



Gastrochilus pankajkumarii, (Aeridinae, Epidendroideae, Orchidaceae) a new lithophytic orchid from southern Vietnam

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(Manuscript received 24 August 2021; Accepted 9 December 2021; Online published 6 January 2022)

ABSTRACT: *Gastrochilus pankajkumarii*, found in the Central Highlands of Vietnam, is described as a new species for science. The protologue includes color analytical photos of the new species and data on phenology, ecology, and distribution. Morphological comparisons with similar species are presented.

KEY WORDS: Central Highlands, endemism, flora of eastern Indochina, *Gastrochilus* sect. *Microphyllae*.

INTRODUCTION

Gastrochilus Don belongs to subtribe Aeridinae of tribe Vandae and comprises more than 69 accepted species (Govaerts *et al.*, 2021). The genus is diagnosed by the presence of a subumbellate inflorescence; free sepals and petals; subdivided lip comprising a recurved epichile and a saccate, spur-like hypochile that is attached to the column at base; and two subglobose pollinia, which are attached to a filiform stipe with a small elliptic, ovate or circular viscidium at base (Pridgeon *et al.*, 2014).

The new species named here as *Gastrochilus pankajkumarii* belongs to *Gastrochilus* sect. *Microphyllae* Bentham & Hooker owing to its elongated stem with placed distichously leaves. The new species is morphologically close to *G. fuscopunctatus* (Hayata) Hayata and *G. kadooriei* Kumar, S.W. Gale, Kocyan, G.A. Fisch. & Aver., but can be distinguished by its erect, rather stout stem, fleshy leaves, the larger number of flowers in each inflorescence and by several floral characters.

The orchid flora of Vietnam contains 15 presently recorded species of the genus *Gastrochilus*, namely *G. acutifolius* (Lindl.) Kuntze, *G. bellinus* (Rchb.f.) Kuntze, *G. calceolaris* (Buch.-Ham. ex Sm.) D. Don, *G. distichus* (Lindl.) Kuntze, *G. dresslerii* Vuong, Aver., V.S. Dang, *G. fuscopunctatus* (Hayata) Hayata, *G. hainanensis* Z.H. Tsi, *G. intermedius* (Griff. ex Lindl.) Kuntz, *G. kadooriei* Kumar, S.W. Gale, Kocyan, G.A. Fisch. & Aver., *G. minutiflorus* Aver., *G. obliquus* (Lindl.) Kuntze, *G. pseudodistichus* (King & Pantl.) Schltr., *G. setosus* Aver. & Vuong, *G. simplicilabius* Aver., and *G. yunnanensis* Schltr. (Seidenfaden, 1992; Averyanov and Averyanova, 2003; Nguyen *et al.*, 2021). With the newly described

plant, the total species number of this genus increases in Vietnam to 16.

MATERIALS AND METHODS

The measurements and description of *Gastrochilus pankajkumarii* were based on the living flowering plants. Studied voucher herbarium specimens and additional alcohol-preserved material are stored at VNM Herbarium. The terminology for morphological description follows Beentje (2012).

TAXONOMIC TREATMENT

Gastrochilus sect. *Microphyllae* Bentham & Hooker

Gastrochilus pankajkumarii Vuong, Aver., & V.C. Nguyen, *sp. nov.* **Fig. 1, 2**

Type. VIETNAM, Dak Lak Province, Chu Mu Mountain, lithophytic herb on mossy granite rocks in primary humid montane forest at elevation about 1800 m a.s.l., 19 August 2020, *Truong Ba Vuong, Nguyen Van Canh BV 1253* (VNM 00069911).

Description. Perennial lithophytic perennial herb. Stem ascending, unbranched, up to 10 cm long, ca. 5 mm in diameter, green flushed with purple, glabrous, semi-woody toward base, covered by wrinkled leaf sheaths; stem internodes 9–11 mm long. Roots numerous at the base and with a few in middle part of the stem, stout, up to 12 cm long, ca. 3.5 mm in diameter, white with green apex. Leaves distichous, sessile; leaf blade lanceolate, fleshy, 6.5–7 cm long, 0.8–1.1 cm wide, sheathing at base, falcate, acuminate, sparsely serrulate, adaxially green,

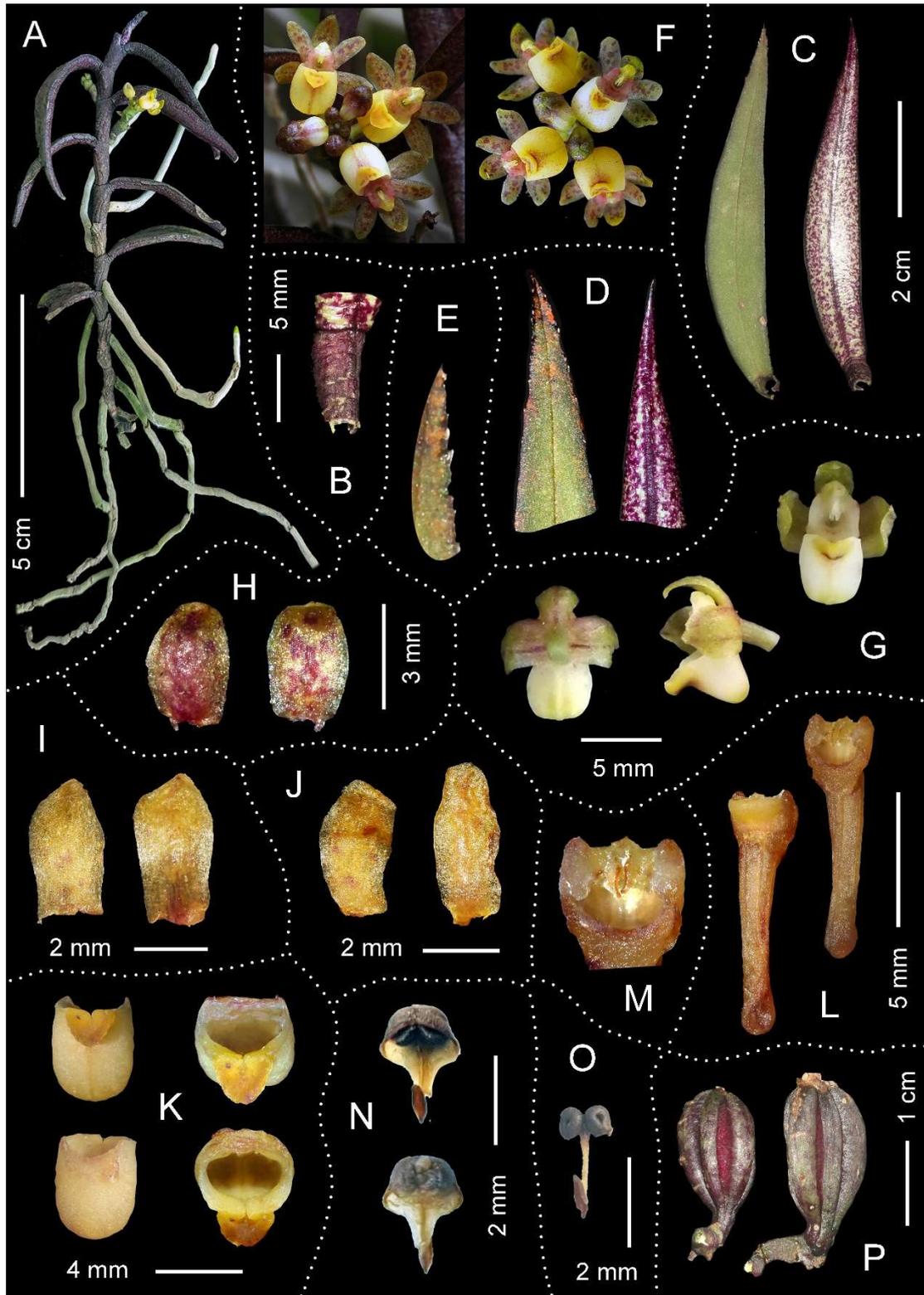


Fig. 2. *Gastrochilus pankajkumarii* Vuong, Aver. & V.C. Nguyen, type specimen. **A.** Flowering plant. **B.** Leaf sheath. **C.** Leaf, adaxial and abaxial surface. **D.** Apical part of leaf, adaxial and abaxial surface. **E.** Margin of leaf near the apex. **F.** Intact inflorescences. **G.** Flower, frontal, side view, and view from behind. **H.** Dorsal sepal, adaxial and abaxial surface. **I.** Lateral sepals, adaxial and abaxial surface. **J.** Petals, adaxial and abaxial surface. **K.** Lip, views from different sides; **L.** Column, ovary and pedicel, frontal view and view from behind. **M.** Column, frontal view. **N.** Anther cap, view from above and from below. **O.** Pollinarium; **P.** Ripening capsules. Photo by Truong Ba Vuong and Nguyen Van Canh. Correction and design by L. Aveyanov and T. Maisak.



Fig. 2. Flowering plants of *Gastrochilus pankajkumarii* Vuong, Aver. & V.C. Nguyen in nature (Photo by Nguyen, Van Canh).

abaxially pale green, heavily dark purple spotted. Inflorescence a subumbellate raceme, spreading horizontally or obliquely, fleshy, green or green with with many dark purple spots, 10–13 mm long; peduncle ca. 4 mm long with 2 sterile bracts; rachis ca. 1 cm long, bearing up to 8 flowers; floral bracts triangular, acute, ca. 4 mm long, half the length of the pedicel and ovary; pedicel with ovary ca. 7 mm long. Flowers glabrous, widely opening; tepals yellow with purple dots; sepals sometimes with purple median veins on abaxial surface; lip pale yellow, epichile with or without purple dots. Dorsal sepal ovate, ca. 4 mm long, 2.5 mm wide, acute to obtuse, slightly hooded. Lateral sepals oblong to narrowly ovate, ca. 4 mm long, 2 mm wide, obtuse, spreading horizontally. Petals oblong to narrowly obovate, oblique, ca. 4 mm long, 2 mm wide, apex rounded. Lip glabrous, distinctly divided into hypochile and epichile; hypochile saccate, ca. 4 mm long, 3 mm wide, rounded at apex, front margin with 2 rounded calli connate at base of epichile, inside with inconspicuous median keel; epichile triangular-ovate, recurved downwards, ca. 2 mm long, 2.2 mm wide, without ornamentations, rounded at apex. Column short and stout, ca. 1 mm long; rostellum with 2 lobes ca. 0.9 mm long, apex acute or obtuse, hanging at front of stigma; stigma transversely elliptic, ca. 1 mm wide; anther cap helmet-shaped, ca. 1.2 mm long, 1.5 mm wide, at front with truncate prominent beak 0.6 mm long. Pollinia 2, subglobular, porate, ca. 0.8 mm long and wide; stipe slender, ca. 2 mm long; viscidium narrowly elliptic, ca. 1 mm long. Capsule narrowly obovoid, 12–16 mm long, dull green, with irregular dark purple spots, prominently 6-ridged.

Etymology. The species name honors Dr. Pankaj Kumar for his great contribution to orchid taxonomy and ecology.

Vernacular names. Túi thơ Pankaj, Túi thơ Chư Mu.

Habitat and phenology. Humid primary montane broad-leaved evergreen forest, at an elevation of about 1800–2000 m. a.s.l. Growing lithophytically on mossy granite rocks near mountain summit. Common species in the area.

Distribution. Southern Vietnam (Dak Lak Province). Endemic of the Central Highlands.

Conservation status. *Gastrochilus pankajkumarii* occurs on the uppermost ridges of the Chu Mu Mountain in Vietnam with eight subpopulations falling in six distinct grid cells of 2×2 km². These generate an AOO of 24 km² and an EOO of 6.9 km². Each subpopulation contains around 70–80 mature individuals and accordingly the overall population size of the species is estimated to be around 700 mature individuals. The subpopulations, being on the ridge top of granite mountains, is not easily accessible for orchid lovers and local collectors, hence, the species currently is not known to be under any threat of poaching. Plants are seen to set fruits naturally, hence the species' habitat is not fragmented and there is a chance of population expansion with the dispersal of seeds. However, the habitat seems to be highly specific. Based on the above knowledge and on the guidelines of IUCN (2019), this species can be best assessed as Vulnerable owing to it is very small and restricted population under Criterion D (VU D1).

Notes. The newly described species morphologically resembles *Gastrochilus dulongjiangensis* Q. Liu & J.-Y. Gao, *G. fuscopunctatus*, and *G. kadooriei*, all three of which are known from limestone areas of northeast Indochina and southern China, as well as *G. pseudodistichus* (King & Pantl.) Schltr., which is more widespread in the Indo-Burma region, including southern Vietnam. Further molecular studies of these species may be useful for understanding their mutual genetic relationships. A critical comparison of the new species with each of these four species is presented in Table 1.

Additional specimens studied. *Gastrochilus dulongjiangensis*: CHINA, Yunnan province, Nujiang Prefecture, Dulongjiang Town, 2017, Liu 415 (HITBC). *Gastrochilus fuscopunctatus*: TAIWAN, Taoyuan County, Tamanshan, 2002, Ching-Kuoh Liou, 1601 (TAIF 157896 photo!); TAIWAN, Taoyuan, Chatienshan (Mt. Minami-Soten), 2011, Chang, L.Z. s.n. (TAI 278551 photo!). Additional studied materials presented in Herbarium LE database (<http://en.herbariumle.ru/?t=occ&s=Gastrochilus%20fuscopunctatu&f=%5Ball%5D>). *Gastrochilus kadooriei*: VIETNAM, Ha Giang Province, Quan Ba District, 4 August 2019, Truong Ba Vuong, BV 401 (VNM); VIETNAM, Tuyen Quang Province, Na Hang District, Sinh Long Municipality, Khuoi Phin village, 2017, Averyanov *et al.* CPC 5323 (LE01069724!, <http://en.herbariumle.ru/?t=occ&id=41712>); VIETNAM, Cao Bang Province, Nguyen Binh District, Ca Thanh Municipality, Ta Pin village, Averyanov *et al.* CPC 5354 (LE01069706!, <http://en.herbariumle.ru/?t=occ&id=41691>); VIETNAM, Cao Bang Province, Thong Nong District, Yen Son Municipality, Nhieu Lung Village, 2013, Averyanov *et al.*, CPC 5467 (LE01069710!, <http://en.herbariumle.ru/?t=occ&id=41695>). *G. pseudodistichus*:

**Table 1.** Morphological comparison of *Gastrochilus pankajkumarii*, *G. fuscopunctatus*, *G. kadooriei*, *G. dulongjiangensis* and *G. pseudodistichus*.

	<i>G. pankajkumarii</i>	<i>G. fuscopunctatus</i>	<i>G. kadooriei</i>	<i>G. dulongjiangensis</i>	<i>G. pseudodistichus</i>
Stem	Ascending to erect, unbranched, up to 10 cm long	Pendulous, unbranched, less than 15 cm long	Ascending, rarely branched, up to 30 cm long	Pendulous, branched, 30 cm long	Pendulous, branched, up to 28 cm long
Leaf blade	Lanceolate, serrulate, acuminate, without median seta	Broadly lanceolate, entire, retuse, with minute median seta	Ovate to narrowly ovate, serrulate, apex acute, with 3-teeth or setae	Ovate, apex acute with 2 to 3 setae	Lanceolate, apex with median seta and 2 lateral teeth
Inflorescence	1–1.3 cm long, with 7–8 flowers	1–2 cm long, with 4–6 flowers	1 cm long, with 1–4 flowers	1.2 cm long, with 3–4 flowers	2 cm long, with 5–6 flowers
Hypochile	4 mm long, with 2 rounded calli connate at base of epichile, abaxially with inconspicuous median keel	5 mm long, without ornamentation, abaxially without keel	6 mm long, without ornamentation, abaxially with median keel	4.8 mm long, without ornamentation, abaxially with 3 keels	6 mm long, without ornamentation, abaxially with median keel
Epichile	2 mm long, ovate triangular, glabrous, entire	1.6 mm long, elliptic-orbicular to broadly ovate, hirsute, with center cushion, entire	1.6 mm long, ovate-broadly ovate, glabrous, slightly erose	3 mm long, orbicular, glabrous, with low keel, entire	2 mm long, broadly ovate, glabrous, entire

Data on the comparison is based on Chen and Ji (2009), Kumar *et al.* (2014), Liu and Gao (2019), Liu *et al.* (2019)

VIETNAM, Lao Cai Province, *Petelot P.A. 5170* (MNHN-P-P00361115 photo!), VIETNAM, Kontum Province, 1995, *Averyanov et al., VH 880* (MNHN-P-P00361118 photo!), Kontum Province, 1995, *Averyanov et al., VH 635* (MNHN-P-P00361117 photo!); VIETNAM, Chapa, 1927, P.A. *Pételot 5170* (MNHN-P-P00361115 photo!); INDIA, Sikkim, 1892, *Pantling, R. 49* (K000891599 photo!). *G. pankajkumarii*: VIETNAM, Dak Lak Province, Chu Mu Mountain, primary humid montane forest at elevation about 1800 m a.s.l., 6 August 2019, *Nguyen Van Canh, AL 494* (photo LE 01061429 <http://en.herbariumle.ru/?t=occ&id=8753>). VIETNAM, Dak Lak Province, M'Drak District, Chu Mu Mountain, primary coniferous evergreen forest on granite at elevation about 1900 m a.s.l., lithophyte on mossy granite rocks on mountain top, rare, July 2019, *Nguyen Van Canh*, photo of 23.10.2019, *L. Averyanov, AL 1104* (photo LE 01089425 <http://en.herbariumle.ru/?t=occ&id=73105>). VIETNAM, Dak Lak Province, Chu Mu Mountain, primary humid montane forest at elevation about 2000 m a.s.l., 15 August 2020, *Truong Ba Vuong, Nguyen Van Canh, Nguyen Van Khuong BV 1254* (VNM 00069913).

Key to species of genus *Gastrochilus* in Vietnam

- 1a. Stem slender, less than 3 mm in diameter, usually with purple dots, bearing more than 6 leaves 2
- 1b. Stem stout, more than 4 mm in diameter, uniformly green, bearing up to 5 leaves or fewer 10
- 2a. Epichile margin winged, center distinctly convex or with one or several calli 3
- 2b. Epichile margin not winged, center almost flat, without callus .. 8
- 3a. Adaxial surface of epichile hairy 4
- 3b. Adaxial surface of epichile glabrous 5
- 4a. Hypochile spur-liked (conical), with dense hairs on inner surface *G. setosus*
- 4b. Hypochile saccate (globose), hairs only near base of epichile *G. dresslerii*
- 5a. Epichile margin entire or slightly erose 6
- 5b. Epichile margin distinctly erose or irregularly denticulate 7
- 6a. Epichile with 2 calli near base and triangular wings placed laterally *G. distichus*
- 6b. Epichile without callus, narrow wings places laterally *G. pseudodistichus*
- 7a. Leaves lanceolate to narrowly ovate, apex entire; margin of epichile finely denticulate *G. minutiflorus*
- 7b. Leaves narrowly lanceolate, apex with 2–3 dentae; margin of

- epichile roughly dentate *G. intermedius*
- 8a. Leaf apex acuminate, without seta *G. pankajkumarii*
- 8b. Leaf apex retuse with seta 9
- 9a. Leaves narrowly ovate to ovate, margin serrulate; epichile glabrous *G. kadooriei*
- 9b. Leaves broadly lanceolate, margin entire; epichile hirsute *G. fuscopunctatus*
- 10a. Epichile with cavity or groove at base 11
- 10b. Epichile without cavity or groove at base 14
- 11a. Epichile glabrous *G. hainanensis*
- 11b. Epichile hairy 12
- 12a. Stem longer than 10 cm *G. yunnanensis*
- 12b. Stem less than 5 cm long 13
- 13a. Flowers 2–3 cm in diameter; epichile reniform-triangular *G. bellinus*
- 13b. Flowers 1–1.5 cm in diameter; epichile suborbicular-triangular ... *G. calceolaris*
- 14a. Epichile margin entire *G. simplicilabius*
- 14b. Epichile margin erose, dentate or lacinate 15
- 15a. Leaf apex acute, unequally 2-dentate; epichile margin irregularly lacinate *G. obliquus*
- 15b. Leaf apex acute to somewhat acuminate, entire; epichile margin fimbriate *G. acutifolius*

ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to the reviewers for their critical suggestions which are helpful in improvement the manuscript. The studies, results of which are presented in this paper were supported in parts by the Institute of Tropical Biology of Vietnam Academy of Science and Technology (Ho Chi Minh City), Institute of Applied Technology from Thu Dau Mot University, and the Russian Found of Basic Researches (RFBR) A 20-04-00339 & Viet_a 21-54-54001.

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