



## *Petrocodon albinervius*, a new species of Gesneriaceae from limestone areas in southwestern Guangxi, China

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**ABSTRACT:** *Petrocodon albinervius* D.X. Nong & Y.S. Huang (Gesneriaceae) is described and illustrated as a species new to science occurring in the limestone area of southwestern Guangxi, China. It shows overall most similarity with *P. ionophyllus* F. Wen, S. Li & B. Pan, *P. integrifolius* (D. Fang & L. Zeng) A. Weber & Mich. Möller and *P. ainsliifolius* W.H. Chen & Y.M. Shui in leaf shape, but differs in several characters such as the leaf blade indumentum, leaf veins coloration, the size and shape of bracts, the number of cymes per plant and flowers per cyme, and the shape of the stigma. Besides a diagnosis and detailed description, we also provide ecological information, photographic images, a table and taxonomic notes to distinguish several other morphologically similar *Petrocodon* species and proposed conservation status for this species.

**KEY WORDS:** limestone flora, new taxon, *Petrocodon ainsliifolius*, *Petrocodon integrifolius*, *Petrocodon ionophyllus*, taxonomy.

### INTRODUCTION

The genus *Petrocodon* Hance (1883) has recently been revised, and *Dolicholoma* D. Fang & W.T. Wang (Wang, 1983), *Lagarosolen* W.T. Wang (1984), *Tengia* Chun (1946), *Paralagarosolen* Y.G. Wei (2004), *Calcareaoboea* C.Y. Wu ex H.W. Li (Li, 1982), one species of *Wentsaiboea* D. Fang & D.H. Qin (Fang *et al.*, 2004) and four species of *Didymocarpus* Wallich (1819), were moved to *Petrocodon* Hance (Wang *et al.*, 2011; Weber *et al.*, 2011). Thus, including *P. tiandengensis* (Yan Liu & B. Pan) A. Weber & Mich. Möller (Liu *et al.*, 2010; Weber *et al.*, 2011), *P. guangxiensis* (Yan Liu & W.B. Xu) W.B. Xu & K.F. Chung (Liu *et al.*, 2011; Xu *et al.*, 2014) and several newly published species (Zhang *et al.*, 2018, 2020; Chen *et al.*, 2019; Su *et al.*, 2019a, b; Li, C.R., *et al.*, 2019; Zhang *et al.*, 2019; Fan *et al.*, 2020; Li, S., *et al.*, 2020; Li, Z.L., *et al.*, 2020; Xin *et al.*, 2020), *Petrocodon* contains 50 species and one variety at present.

In 2011, we collected some living Gesneriaceae plants with silvery leaf veins in the course of a floristic survey in Jingxi City, Guangxi, China. The plants were cultivated in the Guangxi Botanical Garden of Medicinal Plants, and flowered in early April 2012. They had a rhizomatous stem, and a funnel-shaped corolla with a tube longer than the limb and 2 fertile stamens and inconspicuous stigma reminiscent of those in species of the previous genus *Lagarosolen*, especially *L. integrifolius* D. Fang & L. Zeng, now placed in *Petrocodon* s.l. (Weber *et al.*, 2011, 2020). At first it was considered to be *P. ainsliifolius* W.H. Chen & Y.M. Shui (Chen *et al.*, 2014), as they share a similar leaf shape and flower form. However, after detailed morphological

research, we found they differ mainly by the indumentum of the leaf blade, the shape of the bract, the size of the filament and the shape of stigma. It most resembles the recently published species *P. ionophyllus* F. Wen, S. Li & B. Pan (Li S., *et al.*, 2020) in leaf shape and style morphology, which is deflected to one side and the stamen to the other, but differs in the indumentum and colour of the leaf blade and veins, the number of cymes and flowers per cyme, the shape of the bracts and stigma. We conclude that it is a species of *Petrocodon* new to science, which is described and illustrated here.

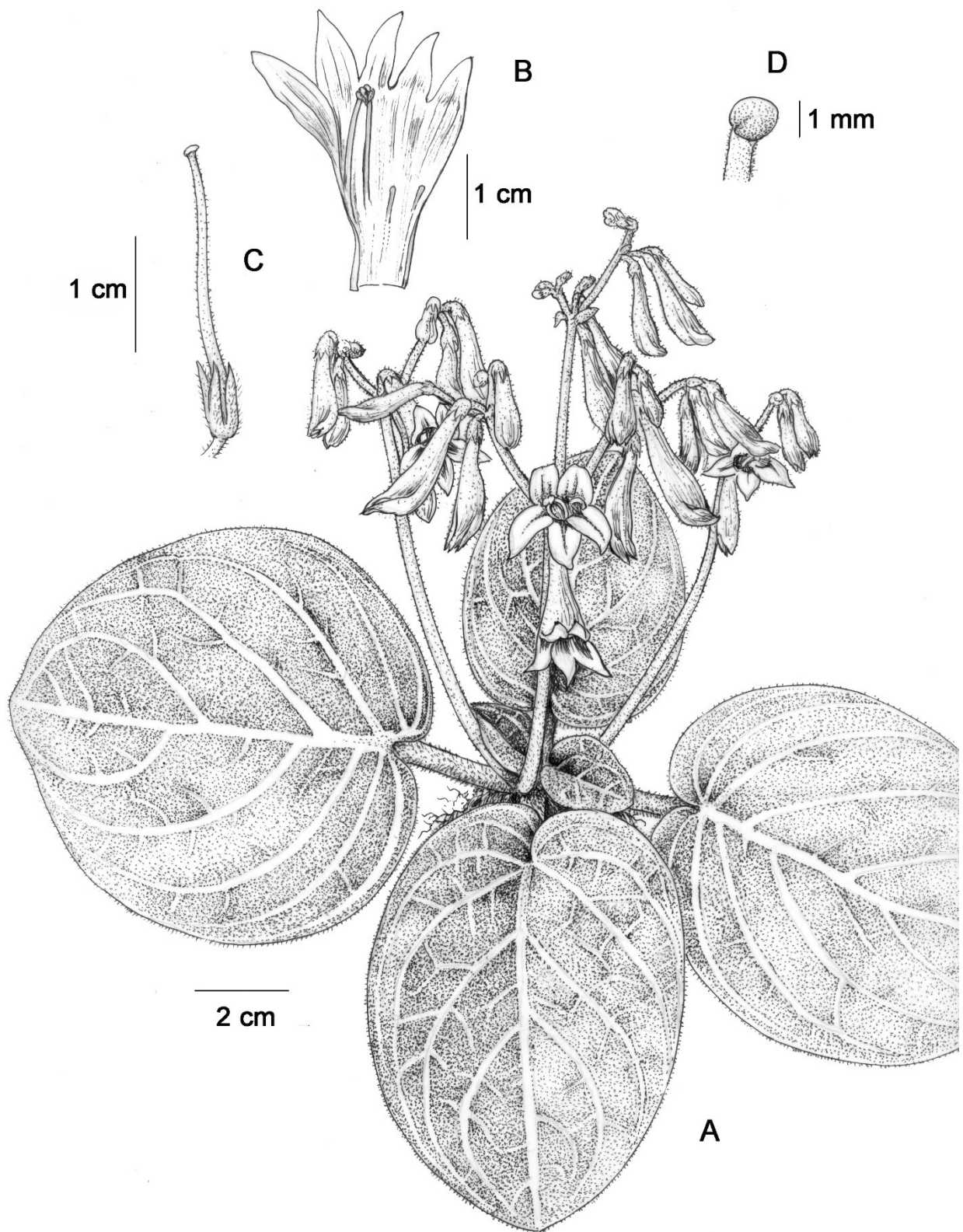
### TAXONOMIC TREATMENT

*Petrocodon albinervius* D.X. Nong & Y.S. Huang, *sp. nov.*

白脈石山莖苔 Figs. 1 & 2

**Type:** CHINA. Guangxi Zhuang Autonomous Region: Jingxi City, Dizhou Township, elev. 850 m, on rock face in forest of limestone hills, 15 April 2012, D.X. Nong & Y.S. Huang Y1219 (holotype: IBK! IBK00425097; isotypes: IBK! IBK00425098; GXMG! GXMG0215269).

**Diagnosis:** *Petrocodon albinervius* is morphologically similar to *P. ionophyllus*, *P. integrifolius* and *P. ainsliifolius*, but can be easily distinguished from *P. integrifolius* and *P. ainsliifolius* by its densely pubescent lamina (*vs.* densely white strigose lamina), ca. 8 mm long filaments (*vs.* ca. 3 mm long filaments), undivided stigma (*vs.* divided stigma). It also can be distinguished from *P. ainsliifolius* by its elliptic bracts (*vs.* linear bracts). *Petrocodon albinervius* most resembles *P. ionophyllus* in the leaf shape and style, but differs from the latter by its densely pubescent and pale



**Fig. 1.** *Petrocodon albinervius* sp. nov. **A.** Habit. **B.** Opened corolla (showing stamens and staminodes). **C.** Calyx and pistil. **D.** Stigma. Illustration by W.-H. Lin (IBK) based on specimen *D.-X. Nong & Y.-S. Huang* Y1219.



**Fig. 2.** *Petrocodon albinervius* sp. nov. **A.** Habitat. **B–C.** Habit in natural habitat. **D.** Leaf blade. **E.** Inflorescences. **F.** Flower buds. **G.** Flowers in oblique top view. **H–I.** Flowers in front view. **J.** Flowers in top view. **K–L.** Opened corolla. **K,** Photographed by H.-Z. Lv (GXMG).



Fig. 3. The distribution of *Petrocodon albinervius* sp. nov. and its morphologically-close species. A. *P. albinervius* sp. nov. B. *P. ionophyllus*. C. *P. ainsliifolius*. D. *P. integrifolius*.

green lamina (*vs.* sparsely strigose and purplish green to purplish brown lamina), cymes 3–7 per plant and flowers 4–30 per cyme (*vs.* cymes 1–2 per plant and flowers 3–5 per cyme), elliptic bracts (*vs.* lanceolate bracts), undivided and hippocrepiform stigma (*vs.* bilobed stigma, with ovate lobes).

Perennial herbs, rhizomatous stem subterete, 1–3 cm long, 5–8 mm in diam. Leaves 5–7, basal; petiole 1.5–4 cm long, densely spreading white pubescent; leaf blade pale green with silvery veins, broadly ovate to suborbicular, 9–15 cm long, 6–10 cm wide, papyraceous, densely pubescent on both surfaces, base cordate, margin entire, apex obtuse to round, lateral veins 4–6 pairs, prominent abaxially, slightly sunken adaxially. Inflorescences 3–7 cymes, axillary, 4–30-flowered; peduncle 10–15 cm long, densely spreading white pubescent; bracts 2, opposite, elliptic, 8–10 mm long, 3–4 mm wide, densely white pubescent on both surfaces; bracteoles 2, opposite, lanceolate, 4–5 mm long, 1.5–2 mm wide, densely white pubescent; pedicels 3–5 mm long, densely white pubescent; calyx 5-parted near to the base, lobes narrowly lanceolate, 5–6 mm long, 0.7–1 mm wide, margin entire, outside puberulent, inside glabrous; corolla white to pale purple, 3–3.5 cm long, outside glandular, inside glabrous except for two longitudinal rows of white glandular hairs; corolla tube 1.8–2 cm long, funnellform, 4–5 mm in diam. at the base, 7–8 mm in

diam. at the mouth; adaxial lip 2-lobed, lobes ca. 5 mm long, ca. 2 mm wide, triangular, with three dark purple stripes inside on each lobe; abaxial lip 3-lobed, lobes ca. 7 mm long, ca. 3 mm wide, triangular, with three dark purple stripes inside on each lobe; stamens 2, adnate to 1.5 cm above the corolla base; filaments straight, ca. 8 mm long, linear, glabrous; anthers light yellow, nearly reniform, ca. 2 mm long, dorsifixed, fused by their entire adaxial surfaces; staminodes 3, glabrous, adnate to 1.3 cm above the corolla base, lateral ones 3–5 mm long, middle one ca. 2 mm long; disc ringlike, glabrous, ca. 1.5 mm high, margin undulate; pistil 2–2.5 cm long; ovary ca. 7 mm long, ca. 1.5 mm in diam., densely puberulent; style ca. 1.5 cm long, pubescence; stigma undivided, hippocrepiform. Fruit unknown.

**Phenology:** The new species was observed flowering from April to May in the wild. Flowering of the cultivated plant was recorded in early April. The fruiting period is unknown.

**Etymology:** The species epithet “*albinervius*” refers to the distinctive leaf blade with silvery veins. The Chinese name is proposed here as “白脈石山苣苔”. Phonetics: “Bái Mài Shí Shān JùTái”.

**Distribution and Ecology:** The new species is endemic to Guangxi and known only from the type locality (Fig. 4). It grows on moist and shaded rocky faces of steep rocky slope under evergreen broad-leaved

**Table 1.** Morphological comparisons amongst *Petrocodon albinervius*, *P. ionophyllus*, *P. ainsliifolius* and *P. integrifolius*.

Characters	<i>P. albinervius</i>	<i>P. ionophyllus</i>	<i>P. ainsliifolius</i>	<i>P. integrifolius</i>
Leaf blade	broadly ovate to suborbicular, pale green, densely pubescent on both surfaces	ovate or broadly ovate, purplish green to purplish brown, sparsely strigose on adaxial surface, pubescent on abaxial surface	ovate, green, densely white strigose on both surfaces	ovate, broadly ovate to orbicular, pale green to green, densely white strigose on both surfaces
Bracts	elliptic	lanceolate	linear	oblong to lanceolate
Calyx lobes	lanceolate	narrowly lanceolate to linear-lanceolate	narrowly lanceolate-linear	narrowly triangular
Inflorescence	cymes 3–7, flowers 4–30	cymes 1–2, flowers 3–5	cymes 5, flowers 3–6	cymes 1–2, flowers 4–17
Corolla	white to pale purple	purple	purple	purple
Filaments	ca. 8 mm long, not included	ca. 10 mm long, not included	ca. 3 mm long, included	ca. 3 mm long, included
Stigma	hippocrepiform, undivided	bilobed, lobes ovate	divided, lobes broadly ovate	divided, lobes broadly ovate

forests at an elevation of 800–850 m. The slope is facing northwest and at an angle of up to 60 degrees. The tree cover is up to 12 m tall, the canopy cover is 75%, the shrub layer cover is 85%, and the herb layer cover is 35%. Associated species include *Begonia picturata* Yan Liu, S.M. Ku & C.I. Peng (Begoniaceae), *Pseudochirita guangxiensis* (S.Z. Huang) W.T. Wang var. *glauca* Y. G. Wei & Yan Liu and *Lysionotus oblongifolius* W.T. Wang (both Gesneriaceae), *Cymbidium lancifolium* Hook. (Orchidaceae), *Vaccinium dunnianum* Sleumer (Vacciniaceae), and *Ardisia carnosicaulis* C. Chen & D. Fang (Myrsinaceae) amongst others.

**Conservation status:** *Petrocodon albinervius* is known only from the type locality, which is not within a protected area and the plants are seriously affected by local residents through tree-cutting and animal grazing activities. The population has about 100 individuals, including 54 mature individuals. The known Area of Occupancy (AOO) is less than 4 km<sup>2</sup>. Although we have been conducting fieldwork in Jingxi city and its surrounding areas close to the border with Vietnam in similar habitats for more than 15 years, no other subpopulations has been found. According to the IUCN Red List Categories and Criteria (IUCN, 2012) and Guidelines for using the IUCN Red List Categories and Criteria (IUCN Standards and Petitions Committee, 2019), *P. albinervius* is assessed as Critically Endangered (CR) based on: B2ab(iii, v).

**Additional Specimens Examined (paratype):** CHINA, Guangxi Zhuang Autonomous Region, Jingxi City, Dizhou Township, elev. 850 m, on rock face in forest of limestone hills, 6 June 2011, Y.S. Huang & D.X. Nong Y0663 (IBK00425099!).

**Taxonomic Notes:** *Petrocodon albinervius* closely resembles *P. ionophyllus* in the leaf shape and reciprocal enantiostyly (Cardoso *et al.*, 2018; Adhikari and Möller, 2020). However, *P. albinervius* differs in its pale green leaf blade with silvery veins, many flowers, elliptic bracts and undivided stigma from *P. ionophyllus*. The new species is also similar to *P. integrifolius* (population distributed in Napo county, Guangxi, China) with silvery veins adaxially (Wei *et al.* 2010), but can be easily

distinguished by the leaf blade indumentum, the thicker corolla tube, the longer filament, and the undivided stigma. We have conducted surveys in Napo county for years and also found several populations of *P. integrifolius*. We found that in these populations the underside of the leaves was purple, and some leaves on the same plant had silvery veins and some did not. But this characteristics is consistent in all plants of the new species, even in young plants that are just beginning to grow leaves. Details of the morphological differences amongst *P. albinervius*, *P. ionophyllus*, *P. ainsliifolius* and *P. integrifolius* are presented in Table 1 and Supplement 1.

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Supplementary materials are available from Journal Website.