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Vanilla flava (*Orchidaceae*, *Vanilloideae*), a new leafless vine from southern Vietnam

Vanilla flava (*Orchidaceae*, *Vanilloideae*) — новая безлистная лиановидная орхидея из южного Вьетнама

L. V. Averyanov[1a,*], Van Canh Nguyen[2], Truong Ba Vuong[3], T. V. Maisak[1b], I. V. Sokolova[1c]

[1] Komarov Botanical Institute of the Russian Academy of Sciences Herbarium of Higher Plants
Professora Popova Str., 2, St. Petersburg, 197022, Russia
[a] av_leonid@mail.ru
https://orcid.org/0000-0001-8031-2925
[b] tmaisak@mail.ru
https://orcid.org/0000-0001-5919-6755
[c] isokolova@binran.ru
https://orcid.org/0000-0001-5277-6669

[2] Institute of Applied Technology, Thu Dau Mot University
Tran Van On Str., 6, Phu Hoa Ward, Thu Dau Mot City, Binh Duong Province, Vietnam
nguyenvancanh@tdmu.edu.vn
https://orcid.org/0000-0001-9578-0342

[3] Institute of Tropical Biology of the Vietnam Academy of Science and Technology
Tran Quoc Toan Str., 85, District 3, Ho Chi Minh City, Vietnam
bavuong2019@yahoo.com
https://orcid.org/0000-0003-3452-8455

* Corresponding author

Л. В. Аверьянов[1a,*], Ван Кань Нгуен[2], Труонг Ба Вын[3], Т. В. Майсак[1b], И. В. Соколова[1c]

[1] Ботанический институт им. В. Л. Комарова РАН
ул. Профессора Попова, 2, Санкт-Петербург, 197022, Россия
[a] av_leonid@mail.ru
https://orcid.org/0000-0001-8031-2925
[b] tmaisak@mail.ru
https://orcid.org/0000-0001-5919-6755
[c] isokolova@binran.ru
https://orcid.org/0000-0001-5277-6669

[2] Институт прикладной технологии, Университет города Тхузаумот
ул. Чан Ван Он, 6, район Фу Хоа, город Тхузаумот, провинция Бин Донг, Вьетнам
nguyenvancanh@tdmu.edu.vn
https://orcid.org/0000-0001-9578-0342

[3] Институт тропической биологии Вьетнамской академии наук и технологии
ул. Чан Куок Тоан, 85, район 3, город Хошимин, Вьетнам
bavuong2019@yahoo.com
https://orcid.org/0000-0003-3452-8455

* Автор для переписки

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Abstract. Here we describe a new leafless vine orchid, *Vanilla flava* Aver., Vuong et V. C. Nguyen (*Orchidaceae*, *Vanilloideae*), that we discovered in southern Vietnam (Dak Lak and Gia Lai provinces). It differs from the morphologically closest *V. aphylla* Blume and *V. wightiana* Lindl. ex Hook. f. in having large inflorescence up to 4.5 cm long, commonly with 4–9 flowers, a stout peduncle 3–5 mm diam., with 3–6 distant bracts, a pedicel with ovary 2.8–6.4 cm long, 2.2–4 mm diam., and a lip disc with a prominent pack of densely placed, imbricate, backwards-pointing bristles. Data on ecology, phenology, and distribution, as well as relevant taxonomical notes for the new species, are provided. The conservation status of the new species is tentatively assessed as endangered following terms and criteria proposed by the IUCN Red List. The nomenclature of *V. wightiana* is adjusted, its lectotype is designated.

Keywords: *Vanilla*, *Vanilla wightiana*, endangered plant, endemism, flora of Vietnam, leafless vanilla, new species, orchids, plant diversity, plant taxonomy.

Аннотация. В статье описывается новая безлистная лиановидная орхидея *Vanilla flava* Aver., Vuong et V. C. Nguyen (*Orchidaceae*, *Vanilloideae*), обнаруженная нами на юге Вьетнама (провинции Даклак и Зялай). Она отличается от наиболее морфологически близких *V. aphylla* Blume и *V. wightiana* Lindl. ex Hook. f. крупным соцветием до 4.5 см дл., обычно с 4–9 цветками, толстым цветоносом 3–5 мм в диам. с 3–6 расставленными прицветниками, цветоножкой вместе с завязью 2.8–6.4 см дл. и 2.2–4 мм в диам., а также диском губы с группой плотно черепитчато сближенных, направленных назад щетинок. Приводятся данные об экологии, фенологии и распространении, а также необходимые таксономические заметки о новом виде. Охранный статус нового вида предварительно оценивается как находящийся под угрозой исчезновения в соответствии с терминами и критериями Красного списка МСОП. Уточнена номенклатура и обозначен лектотип *V. wightiana*.

Ключевые слова: *Vanilla*, *Vanilla wightiana*, исчезающее растение, эндемизм, флора Вьетнама, безлистная ваниль, новый вид, орхидеи, разнообразие растений, таксономия растений.

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Introduction

Vanilla Miller is a pantropical genus with about 128 species (Soto Arenas, 2003; Soto Arenas, Cribb, 2010; Cameron, 2011; Karremans et al., 2025). Among them, a few widely known taxa are cultivated for the natural vanilla flavor extracted from their fermented fruits. Almost all other species are commonly poorly known, uncommon in cultivation, and usually rare in the wild. As to their living form, species of this genus are leafy or leafless herbaceous epiphytic or lithophytic creeping succulent vines often reaching a length of 20 m or more, with flowers lasting often only one day near the top of mature stems, commonly in crowns of tall trees or on open rocky cliffs. As a result, the flowers are very difficult to observe and easily overlooked by collectors. Herbarium specimens of the genus are frequently difficult for morphological analysis because the fleshy flowers become somewhat flimsy after drying. As a result, taxonomic inventory of *Vanilla* in many local floras, including the flora of Vietnam, remains incomplete.

In Vietnam, eight species of *Vanilla* s. str. (except the species presently assigned to the genus *Miguelia* Aver.) are currently known, including the species described in this paper. They are *V. aphylla* Blume (Blume, 1825: 422), *V. atropogon* Schuit., Aver. et Rybková (Schuiteman et al., 2013: 10), *V. baosangii* Vuong, Aver. et V. C. Nguyen (Dang et al., 2025), *V. cardinalis* Aver. et Nuraliev (Averyanov et al., 2022: 120), *V. siamensis* Rolfe ex Downie (Downie, 1925: 410), *V. tiendatii* Vuong, V. H. Bui, V. S. Dang et Aver. (Nguyen et al., 2020: 438), and *V. yersiniana* Guillaumin et Sigaldi (Guillaumin, 1964: 162). Additionally, several Asian species placed in the past in *Vanilla* and later segregated at the rank of a separate genus *Miguelia* Aver. (Averyanov, 2011: 45; Averyanov, Truong, 2015) also are reported in the flora of Vietnam. These species are *M. annamica* (Gagnep.) Aver. (Gagnepain, 1931: 686; Averyanov, 2011: 49), *M. cruenta* Aver. et Vuong (Averyanov, Truong, 2015: 36), *M. shenzhenica* (Z. J. Liu et S. C. Chen) Aver. (Liu et al., 2007: 301; Averyanov, Truong, 2015: 34), and *M. somai* (Hayata) Aver. (Hayata, 1916: 88; Averyanov, 2011: 49). In recent molecular studies, these species (along with a series of morphologically unsimilar taxa) were regarded at the rank of section as *Vanilla* subgen. *Tethyos* Karremans, Damián et Pupulin sect. *Miguelia* (Aver.) Karremans, Damián et Pupulin (Karremans et al., 2025). The newly described plant belongs to a complex of leafless species with fleshy, succulent green stems and almost completely reduced leaves presented by small, inconspicuous, caducous bracts arising from nodes at the shoot top. In the Old World, this complex comprises two groups of species with different morphological lineages within the genus.

The first group includes species with very long, erect many-flowered inflorescences, white flowers with petals distinctly wider than sepals, and a lip with two rows of short, dense hairs. This group was recently recognized as *Vanilla* subgen. *Tethyos* sect. *Aphyllae* Rolfe, "*V. phalaenopsis* group", and includes *V. decaryana* H. Perrier, *V. humblotii* Rchb. f., *V. madagascariensis* Rolfe, *V. perrieri* Schltr., *V. phalaenopsis* Rchb. f. ex Van Houtte, *V. roscheri* Rchb. f., and *V. walkerae* Wight distributed in E Africa, Madagascar, Seychelles, Comoros, India, and Sri Lanka (Soto Arenas, Cribb, 2010; Karremans et al., 2025).

The second group includes the species with short, few-flowered inflorescence, yellow or greenish flowers with petals of the same width as sepals, and lip epichile with prominent, elongate, densely hairy callus. Three species belong to this group known as "*V. aphylla* group" (within *Vanilla* subgen. *Tethyos* sect. *Miguelia*), namely *V. aphylla* (distributed in mainland SE Asia, the Philippines, and Java), *V. wightiana* Lindl. ex Hook. f. (India), and *V. flava* Aver., Vuong et V. C. Nguyen described here (endemic to southern Vietnam).

Material and methods

Morphological description and measurements are based on fresh and alcohol-preserved material, which means that the dimensions of fleshy floral parts in dried (herbarium) specimens are likely to be 15–20% smaller due to shrinking, as documented, e. g., by Averyanov et al. (2019). For the quantitative characters, a typical variation range (separated by a dash) is given in the description, whereas the rarely observed low and high values are given in brackets before and after the range (where applicable). Photos were taken using Sony DSC-HX80 and Canon EOS 750D with various compatible lenses. Scanned images of herbarium specimens and associated analytical photos are available in the open access database "Vascular Plants Herbarium of the Komarov Botanical Institute RAS" (Herbarium LE, 2025). The IUCN Red List Categories and Criteria, version 16 (IUCN..., 2024), was used for a preliminary assessment of the species conservation status. The general terminology for morphological descriptions follows H. Beentje (2016) and M. G. Simpson (2019).

Taxonomic treatment

Vanilla flava Aver., Vuong et V. C. Nguyen, sp. nova. — Figs. 1; 2: A–E.

Description. Herbaceous, terrestrial, epiphytic, or lithophytic leafless succulent glabrous creeping vine to 5 m long. **Stem** fleshy, grassy green, unbranched or sparsely branched, terete to subterete, grooved adaxially, 8–11 mm diam.; internodes (8)9–14(16) cm long;

aerial climbing roots gray greenish, arising from stem nodes, (1.3)1.5–2(2.2) mm diam. **Leaves** reduced into small, inconspicuous, grassy green, caducous, triangular, obtuse bracts to 1 cm long, 3–5 mm wide. **Inflorescence** axillary, pedunculate, peduncle together with rachis (2)2.5–4(4.5) cm long, 3–5 mm diam., stout, fleshy, grassy green, straight or slightly curved; peduncle 1–2.8 cm long, bearing (3)4–5(6) distant, triangular, cymbiform sterile bracts; rachis (1)1.2–1.5(1.7) cm long, with (4)5–8(9) spirally arranged flowers. **Floral bracts** persistent, spreading, fleshy, grassy green, broadly triangular, slightly cucullate, obtuse at apex, (3.8)4–5(5.2) mm long, (1.6)2–2.8(3.2) mm wide. **Pedicel with ovary** light green, straight to curved, terete, (2.8)3.2–6(6.4) cm long, (2.2)2.4–3.6(4) mm diam. **Flowers** densely arranged, opening successively, not much widely opened, (4.2)4.5–5(5.2) cm across; sepals and petals evenly light yellow, petals lighter to almost white; lip light yellow, inside rich yellow, near the base with many small purple brown speckles; in center with light pink to pink purple pack of densely placed bristles, hairs on median lobe yellow with brown purple apex. **Sepals and petals** subsimilar, somewhat fleshy, narrowly obovate to elliptic, concave, obtuse, (2.4)2.6–2.8(3) cm long, (9.5)10–11.5(12) cm wide; petals sometimes shortly attenuate and acuminate, abaxially obscurely keeled. **Lip** trumpet-shaped, 3-lobed, (2.3)2.4–2.6(2.8) cm long, (2)2.2(2.4) cm wide (when flattened), slightly erose and wavy along margin; side-lobes half circular, 6–9 mm long, 8–10 mm wide; median lobe narrowly triangular to triangular, 10–12 mm long, (8)9–11(11.5) mm wide, blunt to obtuse at apex; basal margins adnate to the column sides for (8.5)9–10(10.5) mm, forming a tubular structure; adaxial lip surface smooth or finely verruculose, at center with rectangular pack 3 mm long, 2–2.2 mm wide of densely placed, backward pointing bristles; lip apex with elongate callus densely covered with long somewhat fleshy, simple or forked hairs 1–2 mm long; abaxial lip surface with groove coming from the lip base to its apex. **Column** white, with yellowish tint at the base, slender, slightly curved forward at middle, (13.5)1.4–1.7(1.8) cm long, 2.8–3 mm wide, entirely glabrous, at front with two low parallel lamellae; lateral sides of clinandrium with forward directed sides; rostellum semicircular or rectangular truncate at front, hanging above stigma; stigma transversely oval, concave; anther cap conoid, helmet-shaped, bilobed at apex, 3 mm tall and 2 mm wide. **Pollinarium** consists of two half-notched, obovoid, bright yellow pollinia 1.6–1.8 mm long. **Ripening fruits** fleshy, cylindrical, slightly curved, 7–10 cm long, 6–8 mm diam.

Diagnosis. The new species differs from the closest *Vanilla aphylla* (Fig. 2: F–J) and *V. wightiana* in having a large inflorescence to 4.5 cm long, commonly with 4–9 flowers, stout peduncle 3–5 mm diam. with 3–6 distant bracts, pedicel and ovary 2.8–6.4 cm long, 2.2–4 mm diam., and a lip disc with a prominent pack of densely placed, backward-pointing bristles.

Type: Vietnam. Dak Lak Province: Ea'Kar District, Cu Pong Mt., dry secondary evergreen broad-leaved forest on granite at elevation of 600–650 m a. s. l. along rocky stream, among big granite boulders, flowers yellow, lip center with brown reddish hairs, locally common, 24 IV 2025, L. Averyanov, N. V. Canh, T. Maisak, AL3925 (holotype — LE: LE 01282493; isotype — LE 01282492; photo of plants before preparation of the type herbarium specimens — LE 01255781, LE 01255782).

Studied specimens (paratypes). **Vietnam. Gia Lai Province:** K'Bang District, dry primary and old secondary evergreen broad-leaved forest on lava rocks along rocky river at elevation 600–650 m a. s. l., succulent leafless liana to 5 m long in open shrubs along rocky river, flowers yellow, lip inside with brownish red hairs, occasional, 27 IV 2025, L. Averyanov, N. V. Canh, T. Maisak, AL3987 (LE 01282494; photo of plants before preparation of the voucher herbarium specimen — LE 01255824). **Lam Dong Province:** Di Linh district, densely grows along the stream with granite rocks, 15 III 2021, Truong Ba Vuong, Loc Bao Sang, BV1226, BV1128 (VNM 00074071).

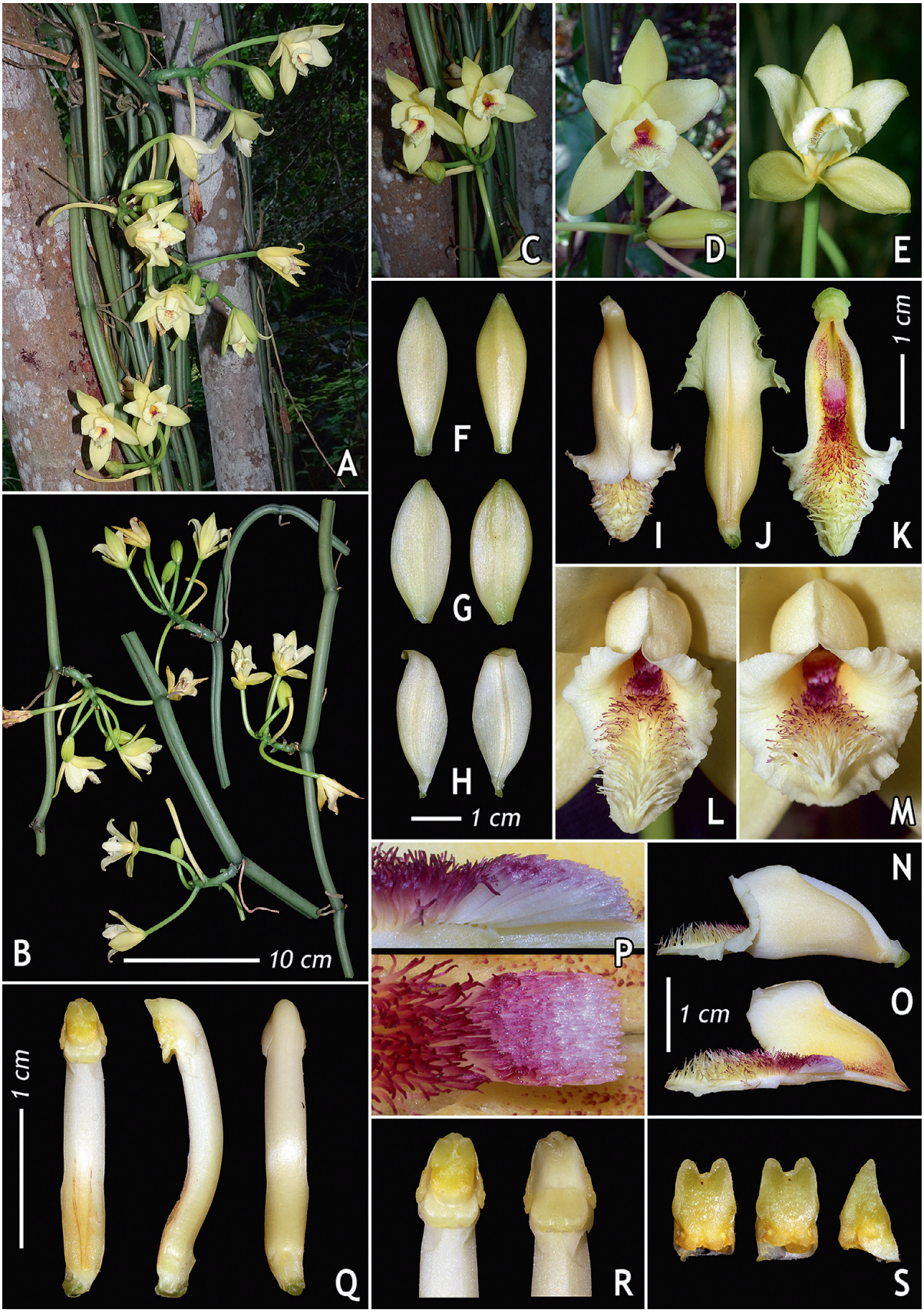
Studied photo records. **Vietnam. Dak Lak Province:** Ea Hleo District, dipterocarp forest along small stream at elevation of 200–300 m a. s. l., 6 V 2014, Nguyen Van Canh, AL4443 (LE 01203399); sine loco, 23 III 2015, N. V. Canh (LE 01073225). **Lam Dong Province:** Di Linh District, densely grows along the stream with granite rocks, 15 III 2021, Truong Ba Vuong, Loc Bao Sang, BV1226, BV1128 (LE 01203416). **Gia Lai Province:** Chu Se District, Ia Ko Commune, leafless succulent vine 4–5 m long, 2 IV 2021, Le Dang Huyen, Nguyen Hoang Tuan (LE 01090759); K'Bang District, So Pai Commune, evergreen broad-leaved forest at elevation of 700–800 m a. s. l., 28 IV 2021, Quang Diep Dinh, AL4436 (LE 01203383).

Etymology. The species epithet refers to yellow color of the flowers.

Ecology and phenology. Open primary and secondary forests and shrubs at elevations of 200–800 m a. s. l., commonly on granite and lava rock outcrops along small rivers. Not common. Fl. (III)IV–V.

Distribution. Vietnam, Dak Lak Province (Ea Hleo and Ea'Kar districts), Gia Lai Province (Chu Se and K'Bang districts). Endemic to southern Vietnam within the South Annamese and South Indochinese floristic provinces (Averyanov et al., 2003; Fu et al., 2019) known from six localities.

Conservation status. A total of six currently known subpopulations of the new species are located in four districts of Dak Lak and Gia Lai provinces in southern Vietnam, with an approximate extent of occurrence (EOO) of about 4500 km^2. At the same time,


A
B
10 cm
C
D
E
F
G
H
1 cm
I
J
K
1 cm
L
M
N
O
1 cm
P
Q
1 cm
R
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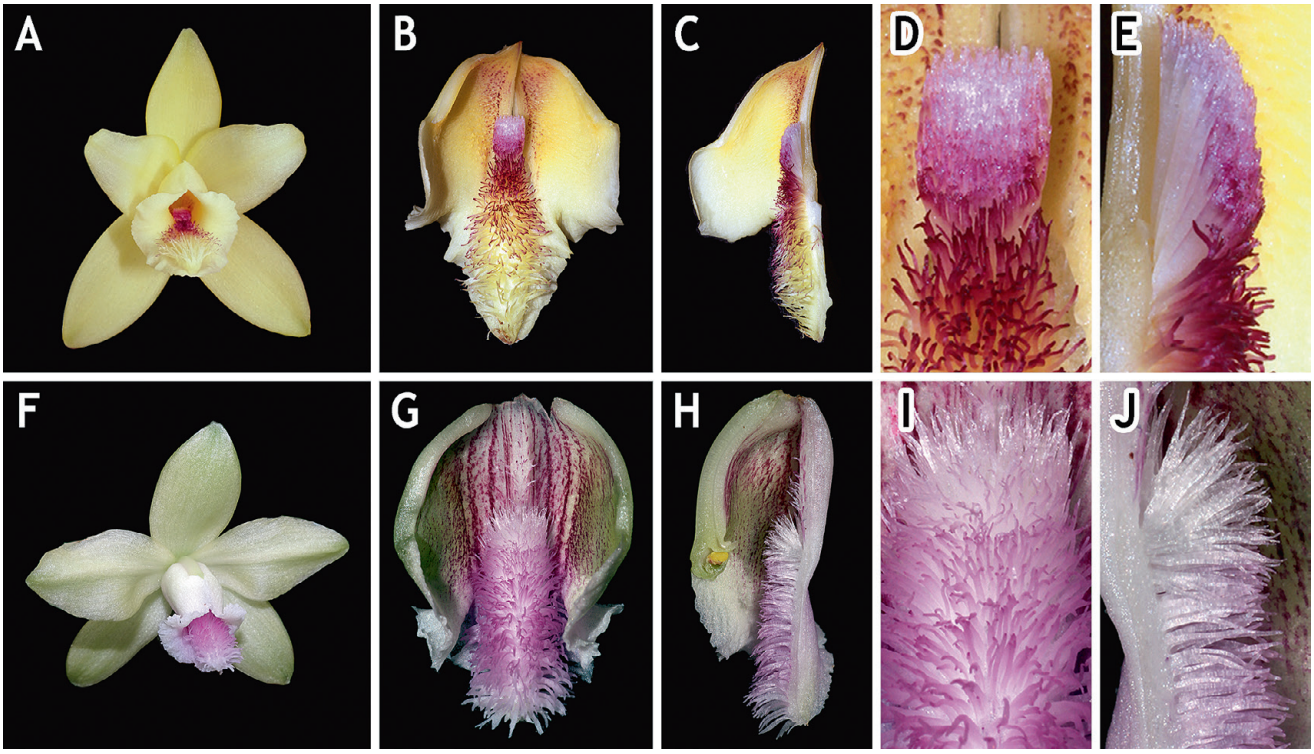


Fig. 2. Comparative floral morphology of *Vanilla flava* (A–E) and *V. aphylla* (F–J).
A, F — flower, front view; B, G — flattened lip, top view; C, H — lip, sagittal section; D, I — ornamentation of the lip center; E, J — lip center, sagittal section. Photos A–E from the plant used for preparation of the type specimens (AL3925); photos F–J from the specimen AL1754 (LE 01203392). Photos, graphic correction, and design by L. Averyanov and T. Maisak.

the observed area of occupancy (AOO) is dramatically small, covering places of intensive tourist recreation along small rocky rivers and waterfalls. According to our observation, the actual known area of AOO is surely less than 10 km^2. Following the terms and formal criteria of the IUCN (2024) Red List, the conservation status of the new species may be tentatively estimated as endangered (EN B1a,b, B2a,b, C1).

This remarkable species endemic to southern Vietnam was discovered in 2014 by Nguyen Van Canh. Unfortunately, voucher herbarium specimens were not prepared at that time. Later, it was additionally reported and documented by photos in 2015 (by Nguyen Van Canh) and in 2021 (by Le Dang Huyen, Nguyen Hoang Tuan, and Dinh Quang Diep). All these records were for some time attributed to *V. aphylla*, which is surely its closest relative. Perfect herbarium specimens desirable for an appropriate study and morphological description were collected recently. They are indicated as the holotype, isotype and one of the paratypes in this paper. These two mentioned species are indistinguishable in their vegetative, flowerless shoots. Meanwhile, their inflorescences and flowers, on close observation, are quite different. The new species clearly differs from *V. aphylla* in having inflorescence to 4.5 cm long, commonly with

Fig. 1. *Vanilla flava*.
A — flowering plant in natural habitat; B — flattened flowering portions of shoots prior to preparing herbarium specimens; C — intact inflorescence; D, E — flower, front view; F — median sepal, adaxial and abaxial side; G — lateral sepal, adaxial and abaxial side; H — petal, adaxial and abaxial side; I — lip, top view; J — lip, bottom view; K — lip, with cut off and removed side-lobes, top view; L, M — intact lip, front view; N, O — intact lip and its sagittal section, side view; P — pack of bristles in the center of lip, top view and sagittal section; Q — column, front, side, and back view; R — column apex with anther cap, and with anther cap removed, front view; S — anther cap, front, back and side view. Photos by L. Averyanov from the plant used for preparation of the type specimens (AL3925); graphic correction and design by L. Averyanov and T. Maisak.

5–8 flowers (vs inflorescence 3–6 mm long with 1–2, rarely 3 flowers), peduncle stout and thick, 3–6 mm diam., with 3–6 distant bracts (vs peduncle 2–3 mm diam. with 2 bracts at the base), pedicel and ovary 2.8–6.4 cm long, 2.2–4 mm diam. (vs 2.4–2.8 m long, 2 mm diam.), flowers yellow (vs flowers light green to almost white), lip inside rich yellow, callus on epichile densely covered with yellow hairs, dark orange-brown at apex (vs lip inside pink with greenish side lobes, callus on epichile covered with light pink to pink purple hairs), and central callus in form of pack of densely placed bristles (vs central callus in form of tuft of stiff spreading hairs).

In floral morphology, *Vanilla flava* also resembles *V. wightiana* from S India and Sri Lanka, a species that has been much confused in the literature and has often been reported under the name *V. wightii* (Soto Arenas, Cribb, 2010). A short taxonomical history and citation of this species in several studies is presented below:

Vanilla wightiana Lindl. ex Hook. f. 1890, Fl. Brit. India, 6 (17): 90; Rolfe, 1896, J. Linn. Soc., Bot. 32: 474, cum auct. Lindl.; A. Abraham a. Vatsala, 1981, Intr. Orchids: 502, fig. 160; P. M. Nayar a. Sastry, 1987, Red Data Book Ind. Pl. [1]: 282, fig. p. 284, cum auct. Lindl.

— *Vanilla aphylla* auct., non Blume, 1825: Lindl. 1840, Gen. Sp. Orchid. Pl.: 436, p. p..

— *Vanilla wightii* Lindl. ex Wight, 1833, Cat. Indian Pl.: 123, publ. inval., nom. nud.; id. 1845, Icon. Pl. Ind. Orient. 3 (3): 1, publ. inval., in syn.; Soto Arenas a. P. J. Cribb, 2010, Lankesteriana, 9 (3): 396, publ. inval., sine descr. lat.

Type: S India, Wight, 2091 (lectotype — K: K000387579, lower central fragment on the herbarium sheet, Averyanov, designated here; isolectotypes: K000387580, lower left fragment on the sheet; E00394234, lower left fragment on the sheet; E00394236, the leftmost fragment on the sheet).

M. Soto Arenas and P. Cribb (2010: 396) referred to "Wight 2091" at Herbarium K as the holotype and isotype of the invalidly published "*Vanilla wightii* Lindl. ex Wight", but rightly observed those specimens to be mixed gatherings of *V. wightiana* and *V. walkerae*. We share their opinion, and designate only one fragment of a plant mounted on the sheet K000387579 as the lectotype of *V. wightiana*.

To note, a series of plant records attributed to *Vanilla wightiana* belong in fact to *V. walkerae* (Wight, 1845: 1, tab. 932). Among them, there is the plant depicted in Tab. 931 in Wight (1845) sub "*Vanilla aphylla*", and those treated as *V. wightiana* in C. E. C. Fischer (1956: 1015), and Rao and Sudhakar (1984).

Following the concept of J. D. Hooker (1890), R. A. Rolfe (1896), M. P. Nayar, A. R. K. Sastry (1987), and M. Soto Arenas, P. Cribb (2010), *Vanilla wightiana* has a short inflorescence with about 3 flowers, and the lip having two rows of hairs from the base to the sides of more or less prominent elongate hairy callus at the center and sometimes coming to the lip apex. In these characters, true *V. wightiana* is rather closer to *V. aphylla* than *V. walkerae*, which belongs (together with mainly African species of *V. madagascariensis* group) to another lineage of the genus (Soto Arenas, Cribb, 2010). *Vanilla flava* differs from *V. wightiana* by its long, stout, many-flowered inflorescence to 4.5 cm long with 4–9 flowers (vs an inflorescence shorter than 1 cm, with 1–3 flowers), long pedicel and ovary 2.8–6.4 cm long (vs 2.4–2.8 cm long), and additionally by the lip bearing at the center a rectangular pack of densely placed bristles and at the apex having an elongate callus densely covered with long hairs (vs the basal third of the lip bearing two rows of hairs and in the center a more or less prominent elongate hairy callus sometimes coming to the lip apex).

It is notable that a plant superficially very similar to *V. flava* cultivated in Kozhikode (Calicut) University Botanical Garden was illustrated in the database "eFloraofIndia" under the name *Vanilla wightii* (*Vanilla wightii*, 2025). Unfortunately, this plant is of unknown origin.

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