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Studies on *Hanguana* (Commelinales-Hanguanaceae) for Sunda I: *Hanguana bakoensis*, a New Forest Species from Sarawak, Malaysian Borneo, and Notes on Critical Morphologies for Elucidating *Hanguana* Taxonomy

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Hanguana bakoensis is described as a new species from Bako National Park, Sarawak, Malaysian Borneo. The confused taxonomic history of *Hanguana* is highlighted and species-level taxonomically important characters are enumerated. A key to the currently recognized *Hanguana* species of Borneo is provided, and the new species is illustrated.

Key words: Borneo, *Hanguana*, macroherbs, Malaysia, Sarawak

In common with many tropical macroherbs (e.g., Araceae, Musaceae, Zingiberaceae, etc.), the taxonomy of *Hanguana* has suffered from an historical over-reliance on fragmentary, poorly preserved, badly documented herbarium specimens coupled with an almost complete absence of reliable field observations. Even the few well-vouchered specimens of *Hanguana* are mainly lacking information on crucial characters, notably details of the ripe fruits, with the result that over 90% of the not inconsiderable herbarium holdings in BO, FRIM, K, L, M, SAR, and SING, among other herbaria, are wrongly determined.

The two modern taxonomic accounts for Hanguanaceae are floristic and wholly herbarium based. For Sri Lanka (Dassanayake 1999), where only the colonial helophytic *H. malayana* (Jack) Merr. occurs, aside from wrong synonymizations of early names, notably *H. kassintu* Blume, the account is acceptable. However, the Flora Malesiana account (Backer 1951) contains numerous problems, including combining a generic description covering only *H. malayana* with a peculiar 'hybrid' species description that while acknowledging the existence of forest species, ignores the slew of morphological and ecological differences that exist between the Sundaic forest species and the sole helophyte. Additional to not describing these morphologies, the account summarily dismisses them as 'of very slight taxonomic value', overlooking that, for example, ripe fruits alone furnish numerous reliable morphological characters pertaining to stigma and style, fruit size, ripe color, and seeds.

Thus currently there is no reliable taxonomic account for the genus, a quite extraordinary situation given that *Hanguana* species are both frequently encountered and also striking elements of perhumid to everwet forest throughout Sunda. Paradoxically although Airy Shaw (1980) and most recently Tillich & Sill (1999) clearly began to realize that the taxonomy of the genus was in

much need of attention, until now no attempt has been made to tackle what is without doubt one of the most taxonomically ill-served monocot genera in tropical Asia.

As part of the first authors' work to investigate the relationships and evolutionary polarity between the single widespread helophyte and the numerous forest species, it is necessary to generate a workable taxonomy for Sundaic *Hanguana*. This paper is the first of an intended series aiming to produce such a taxonomy.

Key to Bornean *Hanguana*

1a. Colonial helophytes with massive, foliaceous, stolons. Plants of open situations along muddy banks of large rivers, margins of freshwater bodies, and of freshwater swamp forest ..... *H. malayana*

1b. Clumping mesophytes lacking stolons. Plants of a variety of closed-canopy forest types, but never in freshwater swamp forest 2

2a. Leaf blade broadly lanceolate to elliptic, abaxially floccose, at least in juveniles; fruits various but never 3-lobed, ripening dull red or black 3

2b. Leaf blade linear-lanceolate to very narrowly elliptic, all parts of the plant glabrous except the submicroscopically puberulent peduncle and scape; fruits weakly 3-lobed, ripening medium pink to magenta ..... **H. bakoensis**

3a. Flowering plants to 1.5m tall, leaves up to 90 cm long, 10 cm wide; peduncle and scape together exceeding 1m tall, conspicuously and extensively reddish brown-floccose; fruits large, ca. 1.5–2 × 1.2 cm when ripe, fusiform-ellipsoid, with a large, prominently stipitate stigma, fruits ripening black ..... *H. major*

3b. Flowering plants to 35 cm tall, leaves up to 25 cm long, 5–6 cm wide; peduncle and scape together not exceeding 35 cm tall, not or only very obscurely and sparsely gray-floccose; fruits small, ca. 0.7 cm diam. when ripe, globose, stigma impressed, minute, fruits ripening dull red ..... *H. bogneri*

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Ab aliis speciebus Borneensibus foliis lineari-lanceolatis vel angustissime ellipticis glabris et fructibus leviter trilobis roseis differt.

Typus. Malaysia, Sarawak, Bahagian Kuching, Bako N.P., Lintang Trail, 27 May 2007, *Nadiah I., Malcom D., Army K. & al. S.100599* (holo- SAR!; iso- KEP, n.v.).

Solitary to weakly clumping, herbaceous, glabrous, dioecious mesophyte to ca. 1 m tall, stem rhizomatous with terminal portion ascending, ca. 1.5 cm diam., older portions sub-woody, active portions covered with fibrous degraded leaf bases. *Leaves* up to 10 together, spreading, the longest leaves arching with the leaf tips touching the ground, bases imbricate, up to 90 cm long; *leaf blade* 1.5–4 cm wide, linear lanceolate to very narrowly elliptic, somewhat leathery, both surfaces bluish green when fresh, drying chartaceous and pale straw-colored; *pseudopetiole* accounting for up to half the entire leaf length, although usually somewhat less, longitudinally folded inwards with the margins somewhat sharp, lowermost part of petiolar sheath margins erose-marcescent; leaf tip attenuate-mucronate; midrib prominently round-raised abaxially, especially in the lower part of the leaf blade, impressed adaxially and lesser venation obscure when fresh, midrib drying flush adaxially and all other venation minutely tessellate-striate in most specimens. *Female and male inflorescences* not observed, although based on very immature fruiting material inflorescence almost certainly erect at anthesis. *Infructescence* solitary, declinate, comprising 3–5 partial, thyrsoid or spicate infructescences plus a terminal spike, *peduncle* (lower non-flower bearing part) *and scape* (upper flower-bearing part) together up to 95 cm tall, sub-microscopically puberulent, dark brown to greenish red, visible portion of peduncle up to 15 cm long but often shorter, start of scape marked by a foliaceous, fertile or sterile, narrowly lanceolate-elliptic

FIG. 1. *Hanguana bakoensis* Siti Nurfazilah, Sofiman Othman & P. C. Boyce. A: Fruiting plant in habitat. B: Detail of a partial inflorescence. Note the weakly 3-lobed fruits, and ripe fruit color. C: Habitat. Photographs by Michael Lo.

bract up to 15 cm long, bract base clawed, tip aristate; *partial infructescences* each subtended by a bract similar to that marking the start of the scape, these diminishing in size distally along the infructescence, the smallest ca. 8 × 1.5 mm; partial infructescences each comprising of 3 branches (exceptionally up to 5 in robust specimens, depauperate specimens with a single or paired branches), branches arising simultaneously from the axil of the subtending bract, median branch usually longer than lateral branches, 2–7 cm long ca. 1.5 mm thick, weakly angled, lateral branches approximately 2/3 the length of median branch, although branches subequal in distal-most partial infructescence. Male flowers not observed. *Female flowers* mainly in scattered groups of 2 to 3, lowermost flowers of each branch occasionally solitary, flowers mainly sessile, very occasionally pedicellate to ca. 0.5 mm, pale green, all flowers with an associated minute bracteole; *perianth* of 6 tepals, outermost ca. 1 × 1 mm, ovate, weakly concave, in fruiting material reflexed from the mid-point, the tips recurved and touching the pedicel, inner tepals ca. 2 × 2 mm, ovate, slightly concave; *Staminodes* minute, clavate, pale green. *Ripe fruit* compressed-globose, very weakly 3-lobed with a faint suture running from the pedicel to a point between the stigma lobes of the defining the fruit lobes, ca. 5 × 3.5 mm initially glossy pale green, ripening glossy medium pink to magenta; *stigma* 3-lobed, lobes joined to form a clover-leaf, minute, impressed, ca. 1 mm diam., matte black. *Seeds* shallowly cupuliform, ca. 3.5 mm diam., 1 deep, smooth, glossy black, placenta waxy-oily, filling the depression in fresh seeds.

Distribution: Malaysian Borneo, Sarawak, endemic to Bako N.P.

Ecology: Kerangas and closed heath forest (virtually all collections, and Low, and Boyce, *pers. sep. obs.*); mixed dipterocarp forest (*fide S. 100599*), ca. 100 m asl.

Other specimens seen. MALAYSIA. **Sarawak**. Kuching, Bako N.P.: Ulu Sawit camp, 29 June 1960, *Abang Muas S.11858* (SAR); Path near Bukit Keruing, 28 March 1960, *J. A. R. Anderson 12489* (SAR); Telok Tajor, 7 June 1963, *P. S. Ashton S.17960* (SAR); Sungai Nipah path, 3 May 1959, *J. Carrick & I. C. Enoch JC/460* (SAR); Telok Asam, 15 May 1956, *J. W. Purseglove P.4917* (SAR); Telok Krium, 18 May 1980, *Yii Puan Ching S.42214* (SAR); without precise locality, 11 March 1956, *S.9918* (SAR), 30 Jan. 1954, *S.10476* (SAR).

Notes. *Hanguana bakoensis* is immediately distinguishable from *H. major* Airy Shaw and *H. bogneri* H.-J.Tillich & E.Sill, the other currently described Bornean forest species, by being glabrous except for the submicroscopically puberulent peduncle and scape, the narrow bluish green leaves, and weakly 3-lobed fruits ripening medium pink to magenta (see above key).

Sterile plants of *Dianella ensifolia* (Xanthorrhoeaceae), another kerangas-favouring species common at Bako, look deceptively similar to of *H. bakoensis* but may be readily distinguished by the minutely serrate leaf margins and distal portion of the abaxial mid-rib.

Critical morphologies for Hanguana *taxonomy*

Based on extensive field observations in Sarawak, and more recently in Peninsular Malaysia the following are the critical morphologies for *Hanguana*. Care must be exercised when preparing herbarium vouchers to sample in such a manner that these characters are recorded.

- Presence or absence of stolons
- Petiole and pseudopetiole morphology, notably the ratio of petiole + pseudopetiole to blade length
- Presence or absence of indumentum, notably floccose indumentum.
- Inflorescence architecture, especially partial inflorescence branching complement, and the morphology and duration of their subtending bracts
- Fruit size, shape, color at ripeness
- Stigma morphology—lobes basally joined or separate, appressed, elevated, ascending, or stipitate
- Seed morphology, especially the depth and width of the placental bowl

Additional to the above morphologies, ecological (especially forest type and geology), and altitudinal data are exceedingly useful.

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