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New species, *Hoya sungwookii* (Apocynaceae, Asclepiadoideae), from southern Vietnam

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Summary. A new species, *Hoya sungwookii*, discovered in southern Vietnam near Nha Trang Town (Khanh Hoa Province) is described and illustrated. It belongs to the type section of the genus and is distinguished from the morphologically closest *H. oblongacutifolia* (= *H. graveolens*) in glabrous pedicels, smaller flower 1.1–1.4 cm across, greenish ciliate calyx, corolla abaxially light green, small green to dark green corona 4.5–5 mm in diameter, 1.6–1.8 mm tall, small, 2–2.2 mm long, corona segments, and short corona segment inner angle, not exceeding anthers. Additionally, data on ecology, phenology, distribution of newly described species are presented, as well as its evaluated conservation status and color illustrations. Taking into consideration our new data, the genus in Vietnam currently includes 45 species.

Новый вид – *Hoya sungwookii* (Аросунасеае, *Asclepiadoideae*) из Южного Вьетнама

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Ключевые слова: Восточный Индокитай, охрана растений, провинция Кханьхоа, разнообразие растений, таксономия растений, флора, эндемизм, *Asclepiadoideae*, *Hoya oblongacutifolia*, *Hoya* sect. *Hoya*.

Аннотация. В статье приводится описание нового вида – *Hoya sungwookii*, обнаруженного в южном Вьетнаме недалеко от города Нячанг (провинция Кханьхоа). Новый вид относится к типовой секции рода и морфологически отличается от наиболее близкого к нему *H. ablongacutifolia* (= *H. graveolens*) гольми цветоножками, более мелкими цветками диаметром 1,1–1,4 см, зеленоватой реснитчатой чашечкой, венчиком светло-зеленым с нижней стороны, зеленой или темно-зеленой короной 4,5–5 мм диаметром и 1,6–1,8 мм высотой, маленькими сегментами короны длиной 2–2,2 мм и коротким внутренним углом сегмента коронки, не превышающим пыльники. Дополнительно к описанию представлены данные по экологии, фенологии, распространению нового вида, а также приведена оценка его природоохранного статуса и детальные цветные иллюстрации. С учетом приведенных в статье новых данных род во Вьетнаме в настоящее время насчитывает 45 видов.

Introduction

Hoya R. Br. (Brown, 1810) is one of the largest genera in the family Apocynaceae (subfamily *Asclepiadoideae*, tribe *Marsdenieae*), which includes 400–450 currently accepted species found mostly in tropics of Asia, Pacific islands and NE Australia (Li et al., 1995; Forster, Liddle, 1996; Forster, 2006; Liddle, 2009; Rodda, 2015; Nguyen et al., 2023). Species of this genus are mostly small herbaceous epiphytic vines or subshrubs with main centers of their diversity in Indochina, Borneo, Philippines and New Guinea (Wanntorp et al., 2014). Many species are widely cultivated as significant ornamental plants known commonly by the name wax plants. The Indochinese Peninsula represents the largest center of genus speciation and diversity in mainland Asia, with about 60 species reported, mainly from Thailand and Vietnam (Pham, 2003; Tran, 2005; Averyanov et al., 2017; Rodda, Rahayu, 2018). The last preliminary assessment of the genus in Cambodia, Laos, and Vietnam documented 40 *Hoya* species in the flora of Vietnam (Averyanov et al., 2017). However, the true genus diversity in Vietnam still remains insufficiently studied. Further

investigation of the genus in Vietnam led to the discovery of additional species, *Hoya lamthanhia* Pham et Kloppenberg (Pham et al., 2020), as well as three novelties, *H. acuminata* (Wight) Benth. ex Hook. f., *H. honglenae* Aver., Vuong, Bao et V. C. Nguyen, and *H. phuwuaensis* Kidyoo (Nguyen, 2023). During a special field investigation of *Hoya* diversity in southern Vietnam, we collected an unidentified species near Nha Trang Town (Khanh Hoa Province) and introduced it into cultivation. After studies of relevant literature and available *Hoya* specimens in P, K, SING, VNM, BM, L, LE, and PKF herbaria, we assume that it is a new species that is here described as *H. sungwookii*. In addition, data on ecology, phenology, distribution of newly described species are presented, as well as its color illustrations and evaluated conservation status. Taking into consideration our new data, the genus in Vietnam currently includes 45 species.

Materials and Methods

The measurements and species description are based on living plants and herbarium specimens. Type herbarium and additional material are stored

at the Herbarium of the Institute of Tropical Biology, Vietnam Academy of Science and Technology (VNM). All photographs were taken with a Canon 700D body and an EF-S 60mm f/2.8 Macro USM lens. The terminology for the morphological description follows Harris J., Harris M. (2006), Randal (2008), Hickey, King (2013), Beentje (2016), and Simpson (2019). Scanned images and associated supplementary analytical photos are kept in the database “Herbarium LE” (<https://en.herbariumle.ru>). In the citation of the taxa distribution in Vietnam, including the provinces, we follow the modern official administrative division of the country (Vietnam Administrative Atlas, 2015). The online version of the IUCN Red List of Threatened Species (IUCN 2024) was used for the assessment of the species conservation status. Institutes where studied specimens are kept are indicated by their internationally accepted herbarium acronyms (Thiers, 2024).

Taxonomic treatment

Hoya R. Br., 1810, Prodr. Fl. Nov. Holland.: 459.

Type: *Hoya carnosa* (L. f.) R. Br., 1810, Prodr. Fl. Nov. Holland: 460 (≡ *Asclepias carnosa* L. f., 1782, in Suppl. Pl.: 170).

400–450 species in India and southern China through continental Southeast Asia and Malesia to the Solomon Islands and Australia. In Vietnam 45 species.

H. sect. *Hoya*

80–100 species spread across the whole general area. In Vietnam about 16 species.

In terms of the number of species, this section is probably the largest in the genus. Species of this group share such diagnostic features as an epiphytic vine living form, many-flowered inflorescence, relatively large flowers, small calyx dissected from the base into 5 lobes, mostly flat, adaxially hirsute corolla dissected on more than half of its length into 5 spreading lobes, and rotate corona with horizontally spreading segments having ovoid outer angle and subulate inner processus. Although the morphological borders of the section remain unclear (Kloppenburger, 1990; Randal, 2008), it forms a monophyletic clade based on molecular data (Wanntorp et al., 2014). The evolution of this group was connected with speciation in Sundaland and the Philippines, from ancestral group inhabited mainland Southeast Asia (Wanntorp et al., 2014). In Vietnam this section comprises such species as *Hoya*

arnottiana Wight, *H. diversifolia* Blume, *H. globulosa* Hook. f., *H. griffithii* Hook. f., *H. hanhiae* V. T. Pham et Aver., *H. lyi* H. Lév., *H. mengtzeensis* Tsiang et P. T. Li, *H. micrantha* Hook. f., *H. nummularioides* Costantin, *H. oblongacutifolia* Costantin (= *H. graveolens* Kerr), *H. revolubilis* Tsiang et P. T. Li, *H. sapaensis* T. B. Tran et Rodda, *H. tamdaoensis* Rodda et T. B. Tran, *H. thuathienhuensis* T. B. Tran, Rodda et Simonsson, and *H. lamthanhiaie* Pham et Kloppenburger. According to morphological characters, our new species undoubtedly belongs to this section, and in floral morphology, it is most similar to *H. carnosa*, *H. aphylla* Aver., K. S. Nguyen et Averyanova (not yet reported for Vietnam), and to *H. oblongacutifolia* found in the southern part of the country in Kien Giang and Tay Ninh provinces (Costantin, 1912; Rodda et al., 2013).

Hoya sungwookii Aver., Vuong, Nhan et V. C. Nguyen, **sp. nov.** (Figs. 1–3).

Diagnosis. The new species is morphologically closest to *Hoya oblongacutifolia*, from which it differs in glabrous pedicels, smaller flower 1.1–1.4 cm across, greenish ciliate calyx, corolla abaxially light green, small green to dark green corona 4.5–5 mm in diameter, 1.6–1.8 mm tall, small corona segments, 2–2.2 mm long, and short corona segment inner angle, not exceeding anthers.

Type: “Vietnam, Khanh Hoa Province, Nha Trang Town area, climbing, coastal dense evergreen broad-leaved forest and scrub on rocky slope among large granite boulders at elevation of about 50 m a. s. l. 1 X 2023. Truong Ba Vuong, Nguyen Van Canh, Um Sung Wook. BV1861” (VNM 00070356!) – Fig. 3.

Photos of plants and their parts were used for the preparation of specimens LE 01124773 (<https://en.herbariumle.ru/?t=occ&id=212557>) and LE 01124774 (<https://en.herbariumle.ru/?t=occ&id=212558>).

Etymology. The species is named after Mr. Um Sung Wook, who first found this plant in nature and kindly shared his discovery for our study.

Description. **Herbaceous vine**, climbing, epiphytic or lithophytic, to 4 m long with white latex in all vegetative parts. **Stem** slender, terete, glabrous, about 3 mm in diameter, greenish, olive, pale brownish, or brownish gray, glabrous, with internodes 1.8–10 cm long. **Leaves** petiolate, glabrous; petiole stout, terete, 1.3–1.6 cm long, 2.8–3 mm in diameter, straight to curved, slightly twisted, light green to green, glabrous; leaf blade thick, fleshy, narrowly elliptic to oblong narrowly

obovate, (4.5)5–8.5(9) cm long, 1.5–3 cm wide; apex shortly acuminate or cuspidate, at the base cuneate or rounded, entire and straight along the margins; adaxial surface grassy green to dark green, sometimes with irregular white marks, glossy when young; abaxial surface light green; main vein and secondary veins unconscious on both sides (evident when dry). **Inflorescence** erect, pedunculate, lax umbelliform raceme, 3–4 cm in diameter, with (5)7–12(13) flowers; peduncle rather stout and straight, terete, perennial, 3.5–4.5 cm long, 1.4–1.6 mm in diameter, light green to green, glabrous; rachis swollen, 2.2–2.6 mm in diameter, with small brownish persistent scars of previous flowerings; pedicels terete, slender, light green to green, 1.5–1.8 cm long, 0.6–1 mm in diameter, glabrous. **Flower buds** shortly obconoid, pentagonal shaped. **Flowers** pentamerous, widely opening, (1.1)1.2–1.3(1.4) cm across. **Calyx** persistent, yellowish green to green with brown tint, flat, 3.2–3.6 mm in diameter, 5-lobed; lobes broadly triangular ovate, obtuse, 1–1.1 mm long and wide, abaxially finely verruculose, margin membranaceous, erose ciliate. **Corolla** rotate, slightly concave to almost flat; adaxially white to white with green tint, abaxially light green, 5-lobed, connate on 1.8–2 mm from the base; lobes spreading, oblong narrowly ovate, 4.5–5.5 mm long, 3.5–4 mm wide

(being flattened), apex blunt to obtuse, often pointed and somewhat recurved, lateral margins revolute; lobes inside at base long pilose, along margin long papillose, central surface finely papillose; lobes outside glabrous. **Corona** 4.5–5 mm in diameter, 1.6–1.8 mm tall, of 5 segments, glossy green, apices of segments dark green, glabrous; each segment obscurely ovoid in outline, held horizontally, 2–2.2 mm long, 1.5–1.6 mm in diameter; outer angle round; inner angle (processus), subulate, as long as anthers, not reaching gynostegium apex. **Gynostegium** with 5 anthers; anther caps yellow; pollinaria with small corpusculum, caudicles, translators (retinacula), and 2 pollinia; corpusculum rhomboid, dark brown, 0.2–0.25 mm long, 0.1–0.05 mm wide, translators (retinacula) and caudicles very small, hardly visible; pollinium, obliquely clavate, 0.4 mm long, 0.15 mm wide, bright yellow, apex truncate roundish, external margin with narrow pellucid wing. **Style head** discoid-oblate with obtuse broadly conoid apex, about 0.8 mm tall and 1–1.2 mm in diameter, tightly connivent to adjacent parts of the flower. **Ovary** of 2 carpels, carpels free, green, about 1.2 mm tall, 0.8 mm wide at base, half-bottle-shaped, superior, densely connivent with each other, articulated apically to style head. Fruits and seeds not seen (Figs. 1–3).

Table

The comparable of morphological characters of *Hoya sungwookii* and the morphologically most similar species, *H. oblongacutifolia*.

	<i>Hoya sungwookii</i>	<i>Hoya oblongacutifolia</i>
Petiole length in cm	1.3–1.6	0.5–1.2
Leaf blade shape	narrowly elliptic to oblong narrowly obovate	obovate or broadly elliptic
Pedicel surface	glabrous	sparsely hirsute
Flower diameter in cm	1.1–1.4	1.5–1.6
Calyx color	predominantly green	predominantly dirty purple
Calyx surface and margin	inside glabrous, outside verruculose, margin ciliate	outside glabrous, margin entire, not ciliate
Corolla color	adaxially white to white with green tint, abaxially light green	adaxially pure white, abaxially white with purple tint
Corolla lobes shape and size	oblong narrowly ovate, 4.5–5.5 mm long, 3.5–4 mm wide	ovate, 8–8.3 mm long, 5–6 mm wide
Corona color	green to dark green	light to dark purple
Corona size	4.5–5 mm in diameter, 1.6–1.8 mm tall	5.5–5.7 mm in diameter, 2.5–3 mm high
Corona segments size	2–2.2 mm long, inner angle, as long as anthers	2.5–3 mm long, inner angle exceeding anthers

Habitat and phenology. Secondary, rather dry, short, sclerophyllous, wind-formed coastal forest and scrub on steep, sea-faced rocky slopes on granite at an elevation of about 50 m a. s. l. Very rare. Flowers in September – December.

Distribution. Vietnam (Khanh Hoa Province, near Nha Trang Town). Endemic of central, coastal part of Vietnam.

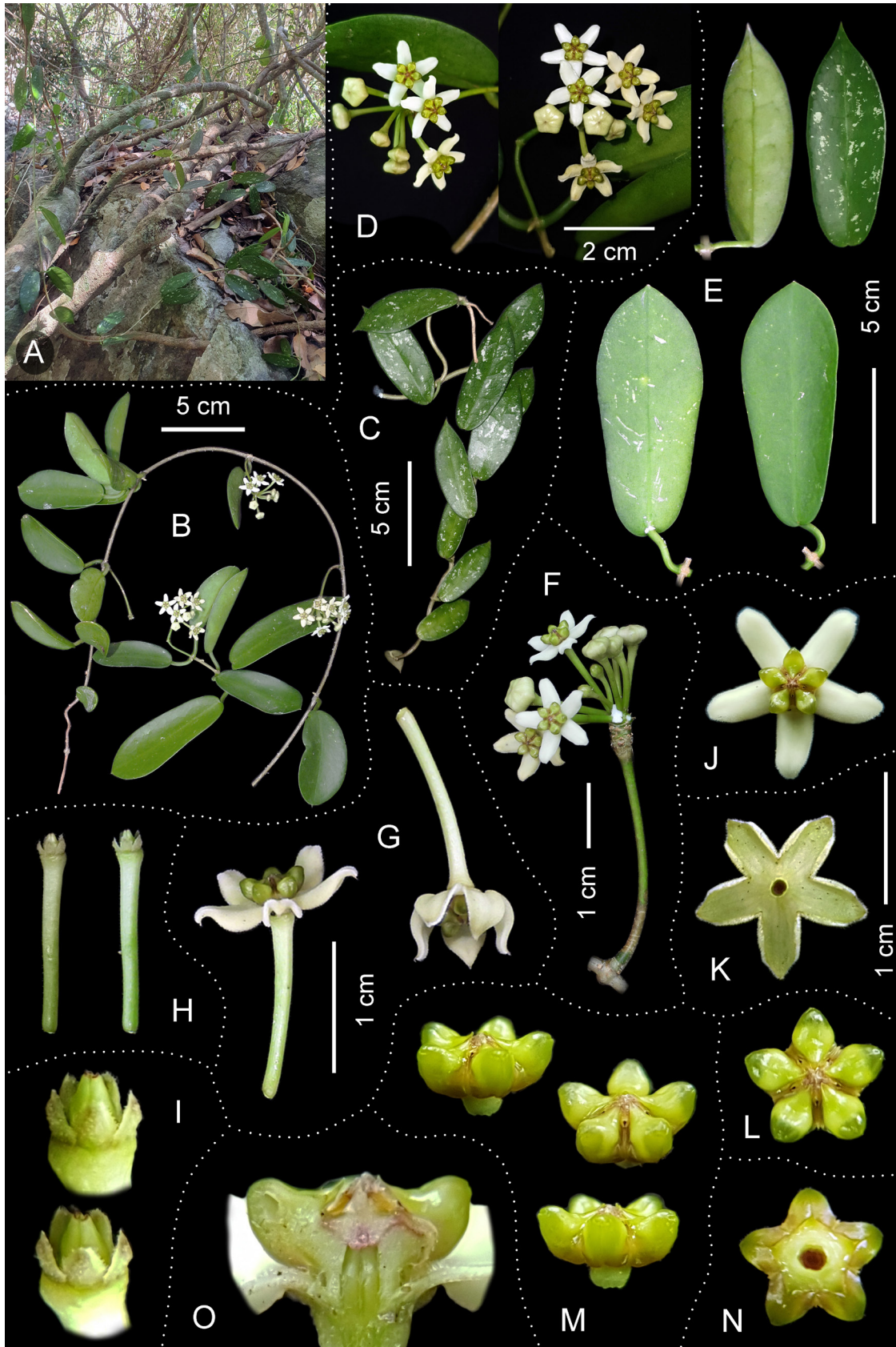


Fig. 1. *Hoya sungwookii*: A – plant in natural habitat in *locus classicus*; B – fresh flattened flowering plant; C – flattened shoot of plant in cultivation; D – intact inflorescences; E – spotted and uniform green leaves, adaxial and abaxial side; F – separated inflorescence; G – separated flowers, side view; H – pedicels with calyx and ovary; I – calyx and ovary; J – flower, frontal view; K – corolla, view from below; L–N – corona, views from above, from side, and from below; O – sagittal section of corona and ovary. Photos by Van Canh Nguyen and Ba Vuong Truong from plant used for the preparation of the holotype specimen VNM 00070356, photo correction and design by L. Averyanov and T. Maisak.

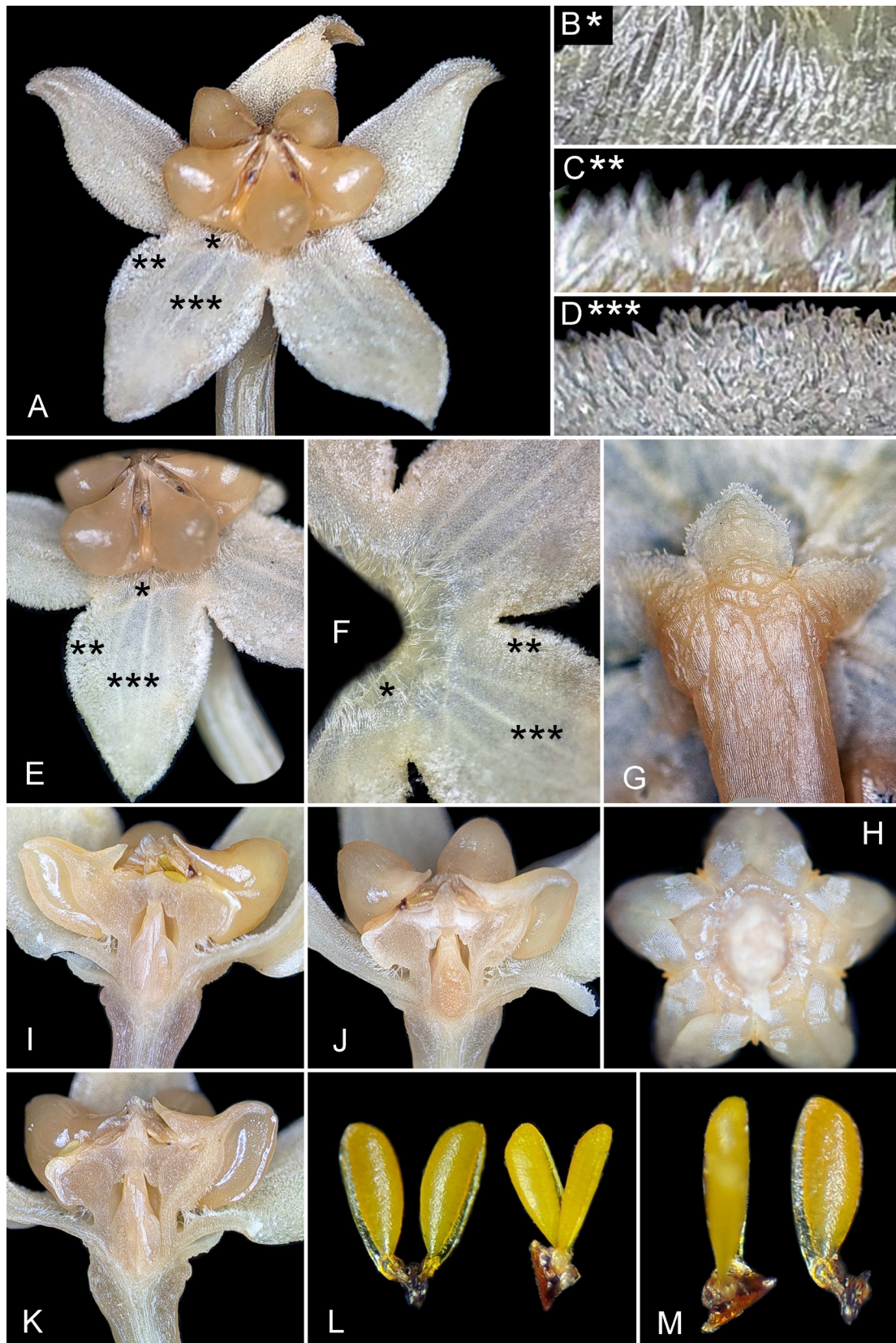


Fig. 2. *Hoya sungwookii*; A – flower (black asterisks on figures A, E, and F indicate areas of corolla lobes magnified on figures B–D); B–D – different kinds of indumentum on adaxial surface of corolla; E – magnified corolla lobe and corona; F – flattened and magnified basal portion of the corolla; G – apex of pedicel and calyx, side view; H – corona, view from below; I–K – sagittal section of corona, gynostegium and apex of pedicel; L – pollinaria, view from different sides; M – pollinaria with corpusculum, caudicles, and translators. All photos by Ba Vuong Truong from alcohol preserved material used for the preparation of the holotype specimen VNM 00070356, photo correction and design by L. Averyanov and T. Maisak.



Fig. 3. *Hoya sungwookii*. Holotype herbarium specimen (VNM 00070356).

Conservation status. This is a very rare species that has been discovered in a single location in a densely populated coastal tourist area near Nha Trang Town in southern Vietnam (Khanh Hoa Province). Our field studies indicate that shortly after its discovery, commercial gathering significantly reduced the single known population. It is highly likely that this plant is currently extinct in its locus classicus. Taking into consideration the very small area of its occurrence, strong anthropogenic pressure on the habitats, and commercial collecting, the conservation status of this species may be surely estimated as globally Critically Endangered (CR) following to formal criteria proposed by IUCN (2024) as following: A2a–c; B1a,b(i–iii, v)+2a, b(i–iii, v); C1+2(i, ii); D1; – expected population reduction for 10 years or 3 generation $\geq 80\%$ are not reversible (A2), based on direct observation (a), observed decline of the area of occupancy, extent of occurrence and habitat quality (b), and actual levels of exploitation (c); – the area of occurrence $< 100 \text{ km}^2$ (B1) and the area of occupancy $< 10 \text{ km}^2$ (B2), with 1 known population (a) and continuing observed decline of extent of occurrence (bi); the

area of occupancy (bii); area, quality of habitat (biii); the number of mature individuals (bv); – the number of mature individuals < 250 , estimated or projected continuing decline in 25% in 3 years or 1 generation (C1), and observed, estimated, projected or inferred continuing decline when the number of mature individuals in each subpopulation (C2(i)) ≤ 50 and % of mature individuals in one subpopulation = $90\text{--}100\%$ (C2(ii)); the number of mature individuals < 50 (D).

Note. Among the morphologically most similar species, our new species is most close to *Hoya oblongacutifolia*, but it well differs in a series of morphological characters presented in the diagnosis and in Table.

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