



## Reinstatement of *Polygonatum yunnanense* (Asparagaceae)

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### Abstract

*Polygonatum yunnanense* is reinstated to specific status based on morphology which differs strongly in key diagnostic characters from *P. nodosum*. The limited original diagnosis is expanded based on examination of the holotype, exsiccata, and three cultivated accessions. Its hypothesized relationship to *P. adnatum* and *P. omeiense* is discussed and a key to these three taxa is provided.

### Introduction

Three morphologically similar collections of an unidentifiable *Polygonatum* Miller (1754) from various locations in western Sichuan, China have been cultivated by the author. The *Polygonatum* treatment in Flora of China (FOC) (Chen and Tamura, 2000) does not allow a satisfactory placement with either species its morphology suggests an affinity with; *P. adnatum* S.Y. Liang (1987: 65) and *P. omeiense* Z.Y. Zhu (1992: 267). Certain salient features are outside the ranges listed, bract types differ, and there are notable filament vestiture discrepancies. The only relevant literature aiding in a tentative identification was Jeffrey (1980) in which these plants key to *P. yunnanense* H. Léveillé (1916: 168).

Filament shape, position of attachment within the perianth tube, and filament vestiture are vital in *Polygonatum* species identification. Filament structure is similar among taxa with the same basic chromosome numbers and in combination with phyllotaxy delimitation of subgeneric groups is possible (Abramova, 1975, Tamura, 1990, 1991, 1993, Tamura et al., 1997, Jang and Kim, 1998). But, monophyly of these morphological and cytological alliances has not been shown by molecular analyses (Tamura et al., 1997, Wu et al., 2000).

*Polygonatum* is a circumboreal genus of approx. 60 species in the Asparagaceae (Reveal and Chase, 2011) with its center of diversification in SW China and the eastern Himalaya's with smaller centers in NE China and Japan. The most recent revision of the East Asian taxa (China, Japan, Korea, Mongolia) recognized 39 species (Jeffrey, 1980). The accounts of Jeffrey (1980) and Tang (1978) differ greatly in the recognition of *P. yunnanense* and *P. nodosum* Hua (1892: 394). *Polygonatum yunnanense* is considered a synonym of *P. nodosum* by Tang (1978), whereas Jeffrey (1980) recognized *P. yunnanense* at specific status while treating *P. nodosum* as a synonym of *P. cyrtonema* Hua (1892: 393). Jeffrey (1982) later concurred with the conclusion of Tang (1978) that *P. nodosum* was the valid name for *P. yunnanense* even though distinct differences between the two species exist. FOC (Chen and Tamura, 2000) follows the circumscription of Tang (1978).

The synonymy of *Polygonatum yunnanense* under *P. nodosum* is perplexing. Superficially the types of *Polygonatum nodosum* could mistakenly be seen to represent juvenile *P. cyrtonema* specimens or as *P. yunnanense* if the internal perianth morphology is not examined. To further complicate the issue *P. nodosum* and *P. cyrtonema* were described *sans numero* (Hua, 1892), but types at P share the same collection number (Farges 586). This likely led Jeffrey (1980) to consider the two taxa as synonymous. *Polygonatum cyrtonema* and *P. nodosum* differ in their rhizome shape and plant size; *P. nodosum* is a smaller plant with slender

rhizomes. Their flower structure is similar but filament size, shape, and papillae type and density differ. The dissimilarities between *P. cyrtanema* and *P. nodosum* do not merit further discussion here.

A digital image of the holotype of *P. yunnanense* (E) provides an indistinguishable morphological match to three genets cultivated by the author that confirms the validity of *P. yunnanense* (Fig. 1). Jeffrey (1980) rightly noted the vestiture of the filaments on *P. yunnanense* as “hairy,” but did not note the type nor distribution. Chen and Tamura (2000) state that *P. nodosum* has “papillose or shortly cottony” filaments. Variability in filament vestiture is not unknown, but indumentum type is not known to be so divergent between varietal subtaxa let alone within a single taxon; i.e. *P. falcatum* A. Gray (1859: 414) (see Tamura, 1991, 1993, 2008). The filaments of *P. yunnanense* differ strongly from *P. nodosum* in that they are elongate, sigmoid-complanate, clearly papillose distally near the anther, with longer multicellular uniseriate trichomes increasing in length from the middle to proximally (Fig. 2).

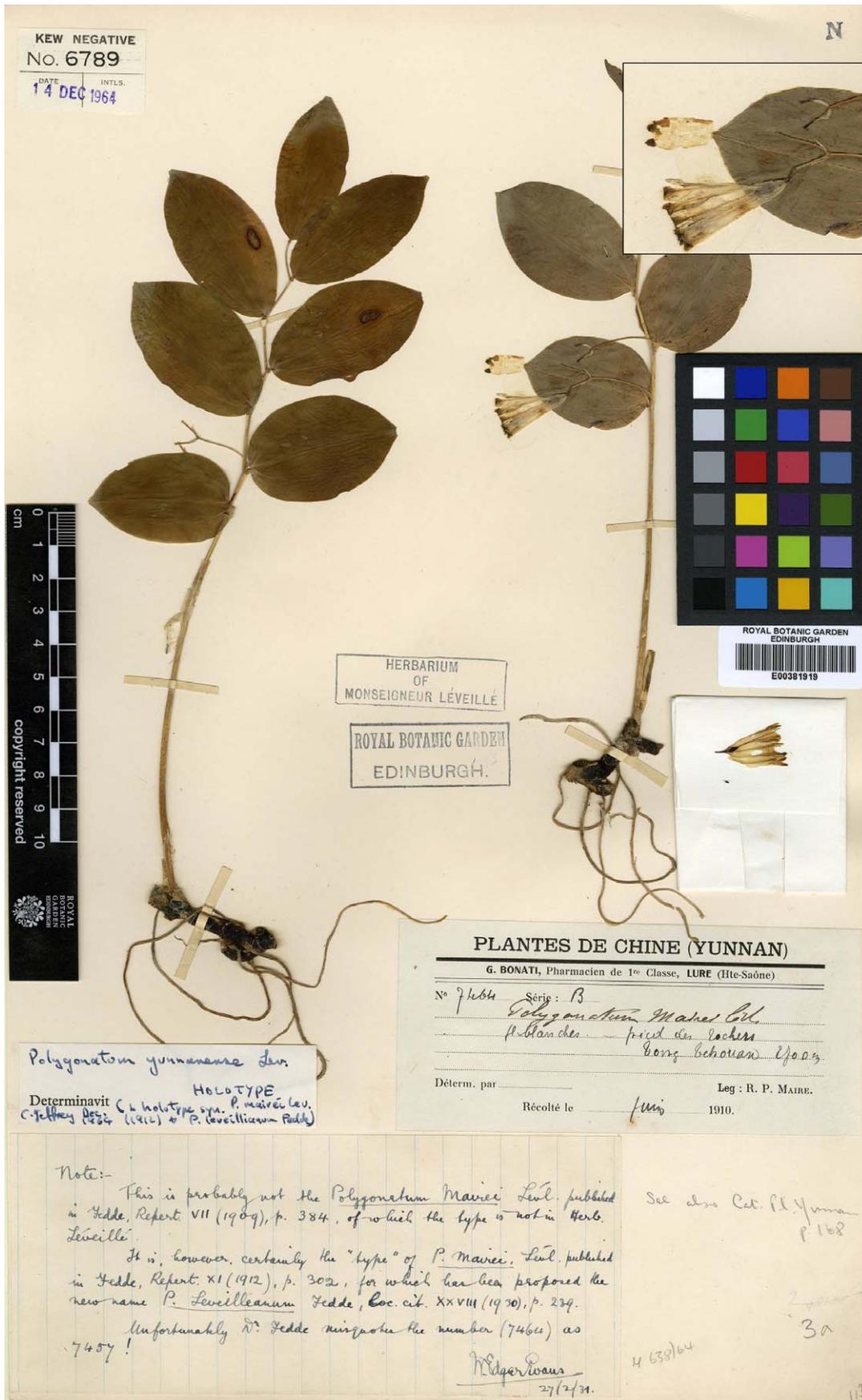
Furthermore, *P. yunnanense* and *P. nodosum* differ in several additional characters; the presence of conspicuous peduncle bracts that are ovate-elliptic and scarious margined vs. subulate or ebracteate, and rhizome shape. The terete, short-internode rhizomes, adnate peduncles, ovate leaf, perianth shape, and filament shape of *P. yunnanense* suggest a close relationship to the recently described *P. adnatum* and *P. omeiense*, but these three taxa differ in several ways (see key below). No mention of filament vestiture was given in the protologue of *P. adnatum*, although the line drawing presented clearly shows glabrous filaments (Liang, 1987). An isotype (PE00036771!) is past anthesis and thus the necessary floral characters are obscured due to the age of the perianth which is withered around the developing fruit. Nonetheless *P. yunnanense* differs in its larger flowers and proximally pubescent filaments. *Polygonatum omeiense* was described with densely villous filaments, but it is unclear if the entire filament bears this vestiture or merely part of it. Despite the lack of data concerning the filament vestiture, *P. yunnanense* differs in its smaller perianth and shorter filaments. All three share a unique character where the inflorescence peduncle is adnate to the stem for several millimeters.

*Polygonatum mairei* H. Léveillé (1912: 302) is an illegitimate homonym superseded by *P. mairei* H. Léveillé (1909: 384). Léveillé corrected this nomenclatural duplication in his *Catalog of the plants of Yunnan* (1916) giving this distinctive plant a *nomen novum*, *P. yunnanense*, therefore the type of *P. mairei* (1912) is the type of *P. yunnanense* is (ICBN Art 7.3) (McNeill et al., 2006). A specimen at E (see Fig. 1) was listed by Jeffrey (1980) as the “holotype” (actually a lectotype) for *P. yunnanense* and this is confirmed when the specimens label data is compared to the protologue; “Pied des rochers à Tong-Tchuoan [Dongchuan], 2700 m, juin 1910, Maire in herb. Bonati, 7464.” Due to the obscurity of Léveillé’s 1916 publication Fedde (1933) later designated a *nomen novum* for *P. mairei* (1912) as *P. leveilleanum* Fedde (1930:239) creating a superfluous synonym, but mistakenly giving the collection number as *Maire 7457*. This collection number represents the type of *Paris mairei* H. Léveillé (1912: 302) which preceded the description of *Polygonatum mairei* (1912) in Léveillé’s enumeration of new species from China by two taxa. Tang recognized *P. yunnanense* previous to the publication of *Flora Reipublicae Popularis Sinicae* (Tang, 1978) as shown by numerous annotated specimens at PE, CDBI, and KUN, but later followed an extremely broad delimitation of numerous Chinese species. Whether some of the specimens cited below represent *P. omeiense* or *P. adnatum* is difficult to determine because many are sterile. Some specimens have the distinctive scarious peduncle bracts visible which differ strongly from the subulate, herbaceous peduncle bracts of *P. nodosum*. Even with bract characters determination remains difficult due to the lack of morphological data associated with the variation of *P. omeiense* and *P. adnatum* and similarities these species share with *P. yunnanense*.

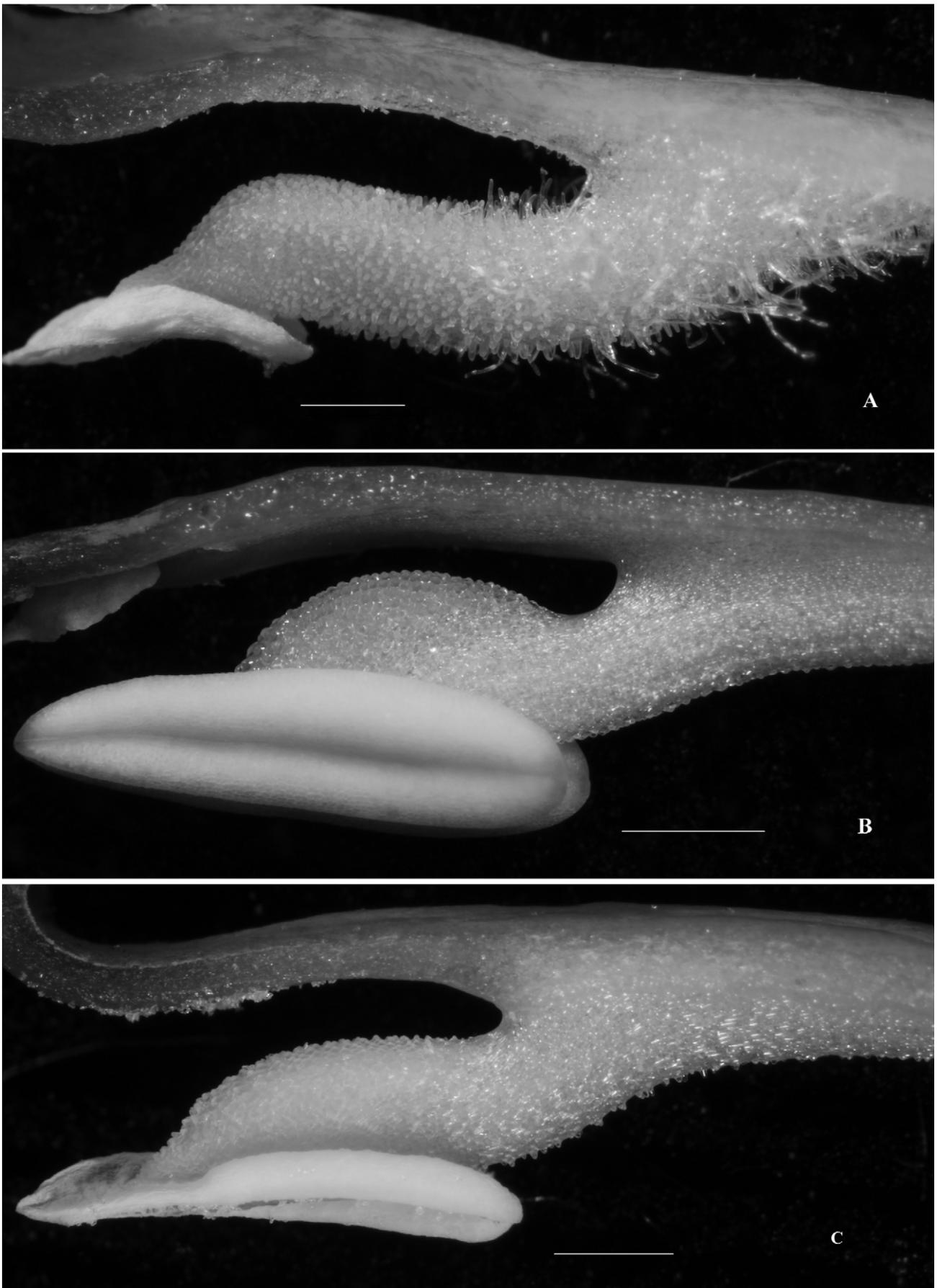
*Polygonatum mairei* H. Léveillé, (1912: 302), non H. Lévé. (1909), *nom. illeg.* Type (lectotype, designated by Jeffrey, 1980):—CHINA. Yunnan, *Maire* in Herb. Bonati 7464 (E!, Fig. 1).

≡ *P. yunnanense* H. Léveillé, (1916: 168)

≡ *P. leveilleanum* Fedde, (1930: 239), *nom. illeg.*



**FIGURE 1.** *Polygonatum yunnanense* H. Léveillé. Lectotype (E). Inset: peduncle bracts. With permission of the Keeper of the Royal Botanic Gardens Edinburgh. Image at; [http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php?cfg=bgbase/vherb/fulldetails.cfg&specimens\\_specimen\\_num=437600&queryRow=1](http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php?cfg=bgbase/vherb/fulldetails.cfg&specimens_specimen_num=437600&queryRow=1)



**FIGURE 2.** A, *Polygonatum yunnanense*, Ogisu 94074, filament; B, *Polygonatum nodosum*, Probst CPC01.4.29.1, Shaanxi, Langao, Daba Shan [living collection], filament; C, *Polygonatum cyrtonema*, Chen Yi s.n., Sichuan [living collection], filament; bar = 1 mm.

Herb, perennial; rhizome terete, internodes 2–5 cm, apically dilated, branching. Stem; glaucous, green and red tessellate, up to 40 cm, naked below, leafy in upper part, leaves 5–10. Leaves; alternate, lustrous above, broadly lanceolate to ovate or elliptic, obtusely acuminate, glaucous beneath, 3–8.4 × 2–4 cm, 5-veined. Inflorescences; axillary, solitary, 1–2–(–3)–flowered; peduncles arcuate, 2–2.3 cm long, slender; bracts borne at base of pedicels, persistent but shriveling, scarious, ovate or elliptic, 2–8 × 1–3 mm, ca. ½ pedicel length; pedicels 0.4–1.3 cm long. Flowers; white-greenish, pendulous; perianth campanulate-conical, 1.8–2.3 cm long, lobes green 2–3 mm; stamens inserted in upper half of perianth-tube; 5–6 mm long, sigmoid-complanate, filaments with long multicellular trichomes proximally, ca. 1 mm, shorter near middle, papillose distally; anthers included, 2.5–3 mm long. Fruit; blue with glaucous bloom, 0.5–1 cm diam. Seeds; spherical, pale brown, ca. 1.5 mm diam. Fl Apr–Jun; Fr Sep–Nov.

distribution:—CHINA: Chongqing: Jinfoshan; Shaanxi: Foping County; Sichuan: Min River Valley; Yunnan: Tong Tchouan.

The distribution of *Polygonatum yunnanense* remains incomplete at this time due to confusion with both *P. adnatum* and *P. omeiense*; the latter two species are known from their type collections only, Leibo and Emei Shan, Sichuan, respectively. In fact, the distribution of *P. yunnanense* occurs to the immediate west of *P. omeiense* and immediate west and south of *P. adnatum*. A single specimen from Wa-wu Shan, Sichuan (*Yao 3958!* PE) may in fact be *P. omeiense*.

The variation in bracteoles of the peduncle is unknown and due to their scarious and frequently caducous nature original diagnoses may be erroneous. Rhizome morphology in all three is of limited value until living collections of all three species can be studied. Thus, a majority of specimens in herbaria that were collected in fruit are difficult to place with certainty. Material in flower provides the best means of identification as the perianth and filament morphology is necessary for determination. It is definitively known from Chongqing, the Minshan Mountains of Sichuan, and NE Yunnan with a single, likely specimen from Shaanxi. It seems phytogeographically impossible for it not to occur in Guizhou, but no specimens have been seen from that province. Specimens listed below are categorized into likely and doubtful specimens though both tentatively assigned to this species with a stipulation that new, non-sterile collections should be made to reach a definite conclusion.

SPECIMENS EXAMINED: **CHINA: Chongqing:** Nanchuan County, Jinfoshan, 2600 m, 18 June 1935, *T.H. Tu 1398* (PE); Nanchuan County, Jinfo Shan, 24 May 1957, *Li 61520* (KUN, PE); **Sichuan:** Wolong, *D. Probst 96.CSC.496* [living collection]; Wolong, *M. Ogisu 94047* [living collection]; *B. Olsen s.n.*, Pingwu [living collection]; Baoxing County, 2200 m, 6 September 1963, *Wang 2982* (PE); Shimian, 1955, *C.C. Hsieh 42679* (PE); Pingwu, 22 May 1961, *Wang et al. 00211* (CDBI); Kangding, *anonymous 1878* (PE); Wenchuan County, 22 May 1959, *Maowen group 2270* (CDBI, KUN, PE); **Yunnan:** Tong Chuan, June 1910, *Maire 7464* (holotype, E); *C. Pei 8208* (PE); Kiao Kia, 1 May 1909, *Ducloux 6125* (P, PE); *Ducloux s.n.* (P).

DOUBTFUL SPECIMENS: **Shaanxi:** Foping Co., 2000 m, 25 June 1952, *Fu 04787* (PE); **Sichuan:** Wawu Shan, 1 July 1939, *C.W. Yao 3958* (PE).

**KEY.** Based on data taken from the protologues of *P. adnatum* and *P. omeiense*, the key in Chen and Tamura (2000), the type collection and 3 living accessions of *P. yunnanense*. This key replaces couplet 39 in Chen and Tamura (2000) whereupon this key serves to distinguish these three taxa.

- 39. Filaments glabrous; perianth 14–16 mm; bracts subulate to lanceolate, ca. 1 mm, scarious on margins ... *P. adnatum*
- Filaments wholly or partly villous and papillose; perianth 15–25 mm; bracts variable, herbaceous to scarious.
- 40. Bracts small, hyaline; perianth 20–25 mm; filaments 7–8 mm, compressed, densely villous ..... *P. omeiense*
- Bracts 2–8 × 1–3 mm, herbaceous; perianth 15–20 mm; filaments 5–6 mm compressed, villous proximally, papillose distally ..... *P. yunnanense*

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