A New Species of Primulina from Guangdong—Primulina huangjinensis Postprint

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Abstract

This paper reports the discovery of a new species of Primulina—Primulina huangjiniana—in Danxia Mountain, Guangdong, and provides its description. This new species is most similar to the congeneric species Primulina depressa, but the two can be well distinguished by the following morphological characters: Primulina huangjiniana has shorter bracts only 2.5–6 mm long (vs. P. depressa with bracts up to 15–30 mm long); calyx lobes of equal length (vs. unequal); filaments geniculate near the base, with glandular hairs above the middle (vs. geniculate at the middle and glabrous); stigma inverted triangular, deeply 2-lobed into two linear lobes (vs. lamellate, slightly 2-lobed, with triangular lobes), parietal placentation (vs. axile placentation). Including this new species, a total of 6 Primulina species have been recorded in Danxia Mountain, among which Primulina danxiaensis and this new species are both endemic to the Danxia landform. Primulina huangjiniana has currently only been found at two localities in Danxia Mountain, with no more than 200 mature individuals. According to the IUCN Red List criteria, it belongs to the Critically Endangered category.

Full Text

Primulina huangjiniana (Gesneriaceae), a New Species from Guangdong, China

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Abstract

Primulina huangjiniana, a new species of Gesneriaceae from Mount Danxia in Guangdong Province, China, is described and illustrated here. The new species is most morphologically similar to *P. depressa* but can be easily distinguished by several key characters: its shorter bracts (2.5–6 mm vs. 15–30 mm long), subequal calyx lobes (vs. unequal), filaments with glandular puberulence above the midpoint and geniculate near the base (vs. glabrous and geniculate near the middle), an obdeltoid stigma that is deeply 2-lobed with linear lobes (vs. lamelliform and slightly 2-lobed with acute-triangular lobes), and parietal placentation (vs. axile). Including this new species, six *Primulina* species are now recorded from Mount Danxia, of which *P. danxiaensis* and *P. huangjiniana* are endemic to the Danxia landform. *Primulina huangjiniana* is currently known from only two localities with fewer than 200 mature individuals, and should be considered Critically Endangered (CR) according to IUCN Red List criteria.

Keywords: Danxia, Didymocarpoideae, Flora of Guangdong, morphological comparison, *Primulina depressa*

Introduction

The redefined genus *Primulina* Hance, based on recent molecular phylogenetic studies, is the largest genus in the subfamily Didymocarpoideae of Gesneriaceae, comprising approximately 204+ species (including subspecies and varieties) in China, encompassing nearly all former species of *Chirita* sect. *Gibbosaccus* Clarke, all species of *Chiritopsis* W. T. Wang, and two species of *Wentsaiboea* D. Fang & D. H. Qin. Its species diversity continues to grow rapidly, with numerous new species discovered and described over the past decade. Notably, more than 170 *Primulina* species are endemic to limestone karsts of southern and southwestern China and northern Vietnam.

Mount Danxia in Guangdong Province represents a classic example of Danxia landform, characterized by red-colored sandstones and conglomerates of primarily Cretaceous age. Over the past three decades, five endemic plant species have been discovered there: *Danxiaorchis sinchiana*, *Diospyros danxiaensis*, *Firmiana danxiaensis*, *Primulina danxiaensis*, and *Viola hybanthoides*. This high endemism in the unique Danxia landform has attracted considerable interest in understanding biodiversity patterns.

Since 2004, we have conducted continuous biological surveys on Mount Danxia to elucidate these biodiversity patterns. During these expeditions, a distinct *Primulina* species was collected by the third author (JQG) in 2016. Including this putative new taxon, six *Primulina* species are now known from Mount Danxia: *P. danxiaensis*, *P. depressa*, *P. rotundifolia*, *P. fimbrisepala*, and *P. eburnea*. At first glance, the putative new taxon resembles *P. depressa*, a relatively common species on Mount Danxia. However, after two years of field observations and comprehensive literature review, we confirm that it represents

a new species clearly distinguished from *P. depressa*, which we describe and illustrate here.

Materials and Methods

Morphological observations of the new species and its close relatives were based on living plants in the field and dried herbarium specimens. A high-resolution image of the *Primulina depressa* holotype (deposited at K, barcoding number K000858361) was consulted via JSTOR Global Plants (https://plants.jstor.org/, accessed 10 July 2019). All morphological characters were measured using a micrometer and stereomicroscope (Leica S8APO, Leica Microsystems Inc., Germany), with descriptions following the terminology of Wang et al. (1998) and Li & Wang (2005). Voucher specimens are deposited in IBSC, IBK, and SYS.

Taxonomic Treatment

***Primulina huangjiniana* W. B. Liao, Q. Fan & C. Y. Huang, sp. nov.**

Figs. 1 [Figure 1: see original paper] and 2 [Figure 2: see original paper]

Similar to *Primulina depressa* but differing in its shorter bracts (2.5–6 mm vs. 15–30 mm long), subequal calyx lobes (vs. unequal), filaments glandular-puberulent above the midpoint and geniculate near the base (vs. glabrous and geniculate near the middle), deeply 2-lobed obdeltoid stigma with linear lobes (vs. slightly 2-lobed lamelliform stigma with acute-triangular lobes), and parietal placentation (vs. axile).

Type. CHINA. Guangdong Province, Renhua County, Mount Danxia, on moist rocks at forest edge, 130 m a.s.l., 20 April 2018, Q. Fan and Y. S. Huang 16997 (holotype: SYS!; isotypes: IBK!, IBSC!, SYS!).

Description. Perennial herbs with subterete rhizomes 0.5–2 cm long and 2–5 mm in diameter, with inconspicuous internodes. Leaves 4–10, crowded at the rhizome apex; petiole flattened, (0.5–)1–4(–7) cm long, 2–5 mm wide, pubescent; leaf blade fleshy when fresh, thin chartaceous when dried, ovate to oblong-elliptic, (2–)3–7.5(–10) × (1–)1.5–4(–5.5) cm, both surfaces densely pubescent, apex acute to obtuse, base cuneate, margin repand or inconspicuously serrate; lateral veins 3–4 on each side, inconspicuous. Cymes 2–7 or more, 1–2-branched, 1–5-flowered; peduncle 0.5–1.5 cm long, ca. 1 mm in diameter, densely pubescent; bracts 2, opposite, green, linear-lanceolate, 2.5–6 × ca. 1 mm, margin entire, apex acute, densely pubescent on both surfaces; pedicel 2–5 mm long, ca. 1 mm in diameter, densely pubescent. Calyx 5-parted to base; lobes lanceolate, 6–12 × 1–1.5 mm, margin entire, both surfaces densely pubescent. Corolla 3.5–4.0 cm long, pale blue-purple or white, with bluish purple stripes inside; upper interior with yellowish brown marking, outside sparsely puberulent, inside glabrous; corolla tube tubular to infundibuliform, 2.4–3.1 cm long, 7–10 mm in diameter at mouth, 3–4 mm at base; limb distinctly 2-lipped,

adaxial lip 2-lobed, lobes ovate, 8–10 × 5–7 mm, abaxial lip deeply 3-lobed, lobes oval to oblong, 10–12 × 5–7 mm. Stamens 2, adnate to 1.5–2 cm above corolla tube base; filaments linear, 8–13 mm long, geniculate near base, with glandular trichomes above midpoint; anthers fused by entire adaxial surfaces, 1.5–3.5 mm long, glabrous. Staminodes 3, the lateral ones 2–5.5 mm long, apex capitate, adnate to 1.3–2 cm above corolla tube base, the middle one 0.5–1 mm long, sometimes absent, adnate to 1–1.2 cm above corolla tube base, glabrous. Disc annular, ca. 1 mm in height. Pistil 2.6–3.2 cm long; ovary conical, 3–4.5 mm long, 1–2 mm in diameter, densely pubescent; style 2.6–3.2 cm long, ca. 0.8 mm in diameter, pubescent; stigma obdeltoid, deeply 2-lobed, 4–8 mm long, lobes linear. Capsule ovoid to cylindrical, 4–9 mm long, 2–3 mm in diameter, densely pubescent.

Distribution and habitat. *Primulina huangjiniana* is currently known only from two localities on Mount Danxia, Renhua County, northern Guangdong, China. The species grows on moist rocks at forest edges or on sunny cliff faces. Associated herb species include *Microsorum fortunei*, *Onychium japonicum*, *Selaginella davidii*, *S. delicatula*, and *Youngia heterophylla*.

Preliminary Conservation Status. Only two populations were found, with no more than 200 mature individuals occupying a total area of about 0.5 km^2. The localities are over 10 km apart. According to IUCN Red List criteria (IUCN 2017), the species should be considered Critically Endangered (CR, B2a).

Phenology. Flowers from March to May and fruits from April to June (based on field observations by QF and JQG from March 2017 to November 2018).

Etymology. The specific epithet honors Prof. Jin Huang (1927–2016) of Sun Yat-sen University, a distinguished expert who made significant contributions to Danxia landform research.

Vernacular name. The Chinese pronunciation is Huáng Jìn Bào Chūn Jù Tái (黄进报春苣苔).

Fig. 1. Illustration of *Primulina huangjiniana*. A. Habit; B. Leaves; C. Flower, lateral view; D. Flower, front view; E. Detached corolla showing stamens and staminodes; F. Fertile stamens; G. Stigma; H. Ovary in longitudinal section; I. Ovary in transverse section; J. Young capsule with sepals and bracts. (Drawn by Yunxiao Liu from the holotype)

Fig. 2. Photographs of *Primulina huangjiniana*. A. Habitat; B. Habit; C. Rhizome; D. Cymes with flowers and buds; E. Flowers in front view showing tubular corolla; F. Flower in front view showing deeply bifid stigma and linear lobes; G. Detached corolla showing yellowish brown marking on upper interior. (Photos by Qiang Fan [A-E] and Zaixiong Chen [F-G])

Notes. Morphologically, the closest relative of *Primulina huangjiniana* appears to be *P. depressa* (Fig. 3 [Figure 3: see original paper]), also endemic to northern Guangdong. The type locality of *P. depressa* was recorded from a district on the North River of Guangdong Province without precise location details. It is

a common species on moist rocks of Mount Danxia but interestingly never co-occurs with *P. huangjiniana*. It was previously mistaken for *P. depressa* until anatomical studies revealed its parietal placentation, which differs from the axile placentation of *P. depressa*.

The two species share some characters: peduncles usually shorter than petioles, giving flowers a nestled appearance among leaves; a yellowish brown marking on the upper corolla interior; and relatively small capsules (less than ca. 1 cm long) compared to other large-flowered *Primulina* species that typically have longer linear capsules (1–5 cm) (except former *Chiritopsis* and *Wentsaiboea* species). However, *P. huangjiniana* is readily distinguished by its slender rhizome (2–5 mm vs. 6–12 mm diameter), shorter leaf blade (3–7.5 cm vs. 8–20 cm long) and bracts (2.5–6 mm vs. 15–30 mm long), subequal calyx lobes (vs. unequal), filaments with glandular puberulence above the middle and geniculate near the base (vs. glabrous and geniculate near the middle), deeply 2-lobed obdeltoid stigma with linear lobes (vs. slightly 2-lobed lamelliform stigma with acute-triangular lobes), and parietal placentation (vs. axile) (Table 1). Additionally, the species have different flowering times: *P. huangjiniana* blooms from March to May, while *P. depressa* blooms from April to June.

Key to differentiate the new species and other *Primulina* species from Mount Danxia, Guangdong, China

1. Leaf blade orbicular-ovate to orbicular-reniform; bracts narrowly triangular, 4–6 × 0.8–1 mm …… *P. rotundifolia*
2. Leaf blade ovate to elliptic or obovate; bracts ovate to orbicular-ovate, 10–45 × 8–28 mm …… *P. eburnea*

Fig. 3. Photographs of *Primulina depressa*. A. Habitat; B. Habit; C. Flowers, front view; D. Detached corolla showing stamens and staminodes. (Photos by Qiang Fan)

Fig. 4. Photographs of four *Primulina* species on Mount Danxia. A. *Primulina danxiaensis*; B. *P. eburnea*; C. *P. fimbrisepala*; D. *P. rotundifolia*. (Photos by Qiang Fan [A, D], Huagu Ye [B], and Feifei Li [C])

Table 1. Diagnostic character differences between *Primulina huangjiniana* sp. nov. and its close relative *P. depressa*.

Characters	*P. huangjiniana*	*P. depressa*
Rhizome	0.5–2 cm long, 2–5 mm diameter	1–3.5 cm long, 6–12 mm diameter
Leaf blade	Ovate to oblong-elliptic, (2–)3–7.5(–10) × (1–)1.5–4(–5.5) cm	Broadly lanceolate to oblong, 8–20 × 3–7 cm
Petiole	(0.5–)1–4(–7) cm long	4–10 cm long
Bracts	2.5–6 × ca. 1 mm	15–30 × 1.5–3 mm

Characters	*P. huangjiniana*	*P. depressa*
Calyx lobes	Subequal, 6–12 × 1–1.5 mm	Unequal, 13–2 × 1.5–2 mm
Corolla	3.5–4 cm long, abaxial lip 3-partite, lobes oblong	4.5–5 cm long, abaxial lip 3-lobed, lobes rounded
Filaments	With glandular trichomes above midpoint, geniculate near base	Glabrous, geniculate near midpoint
Stigma	Obdeltoid, deeply 2-lobed, lobes linear	Lamelliform, slightly 2-lobed, lobes acute-triangular
Placenta	Parietal placenta	Axile placenta

Additional specimen examined (paratypes). CHINA. Guangdong Province, Renhua County, Mount Danxia, on sunny rocks, 466 m a.s.l., 20 April 2018 (fl.), Q. Fan and Y. S. Huang 16995 (SYS); same locality, 125 m a.s.l., 2 June 2018 (fr.), Q. Fan 17003 (SYS).

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Note: Figure translations are in progress. See original paper for figures.