

***Etlingera poulsenii* and *Hornstedtia bella* (Zingiberaceae: Alpinieae), two new species from central Vietnam**

J. Leong-Škorníčková¹, Q.B. Nguyễn², H.Đ. Trần³ & E. Závěská^{4,5}

¹The Herbarium, Singapore Botanic Gardens,
National Parks Board, 1 Cluny Road, Singapore 259569
jana_skornickova@nparks.gov.sg

²Vietnam National Museum of Nature,
Vietnam Academy of Science and Technology,
18 Hoàng Quốc Việt Street, Cầu Giấy, Hanoi, Vietnam

³National University, University of Science,
Ho Chi Minh City, Vietnam

⁴Department of Botany, Faculty of Science, Charles University,
Benátská 1, Prague, 12801, Czech Republic

⁵Institute of Botany, University of Innsbruck, Sternwartestraße 15,
Innsbruck, 6020, Austria

ABSTRACT. Two new ginger species from central Vietnam, *Etlingera poulsenii* Škorníčk. and *Hornstedtia bella* Škorníčk., are described and illustrated here.

Keywords. Endangered, *Etlingera pavieana*, *Etlingera yunnanensis*, *Hornstedtia sanhan*

Introduction

As a result of extensive field exploration and collection of Zingiberales in Vietnam since 2008, numerous novelties, including a new genus, have already been described (e.g. Leong-Škorníčková & Lý, 2010; Leong-Škorníčková et al., 2010, 2011, 2013, 2015a, 2015b; Leong-Škorníčková & Lur, 2013; Leong-Škorníčková & Trần, 2013). To put novelties in Indochinese Zingiberales in a wider context, an introduction to the phytogeography of the region can be found in Averyanov et al. (2003) and an introduction to the family Zingiberaceae can be found in Leong-Škorníčková & Newman (2015), as well as in some of the papers cited above.

In this paper we formally describe and illustrate two new species in Alpinieae, *Etlingera poulsenii* Škorníčk. and *Hornstedtia bella* Škorníčk., from central Vietnam. Both species were informally mentioned (through use of quotation marks) and illustrated in Leong-Škorníčková & Newman (2015) but were not validly published. The species descriptions follow the style and terminology of Poulsen (e.g. 2006, 2012) and Beentje (2012), and the preliminary conservation assessments follow the guidelines of IUCN (2012). Herbarium material (or high resolution images of specimens) from E, HN, HNL, K, P, SING, VNM, VNMN were consulted to compare the new material to the most similar species within the respective genera and to see if they had been previously collected. The herbarium acronyms follow Thiers (continuously updated).

***Etlingera poulsenii* Škorničk., sp. nov.**

Similar to *Etlingera pavieana* (Pierre ex Gagnep.) R.M.Sm., but differs in narrower leaf blades (2.5–5 cm wide versus 6–8 cm in *E. pavieana*), shorter filament (2–4 mm long versus 7–8 mm long) which is half the length of the anther or less (versus as long as or longer than the anther), and the basal lobes of the labellum overlapping and fully covering the filament (versus basal lobes of the labellum upright but not overlapping with the filament clearly visible). – TYPE: Vietnam, Kontum Province, Kon Plong District, Xã Hiếu, way to Ka Bang, 27 April 2012, *Jana Leong-Škorníčková, Nguyễn Quốc Bình, Trần Hữu Đăng, Eliška Závěská JLS-1595* (holotype SING (including spirit); isotypes E, K, P, PR, VNMN (including spirit)). (Fig. 1, 2)

Large terrestrial rhizomatous herb. **Rhizome** 1 cm in diam., pubescent, scales to 4.5 cm long, delicately papery, dehiscent, glabrous, strongly aromatic with somewhat unpleasant smell of kerosene; stilt roots absent. **Leafy shoots** to 2.5 m long, arching, composed of up to 35 leaves, 20–50 cm between neighbouring leafy shoots, leafless part c. 0.8 m; base to 3 cm in diam., pale yellowish brown; sheath yellowish green, striate, not clearly cross-ribbed, glabrous, margin glabrous; **ligule** to 7–11 mm long, entire, rounded, yellowish green, glabrous, margin finely ciliate; **petiole** 3–10 mm long; **lamina** narrowly ovate, to 21–34 × 2.5–5 cm, length to width ratio 6.6–8.5, smooth, mid-green, pale beneath, glabrous, base cuneate, apex acuminate to 1.5 cm, margin ciliate in upper third. **Inflorescence** 8–11 cm long, embedded in the soil, receptacle dome-shaped, c. 8 cm long, with 19–21 flowers, 1–3 open at a time; **peduncle** 3–5 cm long, subterranean, pubescent, peduncular bracts to 3.2 × 3 cm, upper covering base of spike, cream to reddish, puberulous, margin membranous, with a few cilia near apex, subapical mucro < 1 mm; **spike** (including flowers) 6–6.5 cm long, ovoid, flowers extending 1.5 cm above the bracts, spike only including bracts 4.5–5.5 × 2.5–3 cm; **sterile bracts**: 3, lower to 3.8–4.5 × 2.5–3.6 cm, upper to 4.5–5 × 0.8–3.2 cm, ovate, red, pubescent in lower third; **fertile bracts** 4.2–4.5 × 0.9–2.2 cm, ovate, boat-shaped, red, pubescent in lower half and at apex, inner more narrowly obovate, pale red, semi-translucent; **pedicel** 2 mm long below bracteole; **bracteole** 4 cm long, pale red, with two fissures of 0.2 and 1.5 cm, pubescent in lower half and near apex, apex bilobed, lobes close together, 1.7 cm short of apex of calyx. **Flower** 6–8 cm long; **calyx** 5.5 cm long, reaching 5–6 mm beyond base of stamen and 2 mm short of apex of corolla lobes, pale pink, darker at base and apex, with three fissures of 4, 7 and 22 mm, hirsute, apex trilobed, apices pointed, close together, tufted; **floral tube** c. 4.7 cm long, pale red to red at apex, hirsute also on staminal tube, tube inside hairy in a dense band c. 5 mm wide coinciding with attachment of lobes on the outside; **corolla lobes** pinkish red, glabrous with a few hairs at apex; **dorsal corolla lobe** c. 21 × 6 mm, reaching to base of anther, elliptic, apex rounded; **lateral corolla lobes** c. 19 × 5 mm, obovate, apex rounded, with a few hairs at apex, attached at an angle to the tube, inserted 0–1.5 mm above dorsal lobe; **staminal tube** c. 11 mm long; **labellum** panduriform, to 33 × 22 mm, brilliant orange with dark red to maroon centre, glabrous, lateral lobes erect, c. 16 mm across when flattened, central lobe extending c. 25 mm beyond anther. **Stamen** c. 8 mm long (unstraightened), pinkish



Fig. 1. *Etlingera poulsenii* Škorničk. **A.** Habit. **B.** Detail of ligule. **C.** Inflorescence (top view). **D.** Flower (side view). **E.** Flower (front top view). **F.** Inflorescence attached to rhizome. **G.** Inflorescence and infructescence attached to rhizome. **H.** Detail of infructescence. Based on type collection JLS-1595. (Photos: J. Leong-Škorničková)

red, darker at apex; *filament* 2–4 × 3 mm, pubescent adaxially; *anther* c. 8 × 3.5 mm, ± parallel-sided, widest in the middle, at an angle of c. 110°, reddish pink, anther crest emarginate, incision c. 1 mm; *anther thecae* dehiscent for 6 mm in the centre, from 1.5 mm above base to 0.5 mm below apex, with a few hairs at base. **Ovary** c. 5 × 3.5 mm, ± cylindrical, widest in the middle, densely sericeous; *epigynous gland* c. 4.5 mm long, bilobed, split to base dorsally and halfway from apex on opposite side, apex lobes irregularly pointed; *style* c. 5.7 cm long, red, glabrous; *stigma* c. 2.6 mm wide, dark burgundy red, with scattered short hairs, ostiole facing forwards, flexistylous. **Infructescence** partly embedded in the soil, head c. 6 × 6 cm, irregularly globose, bracts persistent, with 4–5 fully developed and 2–4 small (possibly aborted) fruit per head; *mature fruit* c. 2 × 3 cm, rounded, slightly angular, burgundy, rusty-pubescent.

Etymology. We dedicate this beautiful species to Axel Dalberg Poulsen, a Danish ginger specialist focusing on the genus *Etlingera* (see e.g. Poulsen 2006, 2012).

Distribution & provisional IUCN assessment. So far known only from the primary forests on the border of Kontum and Gia Lai Provinces. Considering the existence of suitable habitats in adjacent areas as well as the fact that *Etlingera* species only rarely exhibit stenoendemism, we expect this taxon to be reported from more localities in the near future. Until then we propose to treat this taxon as Data Deficient.

Ecology and phenology. Growing in montane evergreen broad-leaved forest near streams. Flowering and fruiting observed in late April, but likely to continue over an extended period of time.

Notes. The plants of *Etlingera poulsenii*, particularly the rhizomes when crushed, have a very strong and somewhat unpleasant scent of kerosene. No common names or uses were reported by local guides. Based on overall morphology, *Etlingera pavieana* (Pierre ex Gagnep.) R.M.Sm., a fairly widespread species from Thailand to Vietnam, appears to be the closest ally. Plants of *Etlingera pavieana* are also strongly scented, although the scent is more pleasant with fennel undertones, making the rhizomes and the inflorescence buds a popular addition to certain dishes in Thailand. The flowers of *Etlingera pavieana* are mostly bright red, although orange-flowered individuals have also been observed. Although of similar habit, *Etlingera poulsenii* has significantly narrower leaf blades with the leaf width 2.5–5 cm (length to width ratio 6.6–8.5), while the leaf blades of *E. pavieana* on the type specimen are 6–8 cm (with length to width ratio 5.6–6) in the dried state and therefore likely to be even wider when fresh. The main differences between the two species are in the floral morphology. *Etlingera poulsenii* has a short filament 2–4 mm, which is half the length of an anther (c. 8 mm) or less, and the filament is not visible in the open flower as it is fully covered by the overlapping basal part of the labellum. As a result, the labellum appears to be obovate with a decurrent base (in top view). The stigma is dark burgundy red, with a glistening sheen. The filament in *Etlingera pavieana* is at least of the same length as the anther,

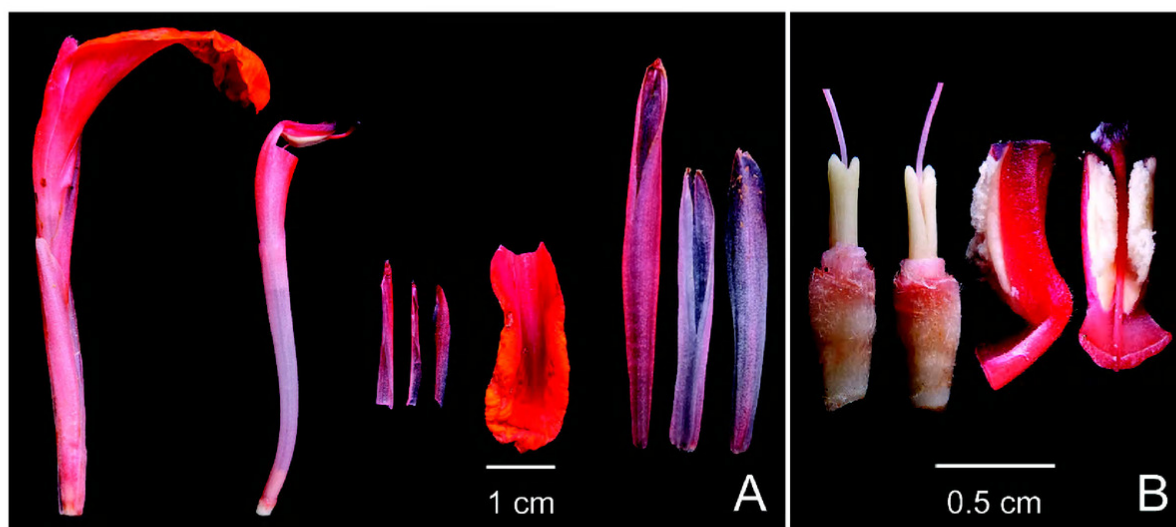


Fig. 2. *Etlingera poulsenii* Škorničk. **A.** Flower dissection (from left): Flower enclosed in bracteole, floral and staminal tube with stamen attached, dorsal and corolla lobes, labellum, calyx, bracteole and bract. **B.** Detail of ovary with epigynous glands (from two angles) and the stamen (side and front view). Based on type collection *JLS-1595*. (Photos: J. Leong-Škorničková)

or slightly longer, and is visible in the open flower as the basal part of the labellum is not tightly overlapping and the entire labellum appears to be oblong in top view. The stigma is white or light red, but never dark burgundy red.

The flowers of *Etlingera poulsenii* are also somewhat similar to *Etlingera yunnanensis* (Wu & Senjen) R.M.Sm. by virtue of the red centre of the labellum, the basal part of the labellum fully covering the filament, and the dark burgundy red, glistening stigma. However, *Etlingera poulsenii* is a smaller species with more slender and arching leafy shoots not exceeding 2 m in height and composed of leaf blades 21–34 × 2.5–5 cm. The habit of *Etlingera yunnanensis* is more robust with more or less erect leafy shoots often reaching 3 m in height and composed of leaf blades 50–60 × 5.5–8 cm, and the labellum is invariably bright yellow with a dark red centre. For a comparison of the flowers of all three species see Leong-Škorničková & Newman (2015).

***Hornstedtia bella* Škorničk., sp. nov.**

Similar to *Hornstedtia hainanensis* T.L.Wu & S.J.Chen, but readily recognised by its prominently pedunculate inflorescences and the bright pink labellum, of which each lobe has two obscure sub-lobes. – TYPE: Vietnam, Thừa Thiên-Huế Province, A Lưới District, A Roang commune, forests around A Ka I village, alt. 554 m, 16°06'56.8" N 107°22'24.8"E, 8 June 2014, Jana Leong-Škorničková, Nguyễn Quốc Bình, Aung Thame & Paul Leong *JLS-2846* (holotype SING (including spirit); isotype E, P, VNMN (including spirit)). (Fig. 3–5)

Large terrestrial rhizomatous herb. **Rhizome** 1.5–2.5 cm in diam.; stilt roots present but not prominent. **Leafy shoots** 3–5 m long composed of up to 31 leaves, arching, 10–20 cm between neighbouring leafy shoots, leafless in basal 1/3–1/2; base swollen, to c. 3 cm in diam.; sheath green, striate, not clearly cross-ribbed, glabrous, margin glabrous; **ligule** 11–15 mm long, entire, rounded, yellowish green, glabrous, margin glabrous; **petiole** to 10 mm long; **lamina** elliptic, to 55–65 × 9–10.5 cm, length to width ratio 5.2–7.2, weakly plicate, mid to dark green, glossy, paler beneath, glabrous, base obtuse, apex acuminate to 1 cm, margin glabrous. **Inflorescence** to (25–)30–60 cm long, erect, receptacle flat, with many flowers, 1–5 open at a time; **peduncle** (15) 20–50 cm long, erect, peduncular bracts to 7 × 2.3 cm, upper covering base of spike, yellowish-green with pink tinge at base, turning pink-red toward apex, densely pubescent at base, less so at apex, margin membranous, densely ciliate, apex blunt; **spike** (including flowers) 12–13.5 cm long, fusiform, flowers extending 1.5 cm above the bracts, spike only including bracts 11–12 × c. 3 cm; **sterile bracts**: c. 18, outer to 6–8 × 2.5–4 cm, pink-red (parts exposed to light, inner bracts or parts shielded by overlapping outer bracts cream-white) densely pubescent at base (rusty golden colour in dried material) becoming sparsely pubescent to almost glabrous at apex, inner c. 8 cm long, but gradually narrower to 1.8 cm, ovate, boat-shaped, cream-white, indumentum as on outer bracts; **fertile bracts** 7–8.5 × 0.6–2.5 cm (longer and wider in outer whorls, gradually smaller and narrower towards centre of inflorescence), ovate, boat-shaped, cream-white, glabrous, semi-translucent; **pedicel** 2 mm long, **bracteole** absent. **Flower** 8–10 cm long; **calyx** 4–5.5 cm long, white, with unilateral incision c. 17 mm, softly sericeous (more towards base), apex trilobed, apices pointed, close together, tufted; **floral tube** 6–7.5 cm long, mostly white with light pink tinge at apex, externally sparsely sericeous, internally long puberulous in apical half, almost glabrous towards base; **corolla lobes** dark pink, glabrous; **dorsal corolla lobe** 20 × 7–8 mm, elliptic, apex obtuse, slightly hooded; **lateral corolla lobes** 12–13 × 5 mm, elliptic, apex obtuse, attached at an angle to the tube, **labellum** c. 25 × 5.5–9 mm, pale pink at base, bright pink-red at apex, hairy at base and centre, lateral lobes somewhat erect, c. 9 mm across when flattened, central lobe bilobed with an incision of 5–7 mm, each lobe with two obscure sub-lobes. **Stamen** 10–11 mm long, **filament** fully reduced; **anther** 10–11 × 3.5–4.5 mm, ± parallel-sided, widest at apex, angled c. 110°, connective tissue white with pale pink tinge dorsally, incision 2–3 mm, no anther crest; **anther thecae** slightly extending into floral tube, dehiscent c. 9 mm in the centre, densely hairy at margins. **Ovary** 8 × 3 mm, ± cylindrical, widest in the middle, sparsely softly villous (denser towards apex); **epigynous gland** c. 5 mm long, bilobed, enveloping the style, split to base dorsally and ventrally, apex lobes irregular, blunt; **style** white, glabrous; **stigma** c. 2.5 mm wide, white, glabrous, ostiole facing forwards, flexistylous. **Infructescence** c. 12 × 6 cm, broadly spindle-shaped, with numerous fruit developed; **fruit** an indehiscent capsule with persistent calyx, 3.5 × 1.3–1.8 cm (mature capsule only, without calyx), ellipsoid, slightly angular, cream-white to beige or with pink tinge throughout, glabrous; **seeds** irregularly globose, 2–3 mm in diam., dark brown, fully embedded in juicy sour-sweet aril.

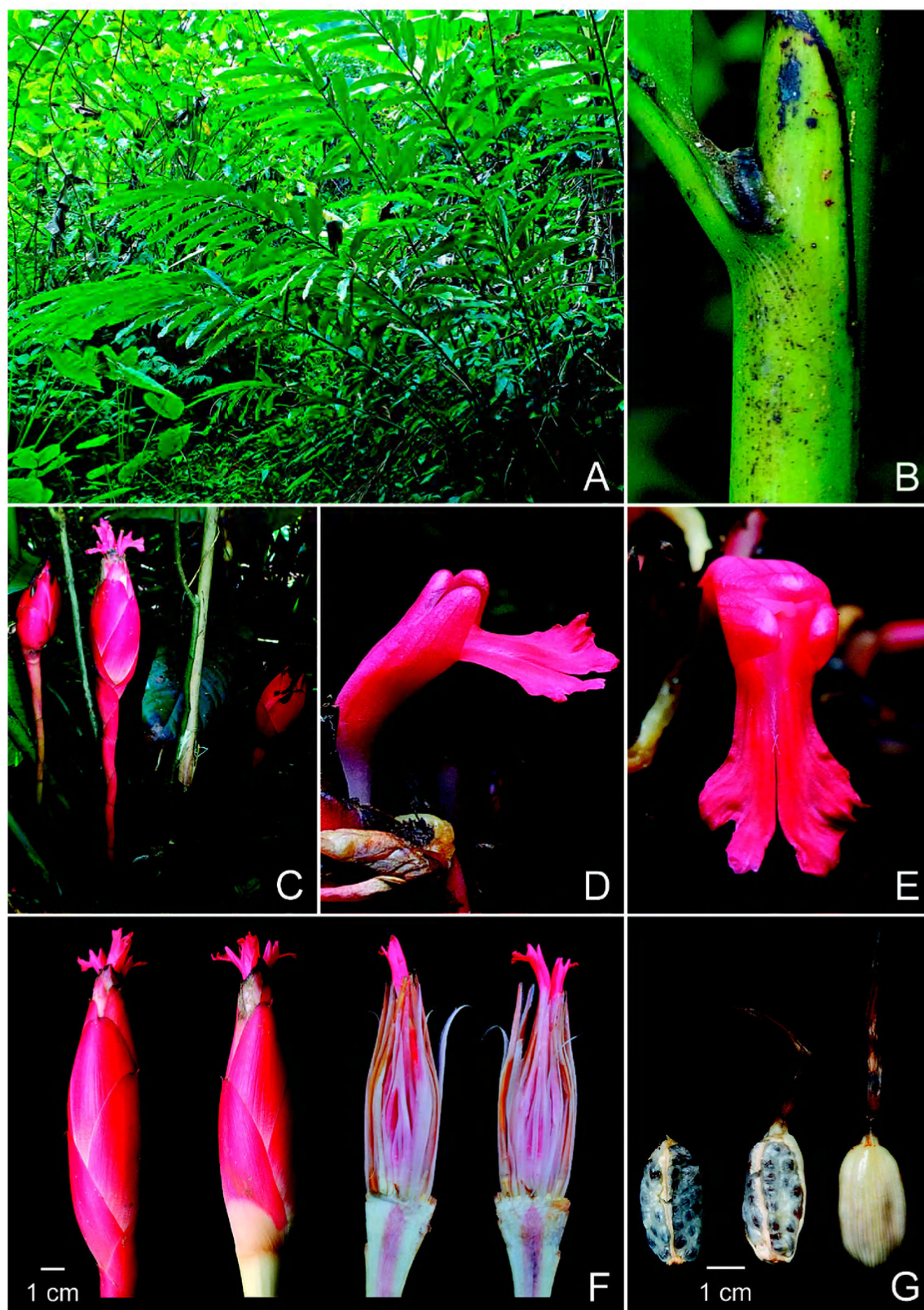


Fig. 3. *Hornstedtia bella* Škorničk. **A.** Habit. **B.** Detail of ligule. **C.** Inflorescence. **D.** Flower (side view of the apical part exerted from bracts). **E.** Flower (front top view). **F.** Flowering head from outside inclusive the sterile bracts (left), and in cross-section showing the almost flat receptacle (sterile bracts were removed) **G.** Fruit and seeds. Based on collections *JLS-2846* (type) and *JLS-2828*. (Photos: J. Leong-Škorničková)

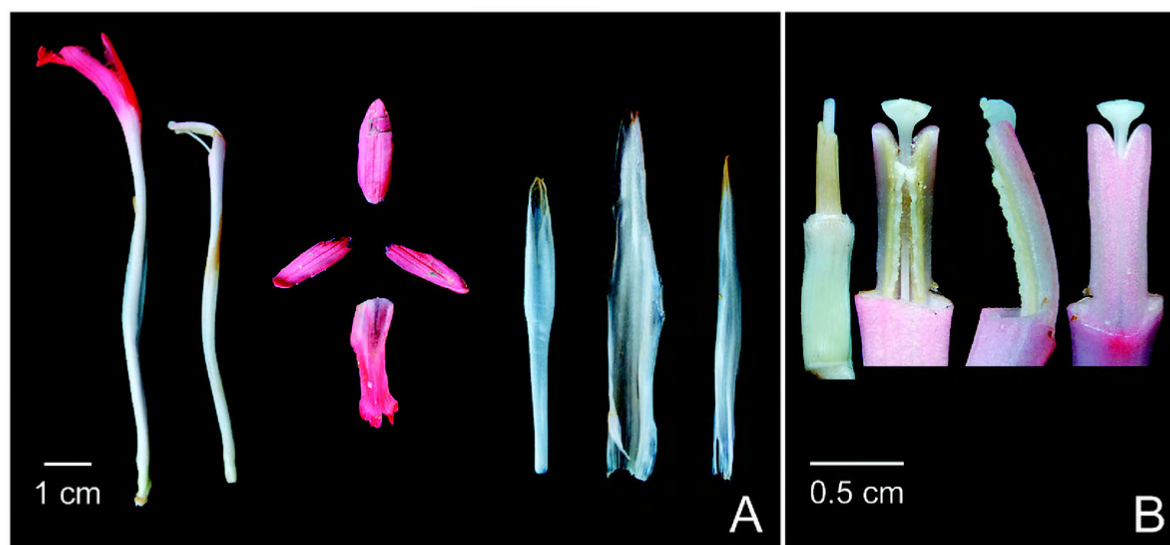


Fig. 4. *Hornstedtia bella* Škorničk. **A.** Flower dissection (from left): Flower (bract and bracteole removed), ovary with floral and staminal tube and stamen attached, dorsal and corolla lobes, labellum, calyx, bract (from outer part of the inflorescence) and bract (from innermost part of the inflorescence). **B.** Detail of ovary with epigynous gland and the stamen (front, side and back view). Based on type *JLS-2846*. (Photos: J. Leong-Škorníčková)

Etymology. We have chosen the epithet ‘bella’ as we think it is one of the most beautiful Vietnamese species (see Fig. 5).

Distribution & provisional IUCN assessment. Although *Hornstedtia* species are not known to exhibit stenoendemism, this rather conspicuous species has been seen and collected only from two locations in A Lưới district (unprotected areas), Thừa Thiên-Huế Province and once each from Quảng Nam and Kontum provinces (both within Nature Reserves). We have not located any historical specimens of this species in the numerous herbaria we have studied. Only the recent specimens and photographic records, which are listed below, are known. Although Averyanov *et al.* state on the label of their collection (*HAL-7547*) that it is locally common, from our surveys and from interviewing local people almost a decade later, it does not appear to be so. No uses were reported, but the damage to the existing primary vegetation is considerable and rapidly expanding outside of the Nature Reserves. The current extent of occurrence (EOO) has been estimated at about 1250 km² with only four populations known and we, therefore, propose that this species be treated as Endangered (EN B1ab(iii)).

Ecology and phenology. Growing in montane evergreen broad-leaved forest near streams and other wet locations, on shale and granite. It has also been seen in secondary closed broad-leaved forest and disturbed forest mixed with bamboos, but only in locations with adequate humidity. Flowering has been observed from April to early June. The first ripe fruit were observed in early June but fruiting is likely to continue till late July or even early August.



Fig. 5. *Hornstedtia bella* Škorničk. **A.** Detail of inflorescences (top view). **B.** Markedly pedunculate inflorescences and infructescences. **C.** Detail of inflorescences and an infructescence (side view). From Averyanov *et al.* HAL-7547. (Photos: L. Averyanov)

Additional specimens examined. VIETNAM: **Thừa Thiên-Huế:** A Lưới District, Hong Kim Municipality, proximity of A Nor waterfall, alt. 663 m, 16°18'04.3"N 107°13'07.0"E, 7 Jun 2014, *Jana Leong-Škorničková, Nguyễn Quốc Bình, Aung Thame & Paul Leong* JLS-2828 (E, P, SING, VNMN). **Kontum:** Đắk Glei District, about 15–18 km to NW of Đắk Glei town, between Mang Khen (Dak Che) and Dak Poko villages, near Laos boundary, 1250–1450 m, 22 November 1995, *Averyanov, L. et al.* VH 1914 (MO). **Quảng Nam:** Nam Giang Distr., Sông Thanh Nature Reserve, 18 Jul 2009, *Vũ Xuân Phương et al.* TVC-360 (HN).

Additional photographic records seen. VIETNAM: **Thừa Thiên-Huế:** A Lưới Distr., Hong Kim Municipality, Dut village, about 3 km to NE from point 16°17'54"N 107°12'41"E near A Nor waterfall, c. 700–800 m a.s.l., 27 Apr 2005, *Averyanov L., Loc P.K., Thao, T.V. & Vinh, N.T.* HAL-7547 (flowering and fruiting material seen). **Kontum:** Đắk Glei District, Ngọc Linh Nature Reserve (fruiting material seen).

Notes. The existence of this beautiful species was brought to our attention by Prof. Leonid Averyanov who showed us his photographs. Although it was clearly a new species, the lack of spirit material discouraged us from describing it until we could collect it ourselves almost a decade later.

Hornstedtia bella is readily distinguished from the only other *Hornstedtia* species in Vietnam, *H. sanhan* M.F. Newman (Newman, 1995), by its prominently pedunculate inflorescences and the bright pink labellum, each lobe of which has two further sub-lobes, resulting in a 4-lobed appearance. Although the seeds are like those of *Hornstedtia sanhan*, fully embedded in a tasty sour-sweet juicy aril, the local people do not seem to consume them. The species might have some horticultural potential for landscaping. Its flowers are short-lived and without them, the bracts are not particularly beautiful so there is little prospect for the cut-flower industry.

ACKNOWLEDGEMENTS. We thank the Asian Zingiberaceae Information Centre at Singapore Botanic Gardens and the Zingiberaceae Resource Centre at the Royal Botanic Garden Edinburgh (<http://elmer.rbge.org.uk/ZRC/>) for providing protologues and other references. We thank the Agriculture Department and other authorities of Kontum and Thừa Thiên-Huế provinces for granting us permission and providing support for our fieldwork. We thank Dr Leonid Averyanov for bringing the existence of *Hornstedtia bella* to our attention and for sharing with us his images and locality data. We also thank Maxim Nuraliev for sharing his photographic records and localities of very many Vietnamese Zingiberaceae including *Etlingera pavieana*. We thank Dr Axel D. Poulsen for useful discussion of the two new species as well as his guidance for preparing the descriptions to capture all the important characters for these genera. Ms Anna Pozarowska, a volunteer of Singapore Botanic Gardens, is thanked for collating the colour plates in Fig. 1–4. Mr Aung Thame and Mr Paul K.F. Leong (Singapore Botanic Gardens) are thanked for their assistance in the field. We thank Assoc. Prof. Dr Nguyễn Trung Minh, Dr Vũ Văn Liên and Prof. Lưu Đàm Cư from the Vietnam National Museum of Nature for their support of our collaborative research. The research of the first author is supported by the National Parks Board, Singapore and the Czech Science Foundation, GAČR (Grant No. P506/14/13541S). We thank the two reviewers and the editor for their constructive comments and language improvements of this paper.

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Leong-Škorničková, Jana et al. 2016. "Etlingera poulsenii and Hornstedtia bella (Zingiberaceae: Alpinieae), two new species from central Vietnam." *The Gardens' bulletin, Singapore* 68(2), 287–297.

<https://doi.org/10.3850/s2382581216000223>.

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