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Source: Willdenowia, 40(2) : 205-219

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.40.40206

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Studies on *Hanguana (Commelinales, Hanguanaceae)* for Sunda II: Five new forest species from Peninsular Malaysia and recircumscription of *Hanguana malayana*

Abstract

Siti Nurfazilah A. R., Ahmad Sofiman O., Mohd Fahmi A. B. & Boyce P. C.: Studies on *Hanguana (Commelinales, Hanguanaceae)* for Sunda II: Five new forest species from Peninsular Malaysia and recircumscription of *Hanguana malayana*. – Willdenowia 40: 205–219. – Online ISSN 1868-6397; © 2010 BGBM Berlin-Dahlem.
doi:10.3372/wi.40.40206 (available via http://dx.doi.org/)

Field work in Peninsular Malaysia as part of the first author's research into relationships and evolutionary polarity between *Hanguana malayana,* a widespread freshwater helophyte, and the numerous and mostly undescribed Sundaic forest species has to date resulted in the collection of five distinctive novel forest-dwelling *Hanguana* species. These are described here and figured in colour. Increased understanding of these and other forest species of *Hanguana* has enabled a concise delimitation of the taxonomically long-obfuscated colonial helophytic *H. malayana,* and this is here presented, and the species figured. The current taxonomy of *Hanguana* is summarised, and a key to the so-far described Peninsular Malaysian species is provided.

Additional key words: monocots, taxonomy, mesophytes, helophytes

Introduction

Although the taxonomy of *Hanguana (Hanguanaceae)* in Sunda remains beset with considerable confusion, field work in Malaysia is beginning to permit better understanding of the many taxonomic novelties and through this gradually establish a stable taxonomic platform from which to begin phylogenetic investigations of the genus *Hanguana* (Nurfazilah & al., in press).

Aside from making a start to bring taxonomic clarity to forest species of *Hanguana,* ongoing field work in Peninsular Malaysia has facilitated correction of several morphological misconceptions, ecological inexactitudes, and taxonomic and nomenclatural problems associated with *Hanguana malayana* (Jack) Merr.

Results

Taxonomy of *Hanguana*

The changes and novel additions proposed in this paper enable the current taxonomy of *Hanguana,* comprising 10 species, to be summarised as follows:

Hanguana Blume, Enum. Pl. Javae: 15. 1827.
Type: *Hanguana kassintu* Blume
= *Susum* Blume ex Roem. & Schult., Syst. Veg. 7(2): 95. 1830. – Type: *Susum anthelminthicum* Blume ex Roem. & Schult.
= *Veratronia* Miq., Fl. Ned. Ind. 3: 553. 1859. – Type: *Veratronia malayana* (Jack) Miq.

References. — Backer 1924: 3, 1951: 248–250; Airy Shaw 1965: 260–261; Rudall & al. 1999: 311–330; Tillich & Sill 1999: 215–238; Dassanayake 2000: 214–215.

1. *Hanguana bakoensis* Siti Nurfazilah, Sofiman Othman & P. C. Boyce, in press. – Holotype: Malaysia, Sarawak, Bahagian Kuching, Bako N. P., Lintang Trail, 27.5.2007, *Nadiah I., Malcom D., Army K. & al. S.100599* (SAR!; isotype: KEP, n.v.)

2. *Hanguana bogneri* H.-J. Tillich & E. Sill in Sendtnera 6: 216. 1999. – Holotype: Malaysia, Sarawak, bei der Orang-Utan-Station Semenggoh, *J. Bogner 94/2211;*

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kultiviert im Botanischen Garten München; 21.10.1996 (M!).

3. *Hanguana exultans* Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, present paper.

4. *Hanguana kassintu* Blume, Enum. Pl. Javae: 15. 1827 ≡ *Susum kassintu* (Blume) Kurz in Flora 56: 224. 1873 ≡ *Susum malayanum* f. *sylvatica* Backer, Handb. Fl. Java 3: 3. 1924 ≡ *Hanguana malayana* subsp. *kassintu* (Blume) Backer, Bekn. Fl. Java 10(212): 2. 1949. – Holotype: Indonesia, Java "crescit in sylvis montium Seribu Javae insulae", *Blume s.n.* (L!; isotype: BO!).

Notes. — Backer (1951) followed Merrill (1915) in assigning *Hanguana kassintu* as a synonym of *H. malayana,* but provided no detailed discussion. In fact, it is obvious from the protologue discussion (Blume 1827) and from examination of the type collection that *H. kassintu* is a forest species fully distinct from *H. malayana*. Blume, who knew both taxa, was perfectly aware of this. That *H. kassinutu* is distinct is also implied by Airy Shaw (1978), who, under the synonymy of *H. malayana,* cited: "*H. kassintu* auctt., pro parte, vix Bl. Enum. Pl. Javae: 15 (1827)". *H. kassintu* and the other Javan species will be the subject of another paper in this series.

5. *Hanguana major* Airy Shaw in Kew Bull. 35: 819. 1981. – Holotype: Malaysia, Sabah, Kinabalu, Mesilau River, 1500 m [converted from feet on the label], 5.2.1964, *Chew & Corner RSNB 4233* (K!).

Notes. — There are problems with the circumscription of *Hanguana major*. The plate accompanying the description does not feature any type elements and in fact represents two additional and furthermore novel taxa, with one *(Chai S 34089)* not cited in the material seen. As yet we have not examined all the cited material; a paper dealing with the taxonomy of *H. major* and the other species inadvertently included in the original publication awaits completion of this examination.

6. *Hanguana malayana* (Jack) Merr. in Philipp. J. Sci., C, 10: 3. 1915 ≡ *Veratrum malayanum* Jack, Malayan Misc. 1(1): 25. 1820

= *Hanguana anthelminthica* (Blume ex Roem. & Schult.) Masam., Enum. Phan. Born.: 81. 1942 ≡ *Susum anthelminthicum* Blume ex Roem. & Schult., Syst. Veg. 7(2): 1493. 1830

= *Hanguana aquatica* Kaneh. in Trans. Nat. Hist. Soc. Formosa 25: 8. 1935.

Note. — A full synonymy and revised circumscription is provided in the present paper below.

7. *Hanguana nitens* Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, present paper.

8. *Hanguana pantiensis* Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, present paper.

9. *Hanguana podzolicola* Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, present paper.

10. *Hanguana stenopoda* Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, present paper.

Insertae sedis

Susum minus Miq., Fl. Ned. Ind., Eerste Bijv.: 598. 1861. – Holotype: Indonesia, Sumatera Tengah, Pariaman ('prov. Priaman') (BO?, L?, not yet traced).

Notes. — Miquel's protologue describes this plant in some detail, comparing it against Blume's *Susum anthelminthicum* (= *Hanguana malayana*). In particular he noted the marked disparity in size between the inner larger and outer smaller sepals, the sepals to be "laciniae" and also the much smaller fruit ("baccis multo minoribus"). The plant is also noted as being glabrous. In the continued absence of an authentic specimen it is impossible to ascribe Miquel's epithet. Although assuming Miquel's observation of laciniate tepals is correct, it is a feature otherwise not recorded in any *Hanguana* with which we are familiar. We are therefore in no doubt that it represents a distinct, almost certainly forest-dwelling taxon.

Key to peninsular Malaysian *Hanguana* species

1. Stoloniferous colonial helophytes 2
– Clumping mesophytes lacking stolons 3
2. Leaves stiffly erect, acute; fruits ellipsoid, ripening glossy purple-red; stigma lobes flat, connate at base, the whole 3–4 mm diam. and almost obscuring the end of the fruit. Plants of open situations along muddy banks of large rivers, margins of freshwater bodies, and of freshwater swamp forest . . . . . ***H. malayana***
– Leaves arching, long-attenuate; fruits globose, ripening semiglossy black; stigma lobes small, separate, erect, pointed. Plants of shaded peatswamp mires . . . . . ***H. nitens***
3. Stigma inserted obliquely 4
– Stigma terminal 5
4. Fertile portion of infructescence not exceeding leaves, panicle dense, branches of the partial inflorescences ascending in fruit; plants sessile even in old age . . . . . ***H. pantiensis***
– Fertile portion of infructescence far exceeding leaves, panicle very open, branches of the partial inflorescences spreading and forming regular tiers; plants developing an erect, leafless stem up to 1.5 m tall . . . . . ***H. podzolicola***
5. Infructescence with caducous foliaceous bracts; partial inflorescences each with 2 or rarely 3 branches, spreading in fruit; fruits globose with a briefly stipi-

tate stigma, lobes connate basally, deep chocolate brown; fruit ripening white with conspicuous black speckles; old plants developing a short (to c. 25 cm) slender, leafless stem. Plants of well-drained slopes and low ridges in lowland humid, moist mixed dipterocarp forest on yellow clay soils . . ***H. stenopoda***

– Infructescence with persistent foliaceous bracts; partial inflorescences each with 4–5 branches, these rather sharply ascending in fruit; fruits ventrally gibbose-ellipsoid, stigma sessile, comprising 3 free orange brown lobes; fruit ripening pale yellow without conspicuous black speckles. Plants of low-lying wet podzols in peatforest . . . . . ***H. exultans***

New forest species from Peninsular Malaysia

Hanguana exultans Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, **sp. nov.**
Holotypus: Malaysia, Johor Bahru, Kota Tinggi, Hutan Lipur Panti, 1°48'07.7"N, 103°57'20.2"E, 40 m, 20.4.2010, *Siti Nurfazilah bt Abdul Rahman, P. C. Boyce & Ooi Im Hin HA-55* (KEP!).

Hanguanae stenopodae maxime similis, facile inflorescentiis partialibus omnibus ramis 4 vel 5, his fructu satis valde ascendentibus, tepalis interioribus fere diaphanis, infrutescentiis bracteis persistentibus foliaceis, fructibus ventraliter gibboso-ellipsoideis, maturatione dilute luteis sine punctis conspicuis nigris, stigmate sessili, lobis 3 separatis (non connatis) distinguenda.

Solitary medium-sized, herbaceous, dioecious mesophyte to c. 1 m tall. *Leaves* up to 1.8 m long; up to 15 together, semi-erect, tips arching, somewhat flocculose abaxially, soon glabrescent, bases imbricate; *leaf blade* up to 90×15 cm, elongate-elliptic, base long-decurrent, tip rather attenuate; glossy deep green when fresh, drying dull olive-green abaxially, silver-green adaxially; *pseudopetiole* up to 80 cm long, 1 cm wide, accounting for almost $^1/_2$ the entire leaf length, shallowly channelled, the margins somewhat sharp, longitudinally folded inwards, petiole very pronounced, c. 24 cm long, petiolar sheath with margins wide, glossy erose-marcescent, drying deep brown; *midrib* somewhat prominently round-raised abaxially, drying shallowly channelled for c. $^2/_3$ of the blade, flush distally adaxially and all other venation prominent minutely tessellate-striate in most specimens. *Female and male inflorescences* not observed, although, based on fruiting material and observations of inflorescence architecture, almost certainly erect at anthesis. *Infructescence* erect, thyrsoid-paniculate, not exceeding the leaves, comprising up to 6 partial alternate-secund, thyrsoid infructescences plus a terminal spike; *peduncle and scape* together up to 60 cm tall, conspicuously very pale brown floccose, especially the scape, dark green when fresh, drying dark brown, visible portion of peduncle up to 9 cm long; bract marking start of scape foliaceous, sterile, persistent, broadly lanceolate, 52×10.5 cm, base clawed, apex long-attenuate; subtending bract of partial infructescences similar to that marking the start of the scape, diminishing in size distally along the infructescence, the largest c. 19.5×2 cm, the smallest 15×3 mm, all infructescence bracts drying pale straw-coloured; *partial infructescences* each comprising up to 7 branches, often fewer, arising simultaneously from the axil of the subtending bract, median branches c. 9 cm long, lateral branches up to 5 cm long, both 1–1.5 mm wide, somewhat erect. *Female flowers* scattered, mainly solitary, sessile, all with an associated minute bracteole; *perianth* of 6 transparent, very pale green tepals, outermost c. 1.9×1.1 mm, ovate, inner tepals c. 2.1×1.9 mm, ovate, all tepals clasping the base of the fruit. *Ripe fruits* ventrally gibbose-ellipsoid, pale yellow; *stigma* sessile when fresh, drying conspicuously raised, c. 1.2 mm diam., comprising 3 free orange-brown lobes. *Seeds* not observed. – Fig. 1.

Ecology. — Low-lying wet (but not swampy) podzols under closed-canopy lowland humid moist peatforest.

Notes. — *Hanguana exultans* is most similar to *H. stenopoda* although readily distinguished by the nearly transparent inner tepals, infructescence with persistent foliaceous bracts, partial inflorescences each with 4–5 branches rather sharply ascending in fruit, ventrally gibbose-ellipsoid fruits with a sessile stigma comprising 3 separate (not connate) orange brown lobes and the fruit ripening pale yellow without conspicuous black speckles.

Older plants of *Hanguana exultans* do not develop the slender, short, naked stem typical for *H. stenopoda*. There are also ecological differences: *H. exultans* is a plant of low-lying wet podzols in peatforest, whereas *H. stenopoda* is restricted to well-drained slopes and low ridges in lowland humid, moist mixed dipterocarp forest on yellow clay soils.

Etymology. — Latin "exultans" = boastful, vainglorious, in rather fanciful allusion to this species remaining aloof from the more abundant and parapatric *Hanguana pantiensis.*

Hanguana nitens Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, **sp. nov.**
Holotypus: Malaysia, Johor Bahru, Mersing, Hutan Simpanan Lenggor, 2°15'72.7"N, 103°43'76.7"E, 55 m, 18.4.2010, *Siti Nurfazilah bt Abdul Rahman, P. C. Boyce & Ooi Im Hin HA-48* (KEP!).

Hanguanae malayanae superficialiter habitu stolonifero coloniali similis, sed facile foliis arcuatis (non rigide erectis) graviter nitide viridibus, lamina conspicue longa (ad $^2/_3$–$^3/_4$ folii longitudine) pseudopetiolata leniter plicata, apice longe attenuato, fructibus globosis maturatione seminitide nigris, stigmatis lobis separatis erectis acutis distinguenda.

Medium-sized, glabrous, dioecious stoloniferous helophyte to c. 1 m tall; *stem* terete, rhizomatous with the terminal portion ascending, up c. 1.5 cm diam., subwoody, the older portions clothed in dense fibrous degraded leaf bases; *stolons* up to 45 cm long (although usually less), c. 1.5 cm diam., semi-erect or creeping, or burrowing through liquid peat, enveloped by appressed petiolar sheaths, these deep green and foliaceous towards the stolon active tip, older leaf portions turning glossy chestnut brown and eventually partially or completely decaying into fibres. *Leaves* up to 1.35 m long, up to 16 together, long-pseudopetiolate, ± erect, innovations sometimes very sparsely flocculose abaxially along the midrib, soon glabrescent, with age entirely glabrous; *leaf blade* 45–100×5–8 cm, narrowly lanceolate, leathery, dark shining green when fresh, drying dull olive-green, the base decurrent on the pseudopetiole, tip long-attenuate; *pseudopetiole* accounting for c. $^{2}/_{3}$–$^{3}/_{4}$ of the leaf length, ± V-shaped in cross-section, margins sharp, petiolar sheath margins drying papery; *midrib* acutely raised abaxially, flush to slightly impressed adaxially, blade irregularly but prominently plicate when fresh, densely longitudinally veined, with numerous close-set very fine cross-veinlets. *Female and male inflorescences* a moderately stout pedunculate panicle, erect at anthesis, subtended by a fully developed foliage leaf, with up to 15 patently branched thyrsoid or spicate partial inflorescences plus a terminal spike; bract subtending proximal partial inflorescences very narrowly triangular, foliaceous, 5–24 cm long, 0.5–2 cm wide, bract subtending distal-most partial inflorescences small to minute, ovate, apiculate; median branches longer than lateral branches, up to 15 cm long and c. 3 mm wide, rectangular in cross section at the base, angle further up, lateral branches approximately 3.5 cm long; terminal spike c. 9 cm long, all branches weakly ascending; *peduncle and scape* together up to 80 cm tall, lower part of peduncle up to 1.5 cm diam., the whole inflorescence weakly flocculose, glabrescent or nearly so in part, pale green with areas of purple-brown speckles and spots when fresh, drying deep brown with remaining hairs pale brown, visible portion of peduncle up to 30 cm long; bract marking onset of scape large, foliaceous, sterile, c. 60 cm long, 9 cm wide, narrowly triangular, base clasping, tip long-attenuate. *Male flowers* not observed. *Female flowers* ± distant, mostly solitary, occasionally in small clusters, especially towards the tips of branches, sessile with a broad base in the axil of a short, broad bract; *tepals* shortly connate at the base, green, outer 3 tepals c. 1×2.5 mm, inner tepals c. 2×2.5 mm; *staminodes* not observed; *ovary* broadly ovoid-globose, pale green, ripening through yellow-green to black; *stigma* sessile, 3-lobed, c. 2 mm diam., lobes separate, erect, acute-pointed, matte black. *Infructescence* erect. *Ripe fruit* globose, c. 4 mm diam., semiglossy black, stigma remains matte black. *Seeds* hemispherical, deeply excavated, with the pit margins incurved, c. 3 mm diam. – Fig. 2.

Distribution. — Malaysia, Johor Bharu.

Ecology. — Blackwater mires over saturated deep peat along margins of closed-canopy lowland humid moist peatswamp forest at altitudes of 40–50 m.

Notes. — *Hanguana nitens* by its stoloniferous, colonial habit is superficially similar to *H. malayana,* but may be readily distinguished by arching (not stiffly erect), deep glossy green leaves, with the blade conspicuously long-pseudopetiolate (up to $^{2}/_{3}$–$^{3}/_{4}$ of the leaf length) and weakly plicate with a long-attenuate tip, and globose fruit ripening semiglossy black with separate, erect, pointed stigma lobes.

So far, *Hanguana nitens* is known from three sites. At the type locality it is abundant, occurring as several moderately extensive female stands, and a single isolated male population. The second known locality, Hutan Simpan Panti, consists of a much smaller single population of female plants. The third site, at Hutan Lipur Panti, is a relict, very much depleted unsexed population critically threatened by an adjacent building development.

Etymology. — Latin "nitens" = shining, polished, in allusion to the remarkably lustrous leaf blade.

Other material seen. — Malaysia: Johor Bahru, Kota Tinggi, Hutan Simpan Panti, 1°52'22.6"N, 103°54'75.5"E, 19.4.2010, *Siti Nurfazilah bt Abdul Rahman, P. C. Boyce & Ooi Im Hin HA-51* (KEP); Johor Bahru, Kota Tinggi, Hutan Lipur Panti, 1°48'07.7"N, 103°57'20.2"E, 20.4. 2010, *Siti Nurfazilah bt Abdul Rahman, P. C. Boyce & Ooi Im Hin HA-57* (KEP).

Hanguana pantiensis Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, **sp. nov.**
Holotypus: Malaysia, Johor Bahru, Kota Tinggi, Hutan Lipur Panti, 1°48'07.7", 103°57'20.2", 40 m, 19.4.2010, *Siti Nurfazilah bte Abdul Rahman, P. C. Boyce & Ooi Im Hin HA-56* (KEP!).

Hanguanae podzolicola maxime similis, aetate sine culmo longo efoliato, pedunculo breviore, inflorescentiae parte fertili foliis non excedenti, paniculae structura confertiore, inflorescentiae partialis ramis fructu ascendentibus (non effusis) differt.

Solitary robust, herbaceous, dioecious mesophyte to c. 2 m tall. *Leaves* up to 1.6 m long, up to 16 together, spreading, flocculose abaxially, the outermost leaves arching with the tips touching the ground, bases imbricate; *leaf blade* up to 84×13.5 cm, narrowly elliptic, base decurrent, tip long-attenuate with a conspicuous apicule to 5 mm, deep green semiglossy when fresh, drying dull olive-green abaxially, silver-green adaxially; *pseudopetiole* up to 15 cm long, 1 cm wide, accounting for c. $^{1}/_{5}$ of the entire leaf length, shallowly channelled, the margins

somewhat sharp, longitudinally folded inwards, lowermost part of petiolar sheath with margins erose-marcescent; *midrib* prominently round-raised abaxially, especially in the lower middle part of the leaf blade, impressed adaxially, drying flush adaxially and all other venation prominent minutely tessellate-striate in most specimens. *Female and male inflorescences* not observed, although, based on fruiting material and observations of inflorescence architecture, almost certainly erect at anthesis. *Infructescence* erect, dense-paniculate, not exceeding the leaves, comprising up to 13 partial, whorled, thyrsoid or more rarely spicate infructescences plus a terminal spike; *peduncle and scape* together up to 70 cm tall, conspicuously very pale brown flocculose, especially the scape, dark green when fresh, drying dark brown, visible portion of peduncle up to 20 cm long; bract seemingly marking start of scape foliaceous, sterile, lanceolate-elliptic, soon falling (but more investigation needed); subtending bract of partial infructescences similar to that marking the start of the scape, diminishing in size distally along the infructescence, the largest c. 48×10 cm, the smallest 18×3 mm; *partial infructescences* each comprising up to 12 branches arising simultaneously from the axil of the subtending bract, median and lateral branches almost equal in length, up to 14 cm long, 1–2 mm wide, markedly erect. *Female flowers* scattered, mainly solitary, sessile, all with an associated minute bracteole; *perianth* of 6 opaque, green tepals, outermost c. 1.5×2 mm, ovate, weakly concave, inner tepals c. 2×2.5 mm, ovate, all tepals clasping the base of the fruit. *Ripe fruit* pink, with minute raised yellow speckles, oblique-globose, c. 5 mm diam., ripening glossy pink; *stigma* 3-lobed, lobes not connate, c. 1 mm, raised, dark brown. *Seeds* not observed. – Fig. 3.

Distribution. — Only known from the type locality, where it is abundant.

Ecology. — Well-drained flat and slightly undulating areas of lowland closed canopy humid moist peatforest. 40–60 m.

Notes. — *Hanguana pantiensis* is one of a group of species, all novel, in which early in development the ovary bends longitudinally to produce a fruit with the stigma obliquely to sublaterally inserted. *H. pantiensis* is most similar to *H. podzolicola,* differing by the much shorter peduncle, with the fertile portion of the inflorescence not exceeding the leaves, the denser panicle structure, with the branches of the partial inflorescence ascending (not spreading) in fruit and by not developing a tall, leafless stem with age.

Hanguana pantiensis is abundant at the type locality, forming dense pure stands. At the time of collection several female plants were fruiting, and numerous plants with spent inflorescences suggested that male plants were common.

Etymology. — Type locality "Panti" + Latin "ensis" = originating from, referring to the type and only known locality.

Hanguana podzolicola Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, **sp. nov.**
Holotypus: Malaysia, Johor Bahru, Mersing, Hutan Simpanan Lenggor, 2°15'72.7"N, 103°43'76.7"E, 55 m, 18.4.2010, *Siti Nurfazilah bt Abdul Rahman, P. C. Boyce & Ooi Im Hin HA-50* (KEP!).

Hanguanae pantiensi maxime similis in stigmatis insertione obliqua, sed paniculae structura plurime aperta, inflorescentiae partialis fructu ramis effusis (non valde ascendentibus), praeterea individuis vetioribus caule erecto efoliato evoluerentibus distinguenda.

Solitary robust, herbaceous, dioecious mesophyte to c. 2 m tall, stem erect, with age becoming leafless to 1.5 m with a terminal crown of leaves. *Leaves* up to 1.5 m long, up to 15 together, spreading, bases imbricate; *leaf blade* up to 80×13 cm, narrowly elliptic, base decurrent, tip long-attenuate with a conspicuous apicule to 7 mm, stiffly chartaceous and deep green when fresh, drying somewhat softer and dull olive-green abaxially, silver-green adaxially; *pseudopetiole* c. 45 cm long, 2 cm wide, accounting for up to $^1/_3$ of the entire leaf length, shallowly channelled, the margins very sharp, especially about half way along the length; petiolar sheath margins hyaline when fresh, drying medium-brown and ultimately marcescent; *midrib* pronouncedly round-raised abaxially, channelled adaxially; lesser venation very obscure when fresh, drying closely and conspicuously longitudinally-raised striate with pronouncedly reticulate lesser venation, with the marginal veins drying darker adaxially and overtopping the leaf blade to form the apicule. *Female and male inflorescences* not observed, although, based on fruiting material and observations of inflorescence architecture, almost certainly erect at anthesis. *Infructescence* solitary, erect, comprising up to 11 partial, whorled, thyrsoid or more rarely spicate infructescences plus a terminal spike; *peduncle and scape* together up to 80 cm tall, conspicuously very pale brown flocculose, green when fresh, drying dark brown, visible portion of peduncle up to 30 cm long; bract seemingly marking start of scape foliaceous, sterile, lanceolate-elliptic, soon falling (but more investigation needed); bract subtending partial infructescences similar to that marking the start of the scape, diminishing in size distally along the infructescence, the largest c. 41×5.5 mm, the smallest 25×5 mm; *partial infructescences* each comprising of 9 branches, branches arising simultaneously from the axil of the subtending bract, median and lateral branches almost equal in length, 10–18 cm long, 1–2 mm wide, somewhat flattened. *Female flowers* scattered, mainly solitary, occasionally in groups of 2, sessile, all with an associated minute bracteole; *perianth* of 6 opaque, green tepals, out-

ermost c. 1×1.8 mm, ovate, weakly concave, inner tepals c. 2×2 mm, ovate, all clasping the base of the fruit. *Ripe fruit* pale yellow with minute pink speckles, oblique-globose, c. 5 mm diam., ripening glossy medium pink to magenta; *stigma* 3-lobed, lobes connate basally, c. 1.3 mm, raised, matte deep brown. *Seeds* not observed. – Fig. 4.

Distribution. — Malaysia, Johor Bahru.

Ecology. — Raised podzols in closed canopy lowland humid moist peatforest, occasionally on raised podzols in seasonally swampy peatforest. 40–60 m.

Notes. — *Hanguana podzolicola* closely resembles *H. pantiensis* by the oblique insertion of stigma, but may be distinguished by the much more open panicle structure, partial inflorescence branches spreading (not sharply ascending) in fruit, and by older individuals developing an erect, leafless stem up to 1.5 m tall.

Etymology. — Latin "cola" (derived from "incola", the inhabitant, dweller) + "podzol", a raised peat deposit. Referring to the restricted ecology of this species.

Other material seen. — Malaysia, Johor Bahru, Kota Tinggi, Hutan Lipur Panti, 1°48'07.7"N, 103°57'20.2"E, 19.4.2010, *Siti Nurfazilah bt Abdul Rahman, P. C. Boyce & Ooi Im Hin HA-53* (KEP).

Hanguana stenopoda Siti Nurfazilah, Mohd Fahmi, Sofiman Othman & P. C. Boyce, **sp. nov.**
Holotypus: Malaysia, Pahang, Rompin, Taman Negeri Endau Rompin, 2°37'37.2"N, 103°19'83.3"E, 12.5.2010, *Siti Nurfazilah bt Abdul Rahman, Mohd Fahmi Bin Abu Bakar & P. C. Boyce HA-60* (KEP!).

Hanguanae exultanti similis, inflorescentiis partialibus omnibus ramis 2 raro 3, his fructu effusis, tepalis interioribus opace viridibus, infructescentiis bracteis caducis foliaceis, fructibus maturitate albis punctis conspicue nigris, stigmate breviter stipitato lobis basaliter connatis graviter badiis differt. Maturitate caule brevi gracili efoliato.

Solitary, herbaceous, dioecious mesophyte to c. 1 m tall, developing a short (up to 25 cm), slender leafless stem with age. *Leaves* up to 1 m long, up to 15 together, initially semi-erect, older (outermost) leaves spreading, the longest leaves arching with the tips touching the ground, bases imbricate; *leaf blade* up to 51.5×9 cm, elliptic, thinly leathery, glossy, bright green when fresh, drying thinly chartaceous and pale straw-coloured; *pseudopetiole* 35–44 cm long, c. 1 cm wide, accounting for just under $^1/_2$ of the entire leaf length, when fresh somewhat channelled, with the margins very sharp, drying strongly longitudinally folded; lowermost part of petiolar sheath c. 16 cm long, margins rather wide, erose-marcescent leaf tip long-attenuate, tipped with a 1 cm tubule; *midrib* prominent proximally, somewhat semiterete, raised abaxially, especially in the lower part of the leaf blade, distally flush, somewhat impressed adaxially until the mid-point, thereafter flush, other venation striate, obscure when fresh, drying somewhat prominent, with all minor venation minutely tessellate. *Female and male inflorescences* not observed, although, based on fruiting material, almost certainly erect at anthesis. *Infructescence* erect, comprising 4 partial, thyrsoid partial infructescences plus a terminal spike, subtended by a fully developed foliage leaf; *peduncle and scape* together up to 62 cm tall, greyish flocculose, dark brown-red, visible portion of peduncle up to 22.5 cm long, 5 mm wide; bract marking start of scape foliaceous, sterile, narrowly elliptic, up to 25×6.5 cm, base clawed, tip attenuate; bract subtending partial infructescences linear-triangular, up to 65×6 mm, diminishing in size distally along the infructescence, the smallest c. 7×2 mm; *partial infructescences* each comprising of 3 branches, the terminal one a single spike, branches arising simultaneously from the axil of the subtending bract, median branch usually longer than lateral branches, 5–7 cm long, c. 1.5 mm wide, weakly angled, lateral branches approximately $^2/_3$ of the length of median branch, although branches subequal in distalmost partial infructescence. *Female flowers* mainly in scattered groups of 2 to 3, lowermost flowers of each branch occasionally solitary, all mainly sessile, very occasionally pedicellate to c. 0.5 mm, all with an associated minute bracteole; *perianth* of 6 tepals, outer tepals 1.2×1.9 mm, ovate, inner tepals c. 2.5×2.5 mm, ovate, all clasping fruits in fresh material and medium green, outer with a narrow dark red margin, inner only red at the tip. *Ripe fruit* compressed-globose, c. 5×4.2 mm, glossy white with conspicuous black speckles; *stigma* 3-lobed, lobes connate to form a clover-leaf, c. 1.9 mm diam., very shortly stipitate, matte black. *Seeds* not observed. – Fig. 5.

Distribution. — Malaysia, Pahang, known only from the type locality.

Ecology. — Lowland humid, moist mixed dipterocarp forest on yellow clay soils with a moderate leaf litter layer at altitudes of 60–125 m.

Notes. — *Hanguana stenopoda* resembles *H. exultans,* differing by the opaque green inner tepals, infructescence with caducous foliaceous bracts, partial inflorescences each with 2 or rarely 3 branches, these spreading in fruit, globose fruits with a briefly stipitate stigma, in which the lobes are connate basally and deep chocolate brown, and the fruit ripening white with conspicuous black speckles. In age, *H. stenopoda* develops a short, slender, leafless stem.

Hanguana stenopoda is restricted to well-drained slopes and low ridges in lowland humid, moist mixed dipterocarp forest on yellow clay soils with a moderate leaf litter layer.

Etymology. — Greek στενος (stenos) = slender, and Latin *podos* = a foot, referring to the short, slender stem that develops in older individuals.

Other material seen. — Malaysia, Pahang, Temerloh, Gunung Benom, Krau Wildlife Sanctuary 3°49'29.8"N, 102°12'84.6"E, 125, 13.5.2010, *Siti Nurfazilah bt Abdul Rahman, Mohd Fahmi Bin Abu Bakar & P. C. Boyce HA-61* (KEP).

Hanguana malayana recircumscribed

Hanguana malayana (Jack) Merr. in Philipp. J. Sci., C, 10: 3. 1915 ≡ *Veratrum malayanum* Jack, Malayan Misc. 1(1): 25. 1820 ≡ *Veratronia malayana* (Jack) Miq., Fl. Ned. Ind. 3: 553. 1859 ≡ *Susum malayanum* (Jack) Planch. ex Hook. f., Fl. Brit. India 6: 391 1892. – Holotype: Malaysia, Pulau Pinang ["Poeloe Pinang"], *Jack s.n.* (not traced). – Epitype (designated here): *Wallich* EIC 3717 [K-WAL!].

= *Hanguana anthelminthica* (Blume ex Roem. & Schult.) Masam., Enum. Phan. Born.: 81. 1942 ≡ *Susum anthelminthicum* Blume ex Roem. & Schult., Syst. Veg. 7(2): 1493. 1830 ≡ *Susum malayanum* f. *aquatica* Backer, Handb. Fl. Java 3: 3 (1924) ≡ *Hanguana malayana* subsp. *anthelminthica* (Blume ex Roem. & Schult.) Backer, Bekn. Fl. Java 10(212): 2. 1949 ≡ *Hanguana malayana* var. *anthelminthica* (Blume ex Roem. & Schult.) Bakh. in Blumea 6: 399 1950. – Holotype: Indonesia, Java "in paludibus circa Buitenzorg", *Blume s.n.* (L!; isotype: BO!).

= *Hanguana aquatica* Kaneh. in Trans. Nat. Hist. Soc. Formosa 25: 8. 1935. – Holotype: Caroline Islands, Palau, Almonogni, Babeldaob, 13.4.1938, *S. Hatusima 4866* (FU!).

References. — Ridley 1907: 131–133, 1924: 369; Backer 1951: 248–250; Airy Shaw 1975: 1–50.

Large to massive colonial stoloniferous dioecious helophytes to c. 3 m tall, exceptionally reaching 4 m; *stem* terete, robustly rhizomatous with the terminal portion ascending, up c. 15 cm diam., although usually somewhat less, spongy, the older portions clothed in dense fibrous degraded leaf bases; *stolons* up to 2.5 m long (usually less), c. 2 cm diam., creeping or burrowing through liquid mud, or floating on the surface of water, enveloped by appressed sheath, these foliaceous towards the stolon active tip, which finally dissolve into fibres. *Leaves* exceptionally up to 3.5 m long, more usually about 1.5–2 m, up to 20 together, stiffly erect, occasionally fleetingly flocculose abaxially when young, otherwise glabrous; lower leaves briefly pseudopetiolate, higher leaves (of flowering plants) remote, smaller; on shorter petioles, pedunculate and scapose bracts sessile or subsessile with a broad base, small, passing into fertile bracts; lower leaf sheaths long and broad, stem clasping, deeply split on the anterior side, gradually narrowing into the petiole; *leaf blade* (20–)45–200(–300)×4–15 cm, lanceolate, somewhat spongy-leathery, medium to dark green, sublustrous when fresh, drying spongy-chartaceous and medium straw-coloured, base acute to decurrent on the pseudopetiole, tip acute; *pseudopetiole* accounting for c. $^1/_5$ of the leaf length, ± flat to shallowly V-shaped, margins sharp, lowermost part of petiolar sheath margins later marcescent; *midrib* rather thick, blade densely longitudinally veined, with numerous close-set thin cross-veinlets, between the longitudinal veins very densely and finely longitudinally striate, not or only very obscurely plicate. *Female and male inflorescences* a stout pedunculate panicle erect at anthesis and subtended by a fully developed foliage leaf, with up to 10 whorls of 1–10× patently branched thyrsoid or spicate partial inflorescences plus a terminal spike; branches arising simultaneously from the axil of the subtending bract, median branches usually longer than lateral branches, although branches subequal in distal-most units; *partial male inflorescences* 30.5 cm long, c. 4 mm wide, weakly angled, lateral branches approximately 29 cm long, c. 2.1 mm wide, thinner and longer than those of female inflorescences, rather distinctly yellowish, with a greater number of flowers, branches initially ascending, later drooping at post-anthesis prior to withering; *partial female inflorescences* stout and short, 18 cm long, c. 4 mm wide, weakly angled, lateral branches approximately 11 cm long and c. 3 mm wide, green, ascending; *peduncle and scape* together often more than 2 m tall, lower part of peduncle up to 3 cm diam., the whole weakly to rather densely flocculose, soon glabrescent or nearly so, medium green, visible portion of peduncle up to 50 cm long; bract marking onset of scape large, foliaceous, fertile, or sterile, broadly lanceolate-elliptic, up to 20 cm long, base clasping, tip long-acute. *Flowers* of both sexes ± distant, either solitary or in small clusters, sessile with a broad base in the axil of a short, broad bract and tepals shortly connate at the base, green or yellowish or the inner tepal dotted red. *Male flowers* with 3 outer tepals c. 1 mm long and 3 inner tepals c. 1.5 cm long, fornicate; *stamens* 6, on the base of the perianth, about as long as the inner tepals; filaments filiform from a broader base, c. 2 mm long; anthers small, c. 1 mm, with longitudinal slits, inserted in a basal cleft; *pistillode* small, stigmas 3, erect, shortly clavate. *Female flowers* with outer 3 tepals c. 2 mm long and inner tepals c. 3 mm long; *staminodes* 6, c. 0.5 mm long, inserted on the base of the perianth, those opposite the outer sepals minute, narrowly triangular, 3 others much longer and broader, rounded, dorsally compressed; *ovary* broadly ovoid-globose, stigma sessile, deeply divided into 3 spreading broadish short arms. *Infructescence* erect, comprising up to 10 partial infructescences each subtended by a semipersistent bract up to 20 cm long, although these diminishing in size distally along the infructescence, the smallest c. 10×2 cm. *Ripe fruit* dark shining purple-red, ellipsoid, c. 1×5 mm, *stigma*

3-lobed, lobes connate to form a clover-leaf almost obscuring the end of the ovary, c. 3 mm diam., matte black. *Seeds* not observed. – Fig. 6–7.

Distribution. — Equatorial tropics from Sri Lanka to western Micronesia (Palau), south as far as northern Australia and north to the Philippines (Luzon). Absent from the area between the Wallace and Webber lines.

Ecology. — Plants of open lowland situations along muddy banks of large rivers, margins of freshwater bodies, and of freshwater swamp forest.

Notes. — Nurfazilah & al. (in press) have highlighted that the Flora Malesiana account for *Hanguana* (Backer 1951) contains numerous misconceptions with the result that the circumscription of *H. malayana* has been subject to considerable and quite unnecessary confusion. Field observations in Malaysia leave us in no doubt that *H. malayana* is both morphologically and ecologically clearly circumscribed, as defined in the above key.

It is interesting to note that Ridley (1907, 1924) was clearly aware that the circumscription of *Hanguana* in Peninsular Malaysia was in need of critical study. Unfortunately, Ridley (1907) unaccountably applied the name *Susum malaynanum* to the forest species (in the broad sense), while for the open habitat helophyte he used the (now synonymous) *S. anthelminthica.*

Backer (1951) stated the fruit to be shining red. This is incorrect; the ripe fruit is dark shining purple-red, as stated by Dassanayake & al. (1999).

Diligent searches of relevant herbaria have failed to turn up Jack's collection of *Veratrum malayanum* [≡ *Hanguana malayana*]. As alluded by Steenis-Kruseman (2006) there are difficulties and obscurities associated with Jack's herbarium, not least because "an important part of his botanical notes and collections was lost by the fire of the ship 'Fame' on which Raffles embarked for Europe in 1824". It might be argued that the type is lost and thus neotypification is justifiable. However, given that Jack material periodically turns up in 'expected' places (e.g. Cowan (1954) "methodically searched the Herb. Edinburgh [E] for Jack specimens and found 64 in all (incl. 1 dupl.). No record of how and when they were acquired was found …"), we are reluctant to take this step. As a compromise, we have opted to epitypify *Wallich EIC 3717,* a Pinang collection as was Jack's, and beyond any doubt well-representative of the species.

Acknowledgements

Fieldwork in Malaysia was supported by a Research University Grant from the Universiti Sains Malaysia, Penang. Thanks go to J. F. Veldkamp (Leiden) for translation of the Latin diagnoses.

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Fig. 1. *Hanguana exultans* – A: flowering plant in habitat; B: infructescence, note the rather sharply ascending branches; C: detail of the ventrally gibbose-ellipsoid fruits ripening pale yellow with a sessile stigma comprising 3 separate (not connate) orange brown lobes; D: median leaf and inflorescence of *H. pantiensis* (left) compared with *H. exultans* (right). – A–D: *Siti Nurfazilah & al. HA-55*; images © Rosazlina Bt Rusly.

Fig. 2. *Hanguana nitens* – A: plants in habitat, note the arching (not stiffly erect) leaves; B: portion of a mature plant showing a stolon and the conspicuous, long ($^{2}/_{3}$–$^{1}/_{4}$ of the leaf length) pseudopetiole; C: plicate leaf blade; D: portion of an immature infructescence, compare the separate, erect, pointed stigma lobes with those of *H. malayana* (Fig. 7B); E: ripe fruits. – A–E: *Siti Nurfazilah & al. HA-48;* images © Rosazlina Bt Rusly.

Fig. 3. *Hanguana pantiensis* – A: plant in habitat, note the dense panicle carried down in the leaves; B: detail of infructescence, note the dense panicle with branches of the partial inflorescences ascending; C: ripe fruits, with the stigma obliquely to sublaterally inserted by longitudinally bending of ovary; D: leaf bases showing litter-trapping. – A–D: *Siti Nurfazilah & al. HA-56*; images © Rosazlina Bt Rusly.

Fig. 4. *Hanguana podzolicola* – A: plant in habitat showing the tall, leafless stem produced by older plants; B: detail of infructescence, note the open nature of the panicle and the spreading branches of the partial inflorescences; C: ripe fruits, with the stigma obliquely to sublaterally inserted by longitudinally bending of ovary; D: median leaf and inflorescence. – A–D: *Siti Nurfazilah & al. HA-49*; images © Rosazlina Bt Rusly.

Fig. 5. *Hanguana stenopoda* – A–B: plants in habitat; B: detail of infructescence, note the partial inflorescences each with only 2 or rarely 3 branches and that the subtending bracts have fallen; D: ripe fruits with opaque tepals, briefly stipitate stigma, with the lobes connate, deep chocolate brown, and the fruit with conspicuous black speckles. – A–D: *Siti Nurfazilah & al. HA-60*; images © Siti Nurfazilah Bt Abdul Rahman.

Fig. 6. *Hanguana malayana* – A: plants in habitat in Maludam N. P., Sarawak, note the stiffly erect leaves and the stolons floating on the water surface; B: detail of semi-terrestrial stolons in habitat, Perak. – A: image © Mike Lo; B: image © Siti Nurfazilah Bt Abdul Rahman.

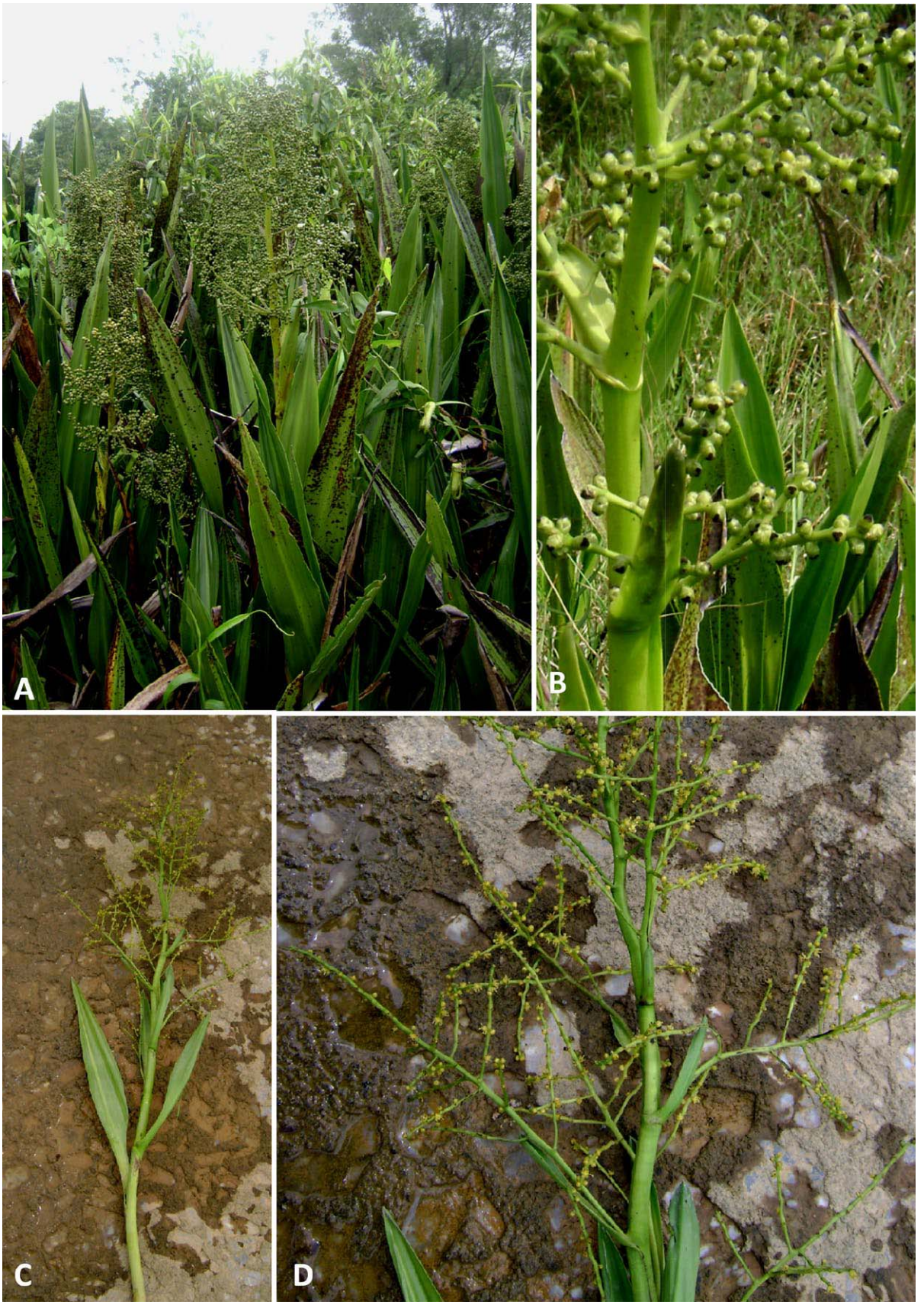

Fig. 7. *Hanguana malayana* – A–B: female plants, note the short, robust branches, the green partial inflorescences, the ellipsoid fruits, and the large sessile stigma almost obscuring the end of the fruit; C–D: male inflorescences, note the much longer, more slender rather yellowish branches of the male inflorescence; after anthesis these branches droop prior to withering. – Images © Siti Nurfazilah Bt Abdul Rahman.