



**GUIDE TO
PREPARING MANUSCRIPTS FOR
THE FLORA
OF PENINSULAR
MALAYSIA**

**R. Kiew, R. C. K. Chung,
L. G. Saw & E. Soepadmo**



**GUIDE TO PREPARING MANUSCRIPTS
FOR THE
FLORA OF PENINSULAR MALAYSIA**

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GUIDE TO PREPARING MANUSCRIPTS FOR THE FLORA OF PENINSULAR MALAYSIA

**R. Kiew, R. C. K. Chung, L. G. Saw
& E. Soepadmo**

based on

Tree Flora of Sabah and Sarawak
– Guide to Preparing and Editing Manuscripts
by E. Soepadmo & K. M. Wong



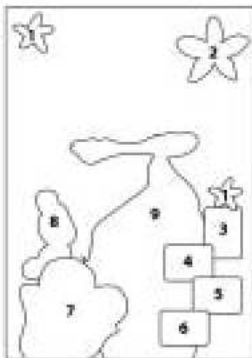
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1. *Shorea bracteolata* Dyer (Photo: L. G. Saw)
2. *Spathoglottis aurea* Lindl. (Photo: L. G. Saw)
3. *Neobalanocarpus heimii* (King) P.S.Ashton (Photo: L. G. Saw)
4. *Licuala ahliidurii* Saw (Photo: L. G. Saw)
5. *Etilingera venusta* (Ridl.) R.M.Sm. (Photo: K. H. Lau)
6. *Sonerila picta* Korth. (Photo: L. S. L. Chua)
7. *Rafflesia cantleyi* Solms (Photo: L. G. Saw)
8. *Podocarpus polystachyus* R.Br. ex Endl. (Photo: L. G. Saw)
9. *Nepenthes macfarlanei* Hemsl. (Photo: L. S. L. Chua)

Back cover:

- Cyathea contaminans* (Wall. ex Hook.) Copel. (Photo: E. Soepadmo)

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INTRODUCTION

This short guide is modified from that prepared for *The Tree Flora of Sabah and Sarawak* by Soepadmo & Wong (1995) and relies heavily on their contribution and the experience of the editors of that Flora.

The Flora of Peninsular Malaysia involves original research based on the study of specimens, both herbarium and living, rather than just being a compilation of previous publications. Ridley's original *Flora of the Malay Peninsula* (1922–1925) even today remains the only complete overview of the flora. It was remarkable for the speed with which it was produced, sometimes at the expense of accuracy. With the accumulation of specimens and knowledge in the last 80 years, it has now become outdated. *The Tree Flora of Malaya* (1972–1989) took into account recent collections for trees, which represent at most about a third of the flora. From time to time monographs of particular genera and families have been published or have appeared in *Flora Malesiana*. But there remains no publication that includes all the families, genera and species of vascular plants in Peninsular Malaysia.

The aim of the Flora of Peninsular Malaysia Project is therefore to produce a complete, updated and comprehensive flora for all vascular plants based on original research. Of particular importance is nomenclature and typification, always a difficulty for taxonomists working in the tropics where libraries are not comprehensive and type specimens are not always available. With the accumulation of data since Ridley's time and the opportunity of examining living plants, the species descriptions will be more detailed and precise than those in either Ridley's Flora or the Tree Flora.

The Flora of Peninsular Malaysia, which will include naturalised species but not cultivated plants, is estimated to number about 8,300 vascular plant species. This remains an estimate because there are new species still to be described and it is likely that some species will prove to be conspecific with already described species.

The Flora departs from *The Tree Flora of Sabah and Sarawak*, apart from including herbs, shrub and climbers, in two ways. Firstly, the four parts of each volume will be published separately as accounts become available. Each part will comprise about 150 pages and include about 100 species. It will therefore take about 20 volumes to cover the entire flora.

Secondly, identification lists of specimens will be issued as a CD with each part to enable herbaria to readily curate their holdings.

Because of the multi-author nature of the Flora, this guide is produced to enable uniformity of style between the accounts. There will, of course, be differences depending on the particular nature of a plant group.

The project welcomes collaboration with taxonomists working on the Malaysian flora and prospective authors are encouraged to contact the Editors.

SUBMIT ENQUIRIES OR MANUSCRIPTS TO

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MALAYSIA**

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website: www.frim.gov.my/tfbc/**

GENERAL INSTRUCTIONS FOR PREPARING MANUSCRIPTS

MANUSCRIPT PAGE FORMAT, SPACING AND FONT SIZE

For hardcopy, use A4 paper and double-line spacing. Do not forget to page manuscripts (even hand-written page numbers are sufficient). Use 10-point font size only.

For softcopy, use MS Word. Do not forget to paginate. Diskette, CD and e-mail attachments are acceptable.

SPELLING AND UNITS OF MEASUREMENT

Spelling conventions should follow The Concise Oxford Dictionary of Current English (7th edition or later). Units of measurement are metric and abbreviated in SI convention, e.g., m, cm, mm. Use English (not American) spelling.

FAMILY AND GENERIC NOMENCLATURE

Names of families and genera will normally follow Mabberley's Plant Book (3rd ed., in press) except for the recent accepted changes. Authors of revisions for the flora should confirm these names, when there is potential confusion or controversy, with the Chief Editor.

MANUSCRIPT MARKINGS

Italics are used for all words not commonly used in the English language, for scientific names of genera and species and taxa of lower rank only, and for indicating diagnostic characters in descriptions.

FAMILY TREATMENT

FAMILY NAME

All caps, bold, centred. For example,

DIPTEROCARPACEAE

DERIVATION OF FAMILY NAME

None to be provided.

AUTHORSHIP

Upper and lower case, key name last, bold, centred. For example,

**R. C. K. Chung
Yen-Yen Sam
H. Normawati
S. Syahida-Emiza**

Use ampersand (&) between last two names if more than one author.

AUTHOR'S AFFILIATION

Use upper and lower case, normal. No postal details. For example, the Malaysian ones include

Forest Research Institute Malaysia,
Kepong, Malaysia

Universiti Kebangsaan Malaysia,
Bangi, Malaysia

Universiti Putra Malaysia,
Serdang, Malaysia

University of Malaya,
Kuala Lumpur, Malaysia

FAMILY REFERENCES

Selected from publications most relevant to the taxonomy and distribution only, and which are relevant to the region, listed chronologically.

The original publication validating or first using the family name is NOT required.

Authors' names in full, not abbreviated.

Ampersand (&) instead of "and" or "et" used to link authors' names.

Comma after author's name. Semi-colon separating references.

Book names abbreviated only if listed in Appendix 1 here (if uncertain, give titles in full and these will be edited later); names of serials abbreviated following Taxonomic Literature by Stafleu & Cowan (1976–1988) and Stafleu & Mennega (1992–2000).

Only Arabic numerals used.

Pagination: only first page of the paper or reference given.

For example,

Ridley, Fl. Malay Pen. 1 (1922) 517; Corner, Wayside Tr. Malaya, 3rd ed. (1988) 106;
Ding Hou, Fl. Malesiana 1, 8 (1978) 395; Kochummen, Tr. Fl. Malaya 4 (1989) 9.

FAMILY SYNONYMS

Normally not necessary, except in certain cases, e.g.,

For Saxifragaceae (if this is used in the Flora) including *Polyosma*, as follows: Polyosmaceae *auct. non* (relevant author(s)), (reference).

For Polyosmaceae excluding other genera of the more widely circumscribed Saxifragaceae, as follows: Saxifragaceae, in part, *auct. non* (relevant author(s)), (reference).

Period after every synonym given.

Family synonyms, if given, follow the references immediately in the same paragraph.

FAMILY DESCRIPTION

None for family with only one genus worldwide. Instead, insert statement: Only one genus.

Description required for any family with more than one genus worldwide. The following sequence as a guide: Habit. Stipules. Leaf arrangement, type. For fertile organs, for gymnosperms, fern and fern allies: type of reproductive structure, position, spores or seeds; for flowering plants: Inflorescence type, position. Flower sexuality,

symmetry, merism, details of fusion of parts and other characters important at family level, male parts (stamens, anthers, filaments), female parts (ovary, ovules, placentation, style, stigma). Fruit type. Seed: embryo, cotyledons, endosperm, aril, etc.

DISTRIBUTION

Heading “**Distribution.**”, flush left. Start on same line: Number (use numerals) of genera and species, followed by global distribution of the family, then Malesian distribution. Sequence of localities from N to S and W to E, as far as possible.

ECOLOGY

Heading “**Ecology.**”, flush left. Start on the same line. Give only if general trends can be summarised, for example,

In Peninsular Malaysia, the Ericaceae are principally montane plants.

USES

Heading “**Uses.**”, flush left. Start on the same line. Give only if there are general or interesting uses, for example,

The Dipterocarpaceae are the mainstay of the timber industry in SE Asia.

The Ericaceae are not much used in Peninsular Malaysia, but includes genera of economic importance elsewhere; *Vaccinium* provides a number of edible fruits in temperate countries, and *Rhododendron* includes many species of importance in horticultural improvement of the known ornamental species and hybrids.

TAXONOMY

Heading “**Taxonomy.**”, flush left. Start on the same line. Include a brief commentary of the classification of the family, in particular for the subdivision of the family, if any; its relationship to other families, and if there are controversies about classification, explain briefly why the present scheme of classification is followed.

KEY TO GENERA

Heading “**Key to genera**”, centred.

Bracket key structure used, not indented structure.

Couplets to be numbered once only, the individual leads in each couplet not further numbered.

Genera in Peninsular Malaysia to be numbered (according to alphabetical order followed in the subsequent detailed treatment); no authority is indicated for such genera within the key.

In manuscripts, follow the example given below:

1. Leaves 3- or 5-veined from the base **1. Cansjera**
Leaves pinnately veined 2
2. Fruits large, 2.5–3.3 × 1.5–2 cm. Panicles only on tree trunk **4. Melientha**
Fruits small, up to 1.3 × 1 cm. Racemes or panicles on twigs, branches and trunks 3
3. Inflorescences usually branched; perianth lobes free, persistent in fruit **2. Champereia**
Inflorescence unbranched; perianth lobes joined into a short tube, not persisting in fruit **3. Lepionurus**

For softcopies and hardcopies of manuscripts, use only six dots to form indicator lines in the Key. Do not attempt to create dotted lines to “right-justify” keys in the manuscript.

GENUS TREATMENT

A genus treatment consists of

genus name, derivation of the name, vernacular name(s), references, description, number of species, distribution, ecology, uses, taxonomy, key to species, individual species treatments.

GENUS NAME

Genus number, period (normal typeface), genus name (in all caps and bold), authority (normal typeface, upper and lower case, abbreviated according to Brummitt & Powell (1992)). Indicate “*nom. cons.*” if a conserved name. All centred. For example,

1. **DEPLANCHEA** Veill., *nom. cons.*

DERIVATION OF GENUS NAME

Language; meanings of root words indicated by = sign; composite meaning if necessary. Upper and lower case, italics for non-English words, otherwise normal, all in brackets and centred. For example,

2. **LOPHOPETALUM** Wight *ex* Arn.
(Greek, *lopho* = crested, *petalum* = petal; the crested petals)

VERNACULAR NAME(S) FOR GENERA

State name (all in lower case and italics), followed by the dialect or language (upper and lower case) in brackets. Inserted below the derivation of genus name, and centred.

GENUS REFERENCES

The first reference given is the original publication of the genus (this need not repeat the author's name, as it is already provided in abbreviated form together with the genus name).

Other references are selected from publications most relevant to the taxonomy and distribution only, and which are relevant to the region, listed chronologically.

Names of serials abbreviated following Taxonomic Literature by Stafleu & Cowan (1976–1988) and Stafleu & Mennega (1992–2000). For other literature not cited in Taxonomic Literature, see Appendix 1.

Authors' names (with the exception of the first given reference) in full, not abbreviated. Ampersand (&) instead of “and” or “*et*” used to link authors' names.

“*in*” rather than “*ex*” to be used, when necessary to indicate publication in a larger work.

Avoid using *l.c.* or *op. cit.* etc.

Comma after author's name. Semi-colon separating references.

Only Arabic numerals used.

Pagination: only first page of the paper or reference given.

For example,

DIPTEROCARPUS Gaertn.f.

Fruct. 3 (1805) 50; Blume, Bijdr. Fl. Ned. Ind. (1825) 223; King & Gamble, J. As. Soc. Beng. 62, 2 (1893) 89; Ridley, Fl. Malay Pen. 1 (1922) 211; Slooten, Bull. Jard. Bot. Buitenz. 3, 8 (1927) 263; Foxworthy, Malay. For. Rec. 10 (1932) 56; Backer & Bakhuizen *f.*, Fl. Java 1 (1964) 328; Ashton, Fl. Malesiana 1, 9 (1982) 291; PROSEA 5, 1 (1995) 166; Ashton, Tr. Fl. Sabah & Sarawak 5 (2004) 85; Symington, Malay. For. Rec. 16, 2nd ed. (2004) 339.

GENERIC BASIONYM

If applicable, i.e. only if it has been previously been used in publications for Peninsular Malaysian plants or is necessary to indicate in a new taxonomic perspective presented in the manuscript.

GENERIC SYNONYMS

Only synonyms relevant to Peninsular Malaysia are listed.

TYPE SPECIES

Not required.

GENUS DESCRIPTION

Necessary, even if a genus is monotypic. No repetition of family characters. Use sequence in “Family Description” above as a guide. Diagnostic characters of the genus to be indicated in italics in the manuscript.

DISTRIBUTION

Heading “**Distribution.**”, flush left. Start on same line: Number of species, followed by global distribution of the genus. Malesian distribution followed by that in Peninsular Malaysia. Sequence of localities from N to S and W to E, as far as possible.

ECOLOGY

Heading “**Ecology.**”, flush left. Start on the same line.

This includes information on habitat, unusual life forms (e.g., rootparasite, saprophyte, insectivorous or ant plant) and, if available, information on pollination and dispersal.

USES

Heading “**Uses.**”, flush left. Start on the same line. Give only if there are general or interesting uses, e.g.,

A few species of *Hopea* have timber value.

Vaccinium is not used in Peninsular Malaysia, but yields the blueberry of temperate countries.

Do not quote as a medicinal plant unless there is recent scientific evidence proving its value or it is a plant still widely used today. Modern information on medicinal uses could be sourced from PROSEA and ethnobotanical journals.

TAXONOMY

Heading “**Taxonomy.**”, flush left. Start on the same line. Include a commentary of the taxonomy of the genus; if there are controversies about classification, explain briefly why the present scheme of classification is followed.

KEY TO SPECIES

Heading “**Key to (genus name) species**”, centred.

Bracket key structure used, not indented structure.

Couplets to be numbered once only, the individual leads in the couplet not further numbered (as in “Key to genera”).

Species that are in Peninsular Malaysia to be numbered (according to alphabetical order followed in the subsequent detailed treatment); no authority is indicated for such species within the key.

Species binomials used should have the genus epithet abbreviated. Where a species is not known by name, but referred to by number, the genus epithet should not be abbreviated, for example, **Persea sp. 1** and **Persea sp. 2**, not **P. sp. 1** and **P. sp. 2**.

In manuscripts, follow the example given below:

1. Shrub **2. P. fruticosa**
Medium-sized tree 2

2. Twigs with ring-like scars **3. Persea sp. 1**
Twigs without such scars 3

3. Perianth in fruit reflexed **4. Persea sp. 2**
Perianth in fruit not reflexed **1. P. declinata**

For softcopies and hardcopies of manuscripts, use only six dots to form indicator lines in the Key. Do not attempt to create dotted lines to “right-justify” keys in the manuscript.

SPECIES TREATMENT

A species treatment consists of

species name, derivation of species name, references, basionym (if applicable), type specimen details, synonym, description, vernacular names (if known), English names (if available), distribution, map distribution, conservation status, ecology, uses, taxonomy.

SPECIES NAME

Species number, full stop (normal typeface), species name (genus epithet spelled in full, in upper and lower case and bold), authority (normal typeface, upper and lower case, abbreviated according to Brummitt & Powell (1992)). All flush left. For example,

1. ***Polyosma harum*** Saw

DERIVATION OF SPECIES NAME

Language; meanings of root words indicated by = sign; composite meaning if necessary. Upper and lower case, italics for non-English words, otherwise normal, all in brackets and flush left. For example,

(Malay, *harum* = fragrant; the flowers)

(Latin, *longi* = long, *caudatus* = ending with a tail-like appendage; the leaves)

SPECIES REFERENCES

The first reference given is the original publication of the species.

Other references are selected from publications most relevant to the taxonomy and distribution only, and which are relevant to the Flora region, listed chronologically.

Author names in full, not abbreviated.

Ampersand (&) instead of “and” or “et” used to link authors’ names.

“in” rather than “ex” to be used, when necessary to indicate publication in a larger work.

Comma after author’s name. Semi-colon separating references.

Abbreviations only if listed in Appendix 1 below; names of serials abbreviated following Taxonomic Literature by Stafleu & Cowan (1976–1988) and Stafleu & Menega (1992–2000).

Only Arabic numerals used.

Pagination: only first page of the paper or reference given.

For example,

1. **Gonystylus macrophyllus** (Miq.) Airy Shaw

(Greek: *macro* = large, *phyllum* = leaf; with large leaf)

Kew Bull. (1947) 9, Fl. Malesiana 1, 4 (1953) 354; Backer & Bakhuizen *f.*, Fl. Java 1 (1964) 401; Whitmore Tr. Fl. Malaya 2 (1973) 388; Tawan, Tr. Fl. Sabah & Sarawak 5 (2004) 464. **Basionym:** *Aquilaria ?macrophylla* Miq., Fl. Ind. Bat., Suppl. (1861) 356. **Type:** *Diepenhorst HB 2356*, Sumatra, Priaman (holotype U; isotype L). **Synonym:** *Gonystylus miquelianus* Teijsman. & Binn., Bot. Zeit. 20 (1862) 265.

SPECIES BASIONYM

To be given when applicable, running on from the end of the Species references. Heading “**Basionym:**”. State: Basionym and authority, place of publication (year) pagination. Only first page of publication required.

TYPE SPECIMEN

Although type details may be omitted from the final publication, contributors are requested to provide these in their manuscripts.

To be given, running on from the Basionym. Heading “**Type:**”. State: Collector and number (or *s.n.* and then include date, if known; for multiple sheets or without collection details, cite herbarium accession number or barcode), locality (if possible, country, state or province, and place collected), holotype and isotype or lectotype (designate if necessary) and isolectotype repositories (in brackets). Locality within inverted commas if known only generally, or imprecise, or unclear. For example,

Wallich 4432, Peninsular Malaysia, Penang (holotype G-DC; isotypes C, CGE, E, FI, K, L, LE, MEL)

Maingay s.n. (= Kew Distr. No. 144), Peninsular Malaysia, Melaka (holotype K)

Griffith 3650, Peninsular Malaysia, Johor, Mt Ophir (lectotype K; isolectotype P).

In instances when recognition of holo- or lectotype designation is not possible or debatable, simply list herbaria where the collection is deposited, as follows:

Ridley s.n., 1898, Singapore (K, L).

Lectotypes should be indicated; when these are provided for the first time in the present publication, this should be made known. For example,

Ridley s.n., 1898, Singapore (lectotype BM, here designated; islectotype K).

Neotypes should be indicated as follows:

Ridley 8888, Singapore (neotype SING; isoneotypes K, L).

When a type is a published figure or illustration, details of the relevant publication or repository should be provided.

SYNONYMY

Only synonyms pertaining to Peninsular Malaysia are particularly required. Running on after listing the Type, heading “**Synonyms:**”. List: synonym and authority, original place of publication (year) pagination. Only first page of publication required. Synonyms separated by a semi-colon. For all synonyms of Peninsular Malaysian taxa, cite the type specimens.

SPECIES DESCRIPTION

No repetition of family or genus characters that are applicable to all the species. Conversely, if the genus has more than one state of a character, the character state must be given for the species, including the negative character state.

Use the following sequence as a guide:

Habit. For trees, include bole characters; buttresses. Bark (bark, inner bark); sap; sapwood. For ferns and fern allies include rhizome characters including indumentum; for herbaceous plants, where appropriate, include special stem or root structures. Shoot characters. Stipules.

Leaves: arrangement, type, petiole (petiolule), (rachis if compound leaf), (number of leaflets or leaflet pairs if compound); blade (leaflet) shape, size range, texture, indumentum, base, margin, apex, venation (midrib, lateral veins, intercostal veins).

For ferns and fern allies, the reproductive structures including, where appropriate, spores.

For gymnosperm, cone and seed characters.

For flowering plants, Inflorescence: position, general type, structural features; size (generally, length); bracts, bracteoles.

Flowers: sexuality, symmetry, merism; calyx colour, shape, size, fusion, number and size of lobes, indumentum; corolla as for calyx; stamen number, length, anthers; disc; ovary type, carpel number, style, stigma, ovules.

Fruit: colour, type, shape, size, and others.

Seed: shape, size, number per fruit locule, aril, testa, wings, ornamentation; endosperm, embryo, etc.

The species description is based on characteristics of the species as known in Peninsular Malaysia.

VERNACULAR NAMES

Heading “**Vernacular names.**”, flush left. Begin on the same line. Give the preferred name first, followed other names listed alphabetically (all in lower case and italics). Indicate if the names are used on a regional basis.

For non-Malay names, indicate the dialect or language in brackets. Do not indicate language or dialect if this is not known.

For example from *Hopea nutans* Ridl.,

Vernacular names. *Giam* (preferred name); *chengal* (Perak), *chengal batu* (Selangor), *chengal keras* (Negeri Sembilan), *chengal pelandok* (Melaka) and *tengkawang* (Johor).

ENGLISH NAMES

Heading “**English names.**”, flush left. Begin on the same line. All in lower case and roman).

For example from *Hopea nutans* Ridl.,

English name. Chengal.

DISTRIBUTION

Heading “**Distribution.**”, flush left. Start on same line: General distribution of the species. Malesian distribution followed by that in Peninsular Malaysia and Singapore. Sequence of distribution from N to S and W to E, as far as possible. For example, Perlis, Kedah, Penang, Perak, Selangor, Negeri Sembilan, Melaka, Kelantan, Terengganu, Pahang and Johor; Sabah and Sarawak. Where a species has a very restricted distribution, the locality should be given, e.g. Pahang (G. Tahan).

MAP DISTRIBUTION

Distribution map of selected species will be generated showing point distribution from herbarium specimens. Mapping will be done using the BRAHMS (Botanical Research And Herbarium Management System) software; the editorial team will provide the necessary facilities and help to generate the maps.

CONSERVATION STATUS

Heading “**Conservation status.**”, flush left. Start on the same line. Where information is sufficient, provide the Conservation Status following the latest IUCN Red List Categories and Criteria following the guidelines in Chua & Saw (2006).

ECOLOGY

Heading “**Ecology.**”, flush left. Start on the same line. For habitat, include forest type, altitude and soil type. For biology, where known include information on life history, phenology, pollination, dispersal, etc. Cite references where specific studies have been carried out.

USES

Heading “**Uses.**”, flush left. Start on the same line. Do not quote as a medicinal plant unless there is recent scientific evidence proving its value. Modern information on medicinal uses could be sourced from PROSEA and ethnobotanical journals.

TAXONOMY

Normally not necessary, but if required then Heading “**Taxonomy.**”, flush left. Start on the same line. Include only a very brief commentary. Do not discuss misinterpretations of species names, etc., unless of a sufficiently serious nature and not well summarised by the synonymy given.

DEALING WITH INFRASPECIFIC TAXA

In cases where **TWO or MORE infraspecific taxa** exist in Peninsular Malaysia, a full description of the species, including all variation known in the Peninsula, should be given in the SPECIES DESCRIPTION. This should be followed by **Distribution** for the species and then by a key to the taxa (titled: **Key to varieties** (or other infraspecific rank), in upper and lower case, bold, flush left). Each infraspecific taxon should follow the following format:

Infraspecific taxon number (same species number and alphabet, for example, 1a, 1b, etc.), full stop (normal typeface), infraspecific taxon name (infraspecific rank abbreviated, in lower case and bold), authority (if any; authority name abbreviated according to Brummitt & Powell (1992), normal typeface, upper and lower case).
All flush left;

Derivation of infraspecific taxon name (if any);

References for the infraspecific taxon;

Basionym;

Type details;

Relevant synonyms;
Description of the infraspecific taxon;
Vernacular name(s) (if available)
English name(s) (if available)
Distribution;
Ecology;
Uses;
Taxonomy.

In cases where only **ONE of the infraspecific taxa** is known to occur in Peninsular Malaysia, the SPECIES DESCRIPTION should follow the following format:

Species name and authority (authority name abbreviated as in Brummitt & Powell (1992));

Derivation of species name;

References for the species as a whole;

Distribution for the species;

Infraspecific taxon name and authority (if any; authority name abbreviated as in Brummitt & Powell (1992));

Derivation of infraspecific taxon name (if any);

References for the infraspecific taxon;

Basionym;

Type specimen details;

Relevant synonyms;

Description of the sole infraspecific taxon which represents the species in Peninsular Malaysia;

Vernacular name(s) (if available);

English name(s) (if available);

Distribution;

Ecology;

Uses;

Taxonomy.

CITATION OF SPECIMENS

Identification lists of specimens will be published in CD format together with each part. Specimen data (species binomial, collector, prefix, collector number, date, locality data, including latitude and longitude where available) should be supplied by the authors either in Excel or BRAHMS format.

REFERENCES

- Brummitt, R. K. & Powell, C. E. (eds.) 1992. *Authors of Plant Names*. Royal Botanic Gardens, Kew, U.K.
- Chua, L. S. L. & Saw, L. G. 2006. *Malaysian Plant Red Data Book. Guide for Contributors*. Forest Research Institute Malaysia, Kepong, Malaysia.
- Mabberley, D. J. 1998 & in press. *The Plant Book*. 2nd & 3rd ed. Cambridge University Press, Cambridge, U.K.
- Ng, F. S. P. (ed.) 1978 & 1989. *Tree Flora of Malaya*. Vols. 3 & 4. Longman Malaysia, Kuala Lumpur, Malaysia.
- Ridley, H. N. 1922–1925. *The Flora of the Malay Peninsula*. Vols. 1–5. Reeves, London, U.K.
- Soepadmo, E. & Wong, K. M. 1995. *Tree Flora of Sabah and Sarawak. Guide to Preparing and Editing Manuscripts*. Forest Research Institute Malaysia, Sabah Forestry Department, Sarawak Forestry Department, Kuala Lumpur, Malaysia.
- Stafleu, F. A. & Cowan, R. S. 1976–1988. *Taxonomic Literature*. Vols. 1–8. 2nd ed. Bohn, Scheltema & Holkema, Utrecht, Netherlands.
- Stafleu, F. A. & Mennega, E. A. 1992–2000. *Taxonomic Literature*. Suppl. 1–6. Scheltema & Holkema, Utrecht, Netherlands.
- Whitmore, T. C. (ed.) 1972 & 1973. *Tree Flora of Malaya*. Vols. 1 & 2. Longman Malaysia, Kuala Lumpur, Malaysia.

ACKNOWLEDGEMENTS

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APPENDIX 1

Abbreviations for Publications Frequently Cited in Manuscripts for Flora of Peninsular Malaysia

Ashton, P. S. 1988. *Manual of the Non-Dipterocarp Trees of Sarawak*. Dewan Bahasa & Pustaka, Sarawak Branch for Forest Department, Kuching, Malaysia.
Man. Non-Dipt. Tr. Sarawak

Backer, C. A. & Bakhuizen van den Brink, R. C. Jr. 1964, 1965 & 1968. *Flora of Java*. Vols. 1, 2 & 3. Noordhoff, Groningen, Netherlands.
Fl. Java

Bentham, G. & Hooker, J. D. 1862–1883. *Genera Plantarum*. Vols. 1–3. Lovell Reeve & Co., London, U.K.
Gen. Pl.

Burkill, I. H. 1966. *A Dictionary of the Economic Products of the Malay Peninsula*. 2nd ed. Ministry of Agriculture and Cooperatives, Kuala Lumpur, Malaysia.
Econ. Prod. Malay Pen.

Cockburn, P. F. 1976 & 1980. *Trees of Sabah*. Vols. 1 & 2. Sabah Forest Records No. 10. Sabah Forest Department, Sandakan, Malaysia.
Tr. Sabah

Corner, E. J. H. 1988. *Wayside Trees of Malaya*. 3rd ed. Malayan Nature Society, Kuala Lumpur, Malaysia.
Wayside Tr. Malaya

Flora Malesiana Series 1 (to be listed without editor names, but to include author names, volume and page numbers).
Fl. Malesiana 1

Flora Malesiana Series 2 (to be listed without editor names, but to include author names, volume and page numbers).
Fl. Malesiana 2

Henderson, M. R. 1954. *Malayan Wild Flowers. Monocotyledons*. Malayan Nature Society, Kuala Lumpur, Malaysia.
Malay. Wild Flowers, Monocot.

- Henderson, M. R.** 1959. *Malayan Wild Flowers. Dicotyledons*. Malayan Nature Society, Malaysia.
Malay. Wild Flowers, Dicot.
- Hooker, J. D.** 1875–1890. *Flora of British India*. Vols. 1–5. Reeve, London, U.K.
Fl. Brit. India
- Hutchinson, J.** 1959. *The Families of Flowering Plants*. Vols. 1 & 2. 2nd ed. Clarendon Press, Oxford, U.K.
Fam. Fl. Pl.
- Hutchinson, J.** 1964 & 1967. *The Genus of Flowering Plants*. Vols. 1 & 2. Clarendon Press, Oxford, U.K.
Gen. Fl. Pl.
- Keng, H.** 1983. *Orders and Families of Malayan Seed Plants*. 3rd ed. Singapore University Press, Singapore.
Order Fam. Malay. Seed Pl.
- Kochummen, K. M.** 1997. *Tree Flora of Pasoh Forest*. Malayan Forest Record No. 44, Forest Research Institute Malaysia, Kuala Lumpur, Malaysia.
Tr. Fl. Pasoh For.
- Kubitzki, K. et al.** (eds.) 1993–present. *The Families and Genera of Vascular Plants*. Vol. 1–. Springer-Verlag, Berlin, Germany (to be listed without editor names, but to include author names, volume and page numbers).
Fam. Gen. Vasc. Pl.
- Mabberley, D. J.** 1998 & in press. *The Plant Book*. 2nd & 3rd ed. Cambridge University Press, Cambridge, U.K.
Pl. Book
- Ng, F. S. P.** (ed.) 1978 & 1989. *Tree Flora of Malaya*. Vols. 3 & 4. Longman Malaysia, Kuala Lumpur, Malaysia (to be listed without editor name, but to include author names, volume and page numbers).
Tr. Fl. Malaya
- Ng, F. S. P.** 1991 & 1992. *Manual of Forest Fruits, Seeds and Seedlings*. Vols. 1 & 2. Malaysian Forest Records, No. 34. Forest Research Institute Malaysia, Malaysia.
Man. For. Fruits, Seeds & Seedlings

Ng, T. P. & Shamsuddin, I. 2001. *Common Trees in Peat Swamp Forests of Peninsular Malaysia*. Research Pamphlet 124, Forest Research Institute Malaysia, Kuala Lumpur, Malaysia.

Common Tr. Peat Swamp For. Penins. Malay.

Plant Resources of South East Asia. 1989–2003. Vols 1–19. Pudoc Scientific Publisjers, Wageningen, and Backhuys, Leiden, Netherlands (to be listed without editor names, but to include author names, volume and page numbers).

PROSEA

Ridley, H. N. 1922–1925. *The Flora of the Malay Peninsula*. Vols. 1–5. Reeves, London, U.K.

Fl. Malay Pen.

Soepadmo, E. et al. (eds.) 1995–present. *Tree Flora of Sabah and Sarawak*. Vols 1– . Forest Research Institute Malaysia and Forest Departments of Sabah and Sarawak, Kuala Lumpur, Malaysia (to be listed without editor names, but to include author names, volume and page numbers).

Tr. Fl. Sabah & Sarawak

Whitmore, T. C. (ed.) 1972 & 1973. *Tree Flora of Malaya*. Vols. 1 & 2. Longman Malaysia, Kuala Lumpur, Malaysia. (to be listed without editor name, but to include author names, volume and page numbers).

Tr. Fl. Malaya

APPENDIX 2

List of Abbreviations

English		Malay	
Word	Abbreviation	Word	Abbreviation
Central	C	Bukit	Bt.
East	E	Gunung	G.
Forest Reserve	FR	Kampung	Kg.
Mount	Mt	Sungai	Sg.
National Park	NP	Tanjung	Tg.
North-East	NE		
North-West	NW		
River	R		
South	S		
South-East	SE		
South-West	SW		
West	W		

*Batu, Gua and Telok to be spelt in full

APPENDIX 3

Preparation of Illustrations Submitted Together with Manuscripts

The Flora will include both line drawings and colour photographs.

Line drawings will be used in the Flora. Ideally, a typical or representative species of each genus in a family should be depicted as a full-page illustration showing habit or gross morphology as well as the detailed structure of particular organs that yield diagnostic characters. For large genera, about one species in ten will be illustrated. Composite illustrations of several species or genera are also acceptable, particularly for families with many small genera.

Every attempt should be made to have the illustration drawn on good paper (such as CS-10) or art board, and with permanent black drawing ink. Drawings should have a portrait rather than a landscape orientation, i.e., the height should be more than the width.

To maintain a good resolution upon publication, each original illustration will need to be larger than the final printed (and reduced) version. The following dimensions for original illustrations are recommended:

	For 2:1 reduction	For 3:1 reduction
Width (cm)	26	39
Height (cm)	42	63

A bar scale in ink should be provided at an unobtrusive place on the drawing. The measurement represented by the bar scale should be given in metric units on a separate same-size photocopy of the drawing.

No lettering should be made on the original drawing. Instead, the desired lettering should be indicated on a clear photocopy of the illustration; such lettering should correspond to that used in the caption.

Illustrators' signatures or monograms should be placed at unobtrusive places on drawings. If there are more than one illustrator to be acknowledged for a single illustration plate, this acknowledgement will be made in the caption.

All illustrations should have clear, concise captions provided on a separate sheet. The species name, features depicted and voucher specimen(s) on which the drawing was based should be clearly mentioned.

Colour photographs can be submitted as slides or in high resolution digital format. All images must be clearly labelled with the species name. Authors are encouraged to submit only top quality photos. The Flora also welcomes submissions from non-authors. A final selection of which will appear in each part will be made at the time of publication. The photographer's name will appear beside the photo.

APPENDIX 4

**Family Treatment—
An Example of How It Will Appear in the Flora**

NYSSACEAE

R. C. K. Chung

Forest Research Institute Malaysia,
Kepong, Malaysia

Bentham & Hooker *f.*, Gen. Pl. 1 (1867) 947 (as Cornaceae); Hooker *f.*, Fl. Brit. India 2 (1879) 740 (as Cornaceae); King, J. As. Soc. Beng. 71, 2 (1902) 72 (under Cornaceae incl. *Alangium*); Ridley, Fl. Malay Pen. 1 (1922) 889 (under Cornaceae incl. *Alangium* & *Aralidium*); Wasscher, Blumea 1 (1935) 343 (as Nyssaceae); Hutchinson, Fam. Fl. Pl. 1, 2nd ed. (1959) 171 (as Cornaceae), 175 (as Nyssaceae), Gen. Fl. Pl. 2 (1967) 41 (as Cornaceae), 50 (as Nyssaceae); Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 158 (as Cornaceae), 161 (as Nyssaceae); Kochummen, Tr. Fl. Malaya 1 (1972) 346 (as Nyssaceae), Tr. Fl. Malaya 3 (1978) 53 (as Cornaceae); Matthew, Fl. Malesiana 1, 8 (1977) 85 (as Cornaceae); Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 199 (as Cornaceae), Field Guide For. Tr. Brunei 1 (2003) 190 (as Cornaceae); Yii, Tr. Fl. Sabah & Sarawak 1 (1995) 253 (as Nyssaceae); Kubitzki, Fam. Gen. Vasc. Pl. 6 (2004) 82 (under Cornaceae incl. *Alangium*).

Tree or shrubs. **Leaves** opposite, subopposite, alternate or spirally arranged, *simple*, usually entire or rarely serrate or dentate, pinnately veined, *extipulate*, usually petiolate. **Inflorescences** many-flowered thyrsoid panicles, heads or few-flowered racemes. **Flowers** bisexual or unisexual, *regular or nearly so*, mostly 4- or 5-merous; calyx 4–5(–10)-lobes or teeth or absent; petals free, valvate or imbricate, reduced or lacking in female flowers; stamens as many as and alternating with petals, or in 2 isomerous whorls, mostly attached to the edge of an epigynous disc, filaments free, anthers dorsifixed, 2-locular, dehiscing lengthwise; disc large, cushion-shaped at top of the ovary, generally persistent in fruit (or absent); *ovary inferior*, 1- or (–10)-locular, ovule solitary in each locule, pendulous, style simple or lobed, or with 2–3 style arms. **Fruit** a *drupe* or *berry*. **Seed** 1 or (2–5), with small elongate embryo embedded in copious oily endosperm.

Distribution. Five genera and *c.* 31 species in East Asia, Indo-Malesia and SE North America. In Peninsular Malaysia, represented by *Mastixia* and *Nyssa* with four and one species, respectively.

Ecology. The flowers of Nyssaceae typically produce nectar and attract bees, flies and beetles. The drupes are dispersed by birds and mammals. The drupes of several species of *Nyssa* float well and are probably, at least, partly dispersed by water.

Uses. Ornamental trees and shrubs.

Taxonomy. The monophyly of Cornaceae, as defined broadly (i.e., including Nyssaceae and Alangiaceae), is supported by morphology as well as *matK* and *rbcL* sequences (Xiang *et al.*, Amer. J. Bot. 85 (1998) 285). Intrafamilial relationships have been investigated by Eyde (Bot. Rev. 54 (1988) 233), Murrell (Syst. Bot. 18 (1993) 469), and Xiang *et al.* (Ann. Missouri Bot. Gard. 80 (1993) 723, Syst. Bot. 21 (1996) 515, Amer. J. Bot. 85 (1998) 285). Two major clades can be recognised within Cornaceae: a cornoid clade (*Cornus* L. and *Alangium* Lam.) with usually bisexual, 4-merous flowers; and a nyssoid-mastixioid clade (*Nyssa*, *Mastixia*, *Camptotheca* Decne., *Davidia* Baillon and *Diplopanax* Hand.-Mazz.) with usually unisexual, 5-merous flowers.

However, Kubitzki (2004) recognised a broader circumscription of the family concept of Cornaceae including *Camptotheca*, *Cornus*, *Davidia*, *Diplopanax*, *Mastixia*, Alangiaceae and Nyssaceae. Recently, Steven (see APG website, 2006) and Mabberley (pers. comm.) recognised the cornoid clade as Cornaceae (*Alangium* and *Cornus*) and the nyssoid-mastixioid clade as Nyssaceae (*Camptotheca*, *Davidia*, *Diplopanax*, *Mastixia* and *Nyssa*). The circumscription of Nyssaceae by Mabberley and Steven is followed here.

Key to genera

Leaves alternate or (sub)opposite. Inflorescences cymose panicles. Flowers bisexual; stamens as many as petals; petals valvate. **1. Mastixia**

Leaves strictly spirally arranged. Inflorescences heads or condensed racemes. Flowers unisexual or bisexual; stamens often more numerous than petals; petals imbricate. **2. Nyssa**

1. MASTIXIA Blume

(Greek, *mastix* = whip; the whiplike apex of the petals)

tetebu, tebu-tebu (Malay)

Bijdr. Fl. Ned. Ind. (1825) 654, Mus. Bot. Lugd. Bat. 1 (1850) 256; Bentham & Hooker *f.*, Gen. Pl. 1 (1867) 950; Hooker *f.*, Fl. Brit. India 2 (1879) 745; King, J. As. Soc. Beng. 71, 2 (1902) 72; Ridley, Fl. Malay Pen. 1 (1922) 889; Danser, Blumea 1 (1934) 47; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 159; Hutchinson, Gen. Fl. Pl. 2 (1967) 45; Matthew, Blumea 23 (1976) 61, Fl. Malesiana 1, 8 (1977) 85; Kochummen, Tr. Fl. Malaya 3 (1978) 54, Tr. Fl. Pasoh For. (1997) 174; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 200, Field Guide For. Tr. Brunei 1 (2003) 190; Kubitzki, Fam. Gen. Vasc. Pl. 6 (2004) 87.

Trees, usually without buttresses. **Bark** grey to grey-brown, smooth with horizontal rings, rarely cracked to shallowly fissured, often exuding white resin when bruised; inner bark orange-yellow, gritty, granular, with a strong crushed sugarcane smell. **Sapwood** soft, yellowish white or white. **Leaves** alternate, subopposite or opposite, margin entire; midrib sunken above, prominent beneath; lateral veins usually distinct beneath. **Inflorescences** terminal or sometimes axillary, cymose panicles. **Flowers** bisexual, in triads, sessile, subtended by tiny, persistent bracts; calyx tube obconical or barrel-shaped or cup-shaped, lobes spreading or not, broader than long or sometimes appearing as minute sharp tips, persistent in fruit; *petals* thick, concave, *valvate* in bud, inflexed and strongly connate in the upper parts; *stamens as many as petals*, in 1 or 2 whorls, attached below the disc, abutting on and alternating with disc lobes, opposite the calyx lobes, filaments subulate, flattened and tapered toward the upper part, anthers cordate, introrse-latrorse; ovary turbinate, one-locular, surmounted by a fleshy, lobed and grooved disc that is sometimes persistent in fruit, style very short, stout, ribbed, stigma punctiform, sometimes bifid or 4–5-lobed, reflexed, some persistent in fruit. **Fruit** a drupe, ovoid, ellipsoid or oblong, surmounted by calyx tube and crowned by the persistent disc (the exposed part of the fruit); fruit wall formed by calyx-tube and pericarp (exocarp and mesocarp); pericarp thin or thick, when ripe turning to dark purple or blue; endocarp stony. **Seed** 1, ovoid or ellipsoid,

testa membranous; endosperm large and V-shaped in transverse section; embryo small and straight, cotyledons thin and foliaceous; germination epigeal.

Distribution. About 19 species; from Sri Lanka, NE India and the western Ghats, Bhutan, Myanmar, Thailand, Indo-China, China (S Yunnan and Hainan) through Malesia to New Britain and the Solomon Islands. Four species occur in Peninsular Malaysia.

Ecology. Found mainly in valleys, on slopes or ridges in primary lowland dipterocarp to montane forests, often in moist habitats, from sea-level to 2200 m.

Uses. Although the trees may reach a considerable size, their scattered occurrence precludes their general use as timber. In addition, the timber is moderately strong and has little commercial value. Therefore, the timber is only used for packing cases and temporary construction (Chung, PROSEA 5, 3 (1998) 357).

Taxonomy. *Mastixia* is strictly a SE Asian genus. It was included in the Cornaceae by Bentham & Hooker f. (1867) and Hutchinson (1967), while Harms (*in Engl. & Prantl*, Nat. Pflanzfam. 3, 8 (1898) 262) and Wangerin (*in Engl., Pfl. Reich.* 41 (1910) 19) included it in a distinct subfamily Mastixioideae. Wangerin distinguished two subgenera, viz. *Tetramastixia* and *Pentamastixia*. Matthew (1976 & 1977), on the other hand, established two subgenera, *Manglesia* (2 species) and *Mastixia* (11 species). He recognised two series, the *Oppositae* and *Alternae* within the subgenus *Mastixia* based on a single character, viz. whether the first branches of the inflorescence are opposite (or subopposite) or alternate. In the absence of flowers and fruits and due to the presence of resin in the bole and on the cut ends of logs, the genus can easily be confused with some species of the Dipterocarpaceae that have smooth or cracked bark, such as *Vatica* species. However, in *Mastixia* the inner bark is thick and gritty with a strong crushed sugarcane smell and the wood is soft. Foresters sometimes confuse this genus with those of the Lauraceae (*medang*) because of the gritty inner bark and strong aromatic smell, but *medang* has no resin.

Key to *Mastixia* species

1. Leaves always opposite. **4. *M. trichotoma***
 Leaves alternate or spiral, only sometimes (sub)opposite but then never exclusively so. 2
2. Leaves thickly coriaceous; margin recurved; apex acute to acuminate, only sometimes caudate but then never exclusively so; petioles stout, (1–)1.5–2 mm thick. **2. *M. pentandra***
 Leaves chartaceous or thinly coriaceous; margin not recurved; apex cuspidate or caudate with acumen to 1.5 cm long; petioles slender, 0.4–0.8(–1) mm thick. 3
3. Leaf lateral veins looping near the margin. Flowers 5-merous; calyx tube and petals densely silky hairy outside. **1. *M. cuspidata***
 Leaf lateral veins not looping near the margin. Flower 4-merous; calyx tube and petals glabrous outside. **3. *M. rostrata***

1. *Mastixia cuspidata* Blume

(Latin, *cuspidatus* = sharp-pointed; the leaf apex)

Mus. Bot. Lugd. Bat. 1 (1850) 256; Miquel, Fl. Ind. Bat. 1, 1 (1856) 772; Danser, Blumea 1 (1934) 55 (excl. var. *margarethae*); Matthew, Blumea 23 (1976) 79, Fl. Malesiana 1, 8 (1977) 95; Kochummen, Tr. Fl. Malaya 3 (1978) 54; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 201. **Type:** *Korihals s.n.*, Sumatra, W Coast (lectotype L (acc. no. 901.169.373); isolectotype U). **Synonym:** *Mastixia bracteata* C.B. Clarke in Hooker f., Fl. Brit. Ind. 2 (1879) 746, King, J. As. Soc. Beng. 71, 2 (1902) 73, Ridley, Fl. Malay Pen. 1 (1922) 891. **Type:** *Maingay 2398* (= Kew Distr. No. 710), Peninsular Malaysia, Melaka (holotype K).

Tree to 40 m tall and 40 cm diameter. **Bark** greyish to chocolate-brown, smooth to shallowly fissured; inner bark yellowish to brownish, mottled. **Sapwood** yellowish to brownish. **Twigs** subglabrous, grey-brown. **Leaves** alternate or sometimes (sub)opposite; petioles slender, 0.5–1.5 cm long, 0.4–0.8(–1) mm thick, glabrous; blades narrowly obovate, elliptic or oblong, 3.5–9 × 1.5–3.5 cm, thinly coriaceous, glabrous, base cuneate, margin not recurved, apex cuspidate, acumen 0.5–1(–1.5) cm long, oblique; lateral veins (4–)5 pairs, curving near the margin and joining with the next one to form a looped intramarginal vein, sunken above; intercostal veins faint or inconspicuous beneath, inconspicuous above. **Inflorescences** to c. 4 cm long, subglabrous to puberulous. **Flowers** 5-merous, green to yellow; buds to 3 mm diameter; calyx tube 5 lobed, lobes broader than long, densely silky-hairy; petals 1.5–2 × 0.5–1 mm, densely silky-hairy outside; stamens 5, filaments 1–3.2 mm long; disc yellowish. **Fruits** oblong, 1.5–3 × 0.5–1.3 cm; fruit wall thin; persistent disc exposed; persistent calyx lobes inconspicuous. **Seeds** ellipsoid, 1.5–2.5 × 0.4–1 cm.

Distribution. Sumatra, Peninsular Malaysia and throughout Borneo. In Peninsular Malaysia known from Perak, Selangor, Negeri Sembilan, Melaka and Johor.

Conservation status. Regionally endangered.

Ecology. Found in primary and secondary lowland and hill dipterocarp forest, to 900 m.

Notes. Sterile specimens of small-leaved *Mastixia cuspidata* are difficult to distinguish from *M. rostrata* subsp. *caudatifolia*.

2. *Mastixia pentandra* Blume

Map 1

(Greek, *penta* = five, *-andros* = male; with 5 stamens)

Bijdr. Fl. Ned. Ind. (1825) 654; Hooker f., Fl. Brit. India 2 (1879) 746; Danser, Blumea 1 (1934) 49; Backer & Bakhuizen f., Fl. Java 2 (1965) 159; Matthew, Blumea 23 (1976) 80, Fl. Malesiana 1, 8 (1977) 95; Kochummen, Tr. Fl. Malaya 3 (1978) 53, Tr. Fl. Pasoh For. (1997) 173; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 204. **Type:** *Blume 1486*, W Java (lectotype L (acc. no. 901.169.375); isolectotypes NY, W).

Tree. **Bark** grey-brown, smooth to shallowly fissured with horizontal rings and lenticels in rows; inner bark yellowish brown to dark yellow. **Sapwood** pale yellow to brownish. **Twigs** glabrous to puberulous. **Leaves** alternate, spiral or sometimes subopposite; petioles stout, 1–4 cm long, 1–2 mm thick, glabrous; blades obovate, oblanceolate, elliptic to oblong-elliptic, 4–20 × 2–8 cm, thickly coriaceous or rarely chartaceous, glabrous, base cuneate to attenuate, margin recurved, apex acute or acuminate, sometimes caudate; lateral veins 4–7(–9) pairs; intercostal veins distinct or faint beneath. **Inflorescences** to c. 8 cm long, subglabrous to

densely appressed-hairy. **Flowers** 4- or 5-merous; buds to 3.5 mm diameter; calyx tube 4 or 5 lobed, lobes broader than long or as long as wide, thick, puberulous to appressed-hairy; petals 4 or 5, thick, glabrous to appressed-hairy; stamens 4 or 5; ovary puberulous to appressed-hairy. **Fruits** ovoid to oblong, 1.6–3.5 × 0.8–1.2 cm; persistent disc conspicuous or not; persistent calyx lobes inconspicuous.

Vernacular name. *Medang pisang* (Malay).

Distribution. NE India, Bhutan, Myanmar, Thailand, N Vietnam, China (S Yunnan) and throughout Malesia (except Lesser Sunda Islands and New Guinea).

Taxonomy. In Matthew's treatment, *Mastixia pentandra* was segregated into six subspecies, viz. *chinensis*, *cambodiana* (Pierre) Matthew, *mohuccana* Matthew, *pentandra*, *philippinensis* (Wangerin) Matthew and *scortechinii*. Of these, only subsp. *chinensis* and subsp. *scortechinii* are known from Peninsular Malaysia.

Key to subspecies

Leaves elliptic to elliptic-oblongate; intercostal veins distinct below. Calyx lobes broader than long. Fruits oblong. **2a. subsp. chinensis**

Leaves obovate to oblong or sometimes elliptic; intercostal veins faint and inconspicuous below. Calyx lobes as long as wide. Fruits broadly ellipsoid or sometimes ovoid. **2b. subsp. scortechinii**

2a. subsp. *chinensis* (Merr.) Matthew (of China)

Blumea 23 (1976) 83, Fl. Malesiana 1, 8 (1977) 96, fig. 3c; Kochummen, Tree Fl. Malaya 3 (1978) 54. **Basionym:** *Mastixia chinensis* Merr., Sunyatsenia 3 (1937) 256. **Type:** *Henry 12414*, China, Yunnan, Szemao (holotype NY; isotypes A, K, NY).

Tree to 20 m tall. **Twigs** glabrous. **Leaves:** petioles stout, 1.8–2.5 cm long, to *c.* 2 mm thick; blades elliptic to elliptic-oblongate, 8–20 × 4–8 cm, thickly coriaceous, base attenuate, apex acute; lateral veins 6–8 pairs, flat above; intercostal veins distinct beneath. **Inflorescences** subglabrous to appressed-hairy. **Flowers** 5-merous; calyx tube 5 lobed, lobes broader than long, puberulous; petals 5, appressed-hairy outside; stamens 5. **Fruits** oblong, 2–2.5 × *c.* 1 cm; persistent disc conspicuous.

Distribution. NE India, Bhutan, Myanmar, Thailand, Vietnam, S China and Peninsular Malaysia. In Peninsular Malaysia, only collected once from G. Raya, Langkawi Island, Kedah (*Kerr 21726*).

Conservation status. Regionally critically endangered.

Ecology. Very rare. Found in lower montane forest.

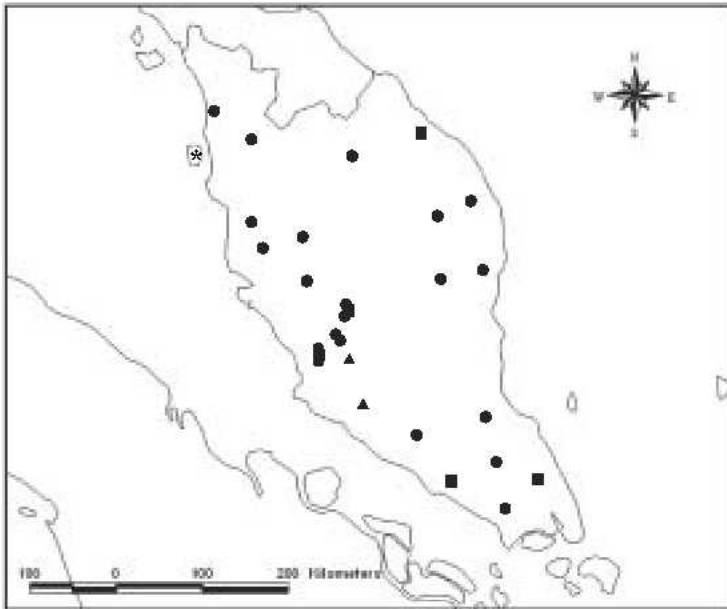
2b. subsp. *scortechinii* (King) Matthew

(Reverend Scortechini, 1845–1886, a Roman Catholic missionary; 1884–1886 government botanist stationed in Taiping, Perak)

Blumea 23 (1976) 86, Fl. Malesiana 1, 8 (1977) 97; Kochummen, Tr. Fl. Malaya 3 (1978) 54, fig. 1; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 204, Field Guide For. Tr. Brunei 1 (2003) 194, fig. 41d. **Basionym:** *Mastixia scortechinii* King, J. As. Soc. Beng. 71, 2 (1902) 73; Ridley, Fl. Malay Pen. 1 (1922) 891. **Type:** *Scortechinii* 1971, Peninsular Malaysia, Perak (lectotype K; isolectotypes BM, CAL, G, L, P). **Synonym:** *M. megacarpa* Ridl., Fl. Malay Pen. 1 (1922) 891. **Type:** *Curtis* 919, Peninsular Malaysia, Penang, Pulau Betong Reserve (holotype SING; isotype K).

Tree to 36 m tall and 80 cm diameter; buttresses short. **Twigs** glabrous, dark brown to black. **Leaves:** petioles stout, 1–3 cm long, (1–)1.5–2 mm thick; *blades obovate to oblong or sometimes elliptic*, 5–16.5 × 2.5–6 cm, thickly coriaceous, drying greenish grey or greenish brown, occasionally glaucous beneath, base cuneate, apex acute or acuminate but sometimes caudate; lateral veins 4–6 pairs, flat above; *intercostal veins and reticulations faint to inconspicuous on both surfaces*. **Inflorescences** puberulous to villous. **Flowers** (4-) or 5-merous, greenish yellow; buds *c.* 2 mm diameter; *calyx tube* (4) or 5 lobed, *lobes as long as wide*, puberulous; petals (4) or 5, 1.2–1.5 × 0.8–1 mm, appressed-hairy outside; stamens (4) or 5, filaments 0.5–0.7 mm long. **Fruits** green, ripening purple to bluish black, *broadly ellipsoid or sometimes ovoid*, 1.6–3.5 × 0.8–1.2 cm; fruit wall thick; persistent disc exposed. **Seeds** ovoid, 0.9–1.2 × 0.5–0.8 cm.

Distribution. Thailand, Sumatra, Peninsular Malaysia, Borneo (Sabah and Kalimantan) and Sulawesi. In Peninsular Malaysia, recorded from Kedah, Penang, Perak, Selangor, Kelantan, Terengganu, Pahang and Johor.



Map 1. Distribution of *Mastixia pentandra* subsp. *chinensis* (*), *M. pentandra* subsp. *scortechinii* (●), *M. trichotoma* var. *clarkeana* (▲) and *M. trichotoma* var. *maingayi* (■) in Peninsular Malaysia.

Conservation status. Regionally vulnerable.

Ecology. Widely distributed from lowland to lower montane forest to 1500 m.

3. *Mastixia rostrata* Blume

(Latin, *rostratus* = with a beak, narrowed into a slender tip or point; the leaf apex)

Mus. Bot. Lugd. Bat. 1 (1850) 258; Ridley, Fl. Malay Pen. 1 (1922) 890, *p.p.*; Danser, Blumea 1 (1934) 52; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 159; Matthew, Blumea 23 (1976) 73, Fl. Malesiana 1, 8 (1977) 94; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 204. **Type:** *Blume '2244'*, W Java (lectotype L, acc. no. 901.169.384). **Synonym:** *Mastixia junghuhniana* Miq., Fl. Ind. Bat 1, 1 (1856) 772, Clarke *in* Hooker *f.*, Fl. Brit. India 2 (1879) 746, *p.p.* **Type:** *Junghuhn s.n.*, W Java (holotype U, sheet no. 06764A)

Distribution. Sumatra, Peninsular Malaysia, Borneo, Java and Lesser Sunda Islands.

Taxonomy. In Matthew's treatment, *Mastixia rostrata* was segregated into two subspecies, of which (the other, subsp. *rostrata* occurs in Java and Lesser Sunda Islands), only subsp. *caudatifolia* is known from Peninsular Malaysia.

subsp. *caudatifolia* (Merr.) Matthew

Fig. 1

(Latin, *caudatus* = caudate or ending with a tail-like appendage, *-folius* = leaf; the leaf apex)

Blumea 23 (1976) 74, Fl. Malesiana 1, 8 (1977) 94, fig. 3f; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 205, fig. 1, J. Trop. For. Sci. (1996) 271, fig. 1. **Basionym:** *Mastixia caudatifolia* Merr., Pl. Elm. Born. (1929) 233. **Type:** *Elmer 21584*, Borneo, Sabah, Tawau (holotype UC; isotypes A, BM, BO, GH, HBG, K, L, NY, P, SING, U, UC, US).

Tree to 15 m tall and 10 cm diameter. **Bark** greyish to chocolate-brown, smooth to occasionally shallowly fissured; inner bark yellowish to pale orange-yellow, fibrous, soft. **Sapwood** yellowish. **Twigs** glabrous to subglabrous, grey or grey-brown. **Leaves** *alternate, sometimes (sub)opposite* but then never exclusively so; *petioles slender*, to *c.* 1.5 cm long, *0.4–0.8(–1) mm thick*, appressed hairy to glabrescent; *blades* elliptic-oblong to elliptic, *4–8(–10) × 2–5 cm, chartaceous to thinly coriaceous*, glabrescent beneath but hairy on the midrib, glabrous above, base cuneate to acute, *margin not recurved, apex caudate with acumen to c. 1.5 cm long; lateral veins 4–6 pairs, not looping toward leaf margin, sunken above; intercostal veins faint or conspicuous beneath.* **Inflorescences** to *c.* 6 cm long, subglabrous. **Flowers** *4-merous*, green-yellow; buds to *c.* 2 mm diameter; *calyx tube* 4 lobed, lobes broader than long, *glabrous*; petals 4, *1.1–1.3 × 0.7–0.9 mm, glabrous outside*; stamens 4, filament 1–1.3 mm long; disc yellowish. **Fruits** ovoid to ellipsoid, *1.5–2.2 × 0.5–1.3 cm*; fruit wall thick; persistent disc exposed; persistent calyx lobes inconspicuous. **Seeds** ellipsoid, *1.3–2 × 0.4–0.8 cm.*

Distribution. Sumatra, Peninsular Malaysia and Borneo. In Peninsular Malaysia recorded only from Pahang: Fraser's Hill and Genting Highlands.

Conservation status. Regionally critically endangered.

Ecology. Locally common in lower montane forest at 1100–1500 m.

4. *Mastixia trichotoma* Blume

Map 1

(Greek, *trichotomus* = having divisions always in threes; referring to the inflorescence)

Bijdr. Fl. Ned. Ind. (1825) 655; Danser, Blumea 1 (1934) 57; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 159; Matthew, Blumea 23 (1976) 68, Fl. Malesiana 1, 8 (1977) 92; Kochummen, Tr. Fl. Malaya 3

(1978) 54; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 205. **Type:** *Blume s.n.*, W Java, Mt Salak (lectotype L (acc. no. 901.169.393); isoelectotypes BM, W).

Tree to 40 m tall and 50 cm diameter. **Bark** yellowish grey to grey-brown, smooth to shallowly fissured; inner bark yellowish brown to pale brown. **Sapwood** pale white. **Twigs** yellowish brown to pale brown, puberulous to woolly. **Leaves** *always opposite*; petioles stout or slender, 1–3.5 cm long, 0.6–3 mm thick, puberulous to woolly; blades ovate, elliptic, lanceolate to oblong, 5–24 × 2.5–12 cm, thinly to thickly coriaceous, subglabrous to velvety hairy beneath, base acute, cuneate, obtuse or attenuate, apex acute to acuminate; lateral veins 5–15 pairs, prominent beneath, sunken or flat above; intercostal veins reticulate, faintly visible or prominent beneath. **Inflorescences** to c. 15 cm long, puberulous to woolly. **Flowers** 4- or 5-merous, green to yellowish green; buds 1–2.5 mm diameter; calyx tube 4 or 5 lobed, lobes as long as wide, puberulous to villous; petals 4 or 5, puberulous to villous outside; stamens 4 or 5. **Fruits** ovoid to ellipsoid, 1.5–3 × 0.6–1.5 cm, fruit wall thin; persistent disc exposed; persistent calyx lobes inconspicuous to slightly prominent. **Seeds** ovoid to ellipsoid, 1.3–2.9 × 0.4–1.4 cm.

Distribution. Peninsular Thailand and throughout Malesia (except New Guinea).

Taxonomy. This species is highly variable and was subdivided by Matthew into five varieties (*clarkeana*, *korthalsiana* (Wangerin) Danser, *maingayi*, *rhynchocarpa* Danser and *trichotoma*). Of these, only two occur in Peninsular Malaysia.

Key to varieties

Twigs and petioles finely tomentose. Leaf lateral veins not looping, flat above; intercostal veins faintly visible beneath, flat above. Inflorescences subglabrous to puberulous. **4a. var. clarkeana**

Twigs and petioles woolly hairy. Leaf lateral veins looping to form a marginal vein, sunken above; intercostal veins distinct and prominent beneath, sunken above. Inflorescences woolly hairy. **4b. var. maingayi**

4a. var. *clarkeana* (King) Danser

(Charles Baron Clarke, 1832–1906, British botanist, nephew of Benjamin Clarke in India 1865–1887)

Blumea 1 (1934) 62; Matthew, Blumea 23 (1976) 72, Fl. Malesiana 1, 8 (1977) 93; Kochummen, Tr. Fl. Malaya 3 (1978) 54, fig. 1, Tr. Fl. Pasoh For. (1997) 174; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 208. **Basionym:** *Mastixia clarkeana* King, J. As. Soc. Beng. 71, 2 (1902) 75; Ridley, Fl. Malay Pen. 1 (1922) 890. **Type:** *Scortechini 869*, Peninsular Malaysia, Perak (lectotype K; isoelectotypes CAL, G, L, P). **Synonym:** *M. clarkeana* King var. *macrophylla* King, J. As. Soc. Beng. 71, 2 (1902) 75. **Type:** *King's Coll. 10575*, Peninsular Malaysia, Perak, Ulu Bubong (lectotype K; isoelectotypes BM, CAL, P).

Tree to 24 m tall and 30 cm diameter. **Twigs** covered with a fine pale brown powdery tomentum. **Leaves:** petioles slender, 1–1.5 cm long, 0.6–0.8(–1) mm thick, covered with powdery brown hairs; blades elliptic, 7.5–15 × 2.5–6 cm, on drying pale yellow beneath, subglabrous; lateral veins 5–7 pairs, not looping near the margin, flat above; intercostal veins faintly visible beneath, flat above. **Inflorescences** subglabrous to puberulous. **Flowers** 4-merous. **Fruits** without exposed persistent disc; persistent calyx lobes prominent, 0.5–1 mm long.

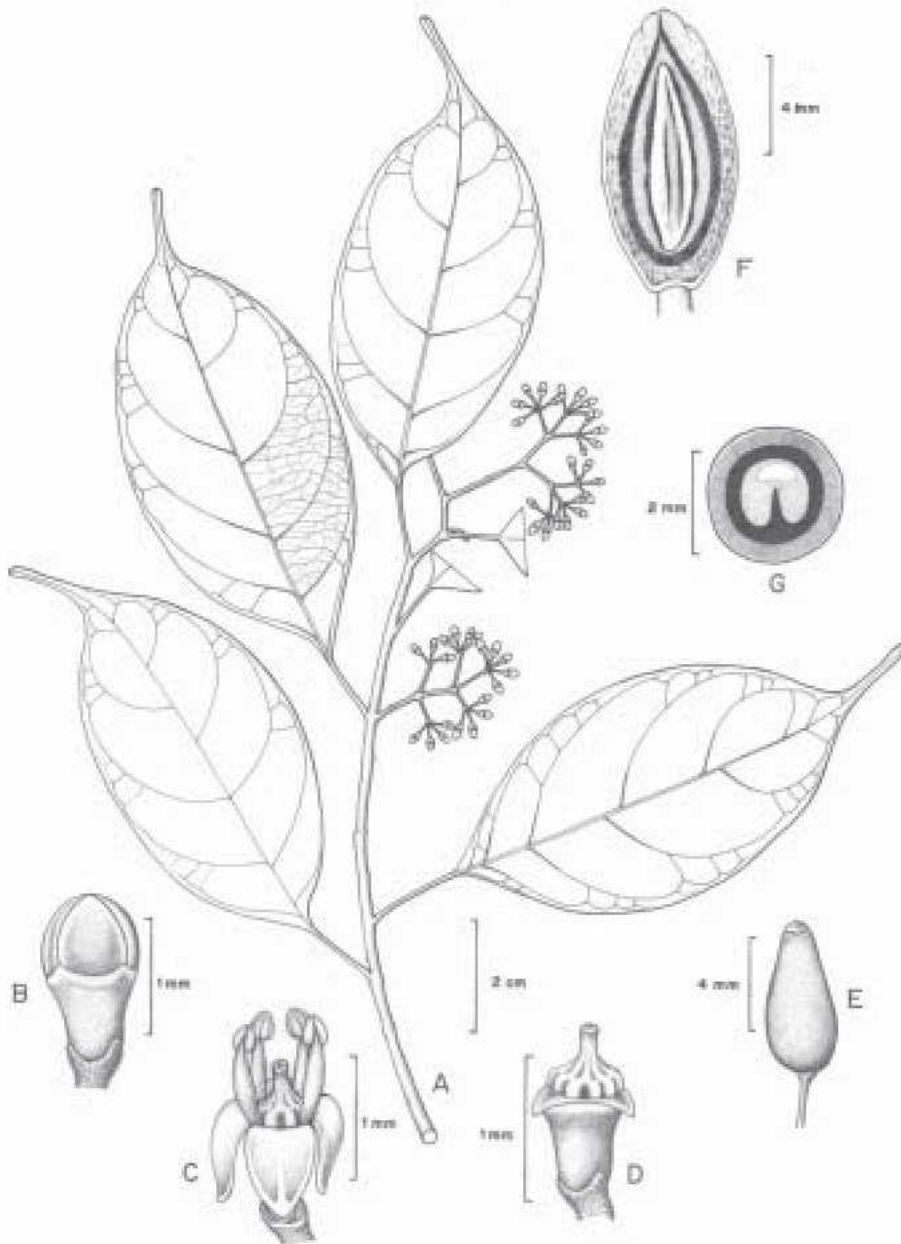


Figure 1. *Mastixia rostrata* subsp. *caudatifolia*. A, flowering leafy twig; B, flower bud; C, open flower; D, open flower with petals and stamens removed; E, fruit; F, fruit in longitudinal section; G, fruit in cross section. (Reproduced with permission from Tr. Fl. Sabah & Sarawak 1 (1995) 207.)

Distribution. Peninsular Thailand (Pattani), Sumatra, Peninsular Malaysia, Borneo and Philippines (Mindanao). In Peninsular Malaysia, known from Kedah, Perak, Selangor, Negeri Sembilan and Johor.

Conservation status. Regionally critically endangered.

Ecology. In primary lowland and hill dipterocarp forest, from low altitudes to 900 m.

4b. var. maingayi (C.B.Clarke) Danser

(A.C. Maingay, 1836–1869, British physician and botanist, sometimes jail-warden in Melaka, Peninsular Malaysia)

Blumea 1 (1934) 63; Matthew, Blumea 23 (1976) 70, Fl. Malesiana 1, 8 (1977) 93; Kochummen, Tr. Fl. Malaya 3 (1978) 54, fig. 1; Chung, Tr. Fl. Sabah & Sarawak 1 (1995) 206, Field Guide For. Tr. Brunei 1 (2003) 194, fig. 41e. **Basionym:** *Mastixia maingayi* C.B.Clarke in Hooker f., Fl. Brit. India 2 (1879) 746; King, J. As. Soc. Beng. 71, 2 (1902) 74; Ridley, Fl. Malay Pen. 1 (1922) 890. **Type:** *Maingay 2680* (= Kew Distr. No. 711), Singapore (holotype K; isotypes BM, GH, L). **Synonyms:** *M. maingayi* C.B.Clarke var. *subtomentosa* King, J. As. Soc. Beng. 71, 2 (1902) 75. **Type:** *Maingay 2436* (= Kew Distr. No. 709), Singapore (holotype K); *M. propinqua* Ridl., J. Fed. Mal. St. Mus. 4, 1 (1909) 25. **Type:** *Ridley 13899*, Peninsular Malaysia, Pahang, Ulu Telom (holotype SING; isotype BM); *M. junghuhniana* auct. non Miq.: Clarke in Hooker f., Fl. Brit. India 2 (1879) 746; *M. rostrata* auct. non Blume: Ridley, Fl. Malay Pen. 1 (1922) 890.

Tree to 24 m tall and 40 cm diameter. **Twigs** woolly with long yellowish brown hairs. **Leaves:** petioles stout, 2–3.5 cm long, 1.5–3 mm thick, *woolly brown-hairy*; blades elliptic, oblong or lanceolate, 8.5–22 × 3.5–10.5 cm, thickly coriaceous, woolly brown-hairy beneath, glabrous above except the midrib and veins; *lateral veins* 5–6 pairs, *looping to form intramarginal vein beneath, prominently sunken above; intercostal veins prominent beneath, conspicuously sunken above.* **Inflorescences** woolly hairy. **Flowers** 4-merous. **Fruits** with exposed persistent disc; persistent calyx lobes prominent, 1.5–2 mm long.

Distribution. Sumatra, Peninsular Malaysia, Singapore and Borneo. Recorded in Peninsular Malaysia from Penang, Perak, Selangor, Terengganu, Pahang and Johor.

Conservation status. Regionally vulnerable.

Ecology. In primary lowland dipterocarp to lower montane forest, to 1500 m.

Excluded Species

Mastixia gracilis King, J. As. Soc. Beng. 71, 2 (1902) 74. **Type:** *Wray 1528*, Peninsular Malaysia, Perak (CAL) = *Vaccinium bancanum* Miq. var. *temuinervium* J.J.Sm. (Ericaceae) (Matthew, 1977).

2. NYSSA L.

(One of the water nymphs)

Sp. Pl. (1753) 1058; Bentham & Hooker f., Gen. Pl. 1 (1867) 952; Hooker f., Fl. Brit. India 2 (1879) 747; King, J. As. Soc. Beng. 71, 2 (1902) 79; Ridley, Fl. Malay Pen. 1 (1922) 895; Wasscher, Blumea

1 (1935) 343, Fl. Malesiana 1, 4 (1948) 29; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 161; Hutchinson, Gen. Fl. Pl. 2 (1967) 51; Kochummen, Tr. Fl. Malaya 1 (1972) 346; Yii, Tr. Fl. Sabah & Sarawak 1 (1995) 253; Kubitzki, Fam. Gen. Vasc. Pl. 6 (2004) 86. **Synonym:** *Agathisanthes* Blume, Bijdr. Fl. Ned. Ind. (1825) 644.

Polygamodioecious (having bisexual and unisexual flowers on separate individuals) or monoecious (flowers unisexual but the male and female ones borne on the same plant) trees or less often shrubs. **Leaves** *spirally arranged* or (alternate), margin entire. **Inflorescences** axillary, *often in heads or condensed racemes*, pedunculate. **Flowers** *unisexual or bisexual*, in the axils of a bract and with 2 bracteoles together enclosing the flower-base. **Male flowers** in axillary heads or short racemes; calyx tube campanulate, rim smooth or 4–5-toothed; *petals* 4–5 or (absent), free, recurved, *imbricate* in bud, alternate with the calyx lobes; *stamens often more numerous than petals*, in 2 alternating whorls, anthers nearly elliptic; disc pulvinate; ovary and style rudimentary. **Bisexual or female flowers** in axillary, stalked heads; calyx tube campanulate, entire or 4–5-toothed; petals 4–5, as in male flowers but smaller; *stamens often more numerous than petals*, inner whorl partly sterile; ovary 1- or (3–10)-locular, adnate to the calyx tube, ovule 1, anatropous, flat, pendent, inserted near the top of the ovary, style with 1–2(–3) curving, arms, stigmatic surface undulate. **Fruit** a drupe, ovoid to broadly ellipsoid, surmounted by calyx tube and crowned by a small persistent disc; exocarp coriaceous, glabrescent, mesocarp fleshy. **Seed** 1 or (3–5), obovoid, flat, grooved on one side and knobby on the other, membranous testa; endosperm smooth; embryo rather large, cotyledons flat, leafy; germination epigeal.

Distribution. About 8 species, 3 in SE North America, 1 in Costa Rica, 3 in China and 1 widespread from NE India to Indo-China, S China, Thailand, Sumatra, Peninsular Malaysia, Borneo and Java.

Ecology. Found mainly in primary and lower montane forest. It occurs on slopes and ridge tops.

Uses. The wood is heavy and occasionally used for construction, interior finish, furniture, packing cases and tea boxes, and for the production of veneer and plywood on a local scale only. The juicy aril of the fruit is edible (Yii, PROSEA 5, 3 (1998) 411).

Nyssa javanica (Blume) Wangerin
(of Java)

Fig. 2, Map 2

in Engler, Pfl. Reich. 41 (1910) 15; Wasscher, Blumea 1 (1935) 344, Fl. Malesiana 1, 4 (1948) 29; Backer & Bakhuizen *f.*, Fl. Java 2 (1965) 161; Kochummen, Tr. Fl. Malaya 1 (1972) 346; Yii, Tr. Fl. Sabah & Sarawak 1 (1995) 255, fig. 1. **Basionym:** *Agathisanthes javanica* Blume, Bijdr. Fl. Ned. Ind. (1825) 645. **Type:** Blume '1781', Java (holotype L (acc. no. 944.234.39); isotypes K, L (acc. no. 944.234.38)). **Synonym:** *Nyssa sessiliflora* Hook. *f.* & Thomson *in* Bentham & Hooker *f.*, Gen. Pl. 1 (1867) 952, Hooker *f.*, Fl. Brit. India 2 (1879) 747, King, J. As. Soc. Beng. 71, 2 (1902) 79, Ridley, Fl. Malay Pen. 1 (1922) 895. **Type:** Hooker *f.* & Thomson *s.n.*, S Himalaya, Khasia Mts (K *n.v.*).

Polygamodioecious tree to 36 m tall, 60 cm diameter, sometimes with very small buttresses. **Bark** grey to pale brown, smooth to slightly flaky, lenticellate; inner bark dull yellow or pale brown, fibrous or laminated, staining dark blue upon exposure. **Sapwood** yellowish white. **Twigs** pale brown to dark brown, with large scattered lenticels and leaf scars, often covered with brown tomentum when young, gradually turning glabrous. **Leaves** typically crowded

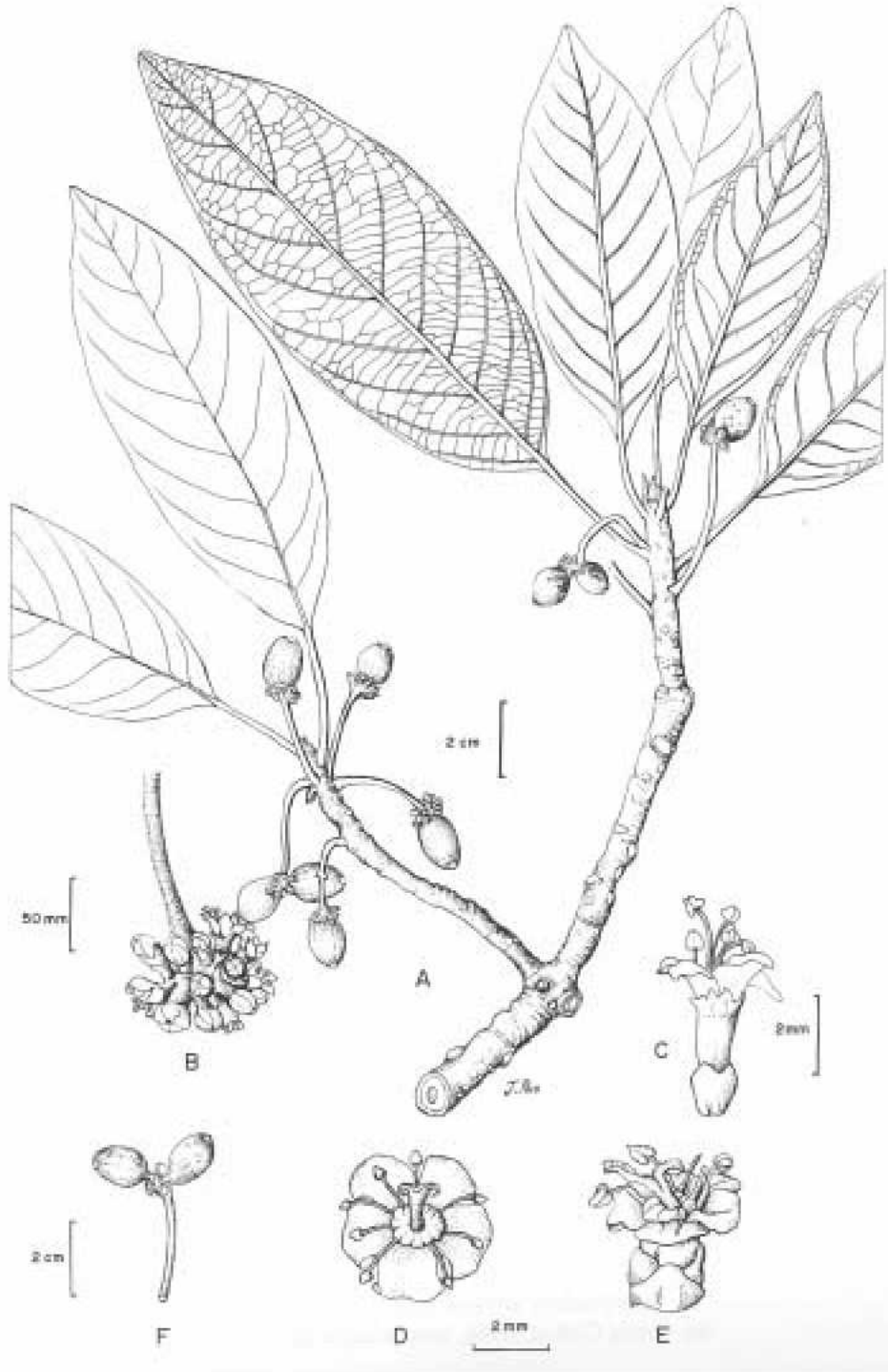
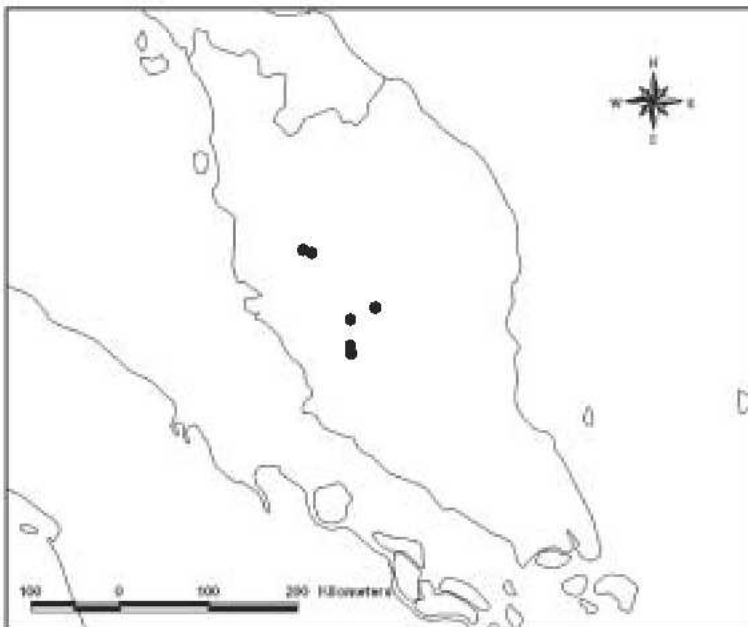


Figure 2. *Nyssa javanica*. A, fruiting leafy twig; B, inflorescence; C, male flower; D & E, female flowers; F, fruits. (Reproduced with permission from Tr. Fl. Sabah & Sarawak 1 (1995) 254.)

towards the end of the twigs; petioles 1.5–2.5 cm long, 1–2.5(–3) mm thick, glabrous; blades lanceolate to elliptic, or obovate, (5–)8–20 × 2–7(–9) cm, slightly glaucous beneath, thinly coriaceous, glabrous on both surfaces but sometimes glabrescent beneath the midrib and veins, base gradually narrowed towards petioles, margin entire to slightly wavy, apex abruptly pointed; midrib flushed reddish; lateral veins 8–11 pairs. **Inflorescences** globose heads, 12–18 mm diameter, in the axils of the leaves; peduncles slightly angular, 0.8–2(–5) cm long, slightly hairy or glabrous, bracteate. **Male flowers** pedicellate, 0.5–4 mm long, in 20–40-flowered heads; calyx tube with 4–5 rounded teeth, 0.5–0.75 mm long, appressed-hairy outside; petals 4–5, 3–5 mm long, shortly hairy on both sides; stamens 8–10, outer whorl 3–5 mm long, slightly flat at the base, inner whorl 2–4 mm long, anthers 1.5 mm long; disc 1–2 mm diameter, 8–10-lobed at the margin. **Female flowers** sessile, in 3–9(–18)-flowered heads; calyx tube with 4–5 irregularly rounded or minute lobed, lobes 2–3 mm long, densely appressed-hairy outside; petals 4–5, 3–4 mm long, appressed-hairy outside; stamens 8–10, outer whorl 2–2.5 mm long, inner whorl 1–2 mm long, anthers all sterile, little developed and *c.* 1 mm long or none; disc *c.* 2 mm diameter, slightly lobed at the margin, impressed in the middle; ovary 1-locular, style 1.5–2 mm long, with 2 curving arms. **Fruits** ellipsoid, 15–22 × 10–15 mm, persistent disc conspicuous; persistent calyx lobes inconspicuous. **Seeds** obovate, 10–20 × 5–12 mm.

Distribution. Sumatra, Peninsular Malaysia, Java and Borneo. Very rare in Peninsular Malaysia, known from G. Benom, Pahang and the Main Range in Perak and Pahang (Cameron Highlands, Genting Highlands and Fraser's Hill).



Map 2. Distribution of *Nyssa javanica* (●) in Peninsular Malaysia.

Conservation status. Regionally endangered.

Ecology. On gentle slopes and ridge tops in primary lower montane forest at about 900–1500 m.

The Flora of Peninsular Malaysia provides accounts based on original research of the families of vascular plants (fern allies, ferns, gymnosperms and flowering plants) that occur in the Peninsula, including naturalised species.

The family accounts include keys for identification and descriptions of all species, distribution maps, botanical plates (at least one per genus) and colour photographs. Specimen identification lists are provided on CD. It is envisaged that the 8300 species will be covered in about 20 volumes.

Contributors of the family accounts come from many institutes in many countries. This Guide is intended as an aid to authors to ensure uniformity of style for the Flora. The project is fully sponsored by the Ministry of Science, Technology and Innovation, Malaysia, and is based at the Forest Research Institute Malaysia.

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