Taiwania 70(1): 75–80, **2025**
DOI: 10.6165/tai.2025.70.75

Primulina yangmingshanensis (Gesneriaceae), a new species from Hunan Province, China

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(Manuscript received 3 August 2024; Accepted 22 December 2024; Online published 17 January 2025)

ABSTRACT: *Primulina yangmingshanensis* F.Wen & K.Liu, a new species of Gesneriaceae from Hunan, China, is described and illustrated. The new species is morphologically similar to *P. latinervis* (W.T.Wang) Mich.Möller & A.Weber, *P. roseoalba* (W.T.Wang) Mich.Möller & A.Weber and *P. pseudoroseoalba* Jian Li, F.Wen & L.J.Yan, but this novel taxon can be effectively distinguished from three morphologically convergent species on the basis of several shared diagnostic characters. Photographs and descriptions of the new species are provided below. According to the IUCN Red List Categories and Criteria, *P. yangmingshanensis* is preliminarily assessed as Vulnerable (VU D1+2).

KEY WORDS: Flora of Hunan, Limestone flora, *Primulina latinervis*, *Primulina roseoalba*, *Primulina pseudoroseoalba*.

INTRODUCTION

In recent years, an upsurge new *Primulina* taxa discoveries has been documented in China and Vietnam. Five new taxa in this genus were reported in the first five months of 2024 alone, including *P. adenopoda* G.L.Xu (Chen *et al*., 2024a), *P. liangshengyui* R.F.Li & L.Ding (Chen *et al*., 2024b), *P. longnanensis* G.L.Xu (Deng *et al*., 2024), and *P. pingguoensis* H.S.Ma & B.Pan (Ma *et al*., 2024) from China, as well as *P. hoangmongii* K.S.Nguyen, Aver. & C.W.Lin (Nguyen *et al*., 2024) from northern Vietnam. It is evident that the species diversity of this genus is still not fully understood by plant taxonomists and botanists, necessitating further in-depth exploration. The vast karst hills and mountainous regions spanning southern and southwestern China to northern Vietnam constitute the primary distribution center of *Primulina*. These areas are often remote and difficult to access with most forms of transportation, resulting in insufficient baseline surveys of *Primulina* species in these regions. It is foreseeable that many new taxa are yet to be discovered and published through future field investigations. In addition to karst landscapes, many non-karst mountainous areas also harbor numerous *Primulina* species. For example, *P. suichuanensis* X.L.Yu & J.J.Zhou (Zhou *et al*., 2016) and *P. danxiaensis* (W.B.Liao, S.S.Lin & R.J.Shen) W.B.Liao & K.F.Chung (Shen *et al*., 2010; Xu *et al*., 2012) are specifically distributed in Danxia landforms. Additionally, some *Primulina* species that depend on acidic parent materials are found in mountainous river valleys characterized by sandstone, shale, and granite formations, such as *P. pinnatifida* (Hand.-Mazz.) Yin Z.Wang and *P. fimbrisepala* (Hand.-Mazz.) Yin Z.Wang (Wang and Pan, 1990; Wang *et al*., 1998; Li and Wang, 2005).

The first author has focused on the Gesneriaceae plants of Hunan Province, China, especially *Primulina*, for over a decade. During extensive field surveys of Gesneriaceae in both karst and non-karst terrains of Hunan Province, he collected numerous *Primulina* specimens and carried out extensive introduction work. Based on continuous fieldwork, he conducted long-term field monitoring and biological studies on some suspected new *Primulina* species, sending live plants to the Gesneriad Conservation Center of China (GCCC) for cultivation in controlled environments in the germplasm garden. After several years of field and indoor introduction and cultivation observations, an unknown species of *Primulina* s.l. from Hunan Province was identified. This species has not appeared or been recorded in domestic and international monographs (Wang and Pan, 1990; Wang *et al*., 1998; Li and Wang, 2005; Wei *et al*., 2010) or in the literature on new *Primulina* taxa published since 2005, indicating it is an undescribed and unrecognized new species.

MATERIAL AND METHODS

During the field observations, photographs of the habitat and live plants of this new taxon were taken. The morphological characteristics were described based on detailed observations and measurements from both field studies and the collected dried specimens preserved at IBK. The terminology used in the descriptions follows the

standards of Hickey and King (2000), Harris and Harris (2006), Beentje (2012), and Simpson (2019). The specific epithet and the abbreviations of the authors' names adhere to the International Plant Names Index (GRC, 2024; IPNI, 2024; POWO, 2024) to ensure no duplication. The conservation status assessment follows the guidelines of the International Union for Conservation of Nature (IUCN) Red List Categories and Criteria (IUCN 2022). All herbarium abbreviations used in the text conform to Thiers (2024).

TAXONOMIC TREATMENT

Primulina yangmingshanensis F.Wen & K.Liu, ***sp. nov.*** **陽明山報春苣苔, Figs 1, 2 & S1A**

***Type*:** China. Hunan Province. Yongzhou City, Shuangpai County, Majiang Town, Majiang village, on moist limestone rock surfaces in a gorge, 26°00′N, 111°51′E, elevation ca. 565 m, 7 August 2021, *Kun Liu LK210807-01* (Holotype: IBK!; Isotype: IBK!).

***Diagnosis*:** *Primulina yangmingshanensis* superficially resembles *P. latinervis*, *P. roseoalba* and *P. pseudoroseoalba* in leaf blade shape. However, it clearly differs from them by its bigger bracts ovate to orbicular-ovate in size 2.5–5.0 × 2.0–3.5 cm. Additionally, it differs from *P. latinervis* by pedicel densely pubescent and glandular pubescent (*vs*. puberulent), anthers densely pubescent (*vs*. glabrous), pistil densely glandular pubescent and puberulent (*vs*. puberulent); from *P. roseoalba* by peduncle and pedicel densely pubescent and glandular pubescent (*vs*. puberulent), calyx lobes ca. 10 × 1–1.5 mm (*vs*. 4–6 × 0.8–1 mm), filaments densely glandular puberulent (*vs*. base sparsely pubescent, apex sparsely glandular puberulent), ovary and style sparsely glandular pubescent and puberulent (*vs*. ovary puberulent, style glandular puberulent); from *P. pseudoroseoalba* by leaf blade margin 9–12 shallowly serrated sometimes undulate (*vs.* entire), bigger bracts 25–50 × 20–35 mm (*vs*. 15–20 × 8–12 mm), filaments glabrous from the base to the middle, but densely glandular puberulent from the middle to the anther attachment (*vs.* glabrous), anthers densely pubescent (vs. bearded).

***Etymology*:** The specific epithet of this new species, "*yangmingshanensis*", is derived from the type locality where this species is found. The type locality is situated in the limestone areas around the foothills of Yangming Mountain, a renowned mountain in Hunan. Therefore, the specific epithet "*yangmingshanensis*" originates from "Yangming Mountain."

***Description*:** Perennial Herb, acaulescent. **Rhizome** nearly cylindrical, size varies with age of growth, commonly 1–3 cm long, ca. 1 cm in diameter; roots fibrous. **Leaves** all basal, 4-6, rosulate fascicled, usually clustered on the top of rhizome. **Petiole** complanate, green, glabrescent when mature, 4–4.5 cm long, 1.0–2.5 cm in diameter. **Leaf blades** slightly asymmetric but not falcate, ovate to broadly ovate, 8–20 × 6–15 cm, slightly fleshy, adaxial surface green, sparsely strigose, abaxial surface glabrous, pale green and occasionally with pale purple hue, apex obtuse, base cuneate, gradually narrowed to form petiole, margin with 9–12 shallowly serrated sometimes undulate, apex acute; lateral veins 3–4 on each side of midrib, adaxially impressed, abaxially conspicuously prominent. **Cymes** 2–4 or more, axillary, (4–)8–15-flowered, or more. **Peduncle** 15–20 cm, ca. 3.0 mm in diameter, densely villous and glandular pubescent; **bracts** 2, free, opposite, ovate to orbicular-ovate, 2.5–5.0 × 2.0–3.5 cm, apex acute, base shallowly cordate to cordate, both surfaces densely puberulent. **Pedicel** green, densely pubescent and glandular pubescent. **Calyx** 5-parted to the base, lobes lanceolate-linear, ca. 10 × 1–1.5 mm, margin entire, apex acute, abaxially densely villous and glandular puberulent, adaxially nearly glabrous. **Corolla** purple with dark purple veins, 4–4.5 cm long, tube nearly cylindric to infundibular, 3–3.5 cm long, outside glandular-pubescent and mixed few eglandular puberulent, inside nearly glabrous; tube orifice ca. 1.5 cm in diameter, limb distinctly 2-lipped; upper lip 2-lobed, ca. 5 mm long; lower lip 3-lobed, ca, 8 mm long. **Stamens** 2, filaments dark purple to blackish purple, ca.1.2 cm long, adnate to ca. 1.5 cm above the tube base, linear, geniculate from the base upwards at ca. 1/2 of the length, glabrous from the base to the middle, but densely glandular-puberulent from the middle to the anther attachment; **Anthers** 2, elliptic, ca. 3 mm long, back densely pubescent. **Staminodes** 3, lateral two pale purple to shite, glabrous, ca. 1 cm long, adnate to ca. 1.2 cm above the tube base, the central one usually inconspicuous, ca. 0.1 mm long, translucent, adnate to nearly the bottom of the tube base**. Pistil** purple, 3–3.5 cm long, **ovary** cylindrical 2–2.5 cm long, ca. 2 mm in diameter, sparsely glandular pubescent and puberulent, the boundary between the ovary and the style indistinct, **style** ca. 1 cm long, linear, sparsely glandular puberulent; **stigma** lingulate, ca. 3 mm long, 2-lobed, lobes ca. 1 mm long, surface covered tiny fleshy puberulent, pale purple; **Capsule** linear-cylindroid, long and straight, 4–4.5 cm long, ca. 3 mm in diameter, densely glandular pubescent, but glabrescent while mature and dehiscent.

***Phenology*:** The natural flowering period of this species is from August to September, and the fruiting period is from October to November.

***Distribution, habitat and preliminary conservation status*:** Through extensive surveys, it is currently known that *Primulina yangmingshanensis* has only three populations. These populations are located at straight-line distances of 7.4 kilometers and 8.6 kilometers from the type locality, growing at altitudes of 500–600 meters in evergreen and deciduous mixed broadleaf forests covering the karst limestone mountains. They are found on shaded rocks or steep slopes. The species is only distributed in its type locality, the limestone mountains at

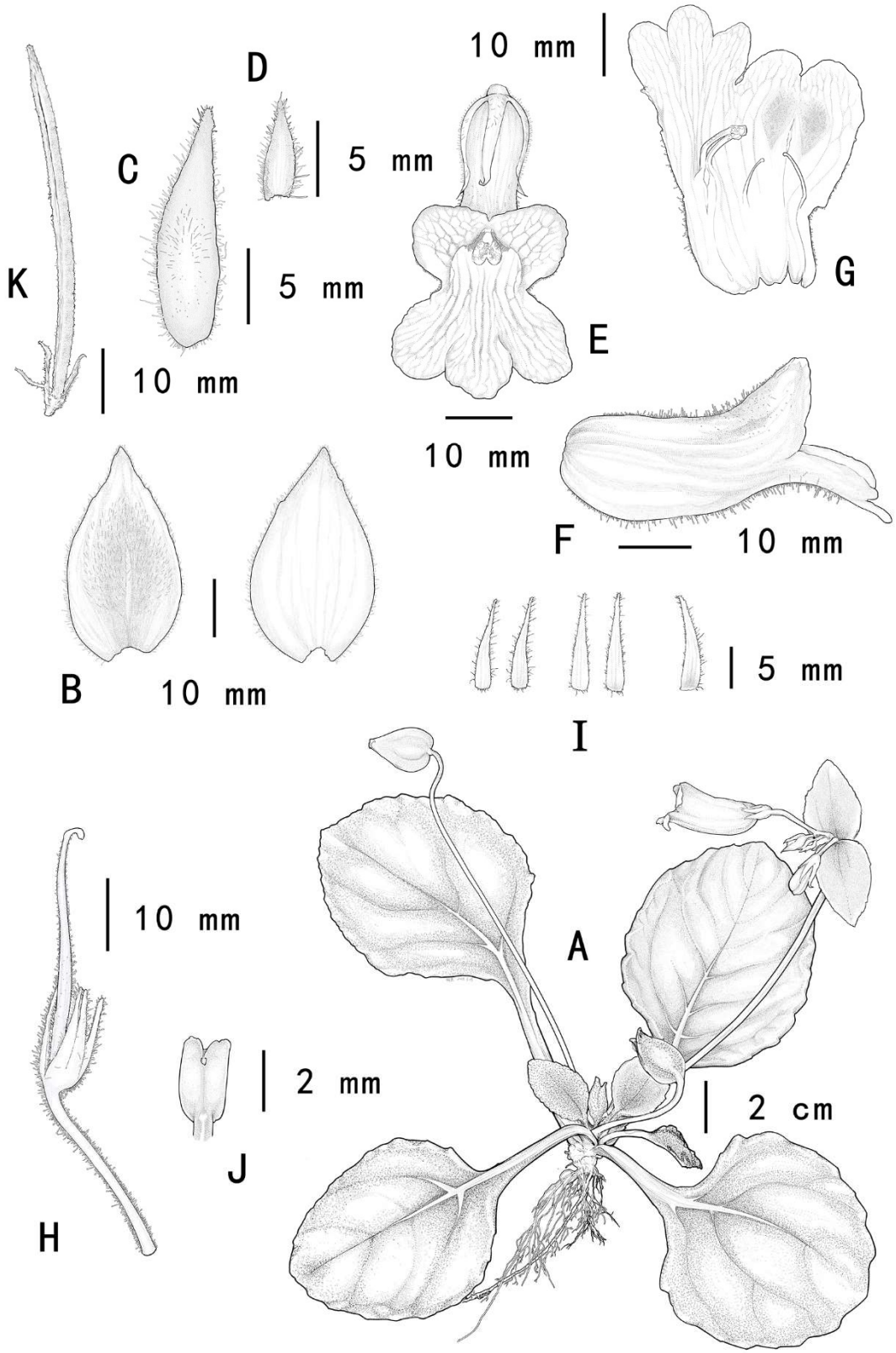

Fig 1. ***Primulina yangmingshanensis*** F.Wen & K.Liu **A.** Habit. **B.** Abaxial (left) and adaxial (right) surfaces of bracts. **C.** Abaxial surface of secondary bracteoles. **D.** The abaxial surfaces of tertiary bracteoles. **E.** The frontal view of corolla. **F.** The lateral view of corolla. **G.** Opened corolla. **H.** Pistil with calyx segments. **I.** Abaxial surface of calyx lobes; **J.** Stigma; K.Mature capsule (Drawing by Di Hu).

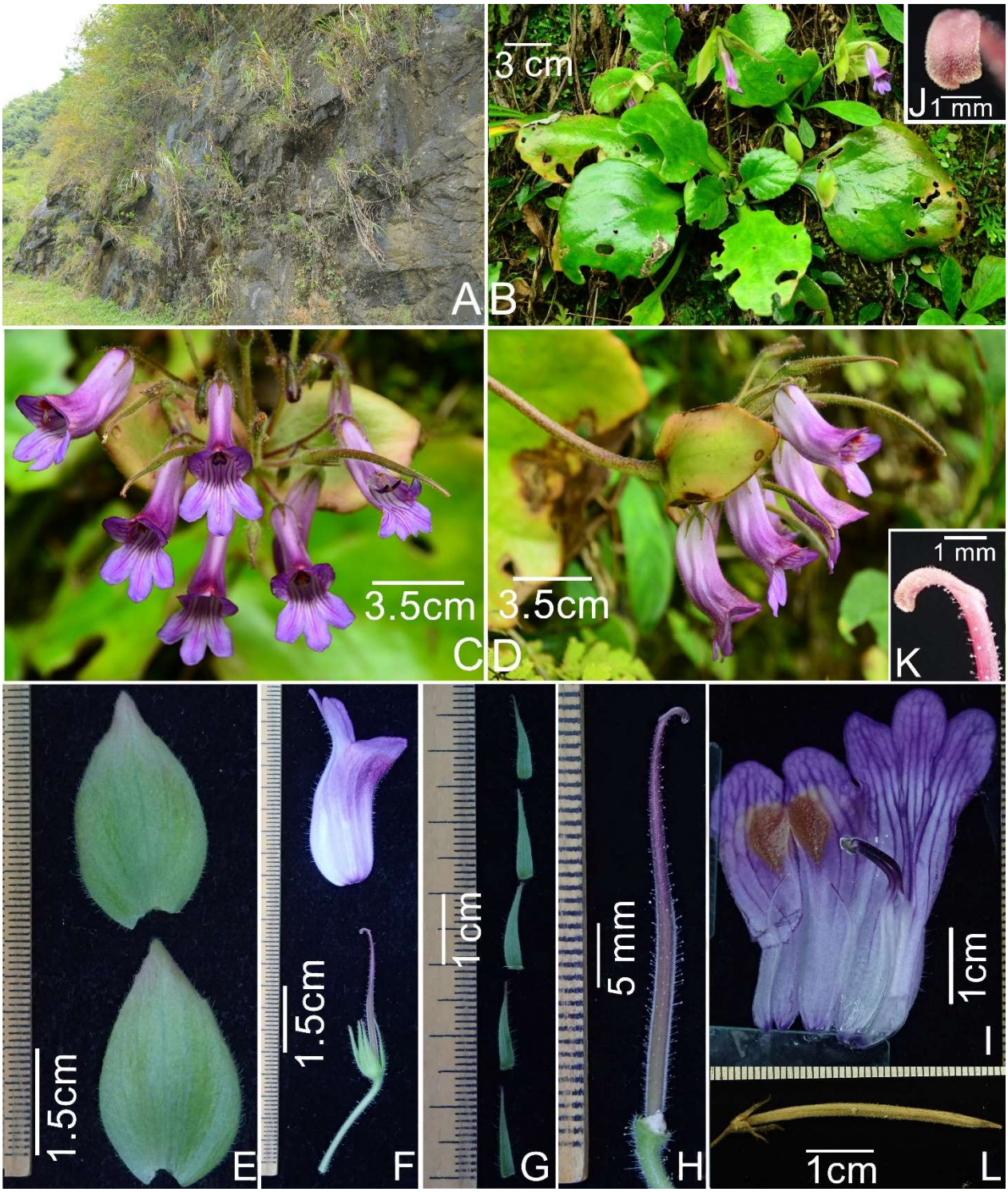

Fig 2. Photographs of ***Primulina yangmingshanensis*** F.Wen & K.Liu sp. nov. **A.** Natural habitat. **B.** Habit. **C.** The cyme and frontal view of corolla. **D.** The lateral view of cyme, bract, corollas and young capsules. **E.** The abaxial (below) and adaxial (upper) view of the corolla. **F.** The top view of the corolla (A, E-K photographed by Fang Wen; B-D, L photographed by Kun Liu).

the foothills of Yangming Mountain in Majiang Town, Shuangpai County, Yongzhou City, Hunan Province. The total number of mature individuals less than 500, and none of the populations are within protected areas, making them susceptible to human activities. In particular, the two newly discovered populations each have fewer than 20 individuals. Therefore, we did not collect specimens from these newly discovered locations but

Table 1. The comparison of ***Primulina yangmingshanensis*** F.Wen & K.Liu sp. nov., ***P. latinervis*** (W.T.Wang) Mich.Möller & A.Weber, ***P. roseoalba*** (W.T.Wang) Mich.Möller & A.Weber and ***P. pseudoroseoalba*** Jian Li, F.Wen & L.J.Yan

characters	***P. yangmingshanensis***	***P. latinervis***	***P. roseoalba***	***P. pseudoroseoalba***
Leaf blades				
Shape	ovate to broadly ovate	broadly ovate to orbicular-ovate	ovate	broadly ovate to elliptic
Indumentum	adaxial surface sparsely strigose, abaxial surface glabrous	both surfaces sparsely appressed puberulent	both surfaces sparsely strigose	adaxially densely eglandular pubescent, abaxially glabrous
base	gradually narrowed being cuneate and forming petiole	both sides of the base slightly asymmetrical, nearly truncate to cuneate	broadly cuneate	base cuneate, slightly asymmetric but not falcate
Margin	with 9–12 shallowly serrated sometimes undulate	undulate-dentate to repand	crenulate to remotely dentate	entire
Peduncle				
Indumentum	densely villous and glandular pubescent	pubescent	puberulent	glandular puberulent
Length	15–20 cm	ca. 18 cm	9–13 cm	3.3–4.2 cm
Bracts				
Shape	ovate to orbicular-ovate	lanceolate to obovate-lanceolate	linear-lanceolate	ovate to orbicular-ovate
size	25–50 × 20–35 mm	ca. 22 × 5–7 mm	11–13 × 2.2–3 mm	15–20 × 8–12 mm
Indumentum	both surfaces densely puberulent	both surfaces appressed puberulent	both surfaces appressed strigose	outside densely puberulent, inside glabrous
Corolla				
Length	4–4.5 cm	ca. 4 cm	ca. 4 cm	3.5–4.5 cm
Colour	purple with dark purple veins	light coeruleo-purpuier with dark purple veins	white with a pink halo to purplish-pink	white to fuchsia-red with light purple veins
Indumentum	outside densely puberulent and glandular puberulent	outside sparsely puberulent, inside nearly glabrous	outside sparsely puberulent, inside puberulent on adaxial lip	outside densely puberulent and glandular puberulent, inside glabrous
Filaments				
Indumentum	glabrous from the base to the middle, but densely glandular puberulent from the middle to the anther attachment	sparsely glandular puberulent near apex, remaining portion glabrous	base sparsely pubescent, apex sparsely glandular puberulent	glabrous
Color	dark purple to blackish purple	pale purple at base and gradually transition to white towards the top	brownish to purplish brown	white
Anthers	densely pubescent	glabrous	sparsely puberulent	bearded on the back
Pistil indumentum	densely glandular pubescent and puberulent	densely puberulent	ovary puberulent, style glandular puberulent	densely puberulent and glandular puberulent
Flowering time	Aug. to Sept.	Aug. to Sept.	Jul.	Sept. to Oct.

only conducted surveys and documentation. Based on the aforementioned information and according to the IUCN Red List Categories and Criteria (IUCN, 2022), *P. yangmingshanensis* is assessed as Vulnerable (VU D1+2).

***Notes*:** Hunan Province, a region in China known for its unique blend of karst and Danxia landforms, has been a hotspot for *Primulina* species discovery. In the past decade alone, 11 new taxa of *Primulina* have been described from this region. These taxa are: *P. gracilipes* X.L.Yu & A.Liu (Gong *et al*., 2022), *P. cataractarum* X.L.Yu & A.Liu (Ding *et al*., 2021), *P. jiuyishanica* K.Liu, D.C.Meng & Z.B.Xin (Liu *et al*., 2020), *P. zixingensis* Li H.Yang & B.Pan (Pan *et al*., 2019), *P. hengshanensis* L.H.Liu & K.M.Liu (Tian *et al*., 2018), *P. porphyria* X.L.Yu & Ming Li (Li and Yu, 2015), *P. hunanensis* K.M.Liu & X.Z.Cai (Cai *et al*., 2015), *P. rubribracteata* Z.L.Ning & M.Kang (Ning *et al*., 2015), *P. minor* F.Wen & Y.G.Wei (Wen *et al*., 2014), *P. jiangyongensis* X.L.Yu & Ming Li (Li *et al*., 2014), *P. jianghuaensis* K.M.Liu & X.Z.Cai (Cai *et al*., 2013). Apart from *P. hengshanensis* and *P. jiuyishanica*, all the species mentioned above are endemic to limestone habitats and exhibit specific preference for limestone. In contrast, *P. hengshanensis* is exclusively found in Danxia landforms, while *P. jiuyishanica* is distributed in acidic sandstone regions. Including this new species, Hunan Province has a total of 32 *Primulina* species, making it the province with the third most *Primulina* species in China, following Guangxi and Guangdong.

ACKNOWLEDGMENTS

We would like to thank the Science & Technological Research and Development Project of Guangxi (ZY21195050), the National Natural Science Foundation of China (32460422), the Capacity-building Project of SBR of CAS (KFJ-BRP-017-68), the Foundation of Guangxi Key Laboratory of Plant Conservation Restoration Ecology in Karst Terrain (22-035-26),

the Basic Research Fund of Guangxi Academy of Sciences (CQZ-C-1901), Hunan Province Wildlife Resource Conservation Project ([2020] No. 42 and [2024] No. 0001) financially supported this study. We also would like to thank Stephen Maciejewski, of the Gesneriad Society, and Michael LoFurno, Associate Professor, Temple University, for their editorial assistance; De-Chang Meng and Jian-Jun Zhou for their handsome plants' photos.

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