



Gastrochilus linzhiensis (Aeridinae, Vandaeae, Epidendroideae, Orchidaceae), a new species from Xizang, China

Meng-Kai LI^{1,2,3}, Ying-Peng YU^{1,3}, Peng-Yue MA^{2,4}, Xue-Da CHEN^{1,3}, Jian-Ping DENG², Qiang LIU⁵, Yan LUO^{2,*}, Zhen XING^{1,3,*}

1. Resources & Environment College, Tibet Agriculture & Animal Husbandry University, Nyingchi 860000, Xizang, China. 2. Southeast Asia Biodiversity Research Institute, Chinese Academy of Sciences & Center for Integrative Conservation, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Mengla, Yunnan 666303, China. 3. The Orchid Conservation Center, Tibet Agriculture & Animal Husbandry University, Nyingchi 860000, Xizang, China. 4. School of Ecology and Environmental Science, Yunnan University, Kunming, 650504, Yunnan, China. 5. Innovation Group of orchid conservation and utilization, Yunnan Forestry Technological College, Jindian Road, Panlong District, Kunming, Yunnan, 650224, China. *Corresponding authors' emails: YL:luoyan@xtbg.org.cn; ZX: xztibetan@163.com

(Manuscript received 4 June 2023; Accepted 31 July 2023; Online published 2 August 2023)

ABSTRACT: A new species *Gastrochilus linzhiensis* M.K.Li, Y.Luo & Z.Xing from Linzhi City, Xizang, China is described and illustrated here. It is morphologically similar to *G. prionophyllus* and *G. distichus*, but can be distinguished from them in having no awned leaf, smaller flowers, semicircular epichile, cushion with 2–3 round papillary projection, and conically elongated hypochile.

KEY WORDS: Data Deficient, *Gastrochilus distichus*, *Gastrochilus prionophyllus*, section *Microphyllae*.

INTRODUCTION

The genus *Gastrochilus* (Epidendroideae; Vandaeae; Aeridinae) was first established by D. Don in 1825 (Don, 1825). It is characterized by epiphytic herbs where inflorescence is a raceme or shortened into an umbel and is highly ornamental. The spur at the base of the lip is enlarged and cystic, two porate and globose pollinia borne on a slender stipe. There are about 70 species (Liu *et al.*, 2023) of *Gastrochilus* in the world, distributed from Sri Lanka, India and the Himalaya eastwards to southern China, Indo-Myanmar and southern Japan and southwards to the Philippines and Indonesia (Chen *et al.*, 2009; Kumar *et al.*, 2014; Raskoti, 2015; Averyanov *et al.*, 2018; Liu and Gao, 2018). In China this genus is represented by 40 species till 2016, that are distributed mainly in the Southern and the Southwestern parts of the country (Chen *et al.*, 2009; Liu *et al.*, 2016, 2019; Zhou *et al.*, 2016). In recent years, studies on this genus have become popular leading to many new species have been discovered in China, such as *Gastrochilus yei*, *G. xizangensis*, *G. wenshanensis* and so on. (Rao *et al.*, 2019; Li *et al.*, 2021; Zhang *et al.*, 2022; Chen *et al.*, 2022; Liu *et al.*, 2023). At present, there are about 48 species of *Gastrochilus* known in China, 9 of which are in Xizang (Chen *et al.*, 2022; Li *et al.*, 2022). Further south, in Northeastern India and Nepal, also part of the Eastern Himalaya region, have 20 and 8 species, respectively (Avishek *et al.*, 2021; Raskoti 2015).

According to morphological characteristics, the genus was divided into three section: sect. *Microphyllae* Benth. & Hook. f., sect. *Caespitosi* Tsi, and sect. *Gastrochilus* D. Don. In 2017, Liu combined

morphological and molecular phylogenetic studies to redivide the genus into five section, namely: sect. *Viscosae* Q.L. & J.Y. Gao, sect. *Acinacifolius* Q.L. & J.Y. Gao, sect. *Brachycaulius* Q.L. & J.Y. Gao, sect. *Microphyllae* and sect. *Gastrochilus* (Liu, 2017).

In April 2023, during a survey of orchid diversity in coniferous and broadleaved mixed forest in southeastern Xizang, China, a flowering species of *Gastrochilus* with two-row of leaves and very small flowers was collected. It was identified as belonging to the section *Microphyllae*, which is characterized by pendulous stems and numerous distantly spaced leaves (Liu *et al.*, 2019). Previously, this species was erroneously identified as *G. prionophyllus* (Li *et al.*, 2023), but after much research, that was considered to be a misidentification, which is corrected here. After a comprehensive literature survey (Hooker, 1890; King and Pantling 1898; Chen *et al.*, 2009; Liu *et al.*, 2016, 2019, 2023.) and study of available specimens at various herbaria (K, PE, KUN, HITBC, XZE), the authors confirm that it is a new species and hence is described in this as *G. linzhiensis*.

TAXONOMIC TREATMENT

Gastrochilus linzhiensis M.K.Li, Y.Luo & Z.Xing, *sp. nov.*

林芝盆距兰 Figs. 1, 2(A1-A2)

Type: CHINA. Xizang, Bomi County, Gutown, 95°12'2.81"E, 30°3'40.12"N, 2358 m, epiphytes on tree trunks in coniferous and broadleaved mixed forest, 23 April 2023, M.K.Li 2023066 (XZE!-XZE016110: holotype; Herbarium of Tibet Agriculture and Animal Husbandry University! -T000173166: isotype).



Fig. 1. *Gastrochilus linzhiensis* M.K.Li, Y.Luo & Z.Xing. **A.** plants and habitat; **B–C.** branches with inflorescence; **D.** inflorescence; **E1–E4.** flowers (**E1–E2.** front view; **E3.** side view; **E4.** upward view); **F1–F2.** sepals and petals; **G1–G2.** close-up of lips (**G1.** top view; **G2.** side view); **G3–G5.** front view of epichile; **H.** column and ovary; **I1–I2.** anther caps; **J.** pollinia; **K.** fruit. (Photos: A. by Ying-Peng Yu in Bomi; B–K. by Meng Kai Li).

Diagnosis: *Gastrochilus linzhiensis* is similar to *G. prionophyllus* H. Jiang, D.P. Ye & Q.Liu and *G. distichus* (Lindl.) O.Kuntze in having pendulous and branched stem with slightly twisted leaves, but differs from them by having longer stem, no awned leaf, more smaller flowers, the semicircular epichile, cushion with 2–3 round papillary projection, and conical hypochile.

Description: Epiphytic herb, stem pendulous, ca. 30 cm long, slender, branched with tiny red-purple spots. Leaves alternate, distichous, narrowly lanceolate, 0.7–0.8×0.2–0.3 cm, green with purple spots, apex acuminate without awn. Inflorescence lateral, 2–3 per stem, pendulous, subumbellate, with 2–5-flowered; peduncle 0.6–0.8 cm, slender, upper part enlarged, lower part with 2–3 cupular sheaths; floral bracts ovate-triangular, ca. 0.5 mm; pedicel and ovary 0.5–0.6 cm, yellow-green at base, reddish-green towards the apex. Flower yellow-green with reddish spots. Dorsal sepal concave, oblong-elliptic, 2.0–2.2×1.0–1.2 mm, apex obtuse or rounded, 1-veined; lateral sepals concave, oblong-elliptic, 2.1–2.3×1.1–1.3 mm, apex rounded, 1-veined; petals ovate, 2.0–2.2×0.9–1.0 mm, apex obtuse, 1-veined. Lip 2.2–2.4×1.5–1.8 cm,

glabrous, with a spreading epichile and a saccate hypochile; epichile semicircular, 1.8–2.0×2.2–2.5 mm, adaxially glabrous, with a central cushion and 2–3 round papillary projections towards the base, the cushion has a different coloration and dots, margin irregularly denticulate; hypochile conical, narrowed towards the apex, 2.0–2.2 mm tall, 1.8–2.0 mm in diameter, with a protrusion on the adaxial surface, apex rounded. Column stout, ca. 2.0 mm long; anther cap with two chambers, 0.7–0.8×1.0–1.1 mm, round, with a beak on the front that partly covers the stipe; pollinia 2, yellow, spherical, stipe elongate, ca. 1.5 mm. Capsules cylindrical with 3 ridges, 0.6–0.7×3–4 mm.

Distribution and habitat: *Gastrochilus linzhiensis* collected from Gu town and Yi' gong town of Bomi County, Linzhi City, Xizang, China. It was found as epiphytes on the trunks of coniferous and broadleaved forest at an elevation range of 2100–2358 m.

Phenology: Flowering from April to May.

Etymology: The specific epithet '*linzhiensis*' refers to the typelocality where the new species occurs, Linzhi City, Xizang, China.

**Table 1.** Morphological comparison of *Gastrochilus linzhiensis* and closely related species

Character	<i>Gastrochilus linzhiensis</i>	<i>Gastrochilus prionophyllus</i>	<i>Gastrochilus distichus</i>
Habitat	Coniferous and broadleaved mixed forest, 2100–2358 m	Limestone forest, 1600 m	Subalpine rhododendron forest, 1100–2700 m
Leaf	Narrowly lanceolate, acuminate without awn, margin entire	Ovate, acuminate with 2 awns, margin serrate	Lanceolate, acuminate with 2–3 awns, margin entire
Inflorescence	Peduncle 0.6–0.8 cm in length, 2–5 flowers	Peduncle 1.0 cm in length, 2–3 flowers	Peduncle 2.5–3.0 cm in length, 2–4 flowers
Flower size	0.5 cm	1.0 cm	1.2 cm
Epichile	Semicircular, with orbicular central cushion, and margin with dentations	Reniform, with thick and orbicular central cushion, and margin and margin entire	Suborbicular, with orbicular central cushion, and margin entire
Cushion	With 2–3 round papillary projection	Projections absent	Projections absent
Hypochile	Conical	Subconic	Subcupular
Flower period	April–May	March–April	January–May

Vernacular name: Lin Zhi Pen Ju Lan, 林芝盆距兰

Conservation status: *Gastrochilus linzhiensis* only known from Linzhi City, with three known subpopulations. Plants have been observed to set fruits naturally. More surveys are needed to confirm the exact distribution range of this species. Hence, we assess this species in with existing information as Data Deficient following IUCN guidelines (IUCN, 2022).

Additional specimens examined (paratypes): CHINA. Xizang, Bomi County, Tongmai Village, 95°4'14.25"E, 30°5'50.18"N, 2100 m, epiphytes on tree trunks in subtropical evergreen broad-leaved forests, 25 December 2021, M.K.Li 20210521 (HITBC!).

Notes: Morphologically, *Gastrochilus linzhiensis* is similar to *G. prionophyllus* and *G. distichus*, but can be clearly distinguished from them by having stem 25–30 cm long (vs. 15–30 cm), leaf with no awn (vs. 2–3 awns), smaller flowers 0.5 cm long (vs. 1.0–1.2 cm). The biggest difference between them is the shape of the lip, the epichile of *G. linzhiensis* is semicircular (vs. reniform or suborbicular), with an orbicular central cushion, and cushion with 2–3 round papillary projection. The hypochile is conical (vs. subconic or subcupular).

ACKNOWLEDGMENTS

We are very grateful to reviewers who made critical comments on our manuscripts. We express sincere thanks to Forestry and Grassland Bureau of Bomi County, Rongjie Zhang and Jiangjuan Dong for their help in field surveys. We also grateful to Ji-Dong Ya for helping us to identify specimens, Jian Luo and Xinxin Yang for helping us to making specimens. This work was financially supported by ‘Study on the model of planting and breeding circular agriculture in Tibet’; ‘Reform and research of innovative talent training mode under the background of new agricultural Science (XZJYKTTZD008)’.

LITERATURE CITED

- Averyanov, L.V., Nguyen, V.C., Truong, B.V., Maisak, T.V., Luu, H.T., Nguyen, K.S., Dinh, Q.D., Gguyen, T., Chu, X.C., Tran, G., Nguyen, V.K., Le, H.S. 2018 New orchids (Orchideaceae: Cymbidieae and Vandeae) in the flora of Vietnam. *Taiwania* **63**(2): 119–138.
- Chen, S.C., Tsi, Z.H., Wood, J.J. 2009 *Gastrochilus* D. Don. In: Wu, Z.Y., Raven, P.H. & Hong, D.Y. (Eds.) *Flora of China* **25** (Orchidaceae). Science Press, Beijing and Missouri Botanical Garden Press, St. Louis, pp. 491–498.
- Chen, W.S., Lei, M., Ma, C.B., Jin, X.H., Wang, X.L. 2022 *Gastrochilus xizangensis* (Aeridinae, Vandeae, Orchidaceae), a new species from Xizang, China. *Phytotaxa* **566**(2): 219–226.
- Don, D. 1825 *Gastrochilus*. *Prodromus Florae Nepalensis*. Gale, London, p. 32.
- Hooker, J.D. 1890. *Orchideae*. In: Hooker, J.D. (ed.) *The Flora of British India*, vol. **5**. pp. 667–858. L. Reeve & Co., London.
- IUCN Standards and Petitions Committee 2022 Guidelines for Using the IUCN Red List Categories and Criteria. Version 15. Prepared by the Standards and Petitions Committee. Available from: <http://www.iucnredlist.org/documents/RedListGuidelines.pdf> (accessed 21 March 2022).
- King, G., Pantling, R. 1898 *The Orchids of the Sikkim-Himalaya*. *Annals of the Royal Botanic Garden, Calcutta* **8**: 1–342.
- Kumar, P., Gale, S.W., Kocyan, A., Fischer, G.A., Averyanov, L.V., Borosova, R., Bhattacharjee, A., Li, J.H., Pang, K.S. 2014 *Gastrochilus kadooriei* (Orchidaceae), a new species from Hong Kong, with notes on allied taxa in section *Microphyllae* found in the region. *Phytotaxa* **164**(2): 91–103.
- Li, J.W., Ya, J.D., Ye, D.P., Liu, C., Liu, Q., Pan, R., He, Z.X., Pan, B., Cai, J., Lin, D.L., Jin, X.H. 2021 Taxonomy notes on Vandeae (Orchidaceae) from China: five new species and two new records. *Plant Divers.* **43**(5): 379–389.
- Li, M.K., Pang, S.S., Deng, J.P., Wang, W., Chen, X.D., Luo, Y., Xing, Z. 2023 New data of Vandeae (Orchidaceae) in Tibet, China. *Chinese J. Trop. Crops*, **44**(2): 282–288.
- Li, M.K., Pang, S.S., Xing, Z., Wang, W. 2022 *Gastrochilus setosus* (Orchidaceae), A New Record of Orchidaceae from China. *Journal of Tropical and Subtropical Botany* **30**(3): 392–394.
- Liu, Q. 2017 Taxonomic revision study of *Gastrochilus* D. Don (Orchidaceae) in China. University of Chinese Academy of Sciences.
- Liu, Q., Gao, J.Y. 2018 *Gastrochilus dulongjiangensis* (Aeridinae, Vandeae, Epidendroideae, Orchidaceae), a new species from Yunnan Province, China. *Phytotaxa* **340**(3): 283–293.



- Liu, Q., Song, Y., Jin, X.H., Gao, J.Y. 2019 Phylogenetic relationships of *Gastrochilus* (Orchidaceae) based on nuclear and plastid DNA. Bot. J. Linn. Soc. **189**(3): 228–243.
- Liu, Q., Tan, Y.H., Gao, J.Y. 2016 A new species of *Gastrochilus* (Aeridinae, Vandaeae, Orchidaceae) and a new record species from Yunnan, China. Phytotaxa **282**(1): 66–70.
- Liu, Q., Wu, X.F., Zhou, S.S., Li, J.W., Jin, X.H. 2023 New species and record of *Gastrochilus* (Orchidaceae, Aeridinae) from China and Laos. Phytotaxa **585**(3): 210–224.
- Rao, W.H., Liu, Z.J., Zhang, G.Q., Chen, X.H., Huang, J., Chen, G.Z., Chen, L.J. 2019 A new epiphytic species of *Gastrochilus* (Orchidaceae: Epidendroideae) from Yunnan, China. Phytotaxa **413**(4): 296–300.
- Raskoti, B.B. 2015 A new species of *Gastrochilus* and new records for the orchids of Nepal. Phytotaxa **233**(2): 179–184.
- Zhang, J.Y., Cheng, Y.H., Liao, M., Jin, S.L., Qu, C.M., Tan, Y.C., Plenković-Moraj, A., Xu, B. 2022 *Gastrochilus wolongensis* (Orchidaceae): a new species from Sichuan, China, based on molecular and morphological data. Ecosyst. Health Sust. **8**(1): 2101546.



Fig. 2. Morphological differences between *Gastrochilus linzhiensis* and its two closely related species. A1-A2. *G. linzhiensis*; B1-B2. *G. prionophyllus*; C1-C2. *G. distichus*. (Photos: A1-A2. by Meng-Kai Li; B1-B2, C2. by Qiang Liu; C1. by Ji-Dong Ya).