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Author(s): Zhang Shu-dong, Wang Hong, Robert R. Mill
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A New Species of *Pedicularis* (Scrophulariaceae) from the Yaoshan Mountain, Yunnan, China

Zhang Shu-dong

Laboratory of Biodiversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650204, China and Graduate School, Chinese Academy of Sciences, Beijing, 100039, China. sdchang@mail.kib.ac.cn

Wang Hong

Laboratory of Biodiversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650204, China. wanghong@mail.kib.ac.cn

Robert R. Mill

Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, Scotland, United Kingdom. R.Mill@rbge.org.uk

ABSTRACT. *Pedicularis yaoshanensis* H. Wang from Yunnan, China, is described and illustrated. The new species was found growing on wet cliffs, at high elevations in the Yaoshan Mountain. It is placed in *Pedicularis* series *Longiflorae* Prain. The main diagnostic features of *P. yaoshanensis* include its acaulescent habit, pinnatipartite leaves, calyx with 3 lobes (the posterior one smaller and tripartite), the deflexed galea beak pointing downward, and the two posterior filaments of the stamens glabrous. A key to similar species is given, and its relationships discussed.

Key words: China, northeastern Yunnan, *Pedicularis*, Scrophulariaceae.

Pedicularis L. is the largest genus of the family Scrophulariaceae as traditionally recognized (Mill, 2001). Between 600 and 800 *Pedicularis* species are distributed primarily in the Arctic and alpine regions of the northern hemisphere (Macior, 1988; Wang et al., 2003). At least 367 species occur in China (H.-B. Yang et al., 1998, and species subsequently published by Yamazaki, 2000, 2001, 2003; F.-S. Yang et al., 2003), where it is the fourth-largest angiosperm genus after *Rhododendron* L., *Carex* L., and *Astragalus* L. (Wu et al., 2003). *Pedicularis* is best represented in the mountains of southwestern China, which represents one of the main centers of species diversity for the genus (H.-B. Yang et al., 1998; Mill, 2001).

There are 152 species, including 53 endemic species, now recognized within the genus *Pedicularis* in Yunnan, China, which is a center of diversity and endemism (Li et al., 2002; Wang, 2005). All four

corolla types recognized in *Pedicularis* by Li (1951) occur in Yunnan; his advanced corolla type with a beak and slender elongated tube is limited in its distribution to the Sino-Himalayan region, and only 16 species have these elongated corolla tubes in Yunnan.

Rising from the upper reaches of the Yangtze River, the Yaoshan Mountain lies in the border area between northeastern Yunnan and southern Sichuan provinces. During recent fieldwork by us, 17 species of *Pedicularis* were found in the Yaoshan Mountain. Of these, only the new species belongs to the advanced corolla type of Li (1951).

***Pedicularis yaoshanensis* H. Wang, sp. nov. TYPE:**

China. Yunnan: Qiaojia county, Yaoshan Mountain, 27°11'N, 103°04'E, 3600–3700 m, 17 Aug. 2004, Hong Wang & Shu-dong Zhang 03-0857 (holotype, KUN). Figure 1.

Species nova cum *P. latituba* Bonati et *P. lobatorostrata* T. Yamazaki (ser. *Longiflorae*) corollae labelli lobo mediano emarginato et galeae rostro apice bilobato congruens sed humilior subacaulis, pedicellis multo minoribus 1–2 mm tantum (non 10–20 mm), calyce minore 5–6 mm longo (non 8–10 mm ut in *P. latituba*, 13–20 mm in *P. lobatorostrata*), rostro galeae corollae minore 3 mm longo (non 5–6 mm), filamentis posticis glabris differt.

Perennial dwarf clustered herb, to 6 cm tall including the flowers, sometimes drying slightly black; roots ± lignified, long-conical, branched, 5–7 cm long, ca. 1 mm diam., drying brown; stems erect, much reduced and almost absent, only 5–10 mm tall, basally obscured by withered petiole bases and brown membranous scales. Leaves alternate, clustered;

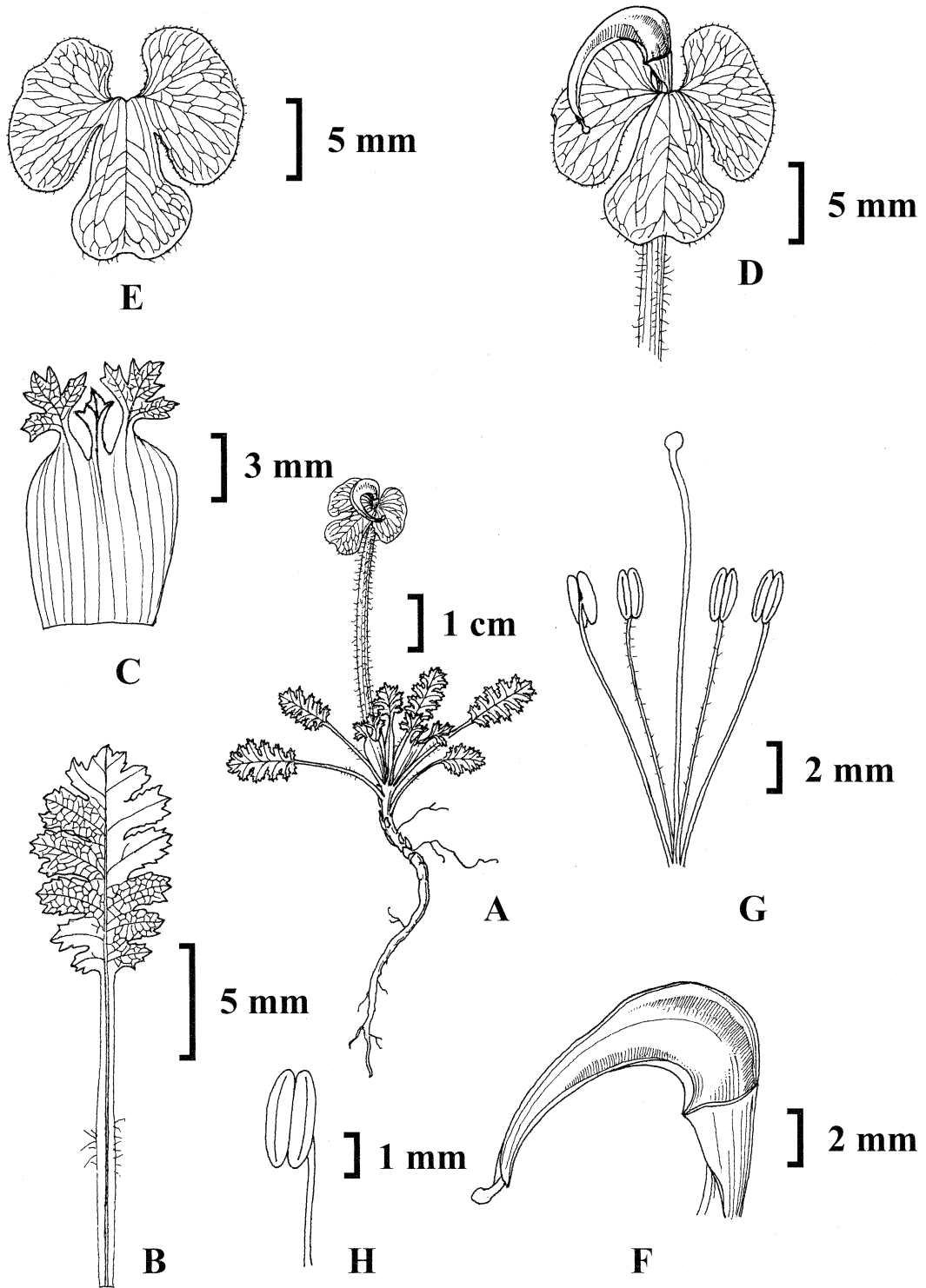


Figure 1. *Pedicularis yaoshanensis* H. Wang. —A. Habit. —B. Leaf. —C. Calyx opened out; posterior tooth in center. —D. Upper part of corolla tube and upper and lower corolla lips. —E. Corolla lower lip dissected out. —F. Upper lip (galea). —G. Stamens and style dissected out; anterior filaments furthest from style. —H. Anther and upper part of filament. Drawn by Xi-Lin Wu from the holotype, *Hong Wang & Shu-dong Zhang 03-0857* (KUN).

petioles 10–20 mm long, drying yellow, widely membranous winged along their length, pilose only for a short distance in the middle, the proximal and distal portions glabrous; blades obovate-elliptic, 14–17 × 6–9 mm, obtuse at apex, glabrous, pinnatipartite, with 3 to 7 pairs of segments, each segment to 1 mm long, serrate, shortly cuspidate at apex, furfuraceous, with veins and veinlets prominent beneath. Flowers 1 to 4, axillary, pedicellate, the pedicels 1–2 mm long, densely long-pilose; calyx campanulate, 9–10 mm long overall, the tube 5–6 × 4 mm, densely long-pilose outside with trichomes ca. 0.1 mm, 1/3 cleft anteriorly and slightly constricted at the mouth, membranous, with 3 prominent veins and numerous veinlets, 3-lobed, calyx lobes leaf-like, furfuraceous, the posterior lobe 2 × 2 mm, smaller than the lateral lobes but equaling or longer than their individual lobules, subelliptic but tripartite, attenuate into a long petiolule; lateral lobes 4 × 3 mm, alternate, oblique and anisomerous at base, attenuate into short, broad petiolules, the upper foliaceous part expanded and orbicular in outline, tripartite, the lateral lobules oblong-obovate, each with 2 or 3 distal teeth, the terminal lobule of each lobe more broadly obovate and more deeply 3-toothed than the 2 lateral lobules; corolla crimson, with white throat; corolla tube 32–43 mm long, cylindrical, not dilated at the apex, densely pilose with thin hairs outside; the erect part of galea about as wide as the tube, gradually broadening above, slightly notched on anterior side at the apex and at almost 90° to the inflexed anther-bearing portion; anther-bearing portion of galea slightly protuberant, glandular; beak falcately curved, ca. 10 mm long, obliquely pointing downward, 2-partite at apex, the lobules broadly band-shaped, ca. 2 mm long; lower lip 3-lobed, shortly ciliate on margins (× 10 lens), the middle lobe oblong-obovate, 8–10 × 5–7 mm, abruptly slightly expanded distally at the middle, the distal half broadly orbicular, retuse at apex, the auriculate base attenuate into a short stipe; lateral lobes longitudinally reniform, 10 × 6 mm, directed slightly backward; staminal filaments inserted at the top of the corolla tube, ca. 10 mm long, 2 anterior ones sparsely pilose, 2 posterior ones glabrous, anthers ellipsoid; style slightly exerted from beak. Capsule and seeds unknown.

Etymology. The new species is named for the type locality, Yaoshan Mountain of Yunnan Province, China.

Distribution and ecology. *Pedicularis yaoshanensis* is probably an endemic species; it has only been collected at the type locality in the Yaoshan Mountain, northeastern Yunnan. According to field

investigations, only one population of this new species was found. There are approximately 100 mature individuals observed on the wet cliffs.

Relationships. *Pedicularis yaoshanensis* differs markedly from previously known species in the genus. It shows resemblances to species belonging to two different series of the genus, series *Pumiliones* Prain and series *Longiflorae* Prain. In its dwarf habit, petiolate leaves, rather long corolla tubes, and corollas with broad, plump lower lips, *P. yaoshanensis* resembles the species placed in series *Pumiliones*. This series comprises two species: *P. przewalskii* Maximowicz (endemic to northwestern and southwestern China, in alpine meadows) and *P. bella* Hooker f. (distributed in Tibet (Xizang, China) and Sikkim, in alpine meadows, steep slopes, and cliff faces). However, *P. yaoshanensis* differs from both these species by pinnatipartite leaves, deflexed galea beak obliquely pointing downward, and glabrous posterior filaments. It is clearly distinguished additionally from *P. bella* by glabrous leaves, a 3-lobed calyx, and especially a different corolla structure. In *P. bella*, the middle lobe of the corolla lower lip is much smaller than the laterals, which curve upward and hide the galea (see photograph: Ree, 2005, fig. 4), whereas in *P. yaoshanensis* the middle lobe of the corolla lower lip is the same size as the lateral ones and the whole lower lip is outspread, not concealing the galea. Its 3-lobed calyx also distinguishes *P. yaoshanensis* from most infraspecific taxa within *P. przewalskii*, except for *P. przewalskii* subsp. *microphyton* (Bureau & Franchet) P. C. Tsoong (= *P. microphyton* Bureau & Franchet). This subspecies has two varieties: variety *microphyton* has a white or pale yellow lower corolla lip that is not ciliate, while variety *purpurea* (Bonati) P. C. Tsoong (= *P. coppeyi* Bonati) from Sichuan has an entirely purple corolla with ciliate lower lip (H.-B. Yang et al., 1998). *Pedicularis yaoshanensis*, on the other hand, has a white corolla throat and a ciliate lower lip, thus combining characters of both varieties of *P. przewalskii* subsp. *microphyton*. However, *Pedicularis yaoshanensis* differs additionally from all infraspecific taxa of *P. przewalskii* by long conical roots, revolute leaf margins, and posterior calyx lobe smaller than the other two and tripartite.

In its 3-lobed calyx and corolla with a falcately curved beak, *Pedicularis yaoshanensis* resembles members of series *Longiflorae* more than it does series *Pumiliones*. Series *Longiflorae* is a large series of about 22 species, 19 of them occurring in China (H.-B. Yang et al., 1998; Yamazaki, 2003). All previously described species of this series whose habitat is known are plants of alpine meadows, often

in swampy habitats; *P. yaoshanensis* is apparently unique in occupying wet cliffs. Within series *Longiflorae*, *P. yaoshanensis* most resembles *P. humilis* Bonati, *P. latituba* Bonati, *P. lobatorostrata* T. Yamazaki, *P. sigmoidea* Franchet ex Maximowicz, and *P. siphonantha* D. Don on account of the emarginate corolla lower lip. Those five species are the only ones currently placed in series *Longiflorae* to have the combination of red-purple or pink corolla and an emarginate labellum. Neither species of series *Pumiliones* has an emarginate labellum, indicating that *P. yaoshanensis* is better placed in series *Longiflorae*, where the character state does occur. Its acaulescent habit easily separates *P. yaoshanensis* from *P. humilis* (which, despite the specific epithet, has stems 5–15 cm tall), *P. sigmoidea*, and *P. siphonantha*. Only *P. latituba* and *P. lobatorostrata* have stems typically not more than 3 cm tall and could be confused, in that respect, with *P. yaoshanensis*. *Pedicularis yaoshanensis* has a much smaller calyx than either of those species; its tube is only 5–6 mm long, as opposed to 8–10 mm in *P. latituba* and 13–20 mm in *P. lobatorostrata*. *Pedicularis yaoshanensis* also differs from both these species in glabrous posterior staminal filaments, although this character does occur in some species of series *Longiflorae* that lack the combination of acaulescent stem, red corolla, and emarginate labellum. *Pedicularis latituba* has a very distinctive bicolored corolla, the central area of each lobe of the labellum being a much deeper purple than the outer area. This further distinguishes it from *P. yaoshanensis*, which has the central area of the labellum paler or whitish, not darker. *Pedicularis yaoshanensis* resembles *P. lobatorostrata* in being dwarf and almost acaulescent (in *P. lobatorostrata* there is a 1.5–3 cm stem, whereas in *P. yaoshanensis* the stem is virtually absent) and in having red-purple corollas with long tubes 32–45 mm long and a deeply bilobed galea. However, *P. lobatorostrata* has a 5-lobed calyx, which is unusual in series *Longiflorae* and distinguishes it from both *P. yaoshanensis* (calyx with 3 lobes) and *P. latituba* (calyx with 2 or 3 lobes). *Pedicularis lobatorostrata* is additionally distinguished from *P. yaoshanensis* by its relatively narrower leaves, which are about 3–5 times (not 1.8–2.5 times) as long as broad.

The key below serves to identify *Pedicularis yaoshanensis* and the taxa mentioned in the discussion above. It includes all taxa belonging to series *Pumiliones*, but only those Chinese species of series *Longiflorae* having a red-purple corolla with an emarginate labellum and a stem less than 5 cm tall.

KEY TO SIMILAR SPECIES WITHIN *PEDICULARIS* SERIES *LONGIFLORAE* AND *PUMILIONES*

- 1a. Middle lobe of labellum emarginate; filaments either all pubescent or 2 glabrous (ser. *Longiflorae*) 2
- 1b. Middle lobe of labellum entire; all 4 filaments pubescent (ser. *Pumiliones*) 4
 - 2a. Calyx tube 13–20 mm long, with 5 lobes at apex *P. lobatorostrata*
 - 2b. Calyx tube 5–10 mm long, with 2 or 3 lobes at apex 3
 - 3a. Galea beak arcuate but not forming a semicircle, deeply bilobed at apex; calyx tube 5–6 mm long; 2 posterior filaments glabrous *P. yaoshanensis*
 - 3b. Galea beak forming a semicircle, not deeply bilobed at apex; calyx tube 8–10 mm long; all filaments pubescent *P. latituba*
 - 4a. Corolla labellum suberect and curved upward, partly hiding galea; galea beak S-shaped, entire, ca. 8 mm long *P. bella*
 - 4b. Corolla labellum spreading, not concealing galea; galea beak straight, 2-cleft, 5–6 mm long (*P. przewalskii*) 5
 - 5a. Corolla ± entirely deep purple except sometimes for whitish throat 6
 - 5b. Corolla with dark galea and pale purple, cream, or whitish labellum 7
 - 6a. Leaf blades sparsely pubescent to glabrous *P. przewalskii* subsp. *przewalskii* var. *przewalskii*
 - 6b. Leaf blades densely pubescent *P. przewalskii* subsp. *australis*
 - 7a. Calyx with 2 or 3 lobes *P. przewalskii* subsp. *microphyton*
 - 7b. Calyx with 5 lobes . . . 8
 - 8a. Leaves glabrous or sparsely pubescent *P. przewalskii* subsp. *przewalskii* var. *cristata*
 - 8b. Leaves densely pubescent *P. przewalskii* subsp. *hirsuta*

Paratype. CHINA. **Yunnan**: Qiaojia county, Yaoshan Mountain, 27°11'N, 103°04'E, 3700 m, 17 Aug. 2004, Hong Wang & Shu-dong Zhang 03-0840A (KUN, MO).

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