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Gastrochilus wenchuanensis (Aeridinae; Orchidaceae): A new species from China based on molecular and morphological data

Peng-Yu WU[1], Jiaxu GUO[1], Cheng-Yuan ZHOU[2], Zi-Yang Wang[1], Qian-Tong SHAN[1], Heng YONG[1], Yu-Tian ZHANG[3,*]

1. *Henan Key Laboratory of Industrial Microbial Resources and Fermentation Technology at School of Biological and Chemical Engineering, Nanyang Institute of Technology, Nanyang 473004, China.* ***2.*** *Key Laboratory of National Forestry and Grassland Administration for Orchid Conservation and Utilization at College of Landscape Architecture and Art, Fujian Agriculture and Forestry University, Fuzhou 350002, China.* ***3.*** *Zhangzhongjing School of Traditional Chinese Medicine, Nanyang Institute of Technology, Nanyang 473004, China.* [*]*Corresponding author's email: 3152095@nyist.edu.cn*

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ABSTRACT: The newly discovered orchid, *Gastrochilus wenchuanensis* (Aeridinae, Orchidaceae), found in Wenchuan, Sichuan of China, is described here based on the data of its morphology, phenology, ecology and distribution. This entity bears resemblance to *G. formosanus, G. wolongensis, G. nanchuanensis, G. sinensis, G. minjiangensis* and *G. armeniacus*, but can be distinguished by a distinctive vein on both the petals and sepals, as well as an epichile and hypochile that are devoid of spots or stripes. The molecular phylogenetic analysis, based on the nuclear ribosomal internal transcribed spacer (nrITS) and four plastid regions (*atpI*, *matK*, *psbA*, and *trnL-F*), supports the conclusion that *Gastrochilus wenchuanensis* is a new species and is sister to *G. formosanus*.

KEY WORDS: *Gastrochilus*, molecular phylogenetics, morphology, new species, sect. *Caespitosi*.

INTRODUCTION

The genus *Gastrochilus* D. Don (1825: 32) (Epidendroideae; Vandeae; Aeridinae), established in 1825, encompasses epiphytic plants characterized by monopodial growth, an erect or pendulous stem, and typically distichously arranged leaves (Pridgeon *et al*., 2014). This genus is characterized by its lip with a saccate hypochile, two porate and globose pollinia connected to a slender stipe, and a short axillary inflorescence (Tsi, 1996; Liu *et al*., 2023). The genus includes approximately 70 species distributed from India to Japan, spanning tropical to temperate alpine regions. (Pridgeon *et al*., 2014; Li *et al*., 2021; Zhang *et al*., 2022, 2023; Liu *et al*., 2023). China represents the center of species diversity for *Gastrochilus*, with over 45 species recorded there; quite a few of them are new species or new hybrids that have only been discovered in recent years. (Hsu *et al*., 2018; Liu and Gao, 2018; Lee *et al*., 2019; Rao *et al*., 2019; Zhou *et al*., 2021a, b; Liu *et al*., 2023; Zhang *et al*., 2023). Differentiating plants within this genus from other genera can be challenging in the absence of flowering material; however, molecular biology techniques have been utilized to address this issue (Liu *et al*., 2019, 2023). Nonetheless, morphological comparison remains essential for classifying the genus, as some species exhibit substantial morphological variation despite their close evolutionary relationships.

During our fieldwork in Wenchuan County, Sichuan Province, China, we identified an orchid that exhibits morphological features consistent with the genus *Gastrochilus*. However, upon conducting a detailed morphological analysis, we found that defining the specific identity of this species is particularly challenging. This is because it possesses certain characteristics that resemble both *Gastrochilus formosanus* and *Gastrochilus wolongensis*, as well as traits that are similar to *Gastrochilus armeniacus*, *Gastrochilus minjiangensis*, *Gastrochilus nanchuanensis*, and *Gastrochilus sinensis.* Despite this, it is characterized by short stems, alternate or basal leaves, an epichile with a central thickened cushion, and being densely covered with papillate hairs, which suggest its placement in G. sect. *Caespitosi*, as defined by Tsi (1996). Molecular phylogenetic of plastid and nrITS analysis provided strong support for the new species as related to *G. formosanus*. Based on the integration of morphological and molecular data, our findings support the classification of this species as a novel member within the genus *Gastrochilus*.

MATERIAL AND METHODS

Morphological description and measurements of the new *Gastrochilus* species were based on both living plants and dried herbarium specimens. The taxonomic description adheres to the terminology used by Beentje (2012). Specimens were deposited in the Herbarium of College of Forestry, Fujian Agriculture and Forestry University (FJFC). Primer information, amplification, sequencing, and data analysis are according to Liu *et al*. (2019). According to Liu *et al*. (2019) and Liu *et al*. (2020), a total of 25 taxa were chosen as ingroup, while 5 taxa were selected as outgroup for taxonomic sampling. Voucher information and GenBank accession numbers

Table 1 Accession numbers of the specimens used in this study. A dash (-) indicates missing data.

Taxa	Voucher	ITS	*matK*	*trnL-F*	*psbA*	*atpI*
G. acinacifolius Z.H.Tsi	*Z.J.Liu 3316*	MK357118	MK357139	KJ733649	KJ733492	KJ733334
G. acutifolius (Lindl.) Kuntze	*Q.Liu 05*	MT225573	MK357140	-	-	-
G. bellinus (Rchb.f.) Kuntze	*Lior011*	MK357123	MN124427	MN124427	MN124427	MN124427
G. calceolaris (Buch.-Ham. ex Smith) D.Don	*Liu4362*	MK357125	MN124413	MN124413	MN124413	MN124413
G. deminutus J.M.H.Shaw	*KFBG2670A*	KY966600	KY966887	-	-	-
G. distichus (Lindl.) Kuntze	*Z.J.Liu 4755*	KJ733414	KJ733571	KJ733651	KJ733494	KJ733336
G. fargesi (Kraenzl.) Schltr.	*Z.J.Liu 6132*	KJ733415	KJ733572	KJ733652	-	KJ733337
G. formosanus (Hayata) Hayata	*Liu4265*	KJ733416	MN124435	MN124435	MN124435	MN124435
G. *fuscopunctatus* (Hayata) Hayata	*PDBK2015-1265*	MK317970	KX871233	KX871233	KX871233	KX871233
G. guangtungensis Z.H.Tsi	*Z.J.Liu 4127*	KJ733417	KJ733574	KJ733654	KJ733496	KJ733339
G. intermedius (Griff. ex Lindl.) Kuntze	*Q.Liu 38*	MK357121	MK357151	MK357190	-	-
G. japonicus (Makino) Schltr.	*Z.J.Liu 4128*	KY966598	KJ733575	KF545897	KJ733497	KJ733340
G. linearifolius Z.H.Tsi & Garay	*Q.Liu 711*	MK357133	MK357136	MK357194	-	-
G. malipoensis X.H.Jin & S.C.Chen	*Q.Liu 68*	-	MK357147	MK357200	-	-
G. matsuran (Makino) Schltr.	-	KT338700	-	-	-	-
G. obliquus (Lindl.) Kuntze	*Z.J.Liu 4191*	MK357131	MK357137	KJ733656	KJ733498	KJ733341
G. rantabunensis C.Chow ex T.P.Lin	*Q.Liu 89*	-	MK357155	MK357193		-
G. sinensis Z.H.Tsi	-	OM985813	OK042953	OK172401	OK172399	-
G. somae (Hayata) Hayata	*Lior073*	MK357128	MN124436	MN124436	MN124436	MN124436
G. tianbaoensis Q.Liu & Y.H.Tan	*Q.Liu 63*	MK357120	MK357157	MK357207	-	-
G. wolongensis Jun Y.Zhang, Bo Xu & Yue H.Cheng	*ZJY239*	OM985810	OM974209	OM974210	OK172402	-
G. yunnanensis Schltr.	*Xuli Fan FB112*	MK165469	MK357158	-	-	-
G. zhenyuanensis Q.Liu & D.P.Ye	*Q.Liu 61*	MK357127	MK357146	MK357199	-	-
G. armeniacus Jun Y. Zhang, B. Xu & Yue H. Cheng	-	OP348888	OP373113	OP373127	OP373118	-
G. minjiangensis Jun Y. Zhang, B. Xu & Yue H. Cheng	*ZJY284*	OQ566806	-	OQ575543	-	-
G. nanchuanensis Z.H.Tsi	*ZJY296*	OQ566808	OQ575574	OQ575545	-	-
G. wenchuanensis P.Y.Wu & C.Y.Zhou	*Zhou 2020103001*	**N_002031873**	**N_002031874**	**N_002031876**	**N_002031875**	**N_002031872**
Acampe papillosa (Lindl.) Lindl.	*Liu3246*	DQ091708	MN124418	MN124418	MN124418	MN124418
Cleisostoma paniculatum (Ker Gawl.) Garay	*Liu2400*	MK165474	MN124416	MN124416	MN124416	MN124416
Pomatocalpa spicatum Breda	*Liu4589*	EF670365	MN124411	MN124411	MN124411	MN124411
Sarcoglyphis smithiana (Kerr) Seidenf.	*Liu4192*	KJ733445	MN124408	MN124408	MN124408	MN124408
Trichoglottis latisepala Ames	*Lior074*	AB217593	MN124432	MN124432	MN124432	MN124432

Note: The nucleotide sequence of ***G. wenchuanensis*** has been deposited in the CNSA database (http://db.cngb.org/cnsa/)

Table 2 Statistics from the analyses.

DNA region	No. of taxa	Aligned length	No. variable characters (%)	No. informative characters (%)	Tree length	Consistency index	Retention index
ITS	30	674	141 (20.92)	88 (13.06)	225	0.7022	0.7789
Plastid	31	4,249	314 (7.39)	98 (2.31)	384	0.8542	0.7695
Combined	32	4,923	455 (9.24)	186 (3.78)	643	0.7558	0.7125

are listed in Table 1. Nucleotide sequences of one nuclear region (nrITS) and 4 plastid regions (*atpI*, *matK*, *psbA* and *trnL-F*) were used in analyses. A total of 17 sequences of *atpI*, 30 of *matK*, 19 of *psbA*, 29 of *trnL-F* and 30 of nrITS were obtained (Table 2). Phylogenetic analysis including maximum likelihood (ML), maximum parsimony (MP) and Bayesian inference (BI) methods were performed according to Liu *et al.* (2020).

RESULTS AND DISCUSSION

Like other groups in the *Aeridinae* subtribe (Orchidaceae), species in this genus are morphologically and florally similar, leading to past taxonomic confusion and classification disputes in traditional systematics. Most scholars classify this genus based on morphological traits such as plant size, stem structure, and the shape of the epichile and hypochile (Tsi, 1996; Liu, 2017). Despite ongoing controversies, some floral traits, like inflorescence length and flower count, are sometimes used as diagnostic features for species delimitation (Jin *et al*., 2010; Kumar *et al*., 2014). According to our research and long-term field observations, plants in this genus show considerable variation in leaf shape, flower number,

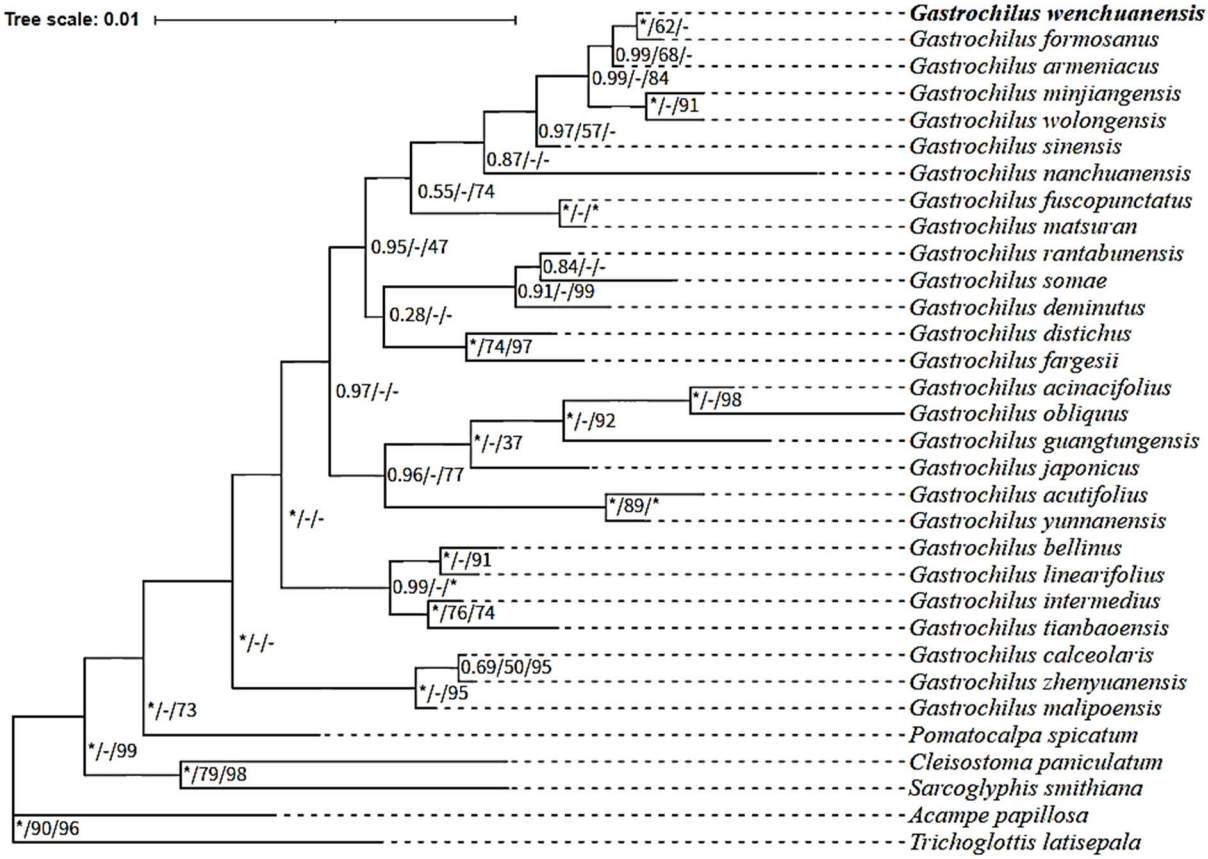

Fig. 1. Phylogenetic relationships of ***Gastrochilus*** based on the combined nrITS and plastid DNA. The numbers near the nodes are Bayesian posterior probabilities and bootstrap percentages (PP, BP_{ML}, BP_{MP}). A dash (-) indicates that a node is inconsistent between the topology of the MP/ML trees and the Bayesian tree; *node is 100 bootstrap percentage or 1.00 posterior probability.

color, and spot patterns on sepals and petals. However, these features are only reliable for species identification when they are consistently and clearly expressed; otherwise, their taxonomic value is uncertain. Recent advances in evolutionary biology support using key morphological traits—such as epichile hairs, leaf length, epichile margin shape, and surface texture—as essential diagnostic features for classifying this genus (Liu, 2017; Zhang *et al*., 2023).

A comparison of morphological characteristics shows that the new species is similar to *G. formosanus* (Hayata) Hayata, *G. wolongensis* Jun Y.Zhang, Bo Xu & Yue H.Cheng, *G. armeniacus* Jun Y.Zhang, B. Xu & Yue H.Cheng, *G. minjiangensis* Jun Y.Zhang, B. Xu & Yue H.Cheng, *G. nanchuanensis* Z.H.Tsi and *G. sinensis* Z.H.Tsi. However, it can be clearly distinguished from these species by its unique petal, lateral sepal, hypochile, and epichile features (Table 3), which set it apart from all other known *Gastrochilus* species. Many species in this genus have purple-red spots on their sepals and petals. Our research shows that this trait varies significantly across regions and environments, with differences in spot size, density, color intensity, and occurrence. However, the spatial distribution remains consistently random and does not become regular. The unique stripes on the sepals and petals of *G.wenchuanensis* clearly distinguish it from related species.

The lengths of the nrITS, plastid *atpI*, *matK*, *psbA* and *trnL-F* sequence of the new species are 671, 692, 1,557, 722 and 818 bp, respectively. Statistics for one of the most parsimonious trees from each analysis is showed in Table 2. The phylogenetic tree collectively suggested a close relationship between the new species and *G. formosanus* (BI/ML=1.00/62), which were sister to *G. armeniacus* (BI/ML=0.99/68) (Fig. 1). *G. sinensis* was resolved as sister to a subclade consisting of the three aforementioned species, along with *G. minjiangensis* and *G. wolongensis*, with moderate support (BI/ML=0.97/57). Our phylogenetic results are consistent with previous studies (Liu *et al*., 2020; Li *et al*., 2022), revealing ambiguous relationships among the major clades within *Gastrochilus*. These findings suggest that the limitation of molecular markers for resolving the intrageneric phylogenetic relationships of *Gastrochilus*.

According to the outcome of the phylogenetic analysis, along with the morphological characteristics exhibited by these specimens, we propose that this newly discovered plant species be classified as a new species.

Table 3. Morphological comparisons for ***G. wenchuanensis, G. formosanus, G. wolongensis, G. armeniacus, G. minjiangensis, G. sinensis*** and ***G. nanchuanensis***

Character	*G. wenchuanensis*	*G. formosanus*	*G. wolongensis*	*G. armeniacus*	*G. minjiangensis*	*G. sinensis*	*G. nanchuanensis*
Flower color	yellowish green, with purplish red stripes	yellowish, with purplish speckles	yellowish green, with purplish red stripes	Apricot-yellow, without spots	yellowish green, with purplish red stripes	yellowish green, with purplish red spots	yellow, with purplish red spots
Dorsal sepal	elliptic–oblong, 4.7–5.0 × 2.6–2.8 mm, with 1 stripe reaching the apex	elliptic–oblong, concave, 4.2–5.6 x 2.5–3.5 mm, apex obtuse	elliptic–oblong, 6.8–8.9 x 4.2–5.8 mm, apex slightly pointed, with 1 vein	elliptic, with one red-purple stripe, 4–6 × 3–4 mm, apex obtuse, with 1 vein	elliptic, with purplish red spots, 5.4–6.8 × 3.5–4.5 mm, apex obtuse, with 1 vein	subelliptic, 4.0–5.0 × 2.0–2.5 mm, apex obtuse, with 3 veins	elliptic, concave, ca. 4.2 × 3.5 mm, apex obtuse
Lateral sepals	elliptic–oblong, slightly pointed at the apex, 4.8–5.4 × 2.5–2.7 mm, with 1 stripe reaching the apex	obliquely oblong, apex obtuse	obliquely oblong, apex obtuse, with 3 veins, ± elevated on abaxial midrib, only midvein reaching apex	Obliquely oblong, with one red purple stripe, apex subacute, with 1 vein	Obliquely oblong, with purplish red spots, apex obtuse, with 1 vein	obliquely oblong, apex obtuse, with 1 vein, ± elevated on abaxial midrib	elliptic, concave, ca. 4.2 × 3.5 mm, apex obtuse
Petals	obovate, 4.5–5.2 × 2.7–2.9 mm, with 1 stripe reaching the apex	oblanceolate, 4.0–5.0 × 2.8–3.0 mm, apex rounded	subobovate, 7.1–8.5 × 4.5–6.0 mm, apex subrounded, with 3veins, none reaching apex	Obovate, with one red-purple stripe, 4–6 × 2–3 mm, apex rounded, with 1 vein	Obovate, with purplish red spots, 4.5–6 × 2.8–3.6 mm, apex rounded, with 1 vein	subobovate, 3.5–4.5 × 1.5–2.0 mm, apex subrounded, with 3 veins, only midvein reaching apex	4.1 × 2.9 mm, apex obtuse
Hypochile	subcupular, laterally compressed, ca. 4.2 × 5.8 mm	subcupular, ca. 3.0 × 4.0 mm	subcupular, laterally compressed, ca. 3.7 × 5.8 mm	helmet-shaped, elongated, 4–5 × 6–7 mm, apex rounded, with 4–5 ridges on the outside	Subcupular, ca. ca. 6 × 5 mm, apex rounded, with sparse purplish-red spots on the outside	subconic, laterally compressed, 3.5–4.0 × ca. 3.0 mm	subconic, dorsiventrally compressed, ca. 3.3 mm tall, ca. 4.2 mm in diam., apex rounded.
Epichile	reniform, densely covered with short papillate hairs, 3.3–3.7 × 7.2–7.5 mm, with a green thickened tissue	broadly triangular or nearly suborbicular, 2.2–3.2 × 7.0–9.0 mm, adaxially with a yellow densely papillate-hairy cushion, margin entire or slightly dentate-undulate, apex subtruncate or rounded	margin and adaxial surface densely hairy, reniform, with purplish red spots, 4.5–5.2 × 10.0–12.3 mm, with a central cushion, apex broadly emarginate	reniform or reniform-triangular, recurved outward, 3–4 × 6–9 mm, apex obtuse, margin slightly undulate, sparsely covered with short papillate hairs, central golden yellow thickened tissue with purple-red spots	reniform, spreading, 7–11 × 4–6 mm, apex broadly notched, margin entire or slightly undulate, sparsely covered with short papillate hairs central yellow-green thickened tissue with conspicuous purplish-red spots	margin and adaxial surface densely shortly hairy, reniform, ca. 2.5 × 4.0–5.0 mm, with a central cushion, apex broadly emarginate	nearly suborbicular or reniform, ca. 3 × 6 mm, adaxially densely shortly hairy, with a central cushion extending to hypochile, apex subtruncate and deeply 2-lobed
Flowering period	March and April	Throughout year	March and April	April and May	April and May	October	December
Reference		Zhang *et al.*, 2022 & Wu *et al.*, 2010	Zhang *et al.*, 2022 & Wu *et al.*, 2010	Zhang *et al.*, 2023	Zhang *et al.*, 2023	Wu *et al.*, 2010	Wu *et al.*, 2010

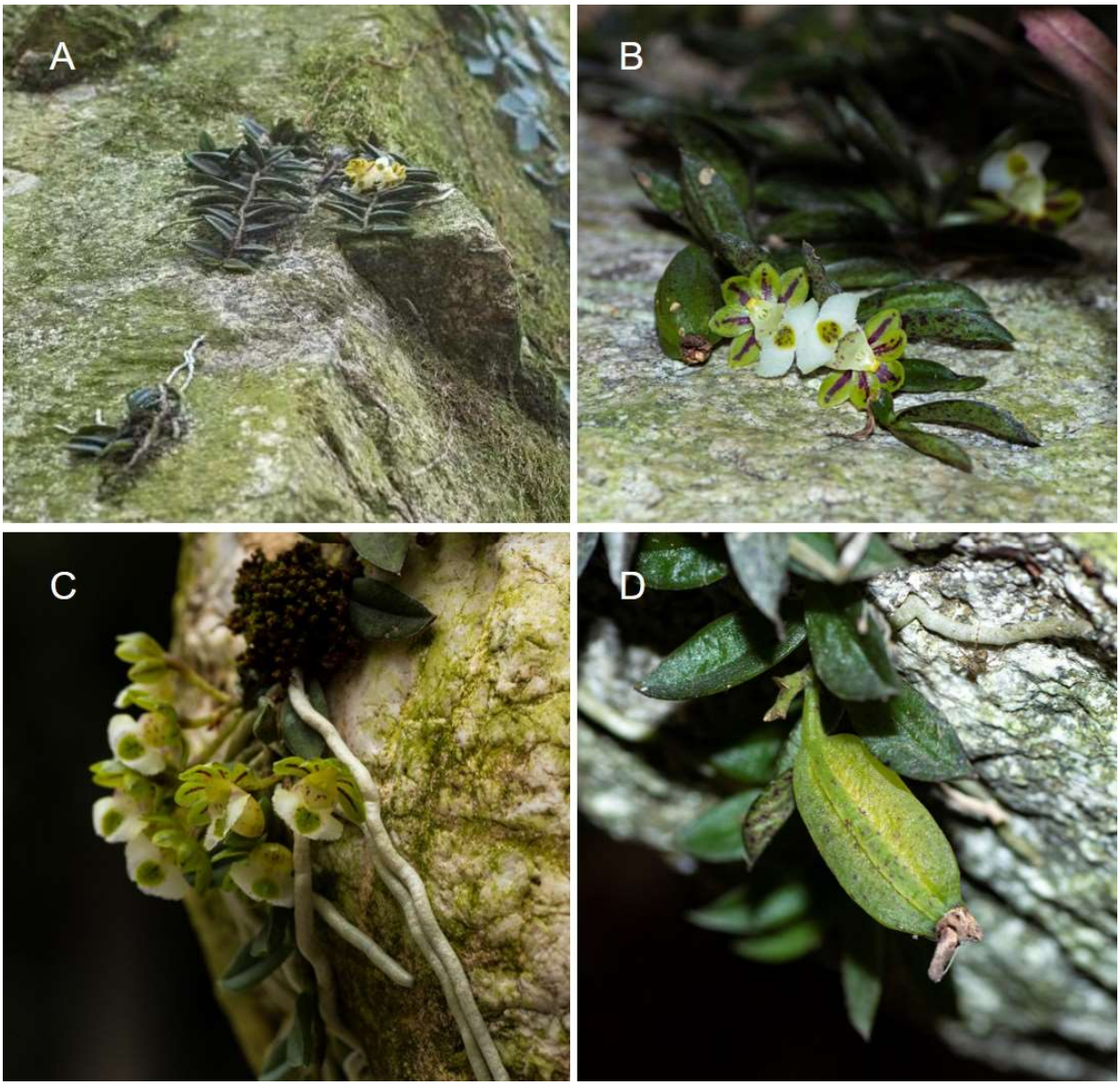

Fig. 2. Plant and inflorescence with flowers for ***Gastrochilus wenchuanensis*** **A.** Habitat. **B.** Plant with flowers in wild. **C.** Plant with flowers in cultivation. **D.** Plant with fruit.

TAXONOMIC TREATMENT

Gastrochilus sect. ***Caespitosi*** Z. H. Tsi

Gastrochilus wenchuanensis P.Y.Wu & C.Y.Zhou, ***sp. nov*** **Figs. 2, 3, 4**

Type: **CHINA.** Sichuan Province, Wenchuan County, epiphytic on rocks and tree trunks, altitude 1020 m, 16 March 2023, *Zhou 2020103001* (holotype, Fujian Agriculture and Forestry University - FJFC!).

Diagnosis: The new species resembles *G. formosanus*, but differs in the morphology of the epichile and the markings on both the petals and sepals. It also deviates from *G. wolongensis* due to its shorter inflorescences, an undimpled and spotless epichile, and a stripeless hypochile. The distinguishing characteristics of the new species compared to *G. armeniacus* include leaf morphology, flower pigmentation, sepal length, epichile trichome density, and the absence of hypochile surface ridges.

The distinctive stripe on the petals and sepals, along with the morphology of the hypochile and epichile, serves to distinguish this species from *G. minjiangensis*. It differs from *G. nanchuanensis* by its reniform epichile, green and fully open flowers. The shape of the epichile and a distinct purple stripe on the petals and sepals distinguish it from *G. sinensis*.

Description: Epiphytic herbs, prostrate, 4.0–11.0 cm long, leafy. Roots vermiform, slender, up to 9.0 cm long. Stems short branched, green, glabrous, up to 8.0 cm long, covered with sheathing leaf bases; sheaths with purplish-red spots; internodes of stems 3.6–5.6 mm long. Leaves

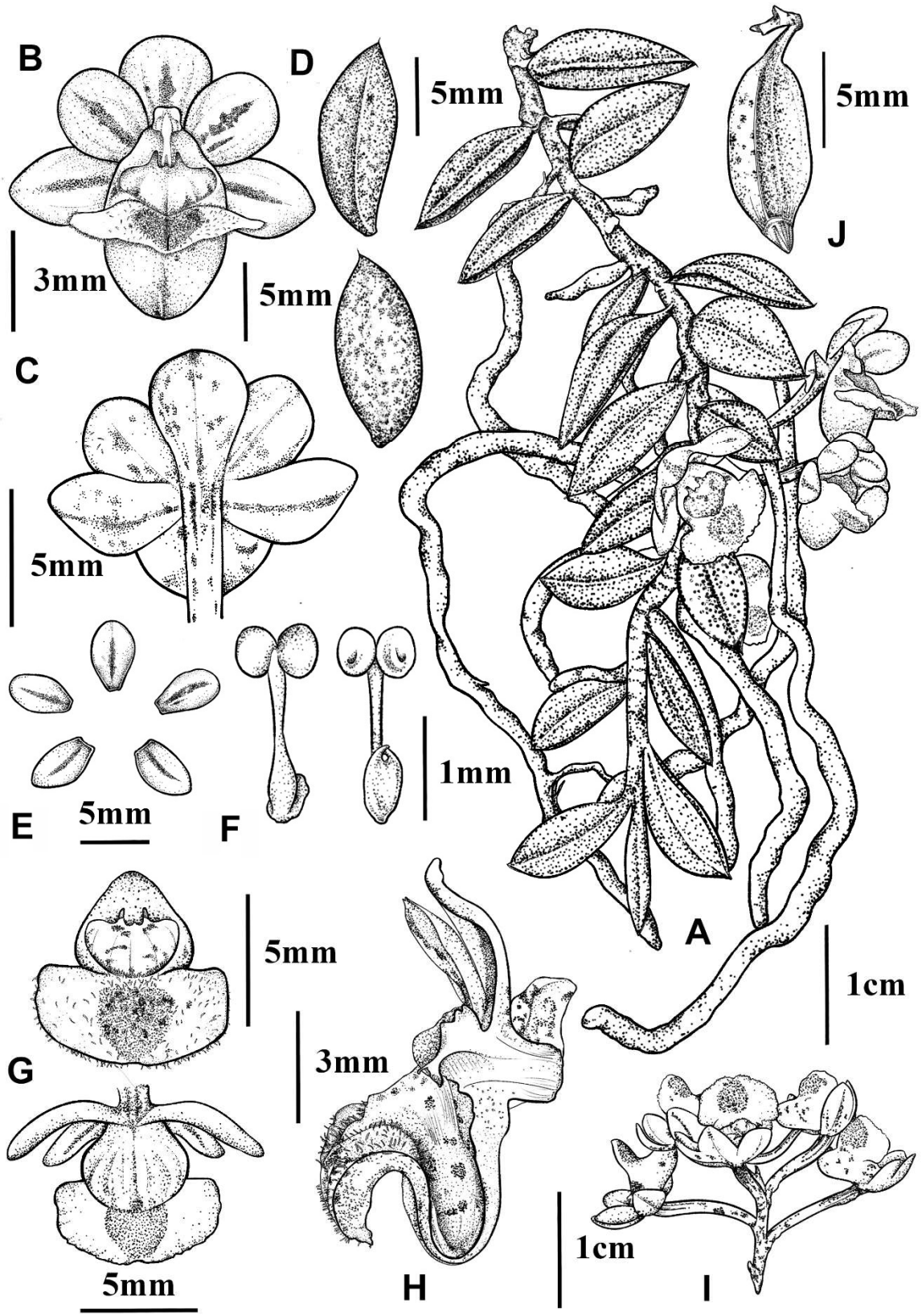

Fig. 3. ***Gastrochilus wenchuanensis*** **A.** Flowering plant. **B.** Flower (front view). **C.** Flowers (view from rear). **D.** Leaves (view from above and from below). **E.** Sepal and petal. **F.** Pollinia. **G.** Labellum (view from above and from below). **H.** Labellum (longitudinal dissection). **I.** Inflorescence. **J.** Capsule.

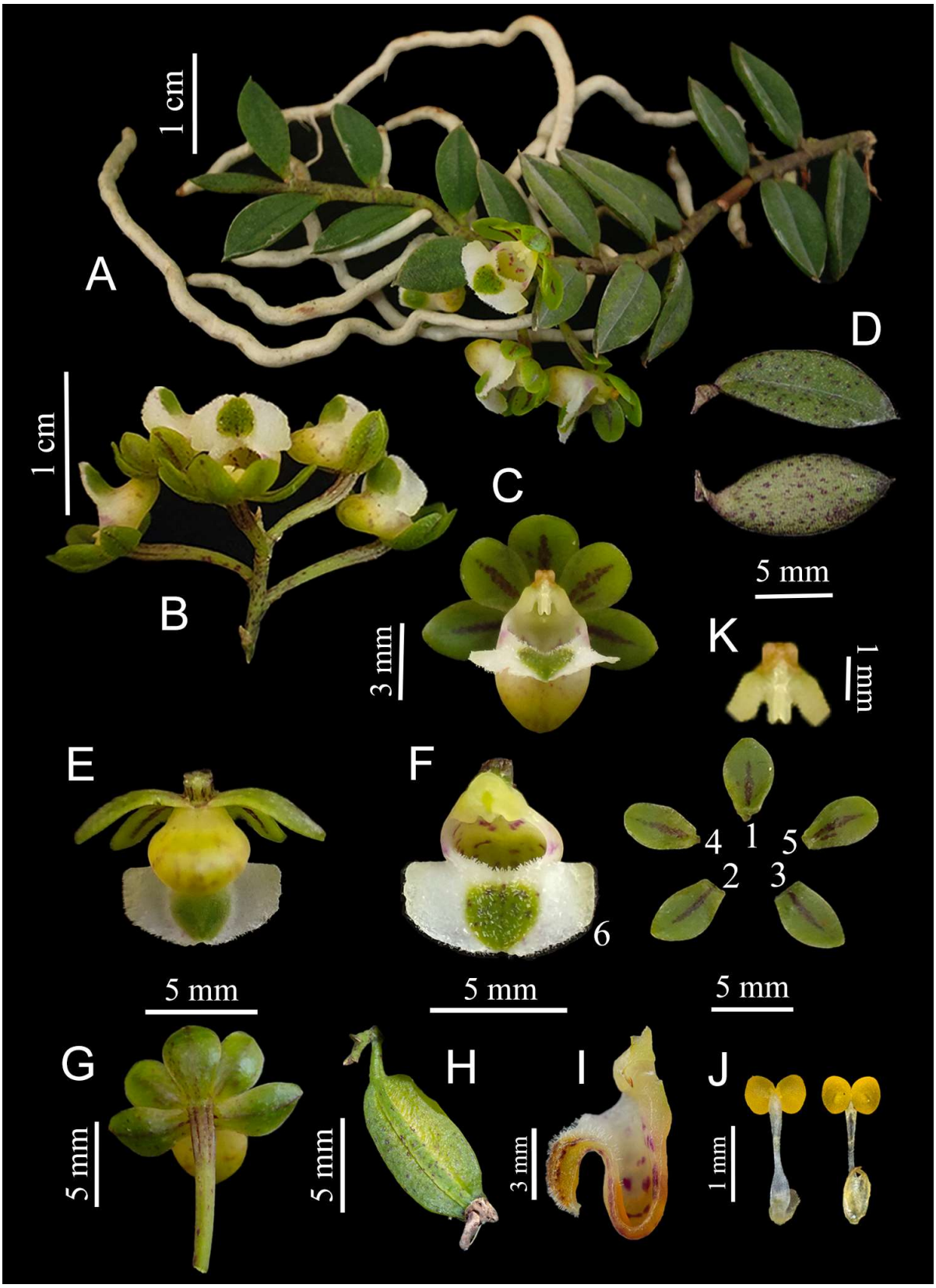

Fig. 4. ***Gastrochilus wenchuanensis*** **A.** Flowering plant. **B.** Inflorescence. **C.** Flower (front view). **D.** Leaves (view from above and from below). **E.** Labellum (view from below). **F.** Anatomy of flowers (**F1:** dorsal sepals; **F2** and **F3:** lateral sepals; **F4** and **F5:** petals; **F6:** labellum). **G.** Flowers (view from rear). **H.** Capsule. **I.** Labellum (longitudinal dissection). **J.** Pollinia. **K.** Stigma.

alternate, distichous, elliptic or oblong, plump, both surfaces green with few purplish-red spots, 1.1–1.6 × 0.4–0.7 cm, margin smooth, apex acute and leathery. Inflorescence in racemes with 2 to 5 flowers, ca. 2.8 cm long. Peduncle 0.8–1.0 cm long. Flowers 0.8–1.1 cm, light yellowish green, with black-purple stripes composed of speckles on petals and sepals, elevated on abaxial midrib; pedicel and ovary 6.0–8.3 mm long, green at the base and blackish green toward the apex. Dorsal sepal elliptic-oblong, 4.7–5.0 × 2.6–2.8 mm, with one vein. Lateral sepals elliptic-oblong, slightly pointed at the apex, 4.8–5.4 × 2.5–2.7 mm, with one vein; Petals obovate, 4.5–5.2 × 2.7–2.9 mm, with one vein. Labellum 7.0–9.8 × 6.2–7.7 mm. Hypochile attached to base of column base, subcupular, laterally compressed, ca. 4.2 × 5.8 mm, opening orbicular, base saccate, sac with lavender patches inside, long papillate hairs near epichile side, outside of sac with sparse purplish-red spots. Epichile reniform, apically emarginate or entire, densely covered with short papillate hairs, 3.3–3.7 × 7.2–7.5 mm, with a green thickened tissue; Column cylindrical, ca. 3.0 mm; rostellum forked at apex; anther cap subhemispheric, yellow, with two chambers, 1.2 × 1.4 mm, with a beak on the front that partly covers the stipe; pollinia 2, 0.7 × 0.6 mm, yellow, waxy, spherical, stipe elongate,. Stigma deeply sunken, inverted V-shaped, 1.2 mm long, yellow, apically forked, with a subtriangular outline. Capsule long ellipsoid, 7–9 mm long, green with sparse purplish-red spots, prominently 3-ridged.

Etymology: The species epithet refers to the place where the species is found.

Phenology: Flowering from March to April.

Distribution and habitat: *Gastrochilus wenchuanensis* has thus far been documented in the Qionglai Mountains and the vicinity of the Wolong Nature Reserve, and there are also some occurrences around Wenchuan County, Sichuan Province, China. It is epiphytic on rocks and tree trunks at elevation ca. 1300 in the evergreen broad-leaved forests.

Vernacular name: Wen Chuan Pen Ju Lan, **汶川盆距兰**

Conservation status: *Gastrochilus wenchuanensis* has been found in the Qionglai Mountains and the Wolong Nature Reserve, both near Wenchuan County in Sichuan Province. Due to difficulties in assessing similar habitats, we recommend classifying its current conservation status as DD (Data Deficient) under the IUCN (2022) criteria.

Note: The morphological features of the new species closely resemble those of *G. formosanus*, particularly the vegetative part. However, a distinctive stripe on the petals and sepals of the new species provides a reliable diagnostic to separate these two species. Furthermore, *G. formosanus* has a smooth epichile surface, except for the central thickened tissue, while *G. wenchuanensis* has a hairy epichile. The distribution and flowering period of the new species resemble those of *G. wolongensis*; however, flower characteristics differ between them. In general, *G. wolongensis* has a lower floral number per inflorescence and a larger flower size. The epichile of *G. wolongensis* differs from the new species by an emarginate apex adorned with purplish-red spots, whereas the epichile of the new species lacks indentations or markings. The hairs on the epichile and the junction between the epichile and the hypochile of *G. wolongensis* are longer and more compact compared to those observed in the new species. Conspicuous purplish-red stripes are present on the exterior of the hypochile sac in *G. wolongensis* but absent in the new species.

Recently, a new species of *Gastrochilus*, named *Gastrochilus armeniacus*, was discovered in Wenchuan. While its distribution and flowering time are similar to those of another new species, *G. armeniacus* can be distinguished by its elongated oval leaves and distinct yellow flowers, as opposed to the ovate leaves and yellow-green flowers of the other species. Further comparison reveals that the new species has more flowers per inflorescence, smaller blossoms, denser trichomes on the epichile, a shorter sepal, green hypertrophied tissue on the epichile surface, and no ridges on the outer hypochile. The stigma and rostellum also differ between the two species, clearly setting them apart. The same article described *G. minjiangensis*, but *G. wenchuanensis* differs by its striped petals and sepals, smooth and spotless hypochile exterior, and the color of the epichile's thickened tissue.

We have observed several species in Sichuan, including Wenchuan, that resemble those mentioned above and show intermediate or transitional features. This indicates frequent interbreeding and complex interspecies relationships in the region, warranting further study. *G. armeniacus* is also be similar to *G. wenchuanensis* and could possibly be another variant. According to Zhang *et al*. (2023), *G. minjiangensis* is more similar to *G. sinensis* than to *G. formosanus*. However, the study only discusses differences between *G. minjiangensis* and *G. formosanus*, and we believe a comparison with *G. sinensis* is also needed.

The new species resembles *G. nanchuanensis*, but they can be distinguished by several key features. The epichile of *G. nanchuanensis* is subtruncate and deeply two-lobed at the apex, while that of *G. wenchuanensis* is reniform with a slightly concave apex. Moreover, *G. nanchuanensis* has yellow flowers with purplish-red spots that do not fully open, whereas *G. wenchuanensis* has yellow-green flowers that open completely.

G. wenchuanensis is similar to *G. sinensis*. However, a review of the literature (Wu *et al*., 2010) shows clear differences: *G. wenchuanensis* lacks purplish-red spots on its flowers, has a broader epichile, green thickened tissue, and petals and sepals with purple stripes. In contrast, *G. sinensis* from Zhejiang, Hubei, Jiangsu, and

Guizhou provinces consistently shows purple-red spots. Recently, Zhang *et al*. (2024) reported the genome of a species from Sichuan identified as *G. sinensis*. Yet, the morphology described in their study—especially petals and sepals with a single stripe — matches *G. wenchuanensis* rather than the typical spotted pattern of *G. sinensis*. Therefore, we suggest that the species in Zhang *et al*. (2024) should be reclassified as *G. wenchuanensis*.

Additional specimens examined (paratypes): **CHINA.** Sichuan Province, Wenchuan County, Gengda Town, 1600 m, epiphytic on tree trunks in subtropical evergreen broad-leaved forests, 25 March 2024, P. Y. Wu *BY01* (Nanyang Institute of Technology!).

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