



## *Petrocosmea hsiwenii* (Gesneriaceae), a new species from Yunnan, China

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**ABSTRACT:** *Petrocosmea hsiwenii* Lei Cai, J.D.Ya & J.Cai, a new species of Gesneriaceae from Jinping County, southeastern Yunnan, China, is described and illustrated. The new species is morphologically similar to *P. rosettifolia* C.Y.Wu ex H.W.Li in the shape, color and structure of the flowers, but it can be easily distinguished by the shape of the leaf blade, the number of lateral veins, the indumentum characters of the leaves, stem, anther and pistil, as well as the type of inflorescence. The morphological relationship between this and similar species is discussed, and a detailed descriptions is provided, together with colored photographs, and information on the distribution. We propose that *P. hsiwenii* be assigned an IUCN conservation status of endangered (EN).

**KEY WORDS:** Flora of Yunnan, Hsi-Wen Li, karst region, new taxa, *Petrocosmea rhombifolia*, *Petrocosmea rosettifolia*.

### INTRODUCTION

The genus *Petrocosmea* Oliv. currently comprises nearly 70 species, and is distributed mainly through northeastern India, northern Myanmar, Thailand, Laos, Vietnam, and into China ((GRC, 2022; Li *et al.*, 2020; Li and Wang, 2004; Middleton and Triboun, 2010; Oliver, 1887; Qiu and Liu, 2015; Wang *et al.*, 1998). The Flora of China (Wang *et al.*, 1998) and Plants of Gesneriaceae (Li and Wang, 2004) list 24 species and 4 varieties of this genus from China, and 34 species and 4 varieties were recorded from China in the recent revision in Plants of *Petrocosmea* (Qiu and Liu, 2015) based on molecular and morphological data. In the past 15 years, more than 30 *Petrocosmea* species have been officially published, with most newly described species being endemic to China, therefore, China is the center of distribution of this genus, and is home to 60 taxa, most of which are found in the south and southwest of the country, especially in the karst area of Yunnan-Guizhou Plateau. (GRC, 2022; Han *et al.*, 2018, 2019, 2022; Huang and Xin, 2021; Jiang *et al.*, 2020; Wang *et al.*, 2013; Wen, 2019; Wen *et al.*, 2022; Yang *et al.*, 2019).

In August 2015, during field investigations in the karst region in southeastern Yunnan, an unknown species of Gesneriaceae with young fruits growing in Jinping County attracted the attention of the first author. Several sterile individuals of this species were subsequently re-collected and cultivated in Kunming Botanical Garden (KBG) in June 2018, where they flowered in May 2019. A further two populations with flowering plants were found in the same area in May and June of 2020.

Examination of the flower and fruit characteristics allowed the authors to identify the species as belonging to *Petrocosmea*. After careful examination of the relevant specimens and literature surrounding the genus *Petrocosmea* in the adjacent regions (Han *et al.*, 2018, 2019, 2022; Huang and Xin, 2021; Jiang *et al.*, 2020; Li and Wang, 2004; Middleton and Triboun, 2010; Qiu and Liu, 2015; Qiu *et al.*, 2012; Wang *et al.*, 1998; Wang *et al.*, 2013; Yang *et al.*, 2019), it was concluded that this plant represents a species new to science. Here, the new species *Petrocosmea hsiwenii* Lei Cai, J.D.Ya & J.Cai is described, and its morphological characters are compared with the closely related species *P. rosettifolia* C.Y.Wu ex H.W.Li (Fig. S1; Table 1) and *Petrocosmea rhombifolia* Y.H.Tan & H.B.Ding (Table 1).

### TAXONOMIC TREATMENT

*Petrocosmea hsiwenii* Lei Cai, J.D.Ya & J.Cai, *sp. nov.*

錫文石蝴蝶 Fig. 1

**Type:** China. Yunnan: Jinping County, Tongchang Town, Dongzonghe Village, Datangzi Fork, 22°46' 45.26"N, 103°04'41.86" E, elev. 1365 m, growing on limestone (cultivated in Kunming Botanical Garden), in flowering, 23 May 2019, *Lei Cai* CL20190501 (holotype: KUN!, isotype: KUN!).

**Diagnosis:** *Petrocosmea hsiwenii* morphologically resembles *P. rosettifolia* in the shape, color and structure of the flowers, but can be easily distinguished from the latter by the following characters. Most plant parts covered with brownish-red jointed pilose and villous indumentum (**vs.** pubescent and puberulent indumentum), petiole to

**Table 1.** Morphological comparison of *Petrocosmea hsiwenii*, *P. rosettifolia* and *P. rhombifolia*.

Characters	<i>P. hsiwenii</i>	<i>P. rosettifolia</i>	<i>P. rhombifolia</i>
Plant indumentum	brownish red jointed pilose and villous	pubescent and puberulent	pubescent to sericeous
Leaf blade shape	ovate, elliptic to oblong	broadly ovate to orbicular or broadly elliptic	ovate or ovate to rhombic
Blade size	1.8–15.3 × 1.2–8.2 cm	0.5–4 × 0.4–3 cm	1.5–5.3 × 1.3–2.8 cm
Blade base	base cordate, rounded or broadly cuneate, sometimes oblique	broadly cuneate to rounded	rounded or cuneate
Blade apex	apex obtuse	apex obtuse to broadly acute	acute or obtuse
Blade margin	serrate	entire to crenulate-serrulate	nearly entire or slightly repand
Blade lateral veins	5–8 on each side, adaxially inconspicuous, abaxially conspicuous	3–4 on each side, both sides inconspicuous	2–3 on each side, abaxially conspicuous
Petiole	up to 17.5 cm	up to 4 cm	0.5–15 cm long
Corolla throat	white	blueish-purple	blue
Anther	covered with golden capitate-glandular puberulent hairs	glabrous	glabrous
Ovary indumentum	densely glandular puberulent	densely puberulent	densely villous
Inflorescence	cyme 2–4-flowered	1-flowered	1-flowered

17.5 cm long (**vs.** to 4 cm long); leaf blades ovate, elliptic to oblong, 1.8–15.3 × 1.2–8.2 cm, base cordate or circular, apex obtuse, margin serrate (**vs.** broadly ovate to orbicular or broadly elliptic, 0.5–4 × 0.4–3 cm, base broadly cuneate to nearly rounded, apex obtuse to broadly acute, margin entire to crenulate-serrulate toward apex); throat white (**vs.** throat blueish-purple); anther covered with golden capitate-glandular puberulent hairs (**vs.** glabrous); ovary densely glandular puberulent (**vs.** puberulent); cyme 2–4-flowered (**vs.** inflorescence 1-flowered).

**Description:** Perennial herb with short rhizomatous stem and crowded fibrous roots. **Leaves** 10–50 per plant, all basal; **petioles** 0.8–17.5 cm long, 3–5 mm in diam., densely brownish red jointed pilose and villous; **leaf blades** ovate, elliptic to oblong, 1.8–15.3 × 1.2–8.2 cm, papery when dry, adaxially densely covered with white jointed pilose and villous indumentum, abaxially densely jointed pilose and brownish red villous along the veins, base cordate, rounded or broadly cuneate, sometimes oblique, apex obtuse, margin serrated; lateral veins 5–8 on either side of midrib, adaxially inconspicuous, abaxially conspicuous. **Cymes** 5–15, 2–4-flowered per branch; **peduncles** 2.0–4.5 cm long, densely brownish red jointed pilose; **bracts** 2, opposite, lanceolate triangular, 5–7 mm long, ca. 2–2.5 mm wide at the widest point, outside densely jointed pilose; **pedicels** 1.0–2.2 cm long, densely jointed pilose. **Calyx** 5-lobed nearly to base; lobes 5–7 mm long, 1.5–2.0 mm at the widest point, lanceolate triangular, equal, outside densely jointed pilose, inside pilose. **Corolla** bluish violet, 1.2–1.5 cm long, outside sparsely pubescent, inside glabrous; tube 0.8–1.0 cm long, campanulate, with two yellow spots and purple halos inside the tube under the stamens, throat white; limb 2-lipped, adaxial lip 2-lobed from the middle, lobes semiorbicular, 5–7 × 5–7 mm, abaxial lip 3-lobed to near base, lobes semiorbicular to oval, 6–8 × 5–7 mm, all lobes margin sparsely glandular puberulent. **Stamens** 2, ca. 4 mm long, adnate to the corolla tube at the base;

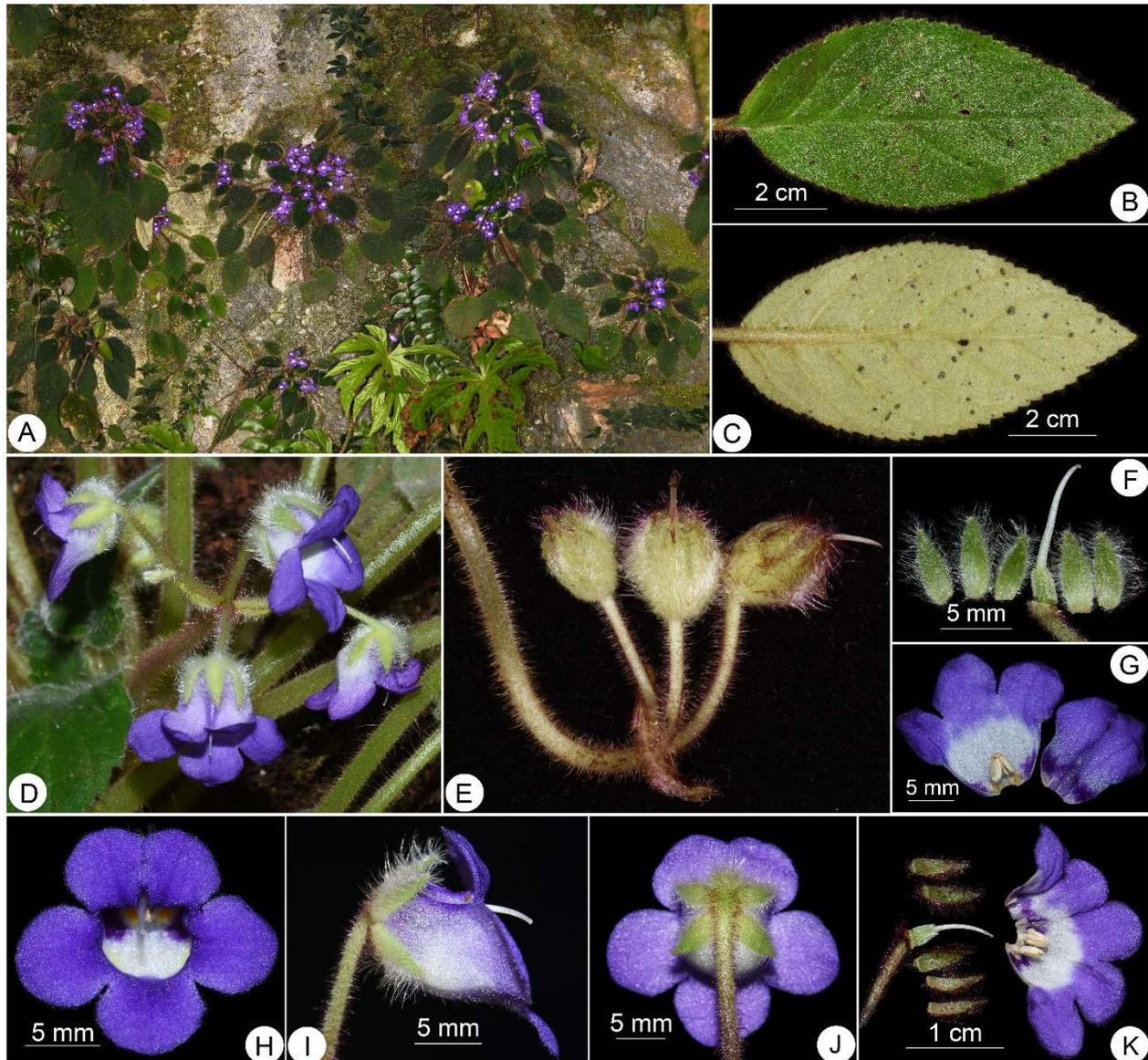
filaments ca. 2 mm long, glabrous; anthers ovate, ca. 2.5 mm long, covered with golden capitate-glandular puberulent hairs, the anthers connivent at ventral of abaxial theca. **Staminodes** 3, ca. 0.6 mm long, adnate to the corolla tube at the base, glabrous, the central one occasionally inconspicuous. **Pistil** 9–12 mm long; ovary ovoid, green, 2–3 mm long, 1.2–2 mm in diameter, densely glandular puberulent; style white, 7–9 mm long, 0.3–0.4 mm in diameter, glabrous, stigma capitate. Young fruit ovoid, densely glandular puberulent.

**Phenology:** Flowering from May to June; fruiting from August to October.

**Etymology:** The specific epithet is in memory of Prof. Li, Hsi-Wen (李錫文, 1931–2021) from the Kunming Institute of Botany, Chinese Academy of Sciences for his contribution to the taxonomy of the Gesneriaceae family in the Flora of Yunnan, China.

**Distribution and Ecology:** *Petrocosmea hsiwenii* is currently known only from the type locality (Tongchang Town, Jinping County, Yunnan, China) in the karst region comprising three adjacent populations. This species grows on the surfaces or in the limestone crevices under limestone forests. It is often associated with the following herbs: *Begonia* sp., *Clarkella nana*, *Elatostema* sp., *Cyrtomium* sp. and other fern species.

**Conservation status:** Our field investigations have only revealed the three populations making up the type locality of *Petrocosmea hsiwenii*, in total comprising ca. 1000 mature individuals within 2.5 km<sup>2</sup>. Road construction and mining have damaged the surrounding habitat. Thus, this species is provisionally assigned an IUCN conservation status of Endangered [EN B2a b(iii)] following the IUCN Red List Categories and Criteria (IUCN, 2019). As the species is located near Tongchang town, road construction and quarrying continue to pose a potential serious threat to its habitat, and this species therefore needs our attention and protection.



**Fig. 1. *Petrocosmea hsiwenii*** Lei Cai, J.D.Ya & J.Cai. **A.** Habitat. **B.** Adaxial surface of leaf blade. **C.** Abaxial surface of leaf blade. **D.** Inflorescences. **E.** Young fruits. **F.** Pistil with calyx lobes. **G.** Dissected flower showing stamens and staminodes. **H.** Frontal view of a flower. **I.** Lateral view of a flower. **J.** Rear view of a flower. **K.** Dissected flower showing the internal structure. Photographs by Ji-Dong Ya (A) and Lei Cai (B–K).

**Additional specimens examined (paratypes):** China. Yunnan: Jinping County, Tongchang Town, Dongzonghe Village, Datangzi Fork, 22°46'45.26"N, 103°04'41.86" E, elev. 1365 m, on the surface of limestone, with young fruits, 30 June 2018, *Lei Cai CL20180601* (KUN!); Yunnan: Jinping County, Tongchang Town, Dongzonghe Village, Qingjiao, 22°46'46.03" N, 103°02'26.55" E, elev. 1802 m, on the surface of limestone, in flowering, 9 May 2020, *Ji-Dong Ya & Jie Cai 20CS19018* (KUN!, TAI!).

**Notes:** *Petrocosmea hsiwenii* most closely resembles *P. rosettifolia* in the morphological characters of their flowers, such as: corolla bluish violet, tube campanulate, anthers not constricted near apex, filaments unbending and glabrous, however, it can be clearly distinguished from the latter species by several characters (see Table 1 and Fig. S1). Moreover, a new species, *Petrocosmea*

*rhombifolia*, which is similar to *P. rosettifolia* in the shape of the leaf and flower, inflorescence 1-flowered was published in 2019 (Yang *et al.*, 2019). However, there are great differences between *P. rhombifolia* and *P. hsiwenii*, only some similarities in the flower shape, and the rest can be distinguished completely (Yang *et al.*, 2019), the detailed comparison is in Table 1. In addition, the leaf shape and overall plant morphology also similar to several other species of *Petrocosmea*, including *P. funingensis* Q.Zhang & B.Pan, *P. grandiflora* Hemsl., and *P. melanophthalma* Huan C.Wang, Z.R.He & Li Bing Zhang, but the following characteristics are completely different, the filaments of the later three species are all



hairy, the leaf bases of *P. funingensis* and *P. melanophthalma* are different, the shape of flowers and the indumentum characteristics of the ovary are also very different (Wang *et al.*, 1998; Wang *et al.*, 2013; Zhang *et al.*, 2013). The color of the indumentum in most wild individuals of *P. hsiwenii* is usually red, which is also an obvious distinguishing feature. The division of groups of this genus has always been very difficult, and some scholars think the existing sectional treatment of the genus insufficiently reflects its morphological diversity and phylogeny (Middleton *et al.*, 2021; Qiu and Liu, 2015). However, the boundaries of the genus have not changed after research based on molecular and morphological data, thus, the systematic taxonomy of this genus is worthy of further study (Qiu and Liu, 2015).

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