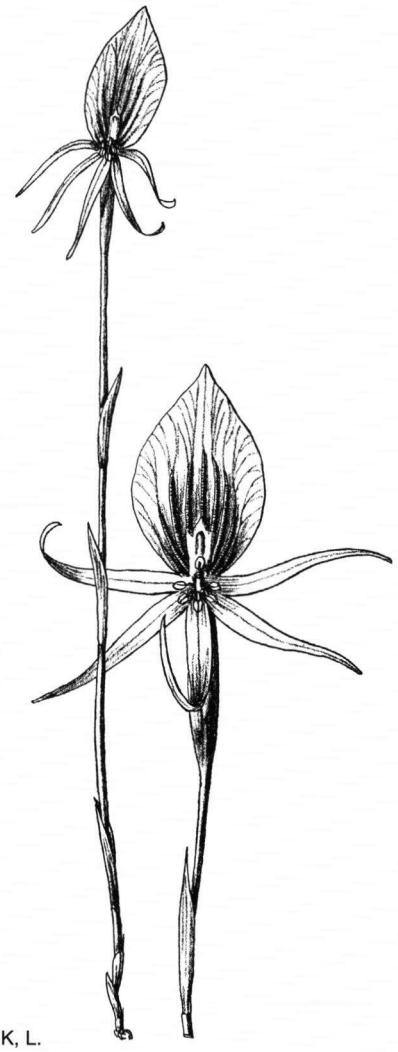

Fig. 58. *Corsia lamellata* Schltr. (Corsiaceae).

Reproduced from Bot. Jahrb. Syst. 49 (1913) 111, fig. 1: K, L.

COSTACEAE

Always: Non aromatic, leaves simple, entire, spirally arranged, with tubular sheaths; flowers bisexual, ovary inferior.

Usually/often: Semi-woody branched stems, lateral staminodes absent.

Different from: *Zingiberaceae:* stemless, aromatic, leaves distichous, lateral staminodes usually present, stems never branched.

Distribution: The family is pantropical. In Malesia: *Costus* (widespread), lowland forest; *Tapeinochilos* (East Malesia, Australia), in (edges of) lowland rain forest.

Notes: The family is often included in the *Zingiberaceae*. Several species are (potential) ornamentals. Some species are used medicinally, or have edible leaves.

Literature: P.J.M. Maas, Blumea 25 (1975) 543–549.

Spot-characters: *Costaceae* 92.

Illustration: Fig. 59.

Fig. 59. *Costus speciosus* (Koenig) Sm. (Costaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 135. With kind permission of the Malaysian Nature Society.

CRASSULACEAE

Always: Herbs, sometimes woody at base, exstipulate; flowers actinomorphic, carpels nearly free, superior.

Usually/often: Succulent, leaves opposite, flowers bisexual, 4- or 5-merous.

Striking features: Leaves bearing bulbils (some species of *Kalanchoë*).

Different from: *Saxifragaceae,* usually woody, not succulent, ovary usually inferior.

Distribution: The family is best represented in the northern hemisphere. In Malesia only *Sedum* and *Kalanchoë**.

Notes: *Kalanchoë* species, have become completely naturalized in places, some species are cultivated as ornamentals.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 197–202; H. Ohba, Fl. Males. I, 9 (1982) 558–560.

Spot-Characters: *Kalanchoë* 13.

Illustration: Fig. 60.

Fig. 60. *Kalanchoë integra* O. Kuntze (Crassulaceae).

Reproduced from Flora Malesiana I, 4 (1951) 201, fig. 2.

CRUCIFERAE (BRASSICACEAE)

Always: Leaves simple, spiral, exstipulate; flowers bisexual, 4-merous; stamens 6; ovary superior, 2-locular; placentation parietal.

Usually/often: Herbaceous; leaves indented or lobed; inflorescence terminal; ovules many; fruit elongate, dehiscent.

Different from: *Capparidaceae* (*Cleome*): stamens many, ovary 1-celled.

Distribution: The family is best represented outside the tropics. In Malesia 3 indigenous genera, incl.:
- *Cardamine*, herbs of open places, especially in the mountains.
- *Lepidium* (*Papuzilla*), spiny subshrubs in alpine vegetation.

Notes: Several species of *Brassica**, *Raphanus** and *Rorippa* are cultivated as vegetables, especially in the mountains. Many species are weeds.

Literature: B. Jonsell, Fl. Males. I, 10 (1988) 541–560.

Spot-characters: *Lepidium* (*Papuzilla*) 1, 12.

Illustrations: Fig. 61 & 62.

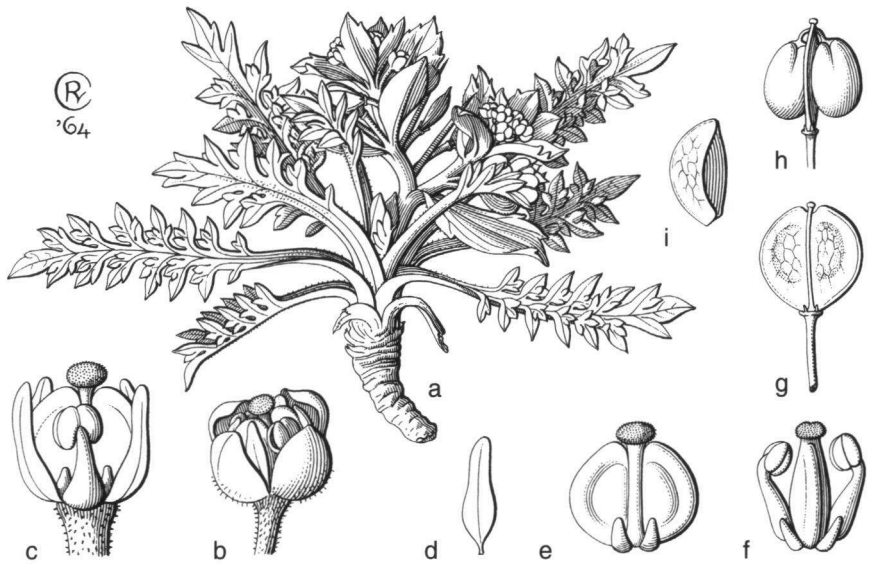

Fig. 61. *Lepidium laeteviride* (P. Royen) Hewson (Cruciferae). a. Habit, × 4; b. flower; c. ditto, calyx removed, both × 12; d. petals; e. ovary; f. ovary, lateral view, all × 16; g. fruit; h. seeds; i. fruit valve, all × 4.

Reproduced from Flora Malesiana I, 10 (1988) 549, fig. 2.

Fig. 62. *Rorippa peekelii* (O.E. Schulz) P. Royen (Cruciferae). Habit and fruiting raceme; seed, scale bar 1 mm.

Reproduced from Flora Malesiana I, 10 (1988) 558, fig. 5.

CUCURBITACEAE

Always: Climbing or creeping; leaves spiral, tendril lateral to leaf; flowers nearly actinomorphic, unisexual, ovary inferior.

Usually/often: Herbaceous, leaves simple, indented or lobed; corolla yellow, placentation parietal; fruit a berry, seeds numerous.

Striking features: Ripe fruit with fibrous skeleton (*Luffa*); 2 glands on top of petiole (*Lagenaria*); leaves deeply bipinnatifid (*Citrullus**); fruit with truncate top (*Neoalsomitra, Zanonia*); seeds winged (*Alsomitra, Zanonia*); corolla red (*Bayabusua*); corolla fimbriate (*Trichosanthes*); fruits 1-seeded (*Sechium**); large 6-seeded fruit (*Hodgsonia*).

Different from: *Passifloraceae:* flowers with a corona, ovary superior, tendril axillary. — *Vitaceae:* flowers much smaller, ovary superior, tendril leaf-opposed.

Distribution: The family widespread. In Malesia 17 genera, incl.:
- *Coccinea* (mainly Africa, 1 Indonesia), forest + open places;
- *Hodgsonia* (Indo-Malesia), rain forest liana;
- *Momordica* (paleotropics), rain forest + secondary forest;
- *Trichosanthes* (Southeast Asia to North Australia), rain forest + secondary forest.

Notes: Many species with edible parts (fruits or young leaves): *Benincasa**, *Citrullus**, *Coccinea, Cucumis**, *Cucurbita**, *Luffa, Momordica, Sechium**, *Trichosanthes*. — Fruits used as container: *Lagenaria*.

Fig. 63. *Gymnopetalum cochinchinense* (Lour.) Kurz (Cucurbitaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 687.

Literature: A. Cogniaux, Pflanzenreich Heft 66 (1916) 1–277; A. Cogniaux & H. Harms, Pflanzenreich Heft 88 (1924) 1–246; C. Jeffrey, Kew Bull. 15 (1962) 337–371. — Drs W.J.J.O. de Wilde, B.E.E. de Wilde-Duyfjes (L) and Rugayah (BO) are revising the family for Flora Malesiana.

Spot-characters: *Cucurbitaceae* 4, 62, 63, 64, 92 – *Alsomitra suberosa* 15 – *Cyclanthera* 95 – *Diplocyclos* 85 – *Ecballium* 95 – *Hodgsonia* 81, 94 – *Lagenaria* 31 – *Luffa* 31 – *Macrozanonia* 102 – *Momordica* 31, 95 – *Muellerargia* 95 – *Neoalsomitra* 2, 12, 102 – *Oreomitra* 52 – *Trichosanthes* 31, 81, 95 – *Zanonia* 102.

Illustrations: Fig. 63–66.

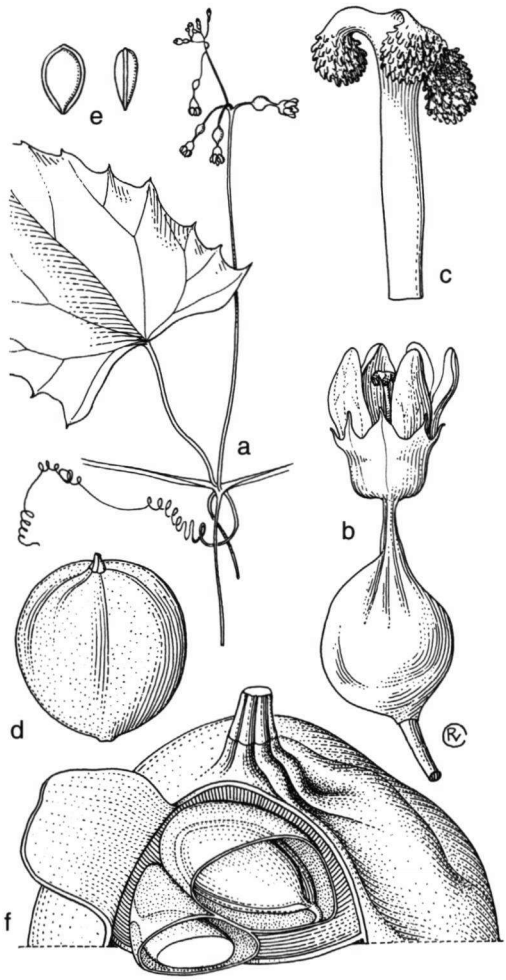

Fig. 64. *Melothria cissybium* M. Jacobs (Cucurbitaceae). Female plant. a. Habit, × 0.75; b. flower, × 5; c. style, × 15; d. fruit, × 3; e. seeds, × 3; f. section through upper part of one cell of the fruit, showing two young seeds in their membranous coat, × 9.

Reproduced from Blumea 7 (1954) 619, fig. 2.

Fig. 65. *Momordica cochinchinensis* (Lour.) Spr. (Cucurbitaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 156. With kind permission of the Malaysian Nature Society.

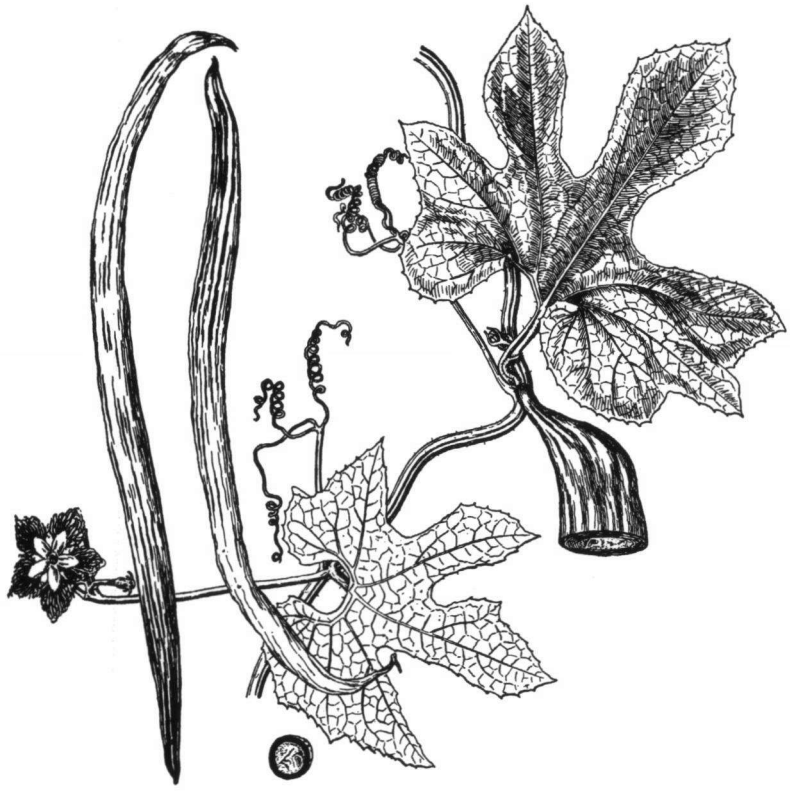

Fig. 66. *Trichosanthes anguina* L. (Cucurbitaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 127.

CYPERACEAE

Always: Grass-like herbs, culms solid not jointed, flowers subtended by a bract (glume) arranged in spikelets.

Usually/often: Stems trigonous; leaves 3-ranked, base of leaf sheathing; perianth consisting of bristles or scales, sometimes absent, spikelets arranged into panicles, stamens 3; ovary solitary, superior, 1-locular, 1 ovule; stigmas 2 or 3, fruit a triangular nut (sometimes reduced).

Striking features: Leaves reduced to scales (*Machaerina* some spp.); *Pandanus*-like herb with woody rhizome (*Scirpodendron*); stems with transverse septa (*Lepironia*); leaves long petioled (*Mapania*); glumes distichous (*Cyperus*); female flowers surrounded by a bottle-shaped utricle (*Carex, Uncinia*).

Different from: *Graminae:* culms often hollow, jointed, leaves often ligulate, each floret subtended by two bracts. — *Restionaceae:* perianth segments membranous.

Distribution: The family cosmopolitan, mostly in open places, often montane, some species in rain forest. In Malesia 30 genera, incl.:
- *Carex* (cosmopolitan), primary + secondary forest, often moist places, mostly montane;
- *Fimbristylis* (cosmopolitan), in a wide range of habitats, mainly lowland;
- *Gahnia* (Asia, Malesia, Australia, Pacific); open forest, mainly montane;
- *Hypolythrum* (pantropical), rain forest, often swampy places;
- *Mapania* (pantropical), rain forest;
- *Paramapania* (Malesia, W Pacific), rain forest;
- *Scleria* (pantropical), lowland monsoon + ever wet rain forest.

Notes: Many species are noxious weeds. Various species are useful to man: plaiting + thatching: species of *Cyperus, Scirpus, Lepironia, Scirpodendron, Thoracostachyum.* — Edible tubers: *Eleocharis dulcis*.

Literature: J.H. Kern, Fl. Males. I, 7 (1974) 435–753; J.H. Kern & H.P. Nooteboom, Fl. Males I, 9 (1979) 107–187.

Spot-characters: *Cyperaceae* 76 – *Cyperus hyalinus* 23 – *Oreobolus* 1 – *Uncinia* 95.

Illustrations: Fig. 67–71.

Fig. 67. *Carex indica* L. (Cyperaceae). a. Habit; b & c. glumes; d. fruit in utricle; e. fruit; b–e enlarged.

Reproduced from Flora Malesiana I, 9 (1979) 133, fig. 125.

Fig. 68. *Cyperus rotundus* L. (Cyperaceae).

Reproduced from C.A. Backer & D.F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) t. 82.

Fig. 69. *Fimbristylis fulvescens* (Thw.) Thw. (Cyperaceae). Habit.

Reproduced from Flora Malesiana I, 7 (1974) 570, fig. 43a.

Fig. 70. *Mapania latifolia* Uittien (Cyperaceae). Habit.

Reproduced from Flora Malesiana I, 7 (1974) 467, fig. 9a.

Fig. 71. *Oreobolus kükenthalii* Steen. (Cyperaceae). Habit, in different sizes.

Reproduced from Flora Malesiana I, 7 (1971) 681, fig. 80a.

DIOSCOREACEAE

Always: Climbers with an underground fleshy rhizome; tepals in 2 rows of 3; ovary inferior, 3-locular.

Usually/often: Leaves simple, alternate, 3 or more parallel nerves, cordate, glandular, petiole bipulvinate; plants dioecious, fruit a winged capsule, seeds winged.

Striking features: Hardly climbing, seeds wingless (*Trichopus*); stems bearing bulbils (*Dioscorea bulbifera*); leaves palmately compound (*Dioscorea* sect. *Lasiophyton*).

Different from: *Menispermaceae:* leaves never opposite, fruit never winged. — *Stemonaceae:* leaves with strongly scalariform venation, ovary superior, 1-locular. — *Smilacaceae:* tendril bearing, ovary superior.

Distribution: The family pantropical. In Malesia 3 genera of which *Dioscorea* is represented with many species.

Notes: Many species of *Dioscorea* have edible tubers, some species are used medicinally, several species are poisonous.

Literature: I.H. Burkill, Fl. Males. I, 4 (1951) 293–335.

Spot-characters: *Dioscoreaceae* 28 – *Dioscorea* 5, 6, 12, 13, 15, 27, 31, 48, 52, 63, 64, 78, 98, 102 – *Stenomeris* 98, 102 – *Trichopus* 6, 85, 105.

Illustration: Fig. 72.

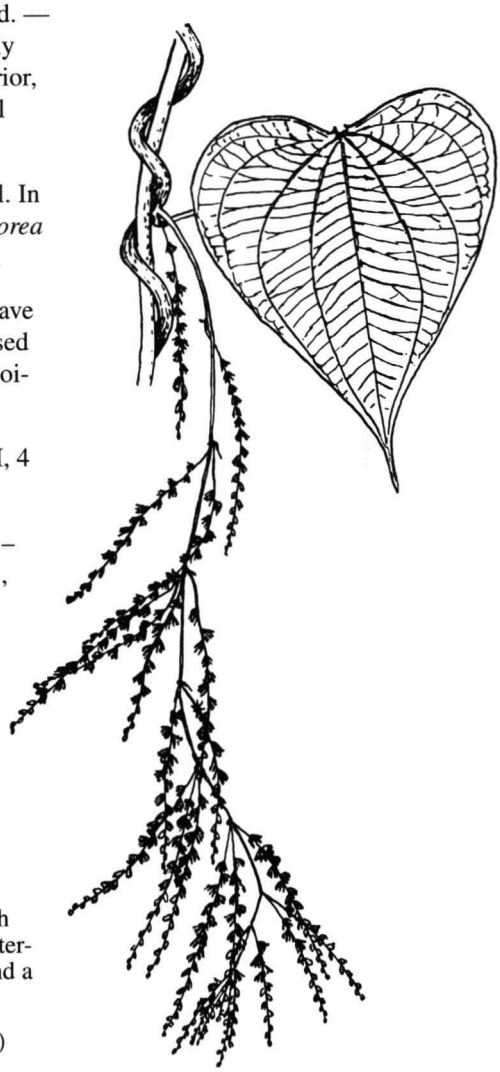

Fig. 72. *Dioscorea bulbifera* L. (Dioscoreaceae), showing a stem which twines to the left, a leaf with its characteristic ladder-like secondary venation, and a male inflorescence.

Reproduced from Flora Malesiana I, 4 (1951) 300, fig. 4a.

DROSERACEAE

Always: Insectivorous herbs, inflorescence a raceme, flowers bisexual, actinomorphic, 5-merous, ovary superior.

Usually/often: Leaves in a rosette provided with stalked sticky glands, stipulate.

Striking features: Submerged aquatic, leaves in whorls (*Aldrovanda*).

Different from: *Lentibulariaceae:* flowers zygomorphic, plants provided with bladders. — *Byblidaceae:* flowers solitary.

Distribution: The family patchily distributed all over the world, best represented in Australia. In Malesia 2 genera: *Aldrovanda* (rare) and *Drosera*.

Notes: All species are found in oligotrophic habitats.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1953) 377–381; B.J. Conn, Brunonia 3 (1980) 209–216.

Spot-characters: *Aldrovanda* 46 – *Drosera* 1.

Illustration: Fig. 73.

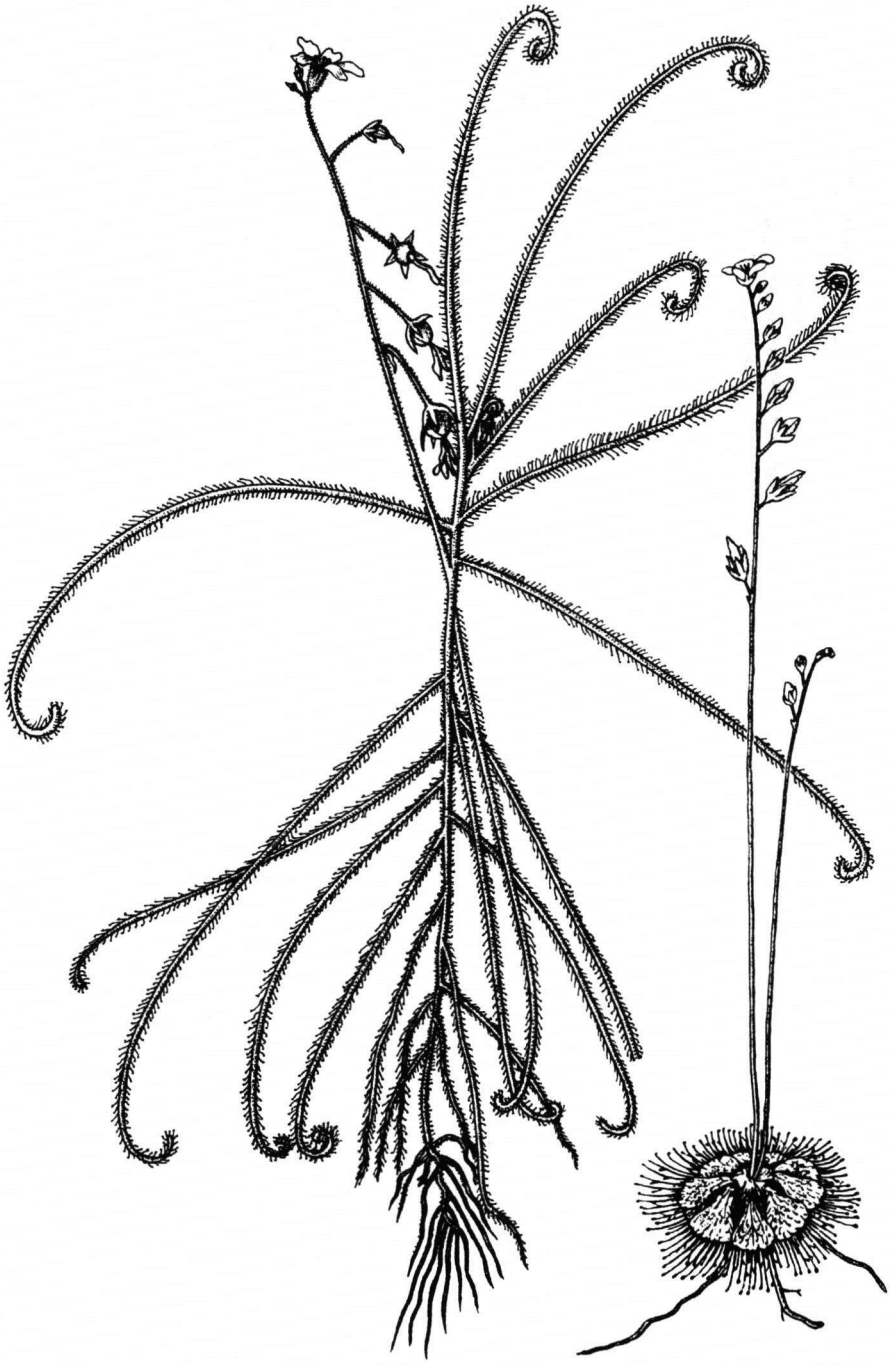

Fig. 73. *Drosera indica* L. (left) and *Drosera burmanni* Vahl (right) (Droseraceae).

Reproduced from Flora Malesiana I, 4 (1953) 378, fig. 1.

ELAEAGNACEAE

Always: Woody; covered with stellate scales; leaves spiral, simple, entire; venation pinnate.

Usually/often: Climbing, older stems with branched thorns; flowers bisexual.

Different from: *Thymelaeaceae:* unarmed, no scales.

Distribution: The family mainly occurs in the northern hemisphere. In Malesia only *Elaeagnus* with two rain forest species.

Notes: Affinity of the family is uncertain. The fruits are edible, but very sour.

Literature: J.F. Veldkamp, Fl. Males. I, 10 (1986) 151–156.

Spot-characters: *Elaeagnus* 12, 26; *E. triflora* 25.

Illustration: Fig. 74.

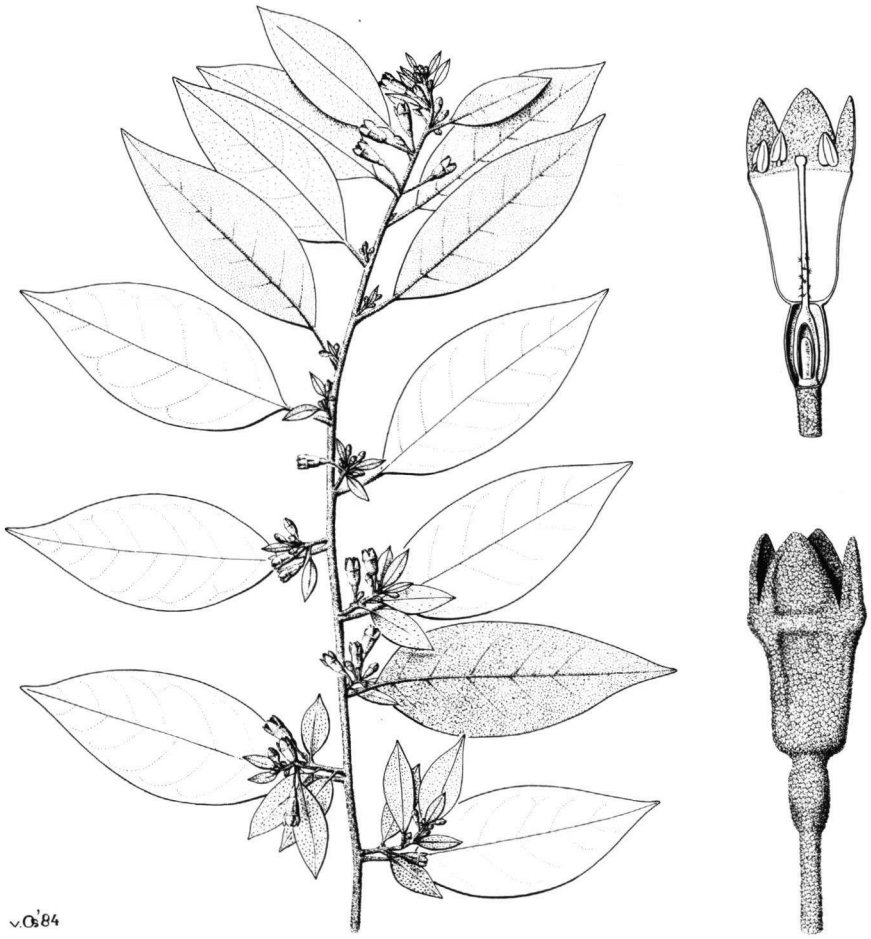

Fig. 74. *Elaeagnus conferta* Roxb. (Elaeagnaceae). Habit; flowers, enlarged.

Reproduced from Flora Malesiana I, 10 (1986) 154, fig. 1a–c.

ELATINACEAE

Always: Herbs; leaves simple, opposite (incl. verticillate), stipulate; flowers bisexual, actinomorphic; ovary superior, fruit a many-seeded capsule.

Usually/often: Sepals and petals free.

Different from: *Aizoaceae:* perianth undifferentiated (tepals). — *Callitrichaceae:* leaves triplinerved, calyx and corolla absent.

Distribution: The family worldwide consisting of two genera, both also in Malesia: *Bergia* and *Elatine*, plants of wet localities.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 203–206.

Spot-characters: *Elatine* 32, 46, 79.

Illustration: Fig. 75.

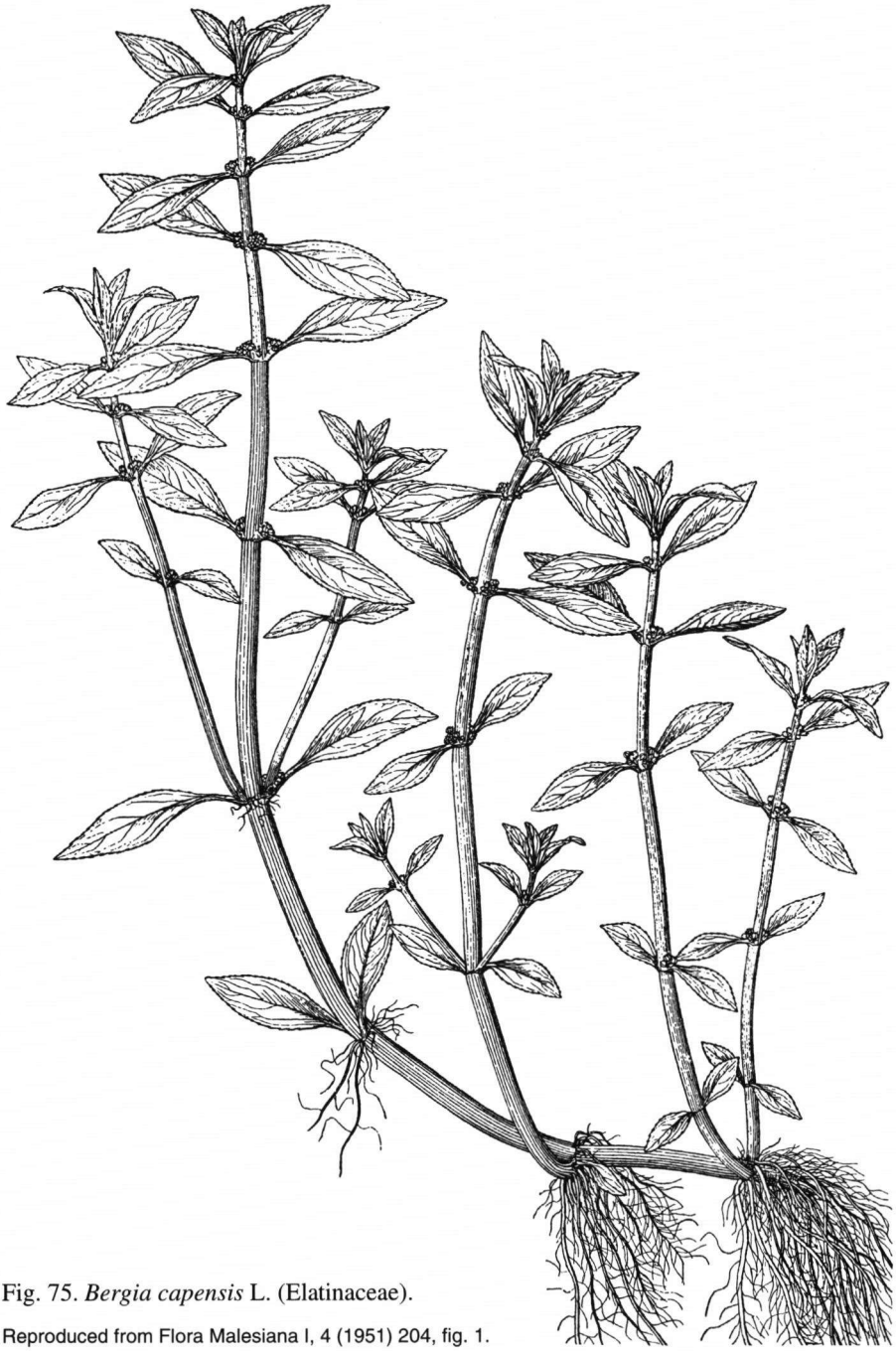

Fig. 75. *Bergia capensis* L. (Elatinaceae).

Reproduced from Flora Malesiana I, 4 (1951) 204, fig. 1.

EPACRIDACEAE

Always: Woody; leaves simple, spiral, entire, venation longitudinal, exstipulate; sepals 4–5, free, corolla tubular, anthers 1-locular, inserted on the corolla, alternating with the lobes, ovary superior.

Usually/often: Inflorescence spike-like, flowers bisexual, disk present, ovule one per cell.

Different from: *Ericaceae:* venation of leaves never longitudinal, anthers 2-locular.

Distribution: The family widespread from SE Asia to South America, best represented in Australia. In Malesia 3 genera, incl.:
- *Styphelia* (Malesia, Australia, Pacific), shrubs, treelets, lowland to montane, often on acid soils.

Notes: Some species are potential ornamentals.

Literature: H. Sleumer, Fl. Males. I, 6 (1964) 422–444.

Illustration: Fig. 76.

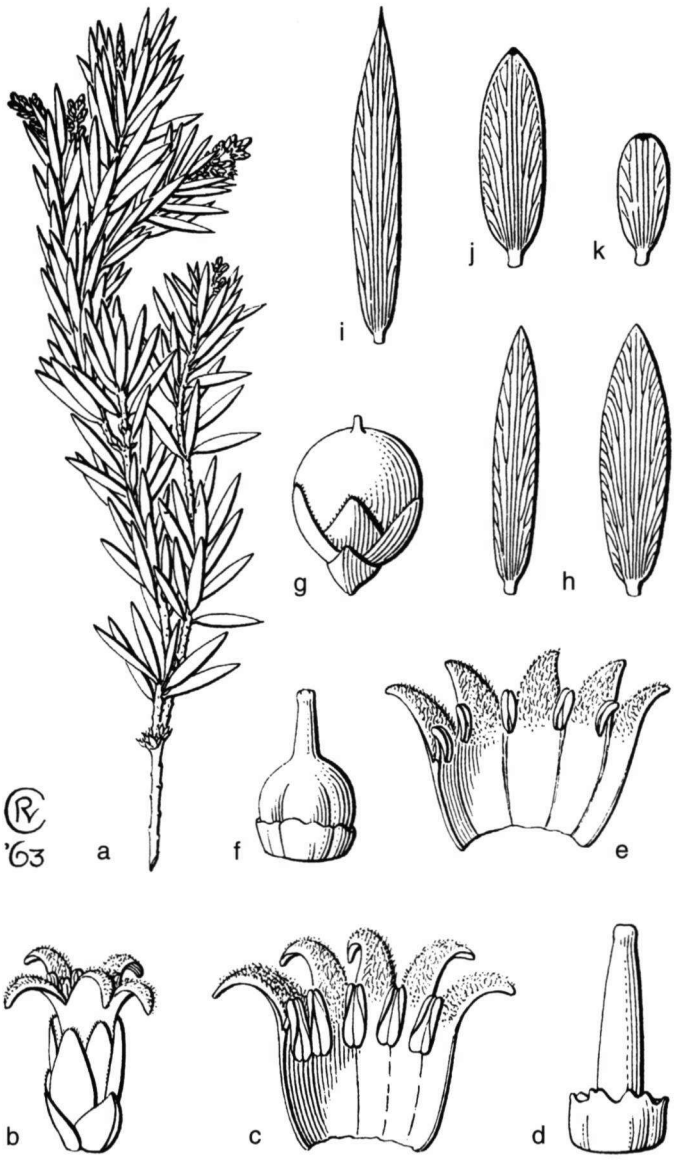

Fig. 76. *Styphelia suaveolens* (Hook. f.) Warb. (Epacridaceae). a. Habit, × 1; b. flower, × 6; c. male flower, open corolla, × 9; d. rudimentary ovary in male flower, × 18; e. female flower, open corolla, × 9; f. female flower, ovary, × 18; g. fruit, × 3; h–k. leaves in various shapes and sizes, × 3.

Reproduced from Flora Malesiana I, 6 (1964) 429, fig. 6.

ERIOCAULACEAE

Always: Herbs; leaves simple, linear, crowded; flowers unisexual, in compact heads; corolla tubular; ovary superior, 2- or 3-locular, 1 ovule per cell; fruit a capsule.

Usually/often: Perennial; stemless; flower heads grey.

Different from: *Xyridaceae:* flowers bisexual, flower heads usually yellow.

Distribution: The family worldwide. In Malesia only *Eriocaulon*, from lowland to alpines, usually in wet places.

Literature: P. van Royen, Nova Guinea Bot. 10 (1959) 21–44.

Spot-characters: *Eriocaulon* 1, 76.

Illustration: Fig. 77.

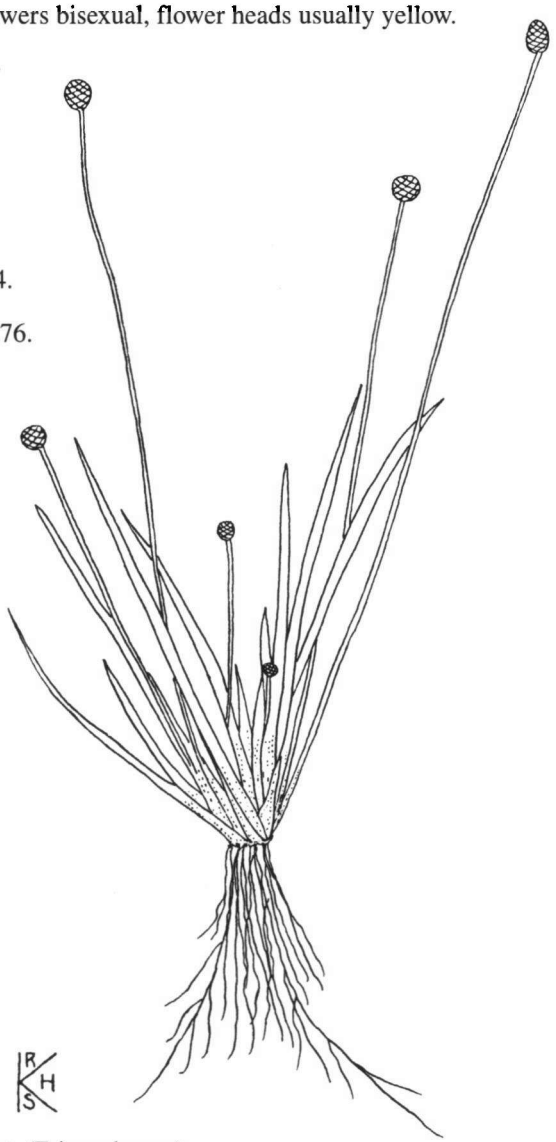

Fig. 77. *Eriocaulon truncatum* Mart. (Eriocaulaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 185. With kind permission of Prof. and Mrs. Keng.

FLAGELLARIACEAE (JOINVILLEACEAE)

Always: Robust herbs; leaves simple, spiral, oblong, veins parallel, leaf base sheathing; flowers bisexual, actinomorphic, tepals 6, ovary superior, fruit a drupe.

Different from: *Gramineae:* inflorescence a panicle, the fruit a drupe (*Joinvillea*). — *Nepenthaceae:* in the absence of pitchers, inflorescence paniculate (*Flagellaria*).

Distribution: *Joinvillea* has a patchy distribution in Malesia and the Pacific; *Flagellaria* is widespread from East Africa to Fiji and Samoa (Van Balgooy 1966).

Notes: *Hanguana* has been removed from the family and is here placed in *Agavaceae*. *Joinvillea* has also been placed in a separate family.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 245–250; M.M.J. van Balgooy, Pacific Plant Areas 2 (1966) map 57 (*Flagellaria*), map 58 (*Joinvillea*).

Spot-characters: *Flagellaria* 4.

Illustration: Fig. 78.

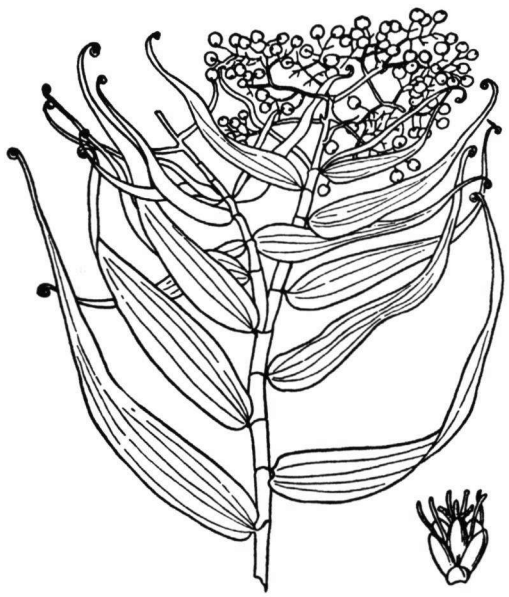

Fig. 78. *Flagellaria indica* L. (Flagellariaceae). Part of plant in fruit; enlarged flower.

Reproduced from M.R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 206. With kind permission of the Malaysian Nature Society.

GENTIANACEAE

Always: Herbs; leaves simple, opposite, entire, exstipulate; flowers bisexual, actinomorphic; calyx and corolla tubular, corolla lobes contorted; ovary superior, 1-locular, with two parietal placentas; ovules many; fruit a capsule.

Usually/often: Erect terrestrial plants; leaves 3-nerved; corolla blue.

Striking features: Climber (*Tripterospermum*); saprophyte (*Cotylanthera*); cushion plants (some species of *Gentiana*).

Different from: *Apocynaceae:* mostly woody, white latex, fruit usually apocarpous. — *Loganiaceae:* mostly woody, interpetiolar stipules, ovary 2-locular. — *Menyanthaceae:* water plants, leaves spiral.

Distribution: The family worldwide, especially in temperate regions. In Malesia 9 genera, incl.:
- *Exacum* (paleotropics);
- *Gentiana* (worldwide), in Malesia chiefly montane/alpine;
- *Microrphium* (West Malesia), shrub of limestone habitats;
- *Swertia* (mainly northern hemisphere), in Malesia mostly montane.

Notes: Some species have horticultural potential.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 437–441; P. van Royen, Nova Guinea Bot. 17 (1964) 369–416.

Spot-characters: *Cotylanthera* 7 – *Exacum* 64 – *Gentiana* 1, 64 – *Swertia* 82 – *Tripterospermum* (*Crawfurdia*) 5, 6, 64.

Illustrations: Fig. 79 & 80.

Fig. 79. *Exacum tetragonum* Roxb. (Gentianaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 306. With kind permission of the Malaysian Nature Society.

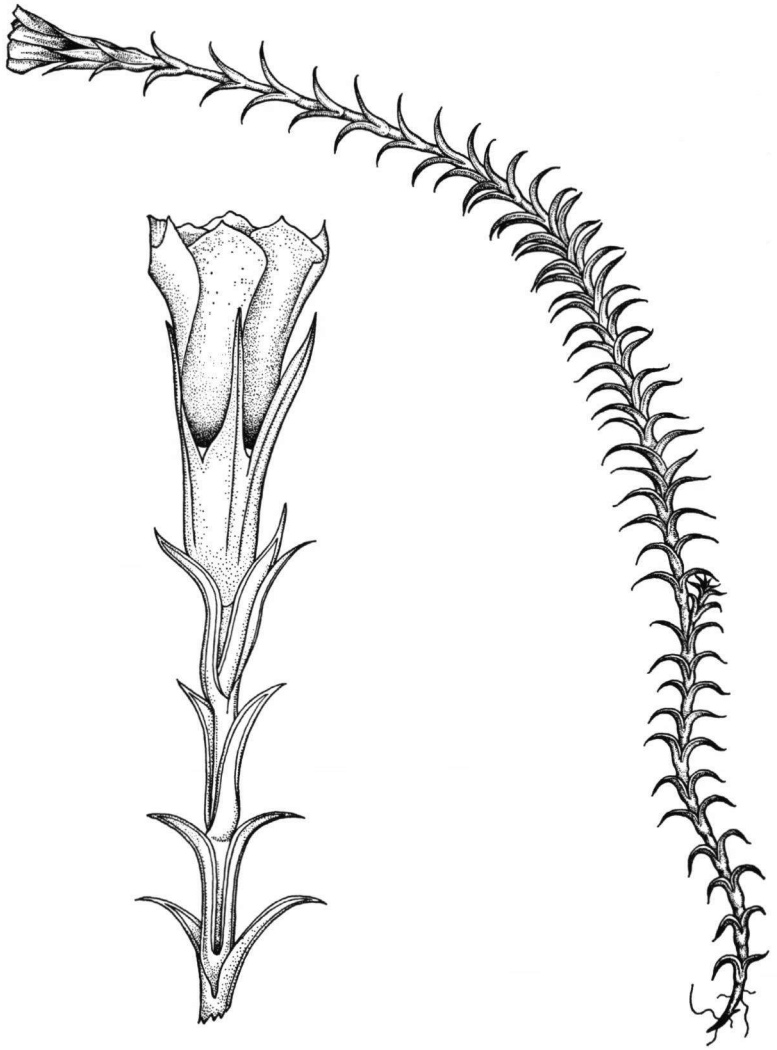

Fig. 80. *Gentiana recurvifolia* P. Royen (Gentianaceae). Habit; enlarged tip of stem with flower.

Reproduced from Nova Guinea, Bot. 17 (1964) 391, fig. 9a, b.

GERANIACEAE

Always: Herbs, with glandular hairs; leaves simple, lobed or dissected; flowers bisexual, actinomorphic, 5-merous, sepals and petals free, ovary superior.

Usually/often: Ovary 5-locular, fruit a schizocarp.

Different from: *Oxalidaceae:* not glandular, leaves usually compound and/or plants woody.

Distribution: The family widespread, best represented in South Africa. In Malesia only *Geranium* native, mostly montane.

Notes: *Pelargonium** species are cultivated as ornamentals or for their scented oil.

Literature: R.C. Carolin, Fl. Males. I, 6 (1964) 445–449; J.F. Veldkamp & A. Moerman, Blumea 24 (1978) 463–477.

Spot-characters: *Geranium* 1 – *Pelargonium* 72.

Illustration: Fig. 81.

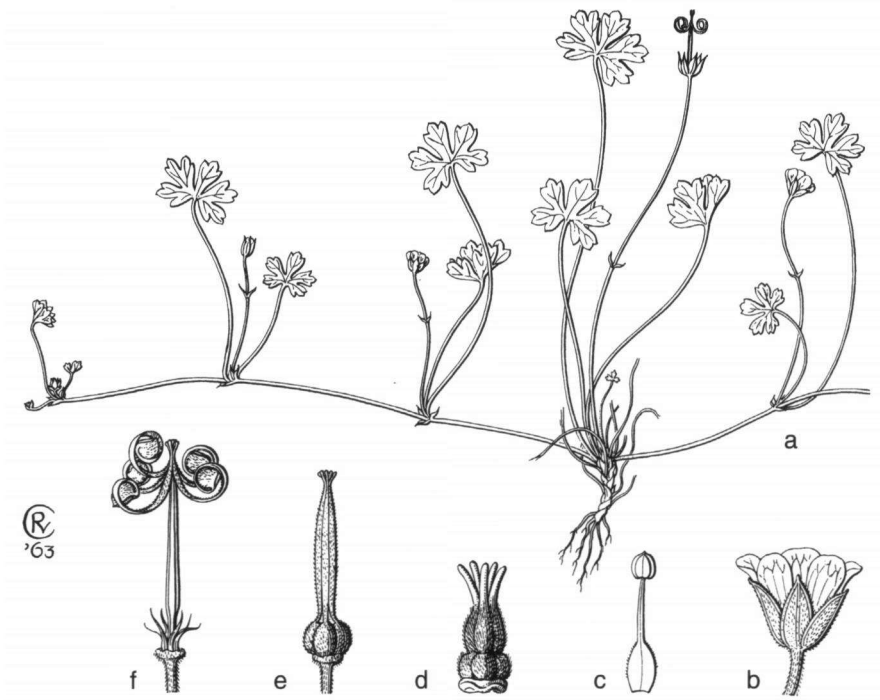

Fig. 81. *Geranium potentilloides* l'Hérit. ex DC. (Geraniaceae). a. Habit, × 0.66; b. flower, × 2; c. stamen, × 6; d. pistil, × 6; e. young fruit, × 2; f. dehisced fruit without seed, × 2.

Reproduced from Flora Malesiana I, 6 (1964) 447, fig. 1.

GESNERIACEAE

Always: Leaves simple, penninerved, exstipulate; flowers hermaphrodite; ovary superior (in Malesia), stamens 2 or 4; seeds numerous.

Usually/often: Herbaceous; leaves decussate; flowers bisexual, zygomorphic, bilabiate; fruit a 1-locular capsule; forest plants.

Striking features: Fruit a berry, plants often woody (*Cyrtandra*); one well-developed leaf (accrescent cotyledon), ovary 2-locular (*Monophyllaea*).

Different from: *Acanthaceae:* cystoliths, ovary 2-locular; few seeds. — *Bignoniaceae:* mostly trees or lianas, seeds nearly always winged. — *Scrophulariaceae:* ovary usually 2-locular, rarely forest plants.

Distribution: The family worldwide, mostly tropics but some genera extending to temperate regions. In Malesia 25 genera, mostly members of the lowland and montane forest undergrowth, epiphytic or terrestrial, incl.:
- *Aeschynanthus* (Indo-Malesia), epiphytes;
- *Agalmyla* (Malesia), climbers;
- *Boea* (China to Australia), terrestrial herbs, often on limestone;
- *Cyrtandra* (Malesia, Pacific), treelets, shrubs, herbs and climbers.

Notes: Many species cultivated as ornamentals, e. g. *Aeschynanthus, Saintpaulia*, Sinningia*, Streptocarpus**. Several indigenous species are potential ornamentals.

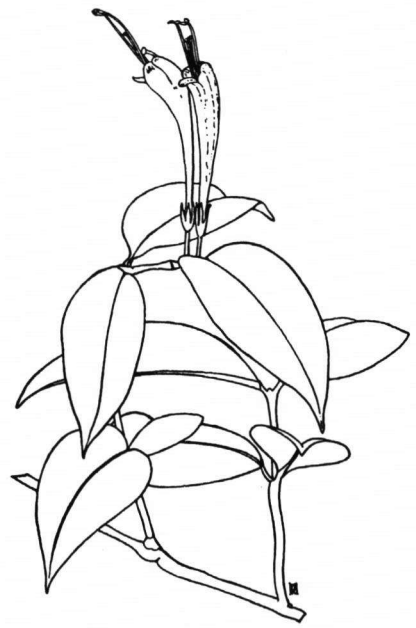

Fig. 82. *Aeschynanthus perakensis* Ridl. (Gesneriaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 341. With kind permission of the Malaysian Nature Society.

(Gesneriaceae continued)

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 518–534; G.W. Gillett, Kew Bull. 30 (1975) 371–412. B.L. Burtt, Keys to the Bornean genera of Gesneriaceae ..., in A.C. Jermy (ed.), Studies on the Flora of Gunung Mulu ..., Kuching (1984) 97–104. Several papers by B.L. Burtt et al. in Notes Roy. Bot. Gard. Edinb.; several papers by B.L. Burtt and Weber in Beitr. Biol. Pflanzen 70 (1998).

Spot-characters: *Gesneriaceae* 44, 58, 81 – *Aeschynanthus* 5, 6, 46, 47, 60, 102, 103 – *Agalmyla* 5, 6, 47, 76, 104 – *Chirita* 62, 74 – *Cyrtandra* 5, 6, 47, 51, 52, 70, 75 – *Didymocarpus* 31, 60 – *Henckelia* 44, 47, 52, 62, 74 – *Loxonia* 47 – *Monophyllaea* 27, 31, 53, 70, 74 – *Paraboea* 3, 25, 27, 28 – *Rhynchoglossum* 44, 47 – *Rhynchotechum* 44, 82 – *Ridleyandra* 52, 74 – *Trisepalum* 28.

Illustrations: Fig. 82–84.

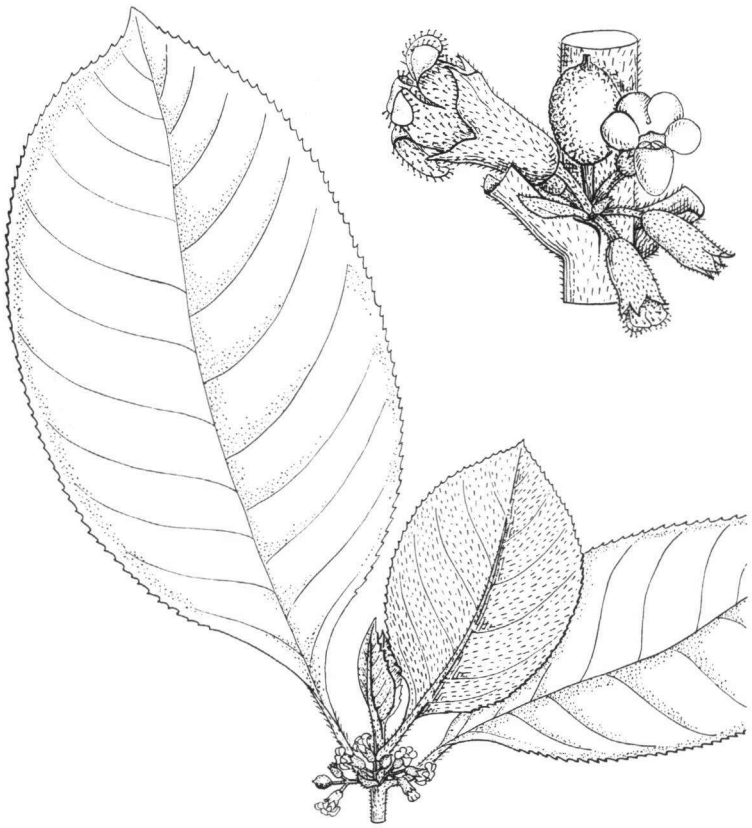

Fig. 83. *Cyrtandra fulvo-villosa* Rech. (Gesneriaceae). Habit; inflorescence enlarged.

Reproduced from Kew Bull. 30 (1975) 381, fig. 2A, B (drawing by Pat Halliday). Courtesy of Royal Botanic Gardens, Kew.

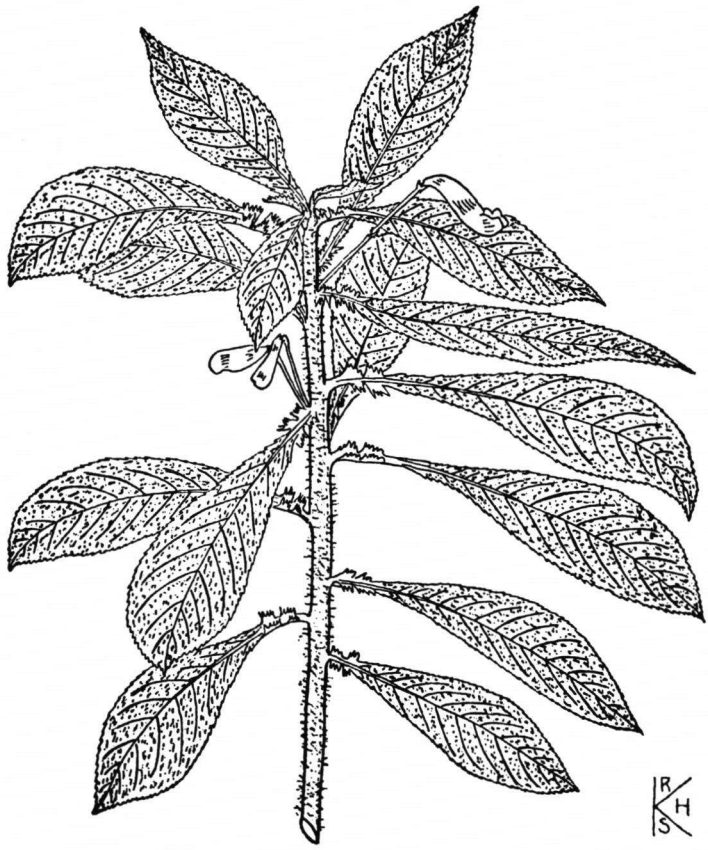

Fig. 84. *Didymocarpus crinita* Jack (Gesneriaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 161. With kind permission of Prof. and Mrs. Keng.

GOODENIACEAE

Always: Leaves simple, penninerved, exstipulate; flowers bisexual, zygomorphic, 5-merous; ovary inferior, stigma surrounded by a cup-shaped indusium.

Usually/often: Shrubs, leaves spiral or crowded; corolla gamopetalous with a dorsal slit; stamens 5, free.

Striking features: Climber with opposite leaves (*Scaevola oppositifolia*).

Different from: *Campanulaceae:* stigma without indusium.

Distribution: The family is best represented in Australia. In Malesia 5 genera, incl.:
– *Scaevola* with one littoral species and a few growing inland.

Notes: *Scaevola oppositifolia* is a potential ornamental.

Literature: P.W. Leenhouts, Fl. Males. I, 5 (1957) 335–344; ibid. I, 6 (1972) 949–952.

Spot-characters: *Goodeniaceae* 92 – *Scaevola* 54; *S. oppositifolia* 5, 6, 45; *S. verticillata* 46.

Illustration: Fig. 85.

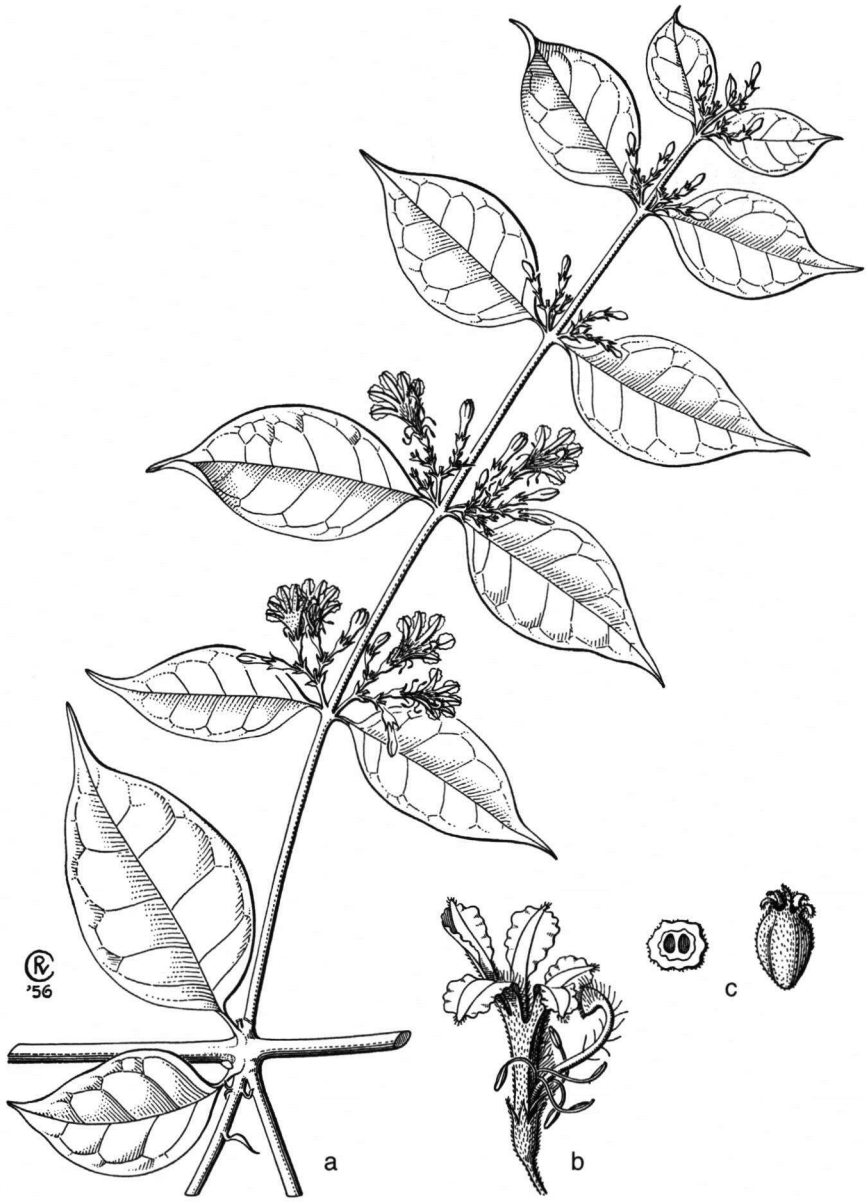

Fig. 85. *Scaevola oppositifolia* R.Br. (Goodeniaceae). a. Flowering twig; b. flower; c. fruit with cross section.

Reproduced from Flora Malesiana I, 5 (1957) 343, fig. 1a, b, f.

HAEMODORACEAE

Always: Rhizomatous herbs; leaves linear, laterally compressed, base sheathing; flowers bisexual, actinomorphic, 3-merous; stamens 3, opposite inner tepals; ovary inferior, 3-celled; fruit a capsule.

Usually/often: Rhizome red; seeds winged.

Different from: *Iridaceae:* stamens opposite outer tepals. — *Liliaceae:* leaves rarely laterally compressed, ovary superior.

Distribution: A southern hemisphere family, best represented in Australia. In Malesia only *Haemodorum* native, in savannah.

Notes: *Xiphidium coeruleum** is an ornamental plant.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 5 (1954) 111–113.

Spot-characters: *Haemodorum* 92.

Illustration: Fig. 86.

Fig. 86. *Haemodorum corymbosum* Vahl (Haemodoraceae). Habit; flower enlarged.

Reproduced from Flora Malesiana I, 5 (1954) 112, fig. 1a, b.

HALORAGACEAE (GUNNERACEAE)

Always: Leaves simple, exstipulate; flowers actinomorphic, disk absent; ovary inferior.

Usually/often: Herbaceous; leaves verticillate, penninerved; inflorescence spike-like, flowers 4-merous.

Striking features: Stoloniferous; leaves large, palminerved on long stalks (*Gunnera*).

Different from: *Callitrichaceae:* ovary superior.

Distribution: The family nearly cosmopolitan. In Malesia 5 genera, incl.:
- *Haloragis*, herbs or shrubs, mostly open places from lowland to high in the mountains;
- *Myriophyllum*, aquatic herbs.

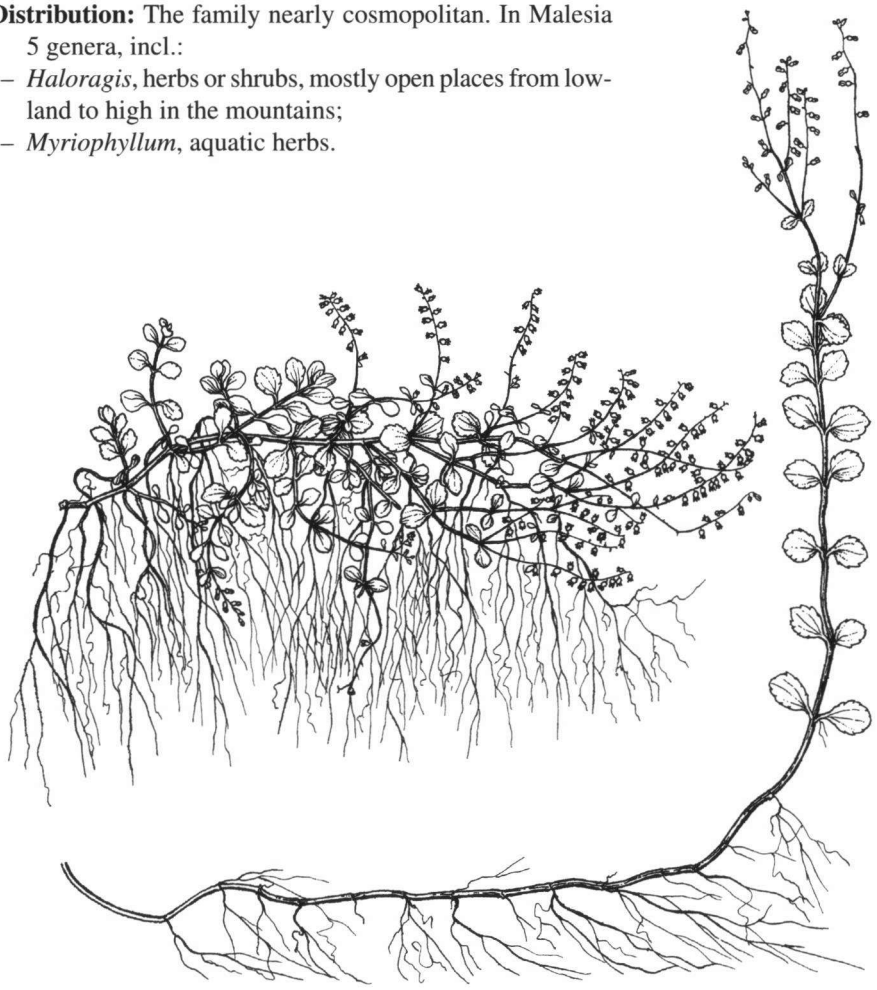

Fig. 87. *Haloragis micrantha* (Thunb.) Sieb. & Zucc. (Haloragaceae). Habit in an exposed (above) and shaded situation (below).

Reproduced from Flora Malesiana I, 7 (1971) 243, fig. 1a, b.

Notes: *Gunnera* is often placed in a separate family: *Gunneraceae*. Species of *Myriophyllum* are grown as aquarium plants. Many species treated under *Haloragis* in Flora Malesiana have been transferred to *Gonocarpus* (Orchard, 1975).

Literature: R. van der Meijden & N. Caspers, Fl. Males. I, 7 (1971) 239–263; A.E. Orchard, Bull. Auckl. Inst. Mus. 10 (1975) 1–299.

Spot-characters: *Haloragaceae* 92 – *Haloragis* 46 – *Myriophyllum* 46.

Illustrations: Fig. 87 & 88.

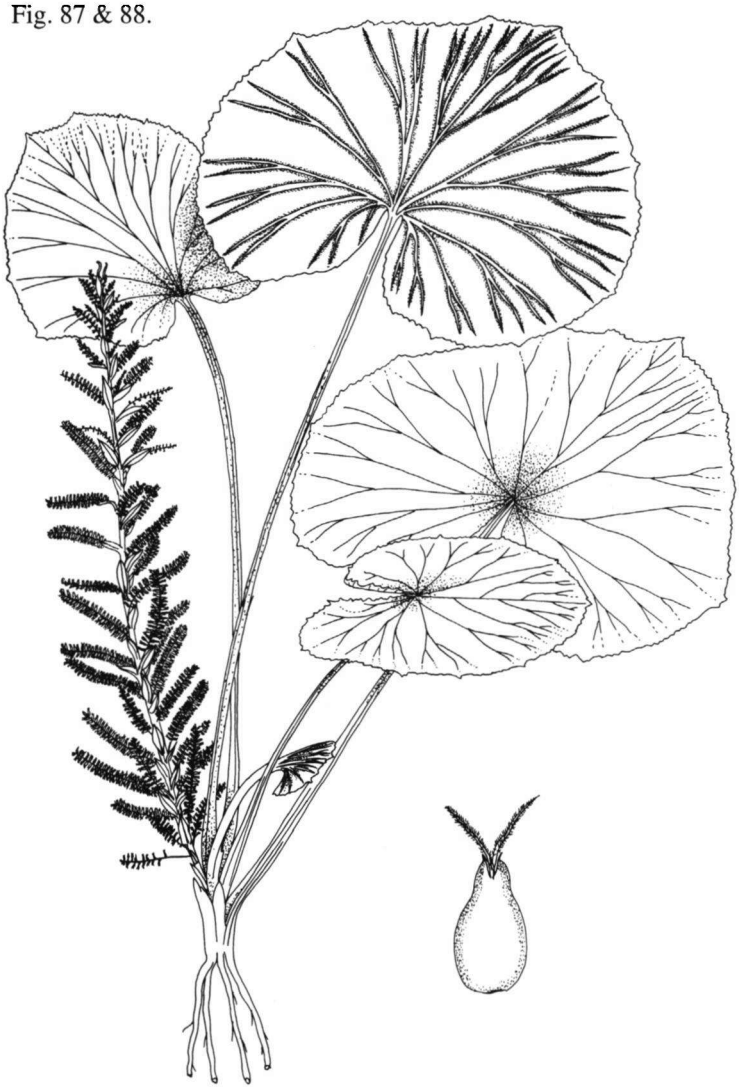

Fig. 88. *Gunnera macrophylla* Blume (Haloragaceae). Habit; enlarged female flower.

Reproduced from P. van Royen, Alpine Flora of New Guinea 4 (1983) 2991, fig. 867.

HYDROCHARITACEAE

Always: Aquatic plants (marine and fresh water), leaves simple, entire; ovary inferior, placentation parietal, ovules many.

Usually/often: Herbaceous; leaves crowded; petioles sheathing, nerves parallel with cross veins; flowers unisexual, actinomorphic.

Different from: *Potamogetonaceae:* ovary superior.

Distribution: The family widespread. In Malesia 9 genera, incl.:
- *Halophila*, marine herbs, with creeping rhizome;
- *Ottelia*, fresh water submerged herb;
- *Thalassia*, coarse marine plants, with more or less woody creeping rhizome.

Notes: Some species (*Hydrilla, Ottelia, Vallisneria*) are (potential) aquarium plants; several marine seagrasses (*Enhalus, Halophila* and *Thalassia*) are eaten by Dugongs and Turtles.

Literature: C. den Hartog, Fl. Males. I, 5 (1957) 381–413; Seagrasses of the World (1970) 213–268..

Spot-characters: *Hydrocharitaceae* 92 – *Hydrilla* 46.

Illustrations: Fig. 89 & 90.

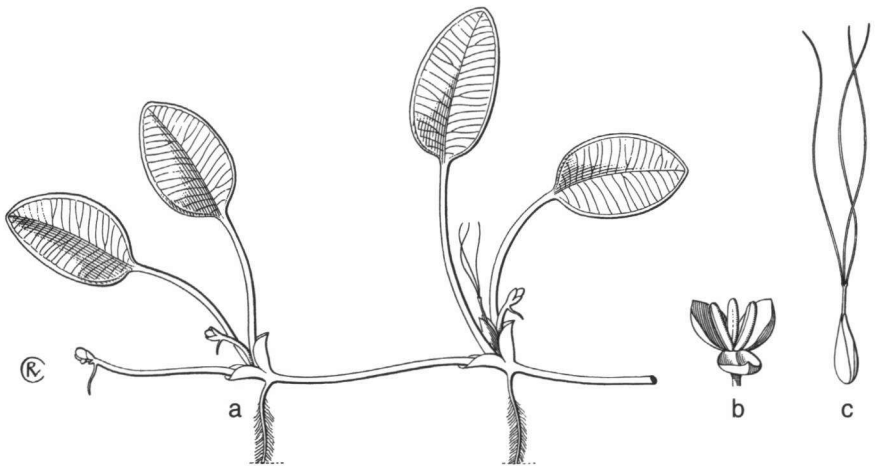

Fig. 89. *Halophila ovalis* (R.Br.) Hook. f. (Hydrocharitaceae). a. Habit; b. male flower; c. female flower; b & c enlarged.

Reproduced from Flora Malesiana I, 5 (1957) 409, fig. 16.

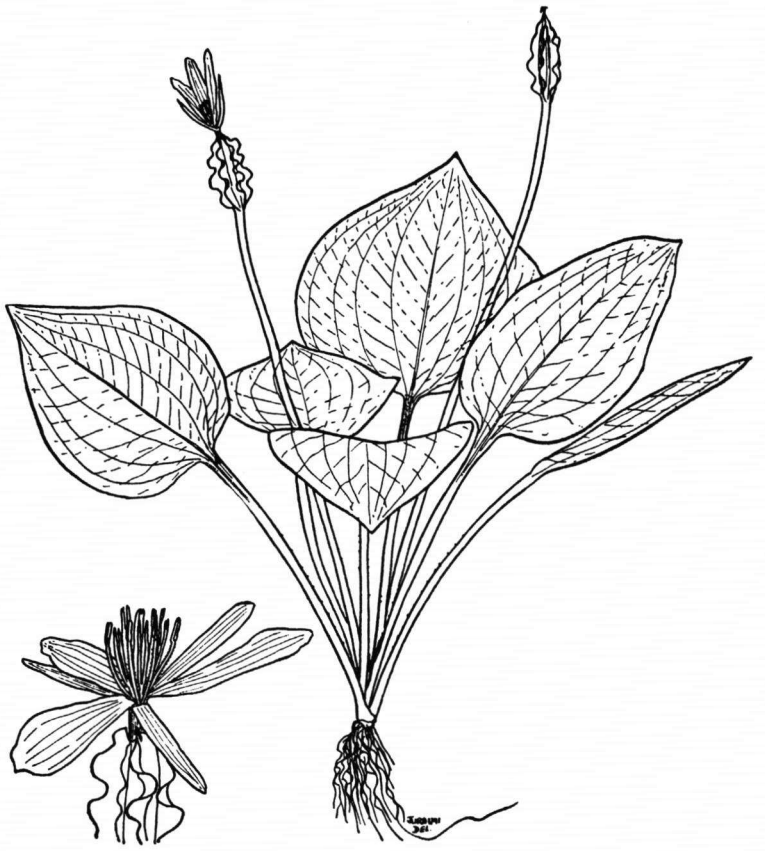

Fig. 90. *Ottelia alismoides* (L.) Pers. (Hydrocharitaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 9. With kind permission of the Malaysian Nature Society.

HYDROPHYLLACEAE

Always: Herbaceous; leaves simple, spiral, entire, penninerved, exstipulate; flowers bisexual, actinomorphic, 5-merous, ovary superior, fruit a many-seeded capsule.

Usually/often: Glandular hairy; styles 2, ovary 2-celled.

Different from: *Primulaceae:* not glandular, ovary 1-locular. — *Solanaceae:* not glandular, fruit a berry.

Distribution: The family best represented in America. In Malesia only 2 species of *Hydrolea*, both in lowland swampy areas.

Notes: *Nemophila** is sometimes cultivated as an ornamental.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 207–209.

Spot-characters: *Hydrolea spinosa* 12.

Illustration: Fig. 91.

Fig. 91. *Hydrolea zeylanica* (L.) Vahl (Hydrophyllaceae). Flowering branch with enlarged flower in anthesis.

Reproduced from Flora Malesiana I, 4 (1951) 208, fig. 1.

IRIDACEAE

Always: Herbs; leaves simple, distichous, parallel nerves; flowers bisexual, tepals in 2 rows of 3; stamens 3, opposite outer tepals; ovary inferior, 3-celled; fruit a capsule.

Usually/often: Bulbs or rhizomes present, flowers slightly zygomorphic.

Striking features: Flowers actinomorphic, inner tepals inconspicuous, stamens united into a tube (*Patersonia*).

Different from: *Amaryllidaceae:* leaves spiral.

Distribution: The family cosmopolitan. In Malesia only two genera with native species: *Patersonia* and *Sisyrinchium*, only found on high mountains.

Notes: Several species cultivated as ornamentals: *Belamcanda*, Crocosmia*, Gladiolus**.

Literature: D.A. Cooke, Fl. Austral. 46 (1986) 1–66; D.J.L. Geerinck, Fl. Males. I, 8 (1977) 77–84.

Spot-characters: *Iridaceae* 92 – *Patersonia* 84.

Illustration: Fig. 92.

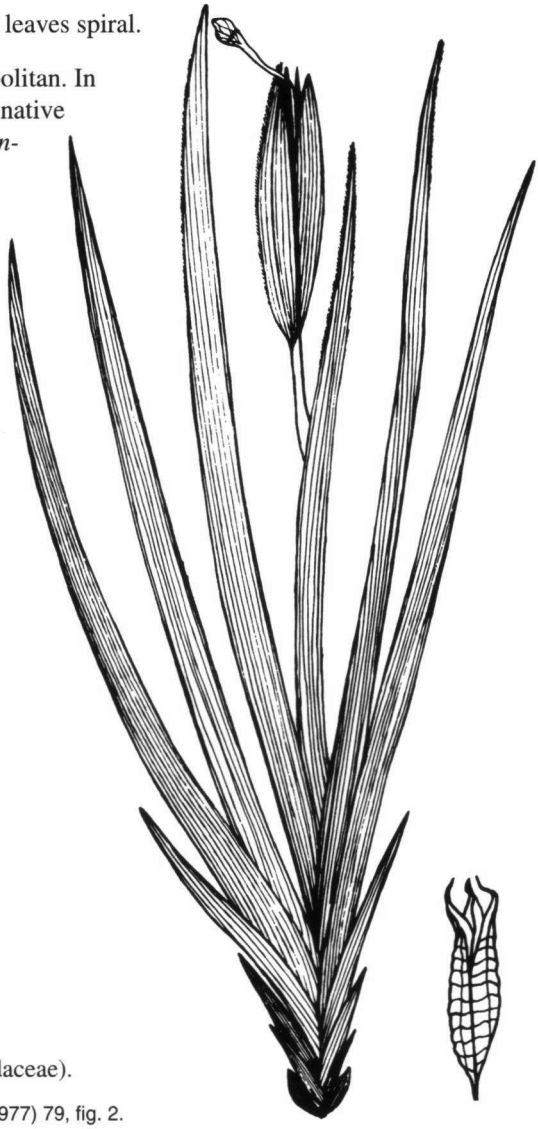

Fig. 92. *Patersonia lowii* Stapf (Iridaceae).

Reproduced from Flora Malesiana I, 8 (1977) 79, fig. 2.

JUNCACEAE

Always: Herbaceous, leaves spiral, sheathing at base; flowers bisexual, 3-merous; ovary superior, ovules 3 or more, fruit a capsule.

Usually/often: Stems tufted, leaves grass-like or terete.

Different from: *Cyperaceae:* leaves 3-ranked, ovule one. — *Restionaceae:* flowers unisexual, ovule one.

Distribution: The family widespread in temperate regions. In Malesia 2 genera, *Juncus* and *Luzula*, both in wet open places in the mountains.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 210–215.

Illustration: Fig. 93.

Fig. 93. *Juncus prismatocarpus* R.Br. (Juncaceae).

Reproduced from Flora Malesiana I, 4 (1951) 213, fig. 2a.

JUNCAGINACEAE (SCHEUCHZERIACEAE)

Always: Herbs; leaves linear, distichous; flowers bisexual, actinomorphic, 3-merous.

Usually/often: Roots swollen and tuberous, carpels 6, more or less free.

Different from: *Cyperaceae:* leaves 3-ranked. — *Restionaceae:* flowers unisexual, ovary 1-carpellate.

Distribution: Widespread, mostly in southern hemisphere. In Malesia only *Triglochin procera*, along streams in savannah forest.

Notes: The tubers are edible.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1949) 57.

Illustration: Fig. 94.

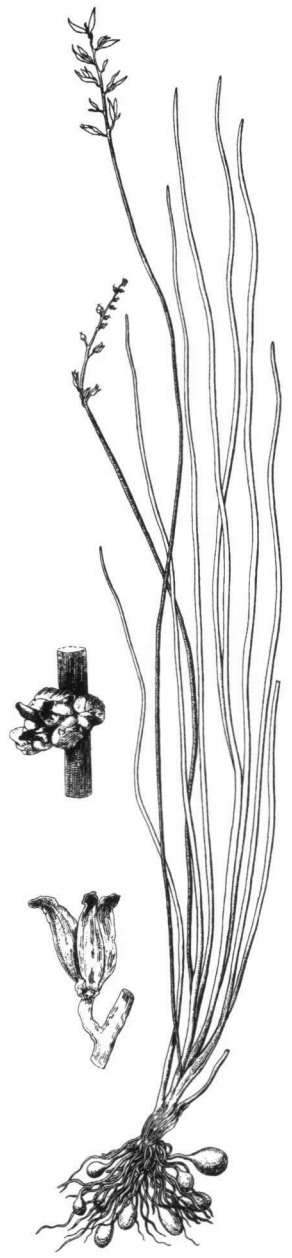

Fig. 94. *Triglochin procera* R. Br. var. *dubia* Benth. (Juncaginaceae). Habit; flower and juvenile fruit enlarged.

Reproduced from Flora Malesiana I, 4 (1949) 56, fig. 1.

LABIATAE (LAMIACEAE)

Always: Stems quadrangular; leaves simple, decussate (incl. verticillate), exstipulate, penninerved; flowers zygomorphic, gamosepalous, gamopetalous, ovary superior; style 1, gynobasic; fruit of 4 one-seeded mericarps.

Usually/often: Aromatic, glandular hairy herbs; leaves lobed or dentate, with glands (not pellucid).

Striking features: Leaves verticillate (*Pogostemon*); stellate hairs (*Gomphostemma*); calyx with a scale (*Scutellaria*); corolla with a spur (*Ceratanthus*); stamens long exerted (*Orthosiphon*).

Different from: *Acanthaceae:* not aromatic or glandular, cystoliths, sepals free, fruit a capsule. — *Boraginaceae:* leaves spiral, flowers ± actinomorphic. — *Gesneriaceae:* not glandular, fruit 1-locular, many-seeded. — *Scrophulariaceae:* not aromatic, fruit many-seeded. — *Verbenaceae:* not aromatic, fruit indehiscent.

Distribution: The family worldwide; in Malesia 30 native genera, incl.:
- *Ocimum* (pantropical, most species in Africa), open places in lowland, also planted;
- *Orthosiphon* (Africa, Asia), open places, often planted;
- *Plectranthus* (Africa to Pacific), primary and secondary forest, mostly lowland.

Notes: Several species useful for mankind. — Medicinal plants: *Basilicum, Ocimum, Orthosiphon, Plectranthus (Coleus), Pogostemon.* — Spices: *Mentha, Ocimum.* — Edible tubers: *Plectranthus rotundifolius.* — Ornamentals: *Plectranthus*, introduced species of *Salvia.*

Literature: H. Keng, Fl. Males. I, 8 (1978) 301–394.

Spot-characters: *Labiatae* 31, 59, 91 – *Dysophylla* 46 – *Gomphostemma* 25 – *Leucas* 2 – *Pogostemon* 46 – *Salvia* 25, 50; *S. scapiformis* 49.

Illustrations: Fig. 95–98.

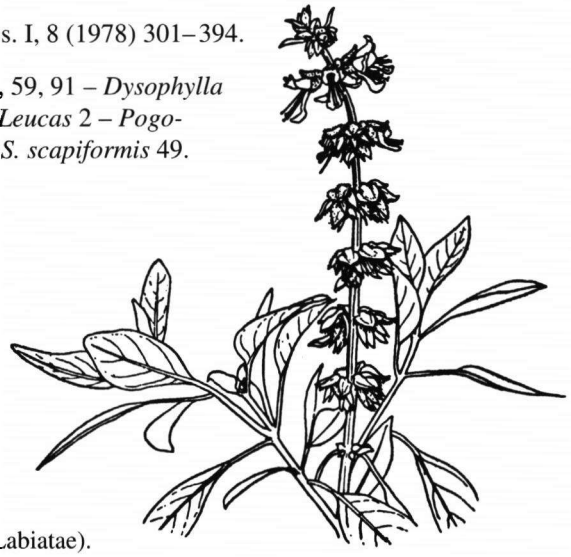

Fig. 95. *Ocimum basilicum* L. (Labiatae).

Reproduced from M.R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 395. With kind permission of the Malaysian Nature Society.

Fig. 96. *Leucas lavandulifolia* Smith (Labiatae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 529.

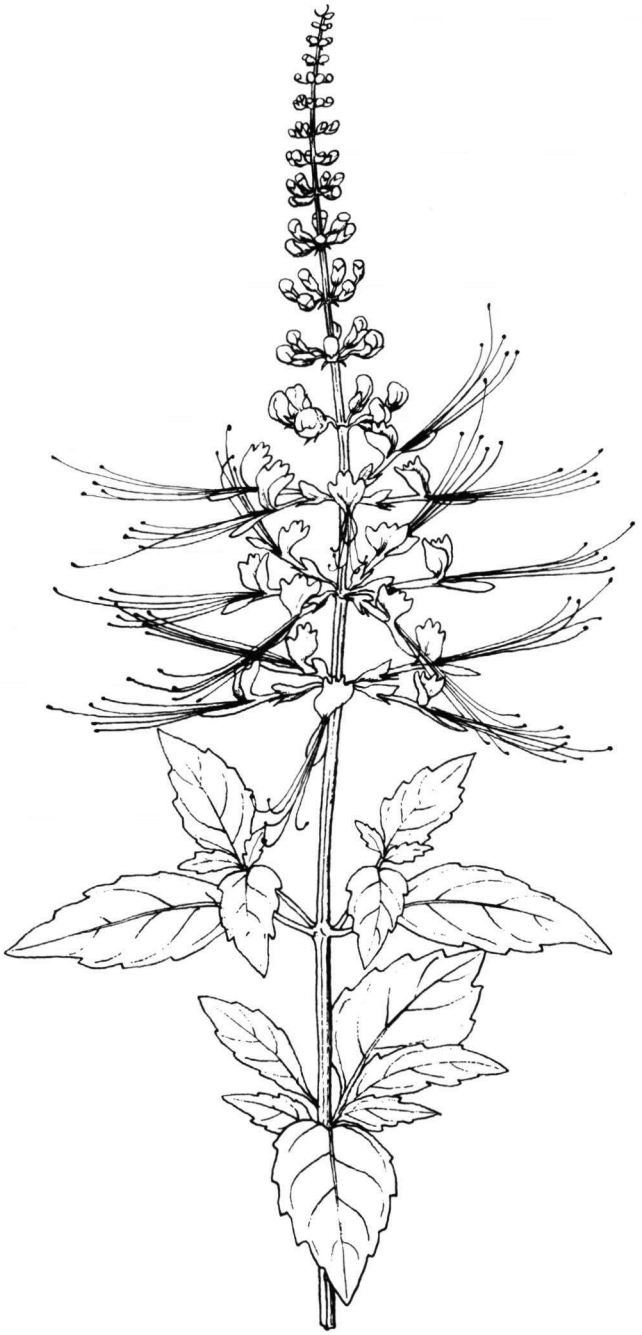

Fig. 97. *Orthosiphon aristatus* (Blume) Miq. (Labiatae).

Reproduced from Flora Malesiana I, 8 (1978) 381, fig. 31a.

Fig. 98. *Plectranthus steenisii* Keng (Labiatae). Habit; enlarged corolla and fruiting calyx.

Reproduced from Flora Malesiana I, 8 (1978) 383, fig. 32a–c.

LEMNACEAE

Always: Minute aquatic floating annual herbs, inflorescence of 1 female and 2 male naked flowers enclosed by a spathe.

Usually/often: Fronds round, connected into small groups.

Distribution: The family is cosmopolitan. In Malesia 3 genera: *Lemna, Spirodela* and *Wolffia*.

Notes: The family is also placed in the *Araceae*.

Literature: F. van der Plas, Fl. Males. I, 7 (1971) 219–237.

Illustration: Fig. 99.

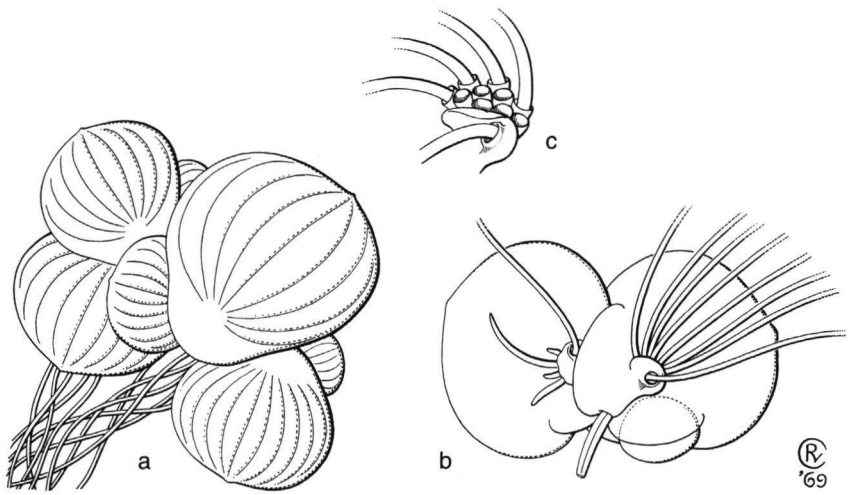

Fig. 99. *Spirodela polyrhiza* (L.) Schleid. (Lemnaceae). a. Habit, mother frond with adhering offspring, dorsal view; b. habit, ventral view, the sheath of the secondary roots covered by the ventral scale; c. detail from ventral side, the primary root piercing the ventral scale, enlarged.

Reproduced from Flora Malesiana I, 7 (1971) 225, fig. 2a–c.

LENTIBULARIACEAE

Always: (Semi)aquatic herbs, leafless, bearing bladder-like organs to capture small organisms; inflorescence racemose; flowers bisexual, zygomorphic; calyx 2-lobed, corolla 2-lipped; stamens 2; ovary superior; fruit a capsule.

Different from: *Scrophulariaceae:* leaves present, bladders absent.

Distribution: The family almost cosmopolitan. In Malesia only *Utricularia* with 22 species.

Notes: In collecting species of *Utricularia*, care should be taken to also collect the minute bladders.

Literature: P. Taylor, Fl. Males. I, 8 (1977) 275–300; The genus Utricularia, Kew Bull. Add. Ser. 14 (1989) 1–724.

Spot-characters: *Utricularia* 8.

Illustration: Fig. 100.

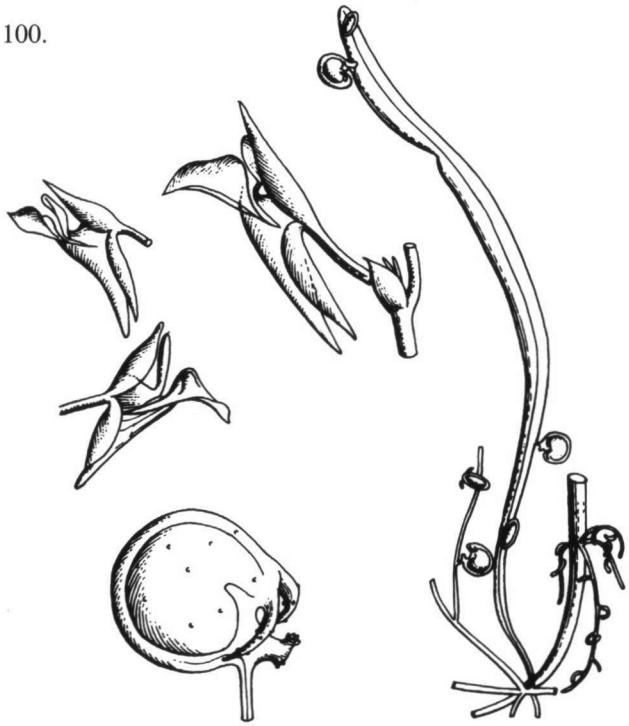

Fig. 100. *Utricularia scandens* Benj. (Lentibulariaceae). Base of peduncle with rhizoids, foliar organ and traps; enlarged trap and flowers.

Reproduced from Flora Malesiana I, 8 (1977) 283, fig. 6a, b, e, f.

LILIACEAE
(ALLIACEAE, ASPARAGACEAE, ASTELIACEAE, PETROSAVIACEAE)

Always: Herbs, with rhizomes or bulbs; leaves simple, entire, exstipulate; flowers 3-merous, tepals in 2 rows of 3; stamens 6; ovary superior.

Usually/often: Leaves caespitose, linear, with parallel venation; inflorescence racemose; flowers bisexual, actinomorphic; fruit a capsule, with flat seeds.

Striking features: Alpine tufted dioecious herb (*Astelia*); tiny saprophytic herb, leaves reduced to scales (*Petrosavia*); leaves needle-like (*Asparagus*); fruit a blue berry (*Dianella, Peliosanthes*).

Fig. 101. *Disporum cantoniense* (Lour.) Merr. (Liliaceae). a. Habit; b. flower of the spurred form, c. ditto of the non-spurred form; d. gynoecium; e. stamen; f. fruit; b–f enlarged.

Reproduced from Flora Malesiana I, 9 (1979) 218, fig. 12.

(Liliaceae continued)

Different from: *Amaryllidaceae:* ovary inferior.

Distribution: The family is cosmopolitan. In Malesia 21 genera, incl.:
- *Asparagus*, scramblers, open places often on limestone;
- *Dianella*, herbs, lowland + mountains.

Notes: Spices, vegetables: *Allium**. — Ornamentals: *Agapanthus*, Asparagus, Gloriosa*. — *Alliaceae* were treated as a separate family in Flora Malesiana (Buysen, 1993). See also Introduction.

Literature: J.P. Jessop, Fl. Males. I, 9 (1979) 192–235; J.R.M. Buysen, Fl. Males. I, 11 (1993) 375–384.

Spot-characters: *Liliaceae* 102 – *Arthropodium* 101 – *Astelia* 1 – *Caesia* 101 – *Chlorophytum* 101 – *Dianella* 93 – *Disporum* 64, 93 – *Gloriosa* 4, 101 – *Iphigenia* 101 – *Lilium* 101 – *Nothoscordium* 13 – *Peliosanthes* 93 – *Petrosavia* 7, 101 – *Thysanotus* 81 – *Tricyrtis* 101.

Illustrations: Fig. 101–103.

Fig. 102. *Petrosavia stellaris* Becc. (Liliaceae).

Reproduced from Flora Malesiana I, 9 (1979) 200, fig. 5a, where redrawn from Hutchinson, Fam. Flow. Pl. 2 (1959) fig. 347.

Fig. 103. *Gloriosa superba* L. (Liliaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 179. With kind permission of the Malaysian Nature Society.

LOPHOPYXIDACEAE

Always: Woody; leaves spiral, simple, dentate, stipulate; inflorescence paniculate; sepals valvate, united at base; petals minute, free; ovary superior; fruit with 5 wings.

Usually/often: Climbing with tendrils, flowers 5-merous.

Different from: *Cardiopteridaceae:* fruit with two wings (*Cardiopteris*). — *Combretaceae:* leaves opposite, no tendrils (*Combretum*). — *Rhamnaceae:* fruit 3-winged (*Gouania*); fruit with one wing (*Ventilago*). — Climbing *Icacinaceae:* exstipulate, fruit not winged.

Notes: The family is monotypic, widespread in lowlands of Malesia and Melanesia.

Literature: H. Sleumer, Fl. Males. I, 7 (1971) 89–91.

Spot-characters: *Lophopyxis* 4, 58, 98.

Illustration: Fig. 104.

Fig. 104. *Lophopyxis maingayi* Hook. f. (Lophopyxidaceae). a. Habit; b. female flower; c. male flower; d. infructescence; e. fruit.

Reproduced from Flora Malesiana I, 7 (1971) 91, fig. 1.

LORANTHACEAE

Always: Woody hemiparasites, on branches of trees; leaves simple, entire; flowers with well developed corolla, calyx much reduced; stamens oppositipetalous; ovary inferior; fruit a one-seeded berry, seed surrounded by a slimy layer.

Usually/often: Attached to the host with several haustoria; leaves opposite, drying opaque, olive green; venation very indistinct, stem with ± swollen nodes; flowers bisexual, sympetalous.

Striking features: Young parts rusty hairy, fruit club-shaped (*Scurulla*); inflorescence covered by many red bracts (*Lepidaria, Lepeostegeres*).

Different from: *Olacaceae:* leaves rarely opposite, leaf surface finely tuberculate. — *Santalaceae:* seed not surrounded by slimy layer, parasitic on roots. — *Viscaceae:* flowers with tiny tepals, unisexual.

Distribution: The family worldwide. In Malesia 23 genera in lowland to montane rain forest and secondary forest, incl.:

- *Amyema* (Malesia, Australia, West Pacific);
- *Decaisnina* (Malesia, Australia to Polynesia);
- *Dendrophthoe* (Paleotropics);
- *Macrosolen* (Indo-Malesia).

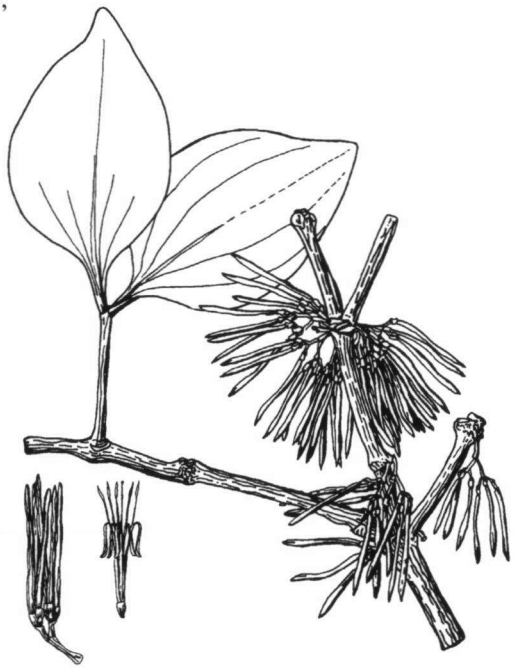

Fig. 105. *Amyema artensis* (Montrouz.) Danser (Loranthaceae). Twig with flower buds; enlarged inflorescence and flower.

Reproduced from Flora Malesiana I, 13 (1997) 242, fig. 3a–c.

Notes: The *Viscaceae* used to be included in the *Loranthaceae*. The flowers of many species are visited by members of the bird family *Dicaeidae* (flowerpeckers) which also disperse the seeds (Docters van Leeuwen, 1954). Some species are hyperparasites (parasitic on other *Loranthaceae*). Many species play a role in rituals and traditional medicine.

Literature: B.H. Danser, The Loranthaceae of the Netherlands Indies, Bull. Jard. Bot. Buitenzorg III, 11 (1931) 233–519; W.M. Docters van Leeuwen, On the biology of some Loranthaceae ..., Beaufortia 4 (1954) 105–205; B.A. Barlow, A revision of the Loranthaceae of New Guinea and the SW Pacific, Austr. J. Bot. 22 (1974) 531–622; Fl. Males. I, 13 (1997) 209–401.

Spot-characters: *Loranthaceae* 16, 57, 61, 79, 83, 92 – *Amyema* 11, 64 – *Amylotheca* 11; *A. duthieana* 46 – *Barathranthus* 11; *B. axanthus* 47 – *Cecarria* 11 – *Cyne* 11 – *Dactyliophora* 11 – *Decaisnina* 11; *D. sumbawaensis* 9 – *Dendrophthoe* 11, 44 – *Distrianthes* 11 – *Elytranthe* 11 – *Helixanthera* 11, 44, 46 – *Lampas* 11, 46 – *Lepeostegeres* 11, 76 – *Lepidaria* 11, 76 – *Loranthus* 11 – *Loxanthera* 11 – *Macrosolen* 11; *M. curvinervis* 46 – *Papuanthes* 11 – *Scurulla* 11, 27 – *Sogerianthe* 11 – *Taxillus* 11, 95 – *Tetradyas* 11 – *Thaumasianthes* 11 – *Trithecanthera* 11, 46.

Illustrations: Fig. 105–107.

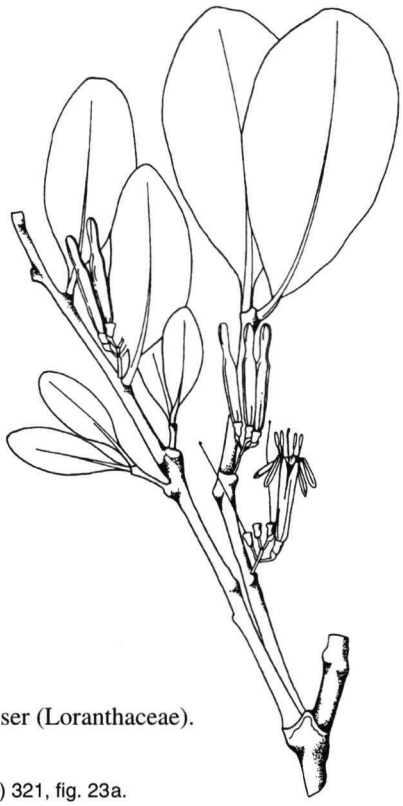

Fig. 106. *Dendrophthoe quadrifida* Danser (Loranthaceae). Flower-bearing twig.

Reproduced from Flora Malesiana I, 13 (1997) 321, fig. 23a.

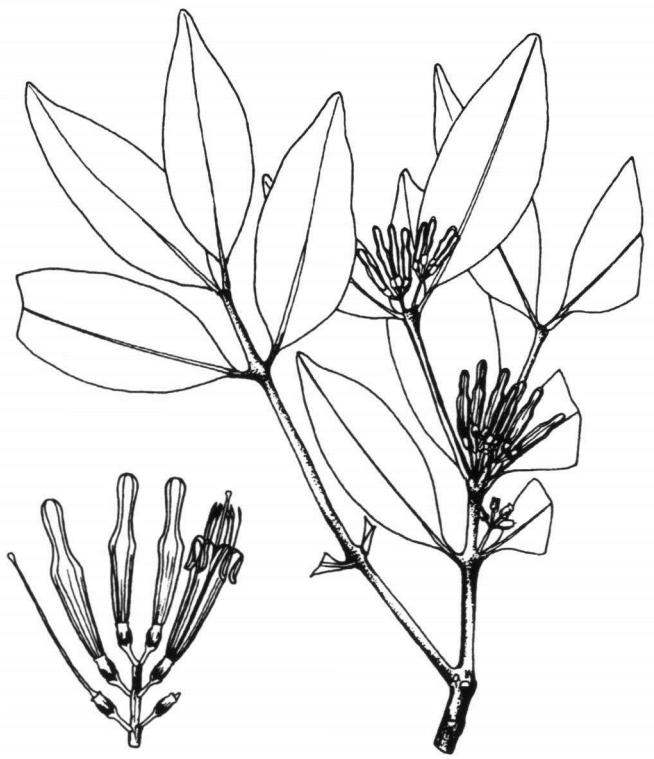

Fig. 107. *Macrosolen flammeus* Danser (Loranthaceae). Flower-bearing twig; enlarged inflorescence.

Reproduced from Flora Malesiana I, 13 (1997) 369, fig. 36b, c.

LOWIACEAE

Always: Stemless herbs, rhizome with scale-like leaves; leaves simple, distichous, base of petiole sheathing, lamina entire, rolled lengthwise in bud, secondary veins parallel at acute angle from midrib; flowers bisexual; tepals in 2 rows of 3, unequal; stamens 5; ovary inferior; fruit a many-seeded capsule, seeds arillate.

Different from: *Musaceae:* leaf sheaths forming a pseudostem, tepals equal. — *Zingiberaceae:* aromatic, stamen one.

Distribution: The only genus of the family, *Orchidantha*, is confined to West Malesia.

Literature: K. Larsen, Fl. Males. I, 12 (1996) 763–774.

Spot-characters: *Orchidantha* 92, 104.

Illustration: Fig. 108.

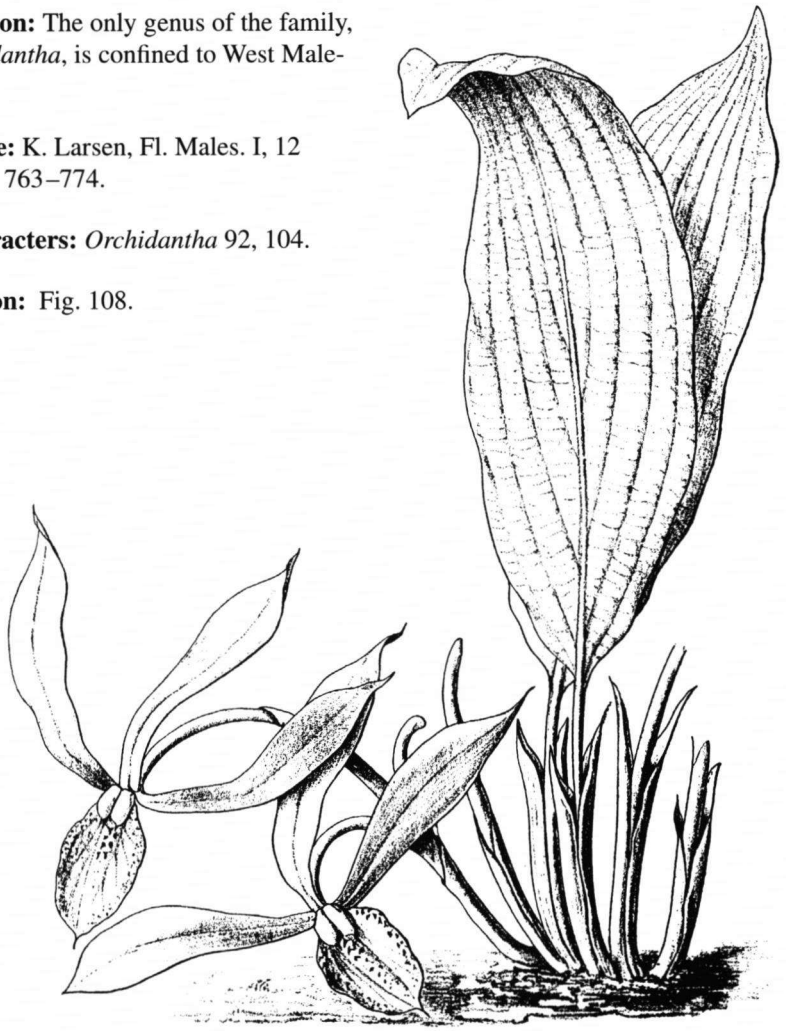

Fig. 108. *Orchidantha maxillarioides* (Ridl.) K. Schum. (Lowiaceae). Flowering plant.

Reproduced from Flora Malesiana I, 12 (1996) 773 / Pflanzenreich IV.45.

MALPIGHIACEAE

Always: Woody; leaves simple, opposite, balance (T) hairs; sepals 5; petals 5, free; stamens 10; ovary superior.

Usually/often: Climbing; leaves entire, stipulate, glands on petiole, lamina or calyx; petals unguiculate; styles 3; fruit winged.

Striking features: Shrub, fruit not winged (*Brachylophon*).

Different from: Climbing *Verbenaceae:* gamosepalous, gamopetalous. — Climbing *Combretaceae:* exstipulate, no glands, ovary inferior.

Distribution: The family pantropical. In Malesia 5 native genera, incl.:
- *Hiptage* (Indo-Malesia), mostly open places, lowland;
- *Rhyssopterys* (New Caledonia to East Malesia and Taiwan), rain forest (edges), lowland.

Notes: Ornamental plants: *Malpighia**, *Tristellateia.* — Edible fruits: *Malpighia glabra**.

Literature: M. Jacobs, Fl. Males. I, 5 (1954) 125–145.

Spot-characters: *Malpighiaceae* 28 – *Aspidopteris* 5, 6, 23, 98 – *Brachylophon* 99 – *Hiptage* 5, 6, 31, 81, 98 – *Malpighia* 12, 81 – *Rhyssopterys* 5, 6, 31, 85, 98 – *Tristellateia* 5, 6, 31, 98.

Illustration: Fig. 109.

Fig. 109. *Rhyssopterys tiliaefolia* (Vent.) Juss. (Malpighiaceae). a. Flowering branch, left beneath with very young fruits; b. hermaphrodite flower; c. the same, showing calyx and styles; d. two fully developed samaras, attached to their carpophores, and an abortive one; e. cordate leaf.

Reproduced from Flora Malesiana I, 5 (1955) 141, fig. 12a–c, e, f.

MARANTACEAE

Always: Rhizomatous non-aromatic herbs; leaves simple, entire, 2-ranked, petioles sheathing at base and swollen apically; flowers bisexual, zygomorphic, perianth in 3 rows of 3, unequal, more of less free; stamens petaloid, the inner one with a 1-locular anther; ovary inferior, 3-locular; fruit a capsule.

Usually/often: Leaves crowded, fruits few-seeded, arillate.

Different from: *Zingiberaceae:* aromatic, anthers 2-locular, calyx tubular.

Distribution: A pantropical family; in Malesia 7 genera, incl.:
- *Cominsia* (East Malesia, Melanesia, Australia), robust herbs, rain forest;
- *Donax* (Southeast Asia–Pacific), robust herbs, rain forest, wet places;
- *Phrynium* (Southeast Asia, Malesia), herbs, floor of rain forest.

Notes: Several exotic species are cultivated as ornamentals, a few local species are (potential) ornamentals. — *Maranta** produces flour.

Literature: R.E. Holttum, Gard. Bull. Sing. 13 (1951) 254–296; H. Kennedy, Kew Bull. 41 (1985) 725–731.

Spot-characters: *Marantaceae* 92, 104 – *Cominsia* 38 – *Halopegia* 38 – *Maranta* 38 – *Monophrynium* 38 – *Phacelophrynium* 38 – *Phrynium* 38, 76 – *Schumannianthus* 38 – *Stachyphrynium* 38.

Illustrations: Fig. 110 & 111.

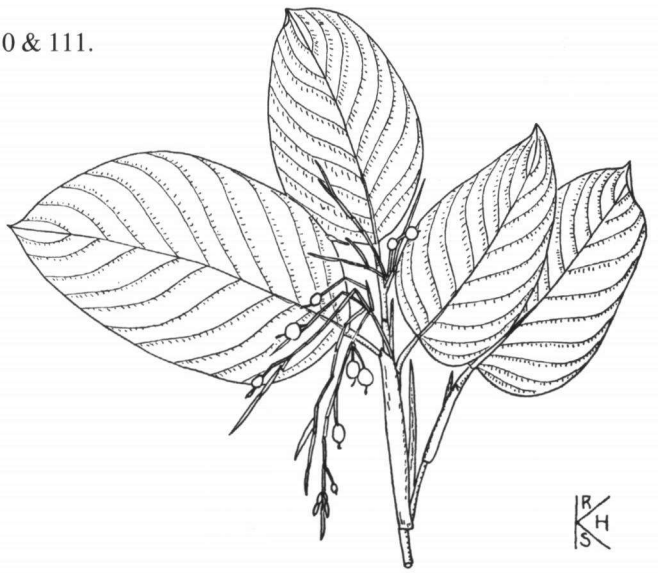

Fig. 110. *Donax cannaeformis* (G. Forst.) K. Schum. (*Donax grandis* (Miq.) Ridl.) (Marantaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 194. With kind permission of Prof. and Mrs. Keng.

Fig. 111. *Stachyphrynium griffithii* (Bak.) K. Schum. (Marantaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 130. With kind permission from the Malaysian Nature Society.

MENISPERMACEAE

Always: Dioecious; leaves simple, spiral, exstipulate; apocarpous, drupe 1-seeded; endocarp variously ornamented.

Usually/often: Woody climbers; leaves palminerved, entire, petiole thickened apically (bipulvinate); flowers 3-merous; inflorescence extra-axillary, often cauliflorous; seed horseshoe-shaped.

Striking features: Erect shrubs (*Cocculus laurifolius*); wood yellow (*Arcangelisia, Coscinium, Fibraurea*); stem tuberculate (*Tinospora crispa*); white latex (*Fibraurea, Tinomiscium*); leaves penninerved (*Albertisia, Carronia, Macrococculus, Pycnarrhena*); the leaves finely striate above (*Tinomiscium*); the inflorescence with large accrescent bracts (*Cissampelos*); leaves peltate + inflorescence umbelliform (*Stephania*).

Different from: *Aristolochiaceae:* leaves withering away on the stem, leaving no scar. — *Cucurbitaceae* and *Passifloraceae:* tendril bearing. — Climbing *Icacinaceae:* petiole without swollen ends, tendril-bearing or leaves opposite. — *Dioscoreaceae:* underground rhizome, petiole not thickened, fruits usually winged.

Distribution: The family pantropical, a few species extra-tropical. In Malesia 25 genera, incl.:
- *Albertisia* (paleotropical), robust lianas; lowland rain forest;
- *Fibraurea* (Indo-Malesia), woody climbers; seasonal forest, primary and secondary lowland rain forest;
- *Limacia* (Indo-Malesia), woody climbers; primary and secondary lowland forest;
- *Stephania* (paleotropical), slender climbers; primary and secondary lowland and montane forest;
- *Tinospora* (paleotropical), woody climbers; seasonal and everwet forest, mainly lowland.

Notes: Most Malesian species are climbers of primary lowland rain forest, some species occur in montane, seasonal and secondary forest. The fruits of some species are eaten by birds and mammals. Many species contain alkaloids and are used medicinally: *Fibraurea, Stephania, Tinomiscium, Tinospora.* — Crushed leaves of *Cyclea barbata* and *Stephania capitata* yield 'cincau' (vegetable jelly used in cool drinks).

Literature: L.L. Forman, Fl. Males. I, 10 (1986) 157–253.

Spot-characters: *Menispermaceae* 5, 30, 58, 79, 83, 91 – *Albertisia* 38 – *Anamirta* 38, 70 – *Arcangelisia* 38, 70, 105 – *Carronia* 38, 78 – *Chlaenandra* 38, 70, 95 – *Cissampelos* 51 – *Cocculus laurifolius* 64; *C. orbiculatus* 81 – *Coscinium* 38, 51, 70 – *Cyclea* 51, 70 – *Diploclisia* 19, 51, 70, 78 – *Fibraurea* 19, 38, 78 – *Haematocarpus*70 – *Hypserpa* 38 – *Legnephora* 38 – *Limacia* 38 – *Macrococculus* 38, 70 –

Pachygone 38 – *Parabaena* 95 – *Pericampylus* 38 – *Pycnarrhena* 38 – *Sarcopetalum* 38, 51, 70 – *Stephania* 38, 51, 70; *S. venosa* 21 – *Tiliacora* 70, 105 – *Tinomiscium* 19, 38, 70, 78 – *Tinospora* 105.

Illustrations: Fig. 112–115.

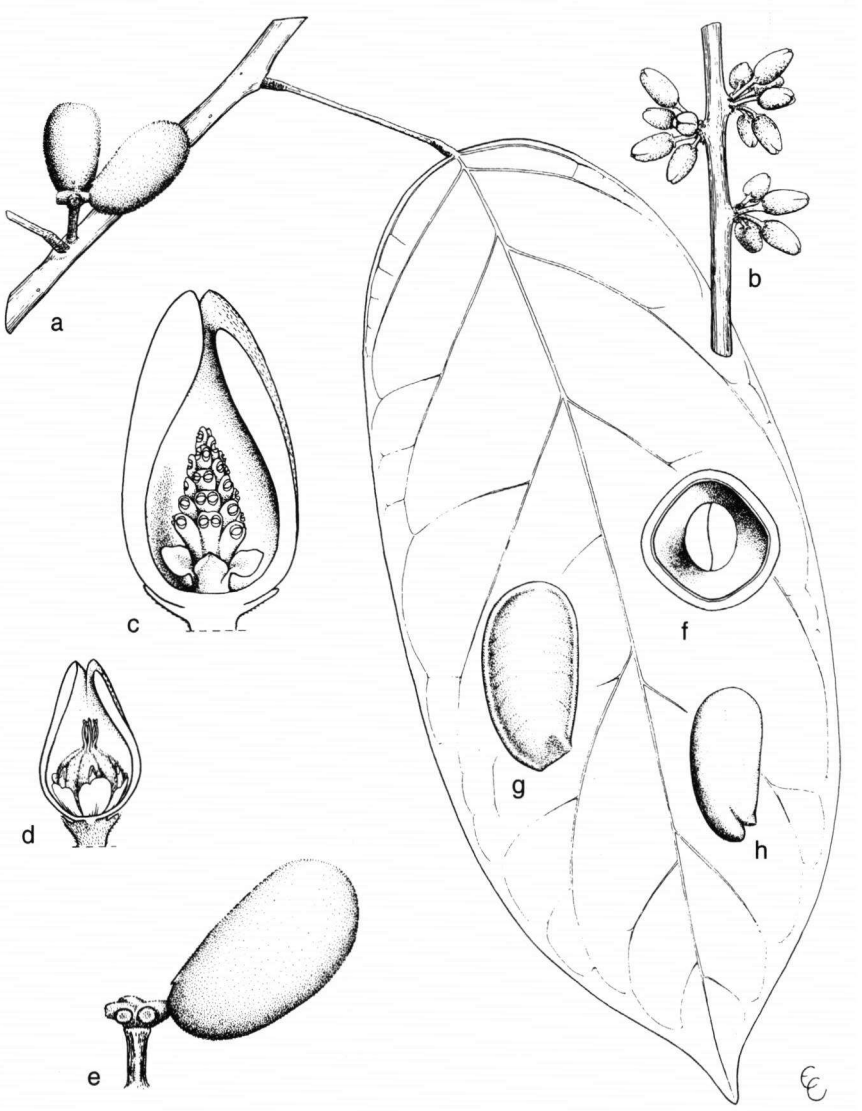

Fig. 112. *Albertisia papuana* Becc. (Menispermaceae). a. Habit with infructescence; b. male inflorescences, both × 0.66; c. male flower and d female flower with half of inner calyx removed, × 4; e. drupe on carpophore, f. TS of drupe, g. endocarp, h. seed, all × 1.

Reproduced from Flora Malesiana I, 10 (1986) 180, fig. 2a–h.

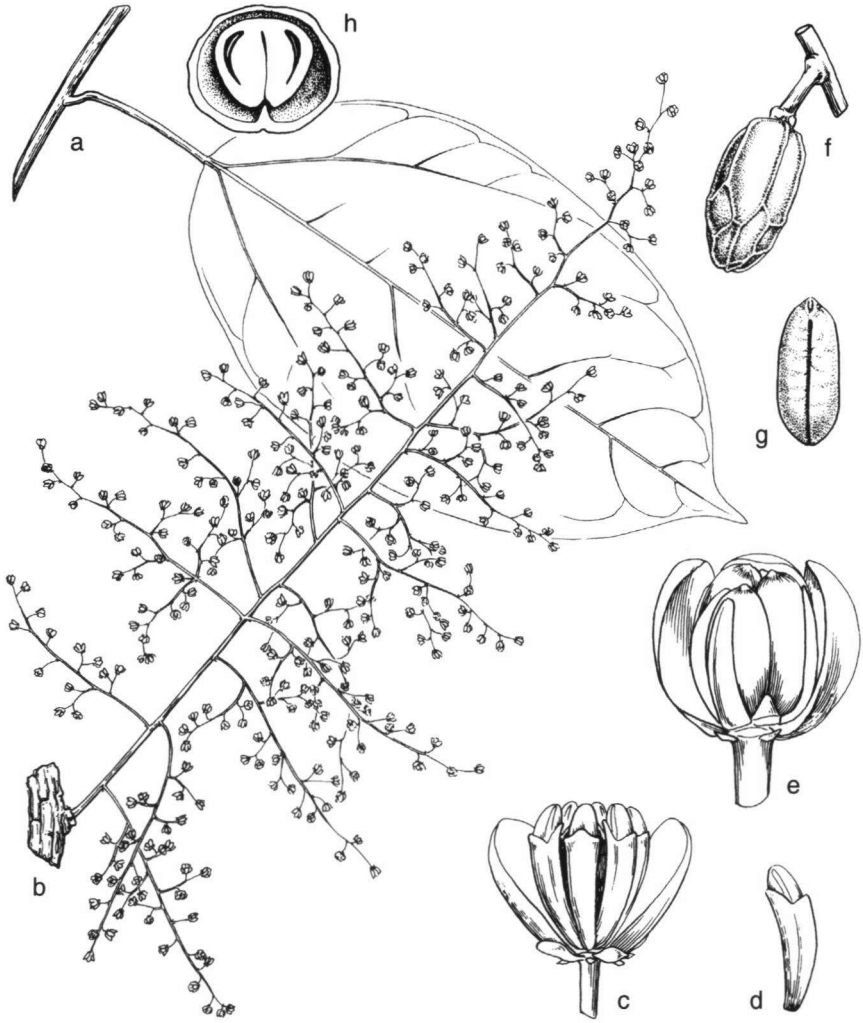

Fig. 113. *Fibraurea tinctoria* Lour. (Menispermaceae). a. Leaf; b. male inflorescence, both × 0.66; c. male flower, front sepals removed; d. stamen, side view, both × 10; e. female flower, front sepals and staminode removed, × 6; f. drupe; g. endocarp, both × 0.66; h. TS of endocarp, × 1.5.

Reproduced from Flora Malesiana I, 10 (1986) 208, fig. 9a–h.

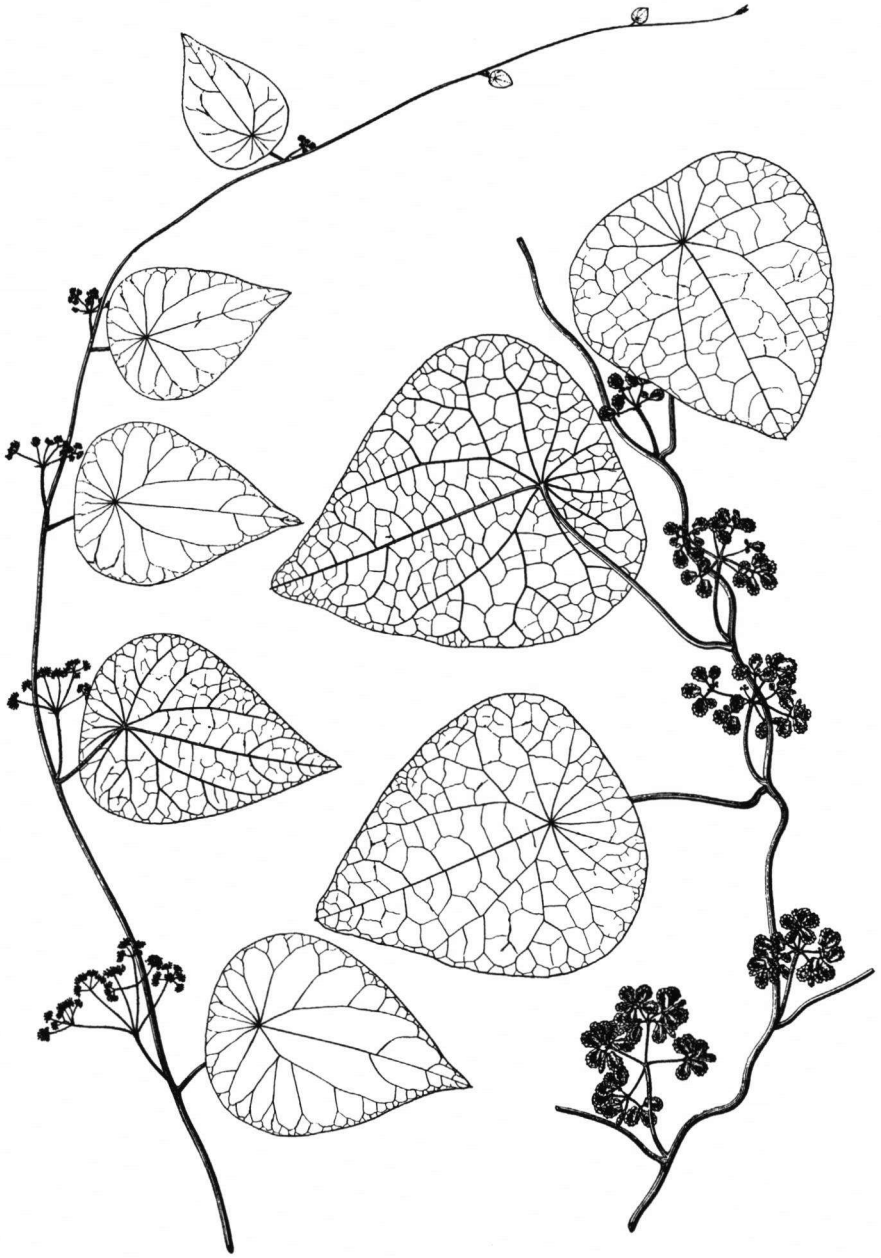

Fig. 114. *Stephania japonica* (Thunb.) Miers (Menispermaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 9 (1936) t. 258.

Fig. 115. *Tinomiscium petiolare* Miers (Menispermaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 19. With kind permission of the Prof. and Mrs. Keng.

MENYANTHACEAE

Always: Aquatic herbs; leaves simple, entire, spiral, exstipulate; flowers bisexual, actinomorphic; calyx and corolla tubular, lobes valvate; ovary superior, 1-locular, placentation parietal.

Usually/often: Floating leaves peltate, corolla lobes long hairy.

Different from: *Gentianaceae:* terrestrial plants, leaves opposite, corolla lobes contorted.

Distribution: The family worldwide. In Malesia 2 genera, incl.:
– *Nymphoides* (*Limnanthemum*), widespread in lowland.

Notes: Some species are (potential) ornamentals. The family is often united with *Gentianaceae*.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 441; H. Aston in Leach and Osborne, Freshwater Plants PNG (1985) 180–185.

Spot-characters: *Nymphoides* 51, 81.

Illustration: Fig. 116.

Fig. 116. *Nymphoides (Limnanthemum) indica* (L.) O. Kuntze (Menyanthaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 307. With kind permission of the Malaysian Nature Society.

MUSACEAE

Always: Robust non-aromatic herbs; leaves simple, huge, spiral, rolled up lengthwise in bud, the leaf bases forming a fleshy pseudotrunk; 5 stamens, 1 staminode; ovary inferior, 3-locular.

Usually/often: Flowers mostly unisexual; fruit a many-seeded berry or fleshy capsule.

Different from: *Strelitziaceae:* leaves in two rows. — *Zingiberaceae:* aromatic, 1 stamen.

Distribution: *Musaceae* s. s. are confined to the Old World. In Malesia 2 genera, incl. *Musa*, with several species some of which are cultivated.

Notes: Cultivated forms with edible fruits derived from several species; the closed inflorescence and young leaf sheaths of some species are eaten as a vegetable. The leaves are often used to wrap food, some species are planted as ornamentals. One species produces fibres. *Heliconia* and *Ravenala* are here treated under *Strelitziaceae*.

Literature: C. A. Backer & R. C. Bakhuizen van den Brink, Fl. Java 3 (1968) 35–38; R.M. Stover & N.W. Simmonds, The evolution of the bananas, Ed. 3, Longmans, Singapore (1995) 468 pp.

Spot-characters: *Musaceae* 92, 104. – *Musa* 3, 67, 78.

Illustrations: Fig. 117 & 118.

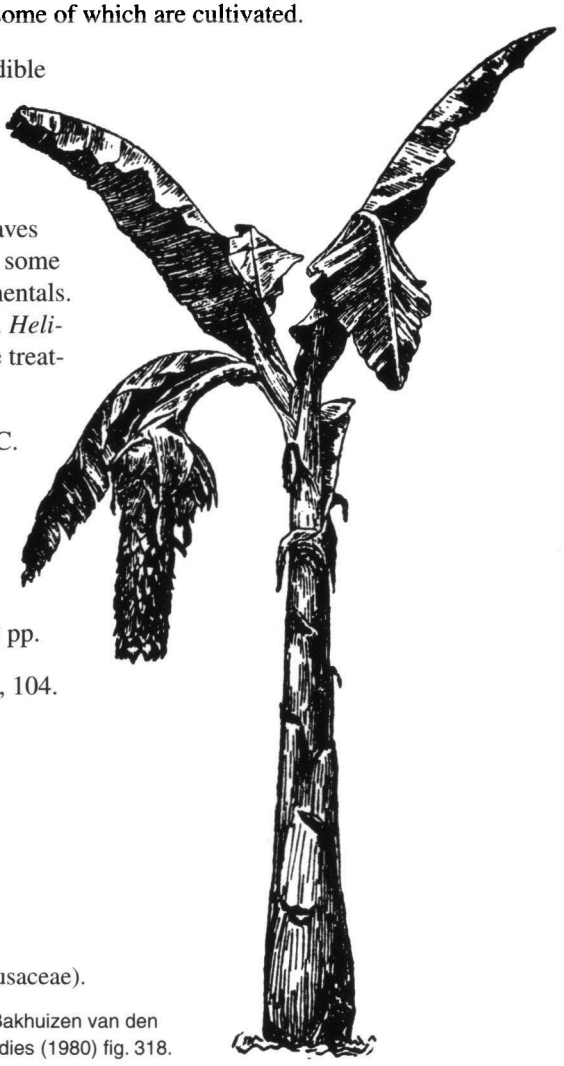

Fig. 117. *Musa glauca* Roxb. (Musaceae).

Reproduced from J. J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 318.

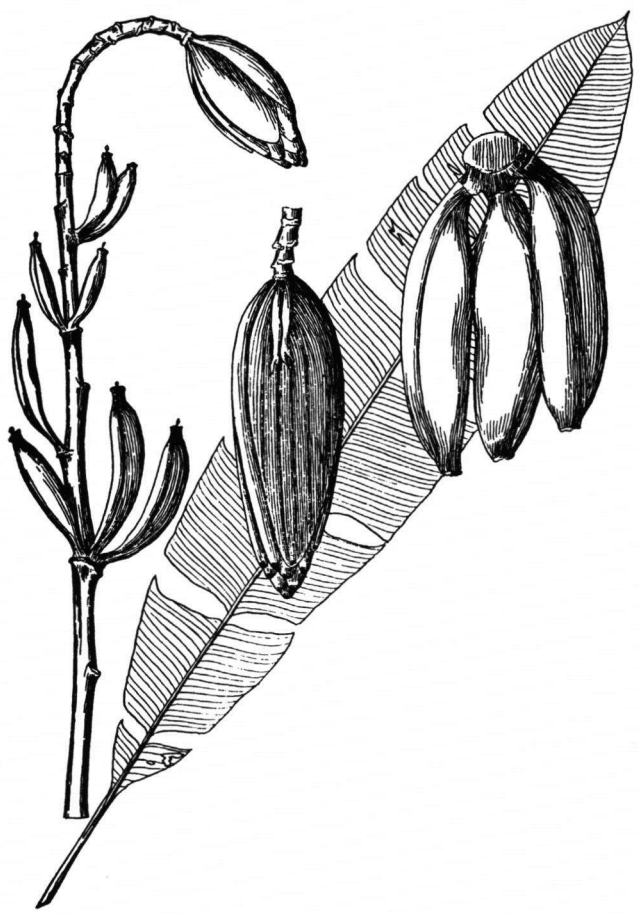

Fig. 118. *Musa salaccensis* Zoll. (Musaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 320.

MYOPORACEAE

Always: Woody, stems terete; leaves simple, penninerved, exstipulate; flowers bisexual, 5-merous, a few together in axils of leaves, corolla tubular; stamens inserted on the tube; ovary superior.

Usually/often: Leaves spiral, flowers zygomorphic, stamens 4, fruit a ridged drupe.

Different from: *Scrophulariaceae:* leaves usually opposite, fruit a capsule. — *Verbenaceae:* leaves usually opposite, stems quadrangular, flowers in compound inflorescence.

Distribution: The family is best represented in Australia. In Malesia only *Myoporum papuanum*, a shrub of open places in savannah and near the coast.

Literature: S. Bloembergen, Fl. Males. I, 4 (1951) 265–266.

Spot-characters: *Myoporum* 59, 99.

Illustration: Fig. 119.

Fig. 119. *Myoporum papuanum* Kraenzl. (Myoporaceae). Flowering twig; flowers enlarged.

Reproduced from Flora Malesiana I, 4 (1951) 265, fig. 1.

NAJADACEAE

Always: Slender, submerged herbs; leaves simple, linear, whorled, sheathing, spiny dentate; male flower with 1 anther enclosed in a tubular perianth, female flower naked, ovary superior with one basal ovule.

Usually/often: Plants monoecious, flowers solitary.

Different from: *Ceratophyllaceae:* leaves dissected, not sheathing. — *Potamogetonaceae:* flowers usually in spikes, bisexual, ovule apical or parietal.

Distribution: The only genus of the family, *Najas*, is widespread; in Malesia 8 species.

Literature: W.J.J.O de Wilde, Fl. Males. I, 6 (1962) 157–171; L. Triest, Ac. R. Sc. d'Outremer Cl. Sc. Nat. & Med., Nouv. Sér. T 22, fasc. 1 (1988).

Spot-characters: *Najas* 46.

Illustration: Fig. 120.

Fig. 120. *Najas tenuifolia* R.Br. subsp. *pseudograminea* (Koch) W.J. de Wilde var. *pseudograminea* (Najadaceae). Habit, arrows pointing to one open and two closed male flowers, respectively.

Reproduced from Flora Malesiana I, 6 (1962) 159, fig. 1a.

NEPENTHACEAE

Always: Leaves simple, spiral, consisting of blade (phyllodium), tendril, pitcher and lid, exstipulate; flowers unisexual, actinomorphic, tepals 3–6, ovary superior, fruit a capsule with numerous tiny seeds.

Usually/often: Climbing, stems more or less woody.

Different from: *Flagellaria:* no pitchers.

Distribution: The only genus *Nepenthes* occurs from Madagascar through the Seychelles and tropical Asia and Malesia to New Caledonia and Australia, Borneo is richest in species (Phillips & Lamb, 1996).

Notes: One of the few insectivorous plants of Malesia; often found in places with soils poor in nutrients. Some species are (potential) ornamentals.

Literature: B.H. Danser, Bull. Jard. Bot. Buitenzorg III, 9 (1928) 249–438; A. Phillips & A. Lamb, Pitcher-plants of Borneo, Kota Kinabalu (1996); M. Cheek & M. Jebb, Fl. Males. I, 15 (2001) 1–162.

Spot characters: *Nepenthes* 4, 66; *N. bicalcarata* 9.

Illustration: Fig. 121.

Fig. 121. *Nepenthes gracillima* Ridl. (Nepenthaceae). Stem with upper pitcher and rosette stem with lower pitcher; male inflorescence; infructescence.

Reproduced from Flora Malesiana I, 15 (2001) 71, fig. 8a, b, g, h.

NYMPHAEACEAE (CABOMBACEAE, NELUMBONACEAE)

Always: Herbaceous, rhizomatous, latificerous water plants; leaves simple, alternate, exstipulate; flowers simple, actinomorphic, sepals 4–6 free, petals many free, stamens numerous; fruit a spongy berry.

Usually/often: Leaves peltate on long petioles, leaf blade on or below water surface.

Different from: *Menyanthaceae:* calyx and corolla tubular, stamens 4–5.

Striking features: Leaf blade above water (*Nelumbo*).

Distribution: The family worldwide; in Malesia 4 genera, incl.:
- *Hydrostemma*, mostly in streams;
- *Nymphaea*, ponds and other stagnant water, often cultivated.

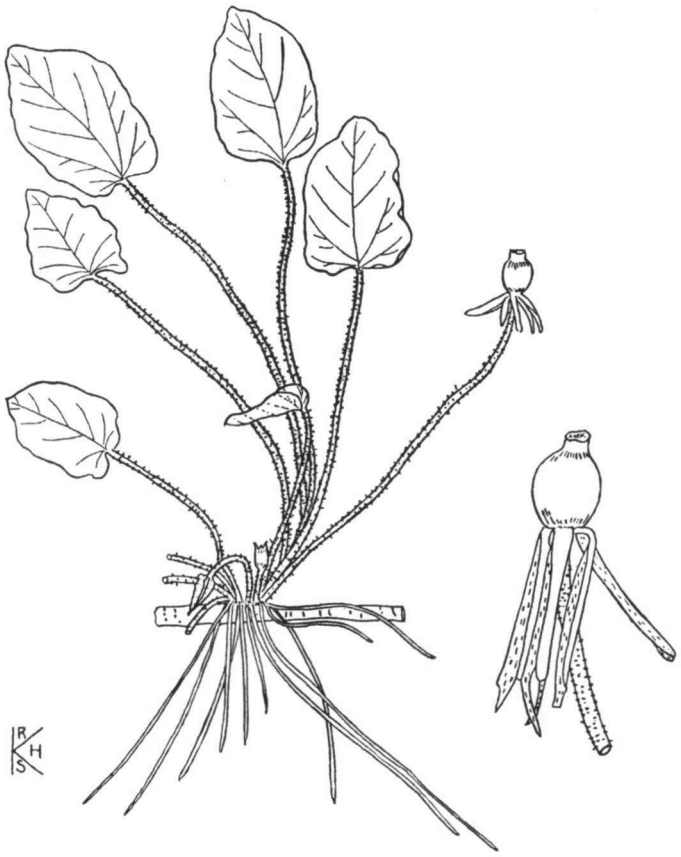

Fig. 122. *Hydrostemma (Barclaya) kunstleri* Ridl. (Nymphaeaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 21. With kind permission of Prof. and Mrs. Keng.

Notes: *Nelumbo* is often regarded as a separate family. Many species are planted as ornamentals; rootstock and seeds of *Nelumbo* are edible.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 1 (1963) 147–149; B.J. Conn in Leach & Osborne, Freshwater Plants PNG (1985) 191–201.

Spot-characters: *Nymphaeaceae* 19, 92 – *Brasenia* 46, 51 – *Hydrostemma* (*Barclaya*) 51, 52 – *Nelumbo* 51– *Nymphaea* 51.

Illustrations: Fig. 122 & 123.

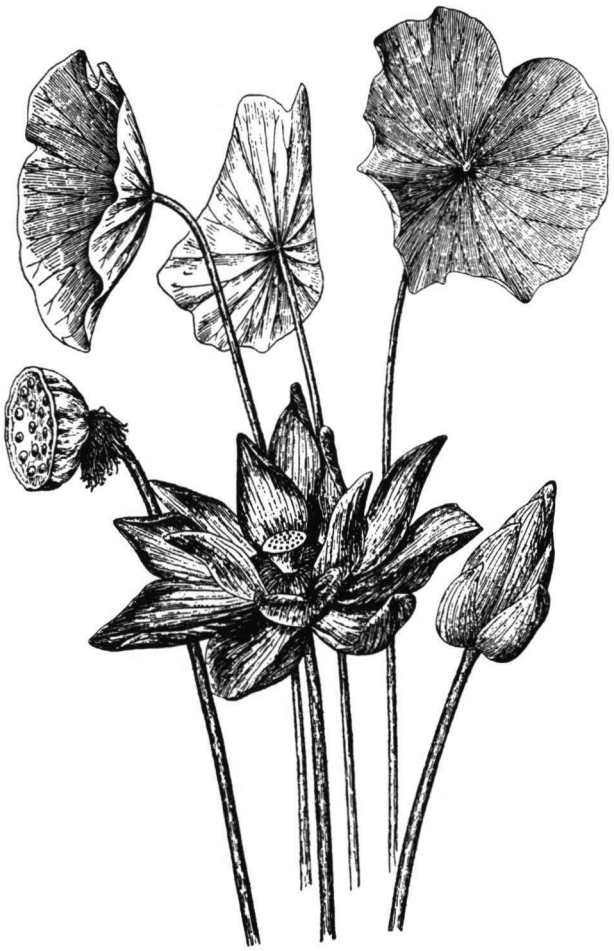

Fig. 123. *Nelumbo nucifera* Gaertn. (Nymphaeaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 334.

ONAGRACEAE (OENOTHERACEAE)

Always: Leaves simple, stipules minute or absent, flowers hermaphrodite, ovary inferior, fruit capsular, seeds numerous.

Usually/often: Herbaceous, leaves spiral, flowers 4-merous, stamens iso- or dimerous.

Striking features: Leaves partly opposite, seeds comose (*Epilobium*); plants with spongy white roots (*Ludwigia adscendens*).

Distribution: The family worldwide. Native genera in Malesia:
- *Epilobium* (worldwide), in Malesia chiefly alpine;
- *Ludwigia* (worldwide), lowland, mostly marshy habitats.

Notes: Several species of *Fuchsia** are planted as ornamentals.

Literature: P.H. Raven, Fl. Males. I, 8 (1977) 98–113.

Spot-characters: *Onagraceae* 79, 83, 92 – *Ludwigia octovalvis* 69.

Illustrations: Fig. 124–126.

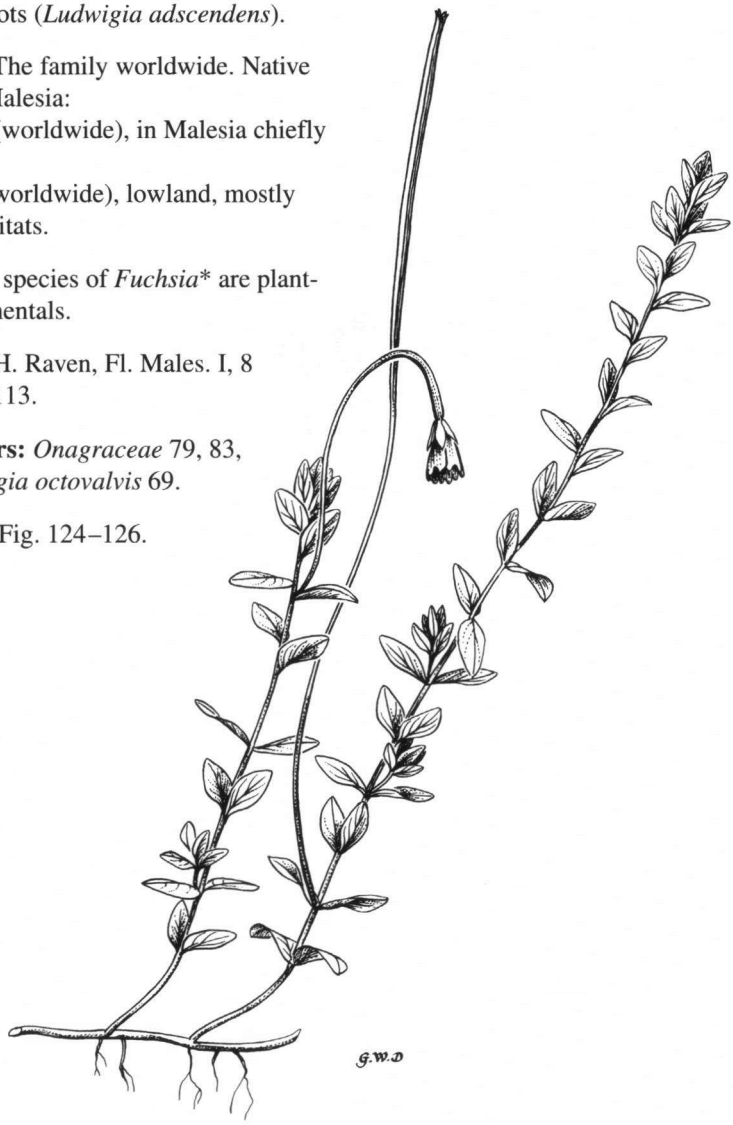

Fig. 124. *Epilobium hooglandii* Raven (Onagraceae). Habit.

Reproduced from Blumea 15 (1967) 276, fig. 2a.

Fig. 125. *Ludwigia hyssopifolia* (G. Don) Exell (Onagraceae). Habit in flower.

Reproduced from Flora Malesiana I, 8 (1977) 105.

Fig. 126. *Ludwigia repens* (L.) Sw. (Onagraceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 14 (1940) t. 443.

ORCHIDACEAE (incl. APOSTASIACEAE)

(A. Schuiteman)

Always: Sympodial or monopodial herbs, leaves simple; flowers perfect, zygomorphic, 3-merous (seemingly 5-merous in some genera with connate lateral sepals: *Acriopsis, Paphiopedilum*); stamen adnate to the pistil, forming a compound structure (column); pollen coherent in small waxy or granular bodies of definite shape and size (pollinia), rarely gel- or powder-like; ovary inferior; seeds numerous, minute, lacking endosperm.

Usually/often: Epiphytes, leaves leathery, stems green, very fleshy or bulbously swollen (pseudobulbs), roots with a layer of water-absorbing dead cells, often white when dry (velamen); flowers resupinate, median petal (lip) very different (in shape, size, and/or coloration) from the lateral petals; fertile stamen(s) 1, rarely 2 or 3; fruit a dry capsule splitting lengthways, with dust-like seed.

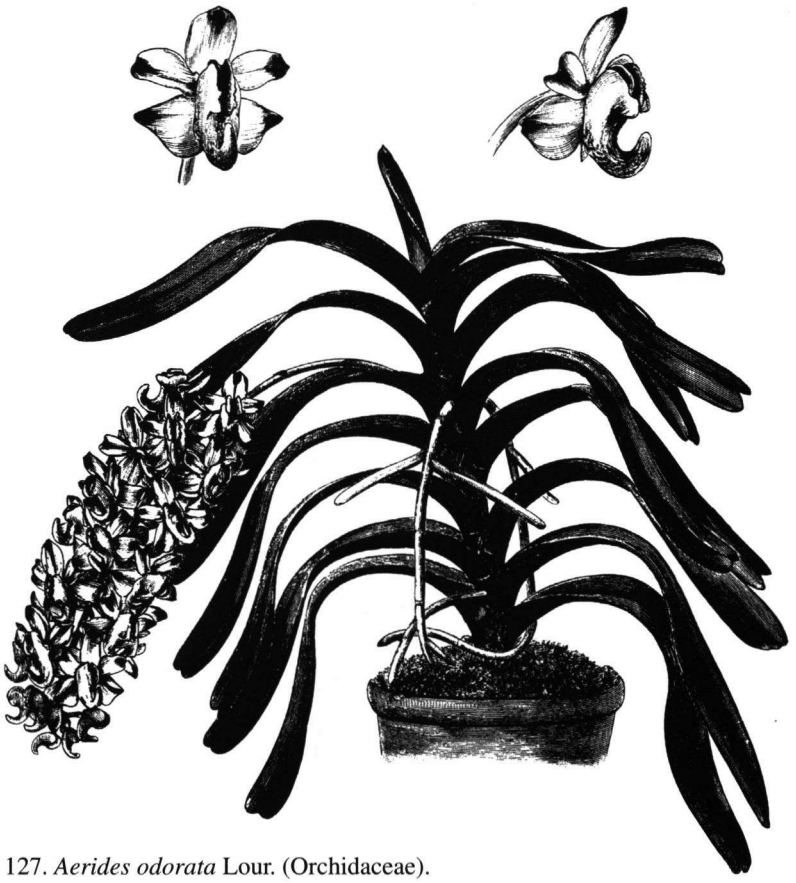

Fig. 127. *Aerides odorata* Lour. (Orchidaceae).

Reproduced from J. Veitch, A manual of Orchidaceous plants (1891) fig. 7, opposite p. 81.

Fig. 128. *Apostasia odorata* Blume (Orchidaceae). Habit; enlarged flower.

Reproduced from Blumea 17 (1969) 342, fig. 12a, b.

(Orchidaceae continued)

Striking features: Leaves laterally flattened: *Bromheadia, Ceratochilus, Dendrobium* pp, *Eria* pp, *Hippeophyllum, Jejewoodia, Microsaccus, Oberonia, Octarrhena, Phreatia* pp, *Podochilus* pp. – Leaves terete: *Bulbophyllum* pp, *Ceratostylis* pp, *Cleisocentron* pp, *Cleisostoma* pp, *Cordiglottis, Dendrobium* pp, *Dendrochilum* pp, *Eria* pp, *Glomera* pp, *Luisia, Microtis, Octarrhena* pp, *Papilionanthe, Paraphalaenopsis, Phragmorchis, Rhynchogyna, Schoenorchis* pp, *Thrixspermum* pp. – Leaves or leaf-sheaths conspicuously hairy: *Calanthe* pp, *Dendrobium* pp, *Glomera* pp, *Nervilia* pp, *Pilophyllum, Plocoglottis* pp, *Trichotosia*. – Leaves with silvery, pink, or golden veins ('Jewel orchids'): *Anoectochilus* pp, *Corybas* pp, *Dossinia, Goodyera* pp, *Ludisia, Macodes, Myrmechis* pp, *Papuaea, Rhomboda, Vrydagzynea* pp. – Leafless terrestrials without chlorophyll ('saprophytes', in fact parasites on fungi): *Aphyllorchis, Corybas* pp, *Cyrtosia, Cystorchis* pp, *Didymoplexiella, Didymoplexis, Dipodium* pp, *Epipogium, Erythrorchis, Eulophia* pp, *Galeola, Gastrodia, Lecanorchis, Neoclemensia, Platanthera* pp, *Pseudovanilla, Silvorchis, Stereosandra, Tropidia* pp. – Leafless epiphytes: *Chiloschista, Microtatorchis* pp, *Taeniophyllum*. – Large, showy flowers: *Acanthephippium, Amesiella, Arachnis, Armodorum, Arundina, Bromheadia* pp, *Bulbophyllum* pp, *Calanthe* pp, *Chelonistele* pp, *Coelogyne* pp, *Cymbidium* pp, *Dendrobium* pp, *Dilochia* pp, *Dimorphorchis, Diplocaulobium* pp, *Dipodium* pp, *Epigeneium* pp, *Grammatophyllum, Gynoglottis* pp, *Paphiopedilum, Papilionanthe, Paraphalaenopsis, Pecteilis, Phaius* pp, *Phalaenopsis* pp, *Pteroceras* pp, *Renanthera* pp, *Rhynchostylis, Spathoglottis, Tainia* pp, *Thrixspermum* pp, *Thunia, Trichoglottis* pp, *Vanda, Vandopsis, Vanilla* pp. – Sepals connate: *Acanthephippium, Acriopsis, Appendicula, Bracisepalum, Bulbophyllum* pp, *Cadetia* pp, *Ceratostylis* pp, *Cheirostylis, Corybas* pp, *Dendrobium* pp, *Didymoplexiella, Didymoplexis, Gastrodia, Glomera, Mediocalcar, Microtatorchis, Myrmechis* pp, *Neoclemensia, Octarrhena* pp, *Paphiopedilum, Podochilus, Porpax, Pristiglottis* pp, *Pterostylis, Taeniophyllum* pp, *Tropidia* pp, *Vexillabium*. – Climbing stems (s), or very long climbing rhizomes (r): *Arachnis* (s) pp, *Bulbophyllum* (r) pp, *Claderia* (r), *Coelogyne* (r) pp, *Dendrobium* (s) pp, *Dipodium* (s) pp, *Epigeneium* (r) pp, *Eria* (r) pp, *Erythrorchis* (s), *Galeola* (s), *Glomera* (s) pp, *Mediocalcar* (r) pp, *Micropera* (s) pp, *Pseuderia* (s), *Pseudovanilla* (s), *Renanthera* (s) pp, *Vanilla* (s). – Dimorphic flowers: *Bulbophyllum mirabile, Dimorphorchis, Grammatophyllum* pp.

Different from: *Amaryllidaceae:* orchids never possess tunicate bulbs, never have more than 3 anthers, filament of anthers in orchids always adnate to the pistil (rarely so in *Amaryllidaceae*), orchid flowers are never truly actinomorphic, orchid seeds lack endosperm. — *Burmanniaceae:* orchid flowers are never completely sympetalous: at least the lip is free from the petals; orchid inflorescences are not bifurcate. — *Corsiaceae:* orchids never have 6 stamens. — *Hypoxidaceae:* orchids never have 6 stamens and truly actinomorphic flowers; no tristichous phyllotaxy in orchids; orchid seeds lack endosperm. — *Zingiberaceae:* orchid plants are not aromatic; in *Zingiberaceae* the lip is formed by two connate sterile stamens, not by the median corolla lobe as in orchids; in *Zingiberaceae* there is in addition to the lip a 3-lobed corolla and a tubular, usually 3-lobed calyx; orchid seeds lack endosperm.

Fig. 129. *Bulbophyllum callichroma* Schltr. (Orchidaceae).

Reproduced from Orchid Monographs 7 (1993) 228, fig. 51a.

(Orchidaceae continued)

Distribution: The family is cosmopolitan. In Malesia about 210 genera, including:

- *Agrostophyllum* (Asia, Indo-Malesia, Pacific), epiphytes, inflorescences very short in dense terminal clusters, leaf-sheaths with blackish margins;
- *Apostasia* (Asia, Indo-Malesia, Pacific), terrestrials, 2 fertile anthers, lip similar to petals;
- *Appendicula* (Asia, Indo-Australia, Pacific), epiphytes, small flowers, 6 pollinia;
- *Arundina* (Asia, Malesia) terrestrial, reed-like stems, *Cattleya*-like flowers appearing in succession;
- *Bromheadia* (Asia, Indo-Australia), terrestrials and epiphytes, inflorescences terminal, with dense distichous bracts, flowers successive, ephemeral;
- *Bulbophyllum* (pantropical), epiphytes, 1- or rarely 2-leaved pseudobulbs, basal inflorescences, mainly fly-pollination syndrome, largest genus in Malesia (> 800 species);
- *Calanthe* (pantropical), terrestrials, spurred flowers, lip adnate to column, all parts becoming bluish when bruised;
- *Ceratostylis* (Asia, Indo-Malesia, Pacific), epiphytes, often rush-like habit;
- *Cleisostoma* (Asia, Indo-Australia, Pacific), epiphytes, monopodial, small spurred flowers, the spur almost blocked by an internal callus;
- *Coelogyne* (Asia, Indo-Malesia, Pacific), epiphytes, showy flowers, lip with erect side-lobes, flattened column;
- *Corybas* (Asia, Indo-Australia, Pacific), terrestrials, dwarf plants with one cordate leaf and one helmet-shaped flower;
- *Cymbidium* (Asia, Indo-Australia), epiphytes, pseudobulbs or stems with few to several sheathing leaves, lip with erect side-lobes;
- *Dendrobium* (Asia, Indo-Australia, Pacific), epiphytes, extremely diverse genus, inflorescences arising from upper half of the stem, pollinia 4, oblong, in two pairs, second largest genus in Malesia (> 700 species);
- *Dendrochilum* (Indo-Malesia), epiphytes, 1-leaved pseudobulbs, racemes of small flowers which are arranged in two ranks;
- *Dipodium* (Asia, Indo-Australia, Pacific), terrestrials, leaves distichous, strap-shaped, stem often climbing, sometimes plant leafless and not scandent; fairly large spotted flowers;
- *Epigeneium* (Asia, West Malesia), epiphytes, long rhizomes, 1- or 2-leaved pseudobulbs, terminal, few-flowered inflorescences, pollinia as in *Dendrobium*;
- *Eria* (Asia, Indo-Australia, Pacific), epiphytes, roots often thin, brown, and hairy, flowers with distinct column-foot, pollinia 8;
- *Flickingeria* (Asia, Indo-Malesia, Pacific), epiphytes with erect, branching rhizomes, short, 1-flowered inflorescences, pollinia as in *Dendrobium*;
- *Galeola* (Indo-Malesia), lianas, lacking leaves and chlorophyll;
- *Gastrodia* (Asia, Indo-Australia, Pacific), terrestrials, lacking leaves and chlorophyll, sepals and petals connate;
- *Glomera* (Malesia, Pacific), epiphytes or terrestrials, inflorescence a head-like terminal raceme, apex of lip often red or black;

(Orchidaceae continued)

- *Goodyera* (circumboreal, Asia, Indo-Australia, Pacific), terrestrials, fleshy rhizome, lip papillose-hairy inside at the base;
- *Grammatophyllum* (Indo-Malesia), epiphytes, large to enormous pseudobulbs, big spotted flowers;
- *Habenaria* (Pantropical), terrestrial, flowers white or green, lip spurred, pollinia 2;
- *Liparis* (cosmopolitan), epiphytes or terrestrials, terminal racemes of small flowers, lip geniculate;
- *Macodes* (Malesia), mainly terrestrial, leaves with silvery or golden reticulate veins, flowers strongly asymmetric;

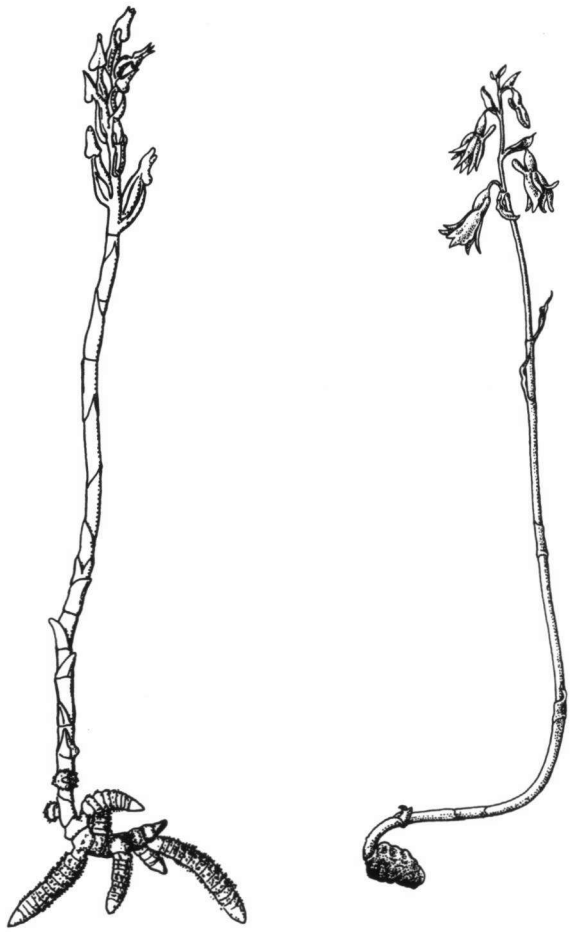

Fig. 130. *Cystorchis aphylla* Ridl. (left) and *Epipogium roseum* (D. Don) Lindl. (right) (Orchidaceae).

Reproduced from H. Burgeff, Saprophytismus und Symbiose (1932).

- *Malaxis* (cosmopolitan), mainly terrestrial, racemes with small, not resupinate flowers;
- *Nervilia* (Africa, Asia, Indo-Pacific), terrestrial, leaves round, plicate, inflorescences appearing before the leaves;
- *Oberonia* (Africa, Asia, Indo-Pacific), epiphytes, leaves laterally flattened, terminal inflorescences with many minute flowers;
- *Paphiopedilum* (Asia, Malesia), terrestrial or sometimes epiphytic, flowers large, lip slipper-shaped;
- *Phalaenopsis* (Asia, Malesia, Australia), epiphytes, short monopodial stem, broad leaves, showy flowers;
- *Spathoglottis* (Asia, Indo-Pacific), terrestrial, raceme with showy flowers, lip with bilobed callus;

Fig. 131. *Mischobulbum papuanum* (J. J. Sm.) Schltr. (Orchidaceae).

Reproduced from Orchid Monographs 6 (1992) 144, fig. 39a.

(Orchidaceae continued)

- *Taeniophyllum* (Africa, Asia, Indo-Pacific), epiphytes, leafless, spurred flowers;
- *Thrixspermum* (Asia, Indo-Pacific), epiphytes, monopodial, often with prominent distichous bracts;
- *Trichotosia* (Asia, Malesia), mostly epiphytes; leaves usually covered with red-brown or yellow hairs;
- *Vanda* (Asia, Indo-Australia), epiphytes; monopodial, strap-shaped leaves, large showy flowers;
- *Vanilla* (Pantropical), lianas, leaves not sheathing, stem green, with a root at each node.

Fig. 132. *Taeniophylum radiatum* J.J. Sm. (Orchidaceae). Habit; enlarged inflorescence (drawing by J.J. Smith & Darmosoediro).

Reproduced from Bull. Jard. Bot. Buitenzorg III, 6 (1924) t. 21 II a, b.

Notes: This is the largest family in Malesia, with 4300–4900 species (Schuiteman, Fl. Males. Bull. 12 (1999) 273–287). Most are restricted to primary forests, where they may be found from the lowlands up to the timber line, but predominantly in the montane zone (1000–2000 m). The great majority are epiphytes. Individual species tend to be widely distributed, but often occur only sporadically within their area. Many orchids possess highly specialised pollination mechanisms, but our knowledge about the Malesian taxa is extremely scanty. Most of the ornamental species have become scarce due to indiscriminate collecting, especially members of genera like *Paphiopedilum, Phalaenopsis,* and *Vanda.* The main threat to the family as a whole, however, is undoubtedly the destruction of the primary forests. — Very few of the Malesian taxa can be considered useful to man except as ornamentals (beauty is not generally considered a useful property); in the Moluccas and New Guinea species of *Diplocaulobium* and *Dendrobium* furnish a tough yellow fibre, made from strips of the stems, which are widely applied in weaving carrying bags, belts, head bands, etc. Some orchids reputedly possess medicinal or magical properties. The dried fruits of *Vanilla planifolia* are widely used for flavouring cakes and other sweets.

Literature: R.L. Dressler, The Orchids. Natural history and classification (1981); R. Schlechter, The Orchidaceae of German New Guinea (1982); J.B. Comber, Orchids of Java (1990); G. Seidenfaden & J.J. Wood, The Orchids of Peninsular Malaysia and Singapore (1992).

Spot-characters: *Orchidaceae* 81, 92 – *Aphyllorchis* 7 – *Bromheadia* 23 – *Calanthe* 54 – *Chiloschista* 8 – *Corybas* 7 – *Cyrtosia* 7 – *Cystorchis* 7 – *Dendrobium* 24 – *Didymoplexiella* 7 – *Didymoplexis* 7 – *Dipodium scandens* 5 – *Epipogium* 7 – *Erythrorchis* 7 – *Eulophia* 7 – *Galeola* 5 – *Gastrodia* 7 – *Lecanorchis* 7 – *Micropera* 5 – *Microtatorchis* 8 – *Neoclemensia* 7 – *Platanthera* 7 – *Pseuderia* 5 – *Pseudovanilla* 5, 7 – *Renanthera* 5 – *Silvorchis* 7 – *Stereosandra* 7 – *Taeniophyllum* 8 – *Tropidia* 7 – *Vanilla* 5.

Illustrations: Fig. 127–132.

OROBANCHACEAE

Always: Herbaceous echlorophyllose root parasites; leaves scale-like; flowers bisexual, zygomorphic, corolla tubular, stamens 4, ovary superior, placentation parietal.

Different from: *Scrophulariaceae:* plants with chlorophyll, placentation axile.

Distribution: The family is widespread, especially in the northern hemisphere. In Malesia only *Aeginetia* and *Christisonia*, both rare.

Literature: H. Keng, Orders and Families of Malaysian Seed Plants (1978) 276; R. Kiew, Nat. Malays. 14 (1989) 94–95.

Spot-characters: *Aeginetia* 11 – *Christisonia* 11.

Illustration: Fig. 133.

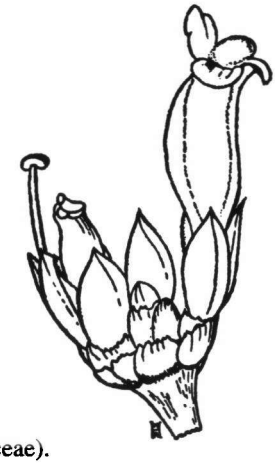

Fig. 133. *Christisonia scortechinii* Prain (Orobanchaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 335. With kind permission of the Malaysian Nature Society.

PAPAVERACEAE*

Always: Laticiferous; leaves simple, spiral, deeply incised, exstipulate; flowers bisexual, actinomorphic; ovary superior, 1-celled.

Usually/often: Herbaceous, petals free, stamens many, seed arillate.

Different from: Confusion with other families unlikely.

Distribution: A mainly northern hemisphere family. In Malesia only introduced species, among others *Argemone mexicana*.

Notes: *Argemone mexicana* is planted as an ornamental. — *Papaver somniferum* produces opium.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 5 (1954) 114–117.

Spot-characters: *Papaveraceae* 19, 83, 104 – *Papaver* 88.

Illustration: Fig. 134.

Fig. 134. *Argemone mexicana* L. (Papaveraceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 9 (1936) t. 260.

PASSIFLORACEAE

Always: Climbers; leaves simple, entire, but sometimes lobed, stipulate; hypanthium cup-shaped or tubular, bearing calyx, corolla and corona, actinomorphic, ovary superior, placentation parietal, seeds arillate.

Usually/often: Leaves spiral, with glands on petiole and base of lamina, axillary tendrils, androgynophore, styles 3, fruit a berry.

Striking features: Leaves opposite (*Passiflora cochinchinensis*); fruit a dehiscent capsule (*Adenia*).

Different from: *Cucurbitaceae:* tendril beside the petiole, ovary inferior. — *Vitaceae:* tendril leaf-opposed, style one, seeds not arillate.

Distribution: Worldwide, best represented in South America, in Malesia 3 genera:
- *Adenia* (paleotropics);
- *Hollrungia* (East Malesia), mostly in lowland primary and secondary rain forest;
- *Passiflora* (Neotropics, Indo-Australia).

Notes: *Paropsia* (*Flacourtiaceae*) is sometimes placed in *Passifloraceae*; several species of introduced *Passiflora* are cultivated for their fruits or as ornamentals.

Literature: W.J.J.O. de Wilde, Fl. Males. I, 7 (1972) 405–434.

Spot-characters: *Passifloraceae* 81, 104 – *Adenia* 4, 31, 64, 82 – *Hollrungia* 4, 18, 31 – *Passiflora* 4, 31, 82; *P. cochinchinensis* 6, 45; *P. quadrangularis* 15.

Illustration: Fig. 135.

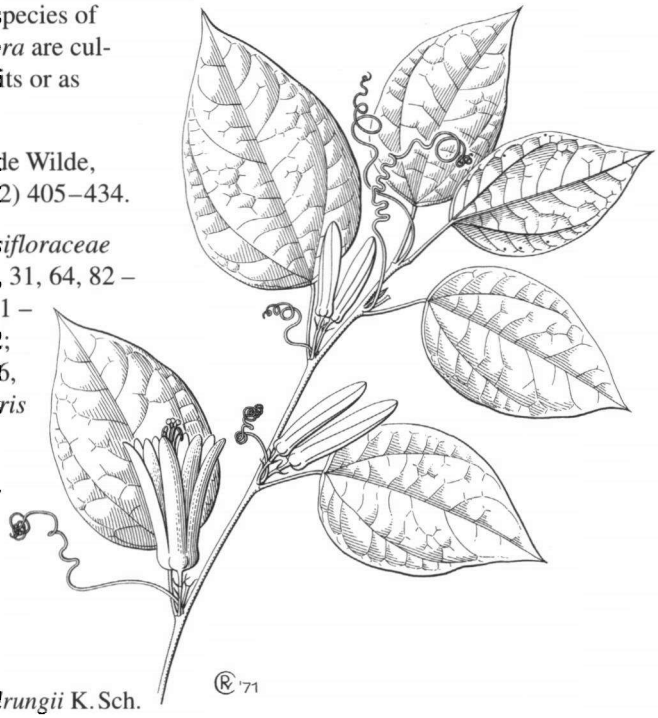

Fig. 135. *Passiflora hollrungii* K.Sch. (Passifloraceae).

Reproduced from Flora Malesiana I, 7 (1972) 409, fig. 1a.

PEDALIACEAE (MARTYNIACEAE)

Always: Herbs, plants glandular hairy, exstipulate; flowers bisexual, zygomorphic, calyx 5 partite, corolla 5-lobed, disk present, ovary superior.

Usually/often: Leaves opposite, strong smelling.

Striking features: Leaves opposite, fruit spiny (*Josephinia*); fruit with claw-like hooks (*Martynia**).

Different from: *Labiatae:* stem quadrangular, ovary 4-partite, not glandular hairy. — *Scrophulariaceae:* not glandular hairy.

Distribution: The family widespread, best represented in Africa. In Malesia 3 genera of which only *Josephinia* native.

Notes: Seeds of *Sesamum** produce cooking oil and are used for flavouring cakes.

Literature: C. A. Backer, Fl. Males. I, 4 (1951) 216–221.

Spot-characters: *Josephinia* 95 – *Martynia* 95 – *Sesamum* 49; *S. indicum* 48.

Illustration: Fig. 136.

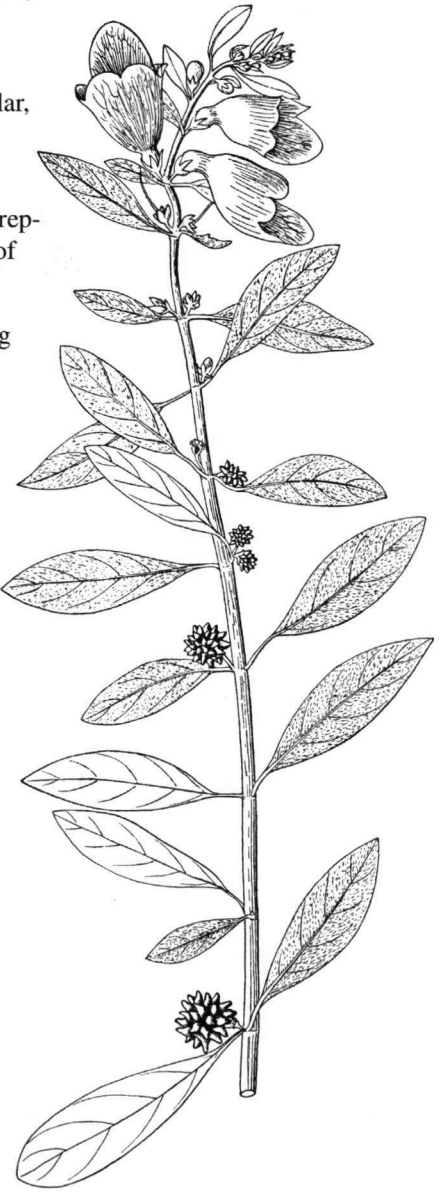

Fig. 136. *Josephinia imperatricis* Vent. (Pedaliaceae). Stem with flowers and fruits.

Reproduced from Flora Malesiana I, 4 (1951) 219, fig. 1.

PENTAPHRAGMATACEAE

Always: Fleshy herbs; leaves simple, alternate, asymmetrical, dentate, exstipulate; flowers 5-merous; ovary inferior, 2-locular, placenta axile; fruit a many-seeded berry.

Usually/often: Flowers bisexual, actinomorphic, inflorescence scorpioid.

Different from: *Campanulaceae:* leaves symmetrical, inflorescence never scorpioid, flowers zygomorphic. — *Gesneriaceae:* leaves usually opposite, ovary superior (in Malesia), placenta parietal.

Distribution: The only genus of the family extends from SE Asia to New Guinea, best represented in Borneo, especially in the undergrowth of rain forest.

Notes: Some species have ornamental potential. *Pentaphragma* is often placed in *Campanulaceae*.

Literature: H.K. Airy Shaw, Fl. Males. I, 4 (1954) 517–528; R. Kiew, Mal. Nat. J. 43 (1989) 1–12.

Spot-characters: *Pentaphragma* 92.

Illustration: Fig. 137.

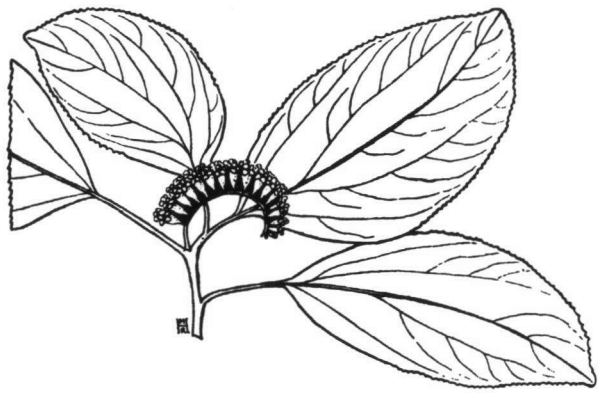

Fig. 137. *Pentaphragma horsfieldii* (Miq.) A. Shaw (Pentaphragmataceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 256. With kind permission of the Malaysian Nature Society.

PENTASTEMONACEAE

Always: Succulent herbs; leaves simple, spiral, entire, with arching nerves; inflorescence racemose; flowers bisexual, 5-merous, tepals 5, stamens 5 epitepalous; ovary inferior.

Usually/often: Plants forming bulbils.

Different from: *Pentaphragmaceae:* inflorescence scorpioid. — *Stemonaceae:* flowers 3-merous, ovary superior.

Distribution: One of the few endemic families of Malesia. The only genus *Pentastemona* is represented with two species in Sumatra.

Notes: The only monocot family with 5-merous flowers.

Literature: B.E.E. Duyfjes, Fl. Males. I, 11 (1993) 393–398.

Spot-characters: *Pentastemona* 13, 92, 99.

Illustration: Fig. 138.

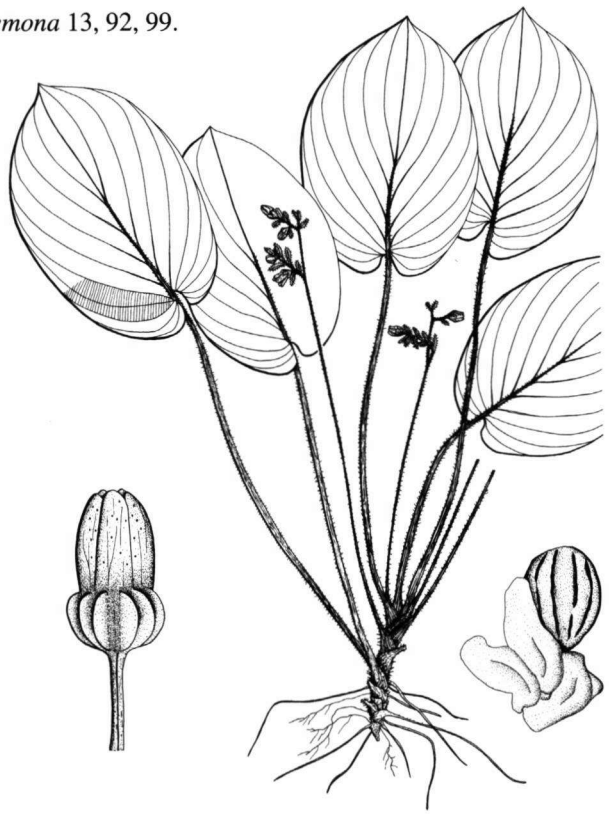

Fig. 138. *Pentastemona sumatrana* Steenis (Pentastemonaceae). Habit; enlarged flower and ribbed seed.

Reproduced from Flora Malesiana I, 11 (1993) 394, fig. 1a, c, e.

PHILESIACEAE (GEITONOPLESIACEAE, LUZURIAGACEAE)

Always: Climbers, woody at the base, unarmed; leaves simple, alternate, entire, veins parallel, midrib present, exstipulate; flowers bisexual, tepals 6, stamens 6, ovary superior, 3-locular.

Different from: *Smilacaceae:* armed, stipules and tendrils present.

Distribution: The family occurs in South America, and in East Malesia, East Australia and the West Pacific as a separate family. See the maps in Van Balgooy (1966).

Notes: The two monotypic Malesian genera *Eustrephus* and *Geitonoplesium* are also regarded distinct from *Philesiaceae* s.l. Both species are sometimes cultivated as ornamentals.

Literature: M.M.J. van Balgooy, Pacific Plant Areas 2 (1966) maps 96 & 97; J.E. Laferrière, Fl. Males. I, 12 (1996) 731–736 (*Geitonoplesiaceae*).

Spot-characters: *Eustrephus* 5, 81 – *Geitonoplesium* 5.

Illustration: Fig. 139.

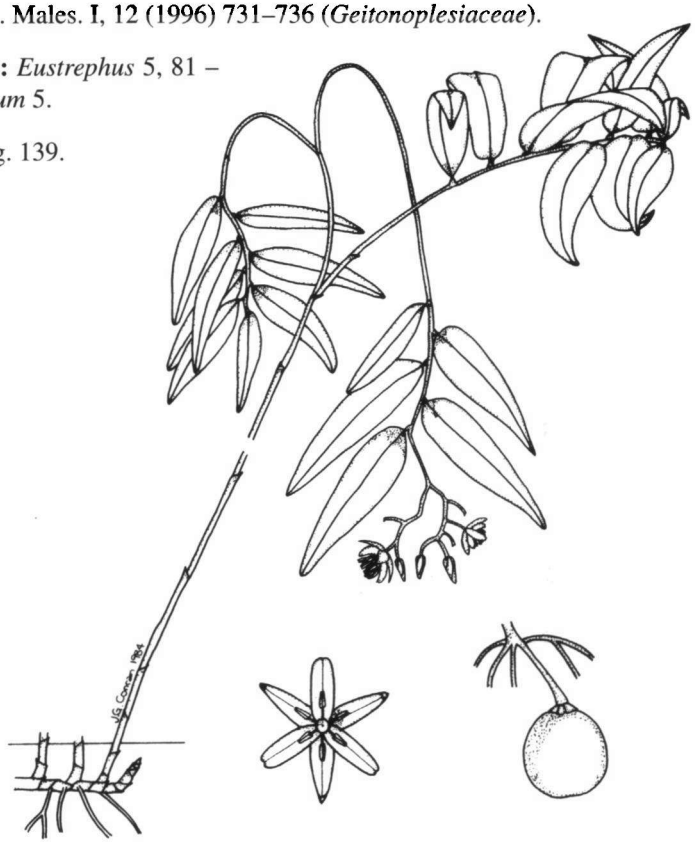

Fig. 139. *Geitonoplesium cymosum* (R. Br.) Hook. (Philesiaceae). Flowering plant; enlarged flower and fruit.

Reproduced from Flora Malesiana I, 12 (1996) 735, fig. 2a, b, h.

PHILYDRACEAE

Always: Herbs; leaves linear, crowded, distichous, nerves parallel; flowers bisexual, zygomorphic, tepals 4, ovary superior, ovules many.

Different from: *Liliaceae* (*Astelia*): flowers actinomorphic, 3-merous. — *Iridaceae:* ovary inferior.

Distribution: The family is rare outside Australia. In Malesia 2 genera, *Helmholtzia* and *Philydrium,* both occurring in wet places.

Literature: C. Skottsberg, Fl. Males. I, 4 (1948) 5–7.

Illustration: Fig. 140.

Fig. 140. ***Philydrum lanuginosum*** Banks (Philydraceae).

Reproduced from Flora Malesiana I, 4 (1948) 6, fig. 1.

PHYTOLACCACEAE*

Always: Leaves simple, alternate, entire, penninerved; inflorescence a raceme, tepals 4 or 5, ovary superior.

Usually/often: Herbaceous, stipules, if present, minute; inflorescence leaf-opposed; fruit a berry.

Different from: *Sphenocleaceae:* ovary semi-inferior, fruit a capsule.

Distribution: The family is pantropical, best represented in America. In Malesia 3 genera, all with introduced, naturalized species.

Notes: Some species of *Phytolacca* and *Rivina humilis* are sometimes planted as ornamentals.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 228–232.

Spot-characters: *Phytolaccaceae* 83 – *Phytolacca* 72.

Illustration: Fig. 141.

Fig. 141. *Rivina humilis* L. (Phytolaccaceae). Habit; flower and fruit enlarged.

Reproduced from Flora Malesiana I, 4 (1951) 228, fig. 1.

PIPERACEAE (PEPEROMIACEAE)

Always: Stem swollen at the nodes, leaves simple, entire; inflorescence a spike; flowers tiny, without perianth; ovary superior, 1-celled, 1 ovule.

Usually/often: Herbaceous, leaves alternate, gland-dotted, stipulate (not *Peperomia*), inflorescence leaf-opposed.

Striking features: Compound spike, huge leaves (*Pothomorphe**); fruit with hooked bristles (*Zippelia*).

Different from: *Chloranthaceae:* leaves opposite, spikes compound, ovary inferior. — *Urticaceae:* cystoliths, perianth present.

Distribution: Pantropical, in Malesia 4 genera:
- *Peperomia* (pantropical), terrestrial and epiphytic herbs;
- *Piper* (pantropical), herbs, shrubs, climbers, lowland and montane rain forest;
- *Pothomorphe* (originally Neotropics, now pantropical), shrubs of open places;
- *Zippelia* (West Malesia), herbs, rain forest, limestone.

Notes: Condiment (pepper): *Piper nigrum.* — Betel chewing: *Piper betle.* — Ornamentals: some *Peperomia.* — Medicinal use: *Piper.*

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 1 (1963) 167–174.

Spot-characters: *Piperaceae* 58, 79 – *Peperomia* 16, 46, 59, 72, 96 – *Piper* 16, 31, 33, 51, 53, 59, 63, 64, 72, 96 – *Pothomorphe* 16, 33, 53, 59, 78, 96; *P. peltata* 51 – *Zippelia* 16, 33, 72, 95.

Illustrations: Fig. 142 & 143.

Fig. 142. *Peperomia pellucida* (L. f.) Kunth (Piperaceae).

Reproduced from E.E. Henty & G.S. Pritchard, Weeds of New Guinea and their control. Botany Bull. no. 7 (1973) 135.

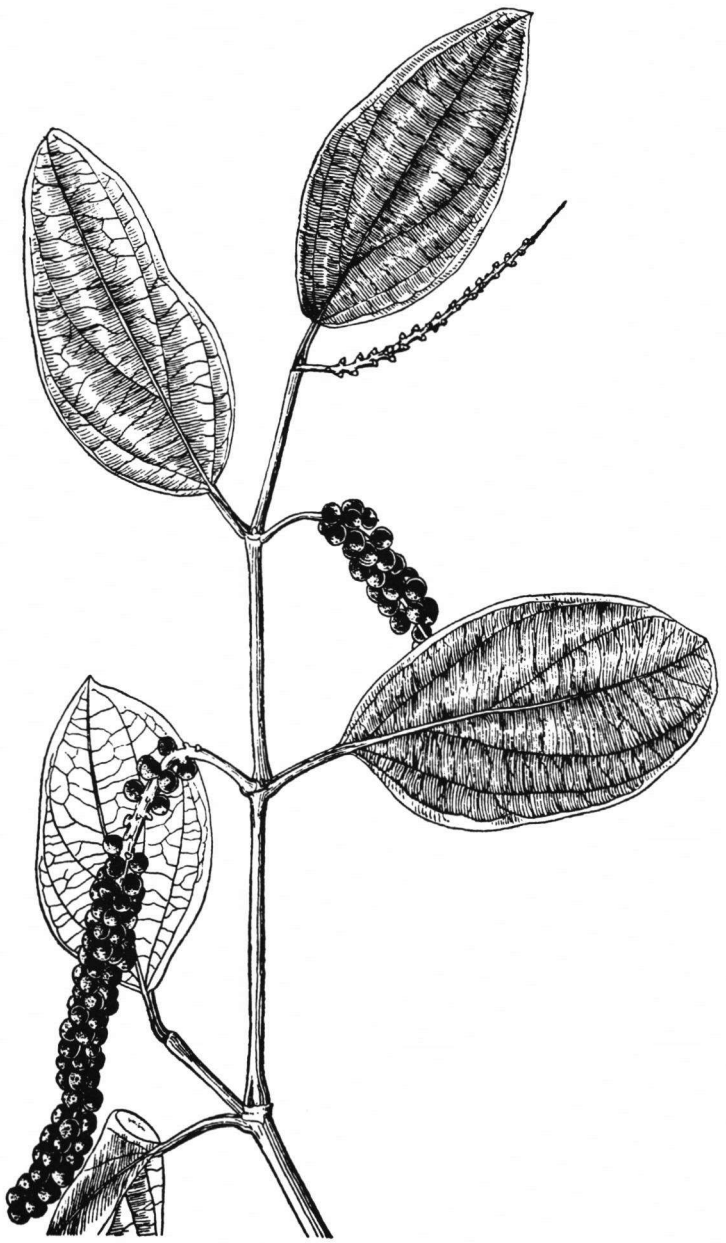

Fig. 143. *Piper nigrum* L. (Piperaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 357.

PLANTAGINACEAE

Always: Herbs; leaves in a rosette, simple, with parallel veins, base sheathing, exstipulate; flowers bisexual, actinomorphic, 4-merous; ovary superior, 2-celled, ovules several.

Usually/often: Calyx and corolla scarious, united at base.

Different from: Cushion-forming species of *Plantago* resemble *Eriocaulon*, but can be distinguished by unisexual flowers, tepals free, not scarious.

Distribution: The family is worldwide, in Malesia only *Plantago*.

Notes: Native species only occur in alpine areas in New Guinea. Some species are widespread weeds.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 445–446; P. van Royen, Nova Guinea Bot. 18 (1964) 417–426.

Spot-characters: *Plantago* 1.

Illustration: Fig. 144.

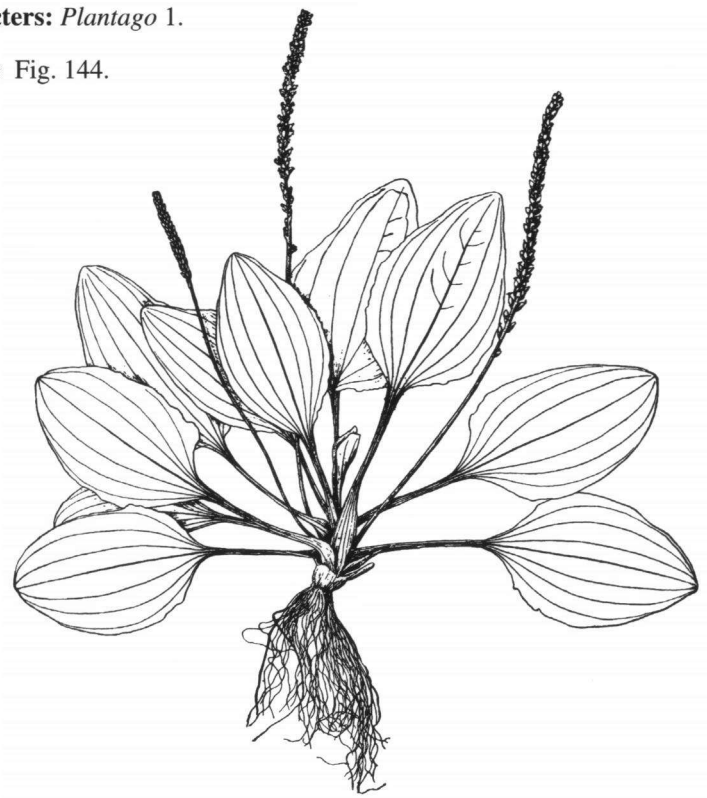

Fig. 144. *Plantago major* L. (Plantaginaceae).

Reproduced from C.A. Backer & D.F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) 200.

PLUMBAGINACEAE

Always: Leaves simple, exstipulate; flowers bisexual, actinomorphic, 5-merous, calyx tubular, petals nearly free, contorted, stamens inserted on base of petal; ovary superior.

Usually/often: Leaves spiral, entire, glandular; fruit a 1-seeded capsule.

Striking features: Shrub of the mangrove, petiole clasping the stem (*Aegialitis*).

Different from: *Primulaceae:* fruit many-seeded.

Distribution: The family worldwide. In Malesia 4 genera of which 2 introduced.

Notes: Some species are cultivated as ornamentals, e.g. *Plumbago indica*, which is also used medicinally.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1949) 107–112.

Spot-characters: *Plumbaginaceae* 83 – *Aegialitis* 31, 33.

Illustration: Fig. 145.

Fig. 145. *Plumbago indica* L. (Plumbaginaceae).

Reproduced from Flora Malesiana I, 4 (1949) 110, fig. 2.

PODOSTEMACEAE

Always: Moss-like herbs; flowers solitary, zygomorphic, tepals 2; ovary superior, fruit a many-seeded capsule.

Usually/often: Leaves alternate, flowers bisexual.

Different from: Sterile specimens might be mistaken for moss.

Distribution: A nearly pantropical family confined to swift running streams, best developed in South America and Africa. In Malesia 3 genera, all rare: *Cladopus, Indotristicha* and *Torrenticola.*

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1949) 65–68; ibid. I, 6 (1972) 963–964.

Illustration: Fig. 146.

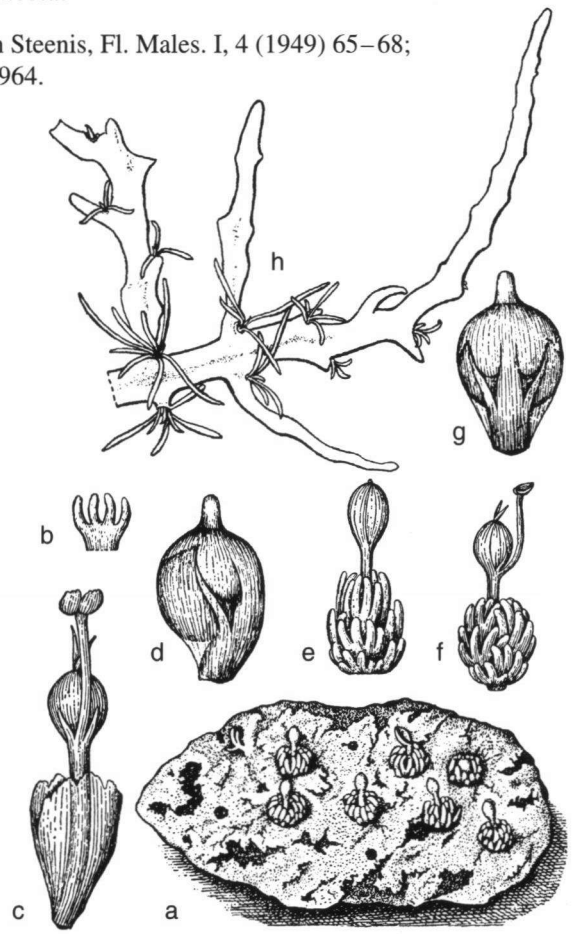

Fig. 146. *Cladopus nymani* Möll. (Podostemaceae). a. Piece of rock with fruiting plant; b. leaf; c. open flower with dehisced spathella; d. bud, lateral view; e. stem in fruit; f. flowering stem; g. bud, dorsal view; h. sterile root system, juvenile plant.

Reproduced from Flora Malesiana I, 4 (1949) 66, fig. 1.

POLYGONACEAE

Always: Stem with swollen nodes; leaves simple, entire, venation pinnate; disk present, ovary superior, 1-locular, 1 basal ovule.

Usually/often: Herbaceous, leaves spiral; petiole with sheath and ocrea; flowers bisexual.

Striking features: Treelet, leaves sessile, broader than long (*Coccoloba**); shrub/climber, twigs flat (*Muehlenbeckia platyclada*).

Different from: *Commelinaceae:* ovary 2- or 3-locular, ovules numerous.

Distribution: The family worldwide; in Malesia 7 genera of which 3 with native species, incl.:
- *Muehlenbeckia*, climbers, mostly in montane habitats in E Malesia.
- *Polygonum* (incl. *Persicaria*), many species mostly in disturbed and wet habitats.

Notes: Some planted as ornamentals: *Antigonon**, *Coccoloba**, *Muehlenbeckia* (*Homalocladium*). — Edible plants: some *Polygonum, Rheum.*

Literature: B.H. Danser, Bull. Jard. Bot. Buitenzorg III, 8 (1927) 117–261.

Spot-characters: *Polygonaceae* 16, 33, 79, 83 – *Antigonon* 4, 80 – *Muehlenbeckia* 5 – *Polygonum* 31, 37, 93; *P. perforatum* 12.

Illustration: Fig. 147.

Fig. 147. *Polygonum chinense* L. (Polygonaceae).

Reproduced from C. A. Backer & D. F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) 104.

PONTEDERIACEAE

Always: Herbs of freshwater; leaves simple, curvinerved, leaf base sheathing; flowers bisexual, 3-merous, ovary superior, 3-celled.

Usually/often: Leaves hastate.

Different from: *Butomaceae:* laticiferous, leaf base not sheathing.

Distribution: The family mostly in America. In Malesia only *Monochoria* native, *Eichhornia* introduced and naturalized.

Notes: Leaves of *Monochoria* are eaten. *Eichhornia** is often a pest covering large stretches of open water.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 255–261.

Illustrations: Fig. 148.

Fig. 148. *Monochoria hastata* (L.) Solms (Pontederiaceae).

Reproduced from Flora Malesiana I, 4 (1951) 257, fig. 1.

PORTULACACEAE

Always: Herbs (sometimes woody at base); leaves and stems succulent; flowers bisexual, actinomorphic; stamens opposite the petals; fruit a capsule opening with an operculum.

Usually/often: Creeping, main root tuberous, exstipulate but sometimes with axillary hairs, sepals 2, petals 4–6 nearly free, ovary superior.

Different from: *Aizoaceae* (*Sesuvium*): interpetiolar stipules.

Distribution: The family is pantropical. In Malesia 4 genera of which 2 native:
- *Montia*, alpines of New Guinea;
- *Portulaca*, widespread in coastal areas.

Notes: *Portulaca* and *Talinum** are both cultivated as ornamentals and for their edible leaves.

Literature: R. Geesink, Fl. Males. I, 7 (1971) 121–133.

Spot-characters: *Portulacaceae* 83.

Illustration: Fig. 149.

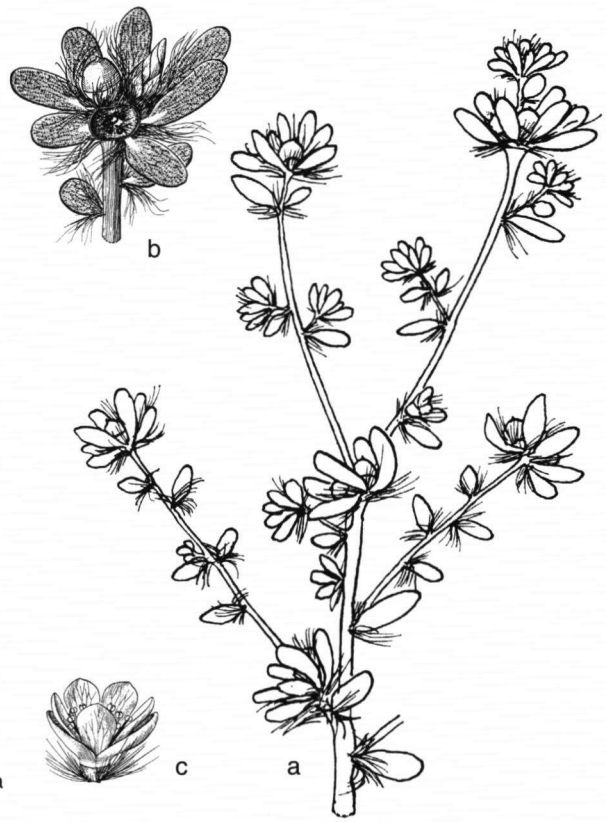

Fig. 149. *Portulaca pilosa* L. subsp. *sundaensis* (Poelln.) Geesink (Portulacaceae). a. Habit; b. flowering end of a branch; c. flower.

Reproduced from Flora Malesiana I, 7 (1971) 132, fig. 6a–c.

POTAMOGETONACEAE
(CYMODOCEACEAE, RUPPIACEAE, ZANNICHELLIACEAE, ZOSTERACEAE)

Always: Submerged aquatic plants, with a rhizome, leaves simple with parallel nerves and cross veins, leaf base sheathing; flowers naked, ovary superior.

Usually/often: Herbaceous, anthers sessile.

Striking features: Rhizome woody, erect (*Thalassodendron*).

Different from: *Hydrocharitaceae:* leaf base not sheathing.

Distribution: The family is cosmopolitan. In Malesia 7 genera, incl.:
- *Cymodocea* (Old World), marine plants;
- *Halodule* (pantropical), marine plants;
- *Potamogeton* (cosmopolitan), freshwater plants.

Notes: Several genera have been placed in separate families.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 3 (1968) 8–10; C. den Hartog, The sea grasses of the world, Verh. Kon. Ned. Akad. Wet. Afd. Natuurk. 2, 59, 1 (1970) 275 pp.; Fl. Males. I, 16 (2002) in prep.

Illustrations: Fig. 150 & 151.

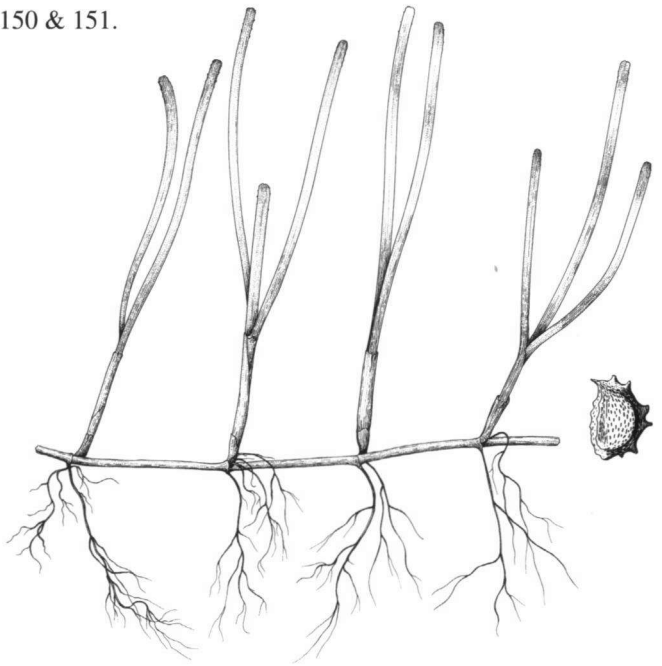

Fig. 150. *Cymodocea rotundata* Ehrenb. & Hempr. ex Aschers. (Potamogetonaceae). Habit; fruit.

Reproduced from Flora Malesiana I, 16 (in prep.).

Fig. 151. *Potamogeton octandrus* Poir. (Potamogetonaceae). 1. Floating leaf and flowering branch; 2. submersed leafy branch; 3. floating leaf; 4. submersed leaf; 5. flower; 6. perianth and stamen; 7. stamen; 8. carpel.

Reproduced from Flora of Taiwan 5 (1978) 29, pl. 1274. Courtesy Dr. Yuen-Po Yang, Sun Yat-sen University, Taiwan.

PRIMULACEAE

Always: Herbs; leaves simple, penninerved, exstipulate; flowers bisexual, calyx dentate, corolla tubular, stamens on tube opposite the lobes; ovary superior, 1-celled, ovules numerous; fruit a capsule.

Usually/often: Leaves spiral or in a rosette, flowers actinomorphic.

Different from: *Myrsinaceae:* mostly woody, fruit a drupe.

Distribution: The family best represented in the northern hemisphere. In Malesia 3 genera, including *Lysimachia* (worldwide), erect or prostrate herbs, mostly montane.

Notes: *Primula prolifera* is a potential ornamental.

Literature: P.A.J. Bentvelzen, Fl. Males. I, 6 (1962) 173–192.

Spot-characters: *Primulaceae* 83 – *Lysimachia* 59.

Illustration: Fig. 152.

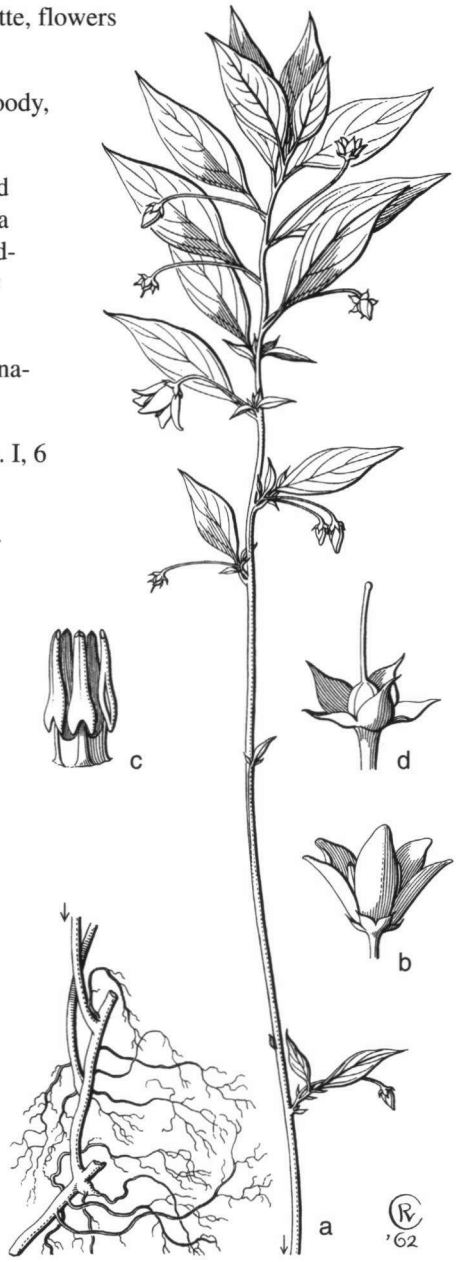

Fig. 152. *Lysimachia sikokiana* Miq. (Primulaceae). a. Habit; b. flower; c. androecium; d. flower, stamens and petals removed; b–d enlarged.

Reproduced from Flora Malesiana I, 6 (1962) 179, fig. 2a–d.

RAFFLESIACEAE

Always: Parasitic, leafless, echlorophyllose herbs; flowers single, actinomorphic with a single perianth; ovary 1-locular with parietal placentas; fruit a berry with numerous minute seeds.

Usually/often: Flowers large, perianth tubular, ovary inferior.

Different from: *Balanophoraceae:* rhizomatous plants, flowers tiny in spikes or heads, fruit few-seeded.

Distribution: The family worldwide, mainly tropical. In Malesia 3 genera, including *Rafflesia* (West Malesia), parasitic on *Tetrastigma* (*Vitaceae*), mostly in lowland rain forest.

Notes: Flower buds of *Rafflesia* are collected for their presumed medicinal properties. Flies play a role in pollination and squirrels in dispersal, but much still has to be learned about the ecology of the *Rafflesiaceae*.

Literature: W. Meijer, Fl. Males. I, 13 (1997) 1–42.

Spot-characters: *Rafflesiaceae* 8, 24, 92 – *Mitrastemma* 7, 11 – *Rafflesia* 7, 11 – *Rhizanthes* 7, 11.

Illustration: Fig. 153.

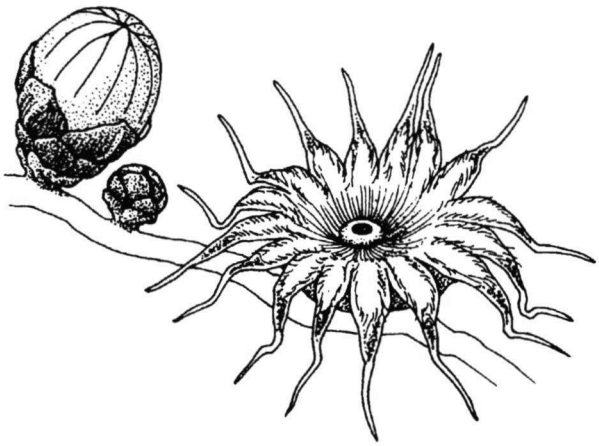

Fig. 153. *Rhizanthes lowii* (Becc.) Harms (Rafflesiaceae). Flowerbuds and open flower on stem or woody root of *Tetrastigma*. The mature bud left shows the cupula at base, the bracts, and the 16-valvate perigone lobes. The open flower shows the perigone and the narrow bayonets which in the bud were directed downwards and partly hidden in an apical cavity of the column.

From drawing by Janis Atlee, reproduced in Flora Malesiana I, 13 (1997) 38, fig. 10a.

RANUNCULACEAE

Always: Flowers bisexual, actinomorphic, stamens numerous; carpels many, more or less free.

Usually/often: Herbaceous, sepals and petals present, free.

Striking features: Climbers with opposite leaves, climbing with petioles (*Clematis*) or with tendrils (*Naravelia*).

Different from: *Clematis* could be confused with *Illigera* (*Hernandiaceae*): stamens few, fruit winged.

Distribution: The family worldwide. In Malesia 4 genera, incl.:
- *Clematis*, climbers, chiefly lowland forest edges and disturbed places;
- *Ranunculus*, simple leaved terrestrial herbs on high mountains.

Notes: Some exotic species are planted as ornamentals, some native species of *Clematis* are potential ornamentals.

Literature: H.J. Eichler, Bibl. Bot. Heft 124 (1958) 1–110.

Spot-characters: *Ranunculaceae* 79 – *Clematis* 5, 6, 48, 49, 50, 64, 86 – *Naravelia* 4, 6, 49 – *Ranunculus* 95 – *Thalictrum* 50.

Illustrations: Fig. 154 & 155.

Fig. 154. *Ranunculus coacervatus* Merr. & Perry (Ranunculaceae).

Reproduced from Bibliotheca Botanica Heft 124 (1958) 78, fig. 15a. Courtesy Schweizerbartsche Verlagsbuchhandlung, Stuttgart.

Fig. 155. *Clematis dioscoreaefolia* Lévl. & Van. (Ranunculaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 18. With kind permission of Prof. and Mrs. Keng.

RESTIONACEAE

Always: Rhizomatous herbs; tepals 4–6, free; stamens 3, ovary superior with 1 ovule.

Usually/often: Leaves consisting of bladeless stemclasping sheaths; flowers unisexual, plants dioecious.

Different from: *Cyperaceae:* leaves three ranked. — *Juncaceae:* flowers bisexual, ovules many.

Distribution: The family almost entirely confined to the southern hemisphere, best represented in Australia. In Malesia only *Leptocarpus* with 3 species.

Literature: K. Bakker, Fl. Males. I, 5 (1957) 416–420.

Illustration: Fig. 156.

Fig. 156. *Leptocarpus barbatus* Bakker (Restionaceae). a. Habit; b. two sheaths, one nearly glabrous by caducous hairs; c. bisexual flower; b & c enlarged.

Reproduced from Flora Malesiana I, 5 (1957) 417, fig. 1a–c.

SALVADORACEAE

Always: Shrubs with axillary spines; leaves simple, opposite, entire, stipules small or absent; flowers 4-merous, petals free, disk absent; ovary superior, ovules 4, basal; fruit a berry.

Usually/often: Flowers unisexual (plants monoecious or dioecious); ovary 2-celled.

Different from: *Oleaceae:* never spiny, stamens 2. — *Rubiaceae:* stipules well developed, ovary inferior.

Distribution: The family paleotropical; in Malesia only *Azima* (Southeast Asia, Philippines, Java, Lesser Sunda Islands), monsoon areas.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 224–225.

Spot-characters: *Azima* 12.

Illustration: Fig. 157.

Fig. 157. *Azima sarmentosa* (Blume) Benth. & Hook. (Salvadoraceae). Female twig with fruits, part of male inflorescence; also a single male flower, enlarged.

Reproduced from Flora Malesiana I, 4 (1951) 224, fig. 1.

SAURURACEAE

Always: Strongly smelling herbs; leaves simple, entire, cordate, spiral, stipulate; flowers bisexual, actinomorphic.

Usually/often: Forming stolons.

Different from: *Piperaceae:* flowers tiny without perianth.

Distribution: The family confined to Asia and North America. In Malesia only *Houttuynia* and *Saururus*, each with one species, growing in wet places, both rather rare.

Notes: Both species are used in Chinese medicine.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1949) 47–48.

Spot-characters: *Houttuynia* 72.

Illustration: Fig. 158.

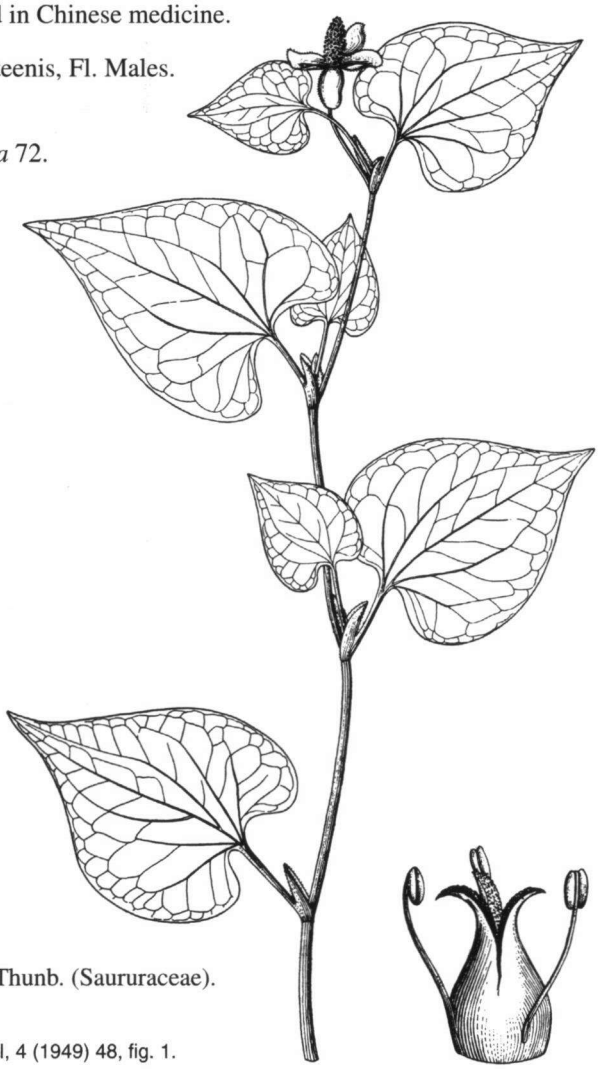

Fig. 158. *Houttuynia cordata* Thunb. (Saururaceae). Habit; flower enlarged.

Reproduced from Flora Malesiana I, 4 (1949) 48, fig. 1.

SCHISANDRACEAE

Always: Monoecious lianas; leaves simple, alternate, penninerved, exstipulate; tepals free, imbricate; fruit a berry.

Usually/often: Leaves denticulate, flowers solitary, axillary, carpels and stamens many, berries red, fused into a head.

Different from: *Magnoliaceae:* never climbing. — *Annonaceae:* leaf margin entire, stem on cross section with stellate rays.

Distribution: A family of 2 genera confined to Southeast Asia, incl. Malesia, with one species of *Schisandra* in North America.

Notes: *Kadsura scandens* is used medicinally.

Literature: M.K. Saunders, Fl. Males. I, 13 (1997) 185–207.

Spot-characters: *Kadsura* 5, 59, 70, 96 – *Schisandra* 5, 59, 96.

Illustration: Fig. 159.

Fig. 159. *Kadsura scandens* (Blume) Blume (Schisandraceae). Flowering branch; enlarged gynoecium, androecium, and fruit.

Reproduced from Flora Malesiana I, 13 (1997) 200, fig. 1a, b, d, f.

SCROPHULARIACEAE

Always: Leaves simple, exstipulate; flowers bisexual, zygomorphic, sympetalous; ovary superior; fruit a 2-locular, many-seeded capsule; style 1, terminal.

Usually/often: Herbs, stem quadrangular, leaves opposite, serrate/dentate; disk present, often one-sided, stamens 4.

Striking features: Trees, stellate hairs, seeds winged (*Wightia*); shrubs (*Brookea, Cyrtandromoea, Detzneria*); calyx winged (*Torenia*); hemiparasites, drying black (*Buchnera, Striga*).

Fig. 160. *Lindernia procumbens* (Crock.) Philcox (Scrophulariaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 588.

Different from: *Acanthaceae:* stem with nodes, cystoliths, few seeds, jaculators. — *Gesneriaceae:* fruit 1-locular. — *Labiatae:* style gynobasic, plants usually aromatic, fruit few-seeded. — *Verbenaceae:* flowers hardly zygomorphic, ovary 4-locular, fruit 4-seeded.

Distribution: Worldwide, in Malesia 32 genera, incl.:
- *Limnophila* (paleotropical), herbs, mostly wet open places;
- *Lindernia* (pantropical), prostrate herbs, open places;
- *Parahebe* (New Guinea, Australia), shrubs, submontane forest, alpines;
- *Torenia* (pantropical), herbs, open places, also forest.

Notes: Several species cultivated as ornamentals: *Angelonia*, Antirrhinum*, Mazus*, Russelia**. — Medicinal plants: *Digitalis**. — Potential native ornamentals: *Brookea, Detzneria, Parahebe, Wightia.*

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 498–515; T. Yamazaki, Fl. Cambodia, Laos, Vietnam 21 (1985) 1–217.

Spot-characters: *Scrophulariaceae* 58 – *Angelonia* 46 – *Buchnera* 11, 54 – *Cyrtandromoea* 15, 47 – *Limnophila* 31, 46 – *Maurandya* 5, 6 – *Russelia* 46 – *Scoparia* 46 – *Sopubia* 46 – *Stemodia* 46 – *Striga* 11, 54 – *Veronica* 46 – *Wightia* 102.

Illustrations: Fig. 160–162.

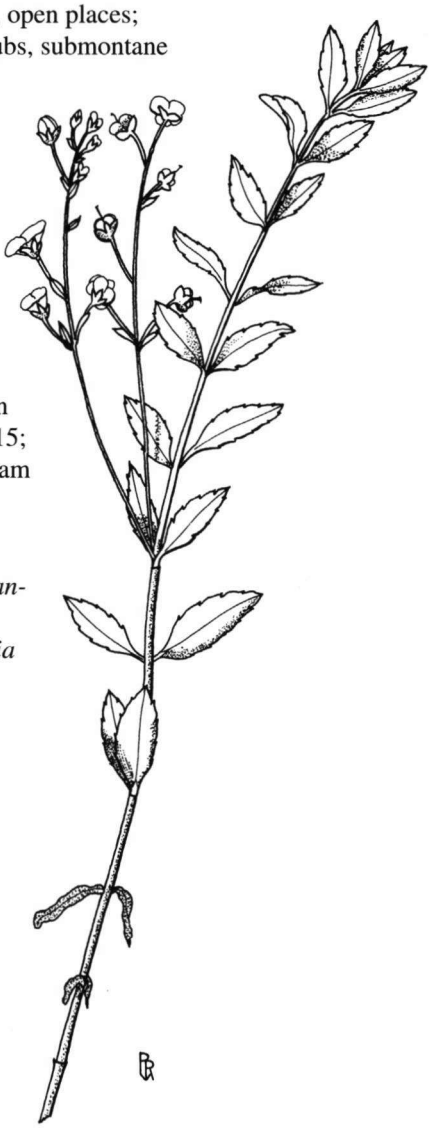

Fig. 161. *Parahebe albiflora* (Pennell) P. Royen (Scrophulariaceae). Flowering branch.

Reproduced from P. van Royen, Alpine Flora of New Guinea 4 (1983) 2867, fig. 832.

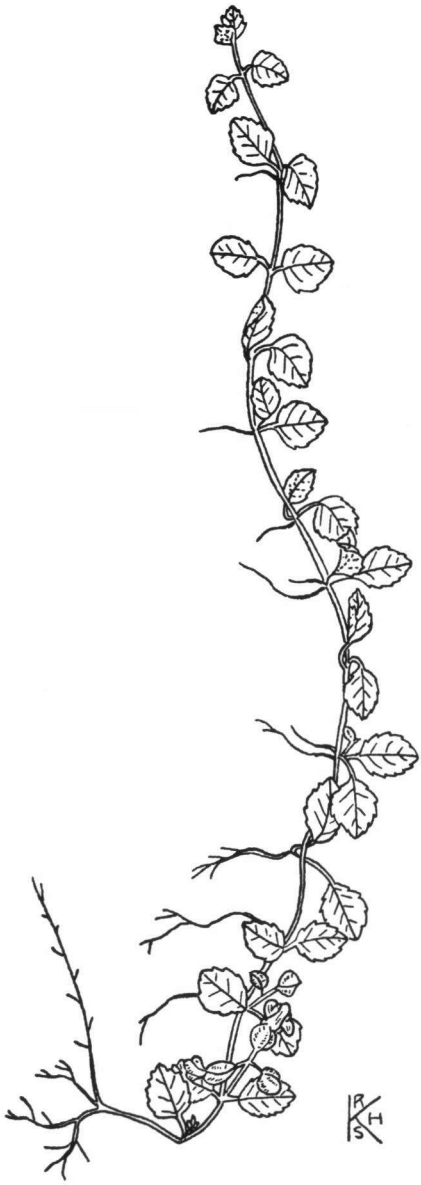

Fig. 162. *Torenia polygonoides* Benth. (Scrophulariaceae).

Reproduced from Hsuan Keng, Orders and Families of Malayan Seed plants (1978) fig. 159. With kind permission of Prof. and Mrs. Keng.

SCYPHOSTEGIACEAE

Always: Shrubs or treelets; leaves simple, alternate, dentate; stipules small; flowers unisexual (plants dioecious), perianth tubular, 3-merous; ovary superior, 1-locular, numerous basal ovules; stigma broad, sessile.

Different from: *Flacourtiaceae:* ovules parietal. — *Celastraceae:* ovules few, ovary 2–many celled. — *Monimiaceae:* no stipules, leaves (sub)opposite.

Distribution: The family is monotypic, its only species *Scyphostegia borneensis* is endemic to the northern part of Borneo.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 5 (1957) 297–299; I, 6 (1972) 967–968; W.A. van Heel, Blumea 15 (1967) 107–125.

Spot-characters: *Scyphostegia* 54, 76, 77, 79, 99.

Illustration: Fig. 163.

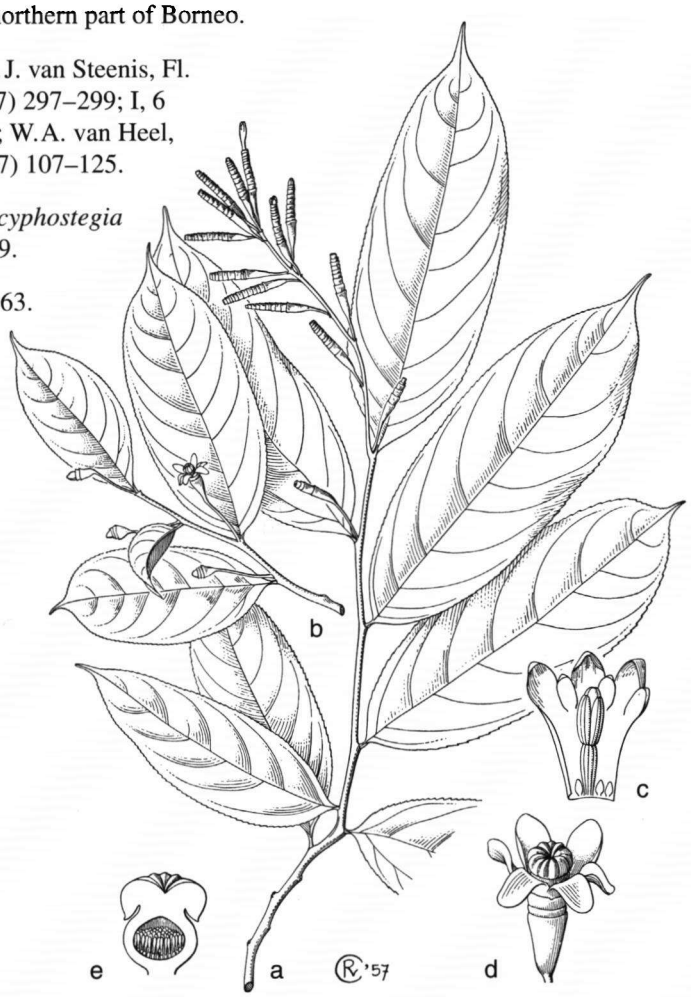

Fig. 163. *Scyphostegia borneensis* Stapf (Scyphostegiaceae). a. Habit of flowering male twig; b. flowering female twig; c. opened male flower; d. young female raceme with open flower; e. tangentially cut young female flower; c–e enlarged.

Reproduced from Flora Malesiana I, 5 (1956) 298, fig. 1a, b, f, g, i.

SMILACACEAE

Always: More or less woody; leaves simple, curvinerved, spiral, petiole broadened; flowers actinomorphic, sepals 3, petals 3; fruit a berry.

Usually/often: Climbing with tendrils, armed with spines, flowers unisexual, stamens 6, ovary superior.

Striking features: Unarmed liana, leaves opposite or verticillate (*Rhipogonum*).

Different from: *Philesiaceae:* no tendrils, unarmed. — *Liliaceae:* herbaceous; usually not climbing, unarmed.

Distribution: The family pantropical, in Malesia:
- *Heterosmilax*, few species;
- *Smilax*, many species widespread in all kinds of vegetation types, mostly in lowland.

Notes: The family is often included in *Liliaceae*. The roots of some American species produce sarsaparilla.

Literature: T. Koyama, Quart. Journal Taiw. Mus. 13 (1960) 1–61; J.G. Conran & H.T. Clifford, Fl. Austral. 46 (1986) 180–196.

Spot-characters: *Heterosmilax* 38 – *Rhipogonum* 5, 6, 46 – *Smilax* 4, 12, 30, 59, 64; *S. borneensis* 9.

Illustration: Fig. 164.

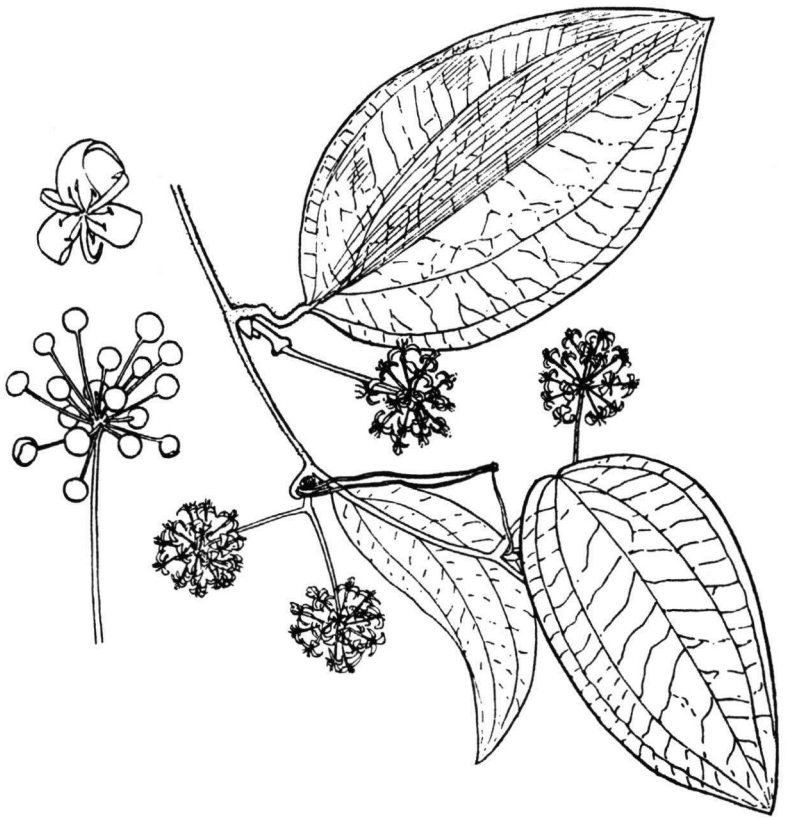

Fig. 164. *Smilax setosa* Miq. (Smilacaceae).

Reproduced from M. R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 182. With kind permission of the Malaysian Nature Society.

SOLANACEAE

Always: Leaves simple, entire (sometimes deeply divided), spiral, penninerved, exstipulate; corolla gamopetalous; ovary superior.

Usually/often: Woody, flowers 5-merous, actinomorphic, ovary 2-celled, ovules numerous, fruit a many-seeded berry.

Striking features: Fruit covered by accrescent calyx (*Physalis**).

Different from: *Boraginaceae:* ovules 1 per cell, style mostly gynobasic, fruit not a berry.

Distribution: Worldwide, best represented in the Neotropics; in Malesia 2 native genera, several introduced.

– *Solanum* (incl. *Lycianthes*, worldwide), herbs, shrubs, epiphytes, scramblers, open places; forest, lowland and montane.

Notes: Several species useful for man. — Edible fruit: *Cyphomandra**, *Lycopersicon**, *Physalis**, *Solanum.* — Vegetables: *Lycium**, *Solanum.* — Spice: *Capsicum**. — Tubers: *Solanum tuberosum**. — Medicinal use: *Datura**, *Solanum.* — Tobacco: *Nicotiana**. — Ornamentals: *Brugmansia**, *Brunfelsia**, *Cestrum**, *Solanum.*

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 464–483; D.E. Symon, The Solanaceae of New Guinea, J. Adel. Bot. Gard. 8 (1985) 1–171. — Mr. D.E. Symon (Adelaide) is revising the family for Flora Malesiana.

Spot-characters: *Solanaceae* 58, 86 – *Lycium chinense* 12 – *Solanum* 4, 12, 47, 70, 72, 74.

Illustration: Fig. 165.

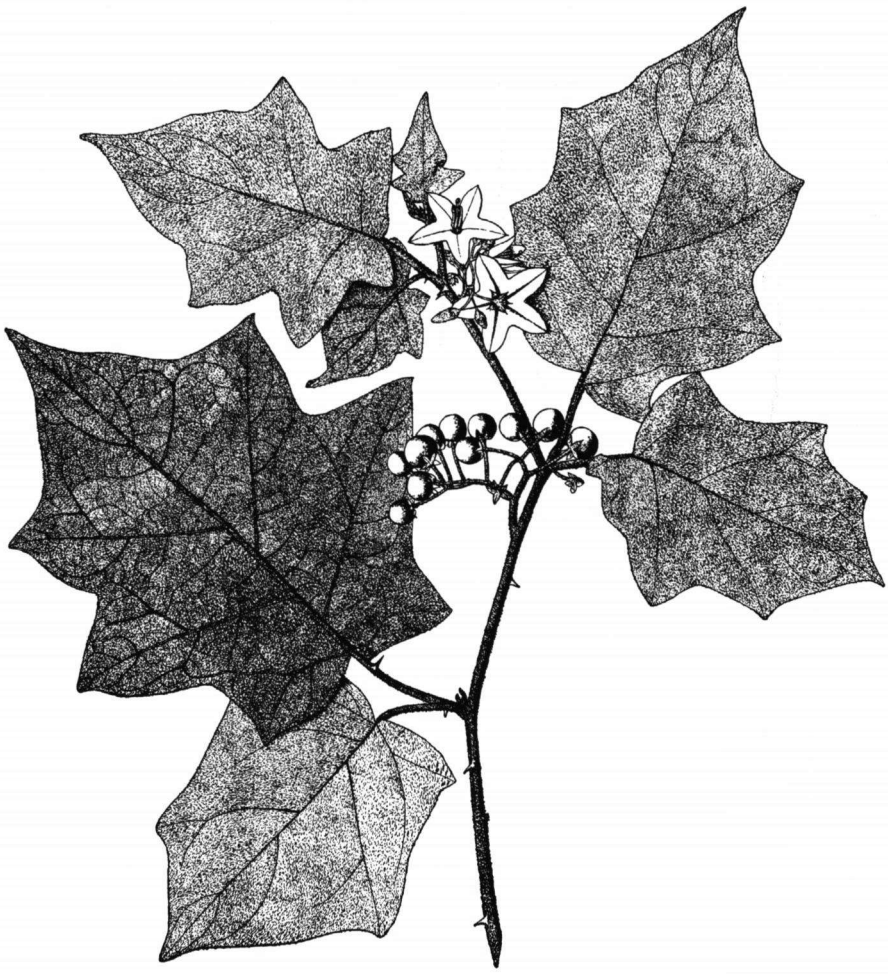

Fig. 165. *Solanum torvum* Sw. (Solanaceae).

Reproduced from C. A. Backer & D. F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) 196.

SPARGANIACEAE

Always: Aquatic, monoecious herbs, forming stolons; leaves linear, distichous, sheathing at base; flowers crowded in globose heads.

Usually/often: Tepals and stamens 3; ovary 1, superior, 1-locular.

Different from: *Araceae* (*Acorus*): leaves not distichous, inflorescence covered by a spatha.

Distribution: The only genus of the family, *Sparganium*, is widespread in the northern hemisphere, one species in Malesia, very patchily distributed.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 233–234.

Spot-characters: *Sparganium* 76.

Illustration: Fig. 166.

Fig. 166. *Sparganium simplex* Huds. (Sparganiaceae).

Reproduced from Flora Malesiana I, 4 (1951) 233, fig. 1.

SPHENOCLEACEAE

Always: Erect herbs; leaves simple, spiral, entire, penninerved, exstipulate; inflorescence a terminal spike; flowers bisexual, 5-merous; ovary semi-inferior; fruit a 2-locular capsule; seeds many.

Usually/often: Stems succulent.

Different from: *Phytolacca:* ovary superior, fruit a berry. — *Hydrolea:* glandular hairy, ovary superior.

Distribution: The family consists of two species, one endemic to W Africa, the other widespread from Africa to Malesia, where it may not be native, and to America where it is certainly introduced.

Notes: The family is allied to *Primulaceae* and *Phytolaccaceae* and not with *Campanulaceae* where it was once placed. The leaves are eaten as a vegetable.

Literature: H.K. Airy Shaw, Fl. Males. I, 4 (1948) 27–28.

Spot-characters: *Sphenoclea* 92.

Illustration: Fig. 167.

Fig. 167. *Sphenoclea zeylanica* Gaertn. (Sphenocleaceae).

Reproduced from C.A. Backer, Weed Flora of Javanese Sugar-cane fields, Atlas pt 16 (1973) t. 693.

STACKHOUSIACEAE

Always: Herbs; leaves simple, spiral, entire, exstipulate; flowers bisexual, actinomorphic, 5-merous; ovary superior.

Usually/often: Petals free at base, connate above, ovary 3-celled.

Different from: *Euphorbiaceae:* flowers unisexual.

Distribution: A small family almost confined to Australia. In Malesia only one species of *Stackhousia*, mostly in grassland and savannah.

Literature: F.I. Brouwer, Fl. Males. I, 4 (1948) 35–36.

Illustration: Fig. 168.

Fig. 168. *Stackhousia intermedia* F.M. Bailey (Stackhousiaceae). Habit; fruits and flowers enlarged.

Reproduced from Flora Malesiana I, 4 (1948) 36, fig. 2.

STEMONACEAE

Always: Herbs; leaves simple, entire, with curved veins and scalariform secondaries, exstipulate; flowers 4-merous, tepals in 2 rows of 2, stamens 4, epitepalous; fruit a capsule, seeds arillate.

Usually/often: Climbing, tuberous, ovary superior.

Different from: *Dioscoreaceae:* flowers 3-merous, ovary inferior.

Distribution: A family of 3 genera, two in Indo-Malesia, one in East Asia and North America. In Malesia: *Stemona* and *Stichoneuron*.

Notes: *Pentastemona,* originally ascribed to *Stemonaceae,* has been placed in a distinct family.

Literature: B.E.E. Duyfjes, Fl. Males. I, 11 (1993) 399–409.

Spot-characters: *Stemonaceae* 104 – *Stemona* 5, 64, 68, 85 – *Stichoneuron* 5.

Illustration: Fig. 169.

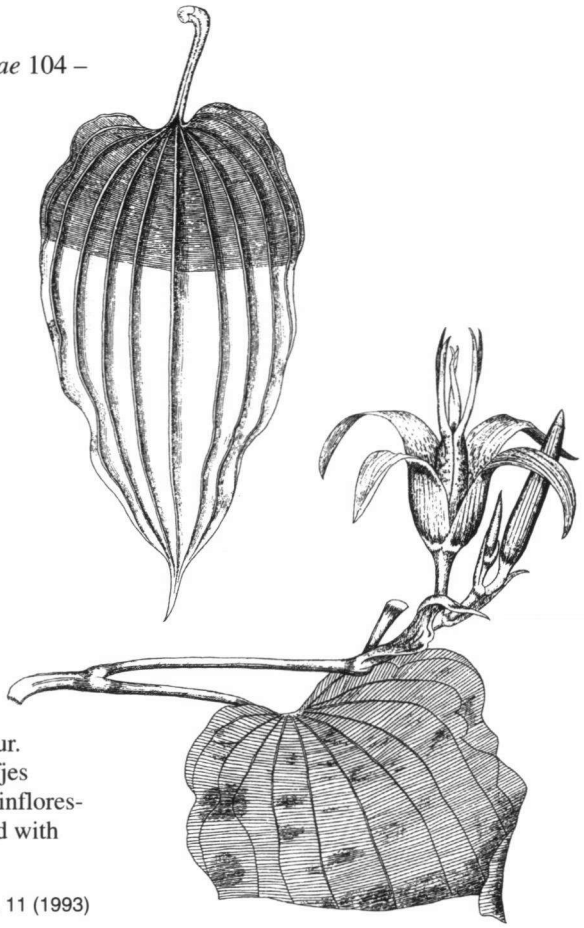

Fig. 169. *Stemona tuberosa* Lour. var. *ternatensis* (J.J. Sm.) Duyfjes (Stemonaceae). Leaf; enlarged inflorescence, the peduncle partly fused with the petiole.

Reproduced from Flora Malesiana I, 11 (1993) 406, fig. 1a, b.

STRELITZIACEAE (HELICONIACEAE)

Always: Leaves simple, in two rows, penninerved; corolla tubular, stamens 5; ovary inferior.

Usually/often: Herbaceous, leaves large, flowers bisexual, seeds arillate.

Striking features: Soft-wooded tree, with distichous leaves (*Ravenala**).

Different from: *Musaceae:* leaves and bracts spiral.

Distribution: The family as here accepted consists of three genera:
- *Heliconia* (mostly Neotropics, some species in East Malesia and the Pacific);
- *Ravenala** (Madagascar);
- *Strelitzia** (South Africa).

Notes: Several alien species planted as ornamentals: *Ravenala, Heliconia, Strelitzia.* — The leaves of native *Heliconia* species are used for wrapping food.

Literature: C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 3 (1968) 38–40; W.J. Kress, Allertonia 6 (1990) 1–58.

Spot-characters: *Strelitziaceae* 67, 92, 104.

Illustration: Fig. 170.

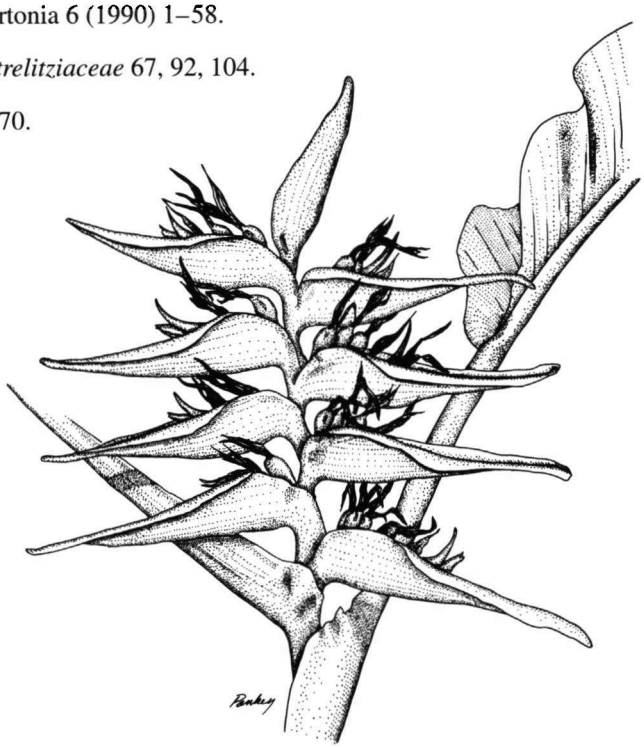

Fig. 170. *Heliconia papuana* W.J. Kress (Strelitziaceae). Inflorescence.

Reproduced from Allertonia 6 (1990) 31, fig. 10A. Courtesy National Tropical Botanical Garden, Lawai, Hawaii, USA.

STYLIDIACEAE

Always: Herbs; leaves simple, entire, alternate, exstipulate; flowers bisexual, zygomorphic, calyx and corolla 5-lobed, stamens 2, ovary inferior.

Usually/often: Glandular hairy, ovary 2-celled, capsule many-seeded.

Different from: *Scrophulariaceae:* leaves opposite, ovary superior.

Distribution: The family is almost confined to Australia, New Zealand and southern South America. In Malesia only *Stylidium*, mostly in wet open localities.

Literature: D.F. van Slooten, Fl. Males. I, 4 (1954) 529–532.

Spot-characters: *Stylidium* 92.

Illustration: Fig. 171.

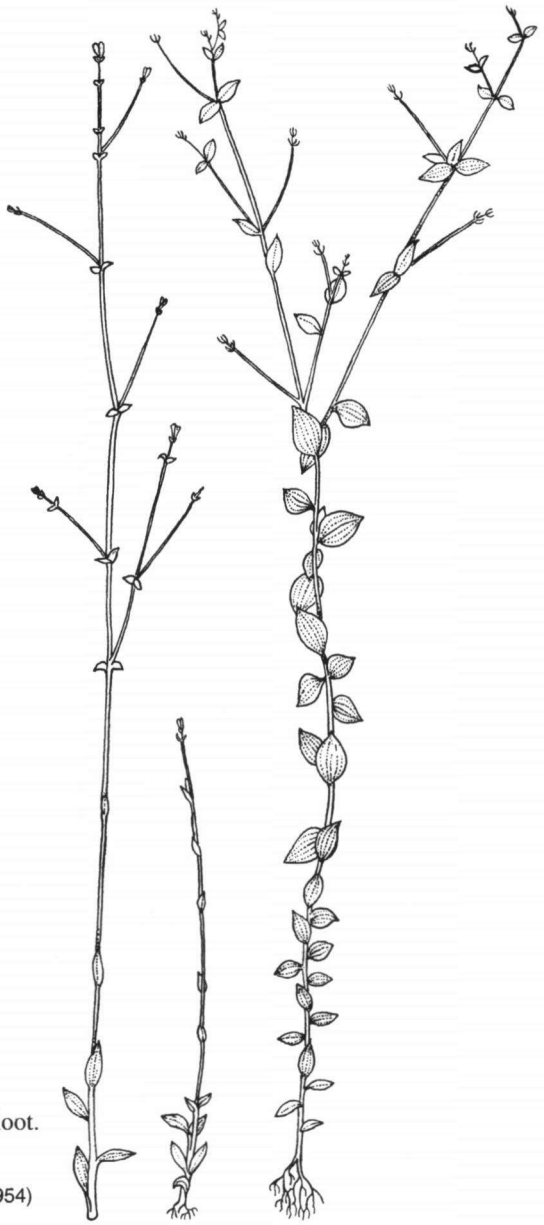

Fig. 171. *Stylidium inconspicuum* Sloot. (Stylidiaceae).

Reproduced from Flora Malesiana I, 4 (1954) 530, fig. 1.

TACCACEAE

Always: Tuberous herbs; inflorescence umbellate, involucrate; flowers bisexual, actinomorphic; perianth 6-lobed, stamens 6, ovary inferior; fruit a 6-ribbed berry.

Usually/often: Leaves crowded, variously dissected, flowers very dark coloured.

Different from: *Amaryllidaceae:* not tuberous. — *Araceae* (*Amorphophallus*): leaves and inflorescence not appearing together, flowers unisexual.

Distribution: The only genus of the family, *Tacca*, is pantropical.

Notes: In times of famine, flour is made out of the corms. Some species are (potential) ornamentals.

Literature: E. Drenth, Fl. Males. I, 7 (1976) 806–819.

Spot-characters: *Tacca* 92, 99.

Illustration: Fig. 172.

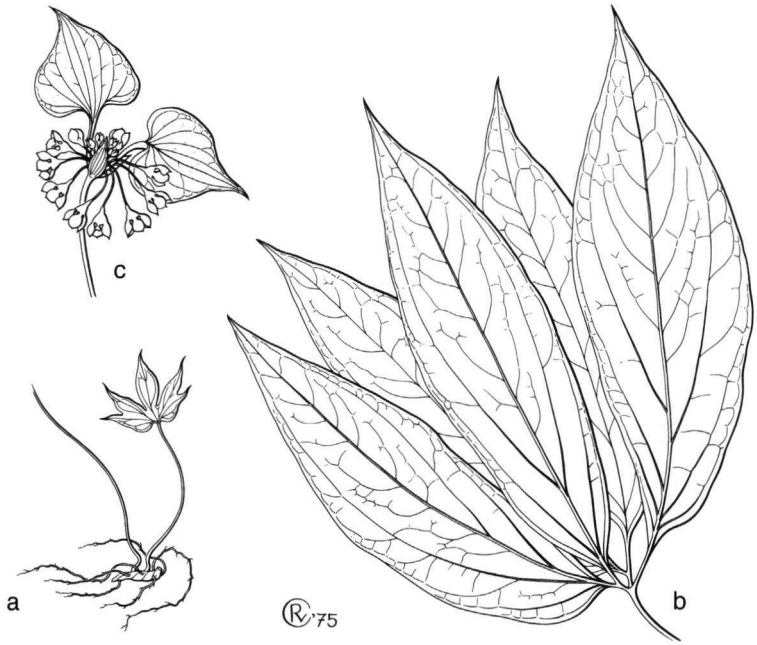

Fig. 172. *Tacca celebica* Koord. (Taccaceae). a. Rootstock of young specimen with one leaf and one petiole; b. mature leaf; c. inflorescence.

Reproduced from Flora Malesiana I, 7 (1976) 818, fig. 1.

TRAPACEAE (HYDROCARYACEAE)

Always: Herbs; leaves dimorphic, floating leaves in a rosette, rhomboid with swollen petiole, submerged leaves opposite, pinnatisect; flowers bisexual, actinomorphic; fruit provided with horns.

Usually/often: Ovary inferior, 1-seeded.

Different from: *Onagraceae* (*Ludwigia*): leaves never dimorphic, fruit many-seeded.

Distribution: The family confined to the Old World. In Malesia only two species of *Trapa* of which one introduced.

Notes: Both species are floating aquatics, the kernels of *T. bicornis* are eaten.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1949) 43–44.

Spot-characters: *Trapa* 92, 95.

Illustration: Fig. 173.

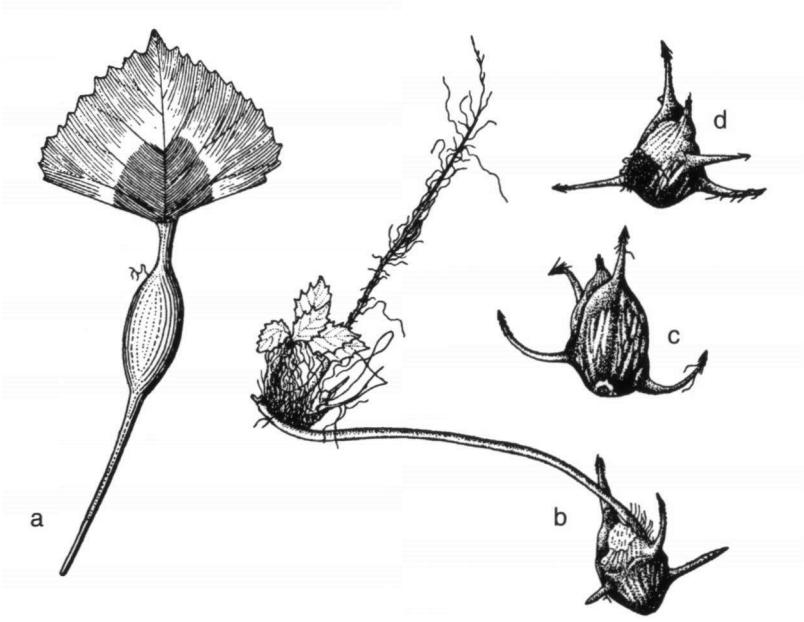

Fig. 173. *Trapa maximoviczii* Korshinsky (Trapaceae). a. Leaf; b. germinating fruit; c & d. fruits.

Reproduced from Flora Malesiana I, 4 (1949) 43, fig. 1a–d.

TRIURIDACEAE

Always: Small saprophytic (echlorophyllose) herbs; leaves reduced to scales; ovary inferior.

Different from: *Polygalaceae* (*Epirixanthes*) and *Liliaceae* (*Petrosavia*): ovary superior.

Distribution: The family is widely, but patchily distributed. In Malesia only *Sciaphila* (*Andruris*).

Notes: Members of the family are inconspicuous inhabitants of the rain forest floor. Where they occur, they may be abundant, often associated with other saprophytes.

Literature: J.P.M. van den Meerendonk, Fl. Males. I, 10 (1984) 109–121.

Spot-characters: *Sciaphila* 7, 92.

Illustration: Fig. 174.

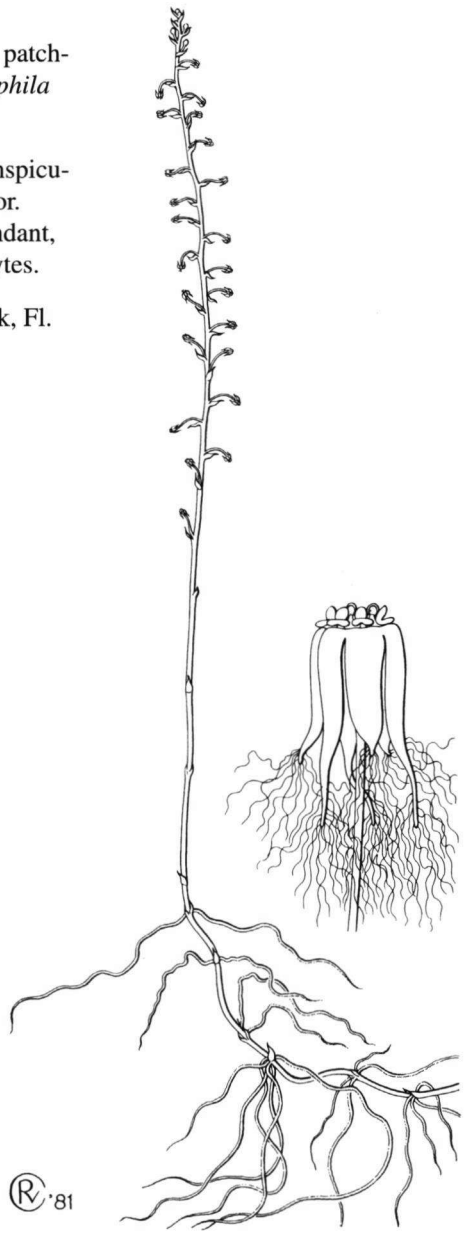

Fig. 174. *Sciaphila densiflora* Schltr. (Triuridaceae). Habit; male flower, enlarged.

Reproduced from Flora Malesiana I, 10 (1984) 119, fig. 4.

TURNERACEAE*

Always: Herbs; leaves simple, alternate, serrate dentate, glandular; venation pinnate; flowers bisexual, actinomorphic, calyx 5-fid, petals 5, contorted in bud; ovary superior; fruit a capsule.

Usually/often: Woody at base.

Different from: *Malvaceae* (*Sida*): leaves not glandular, triplinerved.

Distribution: The family is native in America and Africa. In Malesia 2 genera are locally naturalized: *Piriqueta* and *Turnera*.

Notes: Species of *Turnera* are cultivated as ornamentals.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 235–238.

Spot-characters: *Piriqueta* 25, 26, 31 – *Turnera* 31, 74.

Illustration: Fig. 175.

Fig. 175. *Turnera ulmifolia* L. (Turneraceae). Flowering shoot; enlarged ovary.

Reproduced from M.R. Henderson, Malayan wild flowers, Dicotyledons (1949/51, repr. 1974) 169. With kind permission of the Malaysian Nature Society.

TYPHACEAE

Always: Herbs with a creeping rhizome; leaves long-linear, with parallel veins; inflorescence a terete spike with closely packed female flowers in the lower part and male flowers in the upper part.

Different from: *Graminae*; inflorescence never a spike with unisexual flowers.

Distribution: The only genus of the family, *Typha*, is widespread, only one species in Malesia, gregarious in wet places.

Notes: The rhizomes contain edible starch, the spikes are used for decoration.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 242–244.

Spot-characters: *Typha* 76.

Illustration: Fig. 176.

Fig. 176. *Typha angustifolia* L. (Typhaceae).

Reproduced from Flora Malesiana I, 4 (1951) 242, fig. 1.

UMBELLIFERAE (APIACEAE)

Always: Aromatic herbs; leaves alternate; flowers polygamous in simple or compound umbels, calyx with 5 teeth, petals 5, free, ovary inferior.

Usually/often: Leaves divided, petiole with a sheath; fruit flat, ribbed, topped by a disk and two curved styles.

Different from: *Araliaceae:* woody, fruit rarely flat.

Distribution: The family worldwide. In Malesia 11 native genera, incl.:
- *Hydrocotyle* (widespread), open places from lowland to high in the mountains;
- *Oreomyrrhis* (circum-Pacific, South), alpines, often cushion forming;
- *Trachymene* (Australia, Pacific, Malesia), mainly in the mountains;
- and several introduced ones incl. *Coriandrum* and *Daucus*.

Notes: Several species of the family are useful for man.—Vegetables: *Apium*, Daucus*, Eryngium foetidum*, Oenanthe, Petroselinum**. — Condiments: *Carum*, Coriandrum*, Cuminum*, Foeniculum**. — Medicinal plants: *Anethum, Centella, Pastinaca*, Pimpinella.*

Literature: P. Buwalda, Fl. Males. I, 4 (1949) 113–140.

Spot-characters: *Umbelliferae* 23, 50, 89, 92 – *Eryngium* 24, 76 – *Hydrocotyle* 51 – *Oreomyrrhis* 1 – *Sanicula* 95 – *Trachymene* 1.

Illustrations: Fig. 177 & 178.

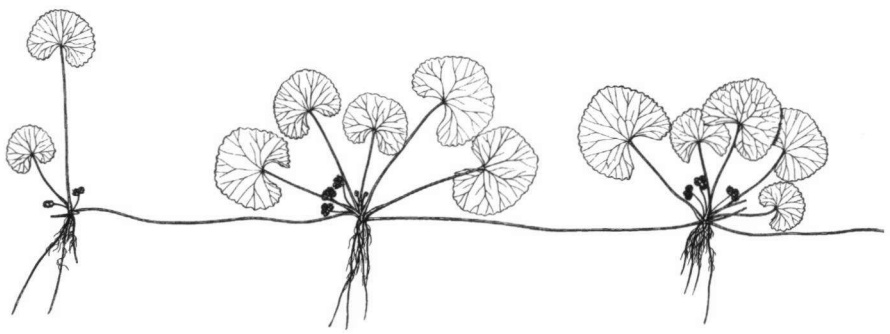

Fig. 177. *Centella asiatica* (L.) Urban (Umbelliferae).

Reproduced from C. A. Backer & D. F. van Slooten, Geïllustreerd Handboek der Javaansche Theeonkruiden (1924) 185.

Fig. 178. *Trachymene novoguineensis* (Domin) Buwalda (Umbelliferae).

Reproduced from Flora Malesiana I, 4 (1949) 119, fig 2a.

VALERIANACEAE

Always: Herbs; leaves opposite, serrate dentate, exstipulate; corolla tubular, stamens inserted on the tube, ovary inferior.

Usually/often: Flowers bisexual.

Different from: *Scrophulariaceae:* ovary superior. — *Rubiaceae:* leaves entire, stipulate.

Distribution: The family mainly in the northern hemisphere, and the Andes (South America). In Malesia 2 genera: *Triplostegia* and *Valeriana*, both in open places in the mountains.

Notes: *Triplostegia* is also placed in the *Dipsacaceae*. *Valeriana* is used medicinally.

Literature: C.A. Backer, Fl. Males. I, 4 (1951) 253–254 (*Valeriana*); C.G.G.J. van Steenis, Fl. Males. I, 4 (1951) 290–292 (*Triplostegia*).

Spot-characters: *Triplostegia* 92 – *Valeriana* 49, 92.

Illustration: Fig. 179.

Fig. 179. *Valeriana hardwickii* Wall. (Valerianaceae). Young flowering stemtop and separate leaf.

Reproduced from Flora Malesiana I, 4 (1951) 253, fig. 1.

VISCACEAE

Always: Parasitic hemiparasites, attached to the host with a single haustorium; leaves simple, opposite; flowers unisexual, tepals 2–4, valvate, ovary inferior, fruit a berry, the single seed covered by sticky layer.

Usually/often: Leaves reduced.

Striking features: Young parts covered by yellow stellate hairs (*Notothixos*), stems with internodes flattened in one plane (*Korthalsella*).

Different from: *Loranthaceae:* usually attached to the host with several haustoria; leaves and corolla well developed; flowers usually bisexual.

Distribution: The family worldwide, but mostly in the tropics. In Malesia 4 genera, incl.:
- *Ginalloa* (Sri Lanka to Solomons), mostly in lowland forest;
- *Viscum* (widespread in Old World), lowland and montane disturbed and primary forest.

Notes: The family used to be included in *Loranthaceae*. Some species of *Viscum* are hyperparasites. A number of species are used medicinally.

Literature: B.A. Barlow, Fl. Males. I, 13 (1997) 403–442.

Spot-characters: *Viscaceae* 16, 83, 92 – *Ginalloa* 12, 64 – *Korthalsella* 12 – *Notothixos* 12, 25, 64 – *Viscum* 12, 54, 64; *V. ovalifolium* 95.

Illustrations: Fig. 180 & 181.

Fig. 180. *Ginalloa flagellaris* Barlow (Viscaceae).

Reproduced from Blumea 41 and Flora Malesiana I, 13 (1997) 416, fig. 2a.

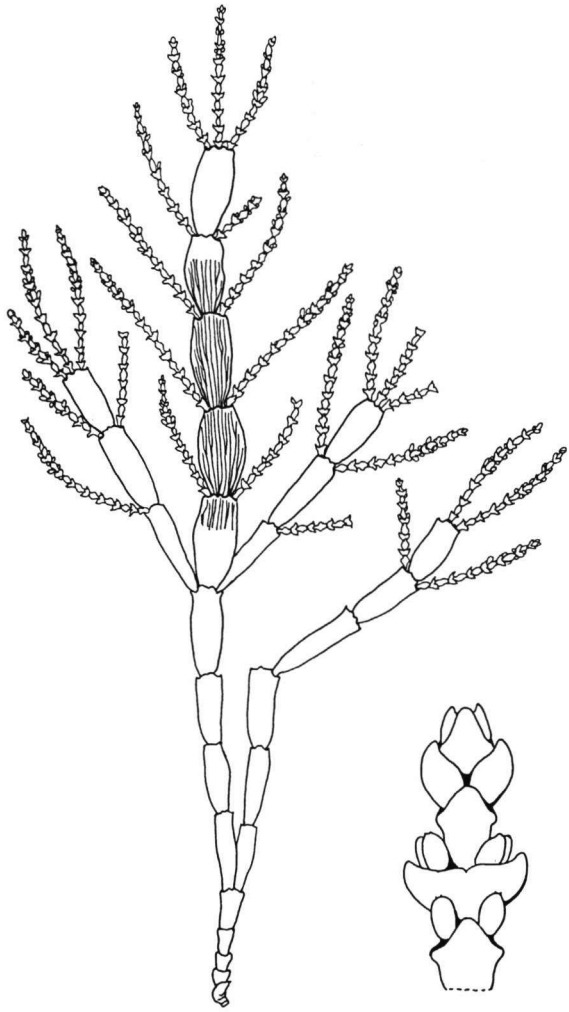

Fig. 181. *Korthalsella papuana* Danser (Viscaceae).

Reproduced from Flora Malesiana I, 13 (1997) 422, fig. 3c.

VITACEAE

Always: Climbers, incl. creepers; leaves spiral; petals free, valvate; stamens opposite the petals; ovary superior, adnate to the disk, 2-locular; fruit a berry with 2–4 seeds.

Usually/often: Leaves compound, stipulate, dentate, tendril and inflorescence leaf-opposed; flowers hermaphrodite.

Striking features: Leaves simple: *Ampelocissus* (some), *Cissus* (most), *Pterisanthes* (some), *Vitis**; tendril on inflorescence (*Ampelocissus*, *Pterisanthes*); inflorescence ribbon-like (*Pterisanthes*).

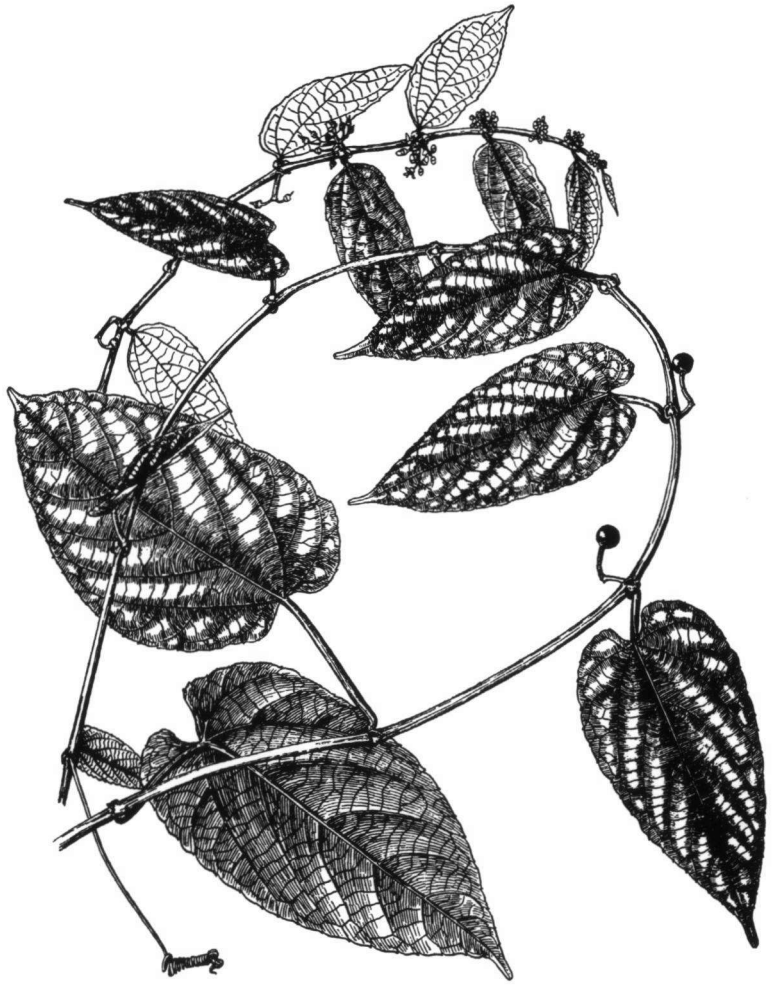

Fig. 182. *Cissus discolor* Blume (Vitaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 440.

Different from: *Cucurbitaceae:* flowers usually large, tendrils lateral to petiole, ovary inferior.

Distribution: The family worldwide, chiefly tropical. In Malesia 9 genera, incl.:
- *Cayratia* (paleotropics), lowland to montane rain forest;
- *Cissus* (pantropical), lowland to montane rain forest;
- *Tetrastigma* (Indo-Australia), lowland to montane rain forest.

Notes: *Leea* (a genus of shrubs and trees, common in Malesia) is considered to belong to a family in its own right: *Leeaceae*; see Ridsdale, Fl. Mal. I, 7 (1976) 755–782. — *Tetrastigma* is the sole host for species of *Rafflesia*. — *Vitis vinifera** is cultivated for its fruit (grapes). Some species are (potential) ornamentals.

Literature: K. Suessenguth, Pfl. Fam. ed. 2, 20d (1953) 174–398; C.A. Backer & R.C. Bakhuizen van den Brink, Fl. Java 2 (1965) 86–93. — Prof. A. Latiff Mohamed (UKMB) is revising the family for Flora Malesiana.

Spot-characters: *Vitaceae* 48, 58, 83 – *Ampelocissus* 4 – *Ampelopsis* 4, 50, 72 – *Cayratia* 4 – *Cissus* 2, 4, 35, 59, 72; *C. alata* 15 – *Nothocissus* 4 – *Parthenocissus* 4 – *Pterisanthes* 4, 76 – *Tetrastigma* 4, 59, 70, 105 – *Vitis* 4.

Illustrations: Fig. 182 & 183.

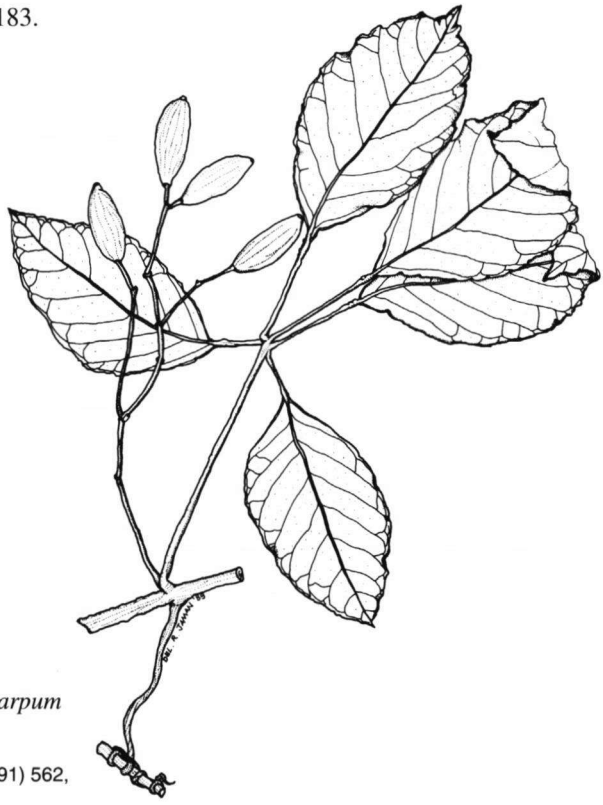

Fig. 183. *Tetrastigma megacarpum* Latiff (Vitaceae). Habit.

Reproduced from Blumea 35 (1991) 562, fig. 2A.

XANTHORRHOEACEAE

Always: Stem woody, leaves linear, crowded, flowers actinomorphic, tepals 6, ovary superior, 3-locular.

Usually/often: Stem short.

Striking features: Leaves breaking off above the base, basal part persistent (*Lomandra banksii*).

Different from: Not readily distinguishable from *Agavaceae*.

Distribution: The family best represented in Australia. In Malesia only *Lomandra* and *Romnalda*.

Notes: *Xanthorrhoea** is locally cultivated as an ornamental.

Literature: P.F. Stevens, J. Arnold Arbor. 59 (1978) 129–155; D.J. Bedford et al., Fl. Austral. 46 (1986) 88–171.

Spot-characters: *Xanthorrhoea** 10.

Illustration: Fig. 184.

Fig. 184. *Lomandra banksii* (R. Br.) Ewart (Xanthorrhoeaceae).

Reproduced from Adansonia II, 20 (1980) 23, fig. 8. Courtesy Prof. J. Jérémie.

XYRIDACEAE

Always: Herbs; leaves distichous, crowded; flowers bisexual, actinomorphic, 3-merous on stalked heads; ovary superior, 1-celled; fruit a capsule, seeds many.

Usually/often: Leaves linear, petals yellow, stamens 3, epipetalous, staminodes 3, fimbriate, alternipetalous.

Different from: *Eriocaulaceae:* flower heads usually grey, flowers unisexual, capsule 1-seeded.

Distribution: A family of two genera, one in South America, the other, *Xyris*, widespread, mostly in open marshy places.

Literature: P. van Royen, Fl. Males. I, 4 (1953) 367–376; B. Hansen, Fl. Males. I, 9 (1982) 571–573.

Spot-characters: *Xyris* 1, 76.

Illustration: Fig. 185.

Fig. 185. *Xyris indica* L. (Xyridaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 192. With kind permission of the Malaysian Nature Society.

ZINGIBERACEAE

Always: Aromatic herbs; leaves simple, with a ligule and sheathing petiole; flowers zygomorphic, 3-merous, calyx tubular, fertile stamen 1, anther 2-locular; labellum and petaloid lateral staminodes (staminodes reduced in *Alpinieae*, fused to margin of labellum in *Zingiber*); ovary inferior.

Usually/often: Terrestrial plants with underground rootstock, petioles forming a pseudostem; flowers in dense capitate inflorescence on a separate peduncle; ovary 3-locular with several ovules per cell.

Striking features: Filament long exerted, bow-like (*Globba*); inflorescence fusiform (*Hornstedtia*); inflorescence breaking through the leafsheaths halfway the stem (*Plagiostachys*); stemless plants (*Boesenbergia, Kaempferia*).

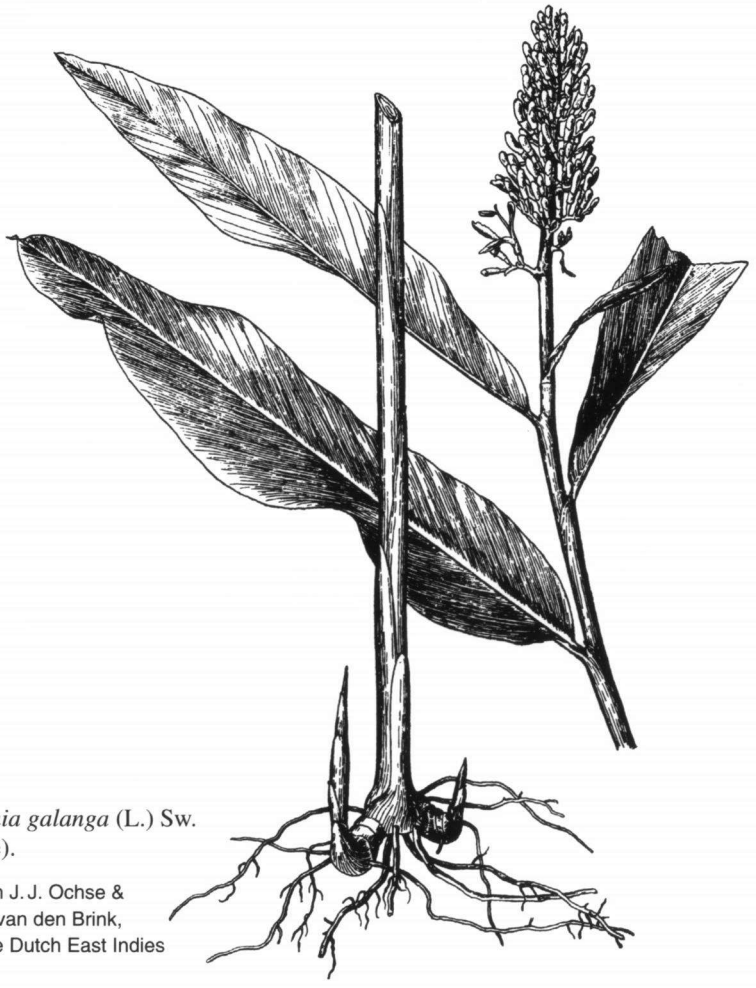

Fig. 186. *Alpinia galanga* (L.) Sw. (Zingiberaceae).

Reproduced from J. J. Ochse & R. C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 442.

Different from: *Marantaceae:* petiole swollen apically, plants not aromatic; sepals more or less free, anther 1-loculate, ovules 1 per cell. — *Orchidaceae:* leaves not ligulate; flowers mostly resupinate, stamen + style forming a column, pollen in waxy masses (pollinia).

Distribution: The family pantropical. In Malesia 26 genera, incl.:
- *Alpinia* (Indo-Malesia, Pacific), tall herbs, lowland + montane rain forest;
- *Curcuma* (Indo-Malesia), medium sized herbs, forest and forest margins, lowland;
- *Globba* (Indo-Malesia), small herbs, forest floor, lowland;
- *Hornstedtia* (Indo-Australia), tall herbs, forest floor, lowland;
- *Zingiber* (Indo-Australia), medium to tall herbs, forest and forest edges, lowland.

Fig. 187. *Curcuma longa* L. (Zingiberaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 445.

(Zingiberaceae continued)

Notes: *Costaceae* are here treated as a separate family. Members of the family are very common in the undergrowth of rain forest and in secondary vegetation. Many species useful to man. — Medicinal: *Curcuma, Kaempferia, Zingiber.* — Edible leaves or inflorescence: *Amomum, Etlingera* (*Achasma, Geanthus, Nicolaia*). — Spices: *Alpinia, Curcuma, Elettaria*, Kaempferia, Zingiber.* — Ornamentals: *Alpinia, Globba, Hedychium, Zingiber.*

Literature: R.E. Holttum, The Zingiberaceae of the Malay Peninsula, Gard. Bull. Sing. 13 (1950) 1–249; R.M. Smith, A review of the Bornean Zingiberaceae, Not. Roy. Bot. Gard. Edinb. 42 (1985) 261–314; 43 (1986) 439–466; 44 (1987) 203–232; 45 (1988) 409–423.

Spot-characters: *Zingiberaceae* 75, 92, 104 – *Alpinia* 13, 78; *A. domatifera* 9 – *Amomum* 95, 96 – *Boesenbergia* 101 – *Brachychilum* 101 – *Etlingera* 76, 96 – *Globba* 13 – *Hedychium* 101 – *Plagiostachys* 70, 76 – *Zingiber* 101.

Illustrations: Fig. 186–189.

Fig. 188. *Kaempferia pulchra* Ridl. (Zingiberaceae).

Reproduced from M.R. Henderson, Malayan wild flowers, Monocotyledons (1954, repr. 1974) 145. With kind permission of the Malaysian Nature Society.

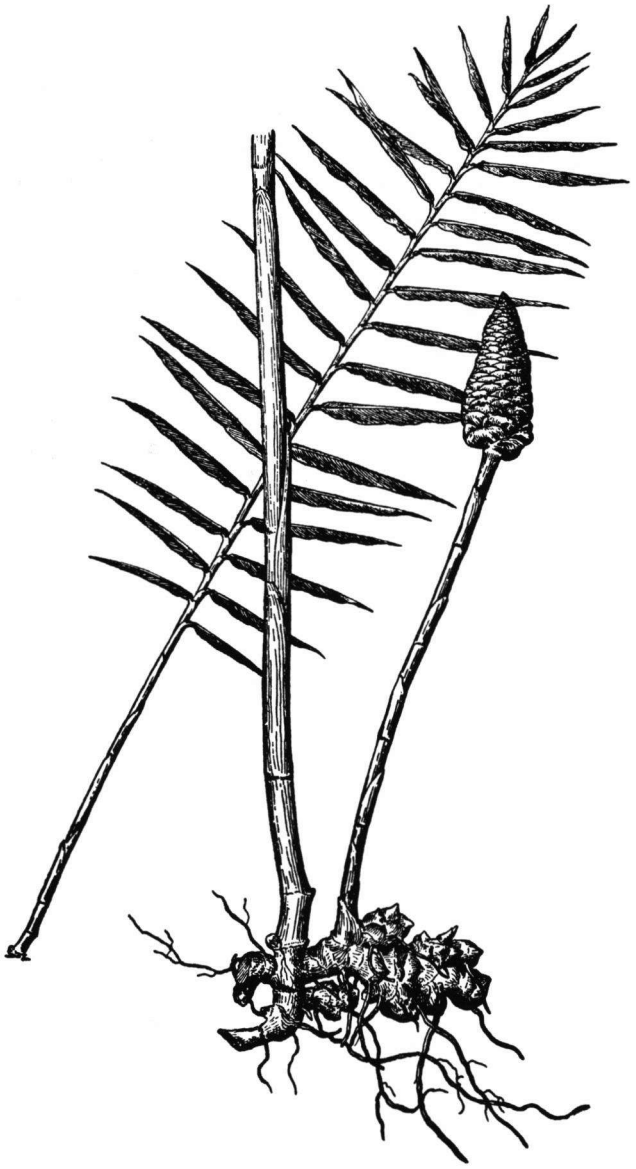

Fig. 189. *Zingiber zerumbet* (L.) E. Sm. (Zingiberaceae).

Reproduced from J.J. Ochse & R.C. Bakhuizen van den Brink, Vegetables of the Dutch East Indies (1980) fig. 463.

ZYGOPHYLLACEAE

Always: Prostrate herbs; leaves pinnate, opposite, stipulate; flowers bisexual, actinomorphic, 5-merous, sepals and petals free, stamens 10, petals yellow; ovary superior, fruit spiny.

Usually/often: Leaves anisophyllous, stamens unequal.

Different from: *Tiliaceae* (*Triumfetta*): leaves simple, spiral.

Distribution: The family worldwide. In Malesia only *Tribulus*, locally common in the eastern part of Malesia, along sandy beach.

Literature: C.G.G.J. van Steenis, Fl. Males. I, 4 (1949) 64.

Spot-characters: *Tribulus* 47, 49, 95.

Illustration: Fig. 190.

Fig. 190. *Tribulus cistoides* L. (Zygophyllaceae). Flowering and fruiting branch.

Reproduced from W.L. Wagner, S.H. Sohmer & D.R. Herbst, Manual of the Flowering Plants of Hawai'i Vol. 2 (1990) 1341, pl. 197. With kind permission of the Bishop Museum Press.

ADDITIONAL SPOT-CHARACTERS

Since the publication of Volume 1 of Malesian Seed Plants (Spot-characters), a number of additions were recorded. The following pages contain these additions and also corrections to the lists in Volume 1, with reference to their pages.

page 9:

1. Cushion plants

Poa pp — Gram.
Rhamphogyne = *Lagenocypsela* — Comp.

page 11:

2. Swollen stems

Alstonia pneumatophora — Apoc.
Clerodendrum fistulosum — Verb.
Epicycas — Cyc.

page 12:

Fig. 3. *Corypha elata* = *Corypha utan*

page 13:

3. Monocarpic plants

Musa — Mus.
Paraboea — Gesn.

page 15:

4. Climbers with hooks / tendrils

Aidia pp — Rub.
Ceriscoides — Rub.
Fagerlindia — Rub.
Heterosmilax should be deleted
Oxyceros — Rub.
Randia, Rub., should be deleted
*Saritaea** — Bign.

page 17:

5. Climbers without hooks / tendrils

Alangium salvifolium — Alang.
Alangium scandens — Alang.
Allaeophania — Rub.
Aphaenandra — Rub.
*Arachnis** — Orch.
Argyreia — Conv.
Artia — Apoc.
Baharuia — Apoc.
*Basella** — Basel.
Calycopteris — Comb.
Canarium pp (Clemens 31095, Docters van Leeuwen 10536, Pleyte 1020) — Burs.
Catanthera — Melast.
Cladomyza — Sant.
Codonopsis javanica — Camp.
Croton caudatus — Euph.
Dalenia — Melast.
Dapania — Oxal.
Dendrobium pp — Orch.
Dendromyza — Sant.
Dendrotrophe — Sant.
Dissochaeta — Melast.
Ecua — Apoc.
Erythrorchis pp — Orch.
Fagraea pp — Logan.
Gelsemium — Logan.
Glomera pp — Orch.
Heterosmilax — Smilac.

page 18:

[**5.** continued]

Lecananthus — Rub.
Lucinaea = *Schradera* — Rub.
Micropera — Orch.
Neuropeltis — Conv.
Neuropeltopsis — Conv.
Nothocnide — Urt.
Poikilospermum — Urt.
Pseuderia — Orch.
Pseudovanilla — Orch.
Renanthera pp — Orch.
Rhus nodosa — Anac.
Rhynchosia (Leg.) = *Rhynchodia* (Apoc.)
Schradera — Rub.
Sericolea micans pp (Hoogland & Craven 10874, 10891) — Elaeoc.
Stichoneuron — Stemon.
Trachelospermum — Apoc.
Trichopus — Diosc.

page 19:

6. Climbers with opposite leaves

Baharuia — Apoc.
Ceriscoides — Rub.
Clerodendrum pp — Verb.
Codonopsis javanica — Camp.
Ecua — Apoc.
Fagerlindia — Rub.

Lecananthus — Rub.
Lucinaea = *Schradera* — Rub.
Oxyceros — Rub.
Passiflora cochinchinensis — Passifl.
Rhipogonum — Smilac.
Schradera — Rub.
Sericolea micans pp — Elaeoc.

page 21:
7. Echlorophyllose plants
Cyrtosia — Orch.
Dipodium pp — Orch.
Erythrorchis — Orch.
Langsdorffia — Raffl. = Balanoph.
Neoclemensia — Orch.
Pachystoma, Orch., should be deleted
Platanthera pp — Orch.
Pseudovanilla — Orch.
Rhizanthes — Balanoph. = Raffl.
Sapria (As.) — Orch. = Raffl.
Silvorchis — Orch.
Stereosandra — Orch.
Tropidia pp — Orch.

page 23:
8. Leafless when flowering
Falconeria — Euph.
Microtatorchis — Orch.
Utricularia — Lent.

page 25:
9. Ant plants
Alectryon pp — Sapind.
Amylotheca formicaria = *Decaisnina sumbawaensis* — Loranth.
Callicarpa saccata — Verb.
Capparis buwaldae — Capp.
Crypteronia griffithii — Crypt.
Cryptocarya (Davis 759) — Laur.
Decaisnina sumbawaensis — Loranth.
Drypetes myrmecophila = *D. longifolia* — Euph.
Drypetes pendula, Euph., should be deleted
Guioa pp — Sapind.
Helicia forbesiana — Prot.
Pachycentria pp — Melast.
Ryparosa calotricha — Flac.
Sarcopteryx pp — Sapind.
Smilax borneensis — Smilac.

page 27:
10. Schopfbäume
Epicycas — Cycad.
Meryta (P) — Aral.
Oroxylum pp — Bign.
Saurauia pp — Actin.
*Xanthorrhoea** — Xanth.

page 29:
11. Parasites
Dendrotrophe — Sant.
Lepidella, Loranth., should be deleted
Loranthus — Loranth.
Rhizomonanthes = *Amyema* — Loranth.

page 31:
12. Armed plants
Acanthophora = *Aralia* — Aral.
Burkillanthus — Rut.
Cadaba — Capp.
Doryxylon — Euph.
Hibiscus pp — Malv.
Lantana * — Verb.
Lycium chinense * — Solan.
Mahonia — Berb.
Monanthocitrus — Rut.

page 32:
[**12.** continued]
Pleiospermium — Rut.
Polygonum perforatum — Polygon.
Rosa — Rosac.
Rubus — Rosac.
Zizyphus — Rhamn.

page 32:
13. Bulbils
Amorphophallus pp — Arac.
Schismatoglottis bulbifera — Arac.

page 35:
15. Stem flanged
Adinandra pp — Theac.
Coriaria — Coriar.
Grangea, Comp., should be deleted
Lecananthus — Rub.
Verbesina alata — Comp.

page 37:
16. Swollen nodes
Kibara — Monim.

page 39:
17. Twigs white, petiole black
Casearia pp — Flac.
Fraxinus pp — Oleac.
Goniothalamus — Annon.
Microtropis pp — Celastr.
Pteleocarpa pp — Borag.
Sphenostemon — Sphen.

page 39:
18. Serial buds
Diospyros pp — Eben.

page 40:
19. White or yellow sap
Aponogeton — Aponog.
Sandoricum (fr.) — Meliac.

page 41:
20. Black or brown sap
Mallotus mollissimus — Euph.

page 43:
23. Fenugreek
Claoxylon pp — Euph.
Tylophora cissoides pp — Ascl.

page 43:
24. Foetid
Sterculia foetida — Sterc.

page 45:
25. Stellate hairs
Dicoelia, Euph., should be deleted
Notothixos — Visc.
Paraboea — Gesn.

page 46:
[**25.** continued]
Tectona — Verb.
Trisepalum — Gesn.

page 47:
27. Dendroid hairs
Monophyllaea (*Moultonia*) — Gesn.
Paraboea — Gesn.

page 47:
28. Balance hairs
Berchemia affinis — Rhamn.

page 47:
29. Stinging hairs
Cnesmocarpon — Sapind.

page 48:
30. Leaves glaucous
Acer pp — Acer.
Paramyristica — Myrist.
Trigoniastrum, Trig., should be deleted

page 49:
31. Glands on petiole or lamina
Agapetes (l) — Eric.
Albizia pp (p) — Leg.
Balakata — Euph.
Botryophora — Euph.
Byttneria (l) — Sterc.
Caldcluvia — Cunon.
Cephalomappa — Euph.
Ceratopetalum — Cunon.
Chrozophora — Euph.
Clethra — Clethr.
Corynocarpus — Coryn.
Costera pp — Eric.
Cubilia pp (l) — Sapind.
Didymocarpus — Gesn.
Dimocarpus pp (l) — Sapind.
Dimorphanthera (p) — Eric.
Dioscorea (l) — Diosc.
Falconeria — Euph.
Guioa pp (l) — Sapind.
Gymnanthes — Euph.
Hiptage — Malp.
Homalanthus pp — Euph.
Hydnocarpus pp — Flac.
Jagera pp — Sapind.
Kosteletzkya (l) — Malv.
Lepisanthes pp (l) — Sapind.

page 51:
[**31.** continued]
Monophyllaea — Gesn.
Octomeles — Datisc.
Paropsia — Flac.
Photinia pp (l) — Rosac.
Sapium, Euph., should be deleted
Sarcopteryx pp (l) — Sapind.
Shirakiopsis — Euph.
Sphenostemon (l) — Sphen.
Stillingia — Euph.
Sumbaviopsis — Euph.
Ternstroemia pp (l) — Theac.
Thespesia pp (l) — Malv.

Triadica — Euph.
Trichosanthes pp — Cuc.
Trigonachras pp (l) — Sapind.
Urena (l) — Malv.
Viburnum pp (l) — Caprif.

page 53:
Correction:
32. Intrapetiolar stipules should be
32. Interpetiolar stipules

page 54:
34. Stipules pectinate
Keenania — Rub.

page 54:
35. Stipules peltate
Cissus pp — Vitac.

page 54:
36. Stipules striate
Alysicarpus — Leg.

page 56:
37. Stipules foliaceous
Acaena — Rosac.
Anthocephalus — Rub.
Leucostegane latistipulata — Leg.
Naucleae — Rub.
Saraca — Leg.
Wendlandia — Rub.

page 57:
38. Petiole swollen apically
Antidesma, Euph., should be deleted
Crudia subsimplicifolia — Leg.
Dialium procerum — Leg.
Loerzingia — Euph.
Maingaya — Hamam.

page 59:
[**38.** continued]
Reinwardtiodendron celebicum — Meliac.

page 61:
39. Petiole wrinkled
Erycibe pp — Conv.
Glyptopetalum pp — Celastr.
Leguminosae pp (petiolules)

page 61:
40. Winged rachis / petiole
Aglaia lawii pp — Meliac.

page 63:
42. Rachis with swollen nodes
Fraxinus — Oleac.

page 64:
43. Petiole strongly swollen at base
Hamamelidaceae pp
Ixonanthes — Ixon.

page 67:
45. Leaves opposite in spiral-leaved families
Syndyophyllum — Euph.

page 69:
46. Leaves verticillate
Barringtonia pp (c) — Lecyth.
Botryophora pp (c) — Euph.
Henckelia pp — Gesn.
Rhipogonum pp — Smilac.

page 71:
47. Leaves anisophyllous
Lycianthes = *Solanum* — Solan.
Syzygium pp — Myrt.

page 73:
48. Leaves palmately compound
Garrettia — Verb.
Hosea — Verb.
Petraeovitex — Verb.
*Sesamum indicum** pp — Pedal.

page 75:
49. Leaves compound opposite
*Saritaea** — Bign.

page 77:
50. Leaves 2-, 3- (or 4-)pinnate
*Cardiospermum** — Sapind.
Leea pp — Leeac.
Petraeovitex pp — Verb.

page 78:
51. Leaves peltate
Cyrtandra pp — Gesn.
Doryxylon — Euph.
*Manihot** pp — Euph.
Octomeles, Datisc., should be deleted
Piper pp — Piper.
Sterculia pp — Sterc.
Sumbaviopsis — Euph.

page 79:
52. Leaves bullate
Centratherum — Comp.
Dichapetalum pp — Dichap.
Henckelia pp — Gesn.
Ridleyandra pp — Gesn.

page 80:
53. Dicots with large leaves
Beilschmiedia pp — Laur.
Crypteronia griffithii — Crypt.
Knema kostermansiana — Myrist.
Litsea pp — Laur.
Loheria magnifolia — Myrsin.
Lunasia amara pp — Rut.
Omphalea bracteata pp — Euph.

page 81:
54. Nigrescence
Dichapetalum pp — Dichap.
Lindera pp — Laur.
Messerschmidia = *Tournefortia argentea* — Borag.
Pittosporum pp — Pitt.
Polyosma pp — Sax.

page 82:
57. Broken leaves with white threads
Monimiaceae pp

page 87:
59. Leaves with dots
Quintinia — Sax.
Sindora pp — Leg.

page 88:
60. Leaf surface puncticulate
Aeschynanthus pp — Gesn.
Didymocarpus pp — Gesn.

page 89:
62. Leaf surface rough
Chirita pp — Gesn.
Gironniera — Ulm.
Henckelia pp — Gesn.
Tectona philippinensis — Verb.

page 89:
63. Cystoliths
Cucurbitaceae pp

page 91:
64. Leaves triplinerved
Ahernia — Flac.
Byttneria pp — Sterc.
Drymaria — Caryoph.

page 94:
67. Parallel secondary venation
Alyxia pp — Apoc.
Heliconia — Strel.
Mammea nervosa — Gutt.
Ochrosia pp — Apoc.

page 95:
69. Leaves withering red
Aleisanthopsis — Rub.
Berberis — Berber.
Ludwigia octovalvis — Onagr.
Photinia pp — Rosac.
Tristaniopsis pp — Myrt.

page 96:
70. Cauliflorous plants
Alchornea borneensis, Euph., should be deleted

page 97:
[**70.** continued]
Dillenia bolsteri — Dillen.
Forrestia = *Amischotolype* — Leg.
Hydnocarpus polypetala — Flac.
Mammea acuminata — Gutt.
Moultonia = *Monophyllaea* — Gesn.
Plagiostachys — Zing.
Pseudosmelia pp — Flac.
Siphonodon pp — Celastr.

page 99:
71. Inflorescence fasciculate, leaves distichous
Flacourtia pp — Flac.
Indorouchera — Linac.
Rhamnaceae pp
Symplocos pp — Sympl.

page 101:
72. Inflorescence leaf-opposed
Phytolacca pp — Phytol.

page 101:
73. Inflorescence supra-axillary
Microtropis pp — Celastr.

page 102:
74. Inflorescence epiphyllous
Chirita — Gesn.
Henckelia — Gesn.
Ridleyandra — Gesn.

page 104:
76. Inflorescence compact
Agalmyla pp — Gesn.
Bucklandia — Hamam.
Cyclophyllum — Rub.

page 105:
[**76.** continued]
Etlingera — Zing.
Lecananthus — Rub.
Phrynium — Marant.
Plagiostachys pp — Zing.
Prismatomeris pp — Rub.
Schradera — Rub.
Symingtonia = *Bucklandia* — Hamam.

page 105:
77. Inflorescence a condensed raceme
Hydnocarpus pp — Flac.

page 107:
78. Flagelliflory
Dioscorea pp — Diosc.
Ficus pp — Morac.
Gaertnera fractiflexa — Rub.
Livistona — Palm.
Sarcotheca ochracea pp — Oxal.

page 108:
80. Calyx accrescent
Calycopteris — Combr.
Ceratopetalum — Cunon.

page 109:
[**80.** continued]
Stictocardia — Conv.
Streblus taxoides — Morac.

page 111:
81. Corolla / petals fimbriate / bifid
Eustrephus — Phil.
Gillbeea (2) — Cunon.
Stylidium (2) — Stylid.

page 112:
82. Corolla / petals with appendages
Cratoxylum — Gutt.
Mangifera — Anac.
Swertia — Gent.

page 114:
84. Staminal tube
Patersonia — Irid.

page 114:
85. Stamens with appendages
Anisoptera — Dipt.
Cotylelobium — Dipt.
Dipterocarpus — Dipt.

page 115:
[**85.** continued]
Hopea — Dipt.
Shorea pp — Dipt.
Upuna — Dipt.
Vatica pp — Dipt.

page 116:
87. Anthers opening by valves
Berberis — Berb.
Mahonia — Berb.

page 117:
88. Broad sessile stigma
Discocalyx — Myrsin.
*Papaver** — Papav.
Reinwardtiodendron — Meliac.
Scyphostegia — Scyph.

page 119:
91. Excentric style
Pleiogynium — Anac.

page 120:
92. Ovary inferior
Drimycarpus — Anac.

page 121:
[**92.** continued]
Fagaceae
Hydrocharitaceae
Iridaceae
Lecythidaceae
Melanochyla pp — Anac.
Orchidantha — Lowiac.
Pegia — Anac.
Pentastemona — Pent.
Semecarpus pp — Anac.
Tacca — Tacc.
Wittsteinia — Alseuosm.

page 122:
94. Woody fruits, scattered seeds
Abdulmajidia — Lecyth.
Careya — Lecyth.
Planchonia — Lecyth.

page 124:
95. Spiny / muricate fruits
Agelaea — Conn.

page 125:
[**95.** continued]
*Canna** — Cann.
Delphyodon = *Parsonsia* — Apoc.
Parinari pp — Chrys.
Parsonsia — Apoc.
Uvaria pp — Annon.
Viscum ovalifolium — Visc.

page 127:
96. Compound fruits
Mitragyna — Rub.
Myrmeconauclea — Rub.
Prismatomeris — Rub.
Sararanga, Pand., should be deleted
Schradera — Rub.

page 128:
97. Moniliform fruit
Baharuia — Apoc.

page 128:
98. Fruit winged
Brachylophon, Malp., should be deleted

page 130:
[**98.** continued]
Hernandia, Hern., should be deleted
Kleinhovia, Sterc., should be deleted
Paederia verticillata — Rub.
Quassia — Simar.
Samadera = *Quassia* — Simar.
*Schizolobium** — Leg.
Trichospermum — Tiliac.

page 131:
99. Fruit ridged
Averrhoa carambola — Oxal.
Baccaurea acutangula — Euph.
Brachylophon — Malp.
Myoporum — Myop.
Tacca — Tacc.

page 135:
102. Seeds winged
Aeschynanthus pp — Gesn.
Neoalsomitra — Cuc.
Zanonia — Cuc.

page 138:
104. Seeds arillate
Musaceae should be deleted
Orchidantha — Lowiac.
Stemonaceae
Strelitziaceae

page 139:
105. Ruminate endosperm
Pyrenacantha — Icac.

NEW SPOT-CHARACTERS

After the publication of Malesian Seed Plants Volume 1, a few more lists of new spot-characters were prepared. They have not been numbered here and are not incorporated in the 'portraits' of Volumes 2 & 3.

Twigs mimicking compound leaves

Recognizable as twigs by the presence of axillary buds

Coriar.	*Coriaria*	Flac.	*Paropsia*
Euph.	*Breynia*	Myrist.	*Horsfieldia sylvestris*
	Cleistanthus	Podoc.	*Dacrycarpus*
	Glochidion	Rhamn.	*Zizyphus*
	Kairothamnus	Rhiz.	*Anisophyllea*
	Phyllanthus	Tax.	*Taxus*
	Sauropus		

Leaf margin dentate / serrate

Most tropical plant families have entire leaf margins (e.g. Annonaceae, Rubiaceae). Dentate or serrate leaf margins are relatively rare. Only in a few Malesian plant families the leaves are always indented; these are marked here by an exclamation mark (!). In some families indented leaves are common (Compositae, Theaceae), in others rare (Rhizophoraceae).

Acanthaceae
Actinidiaceae
Alangiaceae
Alseuosmiaceae
Amaranthaceae
Anacardiaceae
Aquifoliaceae
Araliaceae
Balsaminaceae
Berberidaceae
Boraginaceae
Burseraceae
Buxaceae
Campanulaceae
Cannabinaceae !
Capparidaceae
Caprifoliaceae
Celastraceae
Ceratophyllaceae !
Chloranthaceae !
Clethraceae !
Compositae
Crassulaceae
Cruciferae
Cucurbitaceae
Cunoniaceae
Daphniphyllaceae
Dilleniaceae
Elaeocarpaceae
Ericaceae
Euphorbiaceae
Fagaceae
Flacourtiaceae
Geraniaceae
Gesneriaceae
Goodeniaceae
Haloragaceae
Hamamelidaceae
Juglandaceae
Labiatae
Lecythidaceae
Leeaceae !
Linaceae
Loganiaceae
Lophopyxidaceae !
Malvaceae
Meliaceae
Monimiaceae
Moraceae
Myricaceae !
Myrsinaceae
Najadaceae !
Ochnaceae
Olacaceae
Oleaceae
Oxalidaceae
Pandanaceae
Papaveraceae !
Pentaphragmataceae !
Pittosporaceae
Primulaceae !
Proteaceae
Ranunculaceae
Rhamnaceae
Rhizophoraceae
Rosaceae
Rutaceae
Sabiaceae
Salicaceae !
Sapindaceae
Saxifragaceae
Scrophulariaceae
Scyphostegiaceae !
Simaroubaceae
Sphenostemonaceae !
Staphyleaceae !
Sterculiaceae
Styracaceae
Symplocaceae
Theaceae
Tiliaceae
Trapaceae !
Trimeniaceae
Turneraceae !
Ulmaceae
Umbelliferae
Urticaceae
Valerianaceae !
Verbenaceae
Violaceae
Vitaceae
Zygophyllaceae !

Resinous exudate

Some plants produce a sticky, usually colourless exudate, often with turpentine-like smell. In some species this exudate hardens and is harvested (copal, damar). Good examples are *Agathis* and *Shorea*.

Agav.	*Dracaena*	Pinac.	*Pinus*
Anac.	Anacardiaceae	Pitt.	*Pittosporum*
Aral.	Araliaceae	Podoc.	*Dacrycarpus*
Arauc.	*Agathis*		*Dacrydium*
	Araucaria		*Falcatifolium*
Balan.	Balanophoraceae		*Nageia*
Burs.	Burseraceae		*Phyllocladus*
Cten. / Lin.	*Ctenolophon*		*Podocarpus*
Cupr.	*Libocedrus*		*Prumnopitys*
Cyc.	Cycadaceae	Styr.	*Styrax*
Dipt.	Dipterocarpaceae	Tax.	*Taxus*
Ham.	*Altingia*	Xant.	*Xanthorrhoea*
Moring.	*Moringa**		

Simple oblique leaves

Leaflets of compound leaves are often asymmetric, but simple oblique leaves are rather rare. *Pterospermum* is a good example.

Acant.	*Ptyssiglottis*	Myrt.	*Whiteodendron*
	Hallieracantha	Pent.	*Pentaphragma*
Alang.	*Alangium* pp	Pip.	*Piper* pp
Begon.	*Begonia*	Rhamn.	*Zizyphus* pp
	Symbegonia	Rhiz.	*Anisophyllea*
Euph.	*Drypetes* pp	Sterc.	*Commersonia*
	Glochidion pp		*Pterospermum*
	Phyllanthus	Til.	*Colona*
Flac.	*Flacourtia* pp		*Muntingia**
	Hydnocarpus pp		*Schoutenia*
Gesn.	*Epithema*		*Trichospermum*
	Rhynchoglossum	Ulm.	*Celtis* pp
Morac.	*Ficus* pp	Urt.	*Elatostema*
Musac.	*Musa* pp		

Perianth yellow

Yellow flowers are relatively rare in native Malesian plants. Another feature not easily observed in herbarium specimens. Good examples are *Deplanchea* and many *Dilleniaceae*.

Agav.	*Dracaena* pp	Butom.	*Limnocharis**
Amaryl.	*Curculigo*	Berb.	*Berberis*
	Hypoxis	Bign.	*Deplanchea*
Annon.	Annonaceae pp		*Tecoma**
Apoc.	*Allamanda**	Cart.	*Cartonema*
	Anodendron	Cochl.	*Cochlospermum*
	*Thevetia**	Comp.	*Compositae* pp
Bals.	*Impatiens oncidioides*	Conv.	*Merremia* pp

(Perianth yellow)

Crass.	*Sedum*
Cruc.	*Brassica**
Cucurb.	Cucurbitaceae pp
Dill.	*Acrotrema*
	Didesmandra
	Dillenia pp
	Hibbertia
Eric.	*Rhododendron* pp
Euph.	*Microdesmis*
Gesn.	*Aeschynanthus* pp
	Agalmyla pp
	Didymocarpus pp
Gutt.	*Hypericum* pp
Lab.	*Gomphostemma* pp
	Microtrema pp
	Paraphlomis pp
Legum.	Leguminosae pp
Lent.	*Utricularia* pp
Linac.	*Hugonia*
	Indorouchera
	Philbornea
Lorant.	*Decaisnina* pp
Magn.	*Magnolia* pp
Malp.	*Rhyssopterys*
	Tristellateia
Malv.	*Abelmoschus* pp
	Hibiscus pp
	Sida pp
	Thespesia
	*Waltheria**
Meliac.	*Aglaia*
Menyant.	*Nymphoides*
Myrt.	*Xanthomyrtus*
Ochn.	*Ochna**
Oleac.	*Chionanthus* pp
Onag.	*Ludwigia peruviana*
Orch.	Orchidaceae pp
Oxal.	*Oxalis* pp
Port.	*Portulaca*
Prim.	*Lysimachia* pp
Prot.	*Banksia*
	Finschia
	Grevillea pp
Ranunc.	*Ranunculus* pp
Ros.	*Potentilla* pp
Rub.	*Gardenia* pp
	Mycetia
Scroph.	*Melasma*
	*Mimulus**
Thym.	*Aquilaria* pp
Turn.	*Turnera**
Verb.	*Gmelina*
	Vitex pp
Xyrid.	*Xyris*
Zing.	*Etlingera* pp
Zyg.	*Tribulus*

Stamens numerous

Plants with more than 20 fertile stamens per flower, as in most *Myrtaceae*.

Actin.	*Actinidia*
	Saurauia
Anac.	*Gluta* pp
Annon.	Annonaceae
Bomb.	Bombacaceae
Bixac.	*Bixa*
Cact.	Cactaceae
Capp.	Capparidaceae
Chrys.	*Kostermanthus*
	Maranthes
Cochl.	*Cochlospermum*
Dillen.	*Acrotrema*
	Dillenia
	Hibbertia
	Tetracera
Dipt.	*Anisoptera* pp
	Dipterocarpus pp
	Dryobalanops
	Hopea plagata
	Shorea pp
	Upuna
Elaeoc.	*Elaeocarpus*
	Sloanea
Euph.	*Aleurites*
	Alphandia
	Annesijoa pp
	Baliospermum pp
	Blumeodendron pp
	Claoxylon
	Cleidion

(Euph.)	*Codiaeum* pp	Himant.	*Galbulimima*
	Croton pp	Laur.	*Cinnadenia*
	Dalechampia pp	Lecyth.	Lecythidaceae
	Doryxylon	Legum..	Legum.-Mimosoideae
	Drypetes pp	Lythr.	*Lagerstroemia*
	Fontainea	Magn.	Magnoliaceae
	Homonoia	Malv.	Malvaceae
	Lasiococca	Melast.	*Plethiandra*
	Macaranga pp	Menisp.	*Albertisia* pp
	Mallotus pp		*Anamirta*
	Melanolepis		*Hypserpa* pp
	Ostodes	Monim.	*Faika*
	Petalostigma		*Kairoa*
	Ptychopyxis		*Levieria*
	Ricinus		*Palmeria* pp
	Spathiostemon	Myrt.	Myrtaceae
	Strophioblachia	Nymph.	Nymphaeaceae
	Sumbaviopsis	Punic.	*Punica**
	Suregada	Ranunc.	*Clematis*
	Thyrsanthera	Rhiz.	*Kandelia*
	Trewia	Ros.	Rosaceae
	Wetria	Schis.	*Kadsura*
Flac.	*Ahernia*	Sonn.	*Duabanga*
	Bennettiodendron		*Sonneratia*
	Flacourtia pp	Sterc.	*Firmiana* pp
	Hemiscolopia		*Kleinhovia*
	Pangium	Symp.	*Symplocos*
	Scolopia	Theac.	Theaceae
	Xylosma	Tiliac.	Tiliaceae
Gutt.	Guttiferae	Trim.	*Trimenia*
Hamam.	*Rhodoleia*	Wint.	*Drimys* pp

Apocarpous plants

Plants with fruits of which the carpels are partially (*Dillenia, Illicium*) or completely free (most Annonaceae).

Annon.	Annonaceae pp	Monim.	Monimiaceae
Apoc.	Apocynaceae pp	Ochn.	Ochnaceae
Ascl.	Asclepiadaceae pp	Ranunc.	Ranunculaceae
Butom.	Butomaceae	Saxif.	*Astilbe*
Coriar.	*Coriaria*		*Itea*
Crass.	Crassulaceae	Scheuz.	*Triglochion*
Cunon.	*Acsmithia*	Schis.	*Kadsura*
	Pullea		*Schisandra*
	Weinmannia	Simar.	*Harrisonia*
Dill.	Dilleniaceae		*Picrasma*
Illic.	*Illicium*	Wint.	*Drimys*
Magn.	Magnoliaceae		*Zygogynum*

Ripe fruits white

Generally most fruits turn yellow, red or black at maturity. Few fruits ripen white, which should be recorded by the collector. A good example is *Chloranthus*.

Actin.	*Saurauia* pp	Myrt.	*Acmena* pp
Amarant.	*Deeringia* pp		*Syzygium* pp
Chlor.	*Chloranthus*	Ochn.	*Euthemis leucocarpa*
Cucurb.	*Zehneria*	Rub.	*Mycetia*
Dich.	*Dichapetalum* pp		*Prismatomeris* pp
Eric.	*Gaultheria* pp		*Psychotria* pp
Euph.	*Claoxylon* pp	Rut.	*Acronychia* pp
	Flueggea	Solan.	*Cestrum*
Gesn.	*Cyrtandra* pp	Urt.	*Dendrocnide*
Hern.	*Hernandia* pp		*Oreocnide*
Icac.	*Stemonurus* pp	Verb.	*Callicarpa* pp
Meliac.	*Dysoxylum* pp	Vit.	*Cayratia* pp
Myrs.	*Maesa* pp		

INDEX OF TAXA

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