A New Species and a New Specific Synonym of *Pedicularis* (Scrophulariaceae) from the Hengduan Mountains, China

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ABSTRACT. *Pedicularis inflexirostris* F. S. Yang, D. Y. Hong & X. Q. Wang, a new species from the Hengduan Mountains, China, is described. *Pedicularis inflexirostris* is different from *P. tatarinowii* Maximowicz in having more slender stems, fewer branches, a cucullate middle lobe of the lower corolla lip, and glabrous filaments. *Pedicularis deqinensis* H. P. Yang is reduced to a synonym of *P. ramosissima* Bonati on the basis of their common characters of long and dense branches, recurved calyx teeth, pilose indumentum on the inner margin of the calyx, and cucullate middle lobe of the lower corolla lip.

Key words: China, Hengduan Mountains, *Pedicularis,* Scrophulariaceae.

Pedicularis L., consisting of about 500 species, is the largest genus in the Scrophulariaceae. The genus, confined to the Northern Hemisphere, is a member of the arctic-alpine flora with the majority of species occurring in meadows. Recorded in China are about 352 species, of which 214 are concentrated in the Hengduan Mountains (western Sichuan, eastern Tibet, and western Yunnan), where most *Pedicularis* are endemic (Hong, 1983; Yang et al., 1998).

Due to the large number of species, high diversity of flowers, and extensive parallel evolution of floral characters in *Pedicularis,* it is difficult to reconstruct a natural intrageneric classification system. Quite a few influential but controversial systems have been proposed (Steven, 1823; Bunge, 1841; Maximowicz, 1888; Bonati, 1910; Limpricht, 1924; Li, 1948, 1949; Tsoong, 1955, 1963), but Li's (1948, 1949) and Tsoong's (1955, 1963) systems are the most outstanding. Li's system includes 3 groups, 22 sections, 79 series, and 282 species, while Tsoong's includes 13 groups, 21 subgroups, 112 series, and 329 species (Tsoong, 1963). Despite so many classification systems proposed, taxonomic research on *Pedicularis* in the eastern Himalayas, the modern diversity center of *Pedicularis,* is insufficient compared to the abundant *Pedicularis* species in the region.

In the summers of 2000 and 2001 we conducted an extensive field investigation on *Pedicularis* in the Hengduan Mountains and collected a large amount of *Pedicularis* specimens. Based on examination and identification of the specimens, we found a new species and nominated it as *Pedicularis inflexirostris* F. S. Yang, D. Y. Hong & X. Q. Wang on the basis of the inflexed beak. According to Li's system, the new species should be placed in the group *Cyclophyllum* sect. *Orthosiphonia* ser. *Myriophyllae* Maximowicz, while in Tsoong's system, it belongs to the grex *Orthosiphonia* Tsoong ser. *Myriophyllae* Maximowicz. The series *Myriophyllae* was founded by Maximowicz (1878) and redefined by Maximowicz (1888), Prain (1890), and Limpricht (1924). Li (1948) narrowed the circumscription of this series, removing *Pedicularis curvituba* Maximowicz and *P. anas* Maximowicz with curved and deflexed corolla tubes to form a new series, series *Curvitubae* Li. Therefore, the series *Myriophyllae* in Li's system includes four species, *P. myriophylla* Pallas, *P. alaschanica* Maximowicz, *P. tatarinowii,* and *P. provoti* Franchet, characterized by a deflexed beak and more or less straight corolla tube. Tsoong (1963) broadened the circumscription of the series *Myriophyllae,* adding a new species *Pedicularis pseudocurvituba* Tsoong, and transferring here *P. scolopax* Maximowicz and *P. cristatella* Pennell & Li from other series. Thus the series *Myriophyllae,* according to Tsoong (1963), includes seven species having a deflexed to straight and horizontal beak. Shown in the following key are the circumscription of the series and the distinctness of our new species.

KEY TO THE SPECIES OF SERIES *MYRIOPHYLLAE*

1a. Beak of corolla less than 1 mm long; lateral calyx lobes entire . . . . . *P. myriophylla*
1b. Beak of corolla 2–5 mm long; lateral calyx lobes serrate, pinnatifid, or entire.
  2a. Beak of corolla 3–5 mm long; galea crested . . . . . *P. cristatella*
  2b. Beak of corolla 2–3 mm long; galea not crested.
    3a. Corolla purple-red; beak of corolla strongly inflexed.

4a. Middle lobe of lower lip cucullate; filaments all glabrous . . *P. inflexirostris*
4b. Middle lobe of lower lip elongated, not cucullate; filaments all pubescent . . . . . *P. tatarinowii*
3b. Corolla yellow; beak of corolla slightly curved.
5a. Bracts all or at least proximal ones longer than flowers; filaments all glabrous or only 2 glabrous.
6a. Corolla 2–2.5 cm long; anterior filaments villous, posterior ones glabrous . . . . . *P. alaschanica*
6b. Corolla ca. 1.5 cm long; filaments all glabrous . . . *P. scolopax*
5b. Bracts all shorter than flowers; filaments all pubescent.
7a. Basal leaves persistent; stems herbaceous, unbranched above; calyx at least ½ cleft at anterior . . . . . *P. pseudocurvituba*
7b. Basal leaves caducous; stems ± woody, short-branched throughout; calyx barely ⅓ cleft at anterior . . . . *P. curvituba*

Pedicularis inflexirostris F. S. Yang, D. Y. Hong & X. Q. Wang, sp. nov. TYPE: China. Tibet: Jomda County, Mt. Wangna, dry slope meadow, ca. 3700 m, 13 Aug. 2001, *F. S. Yang Y0180* (holotype, designated here, PE). Figure 1.

Species *P. tatarinowii* affinis, a qua caulibus tenuioribus medio 1–2.5 mm diametro, ramis paucioribus usque ad 4, galeae parte erecta graciliore 1.5 mm diametro, labio infero minore 8–9 mm lato, lobo medio cucullato, filamentis omnibus glabris differt.

Annuals, 20–45 cm tall, ± black when dry. Rootstocks vertical, woody, 4–8 cm long. Stems solitary or sometimes caespitose, 1–2.5 mm diam. at the middle part, erect, with 4 lines of hairs, and 0 to 4 branches at middle and upper parts of stems. Basal leaves opposite, middle and upper leaves in whorls of 4, long crisp pilose along petioles and nerves; petioles 1–2 cm long; laminae oblong-lanceolate, 15–30 × 8–15 mm, pinnatisect; dentate segments 10- to 13-paired, linear-lanceolate. Inflorescences to 15 cm long, interrupted at lower part; lower bracts similar to upper leaves in shape, top bracts dilated at the base, ovate. Calyx tube 5–7 mm long, membranous, with 10 thick veins and 5 triangular to lanceolate teeth, gray-tomentose. Corolla 13–15 mm long, pale purple, tube straight, as long as or slightly longer than the calyx; erect part of the galea 4–5 mm long, 1.4–1.5 mm wide, horizontal part of the galea strongly dilated to 4 mm wide; beak bent downward and backward, ca. 2 mm long; lower lip 6 × 8–9 mm, middle lobe cucullate, ½ as wide as lateral lips. Filaments glabrous. Capsules lanceolate.

Pedicularis inflexirostris resembles *P. tatarinowii* (ser. *Myriophyllae*) in having pinnatisect laminae, a straight corolla tube, and recurved beak, but differs from the latter in having more slender stems, fewer branches at the middle part, and thinner helmet (Table 1). The cucullate middle lobe of the lower lip and glabrous filaments are diagnostic characters of the new species, by which it is readily distinguished from *P. tatarinowii*. The lower lip of *P. inflexirostris* is also similar to that of the species in series *Longicaules* Prain (*P. dielsiana* Bonati, *P. longicaulis* Franchet) in shape, but the pinnatisect laminae, racemose inflorescences, and inflexed beak of the corolla show that *P. inflexirostris* is related to the grex *Cyclocladus* ser. *Myriophyllae* Maximowicz.

Habitat and distribution. *Pedicularis inflexirostris* is found in Garze County in western Sichuan, and Jomda and Qamdo Counties in eastern Tibet, at altitudes of 3700–3900 m, in meadows on dry slopes.

Paratypes. CHINA. **Tibet**: Qamdo County, Mt. Kajila, dry slope meadows, ca. 3700 m, 7 Aug. 2001, *F. S. Yang Y0150* (PE). **Sichuan**: Garze County, Mt. Zhuodala, dry slope meadows, ca. 3900 m, 2 Aug. 2001, *F. S. Yang Y0131* (PE).

Pedicularis ramosissima was described by Bonati (1908). Li (1948) placed it in the group *Cyclophyllum* sect. *Orthosiphonia* ser. *Pectinatae* Prain, while Tsoong (1963) treated it in the grex *Cyclocladus* subgrex *Cyclocladus* ser. *Graciles* Maximowicz. The series *Pectinatae* was founded by Prain (1890) and revised by Limpricht (1924). Li (1948) narrowed the circumscription of the series to include five species, *Pedicularis scolopax, P. moupinensis* Franchet, *P. tantalorhyncha* Franchet, *P. atuntsiensis* Bonati, and *P. ramosissima,* characterized by dilated and serrated bracts at the upper part of inflorescences, and more or less straight and horizontal beak. Tsoong (1963) redefined the series *Pectinatae* Prain to include only one new species, *Pedicularis rhynchotricha* Tsoong, with a twisted and pilose beak to distinguish it from the species in the series *Pectinatae* Prain of previous systems, transferring *P. ramosissima* to the series *Graciles.* Thus the series *Graciles,* according to Tsoong's system (1963), includes two species, *Pedicularis ramosissima* and *P. gracilis* Wallich, characterized by excessive branches at the upper part of stems and flowers with an elongated beak. The circumscription of the series and the distinctness of the two species are shown in the following key.

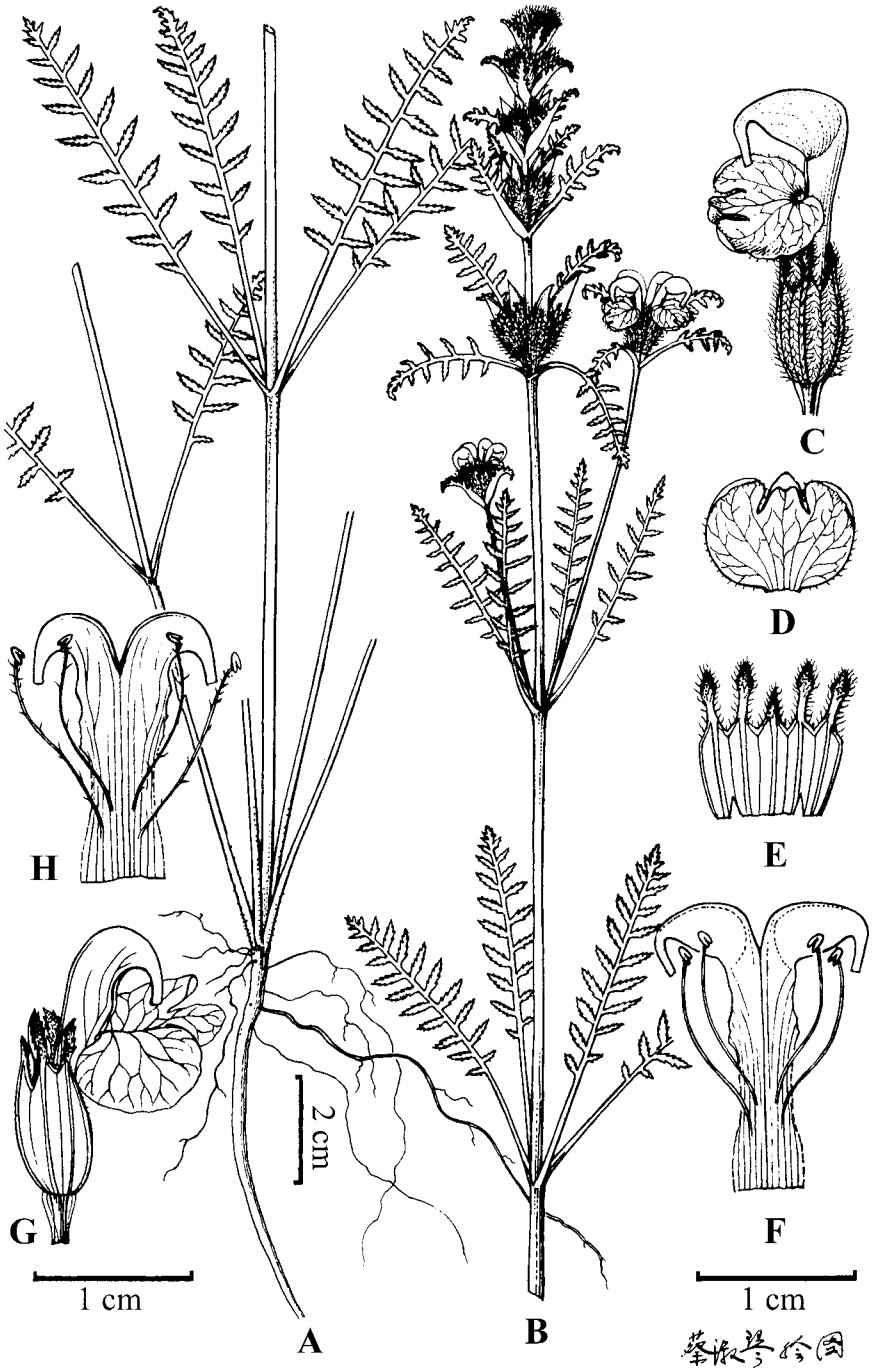

Figure 1. A–F. *Pedicularis inflexirostris* F. S. Yang, D. Y. Hong & X. Q. Wang. (Based on the collection *F. S. Yang Y0150,* PE.) —A, B. Habit. —C. Flower. —D. Lower lip. —E. Calyx. —F. Corolla and stamens. G, H. *Pedicularis tatarinowii.* (Redrawn from figure 48 in Tsoong, 1963.) —G. Flower. —H. Corolla and stamens.

Table 1. Diagnostic characters distinguishing *Pedicularis inflexirostris* from *P. tatarinowii*.

	Number of branches	Diam. of stems at middle part (mm)	Width of helmet at erect part (mm)	Width of lower corolla lip (mm)	Shape of middle lobe of lower corolla lip	Filaments
P. inflexirostris	0–4	1–2.5	1.4–1.5	8–9	cucullate	glabrous
P. tatarinowii	0–26	1.5–5	2.5–3	13–15	elongated, not cucullate	pubescent

Key to Species of *Pedicularis* in Series *Graciles*

1a. Calyx teeth recurved, pilose on inner surface; middle lobe of lower corolla lip cucullate . . . . . *P. ramosissima*
1b. Calyx teeth straight, glabrous on inner surface; middle lobe of lower corolla lip not cucullate . . . . . *P. gracilis*

Pedicularis ramosissima Bonati, Bull. Soc. Bot. France. 55: 246. 1908. TYPE: China. Sichuan: Yargong, Aug. 1904, *R. P. Soulié 5283* (holotype, P not seen, photo PE).

Pedicularis deqinensis H. P. Yang, Acta Phytotax. Sin. 28: 137. 1990. Syn. nov. TYPE: China. Yunnan: Deqen County, 2900–3400 m, 21 Aug. 1981. *Inst. Bot. Acad. Sin. Hengduanshan Exped. 3332* (holotype, PE; isotype, PE).

The original description of *P. ramosissima* was based on a single specimen, *Soulié 5283*. With more specimens examined, the description is revised here, adding some characters.

Stems 20–90 cm tall. Petioles 5–20 mm long, laminae 25–60 × 8–30 mm, dentate segments 5- to 12-paired. Calyx tube ca. 5 mm long with 5 teeth recurved. Corolla pale purple, 15–18 mm long, tube straight; erect part of galea 6–8 mm long; lower lip 8 × 12 mm, middle lobe cucullate.

Pedicularis deqinensis was noted by Yang (1990) to be close to *P. cristatella*, and was grouped, without further explanation, into series *Myriophyllae*, in which the latter also nested. Probably the elongated beak and the crest on the helmet were characters that prompted the author to relate *P. deqinensis* to *P. cristatella* and then to the grex *Orthosiphonia* ser. *Myriophyllae*. But in *Pedicularis*, convergent and parallel evolution of the corolla prevails, so that it may be unjustifiable to circumscribe intrageneric taxa based only on differences in the corolla (Li, 1951; Tsoong, 1955). Based on our observation of the specimens (*Inst. Bot. Acad. Sin. Hengduanshan Exped. 3332*) of *P. deqinensis*, long and dense branches in whorls of 4 at the middle and upper parts of stems and sparse, opposite or 3-verticillate flowers clearly indicate its position in the grex *Cyclocladus* ser. *Graciles*. Furthermore, all important characters of *P. deqinensis*, such as habit, arrangement of branches and flowers, shape of leaf and corolla, and size of calyx and corolla, are perfectly consistent with those of *P. ramosissima*. In particular, the recurved calyx teeth, pilose indumentum on the inner margin of the calyx, and cucullate middle lobe of the lower lip further indicate that *P. deqinensis* should be merged into *P. ramosissima*, and these characters are the principal ones to distinguish *P. ramosissima* from its close species in the series *Graciles*.

Habitat and distribution. *Pedicularis ramosissima* is found in Deqen County in western Yunnan and Zogang County in eastern Tibet, at altitudes of 2900–3700 m, under shrubs and *Quercus* forests.

Additional specimen examined. CHINA. **Tibet**: Zogang County, under shrubs at dry gravelly slope, ca. 3650 m, 18 Aug. 2001, *F. S. Yang Y0182* (PE).

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