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Paraboea yunfuensis: a new calcicolous species of Gesneriaceae from Yunfu, Guangdong Province, China

Fang Wen and Yi-Gang Wei *

Gesneriad Conservation Center of China, Guangxi Key Laboratory of Plant Conservation and Restoration Ecology in Karst Terrain, Guilin Botanical Garden, Guangxi Institute of Botany, Guangxi Zhuang Autonomous Region and Chinese Academy of Sciences, Guilin, 541006, China
**Author for correspondence:* weiyigang@aliyun.com

Abstract

Paraboea yunfuensis F. Wen & Y.G. Wei (Gesneriaceae) is described as a new species endemic to the Guangdong Province, China. This species is one of two peltate-leaved *Paraboea* species in China. It is distinguished from the similar-looking *P. peltifolia* by the presence of longer pedicel and filaments, shorter staminodes, linear-lanceolate calyx lobes, and an indumentum on peduncles, pedicels, and calyx lobes. A detailed description, photographs of a specimen from the type location, and a table of comparative characters are provided.

Introduction

Paraboea (Clarke) Ridley (Gesneriaceae) is one of the largest genera of the Old world Gesneriaceae (Weber 2004). All species in this morphologically diverse genus are herbs, with wide variation in habit, floral indumentum, inflorescence form, and seed capsule shape (Xu and Burtt 1991; Xu et al. 2008). The genus, originally described as a section of *Didymocarpus* (section *Paraboea* Clarke: Clarke 1883), was subsequently upgraded to the generic level by Ridley (1905). Since then, the name *Paraboea* has been maintained despite significant taxonomic changes in the Gesneriaceae over the last decade, where monotypic *Phylloboea* Benth. and *Trisepalum* C.B.Clarke have been synonymized within *Paraboea* (Puglisi et al. 2011; Middleton et al. 2010).

Paraboea includes at least 130 species distributed from South to Southwest China, Indo-China Peninsula to Malaysia, Indonesia, and the Philippines (Burtt 1948, 1984; Xu and Burtt 1991; Xu et al. 2008, 2012; Chen et al. 2008, 2012; Kiew 2010; Puglisi et al. 2011; Triboun and Middleton 2012; Triboun 2013; Xu et al. 2012). Several species of *Paraboea* have recently been described from South and Southwest China, namely *P. trisepala* W.H. Chen & Y.M. Shui, *P. hekouensis* Y.M. Shui & W.H. Chen, *P. manhaoensis* Y.M. Shui & W.H. Chen, *P. angustifolia* Yan Liu & W.B. Xu and *P. tetrabracteata* F.Wen, Xin Hong & Y.G.Wei (Chen et al. 2008, 2012; Xu et al. 2012; Wen et al. 2013). This region includes the Guangdong province, a global plant diversity hotspot, whose karst formations contribute to 3.5% (6, 208 km^2) of its total area (Davis et al. 1995). The high solubility of limestone combined with variable temperatures (6–39 °C) and precipitation (1350–1920 mm per annum) of the region influence its highly variable geomorphology (Cen et al. 1990). This, combined with a high level of edaphic variability, appears to be associated with its correspondingly high levels of biodiversity and endemism (Tao et al. 2015; Clements et al. 2006; Li and Wang 2012).

An area with particularly high biodiversity within Guangdong, Yunfu city, harbours 130 plant families, consisting of 373 genera and >600 species (Wang 2015). In an effort to improve our floristic understanding of the region, a botanical survey was conducted in Aug 2014. During the survey, a specimen of an undescribed *Paraboea* species was discovered and collected from a single population on a limestone cliff. Using this specimen, we here provide a description and images of the new species *P. yunfuensis*.

Taxonomic Treatment

Paraboea yunfuensis F. Wen & Y.G. Wei ***sp. nov.***

Diagnosis: *Paraboea yunfuensis* is morphologically most similar to *P. peltifolia* because they both have a peltate leaf base. The leaf blade apex of *P. yunfensis*, however, is acuminate to obtuse, lateral veins are 5–7 on each side of midrib (vs. 11–18), peduncle nearly glabrous but with reddish-brown matted indumentum near its base (vs. densely woolly and brownish), bracts 4.6–5.2 mm long and glabrous outside (vs. 2–3(–4) mm long and outside densely woolly and brownish), pedicel 1.2–2 cm long and glabrous (vs. c. 6 mm long and densely woolly and brownish), filaments 4–4.5 mm long (vs. c. 3 mm long), staminodes 1–1.2 mm long (vs. c. 2 mm long).

Type: China. Guangdong Province: Yunfu City, Yuncheng District, Luoshi Village, Hongyan, 22.901024 N, 112.011613 E, alt. ± 164 m, 28 Nov 2013, *Fang Wen 141128-01* (flowering) (holo: IBK, iso: ANU).

Terrestrial, rosulate, perennial herb. *Rhizomes* stout and lignified, subterete, 5–8 cm long, 5–12 mm in diameter. *Roots* slender, fibrous. *Leaves* 8–12, congested at the apex of the rhizome, with a short petiole up to 3 cm long, leaf blade 8.0–11.5 × 1.6–5.0 cm, obovate, oblanceolate to narrowly oblanceolate, spatulate, or subpandurate, chartaceous, bases attenuate but becoming peltate-auriculate, margins ± irregularly serrulate, rarely entire, fawn-coloured, matted indumentum, apices acuminate to obtuse, upper leaf surfaces covered with greyish arachnoid hairs when young and glabrescent in age, lower leaf surface indumentum matted, fawn-coloured, lateral veins 5–7 on each side of midrib, adaxially sunken and abaxially prominent. *Inflorescences* cymose, axillary, 1–3-branched, 3–12-flowered; peduncles slender, 4–7 cm long, 1–1.5 mm in diameter, reddish-brown, glabrous with indumentum matted, reddish-brown near base; bracts two, 4.6–5.2 × 0.8–0.9 mm, linear-lanceolate, margins entire, apices obtuse, with sparsely greyish matted indumentum outside, glabrous inside; pedicels 1.2–2 cm long, 0.6–0.7 mm in diameter, reddish-brown, glabrous. *Calyx* 3.2–3.7 × 0.7–0.8 mm, 5-lobed nearly to the base, lobes linear-lanceolate, greenish-brown, glabrous outside and inside, margins entire. *Corolla* 1.4–1.6 cm long, pinkish-purple to reddish-purple, outside and inside glabrous; tube 5.5–7 mm long, 4.5–5.2 mm in diameter at the mouth; the limb distinctly 2-lipped, adaxial lip 2-lobed from its base, lobes broadly ovate, 4.0–4.2 × 3.5–3.9 mm, abaxial lip 3-lobed for more than half of length, lobes broadly ovate, 4.0–4.5 × 5.0–6.0 mm. *Stamens* 2, adnate to the corolla base; filaments 4–4.5 mm long, glabrous; anthers semicircular, c. 3.0 mm long; staminodes two, glabrous, 1–1.2 mm long, adnate to the corolla tube base. *Pistil* glabrous; ovary 3.5–4.0 mm long, c. 1.5 mm in diameter at middle, style c. 4.5 mm long, stigma capitate. *Capsule* straight, glabrous, not twisted, 2.5–3.0 cm long, c. 3 mm diameter. **Fig. 1**.

Etymology: The specific epithet is derived from the type locality, Yunfu city, Guangdong, China.

Vernacular name: Yún Fú Zhū Máo Jǔ Tái (Chinese pronunciation); 云浮蛛毛苣苔 (Chinese name).

Phenology: Flowering in November; fruit develop late January and throughout February.

Ecology and habit: *Paraboea yunfuensis* grows in the Yunfu region, that has a annual average temperature of 21.5 °C, average annual rainfall of 1,600 mm, and frosts occurring 15 to 34 days per year. Plants grow in the shaded crevices of damp limestone cliffs at c. 164 m alt. Subtrate consists of terra rossa and rendzina with pH 7.0–7.5 (Cen et al. 1990). Surrounding vegetation is subtropical evergreen broad-leaved forest consisting of *Pterospermum heterophyllum* Hance, *Dalbergia benthamii* Prain, *Cratoxylum cochinchinense* (Lour.) Bl., *Glycosmis pentaphylla* (Retz.) Correa, *Toddalia asiatica* (L.) Lam., *Sageretia thea* (Osbeck) Johnst., *Alchornea trewioides* (Benth.) Muell. Arg., *Allocasia macrorrhiza* (Linn.) Schott, and *Primulina bicolor* (W.T. Wang) Mich. Möller & A. Weber (Huang 2005).

Proposed IUCN Conservation Status: A search around the type location (c. 5 km^2) revealed no other populations. The type location consists of approx. 500 mature individuals growing on a limestone hill. The population does not occur in a protected area, and future protection measures are required. The area has been relatively undisturbed due to its significance to the surrounding village, although locals continue to forage in it for firewood. Considering the small population size and fragile habitat, we propose that *Paraboea yunfuensis* requires classification as Endangered (EN C2b) under IUCN criteria (2011).

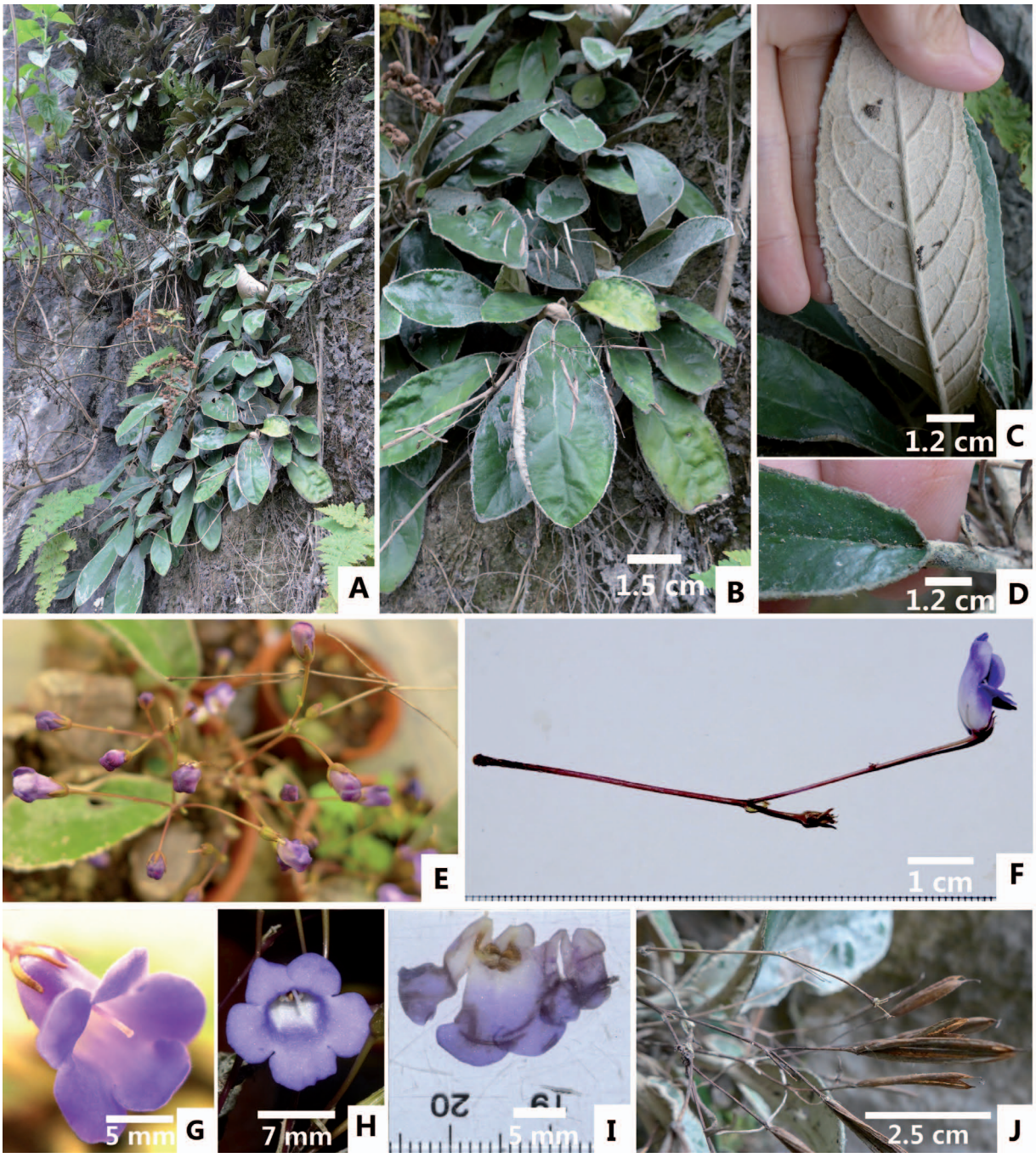

Fig. 1. *Paraboea yunfuensis* F. Wen & Y.G. Wei: **A,** habit; **B,** habit showing infructescence and adaxial view of leaves; **C,** leaf, abaxial view; **D,** peltate base of leaf lamina; **E,** inflorescence with unopened buds; **F,** inflorescence stem showing glabrous surface and flower in profile view; **G,** corolla oblique view; **H,** corolla frontal view; **I,** dissected corolla showing stamens; **J,** infructescence with dehisced capsules. Images taken at type location by F. Wen.

Notes and affinities: There are two patterns of capsule development in *Paraboea*: (1) the capsule forms a spirally twisted valve; and (2) the capsule forms a linear valve. All *Paraboea* species with non-twisted and nearly straight capsules have axillary cymes. As *Paraboea yunfuensis* possesses a linear valve and axillary cyme, it is likely that it is a member of group 2. Although *P. yunfuensis* is most similar to *P. peltifolia* from Mashan County, Guangxi Province (as described in the diagnosis), it also shares a lax cyme and numerous flowers with *P. filipes* and *P. guilinensis*. *Paraboea yunfuensis* can be distinguished from *P. filipes* by its larger vegetative size (*P. yunfuensis*: 1.4–1.6 cm long vs. *P. filipes*: c. 1 cm long) and numerous flowers (3–12-flowered vs. 1–2-flowered). *Paraboea yunfuensis* differs from *P. guilinensis* by having a rosulate growth form vs. erect stem growth habit, and possessing unequal vs. equal length calyx lobes. Diagnostic character differences between *P. paraboea* and similar species are presented in Table 1.

Table 1. Morphological comparison between *Paraboea yunfuensis, P. peltifolia, P. guilinensis* and *P. filipes*.

Characters	*P. yunfuensis*	*P. peltifolia*	*P. guilinensis*	*P. filipes*
Leaf margin	± irregularly serrulate, occasionally entire	irregularly crenate-serrate	entire to slightly denticulate, involute	nearly entire, involute
Lamina apex	acuminate to obtuse	obtuse to rounded	rounded	obtuse to rounded
Lateral veins	5–7 on each side of midrib	11–18 on each side of midrib	5–6 on each side of midrib	4–6 on each side of midrib
Peduncle	glabrous except near base with matted reddish-brown indumentum	densely woolly, brownish indumentum	glabrous	glabrescent
Bracts	4.6–5.2 mm long, glabrous outside	2–3(–4) mm long, densely brownish woolly outside	c. 0.5 mm or not present	c. 1 mm or not present
Pedicel	1.2–2 cm long	c. 6 cm long	1–2 cm long	1.5–3.5 cm long
Corolla colour	pinkish-purple to reddish-purple	white to pale pink	white to purple	purplish
Filaments	4–4.5 mm long	c. 3 mm long	4.5–5 mm long	c. 2.5 mm long
Staminodes	1–1.2 mm long	c. 2 mm long	≤1.2 mm long	c. 0.2 mm long
Anthesis	Nov	Jan–Feb	Apr	Sep–Oct

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