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(continued on inside back cover)
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CONTENTS

R. Cámara-Leret and J.F. Veldkamp
A remarkable new Medinilla (Melastomataceae) from Celebes (Sulawesi), Indonesia .......... 213

W.L. Goh, S. Chandran, K. Kamiya and K.M. Wong
A natural hybrid between Dendrocalamus pendulus and Gigantochloa scorteclini
(Poaceae: Bambusoideae: Bambuseae) in Peninsular Malaysia ................................................. 223

Mark Hughes and Deden Girmansyah
A revision of Begonia sect. Sphenanthera (Hassk.) Warb. (Begoniaceae) from Sumatra ....... 239

R. Kiew and C.L. Lim
Names and new combinations for Peninsular Malaysian species of Codonoboea Ridl. (Gesneriaceae) ......................................................................................................................... 253

Kiaw Kiaw Ng, P.C. Boyce and S. Othman
Studies on Homalomeneae (Araceae) of Peninsular Malaysia II: An historical and taxonomic review of the genus Homalomena (excluding Chamaeladoni) .......................................................... 277

V.D. Nguyen and P.C. Boyce
Pycnospatha (Araceae: Lasiioideae), a new generic record for the flora of Cambodia and Vietnam .................................................................................................................................................. 291

C. Rattamanee, S. Sungkaew and Y. Paisookantivatana
Additional notes on Maclurochloa montana (Poaceae: Bambusoideae) in Thailand ............ 297

J.F. Veldkamp
The nomenclature of Uvaria velutina Roxb. ex Blume (Annonaceae) ...................................... 301

K.M. Wong
Steenisia (Rubiaceae) newly recorded for mainland Asia with a new variety of
S. pleurocarpa (Airy Shaw) Bakh.f. ................................................................................................. 307

Sin Yeng Wong, P.C. Boyce and B.A. Fasihuddin
Studies on Homalomeneae (Araceae) of Borneo III: The helophytic Homalomena of Sunda ... 313

T.L. Yao
Ginalloa siamica var. scorteclini is a species of Viscum (Viscaceae) ........................................ 327
BOOK REVIEWS

Trees of Tropical Asia. An Illustrated Guide to Diversity. James V. LaFrankie, Jr. 2010. (George Staples) ........................................................................................................................................... 329


Alexander von Humboldt and the Botanical Exploration of the Americas. H. Walter Lack. 2009. (George Staples) ........................................................................................................... 335


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A remarkable new *Medinilla* (Melastomataceae) from Celebes (Sulawesi), Indonesia

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ABSTRACT. A new species of *Medinilla* (Melastomataceae) from Celebes, Indonesia, is described. It is a terrestrial shrub or treelet with specialised leafless inflorescence-bearing, many-branched branches at the base of the boles. It is clearly distinct in habit, branch-, leaf-, flower- and fruit morphology from the few other species that are reported to have this type of flowering.

**Keywords.** Celebes, *Medinilla*, Melastomataceae

**Introduction**

Dr. J.B.K Arsana (then of the Kebun Raya Eka Karya, Bali) in July 1996 found a curious species of *Medinilla* Gaud. (Melastomataceae) near the village of Dani in the Bukit Batu Setan Forest, near Enrekang, in the northern part of the S Celebes Province, Indonesia, at 550 m altitude (*E19960709*, EK. L). Two cuttings were brought to the Kebun Raya Eka Karya (“EK”) (planted at plot no. XV.B–242), at c. 1250 m alt. and from these all subsequent collections have been made. JFV and Dr. M.M.J. Van Balgooy (L) were kindly allowed to make a few cuts of branchlets, inflorescences, flowers, and fruits [Van Balgooy 7520 (spirit), 7557, Veldkamp 8943, also in spirit; L: collections from one of the two are *I Made Sija HK*. 826 in EK, June 19th, 2007].

They are terrestrial erect shrubs with inflorescences borne on specialised leafless, incrassate, many-branched branches at and above ground level and sometimes somewhat higher up on the stems forming a dense mat around the base of the plants (Fig. 1).

Mr. A. Kurniawan (EK) and Dr. M.M.J. van Balgooy observed that they flower and fruit throughout the year. Apparently well-developed seeds are produced in great numbers, but although attempts were made, none have germinated. Cuttings, however, were quite successful.

**Inflorescence terminology**

It is not quite clear what this kind of inflorescence is to be called. The terminology for inflorescences is quite confusing and sometimes contradictory. The type encountered here is a special kind of cauliflory (Fig. 2). Various terms have been suggested. Geocarpy is too broad a term as it refers to all kinds of situations where diaspores are
associated with soil. Rhizocarpy is erroneous, as the flowers are not from specialised roots.

Flagelliflory is ambiguous as it is used in two meanings. Weberling (1989: 233–234) defined flagelliflory as when “the flowers or inflorescences hang down from the crown of the tree on long rope-like branches, and so are brought into an exposed position which allows the flowers (and fruits) to be visited by bats”, e.g., in the African Sausage tree, *Kigelia africana* (Lam.) Benth., Bignoniaceae.

In another usage, especially favoured by students of the Annonaceae and Moraceae, the term refers to specialised whip-like leafless branches arising more-or-less at ground level and spreading away, often covered by soil and fallen leaves for sometimes more than 10 m from the stem (Mildbread 1922: 116, Schatz & Wendt 2004). The latter approaches the present situation, were it not that the branches are specialised short shoots (brachyblasts), and not whip-like but more sausage-like, and do not spread so far. Van der Pijl (1982: 26–28) called it basicaulicarpy (fruits at the base of the bole), but this does not exclusively indicate the presence of the brachyblasts.

Perhaps the nearest in meaning is what Mildbread (1922: 116) has called idiocladaanthy (flowers on special branches): plants that flower on special leafless branches with distinct internodes, where related species have axillary solitary flowers. Curiously, Mildbread states that species with axillary panicles “of course” do not belong here, but does not explain what in his eyes the fundamental difference between solitary flowers and panicles would be.

![Fig. 1. *Medinilla tapete-magicum* Câmara-Leret & Veldk. in the Kebun Raya Eka Karya, 15 January 2010. Note the other specimen in the back behind JFV. Photo credit: Mr. A. Kurniawan.](image-url)
Methods

The term “torus” in the flowers as used here is in the sense of Gleason (1939) for the ring of the hypanthium above the ovary upon which the petals and stamens are inserted. The length of the hypanthium was measured from the apex of the torus downwards to the attachment to the pedicel. Its width was taken at the middle of its length. Sepals were measured from the torus upwards. The width of the buds was taken at the widest part of the petals.

Discussion

Medinilla is the largest genus of Melastomataceae in Malesia (c. 360 spp., with an endemicity of nearly 92%: Bodegom & Veldkamp 2001). The latest revision of the species of the family in the Dutch East Indies is by Bakhuizen van den Brink f. (1943, 1946, 1947), in which this species could not be found. More-or-less recent local revisions are available for Thailand (Renner et al. 2001). Java (Backer & Bakhuizen van den Brink f. 1964), while those for Borneo and The Philippines were treated by Regalado (1990, 1995). For the last area, he listed four species apparently with a similar flowering habit.

Medinilla aurantiflora Elmer (1911) from Negros, Panay, and Sibuyan is also an erect terrestrial shrub, as documented by Regalado (1995: 153, t. 11). It differs by the branchlets having soft, yellow, stellate to plumose deciduous hairs, auriculate leaf bases. axillary inflorescences clustered on woody tubercles, 4-merous flowers, hypanthia that are 6–7 mm long, pink to orange red petals, subequal stamens with larger filaments, and fruits that are crowned by persistent calyx lobes. Elmer described the inflorescences as “from near the base of the stem or stems. clustered on gnarly ligneous tubercles 1.5 dm long, more or less branched. the ultimate one ascendingly curved” and compared it to M. cauliflora Merr. (1910; non Hemsl., 1895). Merrill described the inflorescences as “on the trunk below the leaves, of very short, congested branches. forming a compact mass e. 8 cm diameter or less, the branches stout. each bearing many, subdistichous, crowded, oblong-ovate, 9–10 mm long bracts which are acute or obtuse, some empty, some subtending flowers”. Altogether this is quite different from our species. Because of the homonymy Merrill’s species was renamed M. trunciflora Merr. (1913) and synonymised by Regalado (1995: 153, t. 11!) with M. aurantiflora.

Medinilla polillensis C.B.Rob. (Robinson 1911a) from Bohol, Catanduanes, Leyte, S Luzon, and Polillo, is terrestrial, but scandent. rooting in the nodes. branchlets quadrangular, winged. leaves with the transverse veins adaxially faintly distinct, abaxially absent, inflorescences cauline, the flowers more often 3, disposed umbellately, or in two whorls each of three, flowers 4-merous, hypanthia 7–8 mm long, petals c. 12 mm long, filaments c. 6 mm long, anthers c. 6 mm long.

We were not able to study M. pinminatinervia Merr. (Merrill 1913) from Luzon (Cagayan. Pamplona) [lectotype: Ramos 7483, designated by Regalado (1995: 152), isotype in US: 00344975]. It obviously is quite different, too. by being an epiphytic scandent shrub. leaves anisophyllous. 9(–11)-pli-nerved. the larger ones distinctly petiolate. 20–25 × 8–10 cm. the smaller ones subsessile. c. 10 × 4 cm. and fruits crowned by persistent calyx lobes. Merrill described the inflorescences as “cauliflorous.
Medinilla radiciflora Quisumb. & Merr. (Quisumbing & Merrill 1928) differs by the young branches being densely stellate tomentose, and having 11–14-pinnerved leaves that are 15–24 × 8.5–13.5 cm in size, with an obtuse to cordate base. Its inflorescences are cymose, apparently borne on the roots (?), erect, densely and many-flowered, repeatedly dichotomously branched, with peduncles up to 7 cm long. The flowers are 4-merous, the buds c. 16 mm long, the hypanthium 8–10 mm long, with marginal teeth 1.25–1.5 mm long, petals 10–11 × 8 mm, purplish, and stamens of unequal length.

The new species here is also not to be confused with M. radiciflora C.Y.Wu (1979) from Yunnan. The inflorescences of that species, judging from the illustration, are reminiscent of our Medinilla, but it is Pseudodisoschaeota lanceata M.P.Nayar from S. China (Hainan, Yunnan). The record for Vietnam by Hô (1992; “lanceolata”) might well be an undescribed species.

Medinilla tapete-magicum Câmara-Leret & Veldk., sp. nov.


Erect terrestrial shrub or treelet, c. 1.5 m tall, twigs suberete, lenticellate, younger branches ferruginous, old branches (when dry) white and lenticellate, leaf axils with furfuraceous bristles, plant otherwise glabrous. Petioles terete, 2.5–5 cm × 2 mm, lenticellate. Leaves opposite, subequal, elliptic to oblong, 8–17 × 4–8 cm, 3–6 times as long as the petioles, base acute, margin entire, glabrous, apex acute to acuminate, texture pergamnaceous, above glaucous, underneath laxly ferruginous along veins and reticulations, 7-plinerved, distalmost primary nerves 1.5–3 mm away from the preceding pair, submarginal vein conspicuous, secondary nerves conspicuous on both surfaces, angle of divergence from midvein right angle or nearly so, tertiary nerves conspicuous. Inflorescences borne on specialised leafless incrassate many-branched branches up to 50 cm long at and above ground level and sometimes somewhat higher up on the stems forming a kind of dense mat of more than 1 meter diameter around the base of the plants. Bracts not found. Bracteoles minute. Flowers borne in dense basiflorous inflorescences of many-flowered cymes. Peduncles 15–20 mm long. Pedicels in fruit 7–10 mm long. Mature floral buds 6–7 × 2–3 mm. Flowers
5-merous. **Hypanthium** urceolate, $2 \times 2$ mm, covered with crystals (cystoliths). **Torus** 1–1.5 mm long, marginal teeth minute or absent, apex glabrous. **Petals** obliquely diamond-shaped, 4–5 $\times$ 2 mm, pink, glabrous, with conspicuous veins. **Stamens** 10, all of equal length. **Filaments** 2 mm long. **Anthers** 3 mm long, opening with 1 terminal pore, lateral appendages recurved in anthesis. 0.5–1 mm long, dorsal spur rectangular, 0.75–1 mm long. **Style** 4 mm long, glabrous, stigma punctate, glabrous. **Fruit** globose, 6–7 mm diam., purple, fleshy, glabrous, inside filled with jelly; calyx teeth absent. **Seeds** numerous, c. 0.5 mm long, surface minutely punctate. (Fig. 1–5)

**Distribution.** Sulawesi, Enrekang, Bukit Batusetan. c. 550 m alt. (c. $3^\circ33'S$ 119$^\circ46'E$), cultivated in the Eka Karya Botanical Garden, Bali, plot XV.B–242, c. 1250 m alt.

**Habitat.** Rain forest, on clayey soil. 550(–1250) m alt.

**Collectors’ notes.** Shrub in February 2004 c. 1 m tall (*Van Balgooy 7520*, L), in January 2010 c. 1.5 m (*Veldkamp 8943*, L), innovations brown pubescent, twigs lenticellate, inflorescences basiflorous, flowers reddish white, pink, anthers yellow, fruits red turning purple, fleshy, juicy.

**Eponymy.** The epithet *tape-te-magicum* is for the “magic tapestry” formed by the inflorescences at the base of the stems.

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**Fig. 2.** *Medinilla tape-te-magicum* Câmara-Leret & Veldk. Close-up of inflorescences. Photo credit: Irawati.
Fig. 3. *Medinilla tapete-magicum* Câmara-Leret & Veldk. Branchlets and leaves. Photo credit: J.F. Veldkamp.

Fig. 4. *Medinilla tapete-magicum* Câmara-Leret & Veldk. Flower, bud, and very young fruits. Photo credit: J.F. Veldkamp.
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Bakhuizen van den Brink Jr., R.C. (1943) A contribution to the knowledge of the Melastomataceae occurring in the Malay Archipelago, especially in the Netherlands East Indies. Thesis, Utrecht: 1–391. [For the complicated history of this publication, see Stafleu & Cowan (Taxonomic Literature, ed. 2, 1: 106–107. 1976). This is a preprint of the next two, which were published using the original type set.]


A natural hybrid between Dendrocalamus pendulus and Gigantochloa scortechinii (Poaceae: Bambusoideae: Bambuseae) in Peninsular Malaysia

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ABSTRACT. A natural inter-generic bamboo hybrid between Dendrocalamus pendulus and Gigantochloa scortechinii is reported for Peninsular Malaysia. The hybrid has some morphological characteristics of each parent but also shows intermediacy between the parents. We demonstrate the hybridisation using the partial Granule-Bound Starch Synthase (GBSS) I gene sequence. The nothogenus × Gigantocalamus K.M.Wong and nothospecies × Gigantocalamus malpensis K.M.Wong are proposed for the hybrid. We suggest that chloroplast introgression could have occurred among the parental taxa or their ancestors and that the significance of introgressive hybridisation in the complex taxonomic relationships of woody tropical bamboos in SE Asian Bambuseae has not been fully appreciated.

Keywords. Bambuseae, bamboo, Dendrocalamus, × Gigantocalamus. Gigantochloa. hybridisation, introgression, Malay Peninsula

Introduction: hybridisation in bamboos

Notions of bamboo hybridisation have not had a very long history. In the Malay Peninsula and Java, Gigantochloa Kurz shows an interesting diversity that includes many taxa existing or known only in cultivation, which Holttum (1958) postulated could have originated from selection of the products of hybrid swarms in ancient times. The natural distribution of Gigantochloa is believed to be centred in the region from Myanmar to northern Malay Peninsula, and the historical migration of peoples from mainland SE Asia southwards could have brought such selected clones to Java and Peninsular Malaysia. More recently, the observations of Muller (1998) on variation among the offspring of a cultivated clump of Gigantochloa ridleyi Holttum in his farm at Mount Mirinjo, Queensland, and originating from Bali, provided very good corroboration for Holttum’s postulation. At Mount Mirinjo, a single clump of this species flowered, so the seeds were the products of self-fertilisation. Seed set was very poor and seedling mortality, including albino forms, was significant. The confounding diversity in morphology produced among the surviving seedlings and young clumps, most of which had no close resemblance to the mother clump, was reminiscent of the multiple assortments that could be produced in the F2 generation from the selfing of a hybrid (Muller 1998).
Some degree of fertility among different subtropical bamboo taxa has been demonstrated. Zhang & Chen (1980) have reported a successful artificial hybrid, ‘Cheng Ma Qing No. 1’, using the pollen of Deudrocalamus latiflorus Munro and Bambusa pervariabilis McClure as the seed parent, in experimental crossings. The hybrid was reported to be fast-growing and having hard culms, highly resistant to cold, and developing ornamental pale-yellow stripes on the lower internodes, making it a good cultivar for various uses. It showed intermediacy in morphological characteristics and chromosome number compared to the parental species (Zhang & Chen 1980, Zhang 1985). On the basis of chromosome numbers, morphological similarity to an experimental hybrid B. textilis McClure × D. latiflorus, and a high degree of pollen sterility, Zhang (1985) also suspected B. stenoaurita (W.T.Lin) T.H.Wen to be a natural F1 hybrid of the two species. Indeed, B. stenoaurita has proven difficult to classify and has been transferred from one genus to another without clear resolution (Xia et al. 2007, Yang et al. 2010). However, no natural bamboo hybrids in tropical Asia have been clearly demonstrated to date.

Working with temperate bamboos, Muramatsu (1981) suggested that only a weak crossing barrier exists among woody bamboos, which makes both inter-specific and inter-generic hybridisation highly possible. He arrived at this idea based on pollination and germination experiments with Phyllostachys Siebold & Zucc., Pleioblastus Nakai and Sasa Makino & Shibata. The monotypic Hibanobambusa Maruy. & H.Okamura was established as a hybrid genus (Maruyama et al. 1979) and proven to have originated from hybridisation between the distantly related Phyllostachys and Sasa (Takahashi et al. 1994).

Natural hybridisation among American bamboos was first reported by Clark et al. (1989). Their study of three natural hybrids, Chusquea subtessellata Hitchc. × C. amistakensis L.G.Clark, Davidse & R.P.Ellis, C. subtessellata × C. vulcanalis (Soderstr. & S.Calderón) L.G.Clark and C. spencei Ernst × C. tessellata Munro, also showed intermediate morphological and anatomical characteristics of their respective parental species. These hybrids displayed normal meiosis stages and high pollen fertility. Hybridisation was expected to be significant in the evolution of Chusquea sect. Swallenochloa (McClure) L.G.Clark to which these taxa conform, as some of the species exhibit a nearly continuous flowering habit, which increases the probability of hybridisation. Hybridisation was also suggested as a cause of taxonomic difficulties in the Arundinaria complex (McClure 1973) but this has only been investigated genetically when Triplett et al. (2010) demonstrated an F1 natural hybrid between A. gigantea (Walter) Muhl. and A. tecta (Walter) Muhl. using the Amplified Fragment Length Polymorphisms (AFLP) technique and cpDNA phylogenetic analysis. Furthermore, multiple, reciprocal hybridisation and introgression events were implicated based on the complex mosaic pattern of the genetic composition in the three hybrid individuals. Their complex origin involves not only A. gigantea and A. tecta, but also A. appalachiana Triplett, Weakley & L.G.Clark. It is also noteworthy that not all of these hybrid individuals showed morphological intermediacy (Triplett et al. 2010).

The present study provides molecular evidence for an inter-generic bamboo hybrid that shows a combination of morphological features of its parental species, Deudrocalamus pendulus Ridl. and Gigantochloa scortechinii Gamble. Considering that allelic heterozygosity could be a strong indication of an F1 hybrid status, we sequenced the GBSSI gene of the putative hybrid individuals and their parental species.
to demonstrate their relationship. This approach is suitable for the current sampling scale in terms of cost- and time-effectiveness.

**Materials and methods**

**Plant materials**
A putative natural hybrid (hereafter referred to as Hybrid Tapah) was collected from among *Dendrocalamus pendulus* and *Gigantochloa scortechinii* clumps along the Tapah-Cameron Highlands road, Peninsular Malaysia, on 28 November 2001. Material raised from a rhizome offset was planted in the Bambusetum, Rimba Ilmu Botanical Garden, University of Malaya. This clone (Fig. 1) flowered in April 2007, i.e., quite soon after it grew to mature size and then died completely in July 2008. Voucher material was deposited with the Herbaria of the University of Malaya, Kuala Lumpur (KLU), Singapore Botanic Gardens (SING) and Iowa State University (ISC), and leaf material dried in silica gel was obtained for molecular studies.

A population of the same putative hybrid encountered in 2009 along the Old Gombak Road, Selangor, Peninsular Malaysia, again sympatric with *D. pendulus* and *G. scortechinii* clumps, was also studied (Fig. 2). Voucher material of two individuals (Hybrid Gombak-1 and Hybrid Gombak-2) was collected and deposited with KLU. Detailed morphological observations were made, and leaf material dried in silica gel was also obtained.

Besides these three hybrid accessions, three accessions of leaf material of *D. pendulus* and five accessions of *G. scortechinii* were likewise obtained. Identification followed Wong (1995). Voucher reference numbers and collection localities are shown in Table 1.

**DNA extraction and polymerase chain reaction (PCR)**
Total DNA was extracted from silica-dried young leaves using Qiagen DNeasy Extraction kits following instructions by the manufacturer. Polymerase chain reaction (PCR) was run using a Perkin Elmer GeneAmp 9600 Thermocycler with the programme set at 2 min at 95.0°C; 30 cycles of 30 s at 94.0°C, 45 s at annealing temperature, 1 min at 72.0°C; 5 min at 72.0°C; hold at 4.0°C. Annealing temperatures were 59.0°C for primers Gin (forward) and GBSS (reverse) and 55.0°C for primers for cpDNA, *rps16-trnQ, trnC-rpoB, trnH-psbA* and *trnD-T* (Bamboo Phylogeny Group 2005). The DNA markers have been useful in resolving the phylogenetic relationships among some *Dendrocalamus* and *Gigantochloa* taxa in the analyses using both *GBSSI* and *rps16-trnQ + trnC-rpoB + trnH-psbA + trnD-T* (Goh et al. 2010). The PCR reaction mixture contains 1.5 mM MgCl₂, 0.5 μM forward and reverse primers each, 0.2 mM of dNTPs, 1× PCR buffer and ~10 ng of DNA samples. PCR products were purified using Promega PCR Clean-up System kits following instructions by the manufacturer.

**PCR cloning, haplotype-specific primer design and DNA sequencing**
Purified PCR products for the partial *GBSSI* gene of the putative hybrid individuals were ligated into *pDrive* vectors and transformed into EZ competent cells following the instructions of the Qiagen PCR Cloning Plus kit. White colonies were picked to perform colony-PCR using the primers Gin (forward) and GBSS (reverse). Nine to fifteen clones for each hybrid individual were successfully amplified and sequenced.
Fig 1. The putative hybrid *Dendrocalamus pendulus* × *Gigantochloa scortechinii*. A. Clump habit. B. Culm shoot. C. Culm internode characteristics. D. Pseudospikelet cluster. Photo credits: M. Sugumaran.
The sequences of all clones were aligned. Three indel regions and a number of variable sites were observed in the DNA sequences of the clones. As some of the unique nucleotide substitutions could be possibly due to PCR or cloning errors, we designed two sets of internal primers specific for each GBSSI haplotype in order to obtain unambiguous DNA sequence for each allele. The location of haplotype-specific primers are shown in Fig. 3. Internal primers Gin336/1 (forward) and Gin336/2 (forward) were designed for the indel region, and Gin396/1 (reverse) and Gin396/2 (reverse) were designed for the region containing three variable sites. Primer sequences are shown in Table 2. PCR was performed using the following primer-pairs: (i) Gin–Gin396/1, (ii) Gin–Gin396/2, (iii) Gin336/1–GBSS, and (iv) Gin336/2–GBSS for each putative hybrid individual. Direct sequencing of purified PCR products was commercially done by FirstBase Laboratory Sdn. Bhd. (Malaysia). For each hybrid accession, sequences generated using the primer-pairs (i) and (iii) were merged as a haplotype, and those generated using the primer-pairs (ii) and (iv) were merged as another haplotype. All the sequences obtained were deposited in GenBank (Table 1).

**DNA sequence analysis**
Partial GBSSI gene sequences of putative hybrid individuals were aligned with those of the putative parental species using ClustalX (Thompson 1997) and manually adjusted using Bioedit v7.0.9 (Hall 1999) where necessary. Variable sites and indels were extracted and tabulated.

**Phylogenetic analyses**
Sequences representing the putative hybrid, *D. pendulus* and *G. scortechinii* were subjected to maximum parsimony (MP) analysis based on four cpDNA non-coding regions, *rps16-trnQ*, *trnC-rpoB*, *trnH-psbA* and *trnD-T*, and the partial nuclear GBSSI region. *Holttunochloa magica* (Ridl.) K.M. Wong and *Kinabaluchloa nebulosa* (Stapf.)
K.M. Wong (GenBank accession numbers given in Table 1) were used as the outgroup because of their sister relationship to the *Bambusa-Dendrocalamus-Gigantochloa* complex (BDG complex: Goh et al. 2010). *Dinochloa malayana* S.Dransfield (Genbank accession number given in Table 1), a sister-taxon of the BDG complex-*H. magica-K. nebulosa* alliance, was also included for a better polarization between the ingroup and outgroup. Maximum parsimony analysis was performed using PAUP 4.0 b10 (Swofford 2002). A strict consensus tree was reconstructed using heuristic

<table>
<thead>
<tr>
<th>Accession</th>
<th>Collection localities / Literature reference and voucher numbers if available</th>
<th>GenBank accession numbers rps16-trnQ, trnC-rpoB, trnH-photosystem A, trnD-T, GBSSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. pendulus-1</td>
<td>Gombak Road, Selangor, Peninsular Malaysia</td>
<td>HQ697856, HQ697867, HQ697903, HQ697878, HQ697889</td>
</tr>
<tr>
<td>D. pendulus-2</td>
<td>Gombak Road, Selangor, Peninsular Malaysia</td>
<td>HQ697857, HQ697868, HQ697904, HQ697879, HQ697888</td>
</tr>
<tr>
<td>D. pendulus-3</td>
<td>Rimba Ilmu Botanical Garden, Univ. of Malaya, Peninsular Malaysia / GWL 6 (KLU)</td>
<td>HQ697855, HQ697866, HQ697902, HQ697877, HQ697890</td>
</tr>
<tr>
<td>G. scortechinii-1</td>
<td>Hulu Langat, Selangor, Peninsular Malaysia / GWL 2 (KLU)</td>
<td>HQ697861, HQ697872, HQ697908, HQ697883, HQ697897</td>
</tr>
<tr>
<td>G. scortechinii-2</td>
<td>Chebar, Kedah, Peninsular Malaysia</td>
<td>HQ697863, HQ697874, HQ697910, HQ697885, HQ697898</td>
</tr>
<tr>
<td>G. scortechinii-3</td>
<td>Gombak Road, Selangor, Peninsular Malaysia</td>
<td>HQ697864, HQ697875, HQ697911, HQ697886, HQ697899</td>
</tr>
<tr>
<td>G. scortechinii-4</td>
<td>Road from Kuala Kubu Baru to Fraser Hill, Peninsular Malaysia / GWL 9 (KLU)</td>
<td>HQ697865, HQ697876, HQ697912, HQ697887, HQ697900</td>
</tr>
<tr>
<td>G. scortechinii-5</td>
<td>Rimba Ilmu Botanical Garden, Univ. of Malaya, Peninsular Malaysia / Bambusetum Acc. 52</td>
<td>HQ697862, HQ697873, HQ697909, HQ697884, HQ697901</td>
</tr>
<tr>
<td>Hybrid Gombak-1</td>
<td>Gombak Road, Selangor, Peninsular Malaysia / GWL 13 (KLU)</td>
<td>HQ697860, HQ697871, HQ697907, HQ697882, (HQ697891, HQ697894)</td>
</tr>
<tr>
<td>Hybrid Gombak-2</td>
<td>Gombak Road, Selangor, Peninsular Malaysia / GWL 14 (KLU)</td>
<td>HQ697859, HQ697870, HQ697906, HQ697881, (HQ697892, HQ697895)</td>
</tr>
<tr>
<td>Hybrid Tapah</td>
<td>Tapah-Cameron Highlands road, Peninsular Malaysia / WKM 2895 (KLU, SING)</td>
<td>HQ697858, HQ697869, HQ697905, HQ697880, (HQ697893, HQ697896)</td>
</tr>
<tr>
<td><em>Dinochloa malayana</em> (outgroup)</td>
<td>Goh et al. (2010)</td>
<td>FJ416343, GU390924, GU390951, GU390973, GU391005</td>
</tr>
<tr>
<td><em>Holttmannochloa magica</em> (outgroup)</td>
<td>Goh et al. (2010)</td>
<td>FJ416348, GU390931, GU391012, GU390958, GU390980</td>
</tr>
<tr>
<td><em>Kinabaluchloa nebulosa</em> (outgroup)</td>
<td>Goh et al. (2010)</td>
<td>FJ416356, GU390932, GU391013, GU390959, GU390981</td>
</tr>
</tbody>
</table>
search with 10 random sequence additions and TBR branch swapping. ‘MulTrees’ was limited to 10000 trees. Bootstrap analysis was run using 1000 replicates. The potentially informative indels were scored following the Simple Indel Coding (SIC) method (Simmons & Ochoterena 2000).

The best model for the Bayesian Inference (BI) analysis was tested using MrModeltest 2.2 (Nylander 2004). BI analyses were performed in MrBayes 3.1 (Huelsenback & Ronquist 2001), using 2 runs of 4 chains each, and run for 100000 generations with trees sampled every 100 generations. The first 2500 trees were discarded as burn-in.

Table 2. Sequences of PCR primers for the partial GBSSI gene.

<table>
<thead>
<tr>
<th>Primer</th>
<th>Forward/Reverse</th>
<th>Sequence (5' - 3')</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gin</td>
<td>Forward</td>
<td>AAG TTT GAG CGC ATG TTC CAG AGC</td>
<td>Goh et al. (2010)</td>
</tr>
<tr>
<td>GBSS</td>
<td>Reverse</td>
<td>GGC GAG CGG CGC GAT CCC TCG CC</td>
<td>Mason-Gamer et al. (1998)</td>
</tr>
<tr>
<td>Gin336/1</td>
<td>Forward</td>
<td>GTC TTA GTC TTC TCC TTG CAG C</td>
<td>This contribution</td>
</tr>
<tr>
<td>Gin336/2</td>
<td>Forward</td>
<td>GTC CTA GTC TTC TTG CAG CTC</td>
<td>This contribution</td>
</tr>
<tr>
<td>Gin396/1</td>
<td>Reverse</td>
<td>CAA GAG TAA CGC CAT ATA TG</td>
<td>This contribution</td>
</tr>
<tr>
<td>Gin396/2</td>
<td>Reverse</td>
<td>CAA GAG TAA CAC CAT GTA CG</td>
<td>This contribution</td>
</tr>
</tbody>
</table>

Fig. 3. Schematic diagram showing the position of haplotype-specific primers (site numbers) and indel regions (grey bars) in the partial GBSSI gene. Arrows indicate directions of primers.

Results

Morphological characteristics and reproductive behaviour of the hybrid

A comparison of the morphological characters of the hybrid and its parental species is shown in Table 3. As has been noted for many hybrids and hybrid derivatives (Rieseberg 1995), the morphology of the hybrid is a mixture of qualitative characters that match one or the other parental species, e.g., culm leaf auricles with bristles in the hybrid and Dendrocalamus pendulus (Fig. 2), and fused staminal filaments in the hybrid and Gigantochloa scortechinii, or are intermediate between the parents, e.g., length of the pseudospikelets. During the entire flowering period of Hybrid Tapah and up to a month afterwards, no caryopses were found in spite of careful searches.
Table 3. Some character states of the putative bamboo hybrid. Those intermediate between *Gigantochloa scortechini* and *Dendrocalamus pendulus*, or resembling one of them, are given in bold.

<table>
<thead>
<tr>
<th>Character</th>
<th><em>Gigantochloa scortechini</em></th>
<th>Hybrid</th>
<th><em>Dendrocalamus pendulus</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Culm: habit</td>
<td>Erect with nodding tips</td>
<td>Erect, with finely drawn out, pendulous apical parts</td>
<td>Flexuose, leaning on neighbouring plants, with apical parts finely drawn out and whiplike</td>
</tr>
<tr>
<td>Culm: internode waxiness</td>
<td>Copiously white-waxy</td>
<td>Not to only slightly white-waxy</td>
<td>Copiously white-waxy</td>
</tr>
<tr>
<td>Culm: internode hairiness</td>
<td>Glabrous generally except for bands of silvery brown hairs flanking each node; sparsely</td>
<td>Generally covered with scattered dark-brown hairs, with bands of silvery brown hairs</td>
<td>Glabrous generally with bands of silvery brown hairs flanking each node</td>
</tr>
<tr>
<td></td>
<td>covered with pale hairs in juvenile clumps</td>
<td>flanking each node</td>
<td></td>
</tr>
<tr>
<td>Culm leaf: sheath colour</td>
<td>Green at base, flushed intense orange towards the top</td>
<td>Pale yellow-orange with slight tint of pink or dark purple brown</td>
<td>Greenish to yellowish pink-orange near apex</td>
</tr>
<tr>
<td>Culm leaf: sheath hairs</td>
<td>Dark brown to black hairs</td>
<td>Dark brown hairs</td>
<td>Loose pale brown hairs</td>
</tr>
<tr>
<td>Culm leaf: sheath waxiness</td>
<td>Very slight waxiness</td>
<td>Slight to moderately white waxy on the back</td>
<td>Copious loose white wax mixed with the hairs</td>
</tr>
<tr>
<td>Culm leaf: sheath margins</td>
<td>Firm, not drying faster than the rest of the sheath</td>
<td>Papery, drying as a thin marginal zone compared to the rest of the sheath</td>
<td>Papery, drying as a thin marginal zone compared to the rest of the sheath</td>
</tr>
<tr>
<td>Culm leaf: auricle form</td>
<td>Low plane rim, 0.5–1.5 mm high, glabrous</td>
<td>Rounded lobes to about 5 mm high with marginal bristles</td>
<td>Small rounded lobes, 1.5–3.0 mm high, sometimes crisped, with marginal bristles</td>
</tr>
<tr>
<td>Culm leaf: blade colour</td>
<td>Medium green and leaf-like with pink flush</td>
<td>Medium green and leaflike with pink flush</td>
<td>Yellowish green to brown often with pink flush</td>
</tr>
<tr>
<td>Midrib dominant branch: habit</td>
<td>Dominant primary branch rigid-ascending,</td>
<td>Dominant primary branch rigid ascending, tending to extend and droop at its tips</td>
<td>Dominant primary branch long-flexuose, becoming pendulous-whiplike</td>
</tr>
<tr>
<td>Psuedospikelet: length</td>
<td>12–24 mm</td>
<td>7–11 mm</td>
<td>5–8 mm</td>
</tr>
<tr>
<td>Empty glumes: number</td>
<td>3–5</td>
<td>2–3</td>
<td>2–3</td>
</tr>
<tr>
<td>Flores: number</td>
<td>4–5</td>
<td>2 (rarely 3)</td>
<td>1–2</td>
</tr>
<tr>
<td>Terminal empty lemma: Presence</td>
<td>Present</td>
<td>Present (but absent when there is a 3rd floret formed)</td>
<td>Absent</td>
</tr>
<tr>
<td>Lemmas: hairiness</td>
<td>Pale-brown long-hairy all over</td>
<td>Glabrous</td>
<td>Glabrous</td>
</tr>
<tr>
<td>Staminal filaments</td>
<td>Fused into a tube</td>
<td>Fused into a tube</td>
<td>Free</td>
</tr>
<tr>
<td>Anther: colour</td>
<td>Yellow</td>
<td>Pink to pale lilac</td>
<td>Maroon</td>
</tr>
</tbody>
</table>
Sequence characteristics of the partial GBSS1 gene
The haplotypes of each putative hybrid individual are called Haplotype D and Haplotype G, respectively. Haplotypes D and G were 705–706 bp in length. Multiple DNA sequence alignment of GBSS1 haplotypes of the hybrid. D. pendulus and G. scortechinii revealed that 26 out of 35 variable indel sites are indicative of the parentage of the hybrid (Table 4).

Maximum parsimony (MP) and Bayesian Inference (BI) analyses
The aligned data matrix of the partial GBSS1 gene for the ingroup consists of 707 characters, of which 26 are parsimony-informative. MP analysis resulted in four equally most parsimonious trees (shown in Fig. 4). Bayesian analysis using Model K80 generated a similar topology. All five G. scortechinii accessions form a clade with the G haplotypes of the hybrid accessions, whereas all three D. pendulus accessions form a clade with the D haplotypes of the hybrid accessions (Fig. 4).

The aligned data matrix of the combined cpDNA, rps16-trnQ + trnC-rpoB + trnH-psyA + trnD-T dataset for the ingroup consists of 3889 characters, of which 26 are parsimony-informative. MP analysis resulted in four equally most parsimonious trees (shown in Fig. 5). Bayesian analysis using Model HKY+I generated a similar topology. One of the major clades was formed by all three D. pendulus accessions, all three hybrid accessions, as well as three G. scortechinii accessions. Hybrid Tapah was at the basal node of this clade. The remaining two accessions of G. scortechinii form another clade, sister to the other ingroup cluster.

Table 4. The 28 variable sites and 11 indel sites of the partial GBSS1 gene (722 bp) of the hybrid and its parental species. Dots indicate identical nucleotides compared to those in the first row. Dashes indicate the alignment gaps. Twenty six sites characterising the hybrid origin of the hybrid individuals are highlighted.

<table>
<thead>
<tr>
<th>Taxon</th>
<th>site</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. pendulus-1</td>
<td>A</td>
</tr>
<tr>
<td>D. pendulus-2</td>
<td>A</td>
</tr>
<tr>
<td>D. pendulus-3</td>
<td>A</td>
</tr>
<tr>
<td>Hybrid Gombak-1 (haplotype D)</td>
<td>A</td>
</tr>
<tr>
<td>Hybrid Gombak-2 (haplotype D)</td>
<td>A</td>
</tr>
<tr>
<td>Hybrid Tapah (haplotype D)</td>
<td>A</td>
</tr>
<tr>
<td>Hybrid Gombak-1 (haplotype G)</td>
<td>A</td>
</tr>
<tr>
<td>Hybrid Gombak-2 (haplotype G)</td>
<td>A</td>
</tr>
<tr>
<td>Hybrid Tapah (haplotype G)</td>
<td>A</td>
</tr>
<tr>
<td>G. scortechinii-1</td>
<td>A</td>
</tr>
<tr>
<td>G. scortechinii-2</td>
<td>A</td>
</tr>
<tr>
<td>G. scortechinii-3</td>
<td>A</td>
</tr>
<tr>
<td>G. scortechinii-4</td>
<td>A</td>
</tr>
<tr>
<td>G. scortechinii-5</td>
<td>A</td>
</tr>
</tbody>
</table>

Discussion
Indels and nucleotide substitutions observed in the partial GBSS1 gene sequences of Hybrid Gombak-1, Hybrid Gombak-2 and Hybrid Tapah (Table 4) suggest that haplotype D is derived from Dendrocalamus pendulus and haplotype G is derived from Gigantochloa scortechinii, as expected. This hypothesis was also supported by the placement of haplotypes D and G in the GBSS1-based topology, where haplotypes
D form a single clade with *D. pendulus* and haplotypes G form a single clade with *G. scortechinii* (Fig. 4). From the genotypes of the hybrid and its parental species, the hybrid is reasonably interpreted as a relatively recent F1 offspring.

Assuming cpDNA is maternally inherited in the bamboos, as reported for many angiosperm taxa (Corriveau & Coleman 1988), we attempted to deduce the seed parent of the hybrid from the cpDNA-based topology. However, *D. pendulus* and *G. scortechinii* did not form distinct clades. Rather, one of the two clades consists of *D. pendulus*, *G. scortechinii* and the hybrids, and another clade consists of only *G. scortechinii* (Fig. 5). Similar inter- and intra-specific cpDNA variations have been reported for *Quercus* L. (Whittemore & Schaal 1991, Petit et al. 1997, Bordac et al. 2000, Petit et al. 2008) and such patterns were attributed to interspecific gene flow resulting from introgression (Lexer et al. 2006) or shared polymorphism (Muir & Schlotterer 2005, 2006). Other studies inferring chloroplast capture based on shared cpDNA haplotype patterns include those for Saxifragaceae (Soltis et al. 1991, Okuyama et al. 2005), Pinaceae (Watano et al. 1996, Senjo et al. 1999, Ito et al. 2008), *Phlox* L. (Ferguson et al. 2002), *Salix* L. (Hardig et al. 2000) and *Nothofagus* Blume (Acosta & Premoli 2010). Two of these studies demonstrated that this chloroplast introgression has a strong association with geographic distribution rather than with taxonomic relationships (Whittemore & Schaal 1991, Acosta & Premoli 2010). It is

![Fig. 4. One of the four most parsimonious trees from the maximum parsimony analysis based on the partial GBSSI region (Tree length = 67, CI = 0.9254, RI = 0.9655). Posterior probabilities >0.90 are shown above the nodes, bootstrap support values >70% below the nodes. The tree is drawn to scale, with branch lengths indicating evolutionary distances as number of base substitutions per site.](image)
natural hybrid bamboo in Peninsular Malaysia

noteworthy that sharing of chloroplast DNA haplotypes was also observed in two well-defined North American bamboos, *Arundinaria tecta* and *A. appalachianna* (Triplett et al. 2010). Our cpDNA phylogeny is not feasible for determining the direction of the cross but implies that ancient chloroplast introgression has been possible between *D. pendulus* and *G. scortechinii*. However, other possible explanations for the cpDNA phylogenetic tree topology, such as reciprocal crosses followed by introgression, could not be ruled out. Extensive studies including more accessions of hybrid, more populations of *D. pendulus* and *G. scortechinii*, and perhaps more of their congeners in Peninsular Malaysia are much needed to address this problem.

Through this study, we confirm that natural inter-generic hybridisation occurs among Malaysian bamboos and suggest that the role of hybridisation in the evolution of tropical Asian bamboos could have been underestimated. There is circumstantial evidence for natural hybridisation in bamboos but well-documented instances are scarce. Some taxa appear to have a high degree of morphological variation resulting in poorer distinction among species, e.g., the Malayan-Javan *Gigantochloa* taxa (Holttum 1958). A number of taxa are cultivated for their usefulness but have never been found in the wild, e.g., the Malaysian village bamboos *Bambusa heterostachya* (Munro)

![Fig. 5. One of the four most parsimonious trees from the analysis using Bayesian inference based on 4 cpDNA intergenic spacers, rps16-trnQ, trnC-rpoB, trnH-psbA, and trnD-T (Tree length = 78, CI = 0.9231, RI = 0.8868). Posterior probabilities >0.90 are shown above the nodes, bootstrap support values >70% below the nodes. The tree is drawn to scale, with branch lengths indicating evolutionary distances as number of base substitutions per site.](image)
Holttum, *B. laxa* K.M.Wong, *D. asper* Backer and *G. thoii* K.M.Wong (Wong 1995, 2004), and many such taxa are infertile or have low fertility (Wong 1995, Ramanayake 1998, Muller 1998, Koshy & Jee 2001), as is the case with our Hybrid Tapah here. In *B. vulgaris* Schrad. (Koshy & Jee 2001), seed set failure is due to poor stigma exposure and pollen sterility resulting from meiotic irregularities; in addition, chromosomal inconstancy (mosaicism) is also found among root-tip (i.e., somatic) cells. Selfing in a reproductively isolated *G. ridleyi* clump had overwhelmingly high seed failure and the offspring that did survive were morphologically inconsistent with one another and the parent clump (Muller 1998). We suggest that introgressive hybridisation is an important source of variability and, in view of the demonstrated possibilities for hybridisation even among genera (Zhang & Chen 1980, Takahashi et al. 1994, and this study), has contributed to taxonomic complexity in the Bambusinae, particularly the closely related *Bambusa-Dendrocalamus-Gigantochloa* complex. A recent phylogenetic study of SE Asian bamboos (Goh et al. 2010) recovered incongruent elements between nuclear and chloroplast sequence-based topologies which implied that the possibility of reticulate evolution in the Bambusinae should be further investigated.

**Naming and description of the new hybrid**

The detected hybrid has not been previously described or named. It has been produced by hybridisation between *Gigantochloa scortechinii* and *Dendrocalamus pendlus*, both common bamboos in the foothills of the Main Range in Peninsular Malaysia, in at least two localities (Tapah and Hulu Gombak) and seems likely to occur in more localities. Although there has been a suggestion that *Dendrocalamus* and *Gigantochloa* may not be generically distinct (Soderstrom & Ellis 1987), yet currently available analyses using larger data sets (Yang et al. 2008; Yang et al. 2010, Goh et al. 2010) have not clearly resolved this matter. On the other hand, the type species or type alliances of these genera have been recovered as distinct clades in some analyses (Goh et al. 2010), and from a morphological standpoint, these genera do at least seem to form very different extremes (as represented by their type species and other closely related species) (Holttum 1958, Wong 1995). Wong (1995, 2004) notes that there are species currently placed in *Dendrocalamus* that vary significantly from the type alliance that includes *D. pendlus*.

Here we formally name the nothogenus and nothospecies, according to the International Code of Botanical Nomenclature (McNeill et al. 2006). As the nothogeneric name should be formed by combining elements of the names of both parent genera, and *Gigantochloa* has been pre-empted by *Dendrocalamus* C.E. Parkinson, we have opted for the obvious choice, *Gigantocalamus*. The species epithet is an abbreviation of “Malay Peninsula”, where this hybrid was first noted.

**× Gigantocalamus** K.M.Wong, nothogenus nova  
[= *Dendrocalamus* Nees × *Gigantochloa* Kurz]  
*Bambusa erecta caespitosa, culmi foliorum vagina abaxialiter parum ad moderate pallide cerea, in quoque nodo ramus primarins dominans rigidus adscendens distaliter cernins, longitudine pseudospiculaeum inter parentes intermedia, ut videtur seminum absentia sterilis.*
× Gigantocalamus malpenensis K.M.Wong, nothospecies nova
[= Dendrocalamus pendulus Ridl. × Gigantochloa scortechinii Gamble]
Hybrida naturalis Gigantochloae scortechinii similis, culnì foliorum vaginae marginibus papyraceis, auriculis lobiformibus rotundatis marginibus setosis, lemmatibus glabris differt; Dendrocalami penduli similis, culnì foliorum vagina atropilosa, filamentos stamineis tubo connatis differt; in characteribus ceteris inter ambo species intermedia.

TYPE: Peninsular Malaysia, Kuala Lumpur, University of Malaya, Rimba Ilmu Botanic Garden, Bambusetum accession no. 48, 13 Apr 2007 (originally collected from Perak, Tapah-Cameron Highlands road, 28 Nov 2001), Wong et al. WKM 2895 (holo KLU; iso ISC, SING).

Clumped bamboo; culms to c. 10 m tall, at first erect, then arching outwards, diameter c. 4 cm, internodes 20–25 cm at midculm, green except for pale yellow-green stripes at the culm base, with a ring of pale matted hairs above and below each node, dark brown hairs scattered all over, not to only slightly white-waxy. Culn leaf sheath pale yellow-orange with a slight tint of pink or dark purple-brown, dark brown hairy and slightly to moderately white-waxy on the back; edge of the sheath very thin, drying as a thin papery pale-brown marginal zone; auricles rounded lobes to c. 5 mm high, dark purplish black, with pale stiff wavy bristles to over 10 mm long; blade medium green and leaflike with a pink flush, spreading to reflexed. Branch complement developing from a single bud, with one dominant primary central axis and a few smaller higher-order branches from its base, all branches ascending in habit, the dominant primary axis tending to droop at its tip. Branch leaf blades pale short-hairy on the lower side. Pseudospikelets 7–11 mm long, developing into clusters of few to many; with (from the base) 2–4 bracts subtending prophyllated buds. 2–3 empty glumes. 2 (exceptionally 3) florets and a terminal empty lemma (this terminal empty lemma sometimes replaced by a third floret). Lemmas 6–9 mm long, with a short terminal cusp, stiff and scale-like, glabrous, green to pink-flushed; paleas 5.5–8 mm long, 2-keeled, membranous, glabrous except minutely hairy keels, 5-veined on the back, 1-veined between keel and margin; stamens 6, staminal filaments fused into a tube and extruded from the lemma when mature; anthers 3–5 mm long with an apical cusp 0.3–0.5 mm long, flushed pink to pale lilac when fresh, pale when dry; empty; ovary rounded, c. 0.5 mm long, long-hairy at the summit; style short-hairy throughout, terminating in a single plumose stigma. Caryopsis unknown, apparently not or rarely formed. (Fig. 1 A–D, 2C)

Distribution: Peninsular Malaysia, along the Tapah-Cameron Highlands road in Perak (Wong et al. WKM 2895) and along the old Gombak road in Selangor (Goh et al. GWL13, 14).

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Nianhe (South China Institute of Botany) for providing literature on the Guangzhou bamboo hybridisation experiments and arranging for KMW to view the living hybrid clumps at the Guangdong Forest Research Institute. Prof. Lynn Clark (Iowa State University) and Prof. Xia have given useful comments on this work.

References


A revision of *Begonia* sect. *Sphenanthera* (Hassk.) Warb. (Begoniaceae) from Sumatra

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ABSTRACT. *Begonia* sect. *Sphenanthera* is characterised by robust herbs with fleshy fruits. Three species are recognised from Sumatra (*Begonia longifolia* Blume, *B. multangula* Blume and *B. scottii* Tebbitt) and three names have been reduced to synonyms (*B. sarcocarpa* Ridl. and *B. turbinata* Ridl. = *B. longifolia* Blume and *B. trigonocarpa* Ridl. = *B. multiangula* Blume). All species are considered to belong to the IUCN category Least Concern as they have wide distributions within Sumatra and are known from several localities.

**Keywords.** Begonia sect. Sphenanthera, conservation status, Sumatra, taxonomy

Introduction

With a rare exception (Kiew 2005) modern monographs and revisions of Southeast Asian *Begonia* are notable for their absence. Reasons for this include the large number of species, a high proportion of undescribed taxa, uncertainty regarding sectional classification and the fact that *Begonia* tend to make poor herbarium specimens. Recently, baseline information regarding sectional placement (Doorenbos et al. 1998) and regional species lists (Hughes. 2008) has become available for facilitating revisionary work. In order to make the task more manageable still, it has been decided to tackle the considerable *Begonia* diversity of Southeast Asia through a series of regional sectional revisions, beginning with Sumatra and *Begonia* sect. *Sphenanthera*.

*Begonia* sect. *Sphenanthera* currently contains 17 accepted names from Asia. Most of the species diversity is on the continent, tapering off towards the east of the Sunda Shelf and only two species occur east of Wallace’s line. The section contains quite robust species, which are most obviously characterised by bearing fleshy fruit, and also flowers with often quite fleshy tepals and male flowers with large androecia consisting of stamens with extended connectives. It bears a strong resemblance to *Begonia* sect. *Platycentrum* (which differs in having 2-locular dehiscent fruits), and indeed molecular evidence shows *Begonia* sect. *Sphenanthera* to be polyphyletic and nested within it (Tebbitt et al. 2006). Nevertheless, *Begonia* sect. *Sphenanthera* continues to be a useful taxonomic unit in partitioning the otherwise unwieldy diversity of the genus, and its status is upheld here.

The revision is based on consulting specimens of *Begonia* sect. *Sphenanthera* from the herbaria A, ANDA, BM, BO, E, FI, K, L, SING and field work in Aceh. North Sumatra and West Sumatra during 2007–2009. Species classified within *Begonia* sect. *Sphenanthera* tend to be amongst the most widespread in the genus, presumably because of the fleshy berry-like fruit syndrome, an adaptation to animal dispersal of their seeds. The combination of being widespread and having a reasonable amount of
population variability, plus the tendency to form hybrids, means the level of synonymy and taxonomic complexity in species from *Begonia* sect. *Sphenanthera* is higher than in other Asian sections of the genus. It also means a wider species concept needs to be applied, particularly as the propensity for forming narrow endemics is not as high as for other Asian sections. Three species are recognised from Sumatra in this revision, and three species are reduced to synonyms. Only one of the species, *Begonia scottii*, is endemic to Sumatra.

Currently, 52 *Begonia* species are recognized from Sumatra (Hughes 2008, Hughes et al. 2009), with most occurring along the Barisan range, which forms the spine of much of the island and in the mountains of North Sumatra and Aceh. Although there may be some further synonymy to be uncovered, the total number of species, and of endemic species, is likely to rise significantly.

**Taxonomic part**


Robust erect or sprawling fleshy herbs. Stems not woody, stipules large and keeled. Leaves asymmetric. Inflorescences bisexual; male flowers with a large androecium giving rise to buds with a distinct bulge. anthers subequal, dehiscing laterally along the length of the anther, connectives projecting; female flowers with 3 greenish-yellow large stigmas, spirally or convolutely twisted. Fruit fleshy, indehiscent, three locular, each locule with two placentae.

Key to species of *Begonia* sect. *Sphenanthera* from Sumatra

1. Leaves sub-orbicular to broadly ovate, with 5–7 broad pointed lobes .................
   ........................................................................................................ 2. *Begonia multangula*

   Leaves ovate or lanceolate, not lobed ................................................................. 2

2. Leaves ovate, fruits borne in pairs or fours ........................................ 3. *Begonia scottii*

   Leaves lanceolate, fruits borne in clusters of 2–15 ............ 1. *Begonia longifolia*


Plant erect, 40–100(–200) cm high. *Stem* up to 2 cm thick at the base, c. 5 mm thick towards the apex, not woody, green to red, internodes around 8–12 cm apart, glabrous or with minute glandular hairs. *Stipules* deciduous, lanceolate, keeled, glabrous, c. 25 × 7 mm, tip extended. *Leaves*: petiole 2–7 cm long; lamina lanceolate, base shallowly cordate, strongly asymmetric, upper surface dark green, (6–)10–18 × 2.5–6(–10) cm, midrib (5–)8.5–14 cm, underside pale green, glabrous or with scattered short hairs on the veins, upper surface darker green, usually glabrous or sometimes with scattered short bristy hairs. venation pinnate-palmate; margin dentate-denticulate; apex acute. *Inflorescences* axillary, cymose, branching 1–3 times. bisexual, male and
female flowers open at the same time; bracts caducous, lanceolate, 6–12 × 2–4 mm; primary and secondary peduncles stout, distinctly swollen near the nodes, 2 mm thick, primary c. 1 cm long, secondary shorter, each unit consisting of 1 male and 2 female flowers, (3–)7–15 flowers in total, bracteoles often present on terminal female flowers, bracteoles 5 × 1–2 mm. **Male flowers:** pedicels 25–30 mm; tepals 4, white; outer 2 elliptic-orbicular, slightly cup-shaped, fleshy, with a thinner rim, 10–12 × 8–9 mm; inner 2 spatulate-elliptic, 9–10 × 6–7 mm; androecium symmetric, a loose globose cluster; stamens bright yellow, 35–90, subequal; filaments slightly shorter than the anthers, more so for the outer stamens; anthers c. 2 mm long, linear with a rounded tip, dehiscing through lateral slits running almost the entire length of the anther. **Female flowers:** pedicels 7–12 mm; ovary pale green, fleshy, lobed-triangular in cross-section, c. 7–9 × 1–mm, with three ridges or small fleshy wings on the lobes, 3-locular, placenta bifid; tepals (rarely 4–)6, white, elliptic-spathulate, subequal, 8–14 × 5–7 mm; styles 3, greenish yellow, deciduous, bifid, c. 4 mm long, papillose surface spirally twisted. **Fruit** borne in clusters of (1–)2–15, green, fleshy, globose-triangular, pendulous on a stiff pedicel, 10–14 mm diameter, apex sometimes slightly extended. (Fig. 1)

![Fig. 1. Begonia longifolia habit (main photo), female and male flowers (inset top left) and ripening fruit (inset bottom right). All from one plant, Gunung Sorik Merapi, North Sumatra. Photo credits: Mark Hughes.](image)

**Material seen:** SUMATRA. **Aceh:** Gunung Leuser Nature Reserve. Air Panas. 19 Mar 2008, P. Wilkie, et al. PW784 (BO, E). **North Sumatra:** Asahan, Aek Si Tamboerak, 28 Oct 1936, Rhamat si Boeeca 10653 (A); Asahan, Dolok Si Manoeck-manoeck, 5 Oct 1936 - 20 Nov 1936, Rhamat si Boeeca 10246 (A, K, L); Asahan, Hoeta Bagasan, 7 Sep 1934 - 4 Feb 1935, Rhamat si Boeeca 1082 (A); Baboeli - Packas. 9 Jan 1932, Bangham 776 (A); Berastagi Woods, 8 Feb 1921, H.N. Ridley s.n. (BM, K); ibid, 10 Jun 1928, C. Hanel & Rhamat si Boeeca 580 (A); Berastagi Woods, West Hill, 14 Feb 1921, H.N. Ridley s.n. (K); Dolok Sibual Buali, 15 Jan 2000, S.J. Davies & S.K.

Notes. Although Ridley transformed our understanding of the Malesian flora, it is tempting at times to accuse him of being slightly profligate with plant names. Begonia turbinata Ridl. was upheld by Tebbitt (2003) due to its turbinate fruit and slender, red-tinged stems. However this species is impossible to separate satisfactorily in the herbarium. and duplicates were seen carrying conflicting determinations. Also. red-tinged stems have also been noted in plants with robust stems, and the fruit shape on the type and isotypes of B. turbinata fit within the range observed in B. longifolia. Begonia sarcocarpa Ridl. also has the same fruit type as B. longifolia, but differs in its smaller size and having 5 (not 6) tepals in the female flower. However, the large number of specimens housed at ANDA from West Sumatra show a range of intermediate sizes linking B. longifolia and B. sarcocarpa, and observations in the field and from cultivated material show that tepal number is not a stable character and can vary within individuals. Also. B. sarcocarpa is known only from the type, which has only one or two female flowers. It seems appropriate to consider these two species as representing population variants of Begonia longifolia.

Ecology and distribution. Bhutan, northeast India, southern China, Burma, Taiwan, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java. Lesser Sunda Islands. Within Sumatra, Begonia longifolia occurs along the whole of the Barisan range at altitudes of
500–1500 m, though most collections are from 900–1200m (Fig. 2). On steep banks, often near streams, in primary or secondary forest. IUCN category Least Concern.

Fig. 2. Distribution of Begonia longifolia (left), B. multangula (middle) and B. scottii (right) on Sumatra.


Plant repent to erect, 50–150 cm tall. Stem rhizomatous at the very base, thick, fleshy, erect portion with internodes 5–15 cm apart, glabrous or with scattered hairs to densely hairy with long usually white hairs, rarely reddish. Stipules large, semi persistent,
broadly lanceolate, keeled, glabrous or hairy along the keel, 40 × 15 mm. Leaves: petiole 17–25 cm long, glabrous or with short or long hairs. hairs usually white. rarely reddish: lamina broadly ovate to suborbicular with 5–7 broadly triangular lobes, base cordate with lobes overlapping, asymmetric. (15–)24–35 × (15–)20–30 cm. midrib (10–)16–22 cm. venation palmate. margin dentate-denticulate: upper surface glabrous or with scattered short hairs. lower surface glabrous or with scattered short hairs, denser on the veins. Inflorescences a cluster of flowers on a long peduncle. axillary. sometimes appearing pseudo-terminal between a pair of leaves. cymose. branching twice. male and female flowers open at the same time: bracts caducous. elliptic. c. 1.5 cm long, glabrous or slightly fimbriate: primary peduncle 2.5–12 cm × 4–5 mm. glabrous or with long hairs. secondary peduncles 1–1.5(–3.5) cm. tertiary 3–4(–10) mm. remainder of the peduncles very compressed and appearing sub-umbellate. Male flowers: pedicels c. 15–25 mm long. glabrous or with scattered hairs: tepals 4. white or pale pink: outer tepals orbicular-ovate 20–25 × c. 20 mm. with hairs on the reverse: inner tepals, orbicular-elliptic. glabrous. c. 15–20 × 15 mm: androecium symmetric. a loose globose cluster: stamens bright yellow. c. 80 in number; filaments unequal. 1.5–3 mm long. shorter on the basal stamens; anthers elliptic. c. 1.5 mm long. connective slightly extended. dehiscing through slits running nearly the entire length of the anther. Female flowers: pedicels c. 10 mm long: ovary fleshy, lobed-triangulat in cross-section. c. 8–12 mm diameter. with three ridges or small warty wings on the lobes. 1 wing sometimes larger. 3-locular. placentae bifid: tepals 5–6. white. elliptic-spathulate. subequal. c. 18–20 × 11–14 mm: styles 3. greenish yellow. semi-persistent. bifid. c. 4 mm long. papillose surface spirally and convolutely twisted. Fruit green or red. fleshy. globose-triangular. c. 15–18 mm diameter. borne in bunches of around 10–15. with three fleshy ridges. one sometimes more prominent and often slightly warty. (Fig. 3)


Notes. Begonia multangula is a new record for Sumatra. and this extension of its range westwards means that it is considerably more variable than previously circumscribed. Begonia trigonocarpa is reduced here as it fits within the variation of B. multangula comfortably. The small fruit size as noted by Ridley on the type of B. trigonocarpa is due to immaturity - the plant is still in flower. and similar size fruits are found on specimens of B. multangula at the same stage of development. Many of the leaves on parts of this type specimen are more elongate than is typical for B. multangula on Sumatra. and in combination with the plant being glabrous this hints at the possibility of introgression with B. longifolia. A small number of individuals on Sumatra have
reddish hairs, and these are probably hybrids with *B. scottii* (see notes under that species) rather than records of the allied *B. robusta*, which is endemic to western Java. *Begonia multangula* is also allied to *B. chlorocarpa* from Borneo, from which it differs most noticeably in not having spurred fruit.

**Ecology and distribution.** Sumatra, Java, Lesser Sunda Islands. Within Sumatra, *Begonia multangula* is found in the mountains of the West and North at altitudes of 700–2500 m, with most collections being from around 1200–1600 m (Fig. 2). Sprawling on stream banks and slopes in rain forest. IUCN category Least Concern.

**Fig. 3.** *Begonia multangula* habit (main photo). inflorescence (inset top left; Gunung Merapi, West Sumatra) and fruits (insets, bottom). Habit and fruit photographs from Pantai Cermin, West Sumatra. Photo credits: Mark Hughes and Deden Girmansyah.


Plant repent to erect, erect portion 25–50(–100) cm high. **Stem** rhizomatous at base, plants entirely rhizomatous when juvenile with very short internodes, internodes extending to 5–15 (–30) cm apart when mature, sub-glabrous to hairy, hairs white
or red. **Stipules** persistent, lanceolate, keeled, the keel sometimes with long hairs, with a fimbriate filiform extension at the tip, 20–30 × 8–15 mm. **Leaves**: petiole 6–28 cm long, hairy or with scattered hairs 1–2 mm long; lamina ovate, base cordate with lobes overlapping, 11–23 × 6–16 cm, smaller on juvenile plants. midrib 8.5–16 cm long, underside with scattered hairs, denser on the veins, upper surface glabrous or with scattered hairs. hairs white or sometimes reddish on young leaves, venation palmate-pinnate; margin denticulate. **Inflorescences** axillary, cymose. bisexual. male and female flowers open at the same time; bracts lanceolate, c. 15 mm long, smaller towards the apex of the inflorescence. male peduncle 2–8 cm, secondary 5–15 mm. **Male flowers**: pedicels c. 10–15 mm long, hairy: tepals 4, white, outer ovate-orbicular, size c. 18 × 18, with red hairs on the outside (always?); inner tepals elliptic, 15 × 10 mm. glabrous: androecium symmetric. a loose globose cluster; stamens bright yellow, c. 80 in number, subequal: filaments longer than the anthers. 2–3 mm long; anthers narrowly elliptic. 1.5–2 mm long, dehiscing through slits running nearly the entire length of the anther, connective extended. **Female flowers**: pedicels 10–15 mm long; tepals 5, white, subequal. elongate-elliptic, outer c. 17 × 12 mm decreasing to 17 × 8 mm for the innermost, outer sometimes with scattered red hairs; ovary lobed-triangular in cross section. c. 10–15 mm in diameter. either glabrous or red-hairy, with 3 pronounced fleshy ridges sometimes developed into fairly distinct triangular equal to subequal wings c. 5 mm long. 3-locular, placenta bifid: styles 3, large, greenish yellow. bifid. stigmatic surface twice spirally and convolutedly twisted. stigma persistent. **Fruit** green to reddish, globose-triangular, pendulous, borne in pairs or fours, 15–20 × 17–20 mm; with three fleshy ridges or stubby wings up to 5–6 mm wide; glabrous or with scattered hairs; tip bearing remnants of the styles, which wear away as they become brittle with age. (Fig. 4 & 5)

Fig. 4. *Begonia scottii* habit (main photo) and fruits from Gunung Merapi, West Sumatra (inset top left) and from Gunung Kemiri, Aceh (inset lower left). Female flower and ovary (inset right and bottom right) from Gunung Sorik Merapi, North Sumatra. Photo credits: Deden Girmansyah and Mark Hughes.

**Notes.** Despite being quite widely collected, this species was only recently described. Ridley determined some of his collections of this species to his *B. trigonocarpa* (=*B. multangula*), but the two species differ considerably; *B. scottii* has smaller, ovate (not broadly lobed) leaves and often comparatively thin-skinned fruit usually borne in pairs or fours on slender pedicels (not clusters of c. 10 thicker walled berries on stout pedicels). Three collections from the northern part of Sumatra (*van Steenis* 6207 and 6237, *de Wilde & de Wilde Duyfjes* 13531 [BO duplicate]) are more robust than is typical for *B. scottii*, and also have more fruit per infructescence. These specimens possibly represent some introgression with *B. multangula*. The *de Wilde & de Wilde Duyfjes* 13531 duplicates in L show that this collection is mixed (or at least extremely variable) as these 2 sheets are *B. multangula*, although the reddish hairs suggest these also have been introgressed with *B. scottii*. 
Fig. 5. *Begonia scottii*. A. Inflorescence and open male flower. B. Female flower. C. Mature plant in fruit. Drawn by: Heather Raeburn.
Ecology and distribution. Endemic to Sumatra. In moss and montane rain forest in West Sumatra, North Sumatra and Aceh at 900–2600 m, though most frequently reported from 1400–1700 m (Fig. 2). In primary and secondary forest, on steep banks, stream sides or at the base of tree trunks or rotting logs. IUCN category Least Concern.

Excluded name


Miquel created this taxon for a specimen he originally cited under _Diploclinium areoatum_ Miq (= _Begonia areolata_ (Miq.) Miq.). It differs from the type variety of _B. robusta_ Blume in having ‘foliiis minoribus, paniculis longe pedunculatis, ovarii maturiscentis alulis subaequalibus’. The type, collected in West Sumatra by Teijsmann cannot be located despite a thorough search in B. BO, K, L and U, and the description is not sufficient to identify the taxon with certainty. It seems unlikely to represent the sole record of the otherwise entirely Javanese _B. robusta_, but could possibly be referable to _Begonia multangula_.

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References

Names and new combinations for Peninsular Malaysian species of *Codonoboea* Ridl. (Gesneriaceae)

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ABSTRACT. Five species are reinstated in *Codonoboea* Ridl. and new combinations are made for 74 species that occur in Peninsular Malaysia that were formerly included in *Henckelia* Spreng. *Codonoboea albina* (Ridl.) Kiew is reinstated at specific rank and var. *winkleri* (Ridl.) Kiew as a variety of *C. malayana* (Ridl.) Kiew. Lectotypes are designated where appropriate.

Keywords. *Codonoboea*, Gesneriaceae, nomenclature, Peninsular Malaysia, synonymy, taxonomy, typification

Introduction

*Codonoboea* Ridl. in its current wider sense is the largest genus of dicotyledonous herbs in Peninsular Malaysia with 79 named species. This compares with other large herb genera such as the 45 species in *Argostemma* Wall., Rubiaceae, 45 in *Sonerila* Roxb., Melastomataceae (Turner 1997) and 52 species in *Begonia* L., Begoniaceae (Kiew 2005). Botanical exploration of poorly known areas continues to discover new *Codonoboea* species, such as the two new species from Gunung Stong, Kelantan (Kiew 2009) and several others that await description. *Codonoboea* is confined to primary forest where it is ubiquitous from the lowlands to the highlands occurring on granite, sandstone and quartz derived soils or rocks but it is noticeably absent from limestone and aquatic habitats. It is diverse in regard to habit (although there are no climbing or epiphytic species), leaf and flower morphology. Its centre of diversity is Peninsular Malaysia, but species are also found in S Thailand, Sumatra, Singapore, Borneo, Palawan (the Philippines), Sulawesi and New Guinea (Weber & Burtt 1998).

Ridley (1923) in his *Flora of the Malay Peninsula* first described *Codonoboea* as a genus and included three species that in his opinion did not fit into any of the other genera. However, *Codonoboea* was ill-defined and not clearly distinct from the closest genus, *Paraboea* Ridl. Indeed the two diagnostic characters, namely peduncles adnate to the petiole (epiphyllous) and corolla lobes very short and tooth-like were present in only two of the three species. Burtt (1971) later transferred some *Paraboea* species to *Didymocarpus* Wall.

In 1990, Kiew reduced *Codonoboea* to a section within *Didymocarpus* and re-defined it to include four similar species with epiphyllous inflorescences. However, *Didymocarpus* itself underwent re-definition (Weber & Burtt 1983, 1998) that resulted in the exclusion of species with plagiotropic fruits that split on the adaxial side as opposed to the orthotropous ones of *Didymocarpus s. str.* that split both abaxially as well as adaxially. Based on morphological similarity, the excluded Peninsular Malaysian
species together with *Loxocarpus* R.Br. species were placed in *Henckelia* Spreng., a small genus of 15 species from S India and Sri Lanka, a decision that resulted in 180 new combinations (Weber & Burtt 1998, Vitk et al. 2000).

Recent molecular analyses (Moeller et al. 2009) now show conclusively that the Indian and Sri Lankan *Henckelia* species are distinct from the Peninsular Malaysian species and among the Peninsular Malaysian species, *Loxocarpus* species are also distinct from both *Henckelia* and other morphologically similar genera. These non-*Henckelia* and non-*Loxocarpus* species are now accommodated in the genus *Codonoboea* that is the remaining validly published name for this group of species and the generic circumscription is enlarged to accommodate them. For the 79 Peninsular Malaysian species, this necessitates making new combinations for 74 of the species and these are provided below.

### Materials and methods

In working toward the family Gesneriaceae account for the on-going Flora of Peninsular Malaysia project, the Peninsular Malaysian taxa have been re-examined through extensive fieldwork, examination of herbarium specimens including types, and the literature. New combinations in *Codonoboea* are made for accepted names together with references (including recent literature), synonyms and types. Lectotypes are designated where appropriate. Notes are provided where an explanation is needed. The species are arranged alphabetically. In due course, the new taxa will be published and, for all species, distribution in Peninsular Malaysia will be mapped and a conservation status for each taxon will be assessed and a key for identification provided.

In Peninsular Malaysia, *Codonoboea* belongs to a group of genera that includes the seven in the key below, which provides the characters that distinguish between them.

### Key to the *Codonoboea* group of genera in Peninsular Malaysia

**Fertile stamens 4.**
- Capsules very slender, becoming ribbed and scarcely splitting ..... *Didissandra*
- Capsules thick, smooth and hard, splitting completely on the adaxial side .......

**Fertile stamens 2.**
- Capsules orthotropic, splitting adaxially and abaxially.
  - Stigma distinctly bilobed. (Always on limestone.)
    - Rosette herbs, inflorescences scapiform, calyx tubular ..............
      - Caulescent herbs, inflorescences often epiphyllous, calyx divided to base ....................................................... *Daurongia*
    - Stigma peltate or rounded (not bilobed). (Never on limestone.) ....
      - ......................................................................................... *Microchirita*

- Capsules plagiotropic, splitting only adaxially.
  - Capsules slender, cylindric, 1–5 cm long ......................... *Codonoboea*
  - Capsules short and distinctly thicker at base, 0.4–0.9 cm long ..........
*in Borneo. some Didissandra species have 2 fertile stamens.

**Codonoboea** Ridl.

Perennial herbs with continuous growth. **Stems** usually woody, erect and either caulescent with an unbranched or branched stem to c. 50 cm tall or short and forming a rosette, or creeping. **Leaves** usually opposite, sometimes alternate to spiral, sessile or petiolate. **Inflorescences** axillary, with 1 or several per axil, sometimes epiphyllous; pedunculate pair-flowered cymes with 3–4 flowers or reduced to a single flower or branched, paniculate and many-flowered; bracteoles usually small, sometimes absent or large and conspicuous. **Flowers** 5-merous, with a small calyx divided almost to base; corolla tubular with 5 lobes, the lower 3 lobes often longer, large and trumpet-shaped to narrowly tubular to campanulate to short-tubed and flat-faced; tube often pale purple, cream-coloured or white with concolourous lobes or with lobes deeply coloured and contrasting, less commonly red or yellow: frequently with a pair of yellow or orange-brown nectar guides, rarely with additional stripes or spots; stamens 2, filaments long or short with the anthers positioned in the mouth of the corolla. anthers coherent. connectives often with a tooth-like appendage; nectary forming a deep or shallow ring, sometimes with a lobed rim or short on the adaxial side or it does not surround the ovary base and is tongue-like or is lacking; ovary cylindric, tapering into the style, stigma either peltate or rounded (but never bilobed or lamellate). **Capsules** plagirotropic, splitting adaxially, long, cylindric. 1–5 cm long, usually slender, rarely curved and slightly thicker towards the base.

1. **Codonoboea alba** (Ridl.) C.L.Lim, **comb. nov.**


**Codonoboea alba** var. **major** (Ridl.) C.L.Lim, **comb. nov.**


**Note**: Vitek et al. (2000) listed this taxon as ‘var. uncertain’. Examination of the type specimen shows that it belongs to C. alba but that the differences in habit
and internodes length justify its status as a variety. Wray’s collection number was erroneously cited as 3209 in Ridley (1908).

2. **Codonoboea albina** (Ridl.) Kiew, *comb. nov.*


*Note:* Weber & Burtt (1998), followed by Vitek et al. (2000), were in error in considering this species as synonymous with *Codonoboea hispida* (Ridl.) Kiew because it is clearly distinct in its longer petiole and larger lamina with a distinctly serrulate margin, its paniculate inflorescence with about 7 flowers and its smaller flower with purple spots. It is therefore reinstated here as a distinct species.

3. **Codonoboea albomarginata** (Hemsl.) Kiew, *comb. nov.*


4. **Codonoboea alternans** (Ridl.) Kiew, *comb. nov.*


*Note:* Among the syntypes, this specimen is selected because it is deposited in more than one herbarium.

5. **Codonoboea anthonyi** (Kiew) C.L.Lim, *comb. nov.*


6. **Codonoboea ascendens** (Ridl.) C.L.Lim, *comb. nov.*

7. **Codonoboea atrosanguinea** (Ridl.) C.L.Lim, *comb. nov.*

8. **Codonoboea bombycina** (Ridl.) C.L.Lim, *comb. nov.*

9. **Codonoboea breviflora** (Ridl.) Kiew, *comb. nov.*

10. **Codonoboea caelestis** Ridl.

11. **Codonoboea calcarea** (Ridl.) Kiew, *comb. nov.*

12. **Codonoboea castaneifolia** (Ridl.) Kiew, *comb. nov.*

13. **Codonoboea codonion** (Kiew) C.L.Lim, *comb. nov.*
14. *Codonoboea corneri* (Kiew) Kiew, **comb. nov.**
**Basionym:** *Didymocarpus corneri* Kiew. Blumea 35 (1990) 172, figs. 2 & 4.

15. *Codonoboea craspedodroma* (Kiew) Kiew, **comb. nov.**

16. *Codonoboea crinita* (Jack) C.L.Lim, **comb. nov.**

*Codonoboea crinita* var. *elongata* (Ridl.) C.L.Lim, **comb. nov.**

**Note:** *Codonoboea crinita* is one of the most variable species in Peninsular Malaysia and a detailed study is required to understand the variation within this species and whether sub-specific taxa can be recognised.

17. *Codonoboea crocea* (Ridl.) C.L.Lim, **comb. nov.**

**Note:** The type is selected because it includes both flowering and fruiting material and is the earlier collection by Ridley himself.

18. *Codonoboea curtissii* (Ridl.) C.L.Lim, **comb. nov.**
[Gunong Semangko Pass], May 1902 (lectotype SING, here designated).


19. **Codonoboea dawsonii** (Kiew) Kiew, *comb. nov.*
   
   **Basionym:** *Didymocarpus dawsonii* Kiew, Malayan Nat. J. 43 (1990) 242.
   

20. **Codonoboea dawnii** (Kiew) Kiew, *comb. nov.*
   
   **Basionym:** *Didymocarpus dawnii* Kiew, Malayan Nat. J. 48 (1995) 201.
   

21. **Codonoboea densifolia** (Ridl.) C.L.Lim, *comb. nov.*
   


   Note: Ridley (1905) cited Kelsall as the collector in the protologue of *Didymocarpus densifolius*, but the specimen records Lake & Kelsall as the collectors.

22. **Codonoboea doryphylla** (B.L.Burtt) C.L.Lim, *comb. nov.*
   

   Note: A search in BM, CBE, E, K and SING failed to locate the type specimen, which was known from a single collection; nor are there other specimens annotated by Ridley. The status of this species at species level is dubious for Ridley (1923) himself drew attention to its close similarity to *C. fasciata*.

24. *Codonoboea falcata* (Kiew) Kiew, **comb. nov.**

25. *Codonoboea fasciata* (Ridl.) C.L. Lim, **comb. nov.**

26. *Codonoboea flavia* (Ridl.) Kiew, **comb. nov.**

**Heterotypic synonyms:** *Stauroygne serrulata* C.B.Clarke, J. Asiatic. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 642; Ridley. Fl. Malay Pen. 2 (1923) 563. SYNTYPES: Wray 1599, Peninsular Malaysia, Perak, Ulu Batang Padang (CAL); Scortechini s.n., sinu loc. (CAL).


**Notes:** 1. *Stauroygne serrulata* was synonymised by Burtt, Notes Roy. Bot. Gard. Edinburgh 36 (1978) 151. We have not seen the Calcutta specimens so are in no position to choose a lectotype.
2. Ridley (1905) distinguished *Didymocarpus flavus* var. *purpurascens* by its purplish stem and broad leaves but examination of the type shows that its leaves are no broader (3.25–4.25 × 2.5–5 cm) than those of the typical variety (7.5–12.5 × 3.5–5 cm). In species of *Codonoboea*, the presence or absence of purple coloration of the stem and leaves often varies between populations of the same species so is not a good taxonomic character. For these reasons and the fact that it does not differ in other characters, this variety is reduced to synonymy.
27. **Codonoboea flavescens** (Ridl.) Kiew, *comb. nov.*  

28. **Codonoboea flavobrunnea** (Ridl.) Kiew, *comb. nov.*  

29. **Codonoboea floribunda** (M.R.Hend.) C.L.Lim, *comb. nov.*  

30. **Codonoboea geitleri** (A.Weber) C.L.Lim, *comb. nov.*  

31. **Codonoboea glabrata** (Ridl.) Kiew, *comb. nov.*  

*Note:* The Singapore sheet is chosen as the lectotype because the K sheet is a portion of the Singapore one.

32. **Codonoboea grandifolia** (Ridl.) Kiew, *comb. nov.*  
**Basionym:** *Paraboea grandifolia* (Ridl.) Ridl., Fl. Malay Pen. 2 (1923) 531. **Synonyms:** *Didymocarpus grandifolius* Ridl., J. Linn. Soc. Bot. 38 (1908) 318 non *Didymocarpus grandifolius* (A.Dietr.) F.G.Dietr. (1834). – *Didymocarpus*

33. **Codonoboea heterophylla** (Ridl.) C.L. Lim, **comb. nov.**

Note: King’s Coll. 715 is selected as the lectotype because of confusion with the numbering of King’s Coll. 2529 in Ridley (1905) and 2829 in Vitek et al. (2000), which has not been relocated to verify the correct number.

34. **Codonoboea hirsuta** (Ridl.) C.L. Lim, **comb. nov.**

35. **Codonoboea hirta** (Ridl.) Kiew, **comb. nov.**

Notes: 1. Ridley (1905) originally described Didymocarpus hirtus from material without flowers but later (Ridley 1923) described the corolla as ‘nearly 1 in. long’, compared with P. campanulata that he described with corollas ‘half an inch long’. Apart from corolla length, specimens of these two taxa share the same habit, leaf arrangement and morphology. Weber & Burtt (1998) are correct in suggesting that ‘this is probably no more than an abnormal specimen of Henckelia with a very short corolla’. It is here reduced to synonymy.
based on Ridley’s description suggested that it belonged to Henckelia hirta. Based on examination of the type, Rafidah (2010) confirmed that Chirita uniflora is a synonym of Codonoboea hirta.

36. **Codonoboea hispida** (Ridl.) Kiew, *comb. nov.*  
**Staurogyne macrantha** C.B.Clarke, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 74 (1908) 642; Ridley, Fl. Malay Pen. 2 (1923) 563. **TYPE:** King’s Coll. 2417. Peninsular Malaysia, Perak, Larut (holotype CAL n.v.).

**Notes:** 1. *Didymocarpus hispidus* var. *selangorensis* is no more than a white-flowered form of the typical one that has purple stipes on the lower lobes. It is therefore here reduced to synonymy.  
2. Weber & Burtt (1998) were correct in treating *Didymocarpus albinellus* as a synonym. It just represents smaller-leaved plants, perhaps the result of growing in more exposed conditions.  

37. **Codonoboea holttumii** (M.R.Hend.) C.L.Lim, *comb. nov.*  

**Note:** The SING specimen is selected because Henderson was carrying out research there. In addition, the specimen at K has not been relocated.

38. **Codonoboea inaequalis** (Ridl.) Kiew, *comb. nov.*  

39. **Codonoboea kelantanensis** (Kiew) Kiew, **comb. nov.**

**Notes**: Ridley was carrying out research in Singapore when he described this species. Therefore, the SING specimen is selected as lectotype.

40. **Codonoboea johorica** (Ridl.) Kiew, **comb. nov.**

41. **Codonoboea lancifolia** (M.R.Hend.) C.L.Lim, **comb. nov.**

42. **Codonoboea leiophylla** (Kiew) C.L.Lim, **comb. nov.**

43. **Codonoboea leucantha** (Kiew) Kiew, **comb. nov.**

44. **Codonoboea leucocodon** (Ridl.) Ridl.

45. **Codonoboea lilacina** (Ridl.) Ridl.

46. **Codonoboea longipes** (C.B.Clarke) Kiew. **comb. nov.**


**Notes:** Among the syntypes, Maingay 2723 is selected because it is a flowering specimen and the sheet includes a description of the dissected flower. Early collectors approached Gunung Ledang from Malacca town but in fact Gunung Ledang lies within the state of Johor.

47. **Codonoboea malayana** (Hook.f.) Kiew. **comb. nov.**


**Heterotypic synonym:** Didymocarpus malayanus Hook.f. var. fasciatus Ridl.. Fl. Malay Pen. 2 (1923) 514. **syn. nov.** **TYPE:** Robinson s.n. Peninsular Malaysia. Perak. Gunung Korbau [Kerbau], 16 Mar 1913 (lectotype K, here designated).

**Notes:** Among the three specimens in the type folder at K. Robinson s.n. is selected because it is annotated as var. fasciatus in Ridley’s hand and its leaves are conspicuously fasciate even in the dried state. However, whether the leaves have the broad pale grey band along the midrib varies between and within populations so cannot be used as a taxonomic character. In addition, the plate of Didymocarpus malayanus in Botanical Magazine shows the leaves to be clearly fasciate. **Codonoboea malayana** is a widespread and variable species so the distinction between a ‘round-leaved form’ of var. fasciatus versus the typical variety with leaves ‘ovate blunt or rounded. ... sometimes lanceolate acute’ does not support it as a distinct taxon. For these reasons this variety is reduced to synonymy.

**Codonoboea malayana** (Hook.f.) Kiew var. winkleri (Ridl.) Kiew. **comb. & stat. nov.**

**Basionym:** Didymocarpus winkleri Ridl.. J. Straits Branch Roy. Asiat. Soc. 50 (1908) 123. Fl. Malay Pen. 2 (1923) 515; Lim et al., Malay Nat. J. 61 (2009)
178. fig. 3. TYPE: Winkler 1791, Peninsular Malaysia, Negeri Sembilan, Gunung Angsi, 2 Apr 1908 (lectotype SING, here designated, isolectotype BM).

**Notes:** Weber & Burtt (1998) followed by Vittek et al. (2000) reduced *Didymocarpus winkleri* to synonymy with *D. malayanus* without giving any reason for their decision. Apart from its pure white flowers, var. *winkleri* is distinct from var. *malayanus* in its erect habit and floriferous inflorescences with about 10 flowers.

48. **Codonoboea marginata** (C.B.Clarke) C.L.Lim, *comb. nov.*


**Notes:** 1. There are two sheets of *Lobb* 184, one annotated ‘Malacca’, the other ‘Luzon’, which is crossed out and replaced by ‘Malacca’. No doubt both were collected in the Malacca area, probably from Gunung Ledang (Mt. Ophir), which is actually in Johor. This ‘Luzon’ specimen is selected as the lectotype because it has both flowers and fruits (the other specimen has only fruits).

2. It is likely that when Ridley was working on his Flora at Kew, he had the opportunity to examine the Lobbs specimens of *Didymocarpus marginatus* because in Ridley (1923) he treated his *D. ophirensis* as a synonym.

49. **Codonoboea miniata** (Kiew) C.L.Lim, *comb. nov.*


50. **Codonoboea modesta** (Ridl.) Kiew, *comb. nov.*


51. **Codonoboea nitida** (Kiew & A.Weber) Kiew, *comb. nov.*

52. *Codonoboea nivea* Kiew

53. *Codonoboea parviflora* (Ridl.) Kiew. **comb. nov.**

54. *Codonoboea pauziana* (Kiew) Kiew. **comb. nov.**

55. *Codonoboea pectinata* (Oliv.) Kiew. **comb. nov.**

**Notes:** The type collection is recorded from limestone rocks. Unfortunately, the locality of this Perak plant is not recorded, so it is not possible to confirm whether this is correct. So far in Peninsular Malaysia no *Codonoboea* species is recorded from limestone and in Selangor *C. pectinata* grows on granite rocks. The Kiew specimen is selected as the lectotype because the sheet includes a description of the species and a rough flower dissection.

56. *Codonoboea platypus* (C.B.Clarke) C.L.Lim, **comb. nov.**

**Notes:** Griffith 3825 is chosen as the lectotype because among the syntypes it is the only specimen with both flowers and fruits and which shows both the upper and lower leaf surfaces.
57. **Codonoboea polyanthoides** (Kiew) C.L.Lim. *comb. nov.*


58. **Codonoboea primulina** (Ridl.) Kiew. *comb. nov.*


59. **Codonoboea pulchella** (Ridl.) C.L.Lim. *comb. nov.*


60. **Codonoboea pumila** (Ridl.) C.L.Lim. *comb. nov.*


*Note:* Weber in Weber & Burtt (1998) re-named this species *Henckelia nana* because another species was already named *H. pumila*. Since ‘pumila’ has not been used in *Codonoboea*, the original specific name is retained for this species.

61. **Codonoboea puncticulata** (Ridl.) C.L.Lim. *comb. nov.*


*Notes:* *Didymocarpus perditus* was described from Singapore where Ridley (1905) discovered two plants in 1889. However, by 1905 he described the locality as destroyed by cultivation and thought the species probably extinct. Kiew (1987)
showed that it is conspecific with *Codonoboea puncticulata* from Peninsular Malaysia. It has never been collected again from Singapore so is certainly extinct there.


63. *Codonoboea quinquevulnera* (Ridl.) C.L.Lim, *comb. nov.*


64. *Codonoboea ramosa* (Ridl.) Kiew, *comb. nov.*


65. *Codonoboea reptans* (Jack) C.L.Lim, *comb. nov.*


**Notes:** *Codonoboea reptans* is a very variable species with wide ecological amplitude from the lowlands to mountains. The neotype is selected because it was also collected from the type locality in Pulau Pinang.

Only var. *monticola* is distinct from other subspecific taxa of *C. reptans* by its much narrower leaves. Whether var. *modesta* and var. *violascens* are distinct from the typical variety needs more field observations of variation between and within populations.

*Codonoboea reptans* var. *modesta* (Ridl.) C.L.Lim, *comb. nov.*

82 (1920) 186. **nom. illeg.**, non *D. modestus* Redl. (1915). **TYPE:** *Ridley s.n.*. Peninsular Malaysia, Selangor, Ulu Gombak (lectotype K, here designated).

**Note:** Ridley’s specimen is selected as lectotype because it includes a brief description and drawing of the flower.

**Codonoboea reptans** var. *monticola* (Ridl.) C.L.Lim, **comb. nov.**


**Note:** Among the specimens that Ridley cited, this specimen is selected as the lectotype because Ridley (1905) singled out the Larut Hills population as typical of this variety.

**Codonoboea reptans** var. *violascens* (Ridl.) C.L.Lim, **comb. nov.**


66. **Codonoboea ridleyana** (B.L.Burtt) Kiew, **comb. nov.**


**Notes.** 1. For reasons that are not at all clear, Weber considered *Didymocarpus ridleyanus* B.L.Burtt as an illegitimate name and on transferring this species to *Henckelia* recorded it as *H. ridleyana* A.Weber **nom. nov.** However, *Didymocarpus grandiflorus* (Wall.) A.Dietr. ex Steud. is a legitimate name based on *Chirita grandiflora* Wall. Correctly, Weber’s combination should have been *Henckelia ridleyana* (B.L.Burtt) A.Weber.

2. Although reported to be in K (Kiew 1989, Vitek et al. 2000), no specimens of this species could be located in the collection in a recent (2010) search. Nor are there any at SING.

67. **Codonoboea robinsonii** (Ridl.) Kiew, **comb. nov.**


68. Codonoboea rubiginosa (Ridl.) C.L.Lim. *comb. nov.*

69. Codonoboea rugosa (Ridl.) C.L.Lim. *comb. nov.*

70. Codonoboea salicina (Ridl.) C.L.Lim. *comb. nov.*

71. Codonoboea salicinoides (Kiew) C.L.Lim. *comb. nov.*

72. Codonoboea serratifolia (Ridl.) Kiew. *comb. nov.*

73. **Codonoboea soldanella** (Ridl.) C.L.Lim, *comb. nov.*

74. **Codonoboea stolonifera** (Kiew) Kiew, *comb. nov.*

75. **Codonoboea tiumanica** (Ridl.) C.L.Lim, *comb. nov.*

76. **Codonoboea urticoides** (A.Weber) Kiew, *comb. nov.*

   **Notes:** Its smaller stature and two-flowered inflorescences with larger flowers place this species in Codonoboea rather than Didymocarpus. Neither Weber (1998) nor Vittek et al. (2000) typified this species, although Vittek et al. cited both syntypes as being at K. However, a search there and at SING could not locate either of the syntypes nor any other specimens annotated as this species. Therefore it is not possible either to lectotypify or neotypify this species.

77. **Codonoboea venusta** (Ridl.) Kiew, *comb. nov.*
   **Heterotypic synonyms:** Paraboea pnibiflora Ridl., J. Fed. Malay States Mus. 4

Note: Didymocarpus pubiflorus was reduced to synonymy by Kiew (1995).

78. Codonoboea viscosa (Ridl.) Kiew, comb. nov.

79. Codonoboea yongii (Kiew) C.L.Lim, comb. nov.

Name of uncertain status


Notes: In the original description. Ridley (1905) noted that the species was known from ‘a single incomplete specimen’ that had no number or locality. It was presumably without fruits because no description of them was provided. He noted that it was allied to P. cordifolia, which unfortunately is an error because there is no species of this name. Among the species he described under Paraboea, from the description P. scortechinii is most similar to P. cordata (A.DC.) Ridl. so it is likely that he intended P. cordata when he wrote P. cordifolia. In 1923, Ridley again recorded it as ‘very little known’ and no further specimens were cited.

Burtt (1971) transferred all the short-flowered species in Ridley’s Paraboea sect. Campamllatae that included P. scortechinii to Didymocarpus stating ‘although it has not been possible to confirm the botanical validity of every species, it seems desirable to provide names in Didymocarpus if they are not already available’. He did not cite a type so it is not clear whether he had seen any specimens of this species.

However, since then Didymocarpus has been redefined (Weber & Burtt 1983) to include species with fruits that split along both sutures (among other characters) while those that split only on the upper side were included in Henckelia. Didymocarpus cordatus A.DC. remained in Didymocarpus. Weber
& Burtt (1998) transferred D. scortechinii to Henckelia without comment. Vitek et al. (2000) did not locate the type nor did our search, nor have specimens subsequently been collected that have been identified as this species.

From the description, P. scortechinii is in fact more similar to D. cordatus in leaf shape, in its branched panicles and half-inch long flowers, than it is to the other short-flowered campanulate species transferred first to Didymocarpus and then to Henckelia and now to Codonoboea. However, without the fruit the affinity of this species to either Didymocarpus or Codonoboea cannot be resolved. Its half-inch long campanulate flower excludes it from belonging to Paraboea as now redefined by Burtt (1984). Species of Paraboea in Peninsular Malaysia are restricted to limestone but without locality data the habitat of this species remains unknown. For all these reasons Paraboea scortechinii is listed here as a dubious name.

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References


Studies on Homalomeneae (Araceae) of Peninsular Malaysia II: An historical and taxonomic review of the genus *Homalomena* (excluding *Chamaecladon*)

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ABSTRACT. An historical and taxonomic review of *Homalomena* (excluding species assigned to the Chamaecladon Supergroup *sensu* Boyce & Wong) for Peninsular Malaysia is presented. Five species are recognised of which one, *H. truncata* (Schott) Hook.f., represents a new species record for the Peninsula. Keys to the Peninsular Malaysian Supergroups and species, and a taxonomic conspectus, are provided. Three species are illustrated from living plants, and *H. wallichii* from the type specimen.

**Keywords.** Araceae. *Homalomena*. Supergroup. Peninsular Malaysia

**Introduction**

Recent publications on Asian *Homalomena* have focussed on Papuasia (Hay 1999, Herscovitch & Hay 2003) and East Sunda (Hay & Herscovitch 2002; Boyce & Wong 2008, 2009; Boyce, Wong & Fasihuddin 2010). Until recently, apart from *ad hoc* descriptions of new taxa (Bahraruddin & Boyce 2005, 2009), little attention has been paid to the genus in Peninsular Malaysia. Apart from Ridley’s adequate but now outdated account (1925), the only complete review is that of Furtado (1939), an account marred not least by poor and often confused species’ delimitation.

Hay (1999) provided a concise taxonomic and nomenclatural historical review of *Homalomena* in Papuasia. More recently, Boyce & Wong (2008) and Ng et al. (in press) proposed and elaborated informal Supergroups and species complexes as a tool to aid taxonomic study of this speciose and taxonomically ill-understood genus.

This is a precursory account intended to provide a taxonomically and nomenclaturally stable framework for the Peninsular Malaysian *Homalomena* species belonging to the Homalomena and Cyrtocladon Supergroups (*sensu* Boyce & Wong 2008). From this platform it is intended to tackle the taxonomy of the numerous undescribed Peninsular Malaysian species. Species assigned to the Chamaecladon Supergroup (*sensu* Boyce & Wong 2008), which account for the majority of the described species in the Peninsula, present considerable taxonomic and nomenclatural problems and will be the focus of a future study.
History of the genus in Peninsular Malaysia

The first *Homalomena* species pertinent to Peninsular Malaysia appeared in No.1 of Jack’s *Descriptions of Malayan Plants* (Jack 1820) as *Calla angustifolia* Jack and *C. humilis* Jack. Both are now treated as synonyms of *Homalomena humilis* (Jack) Hook.f. (Chamaecladon Supergroup – see Boyce & Wong 2008) and fall outside the scope of this paper.

Griffith (1851a) posthumously established new four species, three in *Homalomena*, and one in a new genus, *Cyrtocladon* Griff. (see also Griffith 1851b). Two of Griffith’s *Homalomena* species (*H. minor* Griff. and *H. major* Griff.), were based upon incomplete material from the same locality (Pulau Besar, Melaka), and since publication have been treated as, and here remain, doubtful. Griffith’s third species, *H. rostrata* Griff., with which *Cyrtocladon sanguinolentum* Griff. is conspecific, is a highly variable colonial helophyte widespread in Sunda and with an extensive synonymy. It has been treated in an account of helophytic *Homalomena* (Wong, Boyce & Fasihuddin 2011).

Schott (1856) recognised nine species for *Homalomena*, with only those described by Griffith listed for the Peninsula. Schott retained Griffith’s *Cyrtocladon*, but made no mention of the species assigned by Jack to *Calla*.

Schott (1860) recognized 12 species for *Homalomena*, and a further nine in *Chamaecladon*, which he treated as a genus, and no longer accepted *Cyrtocladon*. He listed four *Homalomena* species for the Peninsula, viz. Griffith’s three species (*H. major*, *H. minor*, *H. rostrata*), and added *H. wallichii* Schott, which he had described from Pinang the previous year (Schott 1859).

Engler (1879) recognized 17 species for *Homalomena*, but made no increase to the number, nor altered the status of species in the Peninsula from that of Schott (1860). Engler treated *Chamaecladon* as a genus, with 13 species.

Hooker (1893) increased to 23 the number of species in *Homalomena*, with 17 recorded for the Peninsula and Singapore, of which 12 are in *Chamaecladon*, treated as a section. Of the other five species, Hooker erroneously considered Javan *H. coerulescens* Jungh. ex Schott to be present in the Peninsula and within it included *H. major*, *H. minor*, and *H. wallichii* as synonyms. Notwithstanding that *H. minor* and *H. major* (Griffith 1851) have priority over *H. coerulescens* (Schott 1856), virtually all material determined as *H. coerulescens* by Hooker represents novel taxa. The remaining species comprise *H. paludosa* Hook.f., *H. rostrata*, and *H. sagittifolia*, now treated as conspecific (= *H. rostrata*), and Peninsular Malaysian and southern Thai *H. pontederiifolia* Griff. ex Hook.f.

Ridley’s precursory accounts for the Peninsula (Ridley 1902, 1907) listed 21 species with 17, including *H. mixta* Ridl. (= *Furtadoa mixta* (Ridl.) M.Hotta – see Hotta 1985), treated as belonging to sect. *Chamaecladon*. The taxonomy of Ridley’s 1907 treatment follows that of Hooker (1893) with the exceptions that *H. propinqua* Schott was added to the synonymy of *H. sagittifolia*, and *H. pontederiifolia* is treated as a synonym of *H. coerulescens*. Ridley (1907) made no mention of *H. ridleyana* Engl. (Engler 1907), having presumably not yet seen the publication.

Engler (1912) remains the only complete revision of *Homalomena* to date. He recognised 80 species, of which 37 are in sect. *Chamaecladon*. Excluding those assigned to *Chamaecladon*, only six species are recorded for Peninsular Malaysia. One new species, *H. curvata* Engl., is added but otherwise the account generally follows
those of Hooker (1893) and Ridley (1907) in listing \textit{H. coerulescens} (including \textit{H. major}, \textit{H. minor}, and \textit{H. wallichii} as synonyms), and maintaining \textit{H. paludosa}, \textit{H. rostrata}, and \textit{H. sagittifolia} as distinct species. Engler resurrected \textit{H. pontederiifolia}, and treated \textit{H. ridlevana} as a synonym of \textit{H. paludosa}.

Ridley (1925) treated 24 species, with 20 species in sect. \textit{Chamaecladon}. The taxonomy is otherwise as that of Engler (1912) with the exception that Ridley reduced \textit{H. curvata} to \textit{H. coerulescens}, and combined \textit{H. pontederiifolia} as a variety of \textit{H. coerulescens}. \textit{Homalomena deltoidea} Hook.f. (= \textit{H. griffithii} (Schott) Hook.f.) is misplaced in sect. \textit{Homalomena} (\textit{Eu-Homalomena}).

Furtado (1939) recognized 58 species, of which 35 were placed in sect. \textit{Chamaecladon}, four in \textit{Homalomena} (\textit{Eu-Homalomena}), and 18 in \textit{Cyrtocladon}, newly treated as a section. Excluding those assigned to \textit{Chamaecladon}, Furtado listed four species for the Peninsula, of which three (\textit{H. propinqua}, \textit{H. rostrata}, and \textit{H. sagittifolia}) are now treated as a single species: \textit{H. rostrata}. Furtado attempted to update Ridley (1925) and Engler (1912), in particular to deal with confusion surrounding early names published for what is now Indonesia, but in fact his account created more confusion than it resolved. The biggest problem is Furtado’s hopelessly muddled treatment of Javan \textit{H. rubra} Hassk., a species absent from the Peninsula, but into which Furtado subsumed five Peninsular taxa: \textit{H. curvata}, \textit{H. major}, \textit{H. minor}, \textit{H. pontederiifolia}, and \textit{H. wallichii}.

\textbf{Conspicuus of Homalomena (excluding the Chamaecladon Supergroup) in Peninsular Malaysia}

\textit{Homalomena curvata} Engl., Pflanzenr., 55(IV.23Da): 53 (1912). TYPE: Malaysia, Melaka. (“Malakka”), Wells Hill, bei Kuala Lumpur (but see below), 50 m, Feb 1906. A. Engler (\textit{Reise nach Java und Brit. Indien}) n.5292 (holo B!). (Fig. 1)

Notes: Engler’s type locality data are confusing. While Wells Hill (modern Bukit Cina) is indeed in Melaka, it lies some 120 km SE of Kuala Lumpur. It is probable that Engler’s labeling led Ridley to not recognise \textit{H. curvata} as a valid species, since Ridley appears to have not seen the type and instead based his decision on his collection (cited by Ridley 1925) of a different species from Weld’s Hill (now renamed Bukit Nanas, adjacent to Bukit Mahkamah), Kuala Lumpur. It seems that Ridley confounded Weld’s Hill, Kuala Lumpur with Wells Hill, Melaka. Ironically, Ridley’s Weld’s Hill collection almost certainly represents an undescribed species. However, the material is both inadequate and in a poor state of preservation, and thus unsuitable from which to prepare a description.

A good portion of Bukit Nanas is in the Bukit Nanas Forest Reserve where some degree of natural vegetation still exists. This is the same hill as St John’s Institution, Bukit Nanas Convent, and the imposing KL Tower. On the other hand, the present Bukit Mahkamah used to be called Court Hill (Mahkamah = Court) because the former High Court Building was situated there (precursor to the Menara Maybank). There remains a possibility Ridley’s unnamed taxon may have persisted. Bukit Nanas and Bukit Mahkamah are on opposite sides of a road that used to be called Weld Road (now Jalan Raja Chulan).
An alternative interpretation is that Engler only wrote "Malakka" because there was no real country called Malaysia then, and he was in fact referring to Weld's Hill near Kuala Lumpur (and then misspelling that as 'Wells Hill'). If that were the case, the locality formerly called Weld's Hill (now Bukit Nanas) used to accommodate at least two *Homalomena* spp., not impossible by lowland humid forest and *Homalomena* standards. Possible corroboration from Melaka and Bukit Nanas material may become available.

That no one after Engler recognised *H. curvata* as a distinct species is remarkable. Critical examination of the holotype (B), and the first author's recent new collections from the Jerantut Krau Wildlife Centre, Pahang (Ng AR-3052 & Ng AR-3053) leave us in no doubt that the conspicuous striate pellucid secretory canals running parallel to the primary lateral veins on the abaxial side of the leaf blade make *H. curvata* a species wholly distinct from any other yet described in Peninsular Malaysia.

*Homalomena curvata* appears to be an outlying representative of a species complex otherwise centred on N. Borneo, and from where at least a dozen species, in the main associated with limestone, await description.

**Homalomena pontederiifolia** Griff. ex Hook.f., Fl. Brit. Ind. 6: 533 (1893). LECTOTYPE (selected here): Malaysia, Melaka. Air Panas ('Ayer Punus') – see below. *W. Griffith 5964* (lecto K!). (Fig. 2)

*Notes*: As treated here *Homalomena pontederiifolia* is the commonest of the larger species in Peninsular Malaysia, but paradoxically poorly represented in herbaria, possibly because its large and bulky nature dissuades collection. It is very likely that more extensive collecting and exhaustive study will reveal that the species comprises several distinct taxa.

Hooker cites three syntypes, of which Griffith's collection, here selected as lectotype, is the only one that completely matches the protologue. Griffith's locality ('Ayer Punus') is almost certainly the same as modern Taman Rekreasi Air Panas Jasin, Melaka; the specimen was likely collected not long before Griffith's death from a parasitic liver disease in Melaka in February 1845, shortly before his 35th birthday.

Of the other syntypes cited by Hooker, *D.F.A. Hervey s.n.* (K!), although sterile, represents an undescribed species of the Hanneae Complex (see Ng et al., in press), based on the marcescent margin of the petiolar sheath, and leaf blades with scattered glandular punctuations (the latter admittedly only faintly discernible). *Fr. B. Scortechni s.n.* (CAL! K!) approaches *H. pontederiifolia*, but the inflorescences are only half the typical length for the species and the material is otherwise too depauperate to be unequivocally placed taxonomically.


Fig. 2. *Homalomena pontederifolia* Griff. ex Hook.f. A. Plant in cultivation, ex Johor, Malaysia. B. Inflorescence at female anthesis. C. Inflorescence at female anthesis, spathe artificially removed. Scale bar = 2 cm. D. Detail of staminate flower zone. Note the well-defined flowers each with 4–6 anthers and large synconnectives. E. Detail of pistillate flower zone and lower portion of staminate zone. The lowermost staminate flowers are sterile (staminodes). Note that interpistillar staminodes equal the pistils in length. A–E from Boyce AR-2355. Photo credits: P.C. Boyce.


Homalomena raapii Engl. Pflanzer., IV, 23Da: 73 (1912). LECTOTYPE (see Wong et al., 2011): Indonesia, Sumatera, H. Raap 235 (lecto BO!).


Homalomena sagittifolia var. angustifolia Furtado, Gard. Bull. Straits Settlem. 10: 228 (1939). LECTOTYPE (see Wong et al., 2011): Malaysia, Johore, Mt Austin, H.N. Ridley 12018 (lecto SING! isolecto K!).
Notes: See Wong et al. (2011) for a detailed discussion and illustrations of this species.

**Homalomena truncata** (Schott) Hook.f., Fl. Brit. India 6: 535 (1893). – *Chamaeladon truncatum* Schott, Bonplandia (Hannover) 6: (1858). LECTOTYPE selected here: Myanmar, Mergui, *W. Griffith s.n.* (lecto K!). (Fig. 3)

Notes: Schott (1858) cited no material for *Chamaeladon truncatum*, although the protologue is explicitly prepared from preserved rather than living plants. Schott’s description in the *Prodromus* (Schott 1860) is largely identical to that in Bonplandia, and further cites two specimens, from Mergui and Tenasserim, both extant in Kew (K). That chosen as lectotype is autographed by Schott, and is also the better preserved of the two.

Schott’s placement of *H. truncatum* in *Chamaeladon* is at odds with the morphology of the interpistillar staminodes (exceeding the associated pistils), and the staminate flowers comprising four stamens and synconnectives. It seems likely that Schott regarded the rather small, unconstricted spathe as more pertinent to placement than the finer floral details.

This represents a new record for the Peninsula. *Homalomena truncata* is a common species in the north of Peninsular Malaysia occurring in subhumid to humid forest, often, but not exclusively, associated with limestone.

**Homalomena wallichii** Schott, Bonplandia (Hannover) 7(3): 30 (1859). TYPE: Malaysia, Pulau Pinang, Aug 1822, *N. Wallich EIC 8951* (holo K-W!). (Fig. 4)

Notes: Much as with *H. curvata*, *H. wallichii* was reduced to synonymy virtually the moment it was published, and as with *H. curvata* one can only speculate as to how such a distinctive species could have been so treated. The habit of the sterile plant – with long-petiolate pendent leaf blades (leaf tip directed downwards) recalls that of an *Alocasia* – while fertile plants are unmistakable by the exceptionally long peduncle, with the inflorescence often equalling the preceding petiole. *Homalomena wallichii* is very uncommon in the wild, and furthermore appears to be restricted to a very small area of Pinang, fortunately within the Taman Negara Pulau Pinang (“Muka Head N.P.”)

**Inadequately known species**


Notes: These collections are almost certainly the same species, but the material is inadequate, seemingly preserved late in anthesis (thus many important floral characters probably already lost) and now too fragile to enable dissection to assign them to any known plant. A further problem is that Pulau Besar is now much degraded, although
Historical and taxonomic review of *Homalomena*

Fig. 3. *Homalomena truncata* (Schott) Hook.f., A. Plant in cultivation, ex Kedah, Malaysia. B. Emerging inflorescences. C. Inflorescence at female anthesis, spathe artificially removed. Scale bar = 1 cm. D. Detail of staminate flower zone. Note the well-defined flowers each with 4 anthers and small synconnectives. E. Detail of pistillate flower zone and lower portion of staminate zone. The lowermost staminate flowers are sterile (staminodes). Note that interpistillar staminodes subequal the pistils in length. A–E from Boyce AR-2354. Photo credits: P.C. Boyce.
Fig. 4. *Homalomena wallichii* Schott. Holotype, K-W. Photo credit: The Trustees, Royal Botanic Gardens, Kew. Used with permission.
Historical and taxonomic review of Homalomena

287

certainly an attempt to re-collect at the site must be attempted before these names are relegated to "nomina obscura".

Key 1. Peninsular Malaysian Homalomena Supergroups

1a. Spatha at most 1.5 cm long, often much less, without a constriction. Staminate flowers each comprising 2–3 stamens not united by a common connective. Interpistillar staminodes shorter than the pistils. (Mostly small plants and often rheophytic.) ................................................................. Chamaecladon Supergroup

1b. Spatha more than 2.5 cm long, often much longer, with or without a constriction. Staminate flowers each comprising 3–4 (rarely 5–6, very rarely 1) stamens united by a conspicuous common connective. Interpistillar staminodes equaling or slightly exceeding the pistils. (Mostly medium to large plants and in the Peninsula wholly mesophytic.) ................................................................. 2

2a. Spatha not divided into a lower and upper portion by a constriction. Inflorescence movement during anthesis comprising simple gaping and closing of the spathe limb, with virtually no spadix movement ................................................................. Homalomena Supergroup (see Key 2)

2b. Spatha divided by a moderate to pronounced constriction into a well-defined upper (limb) and a lower portion. Inflorescences during anthesis with complex spathe and spadix movements and often spadix elongation ................................................................. Cyrtocladon Supergroup (see Key 3)

Key 2. Peninsular Malaysian Homalomena

1a. Flowering plants large, often exceeding 1 m tall. Spatha 8–14 cm long; spadix 7–13 cm long ................................................................. H. pontederiifolia

1b. Flowering plants of medium size, seldom exceeding 40 cm tall. Spatha 4–6 cm long; spadix 5–6.5 cm long ................................................................. 2

2a. Leaf blade abaxially with conspicuous striate pellucid secretory canals running parallel to the primary lateral veins. (S Peninsula as far north as S Pahang.) ...... ................................................................. H. curvata

2b. Leaf blade abaxially without striate pellucid secretory canals. (Kedah, Perlis.) ...... ................................................................. H. truncata

Key 3. Peninsular Malaysian Cyrtocladon

1a. Colonial helophytes, almost always in peatswamp or the wet facies of kerangas (kerapah) forest and always in inundated situations .................................................. H. rostrata

1b. Solitary to clumping forest mesophytes in moist well-drained situations in lowland perhumid mixed dipterocarp forest .................................................. (numerous sp. nov.)
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References


Historical and taxonomic review of Homalomena


**Pycnospatha** (Araceae: Lasioideae), a new generic record for the flora of Cambodia and Vietnam

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**ABSTRACT.** *Pycnospatha arietina* Gagnep. (Araceae–Lasioideae) is recorded as a new species and genus record for Cambodia and Vietnam. An updated species description and a key to both species of *Pycnospatha* are provided. The Cambodian plant is figured.

**Keywords.** Araceae, Cambodia, Laos, Lasioideae, *Pycnospatha*, *Pycnospatha arietina*, Vietnam

**Introduction**

The first author has for over 15 years been undertaking Araceae-related fieldwork in Vietnam and following easing of access, more recently in Cambodia and Lao. In 2007, during fieldwork in the Peah Ream National Park, Sihanouk Ville, Cambodia, material was collected of *Pycnospatha arietina* Gagnep. (Araceae–Lasioideae), representing a new genus and species record for Cambodia. This new Cambodian collection locality is only approximately 30 km N of Phú Quốc island (Vietnam) from where Hồ (1993, 2000) illustrated, as *Amorphophallus sp.*, what is undoubtedly also *P. arietina*. Thus the genus *Pycnospatha*, represented by *P. arietina*, is also present in Vietnam.

*Pycnospatha* comprises two species. The type, *P. palmata* Thorel ex Gagnep. (Gagnepain 1941) was described from Lao P.D.R. based on a collection made by Clovis Thorel during his 1886-1868 Mekong Delta expedition. Although as yet not recollected from Lao, *P. palmata* has more recently been found in NE Thailand (Bogner 2009).

*Pycnospatha arietina* (Gagnepain 1941, 1942) was described from a collection of Phu Phraisurind, the Thai assistant of A.F.G. Kerr, originating from central Thailand, but is now known to be widespread but scattered, and never common, in Central & SE Thailand (see Boyce 1993). Hu (1968) described a third species, *P. soerensenii* S.Y.Hu. differing from *P. arietina* by a less divided leaf blade, an aculeate petiole epidermis, and by having some flowers with a rudimentary ‘perianth’. In his revision Bogner (1973) regarded *P. soerensenii* as a synonym of *P. arietina*, a stand maintained here.
Key to species

1a. Tuber to over 10 cm diam. Leaf to 2.5 m tall: mature leaf blade ‘dracontioid’ (see below), up to 60 × 100 cm. Spathe 9–20 × 3–5 cm; spadix 4–6 × 1–1.5 cm: style to 6 mm. Fruits c. 2 cm diam ................................................. *Pycnospatha arietina*

1b. Tuber c. 2.5 cm diam. Leaf to 50 cm tall: mature leaf blade palmately trilobed. up to 35 × 16 cm. Spathe 3–7 × 1.5–3 cm; spadix 2–3 × c. 0.5 cm; style to 2 mm. Fruits 7–8 mm diam ................................................. *Pycnospatha palmata*


Geophytic, seasonally dormant, tuberous, moderately robust herb with leaves 80 cm–2.5 m tall. Tuber semi-globose, 13–17 cm in diam.. upper surface somewhat irregularly flattened with many roots and numerous cylindrical or globose secondary tubers. *Roots* stout, 3–4 mm in diam. *Adult leaf* usually solitary, rarely two together: petiole 80–200 cm long. c. 2.5 cm diam. at base, subtended by a triangular cataphyll: cataphyll 4–13 × 1–4.5 cm, pale green to whitish, spotted reddish brown; greyish green to white-grey with blackish green to reddish or dark brown mottling and with scattered to rather dense prickles: *petiolar sheath* short, c. 5–7 cm long, closed: adult *leaf blade* dracontiod (elaborated forms of sagittate, hastate or trisect leaves with the anterior and posterior divisions highly dissected and subdivided, with the terminal lobes each with two or more tips: leaf maturation acropetal with the leaf blade exposed from the bud at a very early stage in its expansion), up to 1 m wide. anterior lobe trilobed with the central lobe again bilobed, posterior lobes bilobed with secondary and tertiary lobes irregularly pinnatifid, each terminal lobe with two or sometimes three tips, blade dark green, upper surface glossy often with a slight bluish green sheen. *Peduncle* 1.5–3 cm long, quite stout, c. 13 mm in diam., and oblong in cross-section at base, ivory at base, red-brown above, enveloped by up to 7 cataphylls: *cataphyll* triangular to lanceolate, shortest one 2.5 cm long, 4 cm wide at base. longest one up to 9 cm. and 3.5 cm wide, white at base, upper part dull red-brown outside, pink-red inside, darker at margin. *Spathe* c. 15 cm long in Cambodian material (overall range 9–20 cm long), lower part convoluted into a tube, c. 10 cm long. c. 4.5 cm diam., margins not overlapping, opened. reddish to dark brown, light brown and green yellow at base, with dull stripes, c. 1 cm distant; spathe limb fimbriate, 4.5 cm long, 9 cm wide at apex, 5.5 cm wide at base, apex truncated, acute at tip, dark red-brown with white spots outside, dark brown.
inside. Spadix sessile, conical, c. 4.5 cm long, 2.3 cm diam. at base, covered densely by flowers and fertile to tip. Flowers bisexual, naked, very densely arranged. Stamens 6, 2–3.5 mm long; filaments flat, c. 1 mm long, whitish; anther truncate apically, 2–2.5 mm long, yellow, dehiscing by a longitudinal slit. Gynoecium ovate, 5–7 × c. 0.7 mm.

Fig. 1. Pycnospatha arietina Gagnep. A. Whole plant (the first author holding the plant with Mr Rattana, Cambodian guide); B. Leaf blade, top view; C. Tuber with secondary tubers; D. Inflorescence; E. Spadix; F. Infructescences; G. Fruits, cut to reveal seeds. Photo credits: V.D. Nguyen.
pale grey; style extending far beyond stamens, conical, c. 6 mm long, 1.8 mm wide; stigma discoid, flat. Ovules 2, anatropous. **Infructescence** globose, sometimes short cylindrical, composed of c. 40 berries; **fruits** ovate, c. 1 cm diam., with persistent style at the acuminate apex, spiny, violet-brown outside, white inside, 1 seeded. **Seeds** kidney-shaped, c. 4 mm diam., testa hard, thick, verrucose, brown.

**Distribution:** C, E & SE Thailand, SW Vietnam, S Cambodia.

**Habitat:** Sandy soil in open places in dry semi-evergreen tropical forest, elsewhere (Thailand) in seasonally dry bamboo forest. 90–450 m asl.

**Materials studied:** CAMBODIA: Krong Preah Sihanouk, Peah Ream National Park 10°33'45.6"N 103°39'14.5"E, 20 Nov 2007, Nguyen Van Du et al., CB-VN 103 (HN! K!).


**Conservation:** The plant is not common in Cambodia and its continued survival much depends on local government plans if the place, where the plant occurs is left to unregulated tourist-related or construction programs. Based on IUCN criteria, *P. arietina* is Vulnerable (VU) in Cambodia.

**Cultivation:** In Hanoi *P. arietina* of Cambodian origin grows well in sandy soil in an open position. The tubers need to should be taken up and stored during (Vietnam) winter to prevent them rotting in the cool, wet weather.

**Notes:** Neither Bogner (1973) nor Boyce (1993) mentioned the presence of secondary tubers on the surface of the mother tubers, nor the often globose infructescence.

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**References**


Additional notes on *Maclurochloa montana* (Poaceae: Bambusoideae) in Thailand

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**ABSTRACT.** The bamboo genus, *Maclurochloa* K.M.Wong, hitherto known by a single species from Peninsular Malaysia, *M. montana* (Ridl.) K.M.Wong, is here recorded with certainty for Thailand. Additional details of morphology based on Thai specimens and illustrations are provided.

**Keywords.** Bamboos, *Maclurochloa*, Thailand

**Introduction**

*Maclurochloa* is a genus of bamboo (Poaceae: Bambusoideae: Bambusinae) first established by Wong (1993) and represented by a single species, *M. montana* (Ridl.) K.M.Wong. It is one of several climbing genera recently shown to be distinct from *Bambusa* Schreb. (Wong 1993, 1995, 2005; Goh et al. 2010). *Maclurochloa montana* was previously regarded as endemic to Peninsular Malaysia and recorded in the states of Penang, Kedah, Pahang and Selangor, in lower montane forest at 780–1350 m above sea level (Wong 1993, 1995; Ohrnberger 1999; Goh et al. 2010). It is easy to identify in the field by its leaning-clambering habit, relatively slender culms, and the presence of conspicuous white hairy bands above and below the culm nodes (Fig. 1).

A recent listing of Thai plant names (Forest Herbarium 2001) had mentioned the occurrence in Thailand of this bamboo by its scientific name, but without any specimens cited and without any certain localities indicated. In the Forest Herbarium (BKF), now under the management of the Department of National Parks, Wildlife and Plant Conservation, a single specimen consisting only of scantly flowering material and small leafy branches (*C. Niyomdhamsan et al.* 2329), collected from Nakhon Si Thammarat, was located for study. This was not certainly identified, bearing only an annotation that uses the basionym, "*Bambusa cf. montana*". During a bamboo expedition for the Flora of Thailand Project, specimens of this bamboo (fertile and with all key vegetative parts including culm leaf sheaths) were collected from the Khao Phanom Bencha National Park, Krabi province, in Southern (peninsular) Thailand. From this, it has been possible to identify *Maclurochloa montana* with certainty. This paper confirms the presence of *M. montana* in Thailand, extending the known distribution of this interesting bamboo further north on the Thai-Malay Peninsula.
Fig. 1. Recently documented Thai material of *Machurochloa montana*. A. Habit and habitat; B. Details of the culm node and branch complement. Note the characteristic band of white hair on both sides of the culm node.
Additional information based on the Thai material

A description of the species is given in Wong (1995). In addition to that, we can add the following details:
(1) The culms are 1–3 cm in diameter, with relatively thin walls, 0.2–0.5 cm thick: with internodes 20–50 cm long.
(2) The culm-sheath has a linear-lanceolate blade: fragile crescentic to lobe-like auricles 3–5 mm long and 1–2 mm wide, with pale brown bristles 0.5–1 cm long fringing the margins.
(3) The leaf ligule is a short denticulate to sub-entire rim c. 0.5 mm high, fringed with a few stiff bristles c. 1–2 mm long, or glabrate.
(4) The pseudospikelet prophylls are 2-keeled. c. 1 mm long by 2 mm wide, with ciliate keels: the empty glumes are 5–12-nerved; the rachilla internode between perfect florets is 1–1.5 mm long, whereas the rachilla internode between perfect floret and terminal vestigial floret is usually longer, 2–3 mm long; the lemmas are 10–13-nerved; the paleas are 3–5-nerved between keels and 2–3-nerved between each keel and margin: the terminal vestigial floret(s) is/are represented only by a lemma, as long as or slightly exceeding the more distal floret(s), or represented by a lemma and a much reduced palea: the 3 lodicules are 6–12-nerved. hyaline, ciliate on the margin: the anthers are 3.5–4.5 mm long, yellow, with acute to pointed tips: the caryopsis is 3–4 mm long, bottled-shaped and grooved on one side. (See Fig. 2.)

Fig. 2. Some details of the pseudospikelet and floret of *Maclurochloa montana*. A. Part of flowering branch, showing clusters of pseudospikelets. B. A single pseudospikelet, with prophyll attached basally. C. A dissected pseudospikelet (from left to right: a prophyll; 2 bracts subtending buds, each followed by its bud: 3 empty glumes: a portion of the rachilla: a perfect floret and 2 terminal vestigial florets (the uppermost one enfolded by the lower one). D. 2 glumes (left and centre) and a lemma (right) with a reduced palea. E. Lodicle complement. F. Pistil with 3 stigmas (2 broken). G. A caryopsis. All from C. Rattamanee M234.

Distribution: Southern (peninsular) Thailand (Krabi and Nakhon Si Thammarat provinces) to Peninsular Malaysia.

Ecology: Disturbed open sites adjacent to lower montane forest, dominated by grasses mixed with Melastoma sp. at 1000–1200 m (C. Rattamanee M234) or montane forest 1500 m above sea level (C. Niyomdham et al. 2329).

Vernacular name: Pai Lueai (Thai).

Notes: The phylogenetic relationships among various Southeast Asian climbing bamboo genera, including Machurochloa, and the core Bambusinae genera Bambusa, Dendrocalamus Nees and Gigantochloa Kurz (‘BDG complex’), were investigated by Goh et al. (2010). Their analyses show Machurochloa to be firmly embedded within the BDG complex, and the authors discussed the possibility of a reticulate origin for such taxa although they emphasised the need for more work to clearly demonstrate this.

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References


The nomenclature of *Uvaria velutina* Roxb. ex Blume (Annonaceae)

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ABSTRACT. The nomenclature of *Uvaria velutina* Roxb. ex Blume (Annonaceae) is clarified.

**Keywords.** Annonaceae, *Cananga, Miliusa*, nomenclature, SE Asia, *Trigynaea*, typification, *Uvaria*

**Introduction**

When trying to solve the nomenclature of *Uvaria velutina* Roxb. ex Blume (Annonaceae), a seemingly simple problem turned out to be quite complicated and to involve four species of four different genera: *Cananga odorata* (Lam.) Hook.f. & Thoms., *Guatteria australis* A.St.-Hil., *Miliusa velutina* (DC.) Hook.f. & Thoms., and *Uvaria hirsuta* Jack.

**Uvaria velutina** Roxb. ex Blume

Blume (1825) described a collection from Kuripan, W. Java, Indonesia, as *Uvaria velutina* ? Roxb. Very few names in the Bijdragen have a reference to an earlier publication or author and *Uvaria velutina* is one of the exceptions. From a survey of the first 20 pages it became clear that most of the taxa described there were indeed new and are to be attributed to Blume, but a few taxa had been published previously by e.g. Linnaeus (1753), Dunal (1817), and De Candolle (1817). It is occasionally cited as a synonym in later literature, e.g. as “*Uvaria velutina* Blume non Roxb.” (Hooker f. & Thomson 1855) or as “*Uvaria velutina* Roxb. ex Blume” (Meade & Parnell 2002). In a fairly recent checklist of the Asiatic-Australian species of Annonaceae Keßler et al. (1995: 87) cited *Uvaria velutina* thrice with the authorities as Blume (1825; “Roxb. ex Blume”), Dunal (1817), and Roxb., the last, however, without any further data.

Where had Blume found this name? The Annonaceae had been more or less simultaneously studied by Dunal and De Candolle in 1817. The monograph of the first appeared between August and November and the treatment by the latter in the first half of November. Their descriptions are often nearly the same and references are made by one to the other. In both publications the name *Uvaria velutina* is used, with *Uvaria villosa* Roxb. as synonym, a name found in Roxburgh (1814) for a plant accessed in Calcutta in 1796 from Bengal. Dunal (p. 91) noted for his specimen: “DC. v. s. h. Lamb.”, that is “De Candolle has seen a dried specimen in the Herbarium of Lambert” and at the end of the description “DC. Syst. univ. med.” apparently a provisional
title for what was shortly afterwards to be published as “Regni vegetabilis systema naturale”. There De Candolle referred to “Dunal, Monogr. p. 91”. These citations support the idea that Dunal has the priority, and as he apparently had not seen any specimen himself, his information of the species must have come from De Candolle who had. In 1824 De Candolle himself attributed the combination to Dunal, and cited his own work as a literature reference. I think the correct citation should be *Uvaria velutina* DC. in Dunal.

The provenance was given as India orientalis.

It is known that Lambert had received “several thousands of species” directly or indirectly from Roxburgh between 1796 and 1810. The specimen that De Candolle had seen must have been one of these and presumably would now be in G (Miller, 1970). However, it was not included in the IDC microfiche set of the specimens used for the Prodromus (1824; G-DC) and Dr. P.J.M. Maas (WAG) told me that he had never seen a Lambert Annonaceae in G, but had so in BM.

There is no *Uvaria velutina* in Roxburgh’s survey of the plants growing in the Calcutta Botanic Garden (1814: 43; 94), and the names listed in it are rarely provided with a diagnosis or a reference to one. *Uvaria villosa* Roxb. is mentioned but all that was said was that the plant had been obtained in 1796 from Bengal. A validating description was published posthumously in 1832. So this could not have been used by Blume to identify his specimen and as a source of the epithet.

It seems to me that *Uvaria velutina* Roxb. ex Blume is an etymological hybrid between *Uvaria velutina* (Dunal) and *Uvaria villosa* Roxb. and was not intended as a “new” species.

In his introduction Blume (1825) complained about the scarcity of scientific literature in faraway Buitenzorg (Bogor, Java). In view of the rarity of Dunal’s paper, it seems more likely that Blume had access to either De Candolle (1817) or (1824). However, in his lengthy paper of 1830 after his return to Europe he cited all three.

Apparently Blume soon realised this misapplication, for in 1830 (p. 31) he corrected the authorship to Dunal and cited “*U. villosa* Roxb. mss”. He stated that the name had been applied to a plant from Bengal, which clearly is a reference to Roxburgh (1814). He seems to have been the first after the latter to have given this provenance; the references he cited all stated “India orientalis”. Curiously, he retained the name for a fragmentary collection by Reinwardt consisting of a branch and some leaves, either from Java or the Moluccas (L shr. 898.63--533). By the way, from this it can be observed that Blume used the Rijnland inch (2.616 cm), although in 1809 that had officially been decreed to be 1 cm long.

Miquel (1858) regarded the Reinwardt specimen as belonging to *Cananga odorata* (Lam.) Hook.f. & Thoms., yet in 1865 described it as new, *Uvaria subcordata*. The first identification was supported by Boerlage in 1899 on the label of the isotype in BO (two leaves and a satchel with the rather typical shrivelled young branch tips). The name was cited but the sheet not labelled by Koorders & Valeton (1903) when they proposed the combination *Canangium odoratum* var. *velutinum* [Blume] Koord. & Valeton. (The square brackets here are used to indicate that there is something “wrong” with the basionym. This useful method of citation was deleted from the ICBN after 1972). It was confirmed again by Turner who saw the specimen in 2008 (pers. comm.), and also by Keßler on the holotype in L (det. slip, 2000).

Blume (1830: 22, t. 5) described and depicted his “own” *Uvaria velutina* from Kuripan as *Uvaria hirsuta*. 
However, confusion still reigned, for unknown to him there was already a *Uvaria hirsuta* by Jack (1820) and another by Vellozo (1829). Later authors have regarded Jack’s and Blume’s names as taxonomic synonyms, e.g. Wallich (1832) (followed by Steudel, 1841), Hooker f. & Thomson (1855; 1872), Miquel (1858), Sinclair (1955), and Backer & Bakhuizen f. (1964). Jack’s name was neotypified by Meade & Parnell (2002), who did include “*Uvaria velutina* Roxb. ex Blume”, but not Blume’s use of *Uvaria hirsuta* for it. They thought that the Blume collection would be in BO, but his main set is in L with duplicates in many other institutes (see Van Steenis-Kruseman, 1950), and some have been distributed to BO.

*Guatteria velutina* A.DC. (1832) has been regarded as a new combination based on *Uvaria velutina* DC. by e.g. Hooker f. & Thomson (1855) and Keßler et al. (1995: 30). However, it is clear from his text that A. De Candolle intended this as a new species, as he gave no reference to an earlier publication on which this would be based, but included it in a paragraph entitled “Species Prodromo addenda” (Species that must be added to the Prodromus). He also gave the provenance as Burma, near the Atran River, not Bengal. No mention of the taxon was made under *Uvaria*.

Steudel (1841) proposed *Uvaria blumeana* as a new name for *Uvaria hirsuta* Blume (and of Jack, according to Wallich), and *Uvaria velutina* Blume (non “Dec.”, i.e. DC.), as he erroneously thought that *Uvaria hirsuta* would be a later homonym of “Arrab.”, i.e., Vellozo (1829). *Uvaria hirsuta* Jack and *Uvaria hirsuta* Vell. are earlier, valid and legitimate names though, so he created a superfluous one, applicable to the oldest combination by Jack, although he named it after Blume.

Vellozo’s name is a synonym of *Guatteria australis* A.St.-Hil. (Maas, in litt.), and not of *Trigynaea oblongifolia* Schltdl., as was said by Meade & Parnell (2002).

Meade & Parnell (2002) also thought that the type of *Uvaria trichomanilla* Blume would be a Blume collection in BO, but in fact it is *Kuhl & Van Hasselt 1837* in L. This was seen and identified by Meade himself (det. slip 1/7/2000) as *U. hirsuta* Jack, but no L specimen is accounted for in the Meade & Parnell paper.

Many authors have included *Uvaria pilosa* Roxb. (1832), a name probably based on a plant cultivated in the Calcutta Botanic Garden as a “native of the Moluccas”, where *Uvaria hirsuta* does not occur. This is another example of a mistaken origin by Roxburgh probably caused by his connections with Christopher Smith. The latter used to work as the Superintendent of the Botanic Gardens in the Moluccas in Ambon (1796–1802), and later (1805–1806) with the same rank in Penang, Malay Peninsula. From Penang he sent plants to Roxburgh, who then thought they had come from the Moluccas.

Kurz (1877) has reported *Uvaria hirsuta* from Pegu (Bago), S. Burma, which was copied by later authors, but not by Kress et al. (2003) who instead mentioned Mon and Taninthayi (Tenasserim). Ban (2000) reported it for S Vietnam [Quang Binh (Vinh Linh), Quang Tri (Takhtajan 212, LE), and Da Nang (Tourane: Poilane 8068, HM, P)]. If this species really occurs in Burma and Vietnam, it would be expected to occur in Thailand and Cambodia as well. Meade (2000) did not report on what Kurz had seen, presumably now in CAL. The Vietnam specimens cited by Ban I have not found in his thesis, either.

However, Meade did not include *Uvaria hirsuta* and in Meade & Pennington (2002) stated: “failed to locate a single specimen or reference to a specimen of *Uvaria hirsuta* or its synonyms from north of the Thai-Malay border”. This is confirmed by the experiences of Dr. P. Chalernglin (Bangkok), Mr. J.F. Maxwell (CMU), and Ms. P. Sidisunthorn (BKF).
From these data it would seem that these records are based on misidentifications. In the Malaysian Peninsula the species is widespread but does not seem to reach the Thai / Malay border (Turner 1997), and furthermore occurs in Singapore, Sumatra (Aceh, West), Bangka, and W Java.

**Uvaria hirsuta** Jack


= *Uvaria hirsuta* Jack

**Uvaria subcordata** Miq.


= *Cananga odorata* (Lam.) Hook.f. & Thoms.

**Uvaria velutina** DC.

Guatteria velutina A.DC., Mém. Anon. (1832) 42. TYPE: Burma, Mon. near the Atran River, Wallich Cat. 6441-C (K, holo, IDC microfiche 7394).

= Miliusa velutina (DC.) Hook.f. & Thoms.

ACKNOWLEDGEMENTS. Ms. L.-L. Zhou (HK) kindly informed me about some specimens she had on loan from L. Dr. N.H. Nghia (Forest Science Institute of Vietnam, Hanoi) graciously translated the description by Ban (2000). Mr. A. Sumadijaya searched for specimens in BO. Dr. I.M. Turner (K) is thanked for pointing out the problem and checking out material in BO and K. Dr. P.J.M. Maas (WAG) kindly informed me about the possible location of Lambert collections of Annonaceae in BM, not G. De Candolle’s role in the Dunal paper, and the present identity of Uvaria hirsuta Vell. Ms. P. Sidisunthorn (BFK) and Dr. P. Chalernglin (Thailand Institute of Scientific and Technological Research, Bangkok) advised on the (non-) occurrence of this species in Thailand. Dr. P.J.A. Keßler (L) assisted in a number of minor questions involving this paper.

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Steenisia (Rubiaceae) newly recorded for mainland Asia with a new variety of S. pleurocarpa (Airy Shaw) Bakh.f.

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ABSTRACT. Mussaendopsis malayana T.Yamaz. (Rubiaceae), described based on material from the Malay Peninsula, is a distinct variety of Steenisia pleurocarpa (Airy Shaw) Bakh.f. It represents a new record for mainland Asia of Steenisia Bakh.f., a genus otherwise endemic to Borneo and the Natuna islands. The new combination Steenisia pleurocarpa var. malayana (T.Yamaz.) K.M.Wong is made.

Keywords. Asia, biogeography, Borneo, Malay Peninsula, Mussaendopsis, Rubiaceae, South China Sea, Steenisia, vicariance

Introduction

Mussaendopsis malayana T.Yamaz. (Rubiaceae) was described based on a collection from around 700 m elevation on the west side of Mount Tahan, between Sungai Luis and the summit, in Peninsular Malaysia (Yamazaki 2001). A good photograph of the holotype specimen (Ohba & Miyamoto 90504) and diagnostic drawings of a vegetative node with a stipule, the axillary inflorescences, flowers and fruits were provided with the description. Images of the holotype, an isotype sheet, and two sheets comprising a paratype collection (Ohba & Miyamoto 90292) were made available from the University of Tokyo herbarium (TI).

These collections from Mount Tahan are identifiable with Steenisia pleurocarpa (Airy Shaw) Bakh.f. from northwest Borneo, particularly in the very similar habit (low treelet); leaf form, venation and pubescence; interpetiolar stipules fringed with linear teeth; paired axillary compound-thyrsoid inflorescences: development of an enlarged calyx member (semaphyll) in some post-anthesis flowers and fruits; and septicidally dehiscent fruits with conspicuous ribbing on the outside (Bremer 1984). Yamazaki (2001) diagnosed the stipules in the Tahan material as intrapetiolar but this is clearly in error as revealed in his Fig. 2a and the material he cited.

Mussaendopsis and Steenisia compared

Although Mussaendopsis Baill. also has axillary inflorescences in which some flowers also develop an enlarged calyx member, that genus has many different attributes compared to Steenisia Bakh.f. Table 1 compares the characters of Mussaendopsis and Steenisia.
**Mussaendopsis** is a distinct genus of much taller trees, easily diagnosed by intrapetiolar stipules, glabrous leaves, right-contorted corolla lobes, free anthers in the open flower, and seeds that are winged all around (Bremekamp 1939, Puff & Igersheim 1994). The molecular evidence suggests a placement for **Mussaendopsis** within the tribe Condamineaeae (Alejandro et al. 2005, Bremer 2009). **Steenisia**, on the other hand, is a genus of low treelets and subshrubs (Bremer 1984) with interpetiolar stipules, pubescent leaves, left-contorted (rarely valvate) corolla lobes, connate anthers in the open flower, and unwinged seeds that are or only slightly winged at two ends. There is as yet no indication of the systematic position of **Steenisia** from molecular studies (Bremer 2009), although Bremer (1984) had compared it with the Rondeletiaceae. It is interesting to note that two other genera with connate anthers in the open flower, *Argostenina* Wall. and *Neurocalyx* Hook. f., once accepted in the same tribe as **Steenisia** (Verdecourt 1958), are now placed by molecular inference in the Argostemmataceae and Ophiorrhizaceae, respectively (Bremer & Manen 2000, Robbrecht & Manen 2006, Rydin et al. 2009).

When describing his "*M. malayana*" Yamazaki (2001), however, had stated “this is the fourth species in the genus”. He was apparently unaware that one of the "**Mussaendopsis**" species was transferred to **Greeniopsis** as early as 1909: *Mussaendopsis multiflora* Elmer, Leafl. Philipp. Bot. 1: 14 (1906) is now **Greeniopsis multiflora** (Elmer) Merr., Philipp. J. Sci., C 4: 325 (1909) (C.Puff, pers. comm.).

The studies of Puff & Igersheim (1994) reveal that **Mussaendopsis beccariana** stipules at inception are already fused up to near their apices, forming an appressed, resin-filled compartment around the young shoot apex, and the position of the apical cleft in the largely fused structure suggests an interpetiolar position at inception. Later ontogenetic development of the full stipular structure, however, is clearly intrapetiolar, with a thickened suture along the interpetiolar median, at which the stipular sheath splits into two clearly intrapetiolar members. In **Steenisia**, the apical buds are not protected in this way, and the stipules are only slightly connate basally and distinctly interpetiolar throughout.

The development of semaphylls is also different. In **Mussaendopsis**, these have already formed as enlarged petaloid structures even at the floral bud stage, although in those species of **Steenisia** where these are found, they form only in the post-anthesis stage. In both cases they persist into the fruit stage.

Professor Christian Puff (pers. comm.) points out that **Steenisia** (with its anther cones) is a typical buzz-pollinated taxon (where pollen is vibrated out of the anther cone by the close buzzing of bees and then collected) (Buchman, 1983), and thus no nectar is produced as reward. On the other hand, **Mussaendopsis** is fly-pollinated: the rotate corolla allows good landing space and a huge fleshy, disc-like nectar-producing structure surrounds the base of the style (the flowers resembling those of numerous Celastraceae taxa).

**A new variety of Steenisia pleurocarpa**

Bremer (1984) distinguished the various **Steenisia** species by characters such as crowded or well-spaced leaf arrangement along the stem, shape of the leaf base, calyx shape, presence / absence of semaphylls, semaphyll form and venation, style pubescence, ribbing of the fruit pericarp, and seed shape. The Malayan taxon is identifiable to
Table 1. Differentiating characteristics of *Mussaendopsis* and *Steenisia*.

<table>
<thead>
<tr>
<th></th>
<th><em>Mussaendopsis</em> (2 spp. known)</th>
<th><em>Steenisia</em> (5 spp. known)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf hairiness</td>
<td>glabrous</td>
<td>pubescent</td>
</tr>
<tr>
<td>Stipule insertion</td>
<td>intrapetiolar, connate for nearly whole length at first</td>
<td>interpetiolar, only basally connate</td>
</tr>
<tr>
<td>Stipule margin</td>
<td>following separation, margins entire except for tiny apical cleft</td>
<td>lacinate to fringed with linear teeth</td>
</tr>
<tr>
<td>Corolla lobe aestivation</td>
<td>right-contorted</td>
<td>left-contorted, rarely valvate</td>
</tr>
<tr>
<td>Anthers in the open flower</td>
<td>widely spaced out</td>
<td>connate into a central cone-like structure</td>
</tr>
<tr>
<td>Seeds</td>
<td>winged all around</td>
<td>not winged, or very slight wings at opposite ends only</td>
</tr>
<tr>
<td>Enlargement of one calyx lobe in a flower fruit as a semaphyll</td>
<td>semaphyll present from flower bud stage</td>
<td>semaphyll developing at post-anthesis</td>
</tr>
</tbody>
</table>

*Steenisia pleurocarpa*. being identical in all these characteristics, overall habit (as low treelets), leaf form and fruit form and size. Mature corollas were not available for the Malayan collections and so could not be directly compared, but flower bud material did not suggest any potential differences.

The only differences between the Malayan taxon and the Bornean material of *Steenisia pleurocarpa* are in peduncle length and degree of branching of the infructescence. Fourteen infructescences were measured for Bornean material, with peduncle length ranging 5.4–8.7 cm long, and the two infructescences in the Malayan material from Mount Tahan had peduncles that were 1.5 and 1.6 cm long. Also, the Bornean material had 3–4 (rarely 2) pairs of branches on the infructescence rachis, with the lowest branches ramifying to 3–5 orders (rarely 2 orders). In the Malayan material, the infructescences had only 1–2 pairs of branches on the infructescence rachis, with just 1–2 orders of ramification. Therefore, the Malayan material appears to have distinctly shorter, less branched infructescences compared to the Bornean material.

Here we propose to consider the Bornean and Malayan material as distinct varieties. The Malayan material is named as follows.

**Biogeographic implications**

Steenisia was previously known only on Borneo (five species) and the Natuna islands (*S. borneensis* (Valeton) Bakh.f., one of the five mentioned). With the diagnosis of *Steenisia pleurocarpa* var. *malayana*, the genus is now newly recorded for the Malay Peninsula and mainland Asia. The genus thus has a distribution spanning both sides of the present South China Sea. The differences between both varieties of *Steenisia pleurocarpa* could be explained by vicariance of a formerly widespread ancestral taxon in this area, separating into two isolated populations that began to diverge evolutionarily.

This is plausible because there is palaeo-ecological, geomorphological and fossil evidence indicating periods of dryland contiguity between the Malay Peninsula and Borneo during the Quaternary from about 1.8 Ma to the Last Glacial Maximum (Flenley 1979, 1984; Morley & Flenley 1987; Stuivts et al. 1988; Morley 2000), when intervening sea levels could have fallen as much as 40–120 m below current level, allowing vegetation development and significant species range extensions (Heaney 1991, Voris 2000). These periods alternated with others during which sea-level rises would have segregated populations of organisms.

The occurrence of *Steenisia borneensis* in both Borneo and the Natuna islands in the South China Sea probably also bespeaks such former land connections that are now interrupted by present sea levels. Similarly, the gecko *Ptychozoon lionotum*, monitor lizard *Varanus nebulosus* and snake *Trimeresurus punicens* are found in the Malay Peninsula with their eastern limit at the Natunas, and some Bornean herpetofauna also reach westward only as far as the Anambas and Natuna islands (Leong et al. 2003).

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**References**

Steenisia new for mainland Asia


Studies on Homalomeneae (Araceae) of Borneo III:  
The helophytic Homalomena of Sunda

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ABSTRACT. An account of the helophytic Homalomena in Sunda is presented. Two species are recognized: H. expedita A.Hay & Herse. and H. rostrata Griff., neither novel. Homalomena expedita is so far endemic to Sarawak, where it is known from three widely separated sites. Homalomena rostrata is widespread from Sumatera through Peninsular Malaysia to Borneo, and onwards to Maluku (Pulau Ceram). Throughout its range H. rostrata is morphologically plastic, such that it has accrued a considerable synonymy, proposed here: Homalomena beccariana Engl., H. ensiformis Alderw., H. miqueliana Schott, H. miqueliana var. truella Alderw., H. pahlodosa Hook.f., H. propinqua Schott, H. raepii Engl., H. sagittifolia Jungh. ex Schott. H. sagittifolia var. angustifolia Furtado. H. sagittifolia var. pantederifolia Ridl. (including homotypic H. ridleyana Engl.). H. sagittifolia var. sumatrensis Alderw., H. teysmannii Engl., and H. triangularis Alderw. An overview of the occurrence of helophytism in Araceae, together with speculations on the evolution of helophytism in Homalomena, a key to the species, and illustrations of both species are presented.

Keywords. Araceae, helophyte, helophytism, Homalomena

Introduction

Homalomena in Sarawak is presently the subject of study by a taxonomic and systematic consortium coordinated from the Universiti Malaysia Sarawak (UNIMAS) (see Boyce & Wong 2008; Boyce & Wong 2009; Boyce, Wong & Fasihuddin 2010; Ng et al., in prep.). One of the first priorities has been the application of previously published names. a task especially problematic in Homalomena due to the poor state of preservation of most of the historical types. Nonetheless, progress has been made, and the taxonomic status of most published Bornean Homalomena names is now resolved. Disturbingly, this process has resulted in just 13 ‘good’ names for Borneo, plus about 10 as yet unresolved, and these virtually all from Kalimantan. Given the very high levels of local endemism that is a feature of Homalomena, and that Sarawak alone likely has in excess of 300 species, it can be confidently stated that nearly everything encountered in the field in Sarawak would be undescribed.

This paper is one in a continuing series that aims to bring a better understanding to this, the most speciose and complex genus of the Araceae of SE Asia. Of the species
dealt with here, *H. rostrata* Griff. is one of the very few widespread and also highly polymorphic species in a genus that is otherwise notable for an exceptionally high degree of localized endemism and low levels of morphological variation. The large amount of material of *H. rostrata* in regional herbaria has been almost universally misidentified, and in addition the two names most commonly applied to almost all cordate-leaved *Homalomena* seen in herbaria, *H. sagittifolia* Jungh. ex Schott and *H. propinqua* Schott, are both junior synonyms of *H. rostrata*. This paper aims to settle the taxonomic chaos that exists around this name.

*Homalomena expedita* A.Hay & Herse. is included in this paper as the only other colonially helophytic species of *Homalomena* and as such is important to include as it is potentially a source of taxonomic confusion. Furthermore, *H. rostrata* and *H. expedita* belong to phylogenetically widely separated parts of the genus and thus are certainly an example of independent evolution into the (for Araceae) rare ecology of colonial helophytism.

The overwhelming majority of *Homalomena* are terrestrial or lithophytic clumping mesophytic herbs occurring in shady perhumid or everwet forest. However, two species, *H. expedita* and *H. rostrata* are colonial, stoloniferous helophytes. Whereas the taxonomy of the recently described *H. expedita* poses no problems, and the species is remarkably stable in terms of gross morphology, perhaps as a result of its clonal colonial habit (see below), *H. rostrata* is exceedingly morphologically variable, as well as widespread, with the result that it has been redescribed no fewer than 15 times.

**Taxonomic Part**

Key to helophytic *Homalomena* in Sunda

Leaves very broadly ovato-sagittate; spathe not constricted; spadix about 4.5 cm long, with a conspicuous warty interstice between the male and female flower zones, interpistillar staminodes absent .............................................. 1. *H. expedita*

Leaves sub-linear to broadly ovato-oblong; spathe conspicuously constricted; spadix up to 14 cm long, male and female flower zones contiguous, interpistillar staminodes present .......................................................... 2. *H. rostrata*


Colonv-forming stoloniferous strongly aromatic (terpenoids – anethol?) helophytic herbs to c. 75 cm tall. *Stem* an erect to ceping rhizome to c. 30 cm long, c. 4 cm thick, spongy, emitting cataphylliferous stolons to c. 40 cm long, 1 cm thick, these eventually upturned, becoming rhizomatous, leafy, and thence emitting further stolons from the base of the rhizomatous portion. *Leaves* clustered, up to c. 10 together; *petiole* to c. 45 cm long, spongy within, pale mid-green with broken darker green longitudinal
Fig. 1. *Homalomena expedita* A.Hay & Hersc. A. Plants in habitat at type locality, Batang Kayan. B. Detail of emerging shoots on margins of colony. C. Active leafy shoot with precursor stolon (to left of shoot) and developing new rhizome (to right). Photo credits: P.C. Boyce.
striations, sheathing in the lower 1/3.; petiolar sheath margins mainly in-rolled except at the base, sheath thus closed; lamina mid-green on both sides, initially glossy, later becoming matt, very broadly ovato-sagittate, leathery, c. 15–20 cm long and wide, the apex broadly obtuse, very abruptly and shortly acuminate for c. 1 cm, finally stiffly apiculate for c. 3 mm, the base shallowly cordate to almost truncate, usually distinctly asymmetric, with widely spreading rounded to subtriangular posterior lobes 7–10 cm long; midrib adaxially flat, abaxially slightly prominent, with c. 5 adaxially impressed abaxially slightly prominent primary lateral veins on each side (plus a cluster of 2 or 3 on each side running to the posterior lobes), alternating with fainter interprimaries and diverging at c. 60°. Inflorescence solitary; peduncle 7–20 cm long, rather thick and spongy, c. 8 mm diam., erect. Spathe green, c. 5 cm long, 1.5 cm across and in bud slightly inflated at level of female zone, thence subcylindric-tapering, but not constricted, later very narrowly ovoid, apiculate for c. 4 mm. Spadix 4.5 cm long, stipitate; stipe c. 6 mm; female flower zone more-or-less cylindric, 0.8–1.2 cm long (irregular length around circumference of spadix), 1.2 cm wide; pistils subglobose, 1–2 mm diam.; stigmas subsessile, discoid or very weakly lobed, slightly narrower than the ovary. papillate; infrapistillar staminodes absent, sterile interstice conspicuous, 1.5 cm long, naked, pale green and c. 6 mm diam. in the lower 1 cm, with more or less regular spirals of low domed warts c. 0.5 mm diam., the upper part (comprising the base of the male zone) 9 mm diam., ivory and clothed in irregular sterile stamens: fertile male zone elongate-bullet-shaped, 1.5 cm long, tapering to a blunt acute tip, ivory; male flowers irregular (1–)2–4-staminate; stamens truncate, irregular in size, 1–1.5 mm across, irregularly polygonal, slightly sinuous on the abaxial side, the thecae overtopped by a syncnecic. Fruit unknown.

Distribution: Malesia: endemic to Sarawak; there known from the extensive type locality, a tiny relictual population along Jalan Steven Yong (Kuching/Bau border), and also sighted near Sibu along the main road to Miri.

Habitat: Forming large, probably clonal colonies in open swamps and ditches at low elevation, sometimes in tidal mud with Cryptocoryne ciliata (Roxb.) Fisch. ex Wydler, and mangroves.

Other material seen: SARAWAK. Kuching Division: Lundu, Kampung Stenggang Melaya Baru, just after the bridge across the Batang Kayang on the Lundu side of the river, 01°39'03.8"N 109°51'40.5"E, 3 Mar 2004, P.C. Boyce & Jeland ak Kisai AR-211 (SAR); 10 Oct 2004, P.C. Boyce & Jipom ak Tisai AR-724 (SAR); 11 May 2008 P.C. Boyce AR-2357 (SAR).

Etymology: The epithet means ‘set free’, or ‘foot-loose’, alluding to the departure from confinement to shaded conditions otherwise typical for the genus, and the invasive, stoloniferous habit.

Notes: Homalomena expedita is remarkable in this genus of predominantly mesophytic shade-loving terrestrial plants for its occupation of open swampy sites, even tidal mudflats, in full sun. The spadix of Homalomena expedita is unique in the genus, having a very conspicuous naked warty interstice above the female zone.
Fig. 2. *Homalomena expedita* A.Hay & Hersc. A. Active shoot with two post anthesis inflorescences (oldest to the right) and prophyll subtending reiterative axis of active shoot. B. Inflorescence at female anthesis. Note the numerous *Colocasimyia* (Diptera, Drosophilidae). C. Inflorescence at onset of male anthesis with a solitary beetle (Chrysomelidae: *Dercetina*?). The damage to the male portion of the spadix is typical for chrysomelid visited inflorescences. D. Spadix at female anthesis with spathe artificially removed. Note the distinctive warty texture of much of the sterile interstice. E. Detail of the sterile interstice. The morphology of the warts and their transitional morphology through staminodes to functional male flowers suggest that they are aborted stamens. Photo credits: P.C. Boyce.
Homalomena expedita was described less than a decade ago, based on collections made in the 1994, although specimens in FL-B seen by the first author reveal that Odoardo Beccari twice collected this species, in a locality where it is probably now extinct, in the 1860s, but failed to recognize its novelty, as too did Engler when working up Beccari's collections in the 1870s (Boyce & Wong 2009).

Homalomena expedita appears to spread rapidly through the production of stolons. At Lundu it forms dense swards in shallow muddy ponds and from a distance rather resembles water hyacinth (Eichhornia: Pontederiaceae). It appears less vigorous, though nonetheless invasive and persistent in tidal brackish conditions at Sibu (Hay & Boyce, pers. obs.).

In relation to the rest of its genus, Homalomena expedita is rather analogous to the open swamp-dwelling, colony-forming Aglaodorum, contrasted with Aglaonema (both Aglaonemataceae). Both Homalomena expedita and Aglaodorum griffithii Schott, besides their similar habitat preferences, and spongy rhizomes, petioles and peduncles, predominantly produce solitary inflorescences where their immediate forest-dwelling, non-proliferating relatives generally produce complex synflorescences (except in some of the most diminutive species). In addition to the reduced number of inflorescences, it seems, on the basis of limited observations of H. expedita, that there is other evidence pointing to depressed or suppressed sexual fertility; the papillae on the interstice appear to be abortive pistils: the staminal thecae contain some pollen, but are partially empty in most anthers: senescent male flowers appear not to have shed pollen, the ovaries however, are filled with ovules which appear normal in form.

Inflorescences of H. expedita attract numerous flies of the genus Colocasio myia (Diptera, Drosophilidae) and also beetles of Chrysomelidae (probably a Dercetina sp). The latter also damage portions of the male flower zone (see Fig. 2 C). It is not yet know which, if either, is the effective pollinator.

Homalomena expedita is quite often seen in cultivation in Sarawak; it seems likely that other populations than those listed above exist and are the source of these cultivated plants. Intriguingly, it is also encountered for sale in markets in Bangkok, with the sellers consistently claiming that the plants originate from southern Thailand. Given the widespread range of other Asian helophytic aroids (e.g., Homalomena rostrata, Cryptocoryne ciliata, Aglaodorum griffithii) it is by no means impossible that H. expedita is much more widespread but simply overlooked; its close resemblance, at least at a distance, to weedy Pontederiaceae might in part explain this.


TYPE: Malaysia, Malacca: W. Griffith 5989 (K, holo!). (Fig. 3)


Homalomena sagittifolia Jungh. ex Schott, Prodr. Syst. Aroid.: 311 (1860), syn. nov.

**Helophytic Homalomena of Sunda**


Clump or colony-forming stoloniferous very strongly aromatic (terpenoids – ocimene or carene?) usually helophytic herbs to c. 1 m tall. *Stem* an erect to creeping rhizome to c. 20 cm long. c. 2 cm thick, somewhat spongy, emitting cataphylliferous stolons to c. 25 cm long. 1 cm thick, these eventually upturned, becoming rhizomatous. leafy.
and thence emitting further stolons from the base of the rhizomatous portion. **Leaves** clustered, up to c. 20 together; **petiole** 10–50 cm long, distally weakly to rather strongly D-shaped in cross-section, rather spongy within, deep-green to dark red or brown, especially for the basal half, with conspicuous broken dark green to brown longitudinal striations, sheathing in the lower 1/3 to half; **petiolar sheath** broadly winged, the wings spreading and somewhat fleshy, sheath open, the petiole essentially canaliculate in cross-section; **lamina** deep green to deep brown, glossy, very variable in overall shape, ranging from sub-linear to broadly ovato-oblong, leathery. c. 10–50 cm long, 3–25 cm wide, the apex ranging from acuminate to broadly obtuse, abruptly and shortly acuminate for c. 1 cm, finally stiffly apiculate for c. 10 mm, base decurrent-cuneate to truncate, shallowly cordate to sagittate or hastate, usually distinctly asymmetric, posterior lobes where present straight to rather widely divergent, up to 12 cm long, somewhat acutely rounded; midrib adaxially flat, abaxially prominent, with c. 5–7 adaxially impressed abaxially rather prominent primary lateral veins on each side, posterior lobes where present with 2 or 3 clustered veins running into them, primary lateral veins alternating with somewhat fainter interprimaries and diverging all at c. 60° from the mid-rib. **Inflorescences** 2–3 together, the synflorescence subtended by a conspicuous prophyll; **peduncle** 8–15 cm long, 5–10 mm diam., robust and somewhat spongy, medium green to reddish or brown, especially near the base, exceptionally glossy bright red. **Spathe** externally green, flushed red, or more rarely deep red, rather glossy, internally somewhat pale, rather variable in size, 5–15 cm long, conspicuously constricted at a point corresponding to the top of the female flower zone: opening by inflation of the lower spathe and loosening of the spathe limb (female anthesis), and then spreading of the spathe limb (male anthesis); post anthesis spathe closing and tightly clasping the spadix; **lower spathe** oblongo-ovate to ovato-globose, c. 1/3, spathe length, up to 5 cm long, 2 cm wide, externally with conspicuous glands (extrafloral nectaries?); **spathe limb** narrowly to somewhat broadly triangular. c. 2/3, spathe length, up to 7 cm long, 3 cm wide. rostrate-apiculate for c. 10 mm. **Spadix** subequaling the spathes, up to 14 cm long; shortly stipitate; **stipe** c. 6 mm; **female flower zone** weakly to rather strongly fusiform, up to 5 × 1.5 cm; **pistils** subglobose, 1–2 mm diam., green to red depending on the overall colour of the spathe, red pistils associated mainly with red or red-flushed spathes; **stigmas** subsessile, discoid to rather well-lobed, slightly wider than the ovary, occasionally remarkably robust, papillate at anthesis; **interpistillar staminodes** weakly to very strongly clavate, subequaling the associated pistil, waxy white; **male flower zone** tapering-cylindrical, up to 10 cm long, 1 cm wide, tapering to an acute tip, ivory to very pale yellow; **male flowers** irregular 3–4-staminate; **stamens** truncate, rather regular in size, 1–2 mm across, polygonal, slightly sinuous on the abaxial side, the thecae overtopped by a pronounced syneconnektive. **Infertices** decline by flexing of the peduncle; spathe persistent, turning deep red; at fruit maturity spathe shed by the abscising of the lower spathe at the insertion on the peduncle. **Fruit** oblong-globose, dull red, smelling strongly of butyric acid. **Seeds** elongate-ellipsoid, c. 1 × 0.3 mm, very finely longitudinally striate, pale brown.

Fig. 3. *Homalomena rostrata* Griff. A & B. Plants in habitat showing variation in leaf lamina shape. C. Sub-mature infructescence. D. Mature infructescence with spathe artificially removed. Note the glands on the lower spathe exterior. Images: A: AR-1416; B: AR-1372; C: AR-2600; Photo credits: P.C. Boyce. D: S. Lee 319. Courtesy of Singapore Botanic Gardens, used with permission.
Habitat: Swampy areas in lowland forest, forest margins, in freshwater or peat swamp, or wet facies of *kerangas*, or *kerapah*, often, but not exclusively, in full sun. 3–90 m elevation.

Other material seen: PENINSULAR MALAYSIA. Johor: Kota Tinggi, 20 Jun 1934, E.J.H. Corner SFN28612 (SING 0057465); Sungai Berassau, 8 Apr 1935, E.J.H. Corner SFN29360 (SING 0031964; SING 0057453); Kota Tinggi, 9 Jul 1939, E.J.H. Corner SFN36965 (SING 0031943; SING 0057466); Kota Tinggi, 30 May 1937, E.J.H Corner s.n. (SING 0057467); Pontian, 28 Sep 1939, I. Ngadiman SFN36652 & SFN36652a & SFN36652b (SING 0057468; SING 0057470; SING 0057471; SING 0051965; SING 0057469; SING 0057452); Kota Tinggi, 24 Jul 1939, I. Ngadiman (SING 0057462); Kota Tinggi, 28 Jul 1961, D.H. Nicolson 1223 (SING 0057475); Johor. 1894, H.N.Ridley 6310 (SING 0057601); Tanjong Kupang, 1892, H.N. Ridley s.n. (SING 0031913); Mt Austin, 1904, H.N. Ridley 12018 (SING 0031914); Castlwood, H.N. Ridley s.n. (SING 0031963); Kukub, 1909, H.N. Ridley s.n. (SING 0057587); Johore, 17 May 1962, J. Sinclair 10690 (SING 0057463); Kota Tinggi-Mersing road, 2 May 1966, J. Sinclair 10895 (SING 0031944; SING 0057464).

Pahang: Sungai Lembing, 1 Jun 1964, H. Singh l (SING 0031946); Temerloh, 18 Mar 1923, M.R. Henderson 10527 (SING 0057449); Pahang, 6 Aug 1929, M.R. Henderson SFN22504 (SING 0057448); Pahang, 26 Jun 1891, H.N. Ridley s.n. (SING 0057450).


SINGAPORE. Chua Chu Kang, 1905, H.N. Ridley s.n. (SING 0003668); Ang Mo Kio, 1894, H.N. Ridley s.n. (SING 0003671); Bukit Mandai, 1899, H.N. Ridley s.n. (SING 0003683); Singapore, 29 Jul 1934, Z. Ternya 2530 (KEP 38212).

BORNEO. SARAWAK: Kuching Division: Kuching, 19 May 1893 E.J. Bartlett s.n. (SING 0003758; 0003759); Bau, Kampung. Segong. 01°32'00.9"N 110°08'58.8"E, 10 Aug 2005, P.C. Boyce et al. AR-1333 (SAR); Lundu, Jalan Lundu, Kampung Perang, 01°37'18.9"N 109°53'05.7"E, 11 Sep 2005, P.C. Boyce & Jipom ak Tisai AR-1355 (SAR); Lundu, Jalan Lundu, Stunggang Ulu 01°36'21.2"N 109°53'46.3"E, 21 Sep 2005, P.C. Boyce et al. AR-1372 (SAR); Lundu Sempadi, Gunung Papan, 19 Jun 2006.
Helophytic Homalomena of Sunda


Etymology: Latin rostratus meaning beaked, curved, hooked, with a crooked point, in referring to tip of the spathe limb prior to anthesis.

Notes on typifications: In publishing Homalomena sagittifolia Schott (1860) attributed the trivial epithet to Junghuhn in schedula, implying that the name was appropriated from a Junghuhn-annotated specimen in Bogor (“Java. Herb. Lugd. Bat.”). However, Schott then went on to cite a Motley Borneo collection he had evidently seen as a living plant presumably in Schoenbrunn (“v. v. – vide vivum”) and as a herbarium specimen in Kew (“et s. in Herb. Hooker”). The Motley collection at Kew is fertile but in poor condition. While the Junghuhn specimen appears to be no longer extant; evidently the bulk of the description was prepared from the non-longer extant living plant. The epitypification above is based on the only image in Schott’s Icones (W) to bear both a Junghuhn and a Schott annotation of ‘Homalomena sagittifolia’ and is most likely therefore to be the Junghuhn collection cited by Schott.

The two syntypes of Homalomena paludosa cited by Hooker (1893) are incontrovertibly conspecific. The collection chosen here to serve as the lectotype is in better condition, and has more distributed duplicates, and is thus the more suitable choice.

Engler’s Homalomena raapii was published with two syntypes, of which only the H.Raap collection cited above appears to be extant; it is assumed that the other collections were destroyed during the bombing of Berlin herbarium during the Second World War.

Alderwerelt’s Homalomena sagittifolia var. sumatrana is based on two specimens, neither now in the best state of preservation. The specimen chosen is the less degraded of the two.

Furtado’s Homalomena sagittifolia var. angustifolia is based on two syntypes. Both extant, the collection chosen more closely matches the protologue and description and is in a better state of preservation.

Other notes: Homalomena rostrata is highly polymorphic in terms of leaf lamina shape, and overall plant size, even within a single population, and has attracted a considerable synonymy as a result. Flowering size plants range in height from barely 20 cm to over 1 m, with the largest plants generally occurring in areas of abundant nutrient availability, for example along the margins of freshwater swampforest, while smaller plants are
generally confined to nutrient-poor soils, especially on white sand and peat kerangas, or along oligotrophic stream systems. Smaller plants tend to have sagittate leaves.

Leaf lamina morphology varies in two distinct manners: leaf width to length ratio, with leaves ranging from sub-linear to oblong; and posterior lobe development, with the leaf bases ranging from decurrent-cuneate through truncate to sagittate or hastate. These morphologies are almost wholly mutually independent, and thus the base of a sub-linear leaf lamina can range from decurrent-cuneate to hastate, while that of an oblong leaf can range from truncate to sagittate or hastate. In extensive populations, e.g., at Niah, all variations in plant size, and leaf lamina morphology, are represented.

Inflorescence morphology is far less variable, with any differences cited by the authors of the synonyms readily encompassed by the variation in inflorescence morphology acceptable in other far less narrowly defined species. In particular, abundance or lack of flowers on the spadix and their relative disposition - congested or lax - and to a great extent overall inflorescence size, is closely correlated to the size and vigour of the plant producing the inflorescence.

Names now considered synonymous with *H. rostrata* can be assigned to the following morphs:

- The robust, oblong-truncate leaf lamina morph includes the types of *H. rostrata* Griff, *H. miqueliana* Schott, and *H. miqueliana* var. *truella* Alderw.
- The medium to robust, sub-linear leaf lamina morph includes the types of *H. beccariana* Engl., *H. ensiformis*, and *H. teysmannii* Engl.
- The robust oblong, sagittate to hastate leaf morph includes the types of *H. sagittifolia* Jungh. ex Schott, *H. sagittifolia* var. *poutederifolia* Ridl. (including the homotypic *H. ridleyana* Engl.), *H. sagittifolia* var. *angustifolia* Furtado, and *H. triangularis* Alderw.
- The small growing, sagittate leaf morph is typified by *H. propinqua* Schott, *H. paludosa* Hook.f., and *H. sagittifolia* var. *sumatrana* Alderw.

**Helophytism in Araceae**

Helophytism in Araceae is generally held to be a plesiomorphic condition, with the greatest number of helophytic species occurring in subfamilies and tribes well supported as being basal in the family: Orontioideae (three genera; eight species), Lasiioideae (seven of 10 genera; 26 of 36 species), Monstroideae: Spathiphyllaeae (one of two genera; many of the c. 60 species), and Calloideae (monospecific). Helophytism in Aroideae is considered to be secondarily derived, with helophytic taxa occurring scattered through most tribes: Spathicarpaceae (*Dieffenbachia* Schott—virtually all); Philodendraceae (*Philodendron* Schott—several species, notably in subgen. *Meconostigma*); Schismataglottideae (arguably *Phymaturum* M.Hotta); Cryptocoryneae (*Cryptocoryne ciliata*); Caladieae (*Caladium* Vent.—a few species); Aglaonemateae (*Aglaodorum* Schott—monospecific); Montrichardiaeae (all species); Zantedeschiaeae (all species); Peltandraceae (all species); Areae (*Typhonium flagelliforme* (Lodd.) Blume); and Colocasiaceae (*Colocasia* Schott—a few, notably *C. esculenta* (L.) Schott; *Alocasia* (Schott) G.Don—a few, notably *A. alba* Schott and *A. sarawakensis* M.Hotta).

The occurrence of helophytism in *Homalomena* is thus unsurprising, although it is interesting that the two species exhibiting this ecology are not considered closely related. *Homalomena expedita* falls uncontroversially into the Homalomena
Helophytic Homalomena of Sunda

Supergroup (sensu Boyce & Wong 2008), while *H. rostrata* belongs in the Cyrtocladon Supergroup (sensu Boyce & Wong 2008). Recently, chemical assaying has indicated that the principal components of *H. expedita* are significantly different to those of species in the Cyrtocladon Supergroup (Ng et al., in prep.): it is fully expected that ongoing molecular work (Ng. et al., in prep.) will reinforce the recognition of two distinct monophyletic lineages, and that helophytism is twice derived in Sundaic Homalomena.

References


Ginalloa siamica var. scortechinii is a species of Viscum (Viscaceae)

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ABSTRACT. Ginalloa Korth. is not represented in Peninsular Malaysia. Ginalloa siamica Craib var. scortechinii Gamble, known only from the type specimen, is conspecific with Viscum ovalifolium Wall. ex DC.

Keywords. Ginalloa, Peninsular Malaysia, Viscaceae, Viscum

Introduction

In Peninsular Malaysia, Ginalloa Korth. is recorded only through Ginalloa siamica Craib var. scortechinii Gamble (Gamble 1914) described from a single specimen, Scortechini s.n., Perak (CAL, accession number 396346). According to Barlow (1997), Ginalloa siamica occurs in Thailand, Cambodia, Peninsular Malaysia and the Philippines. Variety scortechinii is distinguished by its 3-veined leaves compared to the 5-veined ones in the typical variety.

Notes on Ginalloa siamica var. scortechinii

The Scortechini type specimen is undated and the exact locality not specified. According to Gamble (1914), Ginalloa is characterised by flowers in triads on terminal and/or axillary spikes and female flowers with 3 minute perianth lobes, contrasting with Viscum L. that has flowers which are usually in triads or sometimes solitary, in the axils of leaves or at leafless nodes on branches, and female flowers usually with 4 perianth lobes. As the specimen Gamble described has a spike-like inflorescence bearing only female flowers with 3-lobed perianths, he described it as Ginalloa.

However, Gamble’s note (19 Nov 1912) on the specimen reads: “This is the only sheet available. I found it among the sheets of Viscum orientale. Other sheets should be searched for and some sent to the Kew Herbarium.”

I searched the Peninsular Malaysian Viscum collection in the Kew Herbarium and among specimens of Viscum ovalifolium Wall. ex DC. (formerly Viscum orientale auct. non Willd.) that have 3-veined leaves, I found a collection (Scortechini 732) identical to the type of Ginalloa siamica var. scortechinii. Detailed examination showed that the shoot branching, leaf size, shape and venation, and fruits in leaf axils and at leafless nodes were the same. I therefore conclude that Ginalloa siamica var. scortechinii is synonymous with Viscum ovalifolium and Ginalloa does not occur in Peninsular Malaysia.
Barlow (1997) noted that *Viscum ovalifolium* is polymorphic, and that while its flowers are usually arranged in triads or sometimes solitary, they are less usually found along leafless shoots that superficially resemble the spicate inflorescences of *Ginalloa*. This is well illustrated by the collection *Chew et al. FRI 53735* (KEP). Also, it is not uncommon for female flowers to have a perianth lobe missing, i.e. with only three lobes present. Danser (1931) had maintained *Ginalloa siamica* var. *scortechinii* but Barlow (1997) did not recognise the variety, although the latter still regarded *Ginalloa siamica* as having a distribution that extended into Peninsular Malaysia. Neither had seen the type (Barlow, pers. com.).


TYPE: *Scortechini s.n.*, Perak, Peninsular Malaysia (holotype CAL, accession number 396346).

ACKNOWLEDGEMENTS. I am deeply indebted to M.S. Mondal from the Botanical Survey of India, Central National Herbarium (CAL) for providing the image of the specimen. I am grateful to the curators of the herbaria of the Royal Botanic Gardens, Kew (K), Nederlands Centre for Biodiversity Naturalis (section Nationaal Herbarium Nederland), Leiden University (L), and Singapore Botanic Gardens (SING) for permission to examine specimens in their care. The Ministry of Science, Technology and Innovation of Malaysia is acknowledged for financial support for the Flora of Peninsular Malaysia Project (No. 01-04-01-000 Khas 2) under which this study was carried out. I am grateful to L.G. Saw, R.C.K. Chung and R. Kiew for advice and comments in improving the manuscript. Also, I would like to express my gratitude to one of the reviewers who took time to do a careful editing in helping me to shorten the text.

References


The author has 20 years of field experience in several countries of SE Asia, including a considerable time in the company of the legendary Malaysian botanist K.M. Kochummen. This collaboration must have been very profitable for the author, which probably explains why Kochummen is the only person consistently referred to as “Mr.”.

SE Asia is defined as the tropical area from Burma to Borneo and the Philippines. The flora in this part of the world is so rich that a choice has to be made: 157 families and 887 genera are treated, with notes on description, ecology and possible confusion. Numerous illustrations, mostly of good quality, help to give an idea of the taxa discussed. Some genera not occurring in “SE Asia” are also included, such as Schumacheria, a Sri Lankan endemic; Eriandra, a Papuan endemic; Galbulimima; Pigafetta and Macadamia, extending west to Sulawesi.

Although the book deals principally with trees, also lianas, shrubs and even some herbs are mentioned, giving the reader more than promised. On the other hand I wonder why some prominent woody taxa such as Dracaena and the omnipresent Bambusoideae are left out.

The book is said to be aimed at beginning students, young staff of local herbaria and overseas botanists who want to know more about Asian plants. To this aim the author has condensed a large amount of information by using a very small lettertype and leaving out author names. In the introductory chapters the author explains that modern molecular and cladistic research has led to changes in traditional systematic concepts. Although the new phylogeny often confirms some “suspicions” based on morphological grounds, more often than not the conclusions can be quite baffling. Who would suspect that Rafflesia is closer to Euphorbiaceae s.s. than Daphniphyllum or Dichapetalum? On the other hand, the author allows morphological evidence to prevail in the case of Bischofia. This genus belongs to the Phyllanthaceae (split off from Euphorbiaceae) on molecular grounds, but is placed in a separate family because it is morphologically aberrant.

The author urges his readers to look at trees as living populations and not as dried specimens in the herbarium. He also warns that DNA-based information, albeit necessary and sensible, should not lead to the assumption that inventory and enumerations are in the eclipse. I would like to add that young botanists are perhaps best advised to learn to recognise genera rather than families. The last word in modern family phylogeny is far from being said. Generic concepts seem to be less prone to changes.

An extensive list of references is given in which, to my surprise, many prolific authors of the Flora Malesiana series (Ding Hou, Leenhouts, Sleumer) are not mentioned. Indices to scientific names are added as well as to Malay, Thai and Vienamese names, but not to Indonesian names. The few Indonesian names in the text are often wrong. My main point of criticism is the number of spelling and printing errors.
All the same, I want to compliment Dr. LaFrankie for bringing together a vast amount of information on one of the most diverse floras of the world. It is the first work of its kind.

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This is the first volume of the long-awaited Flora in the wake of the Tree Flora of Malaya and Tree Flora of Sabah and Sarawak. The volume is well structured, beginning with a historical overview of botanical interest in the area, followed by highlighting the latest family realignments adopted and the families affected. Subsequent to that is an account of the vegetation of Peninsular Malaysia and current conservation measures, as well as criteria used to categorise the conservation status of species, before embarking on the Flora proper.

‘A Brief History of Taxonomic Research in Peninsular Malaysia’ (Kiew, Chung, Saw & Soepadmo) provides an insight into the botanical interest, collecting activity, as well as the establishment of various herbaria in old Malaya (today’s Peninsular Malaysia and Singapore), chronologically listing many botanists who have done taxonomic research work pertinent to this region, from Hooker to the present day and indicating why a flora account is long overdue since Ridley’s five-volume work, The Flora of the Malay Peninsula. In the account that highlights taxonomic changes in family composition, as well as the recognition of families based on molecular phylogenetic work, the inclusion of a phylogenetic tree showing the evolutionary relationships of the affected families could have been helpful. Some useful statistics, such as the number of species of seed plants in Peninsular Malaysia (estimated 7,834 species with 1,564 genera in 220 families), with detailed breakdown, are provided with the families arranged alphabetically, such that the number of species and genera in the families at a glance are available (pages 16-20). The account of vegetation (Saw), well compiled and easy to follow, is a useful accompaniment to forming better impressions of the ecology of the species in this flora. L.S.L. Chua gives a brief outline of species assessment and conservation in Peninsular Malaysia.

The format of the enumeration comprehensively provides accepted name, etymology, key references and type citation, description, vernacular name and distribution. Identification keys are well-formed and provided when applicable, but it is sometimes clear that it has been necessary to depend on reproductive instead of vegetative characters. Mention of the uses of the species, a species distribution map, conservation status, ecology, taxonomic notes and the italicising of key characters make the account informative and concise. Given under ‘Notes’ are nuggets of information either to provide some identification tips, clarify misconceptions or provide further useful information pertaining to a species, such as phenological attributes.

In this first volume, the families treated are: Ancistrocladaceae, Araucariaceae, Balanophoraceae, Bonnetiaceae, Casuarinaceae, Chloranthaceae, Clethraceae, Cruciferae (naturalised species only), Ctenolophonaceae, Daphniphyllaceae, Datisaceae, Erythroxylaceae, Illiciaceae, Myricaceae, Nelumboaceae, Pedaliaceae (naturalised), Pentaphylacaceae, Pittosporaceae, Podocarpaceae, Portulacaceae (many escapes and weeds), Schisandraceae, Symplocaceae, Tetrameristaceae, Torricelliaceae, Trigoniacae, and Turneraceae (naturalised).

Overall, this may be considered a well-illustrated volume. On the first page, there is a useful reference coloured map of Peninsular Malaysia indicating general...
topography and drainage. The demarcations of the states are not well defined in certain areas, though. Another map on page 25 that shows the vegetation should be enlarged to full-page, as the text is too small for comfortable reading. Included are 17 pages of colour plates and 42 well-drawn figures of species treated, in varying detail.

This flora is long overdue, not just useful to the taxonomist, but also others interested in identifying plants. It is accessible also to students and others wishing to know more about the rich plant life of Peninsular Malaysia.

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In view of the worldwide threat to our environment through habitat degradation and land use change, conservation efforts with the aim to protect the world’s biodiversity have increased dramatically over the last few decades. They are generally based on the understanding that any measures to ensure successful conservation and sustainable utilisation of the biological diversity require a detailed understanding of the plant and animal species to be protected, including their distribution, ecology and conservation status. In Malaysia, one of the aims of the National Strategy for Plant Conservation is to obtain preliminary assessments of the conservation status of all plant species of the country, and as a consequence a project on the conservation monitoring of rare and threatened plants was initiated. Families Dipterocarpaceae, Palmae (= Arecales) and Begoniaceae have been identified for the first phase of this project. Being an economically important ‘keystone family’, the dipterocarp family is treated in the present book which is the first in a series of Red Data assessments.

Although many Malaysian tree families are included in a recent global IUCN Red List, there is currently no national Red Data List, and the present publication is intended to fill this gap for the dipterocarp family. The introductory part of this book gives background information on family Dipterocarpaceae (distribution, habitat ecology, uses), on land use changes in Malaysia and threats to dipterocarp trees. A section explains the IUCN Red List Categories and Criteria version 3.1 (2001) that have been used in the assessments. Existing conservation policies and laws are discussed, and future steps in the conservation monitoring are outlined. The scope and objectives of the conservation monitoring project which forms the basis for the present book are explained. The present Red List is intended as the first critical step towards prioritisation of national conservation measures. Several conservation recommendations are made, most importantly the need to incorporate conservation principles at the planning stage of developments, to make additions to legal and policy provisions with regard to habitat protection, to further fundamental research to increase our knowledge of threatened species, to organise educational programmes aimed at local involvement, and to increase networking efforts among stakeholders. One of the important outcomes of the conservation monitoring project is that the cooperation between the Forest Research Institute Malaysia (FRIM) and various stakeholders has resulted in an increased awareness of rare and threatened species and the need to conserve them. Rescue operations are encouraged which, apart from rescuing threatened populations, would also increase *ex situ* collections of Dipterocarpaceae.

Three informative tables are given in the introductory part, showing the number of taxa arranged after genera in each of the IUCN categories, listing all of the threatened taxa, and breaking down the number of threatened taxa after the Malaysian states. Ninety-two taxa occurring in Peninsular Malaysia are considered threatened, which is roughly 56% of the total number, while one (*Shorea kuantanensis*) is considered extinct. The Malaysian state with the largest number of threatened taxa is Pahang with 59, followed by Johor (54) and Perak (53). Compared with previous assessments, the conservation status of six taxa has been upgraded to a higher threatened category, and
in 57 taxa downgraded to a lower threatened category. Fifty-eight taxa which were assessed as threatened before were here downgraded to not threatened. Another result of the present conservation monitoring project is that one new species was discovered (*Vatica yeechongii*) and two new distribution records were made (*Dipterocarpus tempehelae*, *Dryobalanops beccarii*). Nine species which were previously thought to be extinct were rediscovered.

In the main section of the book, the conservation status of all except one of the 165 taxa of Dipterocarpaceae occurring in Peninsular Malaysia is assessed according to the IUCN Red List Categories DD (= Data Deficient), EX (= Extinct), CR (= Critically Endangered), EN (= Endangered), VU (= Vulnerable), NT (= Near Threatened) and LC (= Least Concern). In the three threatened categories CR, EN and VU the assessment criteria are indicated, e.g., VU B2b(iii)+c(ii). The assessments are based on information obtained from specimens found in Malaysian as well as in European herbaria and on fieldwork during the present conservation monitoring project. In addition, further contributions have been made through data obtained in decades of forest management. Taxa that occur in both Peninsular Malaysia and East Malaysia (= Sabah + Sarawak) are assessed separately for each region, and the higher category was chosen for the national conservation status. In each of the 164 assessed taxa the vernacular names, distribution (both worldwide and within Malaysia) and habitat are also given. Various additional conservation notes are also provided (mostly referring to the presence of the taxon in protected areas), and previous assessments are cited. Each one of the assessments is accompanied by distribution maps of Peninsular Malaysia and East Malaysia (if occurring here also). Grey shading in these maps indicates, a) in case of Peninsular Malaysia the extent of the forest cover of the region, and b) in case of East Malaysia the Extent of Occurrence of the dipterocarp taxon (using grey shading for different attributes in the maps seems somewhat confusing to me, but this is perhaps just a matter of personal preference; in any case it is the only negative point noted in this review). Attached to these maps are several selected localities, the Extent of Occurrence of the taxon, the Area of Occupancy of the taxon and, for Peninsular Malaysia, also the extent of the forest cover within the Extent of Occurrence. In many of the distribution maps also *ex situ* collections are marked. For a number of taxa, line drawings of various plant features (leaves, flowers, fruits) are provided in this assessment section.

The text is followed by a large section with high-quality colour illustrations, comprising well over 150 photos grouped in 39 plates. A total of 68 taxa are illustrated. Most of the photos show the bark, leaves and young or mature fruits, and in some cases also the entire tree, the flowers or seedlings are shown. An index to scientific names and another to vernacular names conclude the book.

The book is the first complete assessment of the conservation status of Peninsular Malaysian dipterocarps, and, with its clear and well-arranged text and the many informative distribution maps and plant illustrations, should be recommended to everyone with an interest in tropical trees.

**Hubert Kurzweil**  
*Singapore Botanic Gardens*

This book is, quite simply, a sumptuous treat to indulge oneself. Beautifully produced on quality paper, boxed in a fine slipcase, the colour reproductions a delight to the eye. It has been a long time since I so enjoyed the sensory experience of exploring a new book such as this. And it is a compliment to the publishers, Prestel Verlag and their international offices, that such beautiful books are still being produced, albeit at a price.

So who is Alexander von Humboldt, the subject of this beautiful tome, and why would a reader in Asia care about his explorations of the Americas? To those who are not familiar with the name, Humboldt (1769–1859) was one of the greatest explorers of the early nineteenth century, a man who pioneered the field methods now used around the world in disciplines as diverse as botany, geology, geography, and oceanography. He belonged to a generation of European scientists that was no longer content to remain cocooned in an academic institute lecturing about places he had never seen on subjects he knew only from second hand. Instead he traveled to tropical America and endured 5 years of hardship to see first-hand the lands, peoples, cultures, and biodiversity there. Humboldt’s name is commemorated in a multitude of geographic features and living things: indeed, virtually any landform, oceanic phenomenon, plant, or animal that includes ‘Humboldt’ is surely named in honor of this German scientist and philosopher.

The author of this book, Professor H. Walter Lack, is the pre-eminent scholar of Humboldt’s botanical legacy, but until now his publications have been entirely in German. Prestel’s decision to translate Lack’s book into the English language makes the story of the expedition and the importance of its scientific contributions more widely available.

The book begins with a brief overview of Humboldt’s early life and education, then takes up the story of the “great expedition” to the Americas. This lasted for five years (1799–1804) and is summarised succinctly in 18 pages that include numerous colour illustrations. The rationale for this brief treatment is that, in the author’s words, “The story of the expedition... has been told ad nauseam...” While this is borne out via the references cited in the German language, an opportunity has been missed here to describe the expedition more fully to readers in the English language. Nonetheless, the synopsis presented hits the high points and gives a very cogent explanation of the scientific field methods employed by Humboldt and his companion and botanical collaborator, Aimé Bonpland. Methods that are largely still followed today by botanists collecting plants in the field.

Then follow seven chapters dealing in some detail with the scientific publications that followed after the expedition, a chapter covering the later years of Humboldt and his botanical collaborators Bonpland and Carl Sigismund Kunth, a summary of the precise dates of publication for the various works mentioned in these chapters, and a postscript explaining the big picture of what the publications accomplished and musing on the roles of the various principles. While these might seem dry and uninteresting, the reality is that they make for fascinating reading. The complex personalities and big egos, political tides in Europe, and nationalistic tussling assured that the publication
of results was anything but simple and the scientific outcomes are still resonating in taxonomy today. Indeed, those who enjoy a good detective novel will find the story of the post-expedition publications intriguing.

For those more visually inclined, the next portion of the book will be the focus of interest: 82 magnificent plates reproduced from the botanical publications that came out of the collaborations and competitions. Some of these are black and white engravings, others are full-colour plates; all are superbly reproduced and are, no doubt, the principle reason for the cost of this book. Lovers of art and plants will find them fascinating; most are credited to the botanical artist Pierre Turpin, a few are the work of Humboldt himself (see plate 33, an orchid, for example)—he was trained as a technical draughtsman and illustrator among his many other accomplishments—and the remainder are the work of noteworthy botanical artists including Redouté, Delile, and others.

One error was detected: in the caption for plate 42 there is a transposition of letters in the name of the genus between the plate and the caption; Aragoa on the plate, which is correct, became Aragao in the caption. This lapse aside, the plates are beautifully reproduced and give a glimpse of the botanical riches the great expedition gathered and described.

The book concludes with a bibliography of selected works about Humboldt and a series of three indexes, to places, proper names, and botanical names for plants. My compliments to the author and the publisher: this book is a welcome and beautiful addition to the body of work about Alexander von Humboldt and his botanical contributions to science.

George Staples
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BOOK REVIEW. **Bamboos at TBGRI. K.C. Koshy.** 2010.

Thiruvananthapuram, Kerala, India: Tropical Botanic Garden and Research Institute. 27.5 cm × 19.8 cm. card cover. 104 p. Price Rs. 800 / USS 30.

“All botanic gardens keep records of their living collections.” Thus declares the opening sentence in the preface to this book by Dr. K.C. Koshy, the founder of the Bambusetum at the Tropical Botanic Garden and Research Institute (TBGRI) in Kerala, India. That exhortation does not detail how well those records should be kept, and Koshy proceeds to show how.

This account was well-conceived, at a time when the TBGRI bamboo collection has just entered its third decade with nearly 70 species (currently recognised as 15 genera) and more than ten putative hybrids making up a whopping 933 accessions, a very good stage at which to declare coming of age. The opening chapter sets the foundation of the Bambusetum in the context of TBGRI’s history. Beginning with a mere 0.5 ha at inception, this Bambusetum has now grown to occupy nearly 6.6 ha (just more than 16 acres) in the sprawling green 121-ha campus of the TBGRI. Koshy gives a quick overview of Asian and Indian bambusetas, drawing attention to the humble beginnings of those collections that today continue to support scientific studies, such as at the East India Company (later Indian) Botanic Garden at Howrah, Calcutta from the time of Roxburgh in the early 19th century, as well as a good number of newer collections established around the 1980s. Notes are provided on the propagation methods used at TBGRI, the stage-by-stage development, and the geographical provenances covered that emphasised the Western Ghats region and North Western and North Eastern India. Koshy also documents how thirteen taxa were duplicated from the bambusetum of the Forest Research Institute at Dehra Dun, where specialist attention for bamboo taxonomy and genetics, biology and utilisation, have been and continue to be emphasised. This kind of duplication represents some insurance against loss at one location and also allows comparative studies in different environments. One or two anecdotes, such as the difficulties of transporting bulky plant offsets by passenger train, the Manipur collecting expedition through insurgency areas, or the monsoonal damage to Bambusetum plants in June 2003 that had to be dealt with, make the account come alive. Building a bambusetum is not just planting bamboo, it brings us into contact with much else, and often in “heavyweight” fashion.

The main records are compiled as Chapter 2. Herbarium and spirit-preserved material help document the living accessions. The entries are organised by genus and species in alphabetical order. Each taxon entry provides the scientific name, relevant taxonomic references, a brief description of the species, a literature-based distribution statement, and a note on the number of hereditary lines represented by the TBGRI material. The accession numbers of the taxon are given with location statement and (presumably GPS) coordinates in the TBGRI Bambusetum; planting date; propagule type used; details of origin (typically state, district and precise location); collection date, and collector and collection number. Herbarium and spirit collections associated with the material (either collected from outside the Bambusetum, or within: this is carefully distinguished) are also given when available. But not only are there planted bamboo accessions in the Bambusetum, as two natural populations, *Bambusa bambos* and *Ochlandra travancorica*, have been carefully conserved on site.

This book is very nicely produced, replete with end-paper photographic spreads of *Pseudoxytenanthera bourdillionii* (Gamble) H.B.Naithani and a frontispiece with
an alluring teaser in the form of an unidentified gigantic *Dendrocalamus* sp. Nearly every page has full-colour photographs, and there are a good number of full-page photographic reproductions (a Roxburgh painting of *Melocanna baccifera* faces the Preface), including many of the Bambusetum accessions. A contour map of the TBGRI Bambusetum showing the locations of all accessions spans nearly two pages, which means a serious fold is found right across it, and the fine print used for accession numbers on this map can be a challenge to the reader. Apart from this, the book is a highly unusual, but extremely welcome, detailed (and pleasant-to-consult) record of a scientific collection of living bamboos. It is unprecedented.

The TBGRI is a young institution, set up in 1979, and its Bambusetum was established in 1987, so it could be surprising that, in effect, this book unveils to the modern world one of the finest, if not the best, scientific living collections of bamboo in all of India and the tropics. And K.C. Koshy, certainly, has set the standard for not only TBGRI, which looks towards an ever-increasing role in tropical plant research, but any institute that seriously wishes to build a scientific collection of bamboos. TBGRI has had the ‘right recipe’: forefathers with good breadth of vision, passionate researchers who are well-qualified and dedicated to the task, good networking, and the great Kerala setting for tropical plants. It had worked before in the tropics and works again.

**K.M. Wong**  
*Singapore Botanic Gardens*
Instructions for contributing authors (continued)

Title and authorship. The title should concisely describe the contents. If a scientific name is used, its authority is normally excluded, but the family name would be provided. Authors' names, affiliations and postal / e-mail addresses are stated below the title. If more than one author, indicate “corresponding author”. Avoid footnotes. A short running title (up to six words) should also be provided.

Abstract. The abstract is at most 100–300 words. It should concisely indicate the article's contents without summarising it; mentioning novelties and name changes. Keywords: Suggest at most eight keywords, in alphabetical order.


(A useful source of verifying names of publications is <http://asaweb.huh.harvard.edu:8080/databases> publication_index.html>. If in doubt, list full titles.

Other abbreviations and units of measurement. If using standard abbreviations and acronyms, give the full term on first mention. Dates are cited as: 1 Jan 2000. SI (metric) units of measurement are used and spelled out except when preceded by a numeral; they are abbreviated in standard form: g, ml, km, etc.

Tables. Tables are numbered in arabic numerals in the order they are first mentioned in the text and carry an indicative legend at the head. Tables are given at the end of the manuscript.

Illustrations. All drawings, maps, graphs and photographic images (individually or collected in a plate) are to be numbered in arabic numerals in the order they are first mentioned in the text, as Fig. 1, Fig. 2, etc. (plate components would be referred to in the text as Fig. 1A, 1B, Fig. 1A–D, etc.). If relevant, scale bars should be used to indicate magnification. When grouping photographs, the maximum page area 19.5 × 13 cm must be heeded. High resolution digital images may be submitted as separate files (line drawings in black and white at 600 dpi, photographs at 300 dpi) sent electronically or in a CD. Do not embed images into the main text file.

References in the text. Citation in the text should take the form: King & Gamble (1886) or (King & Gamble 1886), or King et al. (1886) if more than three authors to a work. Use 2000a, 2000b, etc. if several papers by the same author(s) in one year are cited.


References to web-based resources should include either a doi (digital object identifier) specification or full URL mentioning also the date it was accessed. Use of DNA sequences from GenBank should be acknowledged and the studies for which the sequences were generated should be cited.

Style of nomenclatural summaries. The following style is required: Gardenia anisophylla Jack ex Roxb., Fl. Ind. ed. Carey & Wall. 2: 561 (1824).


If authors include full bibliographic data for these works in the list of references at the end of the paper, they should also be mentioned in the text briefly, e.g., “Nomenclatural references researched include Blume (1849) and Roxburgh (1824).” Homotypic synonyms should be provided in a block, stating the type at the end.

Front cover picture: Medinilla tapete-magicum Câmara-Leret & Veldk. (Photo by Irawati)