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# *Petrocodon anoectochilus*, a Remarkable New Species of Gesneriaceae from Guangxi and Guizhou, Southwest China

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**ABSTRACT.** *Petrocodon anoectochilus* F. Wen & B. Pan, a new species of Gesneriaceae from Guangxi and Guizhou in southwestern China, is described and illustrated. Although the leaf morphology of this new species looks similar to that of *P. coriaceifolius* (Y. G. Wei) Y. G. Wei & Mich. Möller and *P. pseudocoriaceifolius* Yan Liu & W. B. Xu, this remarkable new species can be easily distinguished from all other species of *Petrocodon* s.l. (the two above-mentioned species included) by the shape and color of its memorable corolla. Because of its restricted distribution and threatened environment, the current conservation status of this species should be assessed temporarily as “Endangered.”

**Key words:** Didymocarpoideae, IUCN Red List, karst, limestone flora.

Although the newly delimited *Petrocodon* Hance (Gesneriaceae, subfam. Didymocarpoideae) is not the most speciose genus of Gesneriaceae in China (Weber et al., 2011; Möller et al., 2016; Wen et al., 2019), the highly variable corolla and leaf morphology impel us to continue our study and understanding of the species biodiversity of this genus (Lu et al., 2017; Xu et al., 2017). Over the past decade, researchers and Gesneriaceae enthusiasts have been paying more attention to the diversity of the family Gesneriaceae in China, especially to *Primulina* Hance and *Petrocodon*. Due to road construction and tourism development, more and more wild places are becoming reachable to people. As a result, at least 10 new taxa of *Petrocodon* have been described since 2015 (Möller, 2019; Wen et al., 2019). By the end of August 2020, the genus contained approximately 43 species and one variety and ranged

from China to northern Thailand, northern Laos, and northern Vietnam (Burt, 2001; Weber et al., 2011; Middleton et al., 2015; Möller et al., 2016; Wen et al., 2020). China alone has 41 species and one variety, with four species in Vietnam and two in Thailand.

During a floristic expedition to Guangxi, China, in 2015, the authors observed a population of an interesting Gesneriaceae in Yacha Town, Longlin County, Guangxi. When this new taxon was first discovered by one of the authors (B. Pan), none of the plants were in flower, leading him to suspect it was *Petrocodon coriaceifolius* (Y. G. Wei) Y. G. Wei & Mich. Möller or *P. pseudocoriaceifolius* Yan Liu & W. B. Xu (Wei, 2006; Weber et al., 2011; Xu et al., 2014) because of their similar vegetative morphology. The former once belonged to *Lagarosolen* W. T. Wang (Wang, 1984) as *L. coriaceifolius* Y. G. Wei (Wei, 2006). However, the entire genus was merged into *Petrocodon* s.l. 10 years ago (Weber et al., 2011). Thus, we judged that the new plant should be a member of *Petrocodon*. For better observation, we introduced this plant to the Gesneriad Conservation Center of China (GCCC) nursery as an unknown one. Over the past three years, living plants were monitored in the conservation nursery of the GCCC at the Guilin Botanical Garden and in the field, where an ecological survey was conducted. It was later confirmed to be a member of the genus *Petrocodon* s.l.

This plant differs from all other species of *Petrocodon* in its deeply bipartite upper lip of the corolla limb and attractive corolla color (bright peachblow). The striking color of the corolla is very rare in *Petrocodon*.

We conducted a thorough comparison of diagnostic morphological and anatomical features of similar taxa

from China, Thailand, and Vietnam (Wang et al., 1990, 1998; Li & Wang, 2004; Phuong, 2005; Wei et al., 2010; Middleton et al., 2015; Wei et al., 2018). Subsequently, we searched through relevant reports of new taxa of *Petrocodon* described from 2010 to 2020, e.g., *P. ji-angxiensis* F. Wen, L. F. Fu & L. Y. Su (Su et al., 2019a), *P. chongqingensis* F. Wen, B. Pan & L. Y. Su (Su et al., 2019b), *P. longitubus* Cong R. Li & Yang Luo (Li et al., 2019), *P. tongziensis* R. B. Zhang & F. Wen (Zhang et al., 2019), and *P. chishuiensis* Z. B. Xin, F. Wen & S. B. Zhou (Xin et al., 2020).

Some of the authors checked all available *Petrocodon* specimens that were stored in E and K in 2019. We also visited the following herbaria: ANU, HITBC, HN, IBK, IBSC, KUN, PE, and VNMN, and checked the *Petrocodon* specimens that were collected from China and Vietnam. At the same time, specimen images and name lists were obtained and checked from the National Plant Specimen Resource Center, CVH (<<http://www.cvh.ac.cn>>), Tropicos® (<<http://www.tropicos.org>>), JSTOR Global Plants (<<http://plants.jstor.org>>), The Plant List (<<http://www.plantlist.org>>), and the International Plant Names Index (<<http://www.ipni.org>>).

This research led to the conclusion that the morphological characters of the population we discovered, especially reproductive characters, do not fit any known species. Therefore, we conclude that it is a species new to science and accordingly describe it herein. Its morphological characters are compared with the two most similar species. All morphological characters were studied under dissecting microscopes and described using the terminology presented by Wang et al. (1990, 1998).

***Petrocodon anoetochilus* F. Wen & B. Pan, sp. nov.**

TYPE: China. Guangxi Zhuangzu Autonomous Region: Baise City, Longlin County, Yacha Town, Dahuadi village, 24°59'N, 105°12'E, 1350 m, 20 July 2017 (fl.), *Bo Pan et al. P964* (holotype, IBK!; isotype, IBK!). Figures 1, 2.

**Diagnosis.** *Petrocodon anoetochilus* F. Wen & B. Pan differs from *P. pseudocoriaceifolius* Yan Liu & W. B. Xu and *P. coriaceifolius* (Y. G. Wei) Y. G. Wei & Mich. Möller in its peduncle sparsely brownish pubescent (vs. sparsely purple appressed-pubescent in *P. pseudocoriaceifolius* and densely pale pubescent in *P. coriaceifolius*); cyme 1- to 3(or 4)-flowered (vs. 10- to 25-flowered and 7- to 14-flowered, respectively); corolla larger, bright peachblow to bright purplish pink (vs. pale purple), ringent with the 2 adaxial lobes forming an obtuse-angled triangle to nearly horizontal with the included angle from 170° to 180° (vs. not ringent, with the 2 adaxial lobes forming an acute-angled triangle); and filaments and style glabrous (vs. purple puberulent and pubescent, respectively).

Perennial herb forming acaulescent rosettes. Rhizome subterete, 1–2 cm, 0.5–1 cm diam. Leaves 5 to

10, basal or clustered at apex of the rhizome, opposite; petiole terete, 1.2–2.5 cm, 0.2–0.3 cm diam., adaxially canaliculate, pubescent; leaf blade thickly chartaceous, coriaceous when dried, often nearly symmetrical, narrowly elliptic to lanceolate-elliptic or oblong, 7–12 × 2.2–3.5 cm, cuneate at base, acute to obtuse at apex; margin subentire, inconspicuously serrulate to shallowly undulate; adaxial surface green to dark green, densely appressed-puberulent and short appressed-hispid, abaxial surface grayish green, densely appressed-puberulent; lateral veins 5 or 6 on each side of midrib, prominent abaxially, sunken adaxially. Cymes 1 to 5, usually unbranched, or rarely 1- or 2-branched, 1- to 3(or 4)-flowered; peduncle 6–9.5 cm, ca. 1 mm diam., sparsely brownish pubescent; bracts 2 per cyme, opposite, narrowly obovate to slightly oblanceolate, ca. 7.5 × 1–1.5 mm, margin entire, apex obtuse to rounded, adaxially pubescent, abaxially glabrescent to glabrous; pedicels 9–12 mm, 0.8–1.2 mm diam., pale brownish, sparsely brown pubescent. Calyx 5-parted to the base, lobes linear, 2.5–3 mm, 0.5–0.6 mm wide at the base, adaxially pubescent, abaxially nearly glabrous. Corolla bilabiate, bright peachblow to bright purplish pink, 4.5–5 cm, outside sparsely puberulent, inside nearly glabrous; tube slender, 2.3–2.5 cm, 9–10 mm diam. at orifice along the longitudinal axis and 5–6 mm at the broadest lateral points of the orifice, ca. 1 mm diam. at the base; adaxial lip 2-lobed deeply to base, the lobes forming an obtuse-angled triangle to nearly horizontal (the 2 lobes forming an included angle from 170° to 180°), obliquely broadly triangulate-lanceolate to triangular-ovate, slightly deflexed in late flowering, each lobe 1.6–2.5 cm, 1.5–1.7 cm wide at the base, margin entire, apex acute; abaxial lip 3-lobed nearly to middle, lateral lobes 1.5–1.8 cm, 1.2–1.4 cm wide at base, slightly obliquely triangular to narrowly triangular, central lobe 1.5–1.6 cm, 1.3–1.5 cm wide at base, triangular-oblong, lobe margins entire, apices acute. Stamens 2, included, adnate to 3–3.2 cm above base of corolla tube; filaments glabrous, linear, white, 8–10 mm; anthers dorsifixed, pale brown, ellipsoid, coherent in pairs, thecae divaricate, 2.5–3 mm, theca septum brown to black; staminodes 3, lateral ones adnate to ca. 2.4 cm above the base of corolla tube, glabrous, white, ca. 2.5 mm, central 1 adnate to ca. 1.2 cm above the base of corolla tube, linear, ca. 0.5 mm. Pistil pale green, glabrous; ovary linear-cylindroid, ca. 2.5 cm, slightly swollen near apex; style ca. 5 mm, glabrous; stigmas 2, each one semicircular to tear-shaped, apex rounded, ca. 1.4 mm per stigma lobe. Capsule straight, with valvular dehiscence, linear-cylindroid, slightly swollen near apex, 8–10 cm, glabrous.

**Phenology.** Flowering occurs from April to May and fruiting from June to July.

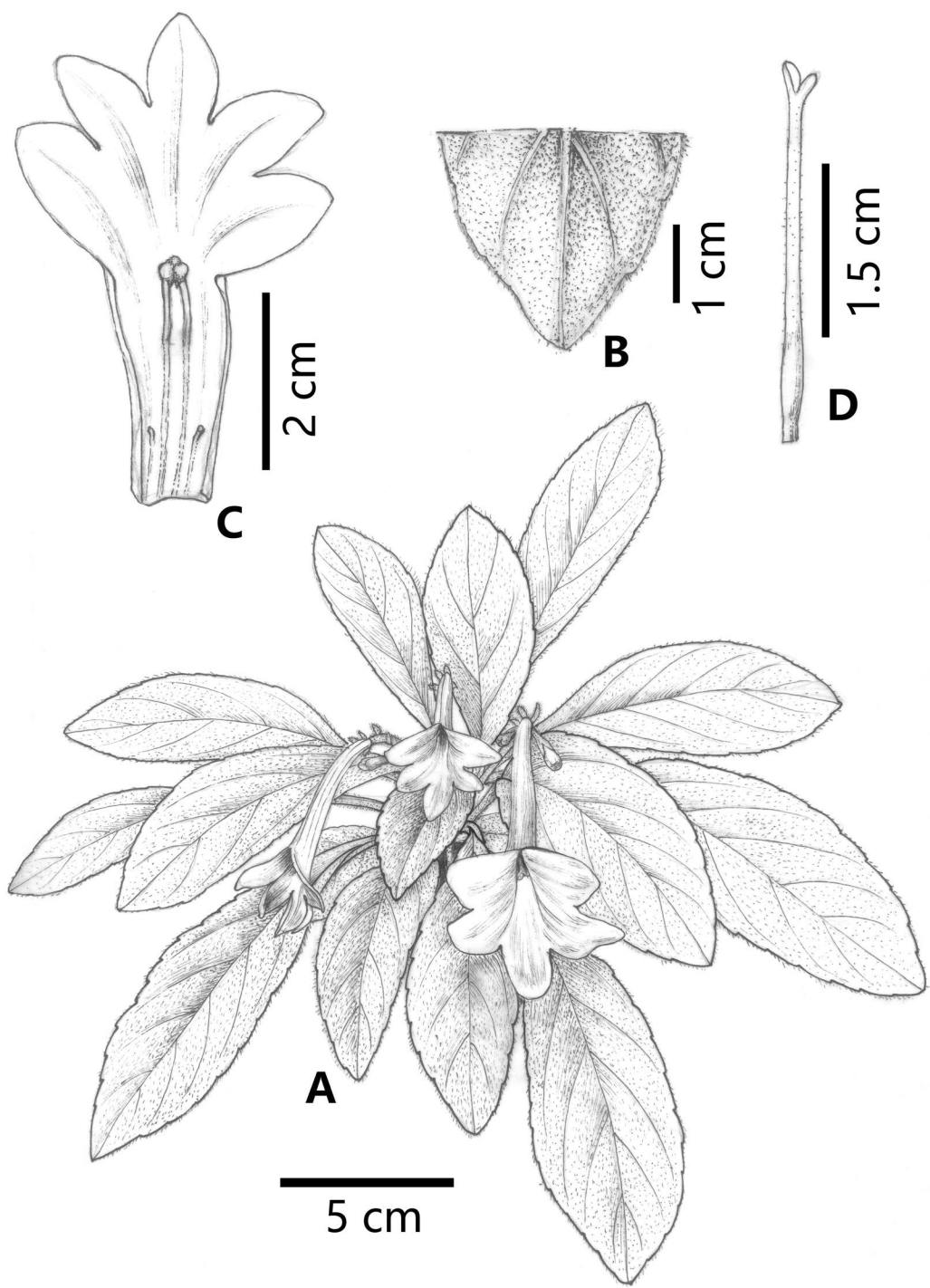


Figure 1. *Petrocodon anoectochilus* F. Wen & B. Pan. —A. Habit. —B. Part of the leaf blade and indument. —C. Opened corolla showing stamens and staminodes. —D. Pistil (style and stigma). Drawn by Wen-Hong Lin.



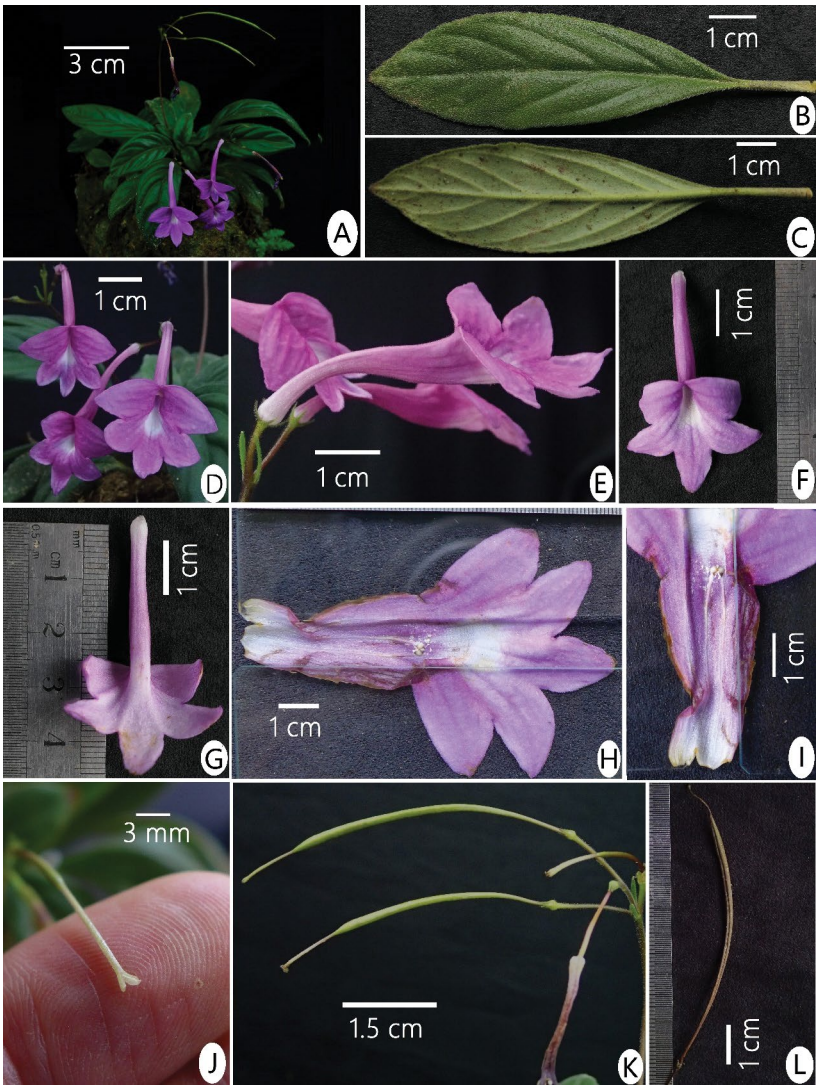


Figure 2. *Petrocodon anoectochilus* F. Wen & B. Pan. —A. Flowering plant cultivated in Gesneriad Conservation Center of China (GCCC). —B. Adaxial surface of leaf. —C. Abaxial surface of leaf. —D. Corolla in front view. —E. Corolla in lateral view. —F. Whole flower and adaxial view of corolla. —G. Abaxial view of corolla. —H. Opened corolla. —I. Stamens and staminodes. —J. Stigma. —K. Fresh young capsules. —L. Dried mature capsule. Photographs by Fang Wen.

*Distribution and habitat.* *Petrocodon anoectochilus* is now known from only two subpopulations at elevational ranges from 450 to 500 m in Longlin County, Baise City, Guangxi, and one in Anlong County, Xingyi City, Guizhou, China, growing on shaded and moist rock surfaces with fewer than 250 mature individuals in Guangxi’s populations and 120 mature individuals in Guizhou’s population. The two localities in Guangxi are about 3 km apart. The species grows in subtropical broad-leaved evergreen monsoon forest with sufficient seasonal run-off water. The primary companion plants

in this limestone area are *Myrsine seguinii* H. Lév., *Ophiorrhiza japonica* Blume, *Paphiopedilum hirsutissimum* (Lindl. ex Hook. f.) Stein, *Paraphlomis javanica* (Blume) Prain, *Petrocosmea minor* Hemsl., *Pittosporum pulchrum* Gagnep., and *Spiradiclis laxiflora* W. L. Sha & X. X. Chen. A distribution map of *Petrocodon anoectochilus*, *P. coriaceifolius*, and *P. pseudocoriaceifolius* is presented as Figure 4.

*IUCN Red List category.* Population information for *Petrocodon anoectochilus* is still insufficient, which

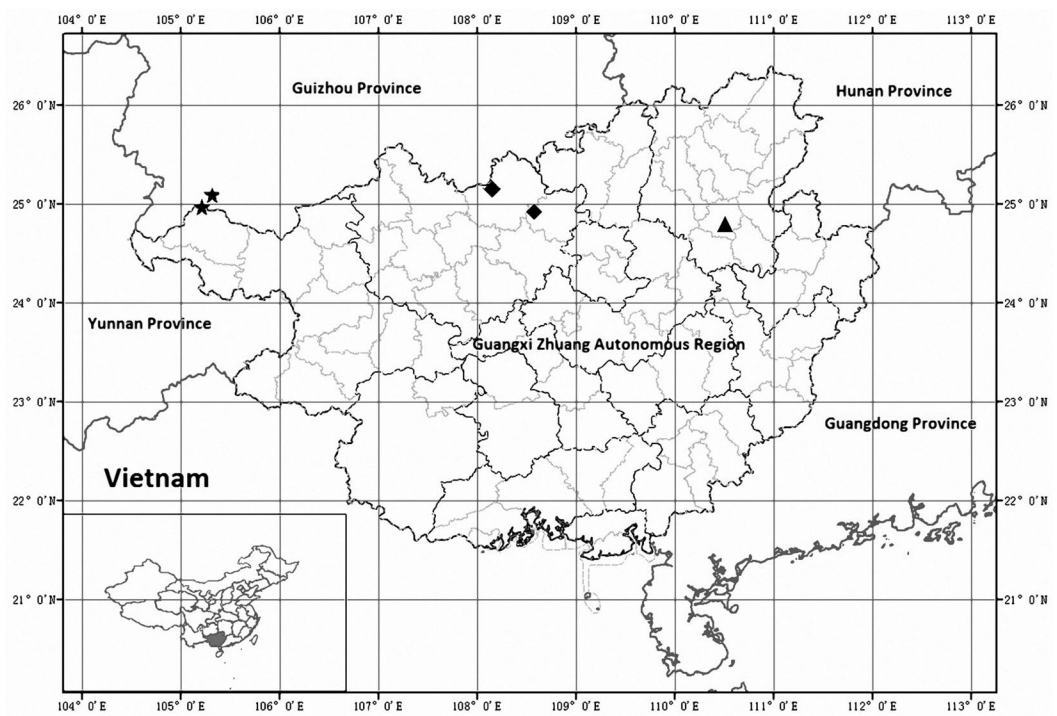


Figure 3. The distribution map of *Petrocodon anoectochilus* F. Wen & B. Pan (★), *P. coriaceifolius* (Y. G. Wei) Y. G. Wei & Mich. Möller (▲), and *P. pseudocoriaceifolius* Yan Liu & W. B. Xu (◆). Map made by Zhang-Jie Huang.

makes it difficult to determine an assessment of the extinction risk faced by this new taxon. At present, there are only three subpopulations, all small. The main threat now comes from environmental damage caused by grazing, specifically by goats that eat almost any green plants they can reach. There is also a risk of poaching because the habitat is not far from surrounding villages. Furthermore, prolonged droughts and illegal logging in this area, including nearby potential habitat, should be considered as potential risks to the persistence of *P. anoectochilus*. Thus, following the IUCN Red List Categories and Criteria (IUCN, 2019), it is assessed temporarily as Endangered [EN B2ab(iii)].

**Etymology.** The specific epithet, “*anoectochilus*,” refers to the unusual corolla (Figs. 1A, 2D–F). It comes from Greek, “ανουκτός” and “χεῖλος,” meaning ringent (*anoktos*) lip (*cheilos*).

**Vernacular name.** Kǎi Chún Shí Shān Jù Tái (Chinese pronunciation); 开唇石山苣苔 (Chinese name).

**Notes.** Obviously, *Petrocodon anoectochilus* is morphologically close to *P. coriaceifolius* and *P. pseudocoriaceifolius* in vegetative appearance (Fig. 4). The three congeners have leaves that are similar in shape

and size, though their petiole and leaf blade indumenta are different. If not in flower, *P. anoectochilus* may be mistaken for *P. coriaceifolius* or *P. pseudocoriaceifolius*. One of the most significant differences separating *P. anoectochilus* from these and all other species of *Petrocodon* is its corolla form and color. *Petrocodon coriaceifolius* has a pale-purple and narrowly funnel-shaped corolla, while *P. pseudocoriaceifolius* has a pale-purple and salver-shaped corolla. Fortunately, several other characters also distinguish the three species (Table 1).

**Paratype.** CHINA. **Guizhou:** Xingyi City, Anlong County, Dewo Town, 25°3′N, 105°15′E, ca. 1150 m, 15 Aug. 2020 (fl.), Meng-Qi Han HMQ20200815-1 (PE).

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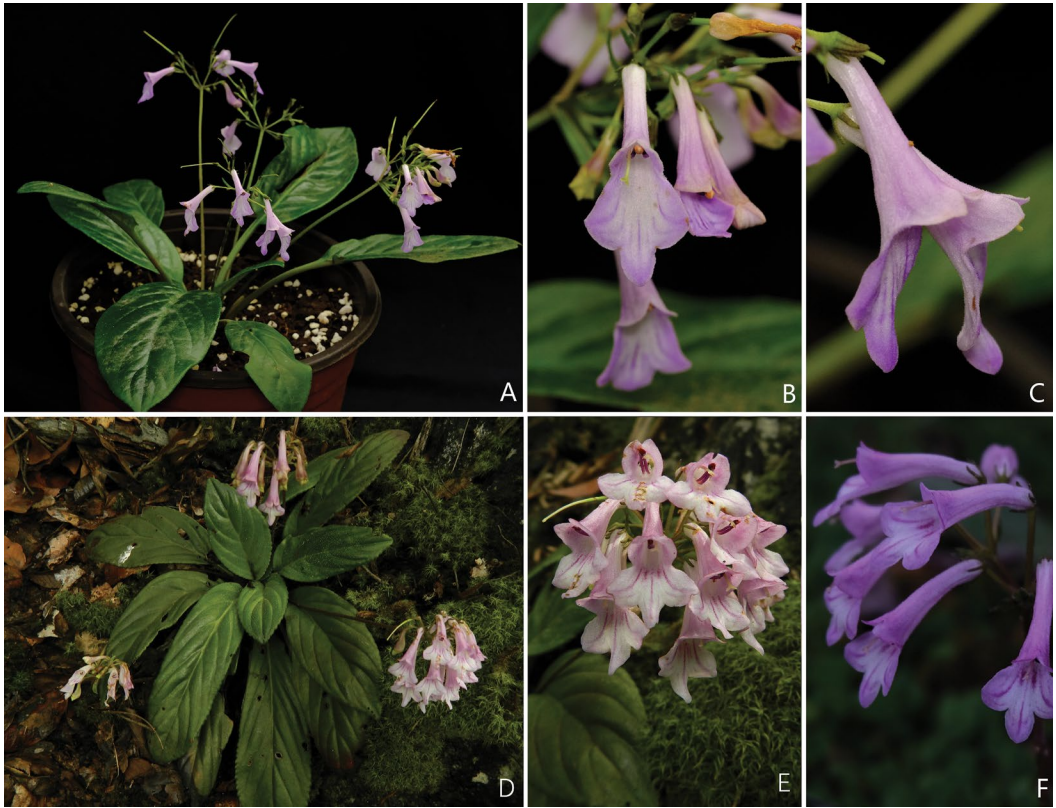


Figure 4. A–C. *Petrocodon coriaceifolius* (Y. G. Wei) Y. G. Wei & Mich. Möller. —A. Plant and cymes. —B. Corolla in front view. —C. Corolla in lateral view. D–F. *Petrocodon pseudocoriaceifolius* Yan Liu & W. B. Xu. —D. Plant and cymes. —E. Corolla in front view. —F. Corolla in lateral view. Photographs: A–C by Fang Wen; D–F by Jing Liu.

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Table 1. Comparison of key characters of *Petrocodon anoectochilus* F. Wen & B. Pan, *P. pseudocoriaceifolius* Yan Liu & W. B. Xu (see Xu et al., 2014), and *P. coriaceifolius* (Y. G. Wei) Y. G. Wei & Mich. Möller (see Wei, 2006).

	<i>P. anoectochilus</i>	<i>P. pseudocoriaceifolius</i>	<i>P. coriaceifolius</i>
Petiole indument	pubescent	purple puberulent	densely pubescent
Leaf blade	adaxial surface densely	both surfaces purple	both surfaces white
indument	appressed-puberulent and short appressed-hispid, abaxial surface densely appressed-puberulent	appressed-pubescent	appressed-pubescent, with purple glands on abaxial surface
Cymes	1 to 5; unbranched, or rarely 1- to 2-branched; 1- to 3(to 4)-flowered	2 to 4; 2- to 3-branched; 10- to 25-flowered	1 to 2; 1- to 3-branched; 7- to 14-flowered
Peduncle	sparsely brownish pubescent	sparsely purple appressed-pubescent	densely pale pubescent
Bracts	7.5 × 1–1.5 mm; apex obtuse to rounded; abaxially glabrescent to glabrous	10–17 × 1.5–3 mm; apex acute; abaxially purple pubescent	ca. 3 × 1 mm; apex acute; abaxially pubescent
Pedicel length	9–12 mm	4–8 mm	3–5 mm
Corolla color, length	bright peachblow to bright purplish pink; 4.5–5 cm	pale purple; 2–2.5 cm	pale purple; 1.8–3 cm
Corolla shape	ringent; adaxial lip 2-lobed deeply to the base, 2 lobes forming an obtuse-angled triangle to nearly horizontal with the included angle from 170° to 180°	not ringent; abaxial lip 2-partite, 2 lobes split to the middle or divided past the middle, forming an acute-angled triangle	not ringent; abaxial lip 2-lobed, 2 lobes split to near base, forming an acute-angled triangle
Corolla tube length	2.3–2.5 cm	1.2–1.6 cm	1.2–1.3 cm
Filaments	glabrous	purple puberulent	pubescent
Pistil length	ca. 25 mm	13–19 mm	ca. 16 mm
Ovary	glabrous	purple puberulent	pubescent
Style	ca. 5 mm, glabrous	6–10 mm, purple puberulent	ca. 8 mm, pubescent
Stigmas	semicircular to tear-shaped, 1.5 mm	broadly ovate, 0.5 mm	ovate, 0.4 mm

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