



## *Hanguana neglecta* (Hanguanaceae): a new plant species from a heavily collected and visited reserve in Singapore

MATTI A. NISSALO<sup>1</sup>, LAHIRU S. WIJEDASA<sup>1,2,3</sup>, PETER C. BOYCE<sup>4</sup> & JANA LEONG-ŠKORNIČKOVÁ<sup>2,\*</sup>

<sup>1</sup> Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore 117543.

<sup>2</sup> Herbarium, Singapore Botanic Gardens, National Parks Board, 1 Cluny Road, Singapore 259569.

<sup>3</sup> Rimba, 18E Kampung Basung, Kuala Berang 21700, Terengganu, Malaysia.

<sup>4</sup> Institute of Biodiversity and Environmental Conservation (IBEC), Universiti Malaysia Sarawak, 94300 Samarahan, Sarawak, Malaysia.

\*Corresponding author

Email: [jana\\_skornickova@nparks.gov.sg](mailto:jana_skornickova@nparks.gov.sg)

### Abstract

We describe and illustrate a new species, *Hanguana neglecta* (Commelinales, Hanguanaceae), from the Bukit Timah Nature Reserve in Singapore, one of the most heavily collected and frequently visited forests in the world. The species, growing prominently near the path at the nature reserve, was not described despite being identified as new fifteen years ago, owing to long-standing taxonomic misconceptions in *Hanguana*. The key to *Hanguana* in Peninsular Malaysia is here updated.

**Key words:** Bukit Timah Nature Reserve, Commelinales, Endangered, *Hanguana loi*, *H. malayana*, *H. nitens*

### Introduction

In contrast to the rest of the region, Singapore, situated in the middle of the Sundaland, has one of the best-known tropical vascular plant floras in the world. With continuous botanical collecting stretching as far back as 1870, and over 33,000 plant specimens stored in the Singapore Botanic Gardens Herbarium (SING) alone, Singapore currently has a collection density of 5,721 specimens per 100 km<sup>2</sup>. This value is the highest collection density reported for any country on Earth (Prance 2001, Middleton 2003, Roos *et al.* 2004, Newman *et al.* 2007). Singapore's botanical collecting has long been accompanied by taxonomic work, with the first flora of Singapore published in 1900 (Ridley 1900), subsequently updated as part of Flora of the Malay Peninsula (Ridley 1922–1925), and followed in the form of checklists (Keng *et al.* 1998, Chong *et al.* 2009). Analysis of type material deposited at Singapore Herbarium shows, that over 230 new species have been described from Singapore between 1890–1955, with a complete hiatus in collection of types after 1955. As the number of general collections added to Singapore Herbarium continued to be more or less consistent even after 1955, the explanation of a sudden drop in species description is, according to our opinion, result of re-focusing the botanical work from alpha taxonomy to plant ecology, rather than a sign of complete knowledge of Singapore flora. There is some indication that species description is starting to speed again in Singapore: a new endemic *Cryptocoryne* Fisch. ex Wydler (1830: 428) hybrid was described in 2001 (Bastmeijer & Kiew 2001), a new species of *Thottea* Rottbøll (1783: 529) which extends to Singapore was described in 2013 (Yao 2013), a new endemic *Zingiber* Miller (1754: unpagged) (Leong-Škorničková *et al.*, 2014), and two species of *Utania* Don (1837: 663) (both extending to Peninsular Malaysia) were described from Singapore this year (Sugumaran & Wong 2014).

*Hanguana neglecta* is significant for several reasons. It was identified as a new species relatively early for the genus (Tillich & Sill 1999), but was not formally described. Regardless, in the absence of a much-needed taxonomic revision, the species has remained invariably referred to as *H. malayana* (Jack 1820: 25) Merrill (1915: 3) (Keng *et al.* 1998, Davison 2008, Chong *et al.* 2009, Ng *et al.* 2011). It is also the most prominent of recently described species in Singapore, as it grows along footpaths in Bukit Timah Nature Reserves, the most heavily collected area in Singapore, and one of the best-known forests in the world. That it was overlooked for this long may be attributed to the state of knowledge of *Hanguana* Blume (1827: 15). It is only in recent years that the species diversity of this genus has been recognised and new species described (Airy Shaw 1981, Tillich & Sill 1999, Siti Nurfazilah *et al.* 2010, Siti Nurfazilah *et al.* 2011, Mohd Fahmi *et al.* 2012). The key to *Hanguana* in Peninsular Malaysia and Singapore provided by Siti Nurfazilah *et al.* (2010) is updated to fit in the new addition.

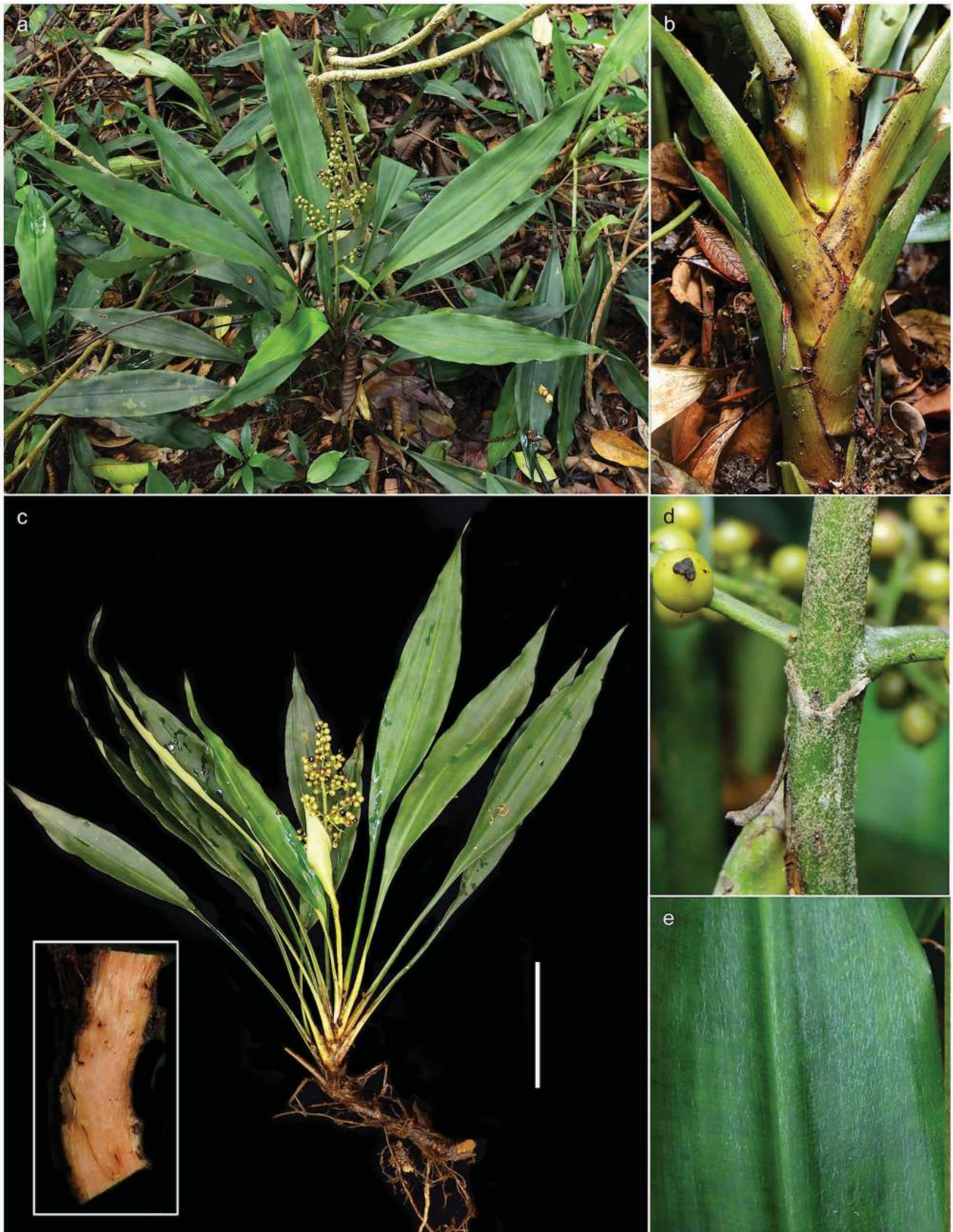
## Taxonomy

*Hanguana neglecta* Škorničk. & Niissalo, *sp. nov.* Type:—SINGAPORE. Bukit Timah Nature Reserve, slopes on lower end of Taban Loop along the stream, 28 May 2014, J. Leong-Škorničková & A. Thame JLS-2793 (holotype SING (including spirit material); isotypes E, KEP, K). Fig. 1–2.

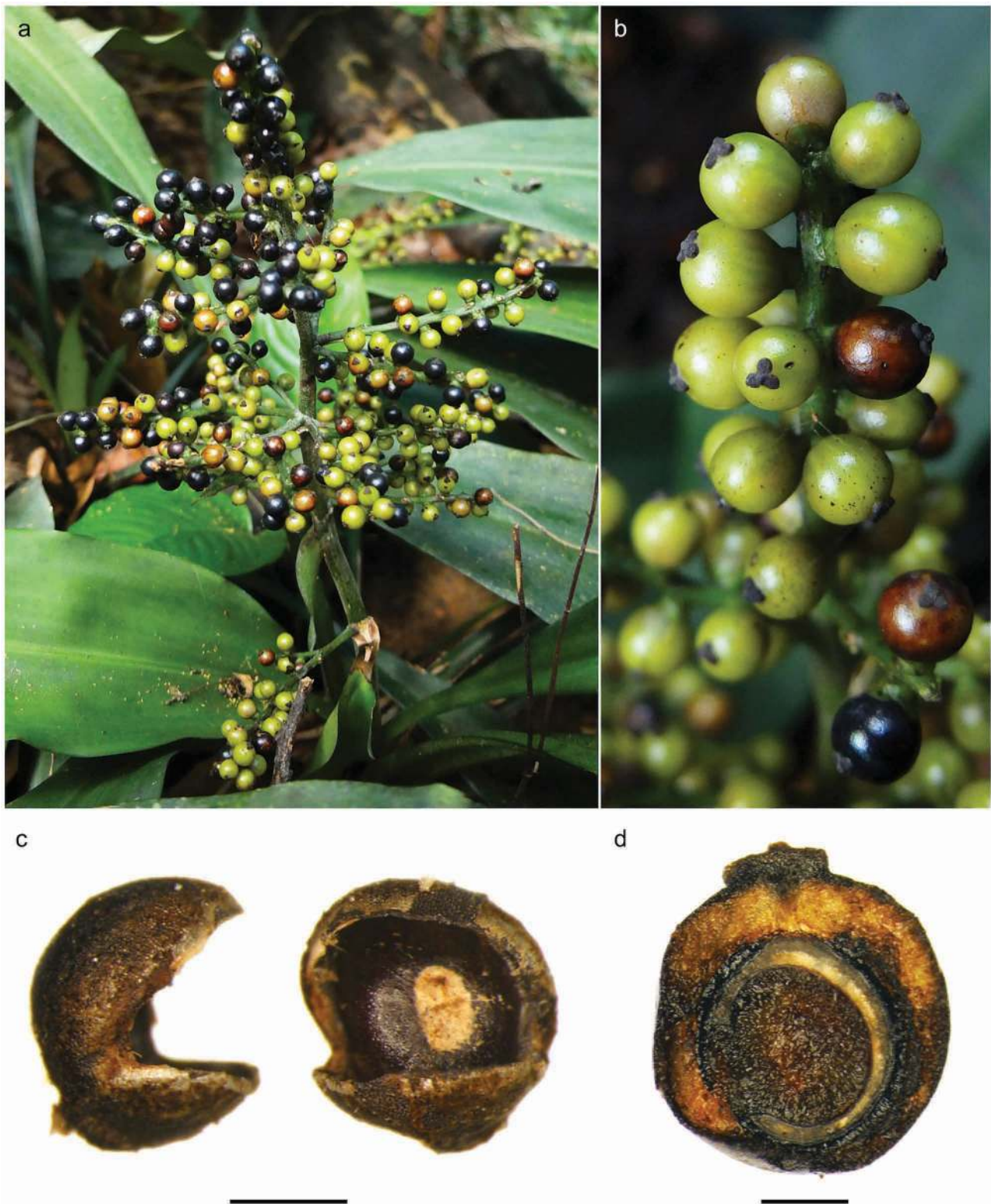
**Diagnosis:**—*Hanguana neglecta* is similar to *H. malayana* and *H. nitens* in fruits ripening semi-glossy black, but differs by lack of stolons, and much smaller habit (up to 0.8 m vs. 1.5–3 m). *H. neglecta* is also similar to Bornean *H. loi* in its small habit and clover-leaf shaped stigma, but is readily differentiated by flat leaf blade and fruits ripening semi-glossy black (vs. prominently corrugate leaf blade and fruits ripening semi-glossy red).

*Small, herbaceous, dioecious mesophyte* to ca. 0.6(–0.8) m tall; stem terete, to 1.8 cm in diam., internally pale orange (young apical part) to dull orange-pinkish (mature basal part), leafless at base, horizontally running to semi-ascending (best visible in old plants), terminally ascending with crown of 10–30 spreading leaves; stolons absent. *Leaves* up to 80 cm long, *bases* imbricate with wider yellow-green semi-translucent erose-marcescent margins; *pseudopetiole* (incl. base) 12–35 cm long, 5–10 mm wide, accounting for 1/2–1/3 of the entire leaf length, shallowly channelled with sharp margins (drying strongly longitudinally folded); *leaf blade* up to 35–56(–68) × 6.5–10.5 cm, narrowly elliptic, base attenuate, apex narrowly attenuate with apicule to 6 mm long, thinly leathery, adaxially mid to dark green with small darker blotches, of somewhat matt-velvety appearance, with sparse silky appressed hairs (less visible in older leaves), abaxially light green when fresh, densely flocculose, drying thinly chartaceous and pale green-greyish (recent specimens) or straw-coloured (historical specimens), margins slightly undulate; midrib weakly impressed, lighter than the rest of lamina adaxially, weakly round-raised, light green, almost glabrous and shiny abaxially. *Male inflorescence* erect at anthesis, comprising of 7 partial inflorescences and terminal spike; peduncle and rachis ca. 27 cm long; *peduncle* ca. 8 cm long, no sterile foliaceous bract observed; bract *subtending lowest partial inflorescence* foliar, narrowly ovate, ca. 12 × 1.5 cm, diminishing in size distally, sometimes fully reduced. *Male flowers* scattered, solitary or in groups of 2–3 flowers, white; *perianth* composed of 6 tepals in two whorls, all tepals broadly ovate, 3 outer tepals ca. 1.5 mm long, connate at base, 3 inner tepals ca. 1.8 mm long, free to base; *stamens* 6, on the base of the perianth, 2.5–3 mm long; *filaments* filiform with broader base, 2–2.5 mm long; *anthers* ca. 0.5 mm long; *central disc* (rudimental gynoeceum) ca. 1 mm in diam., with three irregularly truncate lobes, centre dark with lighter swollen margin (in dried material). *Female inflorescence* terminal, erect at anthesis, with same dimensions as infructescence. *Female flowers* mainly solitary, occasionally in groups of 2, 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 (more prominent in outer whorl), light green with occasional minute brown speckles, margin ca. 0.2 mm wide, hyaline, translucent white (turning brown with age); outer tepals semi-circular, ca. 2 mm long, ca. 2 mm wide, connate at very base, sparsely arachnoid, inner tepals broadly semi-circular, ca. 2.5 mm long, 3 mm wide, free to base, almost glabrous (occasionally sparsely arachnoid, but less than outer ones); *staminodes* 6, in two whorls, pale green to cream, triangular, outer staminodes (positioned at the centre of outer tepals) bluntly triangular, ca. 0.4 mm long, ca. 0.3 mm broad at base, inner staminodes (positioned at the centre of inner tepals) longer, ca. 1.2 mm long, 0.9 mm wide at base, each basally sheathed with semi-circular scale, ca. 1 mm long, 1.2–1.5 mm broad at base, brown (in fruiting material) with translucent margin; *ovary* ovoid, ca. 4 × 3 mm, glossy green; *stigma* sessile, 3-lobed, each lobe ca. 1.3–1.5 mm long (measured from fruiting material), lobes connate basally with free round apices forming a clover-leaf-shaped structure with raised and somewhat pointed centre (ca. 1.5 mm in flowering material, ca. 2.5 mm diam. in fruiting material), green to light brown (flowering stage) to dark matte greyish-brown (fruiting stage). *Infructescence* erect, comprising up to 8 whorled, thyrsoid-paniculate partial infructescences (spreading at ca. 70°–80° angle to rachis) plus a terminal spike; *peduncle* and *rachis* together up to 50 cm tall, grey-brown flocculose, green when fresh, visible portion of peduncle up to 20 cm long, ca. 6–8 mm in diam.; *sterile foliaceous bract* usually one per peduncle (rarely two or three observed), narrowly ovate with a basal claw, 15–35 × 4–8.3 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 7–20 × 1.5–4.5 cm (incl. basal claw), the uppermost smallest, triangular, without claw, ca. 10–15 × (2–)3–4 mm or smaller, sometimes fully reduced; *partial infructescences* each comprising of up to 5 branches at basal levels (gradually less with up to single branch towards the apex of the infructescence), branches arising simultaneously from the axil of the subtending bract, 2–2.5 mm in diam., weakly angled, *median branches* longest, at basal levels usually branched, at upper levels un-branched, up to 10 cm long, *lateral branches* progressively shorter in length (outermost lateral branches 2/3–1/2 of the median branch). *Ripe fruit* a globose single-seeded berry, 6–7 mm diam., ripening from bright green through red brown to semi-glossy black, pulp of ripe fruit soft, cream to brown, quickly oxidising when exposed, exuding strongly coloured brown juice when pressed;

seeds dark brown, 3/4 globose to ellipsoid, deeply excavated with wedge-shaped ostiole leaving ca. 50° angle cleft on the seed, cavity filled with placental tissue.



**FIGURE 1.** *Hanguana neglecta* at the type locality in Bukit Timah Nature Reserve, Singapore. a) Habit; b) Detail of imbricate leaf bases; c) Habit of entire plant including semi-ascending rhizome (inset: longitudinal section of rhizome), scale bar = 15 cm; d) Detail of rachis, note the flocculose indumentums which easily detaches upon touch; e) Adaxial surface of lamina, note the sparse silky appressed hairs.



**FIGURE 2.** *Hanguana neglecta* at the type locality in Bukit Timah Nature Reserve, Singapore. a) Inflorescence; b) Detail of fruits in various stages of ripeness; c) Seeds (side and front view), scale bar = 2 mm; d) Cross section of ripe fruit, scale bar = 2 mm.

The description is based on living material from the type population, *J. Leong-Škorničková & A. Thame JLS-2793*, with exception of description of male inflorescence, which is based on herbarium specimen *H.M. Burkill HMB1787*.

**Additional specimens examined:**—SINGAPORE. Bukit Timah: April 1885, *R.W. Hullett 882* (K, SING); 24th August 1993, *R. Brett 1* (K); 11th September 1995, *Eugene Tang & Hj. Sidek 961* (SING); 4th March 2003, *R. Kiew et al. GW4*. (SING); Chan Chu Kang Forest Reserve [Nee Soon]: November 1889, *H.N. Ridley s.n.* (SING); Reservoir Woods [McRitchie]: April 189? [partly broken label], *H.N. Ridley s.n.* (SING). PENINSULAR MALAYSIA. Johor:

Kwala Sedili, 1892, *J.B. Feilding s.n.* (SING); Kukub, 1908, *H.N. Ridley s.n.* (SING); Rengam Forest Reserve, 24th January 1959, *H.M. Burkill HMB.1787* (SING).

**Ecology, Distribution and Conservation:**—While historical herbarium records (dating from 1885) show that *Hanguana neglecta* occurred in the past in at least three localities in Singapore and extended its distributions to three locations in Johor state in Peninsular Malaysia (Kukub, Sungai Sedili and Rengam Forest Reserve), the only currently known population of *Hanguana neglecta* occurs on slopes in primary forest along the Lower Taban Loop, with increased density closer to the stream.

Although nothing is currently known about genetic diversity of the type population, active seed reproduction and presence of seedlings in various stages has been observed. The total number of adult individuals however does not exceed 250, of which many occur along the trail that is regularly disturbed. In spite of repeated surveys, we were unable to relocate historically documented presence of *H. neglecta* from Nee Soon and MacRitchie areas. Following the criteria for national conservation assessments as outlined by Davison, 2008, *H. neglecta* should be currently considered Endangered in Singapore. Estimation of IUCN (2012) conservation status is more challenging due to lack of recent surveys in Peninsular Malaysia, although even if the historical records are all included, the extent of the occurrence (EOO) for this species is less than 3000 km<sup>2</sup>, with only 6 known locations and continuing decline in area, extent and quality of suitable habitats due to rapid developments in Singapore and Johor, Peninsular Malaysia, qualifying this species at least for a category of Vulnerable (B1ab(iii)).

Several adult individuals have been successfully established in cultivation and efforts to propagate this species from seeds for subsequent re-introductions into suitable habitats have been also initiated in Singapore Botanic Gardens.

**Etymology:**—The specific epithet ‘*neglecta*’ has been chosen to reflect that this species, in spite of sitting right next to the reserve path and being previously collected and studied, has been long neglected.

### Key to *Hanguana* in Peninsular Malaysia and Singapore

1. Stolonerous 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 peat-swamp 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. Fruits ripening black ..... *H. neglecta*  
– Fruits ripening glossy white to pale yellow ..... 6
6. Infructescence with caducous foliaceous bracts; partial inflorescences each with 2 or rarely 3 branches, spreading in fruit; fruits globose with a briefly stipitate stigma, lobes connate basally, deep chocolate brown; fruit ripening white with conspicuous black speckles; old plants developing a short (to ca. 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*

### Acknowledgements

We thank Serena Lee for her assistance in accessing and extraction of data from SING herbarium relating to general and type collections from Singapore, and David P. Edwards, Mary R.C. Posa, Gopalasamy Reuben Clements and Sheema Abdul Aziz for their comments on early drafts of the manuscript. Research of JL-S is funded by the National Parks

Board, Singapore and the Grant Academy of Czech Republic (Grant No. P506/14/13541S). We also thank curators of K, KEP and SING herbaria for letting us access collections in their care. Our sincere thanks are due to NParks staff and volunteers, who supported us in the field and assisted with propagations of this species in the Singapore Botanic Gardens, in particular: Mishak Sunari (Sungei Buloh Wetland Reserve), Hadzinda binte Samri, (Bukit Timah Nature Reserve), Aung Thame, Sunia Teo and Michael Leong (Singapore Botanic Gardens). Two anonymous reviewers are thanked for their constructive comments.

## References

- Airy Shaw, H.K. (1981) A New Species of *Hanguana* from Borneo. *Kew Bulletin* 35: 819–821.  
<http://dx.doi.org/10.2307/4110179>
- Bastmeijer, J.D. & Kiew, R. (2001) A New *Cryptocoryne* hybrid (Araceae) from the Bukit Timah Nature Reserve, Singapore. *The Gardens' Bulletin Singapore* 53: 9–17.
- Chong, K.Y., Tan, H.T.W. & Corlett, R.T. (2009) *A checklist of the total vascular plant flora of Singapore, native, naturalised and cultivated species*. National University of Singapore, Singapore, 273 pp. Available from: [http://lkenhm.nus.edu.sg/nus/pdf/PUBLICATION/LKCNH%20Museum%20Books/LKCNHM%20Books/flora\\_of\\_singapore\\_tc.pdf](http://lkenhm.nus.edu.sg/nus/pdf/PUBLICATION/LKCNH%20Museum%20Books/LKCNHM%20Books/flora_of_singapore_tc.pdf) (accessed 27 August 2014).
- Davison, G.W.H. (2008) The Red List Categories. In: Davison, G.W.H., Ng, P.K.L. & Ho, H.C. (Eds.) *The Singapore Red Data Book: Threatened plants and animals of Singapore, 2nd*. The Nature Society (Singapore), Singapore, pp. 1–4.
- Don, G. (1837) *A General History of the Dichlamydeous Plants, vol 4*. J.G. & F. Rivington, London, 908 pp.
- IUCN (2012) *IUCN Red List Categories and Criteria: Version 3.1. Second edition*. IUCN, Gland and Cambridge, iv + 32 pp.
- Jack, W. (1820) Description of Malayan Plants. In: *Malayan Miscellanies, vol. 1*. Sumatran Mission Press, Bencoolen, pp. 1–27.
- Keng, H., Chin, S.C. & Tan, H.T.W. (1998) *The concise flora of Singapore, volume II: Monocotyledons*. Singapore University Press, Singapore, 222 pp.
- Leong-Škorničková, J., Thame, A. & Chew, P.T. (2014) Notes on Singapore native Zingiberales I: A new species of *Zingiber* and notes on the identities of two further *Zingiber* taxa. *The Gardens' Bulletin Singapore* 66: 153–167.
- Merrill, E.D. (1915) New of noteworthy Philippine plants, XI. *Philippine Journal of Science* 10: 1–84.
- Middleton, D.J. (2003) Progress on the Flora of Thailand. *Telopea* 10: 33–42.
- Miller, P. (1754) *The Gardeners Dictionary, ed. 4, vol. 3*. John and James Rivington, London.
- Mohd Fahmi, A.B., Ahmad Sofiman, O. & Boyce, P.C. (2012) Studies on *Hanguana* (Commelinales: Hanguanaceae) for Sunda IV: *Hanguana major* clarified, a new species from Sarawak, Malaysian Borneo, and description of male reproductive organs in *H. bakoensis*. *Kew Bulletin* 67: 205–211.  
<http://dx.doi.org/10.1007/s12225-012-9358-4>
- Newman, M.F., Ketphanh, S., Svengsuksa, B., Thomas, P., Sengdala, K., Lamxay, V. & Armstrong, K. (2007) *A checklist of the vascular plants of Lao PDR*. Royal Botanic Garden Edinburgh, Edinburgh, 401 pp.
- Ng, P., Corlett, R.T. & Tan, H.T.W. (2011) *Singapore Biodiversity: an encyclopedia of the natural environment and sustainable development*. Editions Didier Millet Pty Ltd, Singapore, 552 pp.
- Prance, G.T. (2001) Discovering the Plant World. *Taxon* 50: 345–459.  
<http://dx.doi.org/10.2307/1223885>
- Ridley, H. (1922–1925) *The flora of the Malay Peninsula vol. 1–5*. L. Reeve & co, Ltd, London.
- Ridley, H.N. (1900) The Flora of Singapore. *Journal of the Straits Branch, Royal Asiatic Society* 33: 27–196.
- Roos, M.C., Keßler, P.J.A., Gradstein, S.R. & Baas, P. (2004) Species diversity and endemism of five major Malesian islands: diversity-area relationships. *Journal of Biogeography* 31: 1893–1908.  
<http://dx.doi.org/10.1111/j.1365-2699.2004.01154.x>
- Rottbøll, C.F. (1783) Beskrivelse af nogle Planter fra de malabariske Kyster, Til Pisoniæ buxifoliæ Beskrivelse, som Side 537 endes, følger følgende Oplysning, som et nyelig med Skibet Tranquebar fra Ostindien af Hr. Dr. Kønig mig tilsendt Exemplar. *Nye Samling af det Kongelige Norske Videnskabers Selskabs Skrifter* 2: 1–537.
- Siti Nurfazilah, A.R., Ahmad Sofiman, O. & Boyce, P.C. (2011) 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. *Acta phytotaxonomica et geobotanica* 61: 139–143.
- Siti Nurfazilah, A.R., Ahmad Sofiman, O., Mohd Fahmi, A.B. & Boyce, P.C. (2010) Studies on *Hanguana* (Commelinales, Hanguanaceae) for Sunda II: Five new forest species from Peninsular Malaysia and recircumscription of *Hanguana malayana*. *Willdenowia* 40: 205–219.

<http://dx.doi.org/10.3372/wi.40.40206>

Sugumaran, M. & Wong, K.M. (2014) Studies in Malesian Gentianaceae, VI. A revision of *Utania* in the Malay Peninsula with two new species. *Plant Ecology and Evolution* 147: 213–223.

<http://dx.doi.org/10.5091/plecevo.2014.971>

Tillich, H.-J. & Sill, E. (1999) Systematische Studien zur Morphologie und Anatomie von *Hanguana* Blume (Hanguanaceae) und *Flagellaria* L. (Flagellariaceae), mit der Beschreibung einer neuen Art, *Hanguana bogneri* spec. nov. *Sendtnera* 6: 215–238.

von Blume, C.L. (1827) *Enumeratio Plantarum Javae*. Apud J.W. van Leeuwen, Leiden, 274 pp.

Wydler, H. (1830) Plantarum quarundam descriptiones. *Linnaea* 5:423–430.

Yao, T.L. (2013) Nine new species of *Thottea* (Aristolochiaceae) in Peninsular Malaysia and Singapore, with two taxa in Peninsular Malaysia redefined and a taxon lectotypified. *Blumea* 58: 245–262.

<http://dx.doi.org/10.3767/000651913x675791>