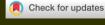
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Research article

Primulina marmorata (Gesneriaceae), a new species from northern Guangxi, China

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Primulina marmorata, a new species of Gesneriaceae from the limestone areas of Siding Town, Rong'an County, liuzhou City, Guangxi, China, is described and illustrated here. It morphologically resembles *P. yungfuensis* in leaf blades. Still, it can be easily distinguished from the latter by noting a combination of characteristics, especially in its obviously larger bracts. We found only one population, about 10 000 mature individuals, at the type locality. According to the IUCN Red List Categories and Criteria (Ver. 3.1), the new species is tentatively designated as 'Critically Endangered' (CR).

Keywords: Flora of Guangxi, Gesneriaceae, new taxon, Primulina marmorata, taxonomy

Introduction

Primulina Hance (Hance 1883, Wang et al. 2011, Weber et al. 2011) consists of perennial herbs, shrubs, a few trees, annual herbs and lianas, which prefers moist and shady environments. Species of this genus are primarily distributed across southern, southwestern, and eastern China, extending southward to the northern margins of the Indochinese Peninsula. A considerable number of species are regional endemics. Currently, the genus is known to occur only in China and Vietnam, with the Guangxi of China, which borders Vietnam, serving as the modern diversity center for this genus. In recent years, with the increase of field surveys, many new taxa have been described (Xin et al. 2021, Qin et al. 2022, Xu et al. 2023, Deng et al. 2024).

The two authors, Mr Wei-Chuen Chou and Mr Qi-Jun Wang, independently discovered a flowering species of Gesneriaceae at the same location in early June 2017 and late May 2022, respectively. Since the species was in bloom, the discoverers were certain

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that it belonged to *Primulina*, due to its rosette plant habit and clustered leaves at the top of a perennial, elongated, and robust rhizome; the corolla is bilabiate with a funnel-shaped tube; the filaments are geniculate, and the stigma is tongue-shaped with a shallowly lobed apex. Some living plants were collected and rapidly sent to the Gesneriad Conservation Center of China (GCCC) and the National Gesneriaceae Germplasm Resources Bank of GXIB (NGGRB) for cultivation and further observation. Since 2018, the culktivated plants have bloomed annually in the nursery, and the authors have conducted field observations in its natural habitat each year. After examination and comparison of the collected plant material with the protologues and type specimens of every recognized Primulina species, it became clear that neither the existing protologues nor the type specimens of these species matched with our newly discovered plant, although the shape and texture of the leaves makes it relatively similar to P. yungfuensis (W. T. Wang) Mich. Möller and A. Weber (Wang 1987, Wang et al. 1998, Weber et al. 2011). At the same time, we also grew P. yungfuensis at the GCCC nursery, caring for them in the same environment for further comparison. Both have flowered for the past six years, and both have grown consistently, but they can easily be distinguished by both their vegetable and reproductive organs. Further, a combination of characteristics easily distinguish our new species from other species, especially corolla tube shape, calyx lobes and bracts. We thus finally confirmed that it represents a new species of Primulina and describe it here.

Material and methods

For morphological observations, all morphological features such as leaves, flowers and capsules were observed and measured in the GCCC homogenization garden for six years of co-cultivation of *Primulina marmorata* and *P. yungfuensis*. The measurements, shapes, colors and other details given in this description are based on live plants. Meanwhile on the Chinese Virtual Herbarium (www.cvh.ac.cn/) we measured and evaluated the morphological characteristics of specimens preserved in relevant herbaria (GXMG, IBK and PE, etc.).

Taxonomic treatment

Primulina marmorata F. Wen, W. C. Chou & Y. G. Wei sp. nov. (Fig. 1, 2, 3A1–F1, 4, 5)

A species resembling *Primulina yungfuensis* (Fig. 3A2–F2) in shape and texture of leaf blades, but easily distinguished by its bracts broadly lanceolate, with strigose pubescence and apex acute (versus narrowly ovate to elliptic, villous indumentum and obtuse apex), $39-60 \times 26-33$ mm (versus $7-12 \times 5-7$ mm); blade margin entire and apex obtuse to round (versus crenate to repand and apex acute to rounded); calyx lobes lanceolate, ca 7×3 mm (versus lanceolate-linear to narrowly triangular, $5.5-7 \times 1.2-2.2$ mm); corolla tube tubular (versus funnel-shaped to narrowly funnel-shaped). Detailed morphological comparisons with *Primulina yungfuensis* are provided in Table 1.

Type: China. Guangxi Zhuangzu Autonomous Region: liuzhou City, Rong'an County, Siding Town, 25°1′N, 109°37′E, ca 460 m a.s.l., 29 June 2024, Fang Wen, Qi-Jun Wang and Hao Nie, WF240629-01 (holotype: IBK00470612; isotypes: IBK00470613, IBK00470614, IBK00470615)

Etymology

The epithet refers to the blade which has an impressively beautiful marble-like pattern looking like a brocade pattern.

Description

Perennial, acaulescent herb. Rhizome subterete, after several years of growth becoming elongated to ca 12 cm long, ca 1 cm in diameter, nearly cylindrical, irregularly curved, glabrous; roots mostly fibrous, developing on the soil surface. Leaves 7-11, all basal or becoming clustered at top of rhizome after several years of growth, petiolate; petiole 2.4-11.5 cm long, ca 6 mm in diameter at middle, 1.2-1.5 cm at base, in cross section broadly 'U'-shaped, at adaxial surface near the blade light green to purplish red from top to bottom, abaxially light green to yellowish white, sparsely lavender brown-pubescent at both surfaces; leaf blade thickly chartaceous to slightly fleshy, ovate, broadly ovate to nearly rounded, slightly asymmetrical on both sides, $6.6-11.6 \times 5.0-9.7$ cm in diameter, adaxially dark green, usually with irregular light green, yellowish green to silver marble-like patterns and patches, rarely pure dark green, extremely short strigillose, abaxially light green to yellowish white, pubescent, sparsely short strigillose, obtuse to round at apex, at base often asymmetrical, cuneate to broadly cuneate, rarely cordate, with entire margin; lateral veins inconspicuous on adaxial surface, slightly concave, conspicuous protruding on abaxial surface, 3-4 on each side, rarely 5. Dichasium cymes 2-4, axillary, 2-8-flowered; peduncle 9.3-12.7 cm long, ca 3 mm in diameter, light purple brown, pubescent; bracts 2, opposite, broadly lanceolate to ovate, $3.9-6.0 \times 2.6-3.3$ mm, pubescent at both surfaces, yellowish brown to light greenish brown with a purple red halo in the middle of the front, with entire to repand margin, with florescence often rolling outward, acute at apex; secondary bracts broadly lanceolate, yellowish brown to light purple brown, with entire margin, acute at apex; bracts and secondary bracts often persist in florescence, occasionally falling off. Calyx 5-parted to base; lobes lanceolate, ca 7 × 3 mm, nearly equal, purple red, pubescent outside, sparsely glandular-puberulent, glabrous inside, acute at apex. Corolla light purple to light purple red; tube with 2 longitudinal orange stripes inside, the limb is light yellowish brown with purple spots, ca 5.2 cm long, puberulent and glandular outside, glabrous inside; tube tubular, gradually narrowed towards base, ca 3.6 cm long, ca 1.6 cm in diameter at mouth; limb distinctly 2-lipped; adaxial lip 2-parted to near middle, its lobes obliquely oblong, rounded at apex, with entire margin, ca 1.4 cm long, ca 2.4 cm in diameter at base; abaxial lip 3-parted to near the base, its lateral lobes slightly obliquely oblong, ca 1.0 cm long, ca 0.9 cm in diameter and the central lobe oblong, round at apex, with entire margin, ca 2.1 cm long, ca 2.8 cm in diameter at base. Stamens 2, adnate to ca 1.7 cm above the

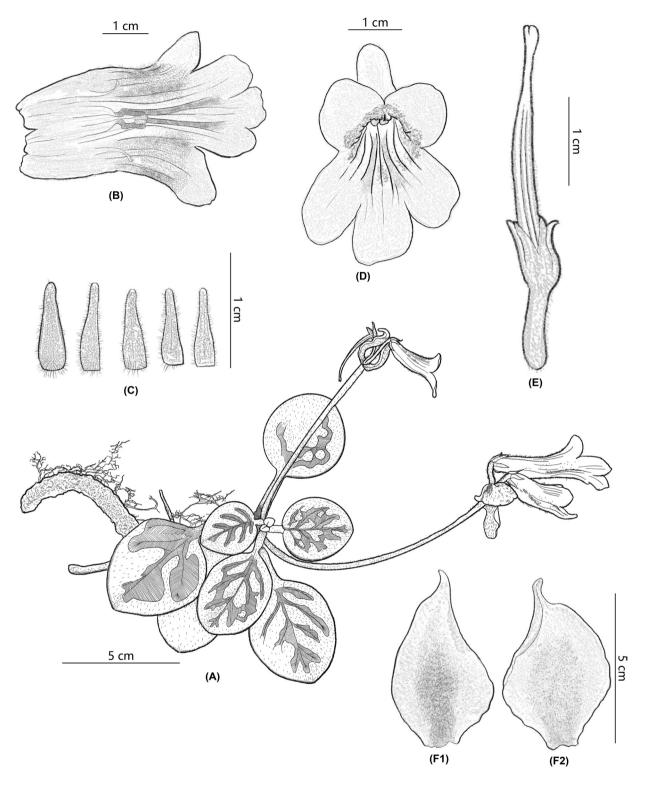


Figure 1. *Primulina marmorata* sp. nov. (A) Flowering plants, (B) opened corolla, (C) calyx, (D) front view of a flower showing the internal structure, (E) pistil with calyx, (F1) adaxial side of bracts, (F2) abaxial side of bracts. Drawn by Shu-Shan Zhang.

corolla base; filament ca 6 mm long, orange, strongly geniculate near base, glabrous; anther reniform, yellowish brown, ca 3 mm long, glabrous; staminodes 3, white, glabrous, lateral ones linear, ca 8 mm long, bending gradually upwards from

the base, capitate at apex, adnate to ca 1.3 cm above corolla tube base, the central one inconspicuous, stilliform, ca 8 mm long, adnate to ca 8 mm above corolla tube base. Disc annular, orange, ca 2 mm high, with slightly purple edge,



Figure 2. Holotype (IBK) of *Primulina marmorata* sp. nov. China, Guangxi Zhuangzu Autonomous Region: liuzhou City, Rong'an County, Siding Town, 25°1′N, 109°37′E, ca 460 m a.s.l., 29 June 2024, Fang Wen, Qi-Jun Wang and Hao Nie, WF240629-01.

and repand margin, glabrous. Pistil ca 3.2 cm long; ovary ca 2.1 cm long, ca 2 mm in diameter, pale yellow with longitudinally oriented purple-red stripes, densely glandular-pubescent; style ca 1.1 cm long, ca 1 mm in diameter, pale yellow, stripe-free, glandular-pubescent; stigma obtrapeziform, pale yellow, 2-lobed at apex, ca 3 mm long. Capsule linear, pale dark brown, ca 4.5 cm long, ca 3 mm in diameter, glabrous, longitudinally dehiscent.

Vernacular name

The scientific name of this new species, translated into Mandarin Chinese is '织锦报春苣苔', pronounced as 'Zhī Jǐn Bào Chūn Jù Tái'.

Phenology

The flowering period lasts from late May to June, occasionally extending slightly into early July; fruiting from September to October.

Distribution, phenology and habitat

Primulina marmorata is only known from the type locality, Siding Town, Rong'an County, Liuzhou City, Guangxi, China. The site belongs to the mid-subtropical monsoon climate zone, with short winters and long summers, mild climate, abundant sunshine and rainfall. Monthly sunshine time is highest in October, a total of 195.3 hours, while it is lowest in June, a total of 51.4 hours. The highest average

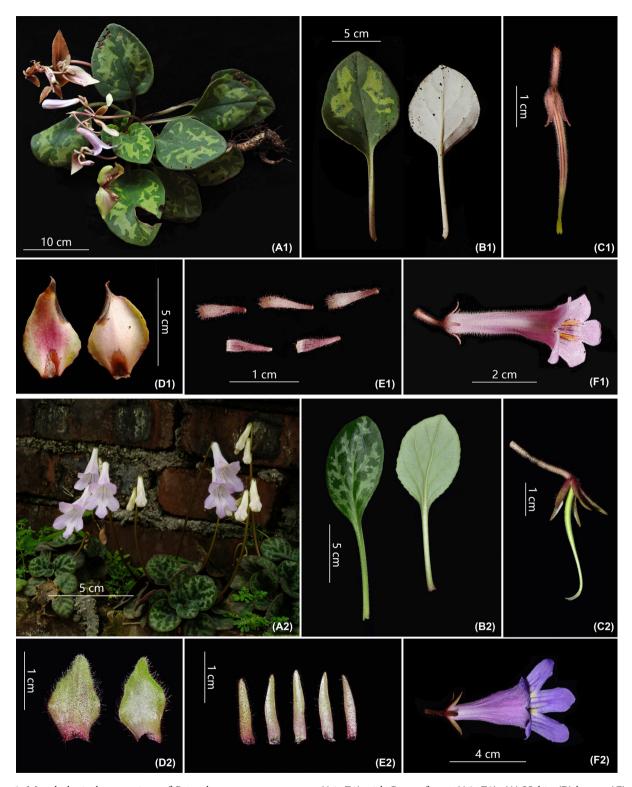


Figure 3. Morphological comparison of *Primulina marmorata* sp. nov. (A1–F1) with *P. yungfuensis* (A2–F2). (A) Habit, (B) leaves, (C) pistil with calyx, (D) bracts, (E) calyx, (F) top view of a flower. (A1)–(F1) photographed by Fang Wen; (A2)–(F2) photographed by De-Chang Men.



Figure 4. *Primulina marmorata* sp. nov. (A) Habit, (B) adaxial side of leaves, (C) abaxial side of leaves, (D) inflorescence, (E) calyx, (F) pistil with calyx, (G) adaxial side of bracts, (H) front view of a flower showing the internal structure, (I) top view of a flower, (J) abaxial side of bracts, (K) opened corolla, (L) lateral view of a flower. Photographs by Fang Wen.



Figure 5. *Primulina marmorata* sp. nov., demonstrating its extremely high ornamental value (Photographs by Wei-Chuen Chou). (A)–(F) variations in leaf upper surface coloration and texture, (D)–(H) different corolla shapes, colors, patches, and spots. Photographs by Fang Wen.

Table 1. Key morphological differences between Primulina marmorata sp. nov. and its close relative, P. yungfuensis.

Characters	P. marmorata	P. yungfuensis
Bracts	broadly lanceolate, strigose pubescence and apex acute, 39–60 × 26–33 mm	narrowly ovate to elliptic, villous indumentum and apex obtuse, $7-12 \times 5-7$ mm
Blade	margin entire and apex obtuse to round	serrate, crenate to repand and apex acute to rounded
Calyx lobes	lanceolate, ca 7×3 mm	lanceolate-linear to narrowly triangular, $5.5-7.0 \times 1.2-2.2 \text{ mm}$
Corolla tube	tubular	funnelform to narrowly funnelform

temperature occurs in August at 32° and the lowest average temperature occurs from December to January at 6°; the highest temperature recorded for the calendar year is 34°C and the lowest is 1°C. The highest average rainfall is 385.8 mm, which occurs in June, and the lowest average rainfall is 53.6 mm, which occurs in December. Accompanying plants belonging to the same family (Gesneriaceae) as the new species include *Petrocodon dealbatus* Hance var. *denticulatus* (W.T.Wang) W.T.Wang, *Hemiboea follicularis* Clarke and *Paraboea dictyoneura* (Hance) Burtt; associated species are also *Elatostema cyrtandrifolium* (Zoll. and Moritzi) Miq., *E. ronganense* W.T.Wang, *Platycarya strobilacea* Siebold & Zucc. *Pyracantha loureiroi* (Kostel.) Merr., *Begonia luzhaiensis* Ku, and so on.

Preliminary conservation status

While Primulina marmorata is currently known from a single location, its population size is substantial, with over 10 000 mature individuals. The species is abundant at its type locality, a limestone hill, and faces no immediate environmental threats. However, due to the high ornamental value of its leaves and flowers, it has been listed for sale on online marketplaces. According to our tracking and investigation of several domestic Chinese online shopping platforms such as 'Xianyu,' 'Taobao,' and 'WeChat' as well as information provided by enthusiasts of Gesneriaceae plants in China, this species has been available for online sale since at least around 2019. Its selling name is 'Zhijin' (织锦), and it is said to have been discovered and named by a Gesneriaceae plant enthusiast from Hong Kong, China. Currently, many enthusiasts in China have collected this species, which can also be considered a form of germplasm preservation. Consequently, excessive collection for ornamental purposes poses the most significant threat to the species' conservation. The estimated extent of occurrence (EOO) and area of occupancy (AOO) for the new species are at least 0.3 km² and 6.5342 ha, respectively. Based on the IUCN Red List Categories and Criteria (IUCN 2012, 2024) and guidelines of the IUCN (2024), it is tentatively assessed as 'Critically Endangered' [CR B1ab (i, v) + B2ab (i, v)].

Results and Discussion

The type locality of *Primulina marmorata* is situated in Rong'an County, Liuzhou City, Guangxi, China. Its morphologically close relative, *P. yungfuensis*, is distributed in Lin'gui District and Yongfu County of Guilin City, Guangxi,

and is not found in Rong'an County. These two distribution areas are at similar latitudes but are geographically separated by longitude. Within the Chinese botanical taxonomy community, there's a widely circulated saying regarding the genus, Primulina, in karst regions: 'one species per hill, one species per gully, one species per cave.' This vividly describes the distribution characteristic of the genus in the karst areas of south and southwest China (especially Guangxi)—as demonstrated by the research of Wei (2018, 2022), the genus has evolved a large number of highly specialized, narrow-endemic species in this area. Rong'an County, Yongfu County, and Lin'gui District are all areas with typical karst landforms. The continuous hills create diverse microhabitats in various small regions, which has inevitably led to the emergence and publication of new taxa—as evidenced by newly discovered and reported species in this area such as P. ronganensis (D.Fang and Y.G.Wei) Mich.Möller and A.Weber (Wei and Fang 2001), P. longii (Z.Yu Li) Z.Yu Li (Li 2002), and P. hiemalis Xin Hong and F.Wen (Hong et al. 2018), and so on.

At first glance, our new species, P. marmorata, shares traits with P. yungfuensis—they both have similar leaf shapes, ranging from ovate, broadly ovate, to nearly round. However, beyond this superficial similarity, they exhibit clearly distinguishable morphological differences, such as the difference in leaf texture. Our new species has tougher and more rigid leaves, tending towards a leathery-fleshy texture, whereas P. yungfuensis has leaves with a more herbaceous-fleshy texture. Nevertheless, these non-qualitative differences—subjective sensory perceptions of the target objects—are clearly not viable for distinguishing between species. More definitive, qualitative characteristics are needed for unambiguous differentiation. Furthermore, P. marmorata and P. yungfuensis exhibit significant differences in other aspects. The bracts of the new species are notably larger than those of the latter, with a clear separation in these two quantitative traits, showing no overlap and differing by centimeters versus millimeters. Secondly, the calyx of the new species is lanceolate, unlike the lanceolate-linear to narrowly triangular shape of P. yungfuensis, which is clearly more slender. Moreover, the leaf margin of the new species is entire, while that of P. yungfuensis is serrate, crenate to repand, a trait that also effectively distinguishes the two. Finally, in terms of reproductive organs, the corolla tube of the new species is nearly straight and tubular, whereas that of *P. yungfuensis* is distinctly funnel-shaped, and their discontinuous flowering periods suggest potentially different pollinators (Table 1 and Fig. 3).

Although morphologically similar to *P. yungfuensis*, especially in leaf shape and texture, *P. marmorata* is significantly

different. Mature plants of *P. marmorata* are considerably larger than *P. yungfuensis* in terms of rhizome, leaves, peduncle, and flowers, and these quantitative traits are quite stable. The specific epithet 'marmorata' alludes to another distinctive feature of this species—the striking marble-like venation on the upper leaf surface. These leaf patterns exhibit exceptional ornamental characteristics due to their highly irregular shapes, colors, and proportions of the patterned areas. In contrast, the venation of the similar species, *P. yungfuensis*, is a more regular fishbone pattern, and the color is mostly white (in *P. marmorata*, the color varies from pale white, silvery white, white, pale yellow, yellow, to glossy silver sand-like granules, and the depth of color is also uneven), which can be used to distinguish the two species.

Additional specimens examined

Primulina yungfuensis: China, Guangxi, Guilin, Yongfu, 12 July 1985, Fa-Nan Wei 19860510 (IBK); China, Guangxi, 10 Mar. 1986, Fa-Nan Wei 1832 (PE); China, Guangxi, Liuzhou, Longtan Park, 27 Apr. 1989, Long Tan Dou Le Team 00133 (IBK); China, Guangxi, Guilin, Yongfu, Luojin, Long Village, 28 Nov. 2012, Yongfu County Pucha Team 450326121128018LY (IBK); ibid., (GXMG); China, Guangxi, Guilin, Yongfu, Luojin, Jinzhong Mountain, 15 July 2013, Yongfu County Pucha Team 450326130715021LY (IBK); China, Guangxi, Guilin, Lingchuan County, Chaotian, Dayeshenjing, 6 Apr. 2013, Lingchuan County Pucha Team 450323130406048LY (IBK); China, Guangxi, Guilin, Lingchuan County, Haiyang, Antai Village, Baidaidi, 19 June 2013, Lingchuan County Pucha Team 450323130619005LY (IBK); China, Guangxi, Guilin, Yongfu, Luojin, Jinzhong Mountain, 15 July 2013, Yongfu County Pucha Team 450326130715021LY (GXMG); China, Guangxi, Guilin, Yongfu, Luojin, Jinfu County, Qianmadongtun, 13 June 2014, Yongfu County Pucha Team 450326140613066LY (IBK).

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Conflict of interest - The authors declare no conflict of interest.

Author contributions

Shu-Shan Zhang: Data curation (equal); Writing – original draft (lead). **Wei-Chuen Chou**: Investigation (lead); Resources (equal). **Qi-Jun Wang**: Investigation (lead). **Yi-Gang Wei**: Conceptualization (lead); Validation (lead).

Fang Wen: Project administration (lead); Writing – review and editing (lead).

Data availability statement

This article has no additional data.

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