



***Brownlowia latifiana* (Malvaceae-Brownlowioideae), a new species from Terengganu, Peninsular Malaysia**

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Abstract

A new species, *Brownlowia latifiana* (Malvaceae-Brownlowioideae), endemic to Terengganu, Peninsular Malaysia, is described and illustrated. This new species has most of its morphological characters that are related to those of the genus *Jarandersonia*. Therefore, a standard morphological taxonomic revision and morphometric analysis were carried out to assess the status of *Brownlowia latifiana*. Results of the morphometric analysis based on morphological characters showed that *Brownlowia latifiana* is embedded within the clades of *Brownlowia* but distanced from the clades *Jarandersonia*. *Brownlowia* formed a distinct clade in the clustering tree well separated from the *Jarandersonia*. A distribution map and a conservation assessment using the IUCN Red List categories and criteria are provided.

Key words: Conservation, endemic, flora, Malaysia, taxonomy, Malvaceae

Introduction

Brownlowia Roxb. (Malvaceae-Brownlowioideae) is a genus of trees, comprising about 25 species in South and Southeast Asia with its centre of distribution in Borneo. Many species of this genus grow along rivers, in swamp forest and mangroves, and the fruits are often dispersed by water (Kostermans 1961, 1962, 1965, Bayer & Kubitzki 2003). In Peninsular Malaysia, the genus, locally known as dungun is currently represented by six species (namely *Brownlowia argentata* Kurz, *B. helferiana* Pierre, *B. kleinhovioidea* King, *B. macrophylla* King, *B. tersa* (L.) Kosterm., and *B. velutina* Kosterm.) with two endemic species (*B. kleinhovioidea* and *B. velutina*), while in Borneo it is represented by 17 species with 15 endemic species (Kochummen 1973, Ashton 1988, Corner 1988, Turner 1995). Two species, *B. argentata* and *B. tersa* are known to occur in Peninsular Malaysia and Borneo.

The genus can be easily distinguished from related genera, *Diplodiscus* Turcz., *Jarandersonia* Kosterm. and *Pentace* Hassk. by its apocarpous fruits (vs. exalate capsules in *Diplodiscus*, spinulous fruits in *Jarandersonia* and winged capsules in *Pentace*) and loosely connected carpels (vs. united carpels in *Diplodiscus*, *Jarandersonia* and *Pentace*) (Kostermans 1960, 1964, 1970, Bayer & Kubitzki 2003). Recent phylogenetic analysis of plastid *atpB*, *rbcl* and *ndhF* DNA sequences support the placement of *Brownlowia*, together with *Diplodiscus*, *Jarandersonia* and *Pentace* in the Brownlowioideae clade of Malvaceae *s.l.* (Judd & Manchester 1997, Alverson *et al.* 1999, Bayer *et al.* 1999, Nyffeler & Baum 2000).

Our recent revision of the genus for the Flora of Peninsular Malaysia recognised seven species of *Brownlowia* from Peninsular Malaysia. Of these, *B. latifiana*, endemic to Terengganu, is new to science and is here described for the first time as a precursory paper to the publication of the revision for the genus.

Material and Methods

The morphological descriptions and comparisons are based on observations of specimens in herbaria A, BM, BO, K, KEP, KLU, L, SAN, SAR, SING, U, and UC (herbarium acronyms follow Holmgren *et al.* 1990) using Olympus SZ61 and LEICA M125 stereomicroscopes. The dimensions given in the descriptions are from dried material except the gynoecium and androecium characters which are from rehydrated flowers or spirit collections.

This new species has most of its morphological characters that are related to those of the genus *Jarandersonia*. Morphometric analysis was used in assessing the close relationship between *Brownlowia* and *Jarandersonia*, determining the relationship between species of the two genera, and in verifying taxonomic status of the new species. All known species of *Brownlowia* in this study and *Jarandersonia* from Borneo were used in this morphometric analysis. Selection and coding of morphological characters and character states were based on herbarium specimens and complemented with data from the following sources: Tan *et al.* 2011, Chung *et al.* 2012 and Joffre *et al.* 2015 (Appendix 1). A total of 26 characters and 94 character states were used, 9 characters were binary, 13 were multiseriate qualitative and 4 were quantitative (Table 1). The data matrix was compiled using Microsoft Excel (Table 2), then analysed using the computer programme MVSP (Multi-variate Statistical Package) Version 3.2. Cluster Analysis was done using UPGMA (Un-weighted Pair Group Clustering Method) with Gower's general similarity coefficient to produce clustering tree. Principal Coordinates Analysis (PCO) was done using eigenanalysis matrix with Gower's general similarity coefficient to measure the distance or similarity between the species.

TABLE 1. Morphological characters utilized in the morphometric analysis of *Brownlowia* and *Jarandersonia* (Tan *et al.* 2011, Chung *et al.* 2012 & Joffre *et al.* 2015).

Character	Character states
1. Leaf arrangement	[0] alternate; [1] spirally arranged
2. Leaf shape	[0] lanceolate; [1] narrowly elliptic; [2] elliptic; [3] broadly elliptic; [4] elliptic- broadly elliptic; [5] ovate- broadly ovate; [6] elliptic- obovate; [7] elliptic-ovate; [8] peltate
3. Leaf base	[0] attenuate; [1] subcordate; [2] cordate; [3] cuneate; [4] rounded; [5] truncate
4. Leaf apex	[0] acute; [1] acuminate; [2] obtuse
5. Leaf texture	[0] chartaceous; [1] subcoriaceous; [2] coriaceous
6. Abaxial surface of leaf	[0] glabrous; [1] densely covered with scales
7. Venation pattern of leaf	[0] pinnate; [1] palmate
8. Lateral veins (pairs)	[0] to 5; [1] 6–10; [2] 11–15; [3] more than 15
9. Cross section of midrib	[0] rounded; [1] square
10. Intramarginal veins	[0] absent; [1] present
11. Petiole length (mm)	[0] to 6; [1] 7–20; [2] 25–30; [3] 31–70; [4] 100–230
12. Inflorescence position	[0] terminal; [1] axillary; [2] terminal & axillary; [3] unknown state
13. Inflorescence type	[0] panicle; [1] panicle & raceme; [2] unknown state
14. Carpel	[0] loosely connate; [1] connate
15. Locule per ovary	[0] 1; [1] 5
16. Cross section of ovary	[0] circular; [1] 5-angled
17. Fruit type	[0] apocarpous; [1] capsular
18. Fruit shape	[0] globose; [1] obovoid; [2] oblate; [3] depressed obovoid; [4] transversely ellipsoid; [5] unknown state
19. Fruit surface	[0] glabrescent; [1] densely covered with scales; [2] spiny; [3] unknown state
20. Spine type	[0] absent; [1] stout, unbranched; [2] stout, short-branched; [3] slender, unbranched; [4] slender, short-branched
21. Spine length (mm)	[0] absent; [1] 2–4; [2] 3–8; [3] 5–15; [4] 10–15; [5] 6–28; [6] 25–35
22. Number of locule per fruit	[0] 1; [1] 2; [2] 3; [3] 2–4
23. Fruit apex	[0] rounded; [1] shallow fissured; [2] deeply sulcate; [3] unknown state
24. Fruit base	[0] truncate; [1] rounded; [2] obtuse; [3] unknown state
25. Shape of seed	[0] ellipsoid; [1] depressed ellipsoid; [2] unknown state
26. Number of seed per fruit	[0] 1; [1] 2; [2] 3

TABLE 2. Data matrix for the morphometric analysis of *Brownlowia* and *Jarandersonia*.

Taxon	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
<i>*Jarandersonia clemensiae</i>	1	6	1	0	2	1	0	2	0	1	1	2	0	1	1	1	1	0	2	1	2	0	0	1	0	0
<i>*Jarandersonia parvifolia</i>	1	2	3	0	1	1	0	1	1	1	1	2	0	1	1	1	1	0	2	4	4	1	0	1	0	0
<i>*Jarandersonia pentaceioides</i>	1	6	3	1	1	1	0	0	1	2	1	0	1	1	1	1	1	0	2	3	4	1	0	1	0	2
<i>*Jarandersonia purseglovei</i>	0	2	0	1	2	1	0	3	1	1	1	2	1	1	1	1	1	1	2	2	1	1	0	2	0	1
<i>*Jarandersonia rinoreioides</i>	1	4	3	0	0	1	0	1	0	1	1	2	0	1	1	1	1	1	2	3	5	3	0	1	0	1
<i>*Jarandersonia spinulosa</i>	1	6	4	1	0	1	0	1	0	1	1	0	0	1	1	1	1	0	2	4	3	1	0	1	0	0
<i>*Jarandersonia yahyantha</i>	1	3	1	2	1	1	0	1	0	1	1	1	0	1	1	1	1	0	2	4	6	2	0	1	0	0
<i>Brownlowia argentata</i>	1	5	2	0	0	1	0	0	0	0	3	2	0	0	0	0	0	3	1	0	0	0	2	0	1	0
<i>Brownlowia helferiana</i>	1	8	2	2	0	1	1	0	0	0	4	0	0	0	0	0	0	4	1	0	0	0	1	0	1	0
<i>Brownlowia kleinhovioidea</i>	1	7	2	2	1	1	0	0	0	0	3	0	0	0	0	0	0	5	3	0	0	0	3	3	2	0
<i>Brownlowia latiflora</i>	1	1	1	1	2	0	0	2	0	1	1	0	0	0	0	0	0	4	0	0	0	0	1	0	1	0
<i>Brownlowia macrophylla</i>	1	7	5	2	2	0	0	0	0	0	4	0	0	0	0	0	0	2	1	0	0	0	3	3	2	0
<i>Brownlowia tersa</i>	0	0	4	0	1	1	0	1	0	0	0	2	0	0	0	0	0	3	1	0	0	0	2	0	1	0
<i>Brownlowia velutina</i>	1	8	4	1	0	1	1	0	0	0	4	3	2	0	0	0	0	5	3	0	0	0	3	3	2	0

* = Outgroups

For scanning electron microscopy (SEM) pollen samples from the mature flower buds were acetolysed following the method of Erdtman (1960) and acetolysed pollen grains were dehydrated through an ethanol series and critical point dried using liquid CO₂. After coating with gold, they were observed with a JEOL JSM-6400 scanning electron microscope. The conservation assessment used the IUCN Red List Categories and Criteria Version 3.1 (IUCN 2012). Terminology of trichome types mainly follows Webster *et al.* (1996).

Results

Cluster Analysis

The clustering tree based on morphological characters (Figure 1) produced from UPGMA (Un-weighted Pair Group Clustering Method) with Gower's general similarity coefficient showed two well-separated clades. The first clade contains all species belong to *Jarandersonia* and the second clade contains species belong to *Brownlowia*.

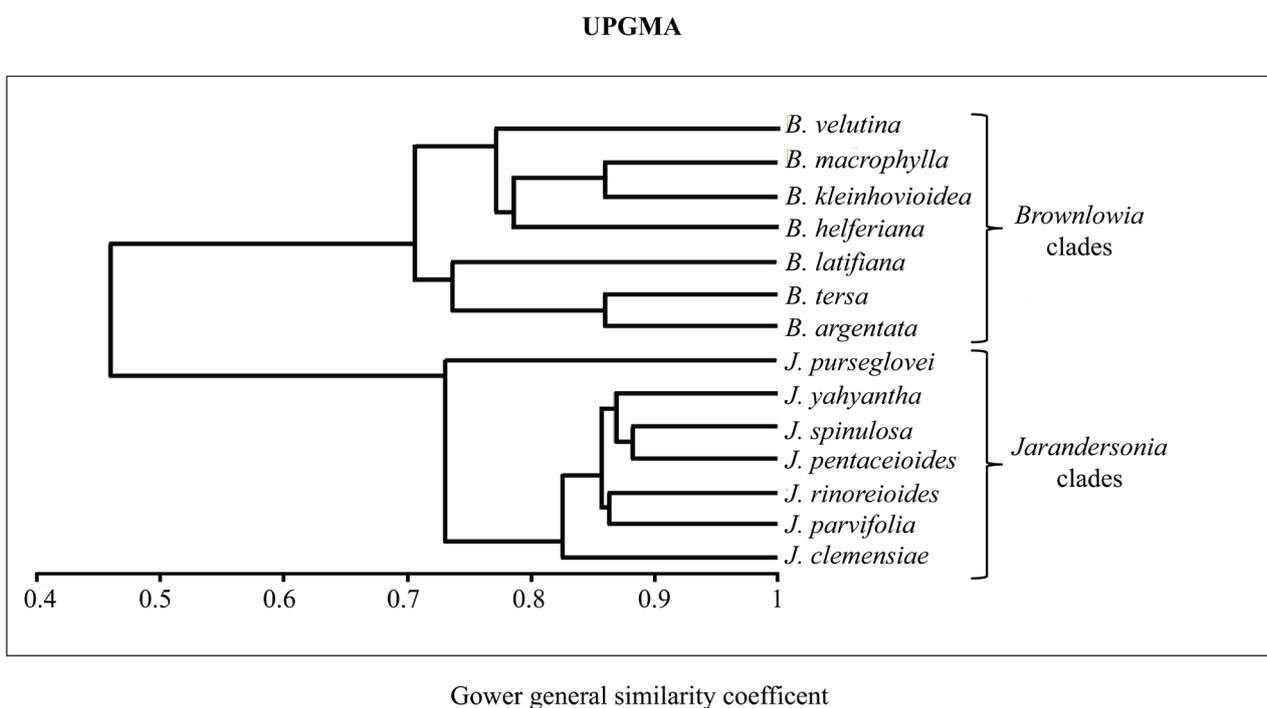


FIGURE 1. Clustering tree of *Brownlowia* and *Jarandersonia*, using UPGMA (Un-weighted Pair Group Clustering Method) with Gower's general similarity coefficient based on morphological characters. Both genera *Brownlowia* and *Jarandersonia* formed two distinct clades that are well-separated from each other.

Principal Coordinate Analysis

Figure 2 showed the relationship between genera, *Brownlowia* and *Jarandersonia* based on morphological characters. The eigenvalue between axis 1 (Principal Coordinates 1) and axis 2 (Principal Coordinates 2) was 1.95, which was good (Figure 3). The cumulative percentage eigenvalue of total variation accounted for in axis 1 (Principal Coordinates 1) and axis 2 (Principal Coordinates 2) was 60.35. There was a high degree of group separation and both *Brownlowia* and *Jarandersonia* groups were clearly shown. The group separation in the scatter plot showed the clearest division into groups representing genera *Brownlowia* and *Jarandersonia*. Both *Brownlowia* and *Jarandersonia* groups formed two separate tight clusters between species in the genus respectively.

PCO case scores (Gower general similarity coefficient)

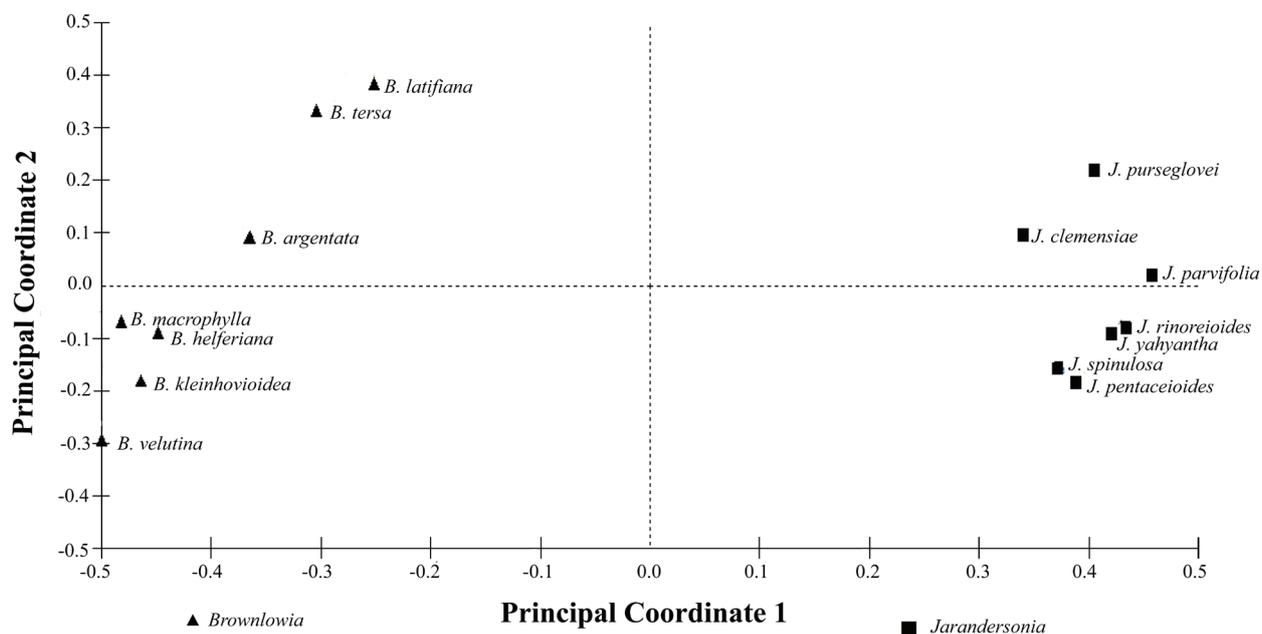


FIGURE 2. Scatterplot analysed by Principal Coordinates Analysis using Gower’s general similarity coefficient on genera *Brownlowia* and *Jarandersonia*.

Scree Plot

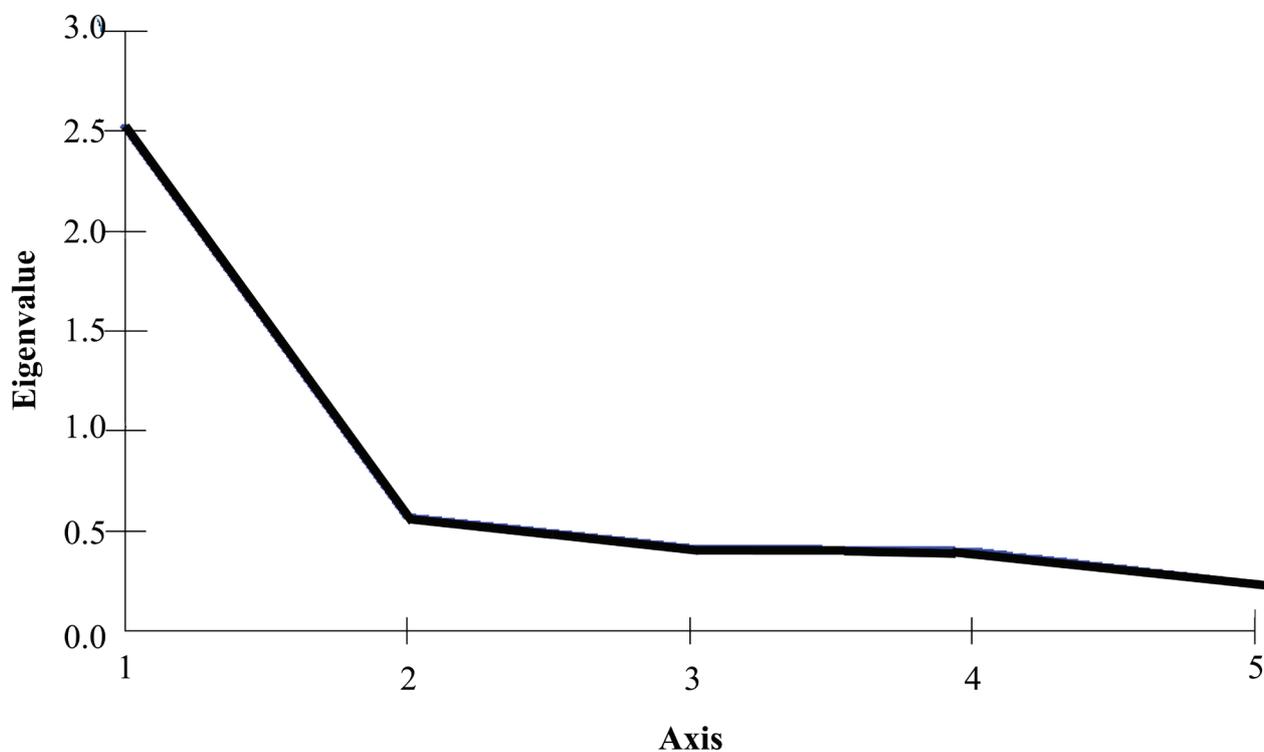


FIGURE 3. Screeplot showing relative importance of axes analysed by Principal Coordinates Analysis using Gower’s general similarity coefficient. Axis 1 (Principal Coordinates 1) showed the highest eigenvalue in segregating *Brownlowia* and *Jarandersonia*.

Discussion

Results of the morphometric analysis based on morphological characters showed that *Brownlowia latifiana* is embedded within the clades of *Brownlowia* but distanced from the clades *Jarandersonia*. *Brownlowia* formed a distinct clade in the clustering tree well separated from the *Jarandersonia*. Morphologically both these genera share a certain degree of similarity except the carpel fusion, locule per ovary, fruit type and fruit surface. *Brownlowia latifiana* forms a distinct clade in the clustering tree and is closely related to *B. argentata* and *B. tersa*. However these three species can easily be separated as shown in Table 3. Therefore, based on the justification given above *Brownlowia latifiana* is here treated as a new species.

TABLE 3. Comparison of diagnostic characters between *Brownlowia latifiana*, *B. argentata* and *B. tersa*.

Morphological characters	<i>B. latifiana</i>	<i>B. argentata</i>	<i>B. tersa</i>
Leaf			
Shape	Narrowly elliptic	Ovate to broadly ovate	lanceolate
Size (cm)	(13–)25–50(–55) × (2.4–)5–8.5(–10)	8–25 × 6–17	6–20 × 2–5
Lower surface	Glabrous	Densely stellate-lepidote and dentate-lepidote	Densely stellate-lepidote
Base	Subcordate	Cordate	Rounded
Apex	Acuminate	Acute or shortly acuminate	Acuminate or acute
Number of lateral veins (pairs)	(10–)18–20	4–5(–8)	7–10
Intramarginal veins	Present	Absent	Absent
Petiole length (mm)	6–10	30–70	(2–)4–7
Inflorescence position	Terminal	Terminal and axillary	Terminal and axillary
Flower			
Pedicel length (mm)	(1–)2–4(–5)	Up to 8	Up to 3
Staminode shape	Lanceolate	Liguliform	Narrowly lanceolate
Petal colour	White	Pale orange to salmon pink	Pink with yellow base
Fruit			
Shape	Transversely ellipsoid	Depressed obovoid or in the form of a golf club head	Depressed obovoid or in the form of a golf club head
Size (mm)	12–23 × 19–32	7–10 × 13–16	5–7 × 12–14
Apex	Shallow fissured	Sulcate with the fissure broadens considerably	Sulcate with the shallow fissured
Androgynophore	Absent	Persistent and elongated to 6 mm long, 3 mm thick	Persistent and elongated to 3 mm long, 2 mm thick
Calyx lobes	Persistent	Absent	Absent
Stalk (pedicel) thickness (mm)	5	1	1.5

Taxonomy

Brownlowia latifiana R.C.K.Chung, *sp. nov.* (Figs. 4–7)

Type:—PENINSULAR MALAYSIA. Terengganu: Dungun, Jerangau Forest Reserve, buffer zone by the stream of Compartment 95, 65 m altitude, 4°47.80'N, 103°04.55'E, 21 July 2009 (flowers and fruits), Y.C. Chan & C.L. Lim FRI 65055 (holotype KEP [barcode 246218]; isotypes A, K).

Brownlowia latiflana is closely related to *B. argentata* and *B. tersa* in leaf texture, type of indumentum and other flower and fruit characters. However, the former differs from the latter, *B. argentata* and *B. tersa*, by its narrowly elliptic leaves (vs. ovate to broadly ovate or lanceolate), glabrous beneath (vs. densely covered with scales), 10–20 pairs lateral veins (vs. 4–10), large transversely ellipsoid fruits (vs. small depressed obovoid), absence of androgynophore (vs. presence and elongated to 6 mm long, 3 mm thick), persistent calyx lobes (vs. absent), and thick fruit stalk (vs. thin stalk). The main morphological differences between these three species are shown in Table 3.

Small tree to 15 m tall, to 10 cm diameter. Bark grey, smooth; inner bark pinkish. Sapwood white. Twigs terete, 4–10 mm diameter, sparsely dentate-lepidote or glabrous, smooth and rugose towards the young twigs, whitish. Stipules caducous, rarely persistent. Leaves spirally arranged, coriaceous, glabrous; blades narrowly elliptic, (13–)25–50(–55) × (2.4–)5–8.5(–10) cm, base subcordate, margin entire, apex acuminate; midrib rounded, prominent below, raised above, glabrous on both sides; lateral veins (10–)18–20 pairs, looping near margin forming conspicuous intramarginal veins, basal pair prominent below, conspicuous above, short, ascending to *c.* 2 cm of the length of the blade; tertiary veins reticulate, prominent to faint on both sides; petioles 6–10 mm long, 4–5 mm thick, sparsely dentate-lepidote. Inflorescences terminal, panicles of 3–4(–5)-flowered cyme-like unit, 18–22 cm long, 0.3–0.5 cm thick, lax, peduncle and rachis pale yellowish brown, angular, densely stellate-lepidote and dentate-lepidote; bracts and bracteoles caducous, rarely persistent. Flowers bisexual, actinomorphic, pedicellate; buds obovoid or spheroid, 4–6 × 3–5 mm, densely stellate-lepidote and dentate-lepidote; pedicels (1–)2–4(–5) × 1–2 mm, densely stellate-lepidote and dentate-lepidote. Calyx bell-shaped, pale whitish brown, *c.* 10 mm long; lobes 5, triangular, valvate, erect, 3–4 mm long, apex acute, densely stellate-lepidote and dentate-lepidote outside, glabrous inside. Petals white, spatulate, *c.* 15 × 5 mm, base gradually tapering, apex emarginate, glabrous on both sides. Androgynophore short, cylindrical, *c.* 2 mm long, glabrous. Staminodes lanceolate, *c.* 3 × 1 mm, shorter than filaments of fertile stamens, glabrous. Fertile stamens numerous; filaments arranged in 5 obscure phalanges, slightly connate at base, *c.* 10 mm long, glabrous; anthers 0.5–0.7 mm in diameter, pollen flattened *Tilia*-type, oblate, polar axis (23.4–)25.13(–28.6) μm, equatorial axis (39–)42.69(–46.8) μm, P/E ratio = 0.59, average colpus length 11.19 μm, average colpus width 2.24 μm, 3-colpate, sexine ornamentation reticulate. Ovary transversely ellipsoid, *c.* 2 × 2.5 mm, densely stellate-lepidote and dentate-lepidote, carpels 5, free, each carpel with 2 ovules; style 1, *c.* 10 mm long, glabrous; stigma punctiform; only one carpel in each flower develop into mature fruit. Infructescences to 18 cm long, densely stellate-lepidote and dentate-lepidote. Fruits woody, transversely ellipsoid, 12–23 × 19–32 mm, 1-locular, base flattened, with a shallow fissure perpendicular to the flattened bottom divides the fruit partially into two halves, surface uneven with small wart-like, sparsely stellate-lepidote and dentate-lepidote or glabrescent; androgynophore absent or not persistent; calyx lobes persistent, reflexed, sparsely stellate-lepidote and dentate-lepidote; stalk (pedicel) 4–6 mm long, *c.* 5 mm thick, sparsely stellate-lepidote and dentate-lepidote; pericarp 2–6 mm thick. Seeds 1, depressed ellipsoid, 9–17 × 16–26 mm.

Etymology:—This species is named after the current Director-General of Forest Research Institute Malaysia (FRIM), Dato' Dr Abd. Latif bin Mohmod, for his contributions in securing fund of RM7.6 million for the Project of Safeguarding the Forest Plant Diversity of Peninsular Malaysia under the Ninth Malaysian Plan; successfully in acquiring the ownership of FRIM land area of 544.3 ha from the Selangor State Government in 2007; and in obtaining the recognition for FRIM as the Natural Heritage Site in 2009 and the National Heritage in 2012.

Distribution and habitat:—This species is endemic to Peninsular Malaysia, known from Jerangau Forest Reserve and Sg. Jerangau in Dungun, Terengganu. It occurs in undulating and riverine areas of lowland dipterocarp forest on clay sandy and alluvial soils at about 65 m elevation.

Conservation status:—Critically Endangered B2ab(iii). To date, this species is known only from the type locality and lies below 100 m. Represented by only two collections and these localities do not lie within a Total Protected Area. The Compartment 95 of Jerangau Forest Reserve is classified as production forest and it was logged in 1996 while the Kuala Sg. Jerangau was surrounded by rubber plantations.

Notes:—There are 15 non-peltate leaved *Brownlowia* species in South and Southeast Asia, namely *Brownlowia argentata*, *B. cuspidata* Low ex Pierre, *B. elata* Roxb., *B. elliptica* Ridl., *B. emarginata* Pierre, *B. glabrata* Stapf ex Ridl., *B. grandistipulata* Kosterm., *B. kleinhovioidea*, *B. macrophylla*, *B. ovalis* Kosterm., *B. palustris* Kosterm., *B. rubra* Kosterm., *B. sarwonoi* Kosterm., *B. tabularis* Pierre, and *B. tersa*. This new species differs from these non-peltate leaved *Brownlowia* species by its narrowly elliptic leaves with short petioles to 10 mm long, glabrous on both sides, lateral veins to 20 pairs with intramarginal veins formed, and large transversely ellipsoid fruits with persistent calyx lobes.

Additional specimens examined (paratype):—PENINSULAR MALAYSIA. Terengganu: Dungun, Kuala Jerangau [Kuala Sg. Jerangau], sea level, 4°50.40'N, 103°12.49'E, 23 July 1997 (flowers), *L.E. Teo & W. Emmanuel* KL 4797 (K, KEP! [barcodes 76033, 76034], KLU, L, P).

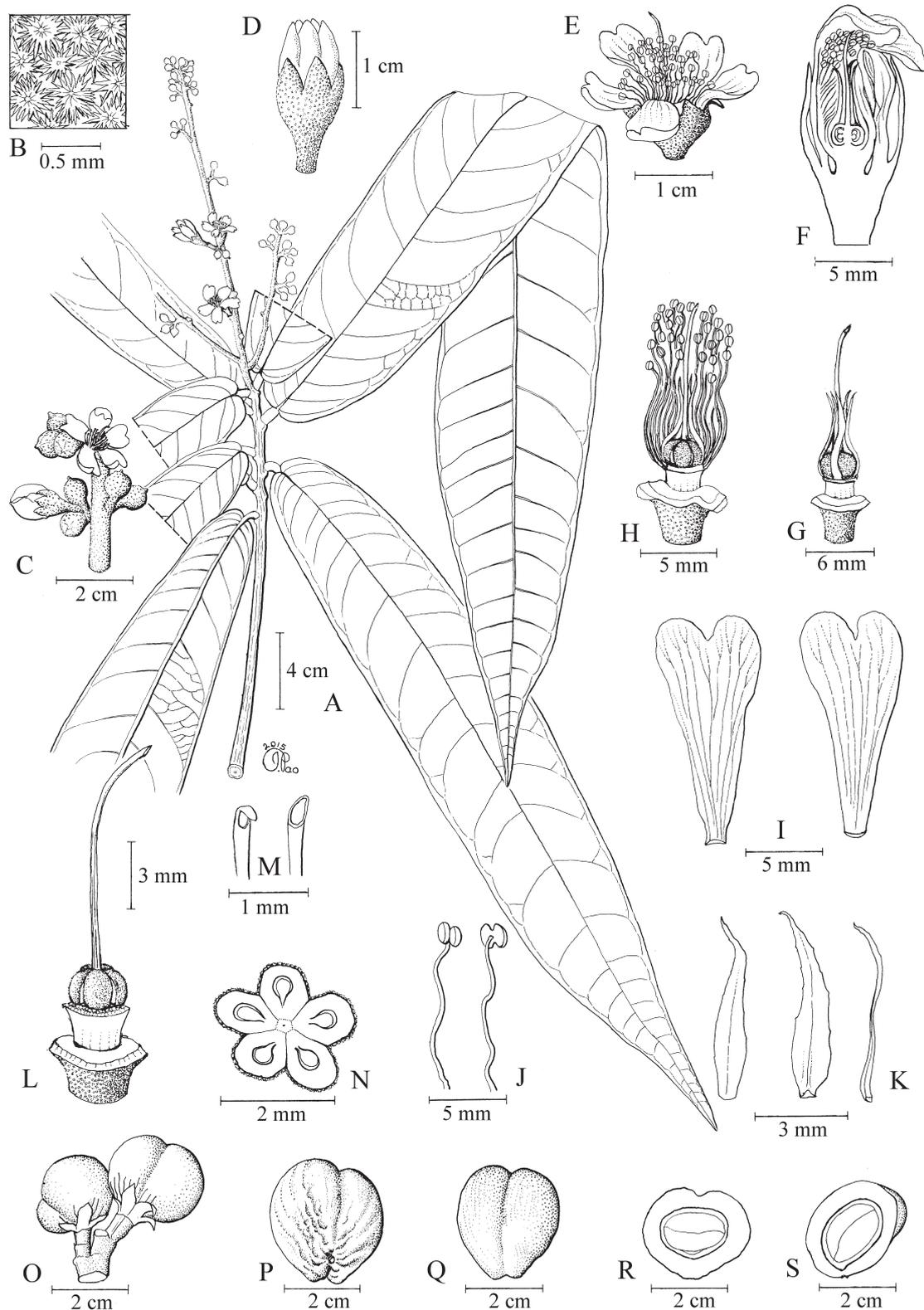


FIGURE 4. *Brownlowia latifiana*. **A.** Flowering leafy twigs. **B.** Dense dentate-lepidote scales on calyx, inflorescences and flower buds. **C.** Part of inflorescence. **D.** Mature flower bud. **E.** Opened flowers. **F.** Longitudinal section of mature flower bud. **G.** Dissected flower with all sepals, petals and stamens removed. **H.** Dissected flower with all sepals and petals, and also parts of the stamens and staminodes removed. **I.** Petals, abaxial side (left) and adaxial side (right). **J.** Stamens, anterior view (left) and posterior view (right). **K.** Staminodes, abaxial side (left), adaxial side (centre) and side view (right). **L.** Mature flower showing androgynophore, ovary, style and stigma. **M.** Stigma. **N.** Cross section at the centre of ovary. **O.** Inflorescence. **P.** Fruit, posterior view. **Q.** Fruit, anterior view. **R.** Cross section of fruit. **S.** Longitudinal section of fruit. All drawn from the type. Drawn by Joseph Pao (SAR).

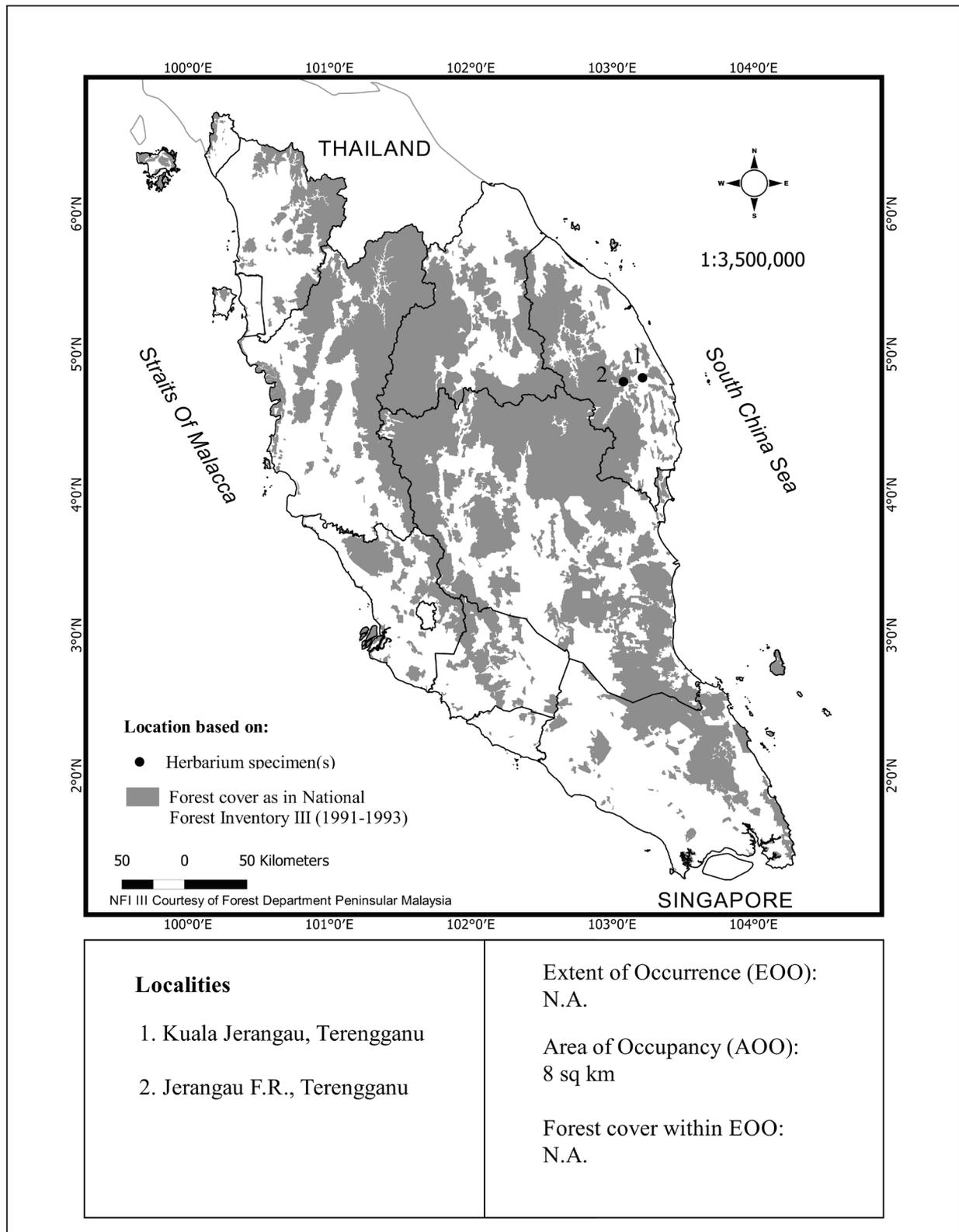


FIGURE 5. *Brownlowia latiflora*. Geographic distribution map.

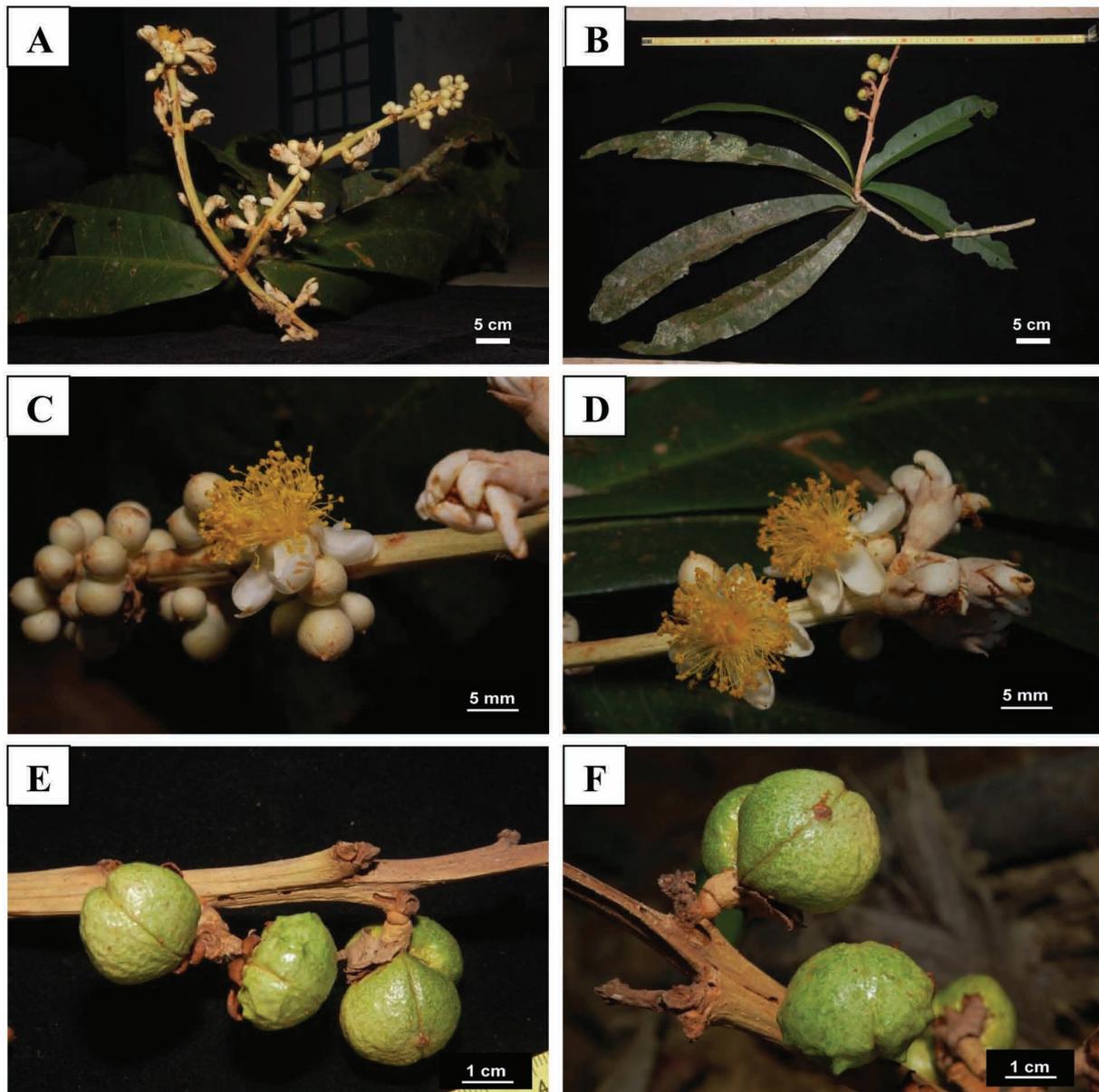


FIGURE 6. *Brownlowia latifiana*. **A.** Flowering leafy twigs. **B.** Fruiting leafy twigs. **C.** Inflorescence with young flower buds (left and centre), opened flower (centre) and mature flower bud (right). **D.** Inflorescence with opened flowers and mature flower buds. **E & F.** Infructescences with young fruits.

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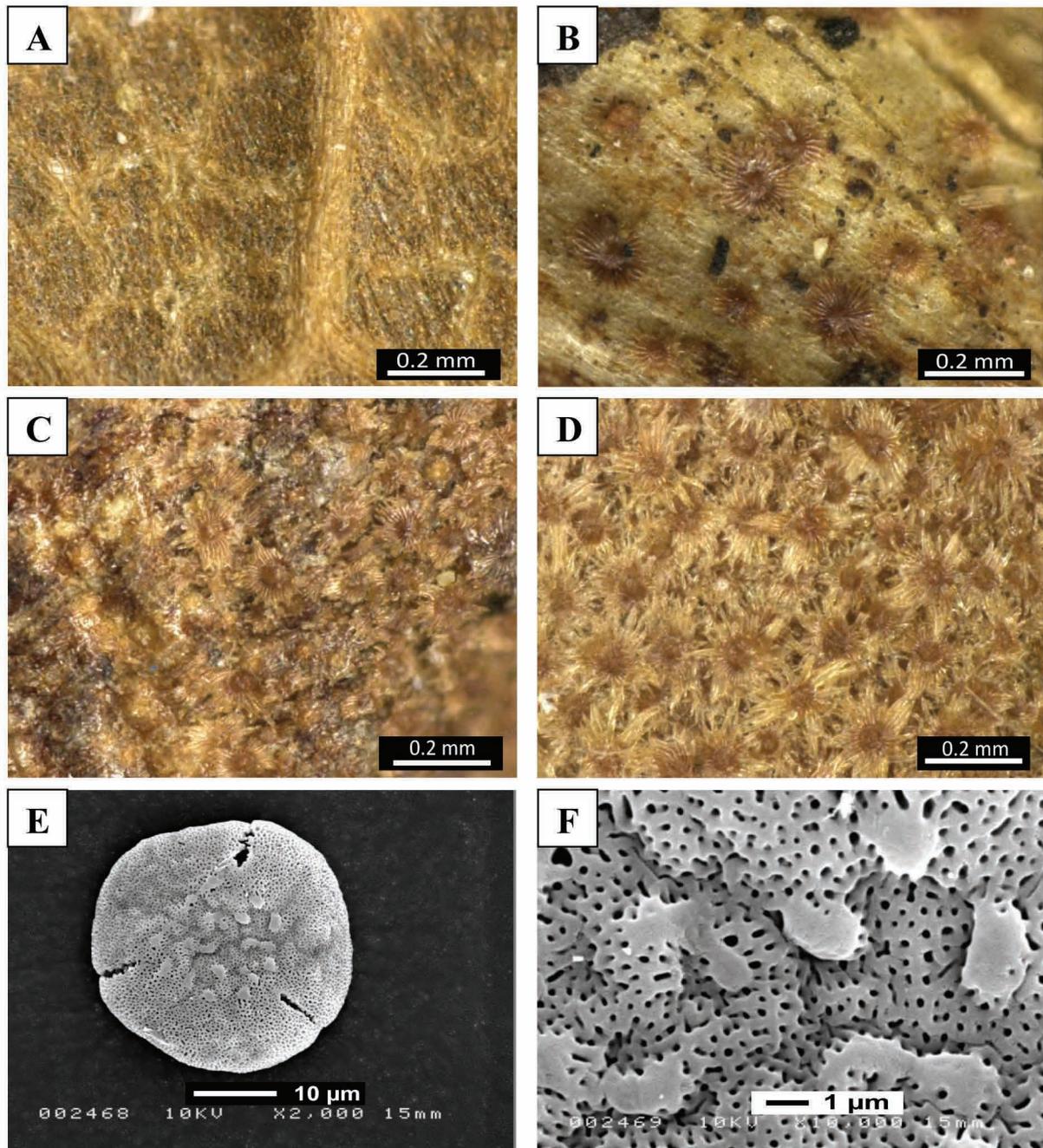


FIGURE 7. *Brownlowia latifiana*. **A.** Leaves glabrous, abaxial view. **B.** Twigs sparsely dentate-lepidote. **C.** Petiole sparsely dentate-lepidote. **D.** Inflorescences and flower buds densely stellate-lepidote and dentate-lepidote. **E.** Tricolpate flattened *Tilia*-type pollen, polar view. **F.** Reticulate sexine ornamentation with verrucate mount in the centre of pollen, polar view (A from *Y.C. Chan & C.L. Lim FRI 65055*; B–F from *L.E. Teo & W. Emmanuel KL 4797*).

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Appendix 1. Representative specimen examined of *Brownlowia* species for morphological comparison in morphometric analysis. Specimen examined of *Jarandersonia* species was referred to Chung *et al* (2012, P. 217) and Joffre *et al.* (2015, P. 57).

***Brownlowia argentata* Kurz**

PENINSULAR MALAYSIA: *Watson FMS 4158* (KEP!, SING!, UC!); *Carrier KEP 67759* (A!, KEP!, L!, SING!); *Evans s.n.* (K); *Ridley SFN 6364* (BM!, K!); *Ridley SFN 6365* (BM!, K!); *Burkill s.n.* (SING!); *Corner SFN 28643* (K!, KEP!, SING!); *Corner s.n.* (SING [2 sheets!]). BORNEO. Brunei: *Ashton BRUN 5060* (K!, KEP!, L [2 sheets!], SING!). Sabah: *Cuadra A 869* (A!, K, KEP!, L!, SING!); *Enchai 10398* (L!); *Kadir A 536* (A!, K!, KEP!, L!, SING!); *Goklin 2078* (K!); *Enggoh SH 10550* (K!, KEP!, SING!); *Agama 462* (GH, K); *Agama 731* (K); *Tandom 4210* (SING!); *Mail 2718* (K!); *Wyatt-Smith KEP 80286* (A!, KEP!, L!). Sarawak: *Beccari 3652* (K!); *Haviland 1640* (A!, SAR!); *Browne S 1261* (KEP!, SAR!); *Anderson S 1552* (KEP!, SAR!, SING!); *David S 2014* (SAR!); *S 1778* (SAR). Kalimantan:

Teijsmann 8128 (FI [2 sheets]!, L!, UC [2 sheets]!); *Teijsmann s.n.* (L [2 sheets]!); *Anang bb. 2160* (L!); *Korthal s.n.* (L [5 sheets]!, U!); *de Vriese s.n.* (K); *Winkler 3432* (BM!, L!); *Boschproefstation bb. 14981* (K!, L!).

Brownlowia helferiana Pierre

PENINSULAR MALAYSIA: *Scortechini 1918* (BM!, BO!, SING!); *Sinclair & Kiah SFN 40426* (SING!), *Strugnell FMS 11189* (KEP!, SAN!).

Brownlowia kleinhovioidea King

PENINSULAR MALAYSIA: *King's Collector 7713* (BM!, BO!, SING [2 sheets]!).

Brownlowia macrophylla King

PENINSULAR MALAYSIA: *King's Collector 6861* (SING!); *King's Collector 3576* (A!, BM!); *Wray 2148* (BO!, SING!); *Corner s.n.* (SING!); *Stone et al. 15204* (L!).

Brownlowia tersa (L.) Kosterm.

PENINSULAR MALAYSIA: *Sinclair SFN 39385* (L!); *Griffith s.n.* (K!); *Corner SFN 28644* (BM!, KEP!); *Ridley 13497* (K!); *Sinclair SFN 40685* (BM!, L!); *Ngadiman HMB 372* (K!, L!). SINGAPORE: *Ridley 10850* (K!, UC!); *Sinclair SFN 39245* (L!). BORNEO. Sarawak: *Haviland & Hose 1467* (BM!, K!, SAR!); *Haviland 1639* (K!, SAR!); *Beccari PB 2473* (FI!); *Purseglove P 5076* (A!, L!, SAR!, SING!). Brunei: *van Niel 3903* (L [2 sheets]!). Kalimantan: *Hallier 265* (L!).

Brownlowia velutina Kosterm.

PENINSULAR MALAYSIA: *Sinclair & Kiah SFN 40462* (BM!, L!, SING!).