

# Typification of seven Chinese species of *Pedicularis* (Orobanchaceae) described by Bureau and Franchet with taxonomic notes

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**Background** – Seven species of *Pedicularis* (*P. batangensis*, *P. birostris*, *P. goniantha*, *P. microphyton*, *P. princeps*, *P. rhynchodonta* and *P. tatsienensis*) described by Bureau & Franchet are based on collections made by Prince Henri d'Orléans in 1890. Because these specimens lack collection numbers Bureau & Franchet merely described their provenance in the protologue, which has created much subsequent difficulty for authors seeking to access the types.

**Material and Methods** – Type materials conserved at P were seen and accessed online through high quality digital photographs. Other materials conserved at CDBI, F, GH, KUN NY, PE, and US were also examined.

**Key results** – The lectotypes for seven names are designated. In addition, *P. przewalskii* var. *hirsuta* H.L.Li is newly reduced to synonym of *P. przewalskii* subsp. *microphyton* ( $\equiv$  *P. microphyton*), and *P. rhynchodonta* f. *maxima* is also lectotypified herein.

**Key words** – China, Hengduan Mountains, lectotypification, *Pedicularis*.

## INTRODUCTION

*Pedicularis* L. (Linnaeus 1753) (Orobanchaceae) comprises approximately 600 species (Li 1948, Fischer 2004). About 300 species are endemic to the Hengduan Mountains region in southwestern China, situated at the juncture of Sichuan, Yunnan, and Xizang Provinces (Hong 1983, Yang et al. 1998, Wang 2006). Based on herbarium collections from western Sichuan made in 1890 by Prince Henri d'Orléans, on an expedition in which he was accompanied by Pierre Gabriel Edouard Bonvalot, Bureau & Franchet (1891a, 1891b) described seven species of *Pedicularis*. For the current usage of these names in the updated *Flora of China* (Yang et al. 1998), *P. batangensis* Bur. & Franch., *P. princeps* Bur. & Franch., *P. rhynchodonta* Bur. & Franch. and *P. tatsienensis* Bur. & Franch. were adopted; *P. microphyton* Bur. & Franch. was reduced to subspecies rank as *P. przewalskii* Maxim. subsp. *microphyton* (Bur. & Franch.) P.C.Tsoong, and *P. birostris* Bur. & Franch. and *P. goniantha* Bur. & Franch. were reduced to synonyms of *P. cranolopha* Maxim. var. *longicornuta* Prain and *P. kansuensis* Maxim. subsp. *kansuensis*, respectively. Due to the gatherings by Prince

Henri d'Orléans lacking collection numbers, Bureau & Franchet (1891a, 1891b) merely provided the provenance information for the types in the protologue. In the subsequent revision of Chinese *Pedicularis*, Li (1948, 1949) and Tsoong (1963) did not access the types of these names, and therefore, the species definition is not completely consistent between authors. After checking the potential type specimens conserved at the herbarium of the Muséum national d'Histoire naturelle (P), the lectotype of these names is designated in this study. In addition, we clarify some taxonomic confusion concerning these names.

## MATERIAL AND METHODS

All specimens designated as lectotypes conserved at the herbarium of the Muséum national d'Histoire Naturelle (P) were seen and accessed online through high quality digital photographs (<http://science.mnhn.fr/institution/mnhn/search>). For selected specimens we consulted the curator of P for more detailed information. Other materials conserved at the herbaria of Harvard University (GH), New York Botanical Garden (NY), and Smithsonian Institution (US) were also seen

and accessed online. Specimens were personally observed on visits to the herbaria of CAS Chengdu Institute of Biology (CDBI), Field Museum of Natural History (F), CAS Kunming Institute of Botany (KUN), and CAS Institute of Botany (PE).

## TYPIFICATION AND TAXONOMIC NOTES

**1. *Pedicularis batangensis*** Bur. & Franch. (Bureau & Franchet 1891a: 106–107). – Type: China, Sichuan, between Litang and Batang (entre Batang et Litang), 1890, *Prince Henri d'Orléans* s.n. (lecto-: P, barcode P02994285, **designated here**).

Two specimens (P02994285 and P02994286) in P were collected by Prince Henri d'Orléans. The sheet P02994285 is selected as the lectotype of *P. batangensis* because it contains nine flowering plants, among them three with roots. By contrast, the sheet P02994286 contains only two incomplete flowering branches. The flower colour of *P. batangensis* was recorded as pink (“rosea”) in the protologue. Field investigations revealed two types of flower colour. In one type the beak is red-purple, and the lower lip and corolla tube are white, then the lower lip changes to pink before withering (fig. 1A). In another type the beak is yellow, and the lower lip and corolla tube are pale yellow (fig. 1B). Four DNA barcoding loci did not discriminate samples between white/pink and yellow corollas (see Yu et al. 2011).

**2. *Pedicularis birostris*** Bur. & Franch. (Bureau & Franchet 1891a: 107–108) [= *Pedicularis cranolopha* Maxim. var. *longicornuta* Prain (Prain 1892: pl. 2208)]. – Type: China, Sichuan, Kangding (Ta-tsien-lou), 1890, *Prince Henri d'Orléans* s.n. (lecto-: P, barcode P02994316, **designated here**).

Only one specimen (P02994316) in P was collected by Prince Henri d'Orléans, which is selected here as the lectotype of *P. birostris*. *Pedicularis birostris* differs from *P. cranolopha* in the crest on the galea which is modified into a long, slender and pointed protrusion (fig. 1C). By contrast, the galea of *P. cranolopha* is simply crested, without appendage (fig. 1D). Therefore, Prain (1892) correctly treated this taxon as a variety of *P. cranolopha*. In addition, we found that the type specimen (*J.A.Soulié* 3763, barcode P02976801, P) of *P. garnieri* Bonati (Bonati 1908a: 243–244) [= *P. cranolopha* var. *garnieri* (Bonati) P.C.Tsoong (Tsoong 1963: 359)] cannot be discriminated from specimens of *P. cranolopha*.

**3. *Pedicularis goniantha*** Bur. & Franch. (Bureau & Franchet 1891b: 128) [= *Pedicularis kansuensis* Maxim. (Maximowicz 1881: 516) subsp. *kansuensis*]. – Type: China, Sichuan, Kangding (Ta-tsien-lou), 1890, *Prince Henri d'Orléans* s.n. (lecto-: P, barcode P04333003, **designated here**).

The specimen (P04333003) in P collected by Prince Henri d'Orléans seems to be the only existing original material, which is chosen as the lectotype of *P. goniantha*. Currently, *P. goniantha* (fig. 1E) is treated as a synonym of *P. kansuensis* Maxim. (fig. 1F), which is a widely distributed and morphologically diverse species in western China, with four subspecies (Yang et al. 1998). Corolla colour of subsp.

*kansuensis* varies from white to purple-red, and *P. goniantha* has a pink flower type (fig. 1E).

**4. *Pedicularis microphyton*** Bur. & Franch. (Bureau & Franchet 1891a: 107) = *Pedicularis przewalskii* Maxim. (Maximowicz 1878: 55) subsp. *microphyton* (Bur. & Franch.) P.C.Tsoong (Tsoong 1963: 353) = *Pedicularis przewalskii* Maxim. var. *microphyton* (Bur. & Franch.) H.L.Li (Li 1949: 114). – Type: China, Sichuan, Kangding (Ta-tsien-lou), 1890, *Prince Henri d'Orléans* s.n. (lecto-: P, barcode P02977046, **designated here**).

*Pedicularis przewalskii* var. *hirsuta* H.L.Li (Li 1949: 113) = *Pedicularis przewalskii* subsp. *hirsuta* (H.L.Li) P.C.Tsoong (Tsoong 1963: 352), **synon. nov.** – Type: China, Yunnan, Yongning, Mt. Wunha, May 1932, *J.F.Rock* 24224 (holo-: US, barcode 00125662; iso-: F, GH, NY).

Three specimens of *P. microphyton* collected by Prince Henri d'Orléans were found in P. Two sheets (P02977045 and P02977046) are annotated as being from “environs de Ta-tsien-lou” and the third sheet (P02977047) as “entre Batang et Litang”. In the protologue, the locality was presented as “entre Batang et Litang, sur les gazons secs et sur les coteaux avant Ta-tsien-lou”, therefore, we treat all three specimens as original materials. The sheet P02977045 consists of two plants and one fragmentary flower, the sheet P02977046 contains four plants and one fragmentary flower, and the sheet P02977047 includes three fragmentary flowers and two leaves. The sheet P02977046 is better conserved than the sheet P02977045; leaf, calyx and corolla traits are easier to identify. Thus, the sheet P02977046 is selected as the lectotype of *P. microphyton*.

*Pedicularis microphyton* (fig. 1G) differs from *P. przewalskii* Maxim. (fig. 1H) in the white to cream-coloured lower lip of the corolla (vs. rose to purple) and the pubescent leaf (vs. sparsely pubescent to glabrous). Li (1949) and Tsoong (1963) treated it as a variety and a subspecies under *P. przewalskii*, respectively. Leaf morphology of subsp. *australis* (H.L.Li) P.C.Tsoong (fig. 1I) is similar to subsp. *microphyton*, while the corolla of subsp. *australis* is purple-red throughout. The type of *P. przewalskii* subsp. *hirsuta* (H.L.Li) P.C.Tsoong was recorded with purple flower, while the pale lower lip when dry indicates that the lower lip may have been white or cream-coloured. To date, *P. przewalskii* subsp. *hirsuta* is only known from a single collection, and the colour of the lower lip may be overlooked by the collector. Therefore, we suggest that *P. przewalskii* subsp. *hirsuta* should be treated as a synonym of *P. przewalskii* subsp. *microphyton*. In addition, *P. przewalskii* var. *cristata* H.L.Li should be transferred from *P. przewalskii* subsp. *przewalskii* to *P. przewalskii* subsp. *microphyton*, and *P. przewalskii* var. *purpurea* (Bonati) H.L.Li should be transferred from *P. przewalskii* subsp. *microphyton* to *P. przewalskii* subsp. *australis*.

**5. *Pedicularis princeps*** Bur. & Franch. (Bureau & Franchet 1891b: 129). – Type: China, Sichuan, Kangding (Ta-tsien-lou), 1890, *Prince Henri d'Orléans* s.n. (lecto-: P, barcode P02977300, **designated here**; epi-: P02977297, **designated here**).





**Figure 1** – Flowers of *Pedicularis*: A–B, *P. batangensis* Bur. & Franch. (A, typical plant, lower lip of withered flower changes to pink; B, yellow flowers); C–D, *P. cranolopa* Maxim. [C, *P. cranolopa* var. *longicornuta* Prain (= *P. birostris* Bur. & Franch.); D, *P. cranolopa* var. *cranolopa*]; E–F, *P. kansuensis* Maxim. [E, pink flowers (= *P. goniantha* Bur. & Franch.); F, purple-red flowers]; G–I, *P. przewalskii* Maxim. [G, *P. przewalskii* subsp. *microphyton* (Bur. & Franch.) P.C.Tsoong; H, *P. przewalskii* subsp. *przewalskii*; I, *P. przewalskii* subsp. *australis* (H.L.Li) P.C.Tsoong]; J, *P. princeps* Bur. & Franch.; K, *P. rhynchodonta* Bur. & Franch.; L, *P. tatsienensis* Bur. & Franch. Photographs: A–F & H–J by Wen-Bin Yu; G & K by Yong-Quan Ren; L by Jun Liu.

Three specimens of *P. princeps* collected by Prince Henri d'Orléans are conserved in P. The two sheets P02977297 and P02977301 appear to be from the same plant: the former is the lower vegetative part and the latter is the upper vegetative part and branched inflorescence, however, we conservatively treated them as duplicates, because labels do not indicate their origin from a single specimen (McNeill et al. 2012, Art. 8.3). The sheet P02977300 consists of a fragmentary whole plant with an unbranched inflorescence, and is not suitable for the lectotype. Therefore, we favour choosing the flowering sheet P02977301 as the lectotype of *P. princeps*, and the vegetative sheet P02977297 as the epitype for providing the information concerning the basal leaves and lower part of the stem.

Within series *Rudes* Prain (Tsoong 1963), the later species *P. decora* Franch. (Franchet 1900) is similar to *P. princeps* (fig. 1J); however, *P. decora* differs from *P. princeps* only in the pubescent stem and calyx tube (vs. sparsely pubescent) on the basis of comparisons of type specimens. Tsoong (1963) treated *P. lasiantha* H.L.Li as a synonym of *P. decora* on the basis of the diagnostic characters of *P. lasiantha* proposed by Li (1949). However, *P. lasiantha* cannot be distinguished from *P. decora*. Actually, *P. lasiantha* is close to *P. dunniana* Bonati, and most plants of “*P. decora*” in eastern Sichuan, Shaanxi, southern Gansu and western Hubei correspond to *P. lasiantha*.

**6. *Pedicularis rhynchodonta*** Bur. & Franch. (Bureau & Franchet 1891a: 108–109). – Type: China, Sichuan, Kangding (Ta-tsien-lou), 1890, *Prince Henri d'Orléans* s.n. (lecto-: P, barcode P02968591, **designated here**).

*Pedicularis rhynchodonta* f. *maxima* Bonati (Bonati 1908: 313–214). – Type: China, Sichuan, Batang, Aug. 1903, *J.A.Soulié* 3341 (lecto-: P, barcode P02968579, **designated here**).

The specimen (P02968591) in P collected by Prince Henri d'Orléans appears to be the only existing original material and is therefore chosen as the lectotype of *P. rhynchodonta*. *Pedicularis rhynchodonta* (fig. 1K) is the only species of series *Rhynchodontae* Prain, and is endemic to western and southwestern Sichuan. Bonati (1908b) described forma *maxima* under *P. rhynchodonta* on the basis of larger plants of *P. rhynchodonta* (*J.A.Soulié* 3341, P02968579). Tsoong (1963) correctly treated the forma as a synonym of *P. rhynchodonta*.

**7. *Pedicularis tatsienensis*** Bur. & Franch. (Bureau & Franchet 1891a: 108). – Type: China, Sichuan, Kangding (Ta-tsien-lou), 1890, *Prince Henri d'Orléans* s.n. (lecto-: P, barcode P02968949, **designated here**).

The sheet P02968949 in P, representing the typical *P. tatsienensis* (fig. 1L), seems to be the only existing original material, and is therefore selected as the lectotype. Morphologically, *P. tatsienensis* is similar to *P. chenocephala* Diels, but differs in having smaller flowers and a longer corolla beak. Notably, geographical distributions between *P. tatsienensis* and *P. chenocephala* are vicariant. *Pedicularis tatsienensis* occurs in western Sichuan and northwestern Yunnan, while *P. chenocephala* is restricted to southwestern Gansu, northern Sichuan and eastern Qinghai.

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