New Taxa of *Pedicularis* (Scrophulariaceae) from the Hengduan Mountains, Southwestern China

Author(s): Yu Wen-bin, Zhang Shu-dong, Wang Hong
Published By: Missouri Botanical Garden
DOI:

BioOne ([www.bioone.org](http://www.bioone.org)) is a nonprofit, online aggregation of core research in the biological, ecological, and environmental sciences. BioOne provides a sustainable online platform for over 170 journals and books published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Web site, and all posted and associated content indicates your acceptance of BioOne’s Terms of Use, available at [www.bioone.org/page/terms_of_use](http://www.bioone.org/page/terms_of_use).

Usage of BioOne content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.
New taxa of Pedicularis (Scrophulariaceae) from the Hengduan Mountains, Southwestern China

Yu Wen-bin,1, 2 Zhang Shu-dong,1, 2 and Wang Hong1, 3*

1 Key Laboratory of Biodiversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650204, People’s Republic of China
2 Graduate School of Chinese Academy of Sciences, Beijing 100039, People’s Republic of China
3 School of Science Life of Nanjing University, Nanjing 210093, People’s Republic of China

*Corresponding author: wanghong@mail.kib.ac.cn

ABSTRACT. One new subspecies and one new variety of Pedicularis L. from the Hengduan Mountains region in southwestern China are described. The main diagnostic features of the taxa are compared with closely related taxa, and distributions and morphological photos are provided. The new taxa are: Pedicularis gyrorhyncha subsp. glabrisepala H. Wang & W. B. Yu and P. siphonantha var. stictochila H. Wang & W. B. Yu.

Key words: Hengduan Mountains, IUCN Red List, Pedicularis, Scrophulariaceae, southwestern China.

Pedicularis L. is one of the largest genera of angiosperms in the northern temperate zone (Li, 1951; Ree, 2005) and belongs to the family Scrophulariaceae as traditionally recognized (Mill, 2001; Yang et al., 1998; Wu et al., 2003; Zhang et al., 2006). There are about 600 to 800 species of this genus distributed primarily in the Arctic and alpine regions of the Northern Hemisphere (Mill, 2001; Wang et al., 2003; Wang & Li, 2005). At least half of the species occur in China, especially in the Hengduan Mountains region of southwestern China, where they represent one of the main centers of species diversity and endemism for this genus (Yang et al., 2003; Wang, 2006).

The flowers of the genus Pedicularis show a range of diversity likely unequaled by any other flowering plant genera. The variations of the corolla shape, particularly in the galea (e.g., toothed, toothless, with short or long beak, curved beak, crested), are dramatic among species and infraspecies, as are obvious differences in the corolla tube lengths (from 0.5 mm to 12 cm). Recent phylogenetic analyses of Pedicularis indicate extensive parallel evolution in floral traits (Yang et al., 2003; Ree, 2005).

Recently, we conducted extensive field investigations on Pedicularis in the Hengduan Mountains region. By careful field observation, we observed interesting and distinct variations in floral color and/or external morphologies, which occur within different populations of the same species. Thus, we propose two new taxa at infraspecific levels within Pedicularis.


1a. Pedicularis gyrorhyncha subsp. glabrisepala H. Wang & W. B. Yu, subsp. nov. TYPE: China. Sichuan: Daocheng Co., roadside betw. Mula & Chitu, ca. 3620 m, 18 Aug. 2005, Wen-bin Yu, Shu-dong Zhang & Ding Wu 86 (holotype, KUN; isotypes, KUN, MO). Figure 1C–E.

A Pediculari gyrorhyncha subsp. gyrorhyncha Franchet ex Maximowicz, plantis parce pubescentibus, bracteis et calyculis glabris, filamentis posticis brevibus differt.

Biennial herbs, 30–100 cm tall, not drying black, sparsely pubescent; rootstock vertical; stems erect, solitary or caespitose, 3 to 5, vertical lines of white pubescence, bearing 3 or 4 slender branches at middle and upper portions. Basal leaves opposite, middle and upper leaves in whorls of 3 or 4; petioles to 30 mm; leaf blade ovate-oblong to lanceolate-oblong, pinnaetidif or pinnaetipartite; lobes linear-lanceolate to ovate, margin denticate, slightly reflexed. Inflorescences spicate, interrupted; bracts glabratar, the lower bracts proximal foliaceous, upper ones dilated at the base, linear-lanceolate, longer than flowers, membranous, margin denticate, slightly reflexed; pedicels short, 1–4 mm. Calyx tube campanulate, ca. 5 mm, membranous, with 10 veins, outer wall glabrous or scarcely pubescent along the thick veins; calyx lobes 5, unequal, callous-dentate and briefly pubescent at margin, slightly reflexed, posterior calyx lobe triangular, small and entire, lateral ones large, ca. 5 mm, linear-lanceolate, almost entire; corolla pale yellow, 15–18 mm, corolla tube ca. 1 cm;
corolla beak dark purple, semicircular, ca. 10 mm, 2-lobed at tip; lower lip larger, ca. 10 × 15 mm, ciliate, middle corolla lobe rounded, hooded; filaments of stamens attached at the middle of tube, the anterior 2 pubescent, the posterior 2 glabrous; style exserted from beak, spherical. Capsule enclosed by persistent and accrescent calyx, ovate-oblong, apiculate, smooth, ca. 1.5 cm long; immature seed long-oblong, brown.

Distribution. *Pedicularis gyrohyrnea* subsp. *glabrisepala* is endemic to southwestern Sichuan province between 3400 and 4000 m elevation, whereas the subspecies *gyrohyrnea* is endemic to northwestern Yunnan province between 2700 and 4000 m (Fig. 2). The two subspecies are separated by the xerothermic riverside of the Yangtze River and the Daxueshan Mountains.

*IUCN Red List category*. The new subspecies is not common, occurring in isolated, small populations or as solitary plants at high altitudes. *Pedicularis gyrohyrnea* subsp. *glabrisepala* is probably not threatened because of the high altitude at which it occurs and can be considered Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).
Phenology. Collected with flowers in August, and with flowers and fruits in September.

Etymology. The epithet ‘’glabrisepala’’ refers to the glabrous sepal of the flowers (Fig. 1D, E), the most distinct characteristic feature in the subspecies.

Relationships. Pedicularis gyrorhyncha subsp. gyrorhyncha differs from subspecies glabrisepala by the dense pubescence on the whole plant, especially at the stem apex, the bracts, the calyx, and the filaments of the four stamens. In contrast, plants of the new subspecies glabrisepala are only sparsely pubescent, with glabrous bracts, a glabrous calyx, and the two posterior filaments of the stamens also glabrous.

Paratypes. CHINA, Sichuan: Daocheng Co., ca. 4000 m, 31 Aug. 1981, Qing-Zang Exped. 5875 (KUN, PE); Derong Co., ca. 3400 m, 4 Aug. 1981, Qing-Zang Exped. 3242 (KUN, PE); Muli Co., ca. 3800 m, 7 Sep. 1983, Qing-Zang Exped. 515 (KUN, PE); Xiangcheng Co., 3800–3900 m, 9 Aug. 1981, Qing-Zang Exped. 3859 (KUN, PE).

2. Pedicularis siphonantha D. Don, Prodr. Fl. Nepal. 95. 1825. TYPE: Nepal. Gosaingshan, in alpine, Wallich s.n. (type, BM not seen). Figure 3A.


2b. Pedicularis siphonantha var. stictochila H. Wang & W. B. Yu, var. nov. TYPE: China. Yunnan: Zhongdian Daxueshan Mtn., Zhongxiang rd., ca. 3750 m, 27 July 2003, H. Wang, J. Cai, L. Lu & H. B. Chu 03-041 (holotype, KUN; isotype, MO). Figure 3D, E.

A Pedicularis siphonantha var. siphonantha D. Don, folium segmentis magoribus, corollarum tubis longioribus, galea rostro sigmoideo exauriculato instructis, labo maculis 4, atro-purpuratis facile differt.

Perennial herbs, drying slightly black or not; taproots cylindric, ca. 5–7 cm; stems solitary and ± erect, or sometimes caespitose, outer ones procumbent and to 30 cm, striate, pubescent. Leaves basal and cauline, basal ones densely fascicled; petiole of basal leaves 3–5 cm, petiole of cauline leaves 1–3.5 cm, winged, glabrescent or sparsely long-pubescent; leaf blade lanceolate to linear, ca. 1.5–8 × 0.7–1.9 cm, sparsely long-pubescent along midvein and both leaf surfaces, pinnatifid, leaf segments in 7 to 18 pairs, to ca. 6 × 8 mm; lobes somewhat lanceolate to broadly ovate or triangular, pinnatifid or double-dentate, callous-dentate, slightly reflexed. Flowers axillary,
dense, sometimes interrupted at basal position; bracts leaf-like, membranous; calyx tubular, ca. 0.7–1.1 cm excluding lobes, sparsely long-pubescent, 1/3 cleft anteriorly. Calyx lobes 3, leaf-like, posterior lobe smallest; corolla purple or rose-red, white at throat; corolla tube erect, ca. 8–10 cm, slender, tube wall finely pubescent; galea strongly twisted at apex, without auriculate, with numerous small dark purple spots; corolla beak slender, conspicuously S-shaped, bent upward, to 1.1 cm; lower lip ciliate, ca. 0.8 × 1.5 cm, with 4 deep purple spots, 2 on middle lobe, 1 on each lateral lobe; middle lobe slightly smaller, emarginate, 2-lobed; filaments attached near tube throat, anterior pair pubescent, posterior pair sparsely pubescent or glabrous. Capsule ovoid-oblong; immature seed linear-ovate, brown.

**Distribution.** *Pedicularis siphonantha* var. *siphonantha* is only distributed in the Himalayas from western Nepal to Bhutan and southeastern Xizang Autonomous Region. The other variety delavayi is distributed in southeastern Qinghai, eastern Xizang, western Sichuan, and southwestern Yunnan of China. The distribution of variety stictochila overlaps with variety delavayi in southwestern Sichuan province, but the two varieties were not observed to occur in the same population (Fig. 2).

**IUCN Red List category.** *Pedicularis siphonantha* var. *stictochila* is not common, and it is restricted to alpine meadows. Its habitats are not likely to be threatened by human activities, but its continued existence may well be threatened by climate change. This variety can be considered Least Concern (LC) according to IUCN Red List criteria (IUCN, 2001).

**Phenology.** Collected with flowers in July, and with flowers and fruits in August.

**Etymology.** The specific epithet “stictochila” refers to the variety’s lower lip with four dark purple spots (Fig. 3E). This morphological character is distinctive from other varieties of *P. siphonantha*. However, because of the close relationship and sympathy with *P. siphonantha* var. delavayi, it is treated at the varietal level here.

**Relationships.** *Pedicularis siphonantha* var. *siphonantha* differs from other varieties in having a conspicuous auriculate protrusion at the base of the floral galea. *Pedicularis siphonantha* var. delavayi and the typical variety bear leaves ca. 1–6 × 0.7–1.6 cm, the leaf segments in 6 to 15 pairs, ca. 1.5–4 × 6 mm, the corolla tubes less than 7 cm, the lower corolla lip lacks the dark purple maculation, and the corolla beak is semicircular or slightly S-shaped. In contrast, *P. siphonantha* var. stictochila has leaves ca. 1.5–8 × 0.7–1.9 cm, the leaf segments are in 7 to 18 pairs, and to ca. 6 × 8 mm, the corolla tube is longer than 8 cm, the lower lips of the corolla are remarkable for their four dark purple spots, the floral galea lacks an auriculate protrusion, and the beak is conspicuously S-shaped.

**Paratypes.** CHINA. Sichuan: Xiangcheng Co., alpine meadows, ca. 3600–3900 m, 17 Aug. 2005, Wen-bin Yu, Sha-duong Zhang & Ding Wu 74 (KUN); meadow slope, ca. 4200 m, 10 Aug. 1973, Xiang 3038 (KUN, PE). Yunnan: Zhongdian Co., Daxueshan, under forest or meadow, ca. 3800 m, 28 Aug. 2002, Wen-li Li & Xue Yang 091 (KUN, MO); alpine meadows, ca. 4100–4200 m, 16 Aug. 2005, Wen-bin Yu, Sha-duong Zhang & Ding Wu 44 (KUN).

**Acknowledgments.** This study was supported by grants from the National Natural Science Foundation of China (grant no. 30570115) and the Keynote Project of the Knowledge Innovation Program, Chinese Academy of Sciences (grant no. KSCX2-YW-Z-034). We are grateful to two anonymous reviewers and Victoria C. Hollowell for valuable comments and suggestions; to De-zhu Li for helpful discussion; to Zhi-yun Su for assistance with Latin; to Jie Cai, Jun He, Na-na Lin, Lu Lu, and Ding Wu for assistance in the field in southwestern China; and to the curators of the herbaria (KUN, PE) for making the specimens available.

**Literature Cited**


