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Reinstatement of the Chinese species *Cremanthodium gypsophilum* (Asteraceae, Senecioneae)

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Abstract

Examination of herbarium specimens (including type material) of *Cremanthodium principis* and *C. gypsophilum* has revealed that the two species are morphologically very distinct from each other. We therefore reinstate the independent specific status of *C. gypsophilum* which has been placed in synonymy with *C. principis*. The latter species is currently known only from the holotype, and all the other specimens previously identified as *C. principis* should belong to *C. gypsophilum*.

Key words: Compositae, misidentification, taxonomy, Yunnan

Introduction

The purpose of this paper is to clear up the taxonomic confusion in which two Chinese species of the genus *Cremanthodium* Bentham (1873: 38) have been involved. We will review the question chronologically.

Senecio principis Franchet (1896: 412) was described on the basis of a single collection, *Prince Henri d'Orleans s.n.* (P; Fig. 1A), from the region of the Mekong River, northwestern Yunnan, China. In the protologue, the author stressed that the species was well characterized by the leaves obscurely sinuate-dentate and densely rufescent woolly-tomentose abaxially. Léveillé (1916) recognized it as a distinct species within *Senecio* Linnaeus (1753: 866). Good (1929) transferred this species to *Cremanthodium* as *C. principis* (Franchet 1896: 412) Good (1929: 283), pointing out that the venation and shape of the leaves placed the species very close to *C. gypsophilum* Good (1929: 283), but it was easily distinguished by the pilose phyllaries and the tomentum on the underside of the leaves. This treatment has been adopted by many later authors including Hu (1966), Koyama (1968), Wu (1984), Liu (1989, 2005), Min (2004), Liu & Illarionova (2011), Xu *et al*. (2014), Peng & Liu (2015), and Chen (2016), although the concept of this species has been totally misunderstood since Liu (1989) (see below). Chen & Li (1994) did not include *C. principis* in their enumeration of the *Cremanthodium* species from the Hengduan Mountains region.

Cremanthodium gypsophilum was described by Good (1929) on the basis of a single collection, *G. Forrest 10933* (BM, E, IBSC, K, PE, W; Fig. 1B), from the Yangtze Bend (Zhongdian), northwestern Yunnan, China. It was recognized by Hu (1966), Koyama (1968), and Wu (1984). However, Liu (1989) placed *C. gypsophilum* in synonymy with *C. principis*, arguing that their type material was all collected from northwestern Yunnan, and that the former was very similar to the latter in habit and leaf shape, differing only in the glabrous phyllaries and the glabrous underside of the leaves as well. He assumed, from his observations of the type specimens of *C. gypsophilum* and some other specimens from the type locality, that *C. gypsophilum* most likely represented just a glabrescent form of *C. principis*. This treatment has since been generally adopted, and consequently all the specimens of *C. gypsophilum* have been referred to *C. principis* (Liu 1989, 2005, Min 2004, Liu & Illarionova 2011, Xu *et al*. 2014, Peng & Liu 2015, Chen 2016).

As in many other cases with his taxonomic treatment of taxa in *Cremanthodium* and its closest ally, *Ligularia* Cassini (1816: 198) (e.g., Ren *et al*. 2013a, b, c, 2014, Wang *et al.* 2016a, b, c, d, Chen & Xu 2016), it is most likely that Liu (1989), when proposing the above synonymization, did not see the type material of *C. principis*. He just explicitly

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claimed that he had checked the type collection of *C. gypsophilum*, G. *Forrest 10933*. Indeed, at least two sheets of this collection deposited respectively in IBSC and PE would be easily accessible to him. The remark made by Good (1929) under *C. principis* that the venation and shape of the leaves placed this species very close to *C. gypsophilum* should have misled Liu (1989) to synonymize *C. gypsophilum* with *C. principis*.

Our critical examination of herbarium specimens (including type material) has shown that *Cremanthodium principis* and *C. gypsophilum* are morphologically most readily distinguishable from each other. We have also observed several living populations of *C. gypsophilum*, although regrettably we failed to discover *C. principis* in the field despite our great efforts to do so. The results of our observations are presented below.

FIGURE 1. Type specimens of *Cremanthodium principis* (A) and *C. gypsophilum* (B). The inset shows the woolly tomentum on the underside of the leaves of *C. principis*.

Material and methods

For morphological comparisons, we critically checked herbarium specimens or high-resolution images of specimens in BM, CDBI, E, HITBC, IBSC, K, KUN, P, PE, SWU and W, and made field observations in Sichuan and Yunnan, China.

Results and discussion

As shown in Figs. 1, 2 and Table 1, *Cremanthodium gypsophilum* is morphologically a distinctive species. It can be immediately distinguished from *C. principis*, among other characters, by the leaves slightly puberulent abaxially (vs. densely woolly-tomentose), often sheathed at base (vs. not sheathed), margin regularly mucronate (vs. indistinctly sinuate-dentate), the capitula smaller (2.0−4.0 vs. 4.5−5.0 cm in diameter), and the ray lamina oblong (vs. oblanceolate),

apex acute (vs. truncate). According to Liu's (1982, 1989) infrageneric classification of *Cremanthodium*, *C. gypsophilum*, which has square, pinnately-veined leaves and oblong ray laminae with an acute apex, should belong to ser. *Oblongata* Y. Ling ex S.W. Liu (1989: 145) under sect. *Pinnatinervia* Y. Ling ex S.W. Liu (1982: 51; "*Pinnatinervus*"), whereas *C. principis*, which has square or oblong, pinnately-veined leaves and oblanceolate ray laminae with a truncate apex, should be placed in ser. *Cuneata* Y. Ling ex S.W. Liu (1982: 52) under the same section. From the other seven species currently referred to this series (Chen 2010, Chen & Xu 2016), *C. principis* is readily distinguished by the leaf shape and the tomentum on the underside of the leaves.

Our survey of herbarium specimens of *Cremanthodium* indicates that *C. principis* is currently known only from the type collection. In contrast, *C. gypsophilum* is very well represented by ample herbarium material from western Sichuan and northwestern Yunnan. In our field work in these two areas, we found that *C. gypsophilum* is indeed fairly common there.

TABLE 1. Morphological comparison between *Cremanthodium gypsophilum* and *C. principis*.

	C. gypsophilum	*C. principis*
Stem	to 20 cm high, glabrous proximally, woolly-tomentose distally	to 35 cm high, glabrous proximally, puberulent and lanuginous distally
Basal leaves	square or oblong, 2.0−4.0 cm long, 1.5−3.0 cm wide, adaxially glabrous, abaxially sparsely puberulent, base sheathed, margin regularly mucronate	square, 5.0 cm long, 5.0 cm wide, adaxially glabrous, abaxially densely woolly-tomentose; base not sheathed, margin indistinctly sinuate-dentate
Stem leaves	1−3; petiole 2−3 cm long	7−8; petiole to 10 cm long
Involucre	campanulate, 2.0−4.0 cm in diam., 2.0−2.5 cm high	hemispheric, 4.5−5.0 cm in diam., ca. 3.0 cm high
Phyllary indumentum	sparsely pubescent abaxially	papillose hairy abaxially
Phyllary width	all subequal, 0.4−0.5 cm wide	inner ones 0.4 cm wide, outer ones 0.6 cm wide
Ray lamina	oblong, 1.6−2.1 cm long, ca. 0.5 cm wide; shallowly 3-dentate or 3-lobed	oblanceolate, 2.0−2.5 cm long, 0.6−0.8 cm wide, markedly 3-dentate or 3-lobed

Taxonomic treatment

Cremanthodium principis (Franchet 1896: 412) Good (1929: 283). *Senecio principis* Franchet (1896: 412). Fig. 1A

Type:—CHINA. Yunnan: the region of the Mekong River (most likely around the pass from Lushui to Yunlong in the Mekong-Salwin divide), 11 July 1895, *Prince Henri d'Orléans s.n.* (holotype, P!).

Perennial herbs. Stem solitary, erect, to 35 cm tall, 1.5−2 mm in diam. at base, proximally glabrous, distally puberulent and lanuginous. Basal leaves petiolate; petiole to 10 cm; leaf blade square, 5.0 cm long, 5.0 cm wide, adaxially glabrous, abaxially densely woolly-tomentose, pinnately veined, margin indistinctly sinuate-dentate. Stem leaves 7−8, not sheathed; proximal stem leaves 2−3, petiolate; petiole to 10 cm long; leaf blade square, oblong or ovate-oblong, 4.0−5.0 cm long, 3.0−5.0 cm wide, adaxially glabrous, abaxially densely woolly-tomentose, pinnately veined, base cordate, margin indistinctly sinuate-dentate, apex rounded, obtuse or emarginated; middle to distal stem leaves 5−6, distally smaller, sessile, bracteal, lanceolate to linear. Capitulum solitary. Involucre hemispheric, 4.5−5.0 cm in diam., ca. 3 cm high, dorsally papillose hairy; phyllaries ca. 15, in 2 rows, outer ones lanceolate, 1.4−1.5 cm long, ca. 0.4 cm wide, apex acute, inner ones oblong, 1.3−1.4 cm long, ca. 0.6 cm wide, margin brown membranous, apex acute. Ray florets yellow, 13−14; lamina oblanceolate, 2.3−2.6 cm long, 0.6−0.8 cm wide, markedly 3-dentate or 3-lobed, apex truncate, apex of lobes acute. Tubular florets numerous, yellow. Pappus white, as long as tubular corolla. Achenes unknown.

Distribution and habitat:—*Cremanthodium principis* is distributed in northwestern Yunnan (most likely around the pass from Lushui to Yunlong in the Mekong-Salwin divide), China (Fig. 3). It grows in humid pasture at an elevation of 3845 m above sea level. The records of the occurrence of this species in Deqen, northwestern Yunnan by Wu (1984) and in central-southern Xizang by Liu (2005) are incorrect. No specimens of this species from there have been seen.

Phenology:—Flowering in July.

Cremanthodium gypsophilum Good (1929: 283). Figs. 1B, 2

Type:—CHINA. Yunnan: the Yangtze Bend (Zhongdian), August 1913, *G. Forrest 10933* (lectotype, here designated, E!, isolectotypes, BM!, IBSC!, K!, PE!,W!).

Cremanthodium principis Liu (1989: 157, 2005: 480); Min (2004: 459); Liu & Illarionova (2011: 432); Xu *et al.* (2014: 336); Peng & Liu (2015: 388); Chen (2016: 473).

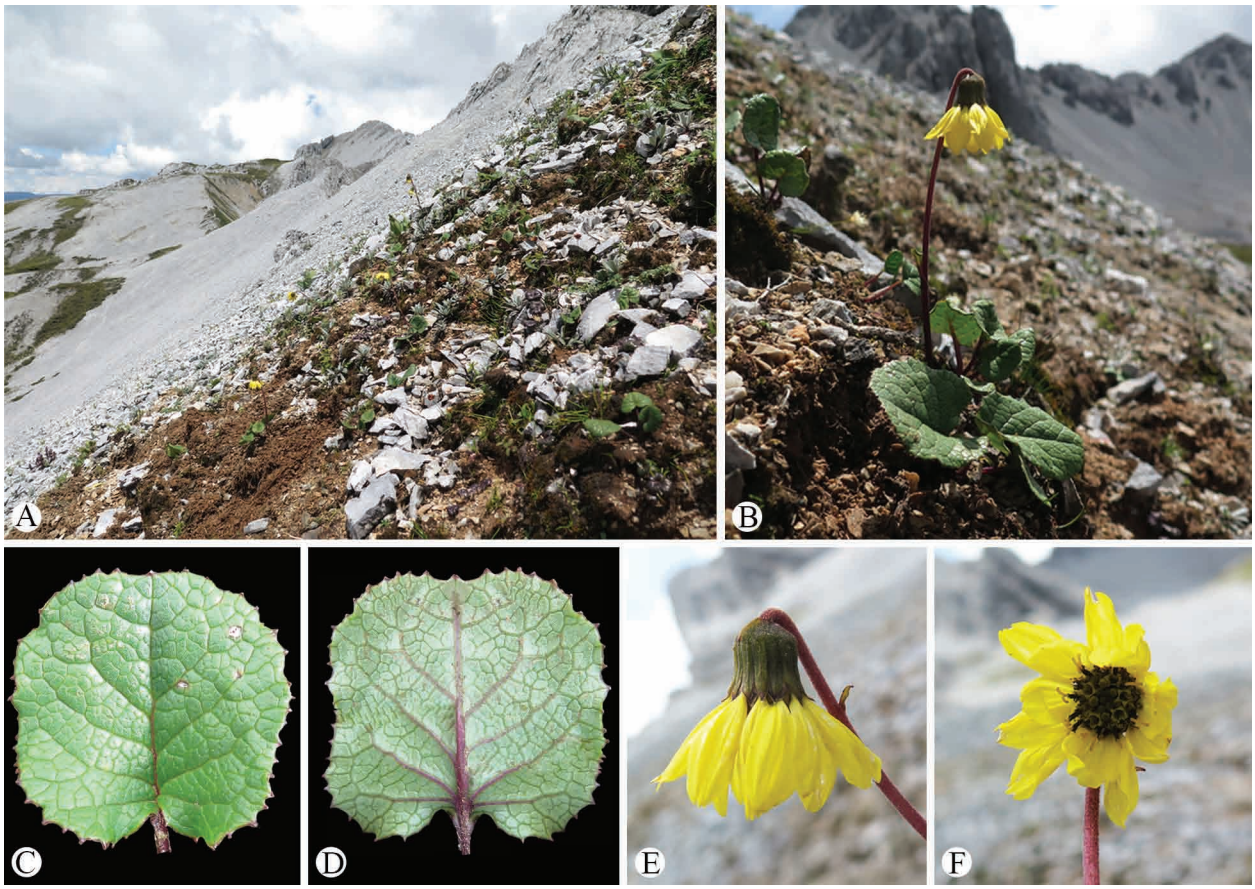

FIGURE 2. *Cremanthodium gypsophilum* in the wild (Zhongdian, Yunnan, China). **A**. Habitat. **B**. Habit. **C**. Leaf blade (adaxial surface). **D**. Leaf blade (abaxial surface). **E**. Capitulum (side view). **F**. Capitulum (top view).

Perennial herbs. Stem solitary or 2, erect, ca. 10 (−20) cm tall, 1.5−2.0 mm in diam. at base, proximally glabrous, distally woolly pubescent. Basal leaves 1−7, adaxially glabrous, abaxially sparsely puberulent, petiolate; petiole to 10 cm, base sheathed; leaf blade square or oblong, 2.0−4.0 cm long, 1.5−3.0 cm wide, pinnately veined, base cordate or truncate, margin regularly mucronate, apex rounded or emarginated. Stem leaves absent or 3, proximal stem leaves absent or 1, petiolate; petiole 2−3 cm long; middle to distal stem leaves absent or 2, sessile, bracteal, lanceolate to linear. Capitula solitary, very rarely 2. Involucre campanulate, 2.0−4.0 cm in diam., ca. 2.0−2.5 cm high, dorsally sparsely pubescent; phyllaries 10−15, nearly in 1 row, lanceolate, ca. 1.0 cm long, 0.4−0.5 cm wide, apex acute, margin brown membranous. Ray florets yellow, 8−10; lamina oblong, 1.6−2.1 cm long, ca. 0.5 cm wide, shallowly 3-dentate or 3-lobed, apex of lobes acute. Tubular florets numerous, yellow, 0.4−0.6 cm long; tube ca. 0.2 cm long. Achenes dark brown, cylindrical, ca. 0.3 cm. Pappus brown or dirty white, as long as tubular corolla.

Distribution and habitat:—*Cremanthodium gypsophilum* is distributed in northwestern Yunnan (Zhongdian) and southwestern Sichuan (Daocheng, Muli, Xiangcheng), China (Fig. 3). It grows in alpine meadows at elevations of 3200−4650 m above sea level. The record of the occurrence of this species, under the name *C. principis*, in Luquan, northeastern Yunnan by Peng & Liu (2015), is not correct. The Luquan population actually belongs to *C. wumengshanicum* Wang *et al*. (2015: 265).

Phenology:—Flowering in July; fruiting in August.

Additional specimens examined:—CHINA. Sichuan: Daocheng, *D.E. Boufford et al. 28284* (E, P), *J.F. Rock 16383* (E), *16807* (E), *Sichuan Veg. Exped. 1926* (CDBI, KUN, PE, SWU), *Tang & Xia 0418* (PE), *T.C. Wei & X.H. Hu 30026* (CDBI); Muli, *Y.S. Chen 7134* (PE), *J.F. Rock 16706* (P), *17831* (P), *23754* (E), 24330 (E), *T.T. Yu 14454*

(KUN); Xiangcheng, *Qinghai-Xizang Exped. 3917* (CDBI, KUN). Yunnan: Zhongdian, *Anonymous s.n.* (HITBC), *ACE 634* (E), *D.E. Boufford et al. 29132* (E), *Y.S. Chen 9686* (PE), *K.M. Feng 1905* (KUN, PE), *23346* (KUN, PE), *G. Forrest 30757* (E, PE), *30794* (E), *M. Tang et al. 1177* (IBSC), *1246* (IBSC), *M. Tang & C. Ren 690* (IBSC), *X.W. Tian et al. 603* (PE), *H. Wang et al. 2004-238* (KUN), *J.S. Yang 88-318* (PE), *Q.E. Yang & H.Z. Kong 98-271* (PE), *98-345* (PE), *99-014* (PE), *T.T. Yu 12198* (KUN, PE), *12662* (KUN), *Y.M. Yuan CN2K2-51* (IBSC).

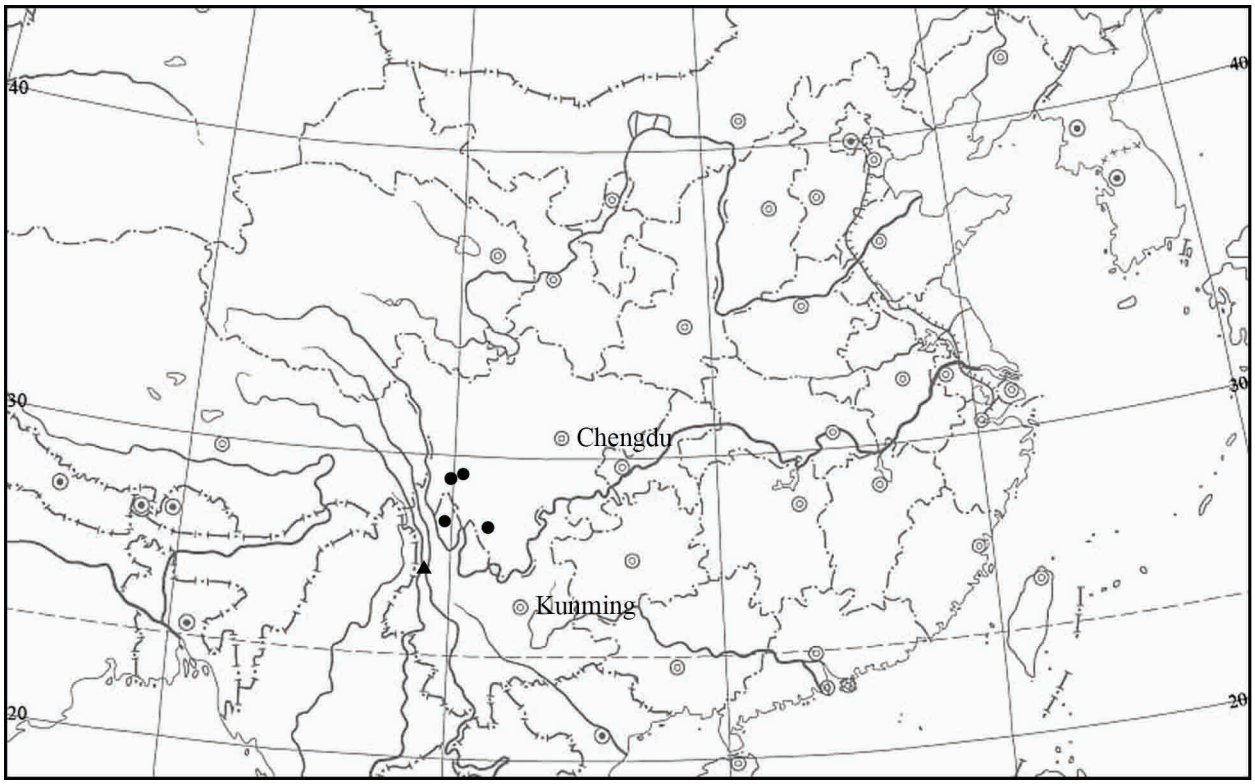

FIGURE 3. Distribution of *Cremanthodium gypsophilum* (●) and *C. principis* (▲).

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