



Ophiorrhiza hoanglienensis (Rubiaceae), a new species from north-western Vietnam

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Abstract

Ophiorrhiza hoanglienensis, a new species from Hoang Lien mountain range, north-western Vietnam, is described and illustrated. The new species is characterized by oblong-lanceolate stipules, equal or subequal paired leaves, congested-cymose inflorescences with 5–10-flowered, distylous flowers, well-developed bracts, lanceolate, 15–20 mm long, unequally 5-lobed calyx with narrowly lanceolate lobes, longest one 3.2–3.5 mm long, shortest one 1.2–2 mm long, exclusively white corolla with 25–28 mm long tube and ovate to broadly triangular lobes, dorsally ribbed without horn. The information on ecology, conservation status, and comparison with similar species is also provided.

Keywords: endemic, Flora of Vietnam, new taxon, Ophiorrhizeae

Introduction

Ophiorrhiza Linnaeus (1753: 150) (Ophiorrhizeae, Rubioideae, Rubiaceae), a predominantly herbaceous genus, comprises ca. 200–300 species worldwide and distributes mainly in wet tropical forests from East India to the West Pacific and from South China to North Australia (Darwin 1976, Bremer & Eriksson 2009, Chen & Taylor 2011, Razafimandimbison & Rydin 2019). The genus has been taxonomically revised only for marginal parts of its area: the Pacific (Darwin 1976), China (Lo 1990, Chen & Taylor 2011), the Indian subcontinent (Deb & Mondal 1997), Thailand and adjacent areas of Peninsular Malaysia (Craib 1932). In China, it is represented by 72 species (with ca. 50 endemics) occurring mainly in the south and south-western of the country and the country is considered as one with the most diversity of the genus (Lo 1999, Chen & Taylor 2011, Wu *et al.* 2018, Yang *et al.* 2018, Duan *et al.* 2019), followed by India with ca. 50 species (Deb & Monda 1997, Hareesh *et al.* 2015), and Thailand and adjacent areas with ca. 33 species (Craib 1932, Schanzer 2005). In contrast to the neighbouring regions, the systematic and taxonomic knowledge of this genus in Vietnam is still poorly known. In Flore générale de l'Indochine, Pittard (1923) reported 11 species and one variety of *Ophiorrhiza* for Vietnam. Later, Pham (2003) and Tran (2005) enumerated a total of 13 species and one variety of the genus for the country. However, a revision of the genus for Vietnam has not been carried out so far.

During recent botanical explorations in the Hoang Lien mountain range, north-western Vietnam which borders the center of *Ophiorrhiza* diversity in southwest of China, we collected specimens of an unidentified *Ophiorrhiza* on

the banks of streams in dense evergreen broad-leaved forests at elevations of 1800–2100 m. After comparison of these specimens with the type specimens and protologues of known *Ophiorrhiza* species from Vietnam and neighbouring countries (Pittard 1923, Craib 1932, Darwin 1976, Deb & Monda 1997, Lo 1999, Tran 2005, Schanzer 2005, Chen & Taylor 2011, Hareesh *et al.* 2015, Wu *et al.* 2018, Yang *et al.* 2018, Tu *et al.* 2018, Duan *et al.* 2019), it was discovered that these specimens could not be assigned to any of the species described so far. They neither fit the existing descriptions nor conform to the type specimens of these species and hence are described and illustrated as a new species, namely *Ophiorrhiza hoanglienensis* T.V.Do.

Materials & methods

The macromorphological features were studied based on the specimen sheets and notes made in the field. The micromorphological observations were analysed and photographed using an optical microscope (Stemi DV4, LEICA S8 AP0) and integrated camera system (Canon 1D-X) under Kaiser Copy Lighting Units (RB 5004 HF). The morphological characters of studied specimens were compared with the type specimens and protologues of previously described *Ophiorrhiza* species and were reviewed on the basis of specialized literature (Pittard 1923, Craib 1932, Darwin 1976, Deb & Monda 1997, Lo 1999, Chen & Taylor 2011), and herbarium specimens deposited in relevant herbaria (A, AAU, BNU, CPNP, GXMI, HITBC, HN, HNU, IBK, IBSC, K, KUN, L, MO, MW, NIMM, NY, P, PE, SING, SYS, VNM, and VNMN).

The description of new species follows the terminology used by Harris & Harris (2001), and recent treatments (Darwin 1976, Deb & Monda 1997, Chen & Taylor 2011).

Conservation status for the new species is presented based on field observations, applying the IUCN red list category criteria of threatened species (IUCN 2019).

Taxonomic treatment

Ophiorrhiza hoanglienensis T.V.Do, *sp. nov.* (Figs. 1 & 2)

It is morphologically similar to *O. napoensis* and *O. fangdingii* but it differs from these two species in having stipules oblong-lanceolate, 9–13 mm long, persistent, leaves in equal or subequal pairs, inflorescences congested-cymose with 5–10-flowered, bracts well-developed, lanceolate, 15–20 mm long, calyx unequally 5-lobed, lobes narrowly lanceolate, longest one 3.2–3.5 mm long, shortest one 1.2–2 mm long, corolla exclusively white with tube 25–28 mm long, hairy at apical part inside, and lobes ovate to broadly triangular, dorsally ribbed without horn.

Type:—VIETNAM. Lai Chau province: Tam Duong district, Son Binh commune, elev.1828 m, 27°46'31.87"N, 108°33'0.84"E, on the ridge of Hoang Lien Son mountain range, along 4D national road, ca. 3 km from Tam Duong to Ton forest station, Hoang Lien National Park, 18 October 2017, *Do Van Truong et al.* VNMN_CN 895 (Holotype: VNMN!; Isotype: IBK!).

Perennial herbs, erect or weak at base, to 40 cm long, sometimes branched. Stems terete and glabrous. Leaves often in equal or subequal pairs, ovate-lanceolate, lanceolate or elliptic-oblong, 5–11 × 2–3.2 cm, acuminate to narrowly cuneate at base, acuminate or cuspidate, slightly oblique, ca. 1 cm long at apex, glabrous on both surfaces, adaxially green, abaxially pale green or whitish becoming yellowish when dry, lateral venation pinnate, 13–14 pairs, adaxially shallowly sunken, abaxially prominent, merged at margin. Petioles 3–6 mm long, glabrous. Stipules narrowly oblong-lanceolate, 9–13 × 2–3 mm, entire or cleaved up to $\frac{3}{4}$ the length, glabrous on both surfaces, margin entire, persistent. Inflorescence terminal, congested-cymose, 5–10-flowered; inflorescence branches helicoid or scorpioid cymes, 5–8 mm long, fine pubescent with congested flowers. Peduncle 8–13 mm long, glabrous. Bracts well-developed, lanceolate, 15–20 × 3–4 mm, venation reticulate and prominent on both surfaces, margin entire. Flowers distylous. Pedicels 1–1.5 mm long, pubescent. Hypanthium subturbinate, 1.3–1.5 × 1.5–1.7 mm, sparsely hairy or glabrescent; calyx lobes unequal, narrowly lanceolate, longest one 3.2–3.5 × 0.3–0.4 mm, shortest one 1.2–2 × 0.25–0.3 mm, membranous, reticulate venation, glabrous. Corolla funnel-form with cylindrical basal part of the tube, exclusively white, drying greenish or yellow, glabrous outside; corolla tube 25–28 × ca. 2 mm, straight or sometimes slightly curved, glabrous inside, except for some sparse hairs at throat; corolla lobes upright, ovate to broadly triangular, 4–5 × 3–4 mm, acute at apex, glabrous on both surfaces, lobes dorsally ribbed and without horn. Longistylous flower: stamens included,

inserted at the top part of the corolla tube wall; filaments 1.2–1.5 mm long; anthers linear, 2–2.2 mm long; style situated above anthers, filiform, as long as the length of corolla tube or lightly longer, $27\text{--}29 \times \text{ca. } 0.2 \text{ mm}$, glabrous; stigmas 2-lobed, lobes oval or roundish, $1 \times 1.2\text{--}1.5 \text{ mm}$, golden, sparsely hairy. Brevistylous flower: stamens inserted at the top part of the corolla tube wall; filaments 1.2–1.4 mm long; anthers oblong linear, 2.3–2.6 mm long; style situated below anthers, filiform, much shorter than the corolla tube, 13–14 mm long, glabrous; stigmas 2-lobed, oval or lanceolate, ca. 2 mm long, glabrous. Capsules not seen.

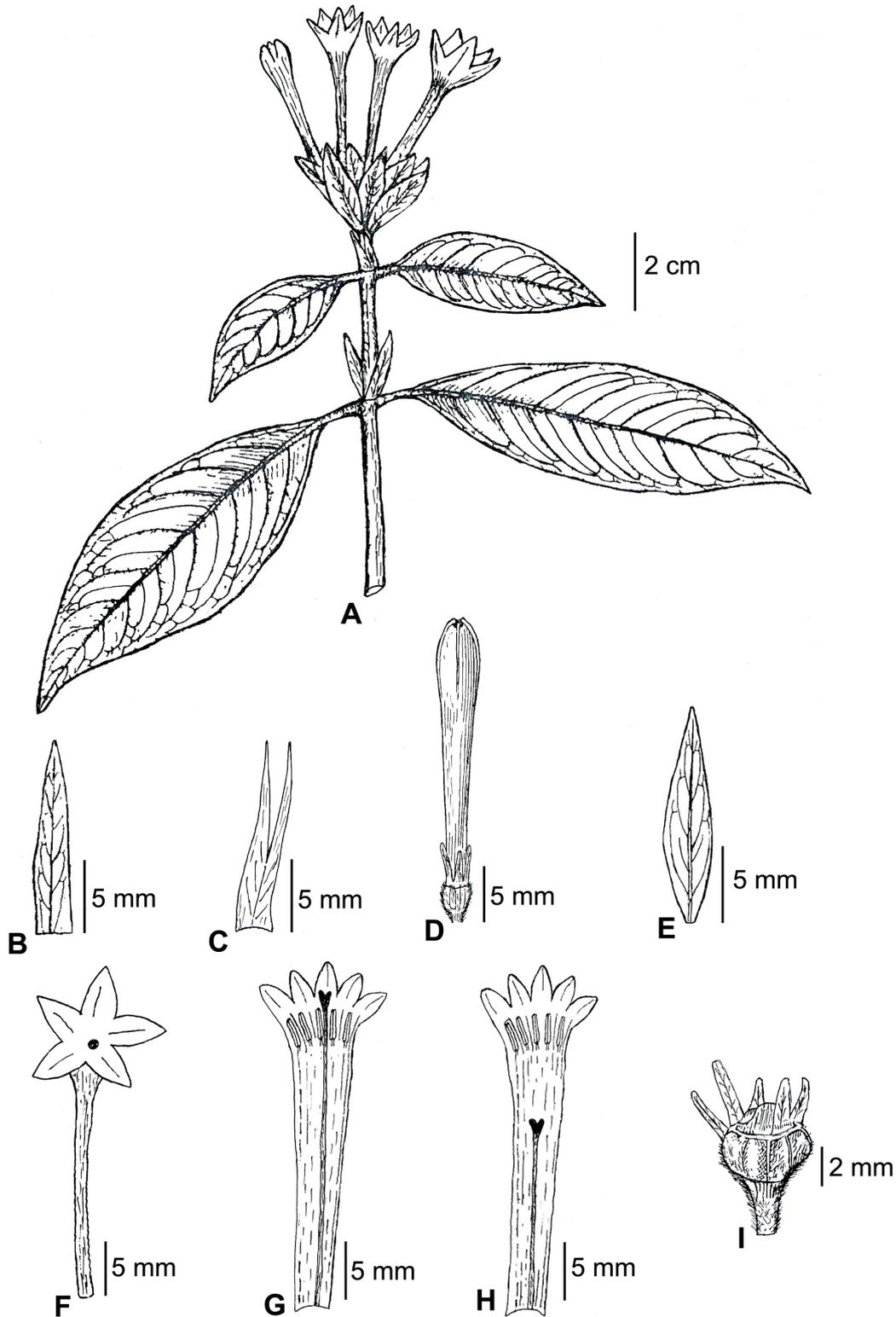


FIGURE 1. *Ophiorrhiza hoanglienensis*. **A.** Habit and Inflorescence congested-cymose; **B.** Stipule entire; **C.** Stipule cleaved up to $\frac{3}{4}$ the length; **D.** Flower bud; **E.** Bracts well-developed; **F.** Frontal view of flower; **G.** Longistylous flower; **H.** Brevistylous flower; **I.** Hypanthium subturbinate with unequal calyx lobes. Drawn by Do Van Truong.

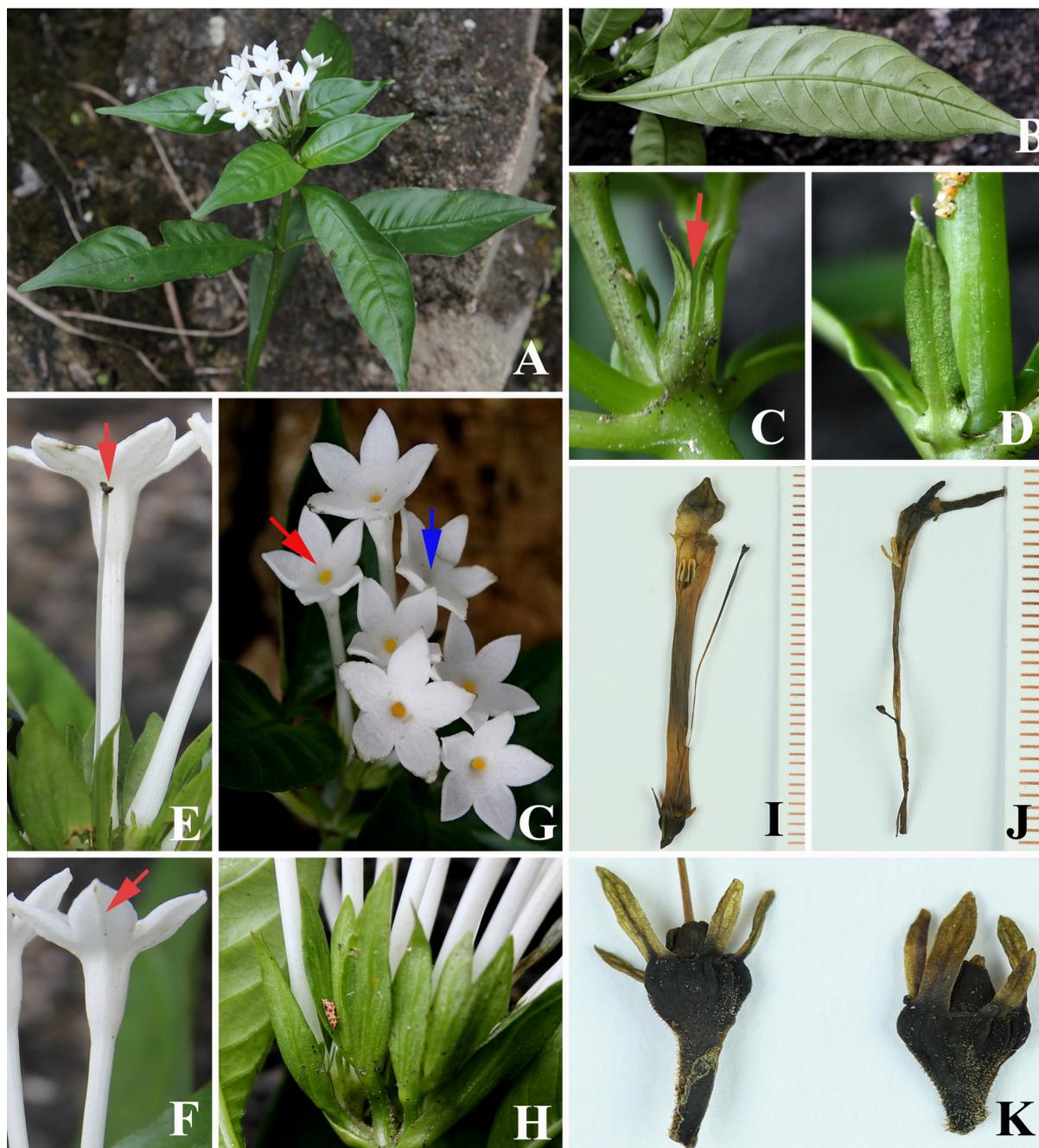


FIGURE 2. *Ophiorrhiza hoanglienensis*. **A.** Habit and Inflorescence congested-cymose; **B.** Abaxial leaf surface; **C.** Stipule cleaved up to $\frac{3}{4}$ the length (indicated by a red arrow); **D.** Stipule entire; **E.** Stigma 2-lobed (indicated by a red arrow); **F.** Corolla lobes dorsally ribbed without horn (indicated by a red arrow); **G.** Flowers distylous (longistylous flower indicated by a red arrow; brevistylous flower indicated by a blue arrow); **H.** Bracts well-developed; **I.** Dissected longistylous flower; **J.** Brevistylous flower; **K.** Hypanthium subturbinate with unequal calyx lobes. Photos by Do Van Truong.

Etymology:—The specific epithet refers to Hoang Lien, a mountain range of north-western Vietnam from which the new species was collected.

Phenology:—Flowering was observed from October to November. Fruiting time of the new species may start from December or early January.

Distribution and ecology:—*Ophiorrhiza hoanglienensis* is currently only known from Hoang Lien mountain range, north-western Vietnam, where only two populations were found. The new species grows on the banks of streams in dense evergreen broad-leaved forests or moist and humid sites nearby trails, at elevations of 1800–2100 m, along with the dominant vegetation of Fagaceae (*Quercus* spp.), Lauraceae (*Lindera* spp., *Litsea* spp.), Ericaceae (*Rhododendron* spp.), Urticaceae (*Elatostema* spp.), Gesneriaceae (*Henckelia pumila* (D. Don) A. Dietr.).

TABLE 1. Morphological comparisons of *Ophiorrhiza hoanglienensis* with *O. napoensis* and *O. fangdingii*.

Character	<i>O. hoanglienensis</i>	<i>O. napoensis</i> *	<i>O. fangdingii</i> **
Stems	Green, glabrous	Green, glabrous	Purplish, subglabrous to glabrous
Stipules	Oblong-lanceolate, 9–13 mm long, entire or cleaved up to ¾ the length, persistent	Triangular, 0.5–1 mm long, entire, caducous	Triangular-ovate, 2–3 mm long, entire, caducous
Leaves pairs	Equal or subequal	Unequal	Unequal
Abaxial leaf surface	Pale green or whitish	Pale yellow	Pale green with brown veins
Secondary veins	13–14 pairs	7–12 pairs	5–10 pairs
Inflorescences	Congested-cymose, 5–10-flowered	Congested-cymose with several flowers	Congested-cymose, 4–5-flowered
Peduncles	8–13 mm long	8–10 mm long	15–20 mm long
Bracts	Lanceolate, 1.5–2.0 mm long, acute at apex	Lanceolate-linear, 10–14 mm long, acute at apex	Linear or narrowly lanceolate, 10–18 mm long, obtuse at apex
Calyx lobes	Unequally 5-lobed, narrowly lanceolate, longest one 3.2–3.5 mm long, shortest one 1.2–2 mm long	Unequally 5-lobed, narrowly triangular, longest one 1.8–2 mm long, shortest one 1.3–1.5 mm long	Subequally 5-lobed, linear-lanceolate, 2–3 mm long
Corolla shape and colour	Funnel form, white	Salverform to funnel form, white	Funnel form, pinkish-white
Corolla tube	2.5–2.8 mm long, hairy at apical part inside	20–22 mm long, inside glabrous	20–22 mm long, villous above middle inside
Corolla lobes	Ovate to broadly triangular, dorsally ribbed without horn	Ligulate to ovate, dorsally ribbed with short horn	Ovate, dorsally narrowly winged, wings extending into very short horn
Distribution	North-western Vietnam	Southern China	Southern China and Northern Vietnam

*Morphological characters following Lo (1999), Chen & Taylor (2011). **Morphological characters following Lo (1999), Chen & Taylor (2011), Pham *et al.* (2019).

Conservation status:—Only two small-sized populations of *O. hoanglienensis* were found in the non-protected and protected forest areas of Hoang Lien mountain range, with a few saplings growing from seeds. Furthermore, the local farmers continue to impose strong pressure on the remaining primary forest patches, converting it mostly into Bengal cardamom plantations (*Amomum aromaticum* Roxb.) and constructing leisure developments. Thus, the persistence of the species might be at risk in the near future. This species is primarily assessed as Endangered (EN B2a, C2a(i), D) according to the IUCN (2019).

Morphological affinities:—*Ophiorrhiza hoanglienensis* is most morphologically similar to *O. napoensis* Lo (1999: 48) and *O. fangdingii* Lo (1999: 190), both endemic to southern China (Guangxi and Yunnan provinces), by sharing salverform to funnel form corolla tube, longer than 20 mm and well-developed bracts. However, *O. hoanglienensis* is clearly distinguished from *O. napoensis* in having stipules oblong-lanceolate, 9–13 mm long, persistent (*vs.* triangular, 0.5–1 mm long, caducous), leaves in equal pairs (*vs.* unequal pairs), bracts lanceolate, 15–20 mm long (*vs.* lanceolate-linear, 10–14 mm long), calyx lobes reaching 3.2–3.5 mm long at max (*vs.* reaching 1.8–2 mm long at max), corolla tube ovate to broadly triangular, 25–28 mm long, sparsely hairy at apical part inside (*vs.* ligulate to ovate corolla, 20–22 mm long, glabrous inside), corolla lobes dorsally ribbed without horn (*vs.* ribbed with short horn). Furthermore, *O. hoanglienensis* differs from *O. fangdingii* by some morphological characters of the stems (green *vs.* purplish), stipules (oblong-lanceolate, 9–13 mm long, persistent *vs.* triangular, 2–3 mm long, caducous), leaves (equal pairs, abaxially pale *vs.* unequal pairs, abaxially pale with brown veins), peduncles (8–13 mm long *vs.* 15–20 mm long), bracts (lanceolate, 15–20 mm long, acute at apex *vs.* lanceolate-linear, 10–14 mm long, obtuse at apex), corolla (exclusively white with a 25–28 mm long tube *vs.* pinkish-white with a 20–22 mm long tube) and corolla lobe dorsally (ribbed without horn *vs.* narrowly winged, with wing extending into very short horn). Detailed comparisons are provided in Table 1.

Additional specimen examined: VIETNAM. Lao Cai province: Sapa, Ton forest station, Hoang Lien National Park, along dry stream, 14 November 2018, *Do Van Truong 151* (VNMN).

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