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Hanguana thailandica (Hanguanaceae): a new peat swamp forest species from Thailand

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A new species of *Hanguana* (Hanguanaceae), *H. thailandica*, is described and illustrated from Trang province, Peninsular Thailand. This is the second *Hanguana* species recorded in Thailand, along with the widespread helophytic *H. malayana*. The species is morphologically similar to *Hanguana exultans* and *H. nitens* found in swamp forests habitats in southern Peninsular Malaysia and Singapore. The conservation status of this species is accessed as Endangered according to the IUCN Red List Category and Criteria.

Keywords: Commelinales, IUCN, Peat swamp forest, Peninsular Thailand, Trang

Introduction

Hanguanaceae (Commelinales) is a small monogeneric family growing in many different forest types across South and Southeast Asia, exhibiting the highest diversity in the Sunda region (Leong-Škorničková & Boyce 2015). A poor understanding in both its taxonomy and distribution has hampered the classification of the genus *Hanguana* Blume (1827: 15). The lack of clarity can be attributed to the loss upon drying of many useful field characters, historical over-reliance on poorly preserved and badly documented specimens, and very few reliable field observations (Siti Nurfazilah *et al*. 2011). This has led to most regional treatments such as those for Malesia and Thailand (Backer 1951, Larsen 1972) specifying the existence of single relatively common species, *Hanguana malayana* (Jack 1820: 25) Merrill (1915:3), across the region.

Recent taxonomic work documenting *Hanguana* in the field has led to the understanding that the genus is comprised of numerous ecologically discrete species, found in different forest types. This led to the results that *H. malayana* was re-circumscribed in 2010 as a habitat specific colonial freshwater helophyte and fourteen new species were described from Peninsular Malaysia, Sarawak, Sabah and Singapore (Siti Nurfazilah *et al.* 2010, 2011, Mohd Fahmi *et al.* 2012, Niissalo *et al.* 2014, Leong-Škorničková & Boyce 2015). While carrying out field work in a peat swamp forest in Trang Province, Peninsular Thailand, the authors encountered a clumping *Hanguana* not matching any of the forest species so far described in the genus. This overlooked species has been collected from the same location five times since 1994.

The *Hanguana* species we found in the peat swamp in Trang Province is morphologically similar to *Hanguana exultans* Siti Nurfazilah *et al.* (2010: 207), a species endemic to peat swamp forest in Johore, Peninsular Malaysia and *H. nitens* Siti Nurfazilah *et al.* (2010: 207), occurring in similar habitats in Johore and Singapore. However, the new species is different from *H. nitens* in having solitary stems instead of forming large rhizotomous colonies, and from both *H. exultans* and *H. nitens* in flower and inflorescence characters. We describe this new species here as *Hanguana thailandica*, the first *Hanguana* species based on material from Thailand. *Hanguana thailandica* is different from the only other *Hanguana* recorded from Thailand, *Hanguana malayana* (Larsen 1972) in being a solitary forest species: *Hanguana malayana*, in its current circumscription (Siti Nurfazilah 2010) is a massive helophyte with a floating rhizome network. *Hanguana malayana s.s.* is present in Thailand, but its previous circumscription in the country has been much too broad.

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Materials and methods

The description is based on field observation at the Peninsular Botanic Garden in Thungkai, Southern Thailand, and herbarium material at PSU, QBG, BK, BKF and SING, and online material from P and K.

Ripe fruit was not observed in situ. Description of fruit and seed is based on a partial inflorescence of *Tillich 5078* (BKF) from the same locality as the type collection, where the authors have seen a single species. The identification of *Tillich 5078* (BKF) as the same taxa described here is confirmed by having identical stigma shape, staminodial structure, size and tepal shape as the flowers of the type specimen. Ripe fruit colour is uncertain, though one of the authors (V. Chamchumroom) reports the colour as black.

Taxonomic treatment

Hanguana thailandica Wijedasa & Niissalo, *sp. nov.* Figure 1.

Type:—THAILAND. Trang: Peninsular Botanical Garden (Thungkhai), peat swamp forest, beside boardwalk, 15 May 2013. *Wijedasa, Chamchumroom, Pudjaa & Thaweechock VC5771* (Holotype: BKF! [barcode SN204335]; Isotype: BKF!).

Diagnosis:—The new species is similar to *H. exultans*, but differs by having larger inflorescences up to 80 cm (not up to 60 cm) and the inflorescence branches arranged in a horizontal angle (not ascending), and stigmatic lobes ca. 1.5 mm (not 1.2 mm) long, very narrowly lanceolate (not rounded) in shape and raised from the gynoecium (not adpressed to it).

Herbaceous, dioecious mesophyte to c. 1 m tall; stolons absent. *Leaves* 110–140 cm long, 10–15 per stem, spreading, arching; *pseudopetiole* 40–60 × 2–3 cm accounting for 1/2–1/3 of the entire leaf length, shallowly canaliculate with sharp margins, drying strongly longitudinally folded; *leaf blade* up to 70–80 × 12–15 cm, lanceolate, base imbricate, long-decurrent, apex acuminate, acumen up to 6 mm long, adaxially glossy dark green, midrib paler green, abaxially light green with white flocculose hair, drying chartaceous, with a rough surface due to protruding cell walls, dark greenish brown adaxially and light straw or olive brown abaxially, margins slightly rolled towards adaxial side, midrib strongly protruding in the lower part of the petiole adaxially, appressed abaxially, lighter than the rest of the lamina adaxially. *Male inflorescence* not seen. *Female inflorescence* terminal, a paniculate thyrse with vertical cincinni, erect, comprising up to 6 whorled, thyrsoid partial infructescences plus a terminal spike, not measured but apparently identical to infrustescence. *Infructescence* identical to female inflorescence in structure; *peduncle* and *rachis* together up to 80 cm long, thickly light brown flocculose while the indumentum appears to be partially lost as the infructescence matures, green when fresh, visible portion of peduncle 30–40 cm long, ca. 8–10 mm in diameter; *sterile foliaceous bract* usually one per peduncle, rarely absent or two, broadly lanceolate, 45–47 × 12 cm, persistent; *bracts subtending lower partial infructescences* similar to sterile bracts, diminishing in size distally along the infructescence, the bract supporting most basal partial infructescence 28–32 × 6–8 cm including basal claw, the uppermost smallest ca. 10–25 × 5 mm; *partial infructescences* each spreading at c. 90˚ angle, in whorls comprised of up to 7 branches at basal levels, but the lowest partial infructescence whorl sometimes not fully developed, simple; branching gradually reduces higher in the infructescence, with simple branches towards the apex of the infructescence, branches arising simultaneously from the axil of the subtending bract, 2–3 mm in diameter (median branch to 4 mm); *median branches* longest, at basal levels usually branched, at upper levels un-branched, 15–20 cm long on lower bracts; *lateral branches* progressively shorter in length, outermost lateral branches only 1/2 the length of the median branch. *Female flowers* solitary or in groups of 2(–4), sessile, all with an associated minute bracteole; *perianth* composed of 6 tepals in two whorls tightly clasping ovary/fruits in fresh material, all tepals with prominent bulbous thickening at base which is more prominent in outer whorl, light green; the two tepal whorls superficially similar, except that inner tepals are somewhat longer, outer tepals semi-circular, ca. 2 × 2.5 mm, free, with a few long hairs along the central ridge of the abaxial surface, inner tepals circular, ca. 2.5 × 2.5 mm, base free, with only very short hair-like protrusions on epidermal cells on the abaxial surface; *staminodes* 6, in two whorls, brown when dried, long, narrow, triangular; outer staminodes triangular to linear with a broad base, ca. 0.5 × 0.15 mm as measured at the base of the narrow portion of the staminode, inner staminodes triangular with abrupt apex, ca. 1.4 × 0.3 mm with width measured at the base, each basally sheathed with semi-circular scale, c. 0.5 × 0.9 mm with width measured at the base,, in dried material brown with translucent margin; *ovary* ovoid, ca. 3.5 × 3.5 mm, pale green; *stigma* sessile, 3-lobed, each lobe c. 1.5 mm long in both flowering and fruiting material, lobes connate basally, very narrow 0.2 mm in flower and to 0.5 mm in fruit, linear to narrowly lanceolate, medium to dark brown. *Infructescence* with same dimensions as the inflorescenc. *Berry* globose, 1–2-seeded, 4–6 mm diameter, light yellow-green when unripe,

FIGURE 1. *Hanguana thailandica.* a. Habitat, b. habitat, c. close up of fruiting specimen; d. infructescence; e. calyx of fruit; f. seed. All scale bars are 2 mm.

colour when ripe not seen, stigma position depends on number of developing seeds: apical if two seeds develop or more commonly oblique when only one seed develops; *seeds* dark grey-brown with minute light grey dots, 4–5 mm, not differing in shape in 1- and 2-seeded fruits, forming a hollow, round cup closed to 1/2 to 3/4, with a minute triangular appendage, cavity filled with placental tissue.

Ecology, distribution and conservation:—Evergreen primary peat swamp forest in the Peninsular Botanical Garden in Thung Khai. 80-90% canopy cover. The soil is made up of peat (i.e. >65% organic matter by weight) with a thick leaf litter layer. The water level was a few centimeters below surface. The plants were scattered in different parts of the peat swamp where they were locally common.

This species is only known from the Peninsular Botanical Garden, where is under protection. The lack of botanical surveys in swamps of the Peninsular Thailand region makes it difficult to assign the IUCN conservation status (2012). We estimate the number of individuals to be about 100. Based on the currently known range, the extent of occurrence (EOO) of this species is less than 5km^2, with only one known locality, which is under protection as it is within the Peninsular Botanical Garden. The conservation status of the species is assessed to be Endangered (EN D) based on the very small, restricted population of less than 250 individuals.

The species is currently only known from peat swamp forest habitats which are understood and still undergoing rapid deforestation (Posa *et al*. 2010, Wijedasa *et al*. 2012, Chisholm *et al*. 2016). More botanical work in this habitat is needed to help understand and conserve the unique flora in these habitats.

Etymology:—The specific epithet '*thailandica*' is derived from Thailand, where this species was collected and it is the first new species of *Hanguana* found in Thailand.

Additional specimens examined (paratypes):—THAILAND. Peninsular Thailand: Trang, Peninsular Botanical Garden (Thungkhai), 13 December 1995. *A. 1. Mauric* (BKF); same locality, 1 July 1994, *N. Chintana 113* (BKF); the same locality, 27 August 1998, *V. Chamchumroom 8141* (BKF); the same locality, 3 October 2005, *H.-J.Tillich 5078* (BKF!).

Discussion

Hanguana thailandica is unique among non-rhizomatous *Hanguana* described so far in three long, very narrow, linear to narrowly lanceolate stigma lobes (1.5 mm long, 0.2 mm wide in flower). The stigma lobes are suprficially similar to *H. nitens*, but the latter differs from the former by the stigma lobes broader, more raised and free from each other. *Hanguana thailandica* also grows as single stems without underground rhizomes, whereas *H. nitens* forms extensive colonies with its creeping rhizomes. *Hanguana thailandica* is quite different from *H. malayana* in that it is a forest mesophyte without stolons, while *H. malayana* is a semiaquatic marginal species with an extensive stolon network.

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