Malayan Forest Records No. 48
Series I: Ferns and Lycophytes , Volume 3



Flora of Peninsular Malaysia

Edited by
B.S. Parris
R. Kiew
R.C.K. Chung
Y.H. Cheah

FLORA
OF
PENINSULAR MALAYSIA

Series I: Ferns and Lycophytes

Produced with the financial support of

GOVERNMENT OF MALAYSIA

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Forest Research Institute Malaysia
Ministry of Water, Land and Natural Resources, Malaysia

2020

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Date of Publication: 28 February 2020

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Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

FLORA OF PENINSULAR MALAYSIA: Series I: Ferns and Lycophytes. Volume 3 /
Edited by B.S. Parris, R. Kiew, R.C.K. Chung & Y.H. Cheah.
ISBN 978-967-2149-64-4
(Malayan Forest Record; No. 48)
1. Ferns--Malaysia.
2. Lycopodiaceae--Malaysia.
3. Goverment publications--Malaysia.
I. Parris, B.S. II. Kiew, R.
III. Chung, R.C.K. IV. Cheah, Y.H.
V. Series.
587.3095951

MS ISO 9001:2015 Certified

Layout: O. Zainun
Cover design: Misas Advertising Sdn Bhd & N, Mohamad-Aidil
Cover: *Adiantum siamense* Tagawa & K.Iwats. (Photo: T. Phutthai)

Printed in Malaysia by Misas Advertising Sdn Bhd, No. 30, Jalan 4/23B,
Taman Danau Kota, 53300 Kuala Lumpur.

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6. MARATTIACEAE

R. Jaman

11 Jalan 2/3B, 43650 Bandar Baru Bangi, Selangor, Malaysia

Kaulf., Enum. Filic. (1824) 31, *nom. cons.*; Camus, Fam. Gen. Vasc. Pl. 1 (1990) 174; Holttum, Rev. Fl. Malaya 2, 2nd ed. (1968) 43; Mabberley, Plant Book 4th ed. (2017) 564; Murdock, Taxon 57 (2008) 740; Parris & Latiff, Malay. Nat. J. 50 (1997) 261; Tagawa & K.Iwatsuki, Fl. Thailand 3, 1 (1979) 41.

Terrestrial or elsewhere occasionally epiphytic, rhizomes erect, ascending, or creeping. **Fronds** monomorphic and relatively long-lived or dimorphic with fertile fronds short-lived, simple, palmately lobed or in our area 1–2-pinnate with paired basal stipules; stipes and stipules often with conspicuous scattered lenticels; pulvini *present at bases of fronds*, *at nodes or bases of leaf segments*, *and occasionally along stipes at leafless nodes.* **Laminae** margins simple, toothed, irregularly crisped or more-or-less entire; veins *free, simple, bifurcating, branching distally, or reticulate*; *false veins present between true veins and extending from margin towards midrib*, *or absent*. Indumentum composed of multicellular uniseriate hairs (simple or branched, glandular or not), and scales (basifixed or peltate, sometimes raised on short stalks). **Sori** lack true indusia but often subtended by a ring of paraphyses, in our area superficial, elongate along veins and bilateral, or radial, sporangia *thick-walled, at least partially fused into synangia*, in our area sporangia dehiscing via a slit. **Spores** monolete or trilete, occasionally alete or incipiently trilete, perispore present, more than 1,000 spores per sporangium. **Gametophytes** above ground, large, thalloid, cordate, green, and photosynthetic. Mycorrhizal associations common in stems, roots, and gametophyte.

Distribution. Cosmopolitan in wet tropical and subtropical to warm temperate forests, world-wide six genera with *c.* 111 species (PPG I, 2016). In Peninsular Malaysia, three genera: *Angiopteris* (2 species), *Christensenia* (1 species) and *Ptisana* (1 species).

Key to genera

1. Frond palmate; veins reticulate…..….....**2. Christensenia**
   Frond pinnate to bipinnate; veins free..….....2

2. False veins (recurrent veins) present between the true veins; stipe swollen at base. Sporangia separate in two opposite rows…….....**1. Angiopteris**
   Without false veins between true veins; stipe not swollen at base. Sporangia in paired synangia..... **3. Ptisana**

1. **ANGIOPTERIS** Hoffm.

(Greek, *angion* = vessel; *pteris* = fern; referring to the shape of the sporangia)

in Comment. Soc. Regiae. Sci. Gott. 12 (1796) 29, *nom. cons*.; Holttum, Rev. Fl. Malaya 2, 2nd ed. (1968) 43; Camus, Fam. Gen. Vasc. Pl. 1 (1990) 177; Murdock, Taxon 57 (2008) 751; Tagawa & K.Iwatsuki, Fl. Thailand 3, 1 (1979) 41.

Large terrestrial ferns; rhizomes massive, short, erect, ascending, or elsewhere creeping, covered by large fleshy stipules of old fronds. **Fronds** many; stipes fleshy with a pair of stipules at base; laminae (1–)2-pinnate, very large to 3 m long, more-or-less evenly divided throughout, pinnae shortly stalked, pulvini at bases of segments, at leafless nodes on the stipe in juvenile leaves, generally absent at maturity; primary pinnae alternate or rarely subopposite, lanceolate to slightly falcate, margins distinctly to minutely serrate to more-or-less entire; veins *free, simple or bifurcating*; false veins *generally present between veins, of varying length extending from the margins towards the costae.* Indumentum of uniseriate simple hairs and peltate scales that generally appear basifixed due to extreme asymmetry. **Sori** on veins, marginal, submarginal, or medial; sporangia *more-or-less free above*, fused at base to receptacles, synangia sessile, bilateral, each comprising two opposing rows of sporangia; each synangium not opening as a unit, each sporangia dehiscing via a vertical slit on the inner surface of each valve.

Vernacular name. *Paku gajah* (Malay).

Distribution. Perhaps 30 species (PPG I, 2016), from Madagascar, Sri Lanka, India, Nepal, Myanmar, Thailand, Indo-China, China, Japan, throughout Malesia to the Pacific Islands with two species in Peninsular Malaysia. Naturalised, sometimes an invasive weed, in Hawaii, Jamaica and Central America (Murdock, 2008).

Ecology. In moist conditions from lowland to mountain forest, often associated with streams. The enormous fronds have no hard tissue and are entirely supported by turgor of the swollen stipe base and pulvini. In dry weather, as water is lost from the frond, the frond gradually collapses but will revive when the water supply is resumed.

Uses. Their massive size and lush glossy leaves make them attractive as ornamental plants.

Taxonomy. Based on morphological variation, over 200 poorly described microspecies have been attributed to this genus. Rolleri (Rev. Museo La Plata, Botanica 16, 116 (2003) 6), based on a very limited sample of Malaysian specimens, attributed two species not previously recorded for Peninsular Malaysia, namely *A. crassipes* Wall. *ex* C. Presl based on a single specimen from Penang (*Curtis 626*) and *A. pruinosa* Kunze. The latter she treated as a subspecies of *A. evecta*. It is likely that these belong to the widespread and variable *A. evecta*. Molecular analysis of Chinese species (Li & Lu, Chin. Sci. Bull. 52 (2007) 91–97) indicates that morphological diversity is far greater than genetic diversity suggesting that there may be a small number of species with highly plastic morphology (Murdock, 2008).

Key to Angiopteris species

Pinnae 1–1.7 cm wide; false vein reaching almost to the costa. Above 1200 m altitude…….....
.....**1. A. angustifolia**

Pinnae 2–2.5(–4) cm wide; false vein reaching at most to halfway to the costa. Sea level to 1200 m altitude…….....**2. A. evecta**

1. **Angiopteris angustifolia** C.Presl

Plate 8A–B, Map 1

(Latin, *angustus* = narrow; *folia* = leaf)

Suppl. Tent. Pterid. (1845) 21; Holttum, Rev. Fl. Malaya 2, 2nd ed. (1968) 45; Piggott, Ferns Malay. (1988) 34, figs. 94–96; Parris & Latiff, Malay. Nat. J. 50 (1997) 261; Rolleri, Rev. Museo La Plata, Botanica 16, 116 (2003) 6. **Type:** *Cuming 18*, the Philippines, Luzon. (holotype PRC, *n.v.*; isotypes L, US, *n.v*).

Rhizome huge, stout. erect. Stipule margin fimbriate, covered with minute scales, few lenticels present. **Fronds** to 4(–6) m long. **Stipes** terete, green with whitish streaks 8–12 × 1.0–1.5 mm scattered along the stipe, smooth, 70–100 cm long with swollen base 3.5–4.5 cm diameter, filiform scales with fimbriate apex, 10–15 × 1.0–1.5 mm, older scales dark wart-like on mature plants. **Laminae** bipinnate; pinnae 1.8–2.5 m long with 7–12 pairs of pinnules, pinnae on basal part somewhat reduced compared to middle and apical part of pinnae, pinnae of middle part *c.* 90–92 cm long with 27–43 pairs of pinnules, pinnules 1.5–1.7 cm apart; pulvinus on middle pinnae 2.5–3.0 cm long, 1.3–1.5 cm diameter; costa winged; pinnules of middle pinnae 7.4–20 × *1.0–1.7 cm*, base of pinnules cuneate, apex acute, serrate, coriaceous; petiole 1.0–2.5 mm long; fertile pinnules 7.0–11.7 × *0.9–1.3 cm wide*, broadly cuneate at base; petiole *c.* 1 mm, rachises swollen at base; venation free 1-2 forked, false vein *in between true veins reaching almost to costa*, *translucent*; synangium about 1 mm from margin, sporangia (*4–6–*)*8–9*(*–10*), paraphyses present in sporangia.

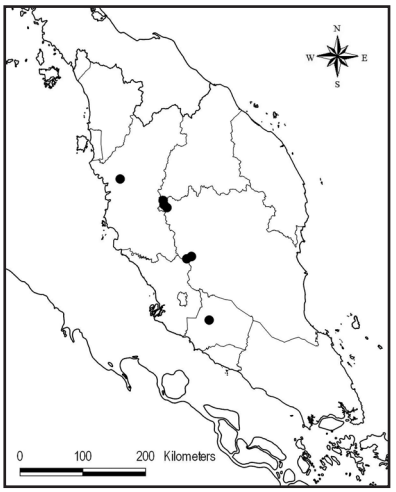
Vernacular names. *Paku gajah gunung*; *paku gajah besar* (Malay).

Distribution. Peninsular Malaysia to the Philippines, including Borneo (Sabah). In Peninsular Malaysia recorded from Perak (Bukit Larut), Pahang (Fraser's Hill and Cameron Highlands) and Negeri Sembilan (G. Telapak Buruk).

Conservation status. Near Threatened (nearly meeting Vulnerable B2ab(ii,iii) (assessed by Y.H. Cheah). Most collections are pre-1950s, and some sites in Cameron Highlands are severely impacted by agricultural activities.

Ecology. In lower montane forest, in shaded and moist places, often by streams in moderately open places, at and above 1200 m altitude.

Uses. Reported as used in folk medicine to cure stomach pains by taking the main base of the frond stalk and placing it on the stomach (Mat-Salleh, Zanariah & Jaman*, Tumbuhan Ubatan Malaysia*: *Paku Pakis dan Kerabatnya* (2002) 44; Bidin, *Paku Pakis Ubatan di Semenanjung Malaysia* (1985) 30).



Map 1. Distribution of *Angiopteris angustifolia.*

2. **Angiopteris evecta** (G.Forst.) Hoffm. Fig. 1, Plate 8C & 9, Map 2

(Latin, *evectum* = moved forward; reference obscure)

in Comment. Soc. Regiae. Sci. Gott. 12 (1796) 29, *t.* 5; Holttum, Rev. Fl. Malaya 2, 2nd ed. (1968) 44, fig. 3; Piggott, Ferns Malay. (1988) 31, figs. 88–93; Parris & Latiff, Malay. Nat. J. 50 (1997) 261; Tagawa & Iwatsuki, Fl. Thailand 3, 1 (1979) 41. **Basionym:** *Polypodium evectum* G.Forst., Fl. Ins. Australium Prodr. (1786) 81. **Type:** *G. Forster s.n.*, Societatis Insulae, French Polynesia (holotype BM, *n.v.*).

Rhizome short, erect, *c.* 20 cm tall, globose with the persistent old stipe bases and stiff woody stipules; stipule margin fimbriate, covered with minute scales, few lenticels present. **Stipes** commonly to 100–150 cm long, sometimes longer, *c*. 2 cm thick, smooth, green with whitish streaks 8–10 × 1.0–1.5 mm scattered along the stipe, when young more-or-less covered with appressed soft, small brown scales and hairs. **Laminae** bipinnate, commonly 200–300 cm long and to 200 cm wide; rachises green, sparsely scaly and hairy like the stipe, especially on the lower surface, sides narrowly winged towards apex of smaller rachises; pinnae to 100 cm or more long, bearing pinnules 2–3 cm apart; pinnules commonly to 20 × *2.5 cm*, each with a short swollen fleshy stalk to 3 mm long, base unequal, the basiscopic side usually rounded and approaching the rachis a little nearer than the more cuneate acroscopic side, edges parallel for most of their length with a small blunt tooth to each vein-ending, teeth commonly 10–12 per cm, apex acuminate and more strongly toothed; veins simple, forked at the basal of midrib or forked nearly above the midrib, at slightly oblique to the midrib, raised on both surfaces, in living material more-or-less translucent; false vein *medial, slender*, *usually distinct and traceable much beyond the sori half way or even more to the costa.* ***S*ori** rather intramarginal, about 1–2 mm from the margin, sporangia usually *about 8–14*, sometimes up to 24.

Distribution. Credited with the range of the genus, from Madagascar to the Pacific Islands (Holttum, 1968). Throughout Peninsular Malaysia, in all states except Melaka and Kedah (but recorded from Langkawi Is.) and in Borneo in Sabah and Sarawak.

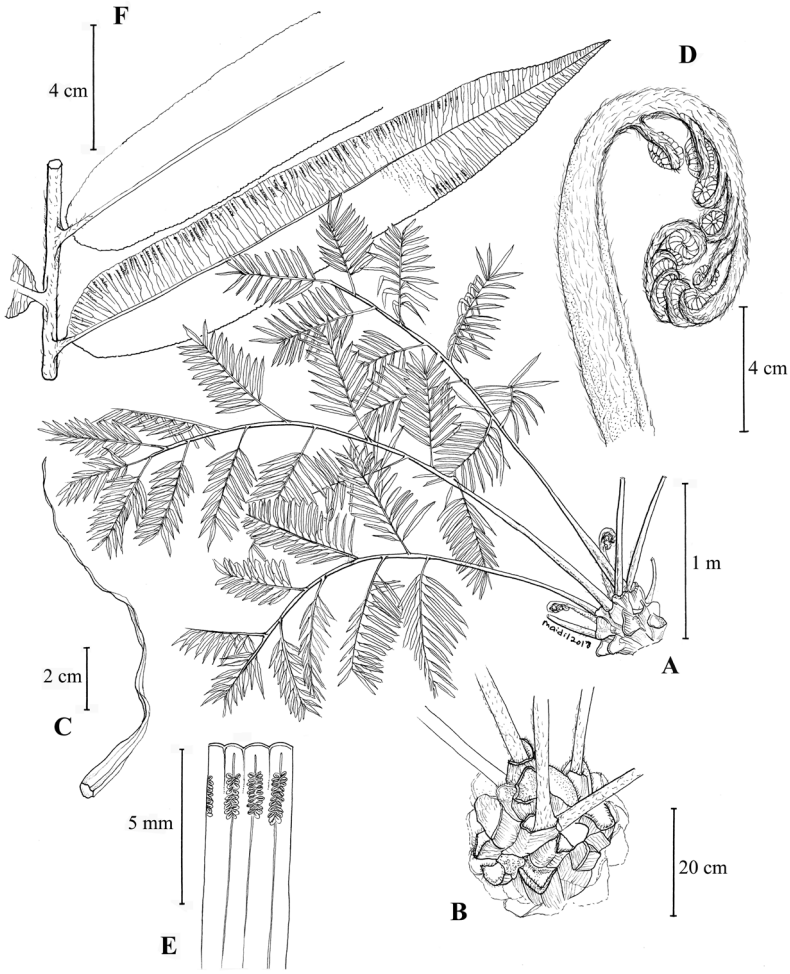
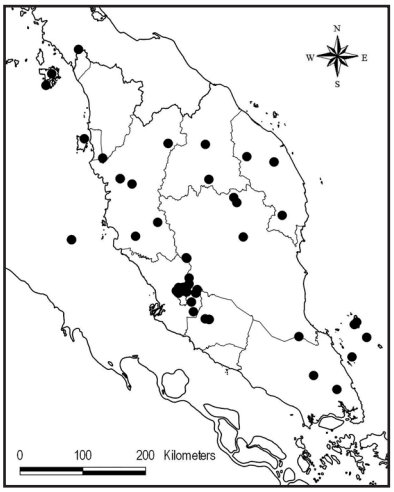


Figure 1. *Angiopteris evecta.* A, habit; B, stem base with persistent stipe bases; C, scale from the stipe base; D, crozier; E, margin of pinnule with sori; F, lower surface of fertile pinnule. (A–E from life; F from *FRI 74239*.)



Map 2. Distribution of *Angiopteris evecta.*

Conservation status. Least Concern (assessed by Y.H. Cheah).

Ecology. The most common *paku gajah*, in lowland forest usually by shady streams or in wet places in primary lowland or hill forest to 1200 m altitude. The swollen base of the stipe has a pair of buds that can sprout and produce new plantlets.

Uses. Burkill (Dict. Econ. Products Malay Pen. (1966) 160) recorded that a decoction of the roots was used to arrest the discharge of blood after a miscarriage and that the fronds were pounded to relieve coughs.

2. **CHRISTENSENIA** Maxon

(C.F.A. Christensen, 1872–1942, a Danish botanist)

in Proc. Biol. Soc. Wash. 18 (1905) 239; Camus, Fam. Gen. Vasc. Pl. 1 (1990) 177, fig. 92; Murdock, Taxon 57 (2008) 743.

Terrestrial, *creeping* rhizome fleshy, to 40–45 cm long, *c.* 1 cm diameter, scaly. **Stipes** fleshy, 17–22(–80) cm long, dark green, crowded, *c*. 6–8 mm apart; stipules present at stipe base. Scales adherent, large, rigid, basifix, 2.7 × 0.8–1.0 mm, with reddish spots, larger cells with thick cell walls. **Fronds** *palmately lobed with 3–5 fleshy, shortly stalked leaflets*, stalks 0.5–2 cm long, dark green above, greenish white beneath, young leaves sometimes purplish; terminal leaflet elliptic to lanceolate, much larger and wider, to 17–25 × 6–9 cm, slightly ascending and curved, base cuneate, margin slightly revolute, usually distantly crenate, rarely entire or undulate, apex shortly acuminate; lateral leaflets 11.5–19 × 4.5–7 cm, lateral leaflets bearing a smaller leaflet at their base; *venation reticulate.* Hairs and scales diverse. **Sorus** a *circular synangium*, *scattered*, in a circular group of 8–12 sporangia; receptacles circular, paraphyses similar to branched trichomes, eglandular and more delicate**. Spores** ellipsoid, monolete; exospore spiny.

Genus with one species.

Distribution. China, NE India, Myanmar, Thailand, Indo-China, Malesia and the Solomon Islands.

Taxonomy. Rolleri (Amer. Fern J. 83, 1 (1993) 3) recognized two species, *Christensenia aesculifolia* and *C. lobbiana* (de Vriese) Rolleri and two subspecies of *C. aesculifolia,* subsp. *aesculifolia* and subsp. *korthalsii* (de Vriese) Rolleri. However, the genus is infrequently collected and poorly known, so this account follows Murdock (2008) and Flora of China (2013) in treating it as a single species.

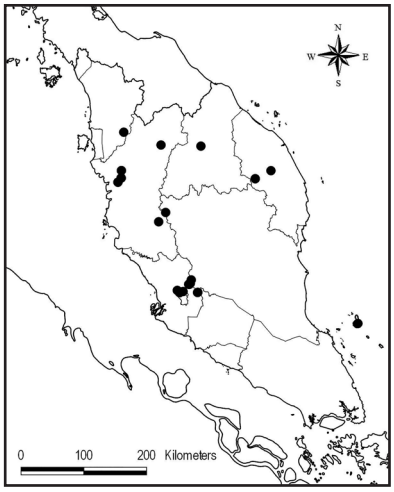
Christensenia aesculifolia (Blume) Maxon Fig. 2, Plate 10A, Map 3

(Latin, -*folia* = leaf; referring to the similarity of its leaves to those of *Aesculus*, Sapindaceae, the horse chestnut)

Proc. Biol. Soc. Wash. 18 (1905) 239; Holttum, Rev. Fl. Malaya 2, 2nd ed. (1968) 45, fig. 4; Tagawa & Iwatsuki, Fl. Thailand 3, 1 (1979) 42; Piggott, Ferns Malay. (1988) 34, figs. 97–99; Parris & Latiff, Malay. Nat. J. 50 (1997) 261. **Basionym:** *Aspidium aesculifolium* Blume, Enum. Pl. Javae (1828) 143. **Type:** *Blume s.n.*, Bantam (holotype L; isotype P, *n.v.*). **Heterotypic synonym:** *Christensenia lobbiana* (de Vriese) Rolleri, Amer. Fern J. 83, 1 (1993) 17. **Type:** *Lobb s.n*., Java (K).

Description. As for genus.

Distribution. In Peninsular Malaysia, found in Kedah, Perak, Selangor, Kelantan, Terengganu and Pahang (including P. Tioman), and in Borneo in Sabah and Sarawak.



Map 3. Distribution of *Christensenia aesculifolia.*

Conservation status. Near Threatened (nearly meeting Vulnerable B2b(ii,iii) (assessed by Y.H. Cheah). This elusive species is rare, its populations often represented by one or two plants, and it is confined to deep shade in lowland forest, a habitat that has drastically declined in extent.

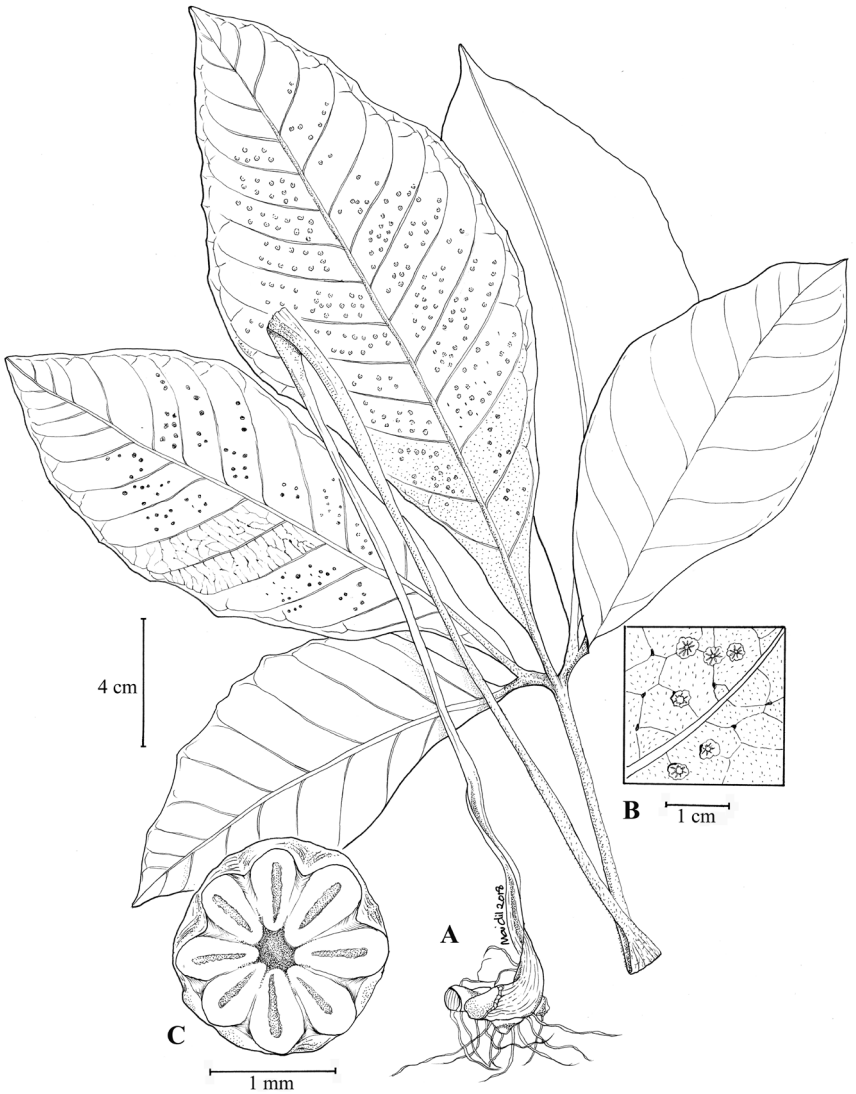


Figure 2. *Christensenia aesculifolia.* A, frond; B, sori on underside of leaflet; C, circular synangium. (All from *FRI 81332*.)

Ecology. Rare, scattered in deep shade, in undisturbed lowland forest, usually beside streams, where it is sometimes locally common; 250(–1000) m altitude.

Notes. Its large raised, permanently open stomata *c*. 80 µm diameter or more, are visible with the naked eye on the lower lamina surface as translucent spots.

3. **PTISANA** Murdock

(Latin, *ptisana* = pearl barley; referring to the form of the synangium)

Taxon 57 (2008) 744.

Terrestrial; rhizome short, erect. **Stipes** with non-clathrate, fimbriate scales; pulvini present at base of segments, absent from stipes. **Laminae** 2–4-pinnate, with hairs and scales, terminal segments on primary pinnae *generally with a prominent suture at point of attachment*, margins generally toothed, occasionally crenulate or more-or-less simple; veins free, mostly simple, rarely forked, *lacking false veins between veins of terminal segments*. **Sori** superficial, marginal to medial, surrounded by nest-like rings of paraphyses, *composed of two opposing rows of sporangia either side of vein, each fully fused into a synangium*. **Synangia** sessile (not raised or stalked), *bilateral*, *each comprised of two opposing regular rows of synangia*, each synangium opening as a unit and *dehiscing via a vertical slit on the inner surface of each valve*. **Spores** monolete, typically ellipsoid, surface granular to spiny.

Distribution. Twenty species (PPG 1, 2016) widely distributed in the Paleotropics from Africa, Madagascar, Indian Ocean Islands, India to Vietnam, throughout Malesia to tropical Australia, New Zealand and the Pacific Islands (Mabberley, 2017). One species in Peninsular Malaysia.

Ecology. In wet forest, often by streams and usually at low altitudes.

Ptisana pellucida (C.Presl) Murdock Fig. 3, Plate 10B–C, Map 4

(Latin, *pellucidus* = transparent; referring to the fronds)

Taxon 57 (2008) 747. **Basionym:** *Marattia pellucida* C.Presl, Suppl. Tent. Pterid. (1845) 10; Maideen *et al*., Malaysian J. Sci. 21 (2002) 32, fig. 1. **Type:** *Cuming 177*, Philippines, Luzon, Camarines Province (possible PRC *n.v.*; isotypes BM, L, P, US *n.v.*).

Rhizome erect. **Fronds** many, clustered, arising radially, to 4 m long. **Stipes** *smooth*, light green, fleshy, to 60 cm long, *c*. 3.2 mm diameter, swollen, flanked by 2 large, fleshy stipules at base *c.* 2 cm thick, with longitudinal interrupted white line of aerophores along both sides of stipes; base of pinnae-rachises swollen to form a pulvinus, 3.0–3.3 mm diameter. **Laminae** bipinnate, main rachis smooth, costa 27–29 cm long, *narrowly winged towards their apex*, *wings to 0.5 mm wide*, articulate at pinnule stalk, pinnules 10–12 pairs; lowest pinnule 3.2–4.5 cm long, smaller than upper pinnule, 5.2–8.7 × 1.0–1.5 cm wide, slightly asymmetric at base, basiscopic pinnule broadly cuneate and truncate on acroscopic side; coriaceous, green on upper surface and paler on lower surfaces, margin coarsely serrate, terminal leaflets similar to lateral ones to 10 × 2.0 cm wide. **Synangium** 1–3 mm long with *6-8 pairs of sporangia*.

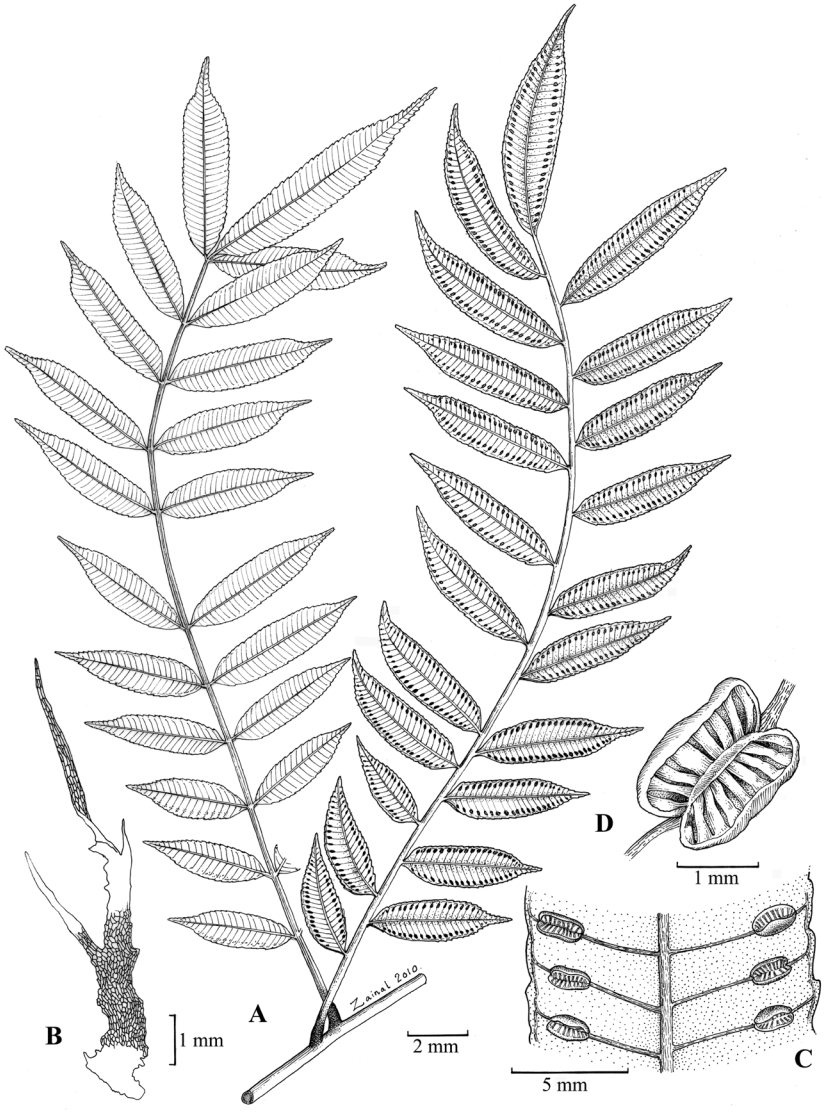
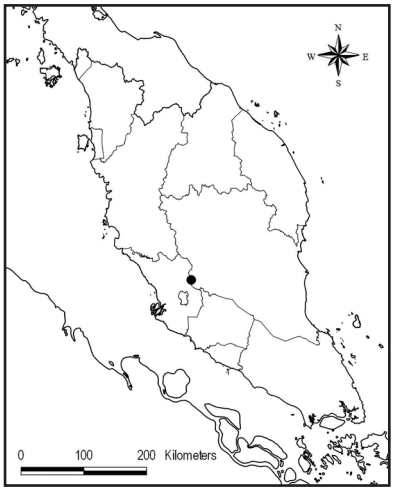


Figure 3. *Ptisana pellucida.* A, portion of frond showing upper and lower surfaces; B, frond scale; C, synangium on lower surface of pinnule; D, synangium. (All from *Zulkapli s.n*., 1997.)

Distribution. Peninsular Malaysia (Pahang, Genting Highlands Road), Borneo (Sabah, Sarawak) and the Philippines.



Map 5. Distribution of *Ptisana pellucida.*

Conservation Status. Critically Endangered D1 (assessed by Y.H. Cheah). In Peninsular Malaysia, it is known from a single collection (*Zulkapli s.n.*, 1997, UKMB) in forest that lies outside the network of Totally Protected Areas in an area threatened by the encroachment of neighbouring small holder vegetable farms.

Ecology. A terrestrial fern in a deeply shaded, humid valley in hill dipterocarp forest at 800 m elevation. *Ex situ* it grows well in deep shade.

PLATES



Plate 8. Marattiaceae. A–B, *Angiopteris angustifolia*; C, *Angiopteris evecta*.



L.G. Saw

Plate 9. Marattiaceae. *Angiopteris evecta.*



Plate 10. Marattiaceae. A, *Christensenia aesculifolia*; B–C, *Ptisana pellucida*.

Flora of Peninsular Malaysia

The Flora of Peninsular Malaysia Series I provides revisions for lycophytes and fern families that occur in Peninsular Malaysia. Volume 3 includes 9 families, 32 genera and 115 species in the Lycopodiaceae, Adiantaceae, Aspleniaceae, Blechnaceae, Cryptogrammaceae, Cyatheaceae, Lomariopsidaceae, Marattiaceae, and Sinopteridaceae. Accounts include descriptions and keys for the identification of genera and species, and, in addition, species accounts include distribution maps, conservation status, illustrations and, where available, colour photographs. A key to the families that occur in Peninsular Malaysia is also provided.

ISBN 978-967-2149-64-4
9 789672 149644