



Nomenclature and taxonomy of *Salix floccosa*, *S. opsimantha* and *S. austrotibetica*

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Abstract

Salix floccosa Burkill was originally described based on a mixed collection of two different taxa. Chinese authors in many cases identified *S. floccosa*, although the species should correctly be named *S. austrotibetica* N. Chao. The name *S. floccosa* is lectotypified. *S. spodiophylla* Handel-Mazzetti, *S. dolia* var. *lineariloba* N. Chao, *S. eriostachya* var. *lineariloba* (N. Chao) G.H. Zhu, *S. spodiophylla* f. *liocarpa* K.S. Hao ex C.F. Fang & A.K. Skvortsov and *S. spodiophylla* var. *liocarpa* (K.S. Hao ex C.F. Fang & A.K. Skvortsov) G.H. Zhu are recognized as *S. floccosa*; *S. annulifera* var. *glabra* P.Y. Mao & W.Z. Li and *S. floccosa* (pro parte) are synonymised with *S. opsimantha* C.K. Schneider; *S. floccosa* var. *leiogyna* P.Y. Mao & W.Z. Li is treated as a synonym of *S. austrotibetica*. Furthermore, the circumscription of *S. austrotibetica* is emended to include partly downy to densely downy ovary.

Key words: Nomenclature, Pan-Himalaya, *Salix*, taxonomy, typification

Introduction

The genus *Salix* Linnaeus (1753: 1015) comprises ca. 350–520 species (Fang *et al.* 1999, Heywood *et al.* 2006, Argus *et al.* 2010). The genus is widely distributed in temperate and boreal regions of the Northern Hemisphere. Among a total of 275 species found in China, of which 189 are endemic (Fang *et al.* 1999).

Taxa of *Salix* are dioecious and have different times of development for flowers and leaves, which prevents the observer from seeing all relevant characters on a single plant. And, there is a comparatively high frequency of natural interspecific hybrids in *Salix* (Skvortsov 1999). Thus, species of this genus are difficult to clarify (Linnaeus 1753).

Working within the framework of the *Flora of Pan-Himalayas* project, we examined many type specimens of relevant names of *Salix* in Chinese herbaria and high resolution digital images of collections in foreign herbaria. We found some names were described based on mixed materials. One such case is *S. floccosa* Burkill (1899: 529), which based on four collections (*Delavay* 2200, 3105, 4323 & 4678) mostly held in P, belong to two completely different taxa, *S. spodiophylla* Handel-Mazzetti (1929: 77) and *S. opsimantha* C.K. Schneider (1916: 63).

Schneider (1916), who noted that he did not see any specimens of Burkill's willow (*S. floccosa*). According to Burkill's description, Schneider considered *S. floccosa* to be most closely related to *S. opsimantha*. Hao (1936) only studied a duplicate of *Delavay* 4323 from K. Subsequently, Wang & Fang (1984) and Fang *et al.* (1999) did not see more type specimens of *S. floccosa*, and misapplied it to *S. austrotibetica* N. Chao (1980: 23). The aim of the present paper is to clarify the relationship between *S. floccosa*, *S. spodiophylla*, *S. opsimantha*, *S. austrotibetica*.

Materials and Methods

In this study, we studied protologues, examined herbarium specimens and observed natural populations. Herbarium specimens from BJFC, CDBI, E (only *Forrest* 10121 & 10256), HNWP, IBSC, IFP, K, KUN, PE, SCFI and WUK and high resolution digital images of collections in A, BM, CAS, E, P, S, US and WU were studied (for herbarium codes, see: <http://sweetgum.nybg.org/ih/>). In addition, we undertook seven expeditions in the Chinese provinces of Sichuan, Xizang, and Yunnan to collect *Salix* during the period 2010–2014.

Representative specimens examined:—*Salix floccosa*: CHINA. **Sichuan**: Daocheng County, 4000 m, 7 June 1973, S.D. Zhao & Z.F. Fang 951 (IFP, WUK, ♂); *ibidem*, 4200 m, 4 August 1973, *Sichuan Vegetation Expedition Dao2449* (CDBI, KUN, PE, ♀); Muli County, Mitzuga, 3800 m, 23 May 1937, T.T. Yu 5746 (KUN, ♂), T.T. Yu 5748 (KUN, ♀). **Xizang**: Zayü County, 3000 m, September 1935, C.W. Wang 66111 (IBSC, KUN, PE, WUK, sterile); *ibidem*, 3500 m, 18 September 1982, *Qinghai-Xizang Expedition 10460* (KUN, PE, ♀). **Yunnan**: Eryuan County, 3780 m, 25 July 1963, *NW Yunnan Jinshajiang Expedition 63-6121* (KUN, PE, ♀); Lijiang, 2500 m, July 1935, C.W. Wang 71170 (IBSC, KUN, PE, WUK, ♀); Lijiang, Yulong Snow Mountain, 4000–4200 m, 17 July 1973, S.D. Zhao, Z.Y. Yu & B.Y. He 1137 (PE, ♂); *ibidem*, 4000–4300 m, 20 July 1973, S.D. Zhao, Z.Y. Yu & Z.F. Fang 1213 (IFP, KUN, PE, WUK, ♀); Shangri-la, 3500 m, 8 June 1937, T.T. Yu 11603 (KUN, PE, ♂); Shangri-la, Haba Snow Mountain, 3600 m, 2 June 1938, T.T. Yu 11525 (KUN, ♂); Shangri-la, Tianbao Snow Mountain, 3600–3800 m, 15 June 1981, *Qinghai-Xizang Expedition 1097* (CDBI, KUN, PE, ♀); Weixi County, Yezhi, 3600 m, August 1935, C.W. Wang 68732 (PE, WUK, ♀).

S. opsimantha: CHINA. **Sichuan**: Jiulong County, 4730 m, 20 June 1960, J.S. Ying 4056 (PE, ♂); Jiulong County, Jichou Mountain, 4467 m, 20 July 2012, L. He & S. Liao PH20120720-02 (BJFC, ♀); Kangding, 3700m, July 1908, Wilson 2139^a (A, BM, CAS, US, ♀ only, digital image examined); Luding County, Yajiageng, 3992 m, 12 July 2012, L. He & S. Liao PH20120712-03 (BJFC, ♂), PH20120712-04 (BJFC, ♀); *ibidem*, 3967 m, 16 July 2012, L. He & S. Liao PH 20120716-01 (BJFC, ♀); Yanyuan County, Huolu Mountain, 4000 m, 23 July 1983, *Qinghai-Xizang Expedition 12367* (KUN, ♀). **Xizang**: Bomi County, 4000 m, 18 August 1983, B.S. Li, S.Z. Cheng & Z.C. Ni 6698 (PE, ♀); Mêdog County, 4000–4300 m, 8 October 1982, B.S. Li & S.Z. Cheng 1155 (PE, ♀); Zayü County, 4400 m, 27 June 1973, *Qinghai-Xizang Expedition 73-422* (KUN, PE, ♂). **Yunnan**: Dêqên County, Duokela, 3960 m, May–June 1932, J.F. Rock 22938 (KUN, ♂); Dêqên County, Yubeng, 4700 m, 11 August 2012, L. He & S. Liao PH20120811-03 (BJFC, ♀); Lijiang, Yulong Snow Mountain, 4300 m, 17 July 1937, S.D. Zhao, Z.Y. Yu & B.Y. He 1147 (IFP, KUN, WUK, ♂); *ibidem*, 4500–4700 m, 20 July 1973, S.D. Zhao, Z.Y. Yu & B.Y. He 1258 (IFP, KUN, PE, WUK, ♀); Shangri-la, 3600 m, 18 July 1937, T.T. Yu 12251 (IBSC, KUN, PE, ♀); *ibidem*, 4000–4100 m, 21 June 1981, *Qinghai-Xizang Expedition 1266* (CDBI, KUN, PE, ♂); Weixi County, Yezhi, 3600 m, August 1935, C.W. Wang 68480 (KUN, PE, ♀).

Salix austrotibetica: CHINA. **Xizang**: Bomi County, 3700 m, 20 August 1965, J.S. Ying & D.Y. Hong 651213 (PE, ♀); *ibidem*, 3100 m, 17 August 1983, B.S. Li, S.Z. Cheng & Z.C. Ni 6546 (PE, ♀); Dinggyê County, 4000 m, 4 June 1975, *Qinghai-Xizang Expedition 5473* (HNWP, KUN, ♀); *ibidem*, 3820 m, 17 July 2011, L. He, Y.Q. Ruan, C. Shang PH110717-05 (BJFC, sterile); *ibidem*, 3905 m, 17 July 2011, L. He, Y.Q. Ruan, C. Shang PH110717-11 (BJFC, ♀); Mainling County, Pai Town, Songlinkou, 3787 m, 20 August 2012, L. He & S. Liao PH20120820-01 (BJFC, ♀), PH20120820-02 (BJFC, ♂); Mêdog County, Duoxiongla, 2800–3500 m, 26 August 1977, T.P. Yi 77201 (SCFI, ♂, paratype of *S. austrotibetica*); *ibidem*, 1 August 2012, *Yarlung Zangbo Expedition Team 398, 406* (BJFC, ♀); Zayü County, 4200–4300 m, 26 September 1982, *Qinghai-Xizang Expedition 10632* (PE, sterile); Zayü County, Ridong, 4400 m, 26 September 1982, *Qinghai-Xizang Expedition 10651* (PE, ♀). **Yunnan**: Dêqên County, 3000 m, July to August 1935, C.W. Wang 64872 (KUN, PE, WUK, ♀); Dêqên County, Mingyong Glacier, 4000–4100m, 7 August 2012, L. He & S. Liao PH20120807-02 (BJFC, ♂), PH20120807-05 (BJFC, ♀), PH20120807-06 (BJFC, ♀), PH20120807-11 (BJFC, ♀); Upper kiukiang valley, 3800 m, 7 August 1938, T.T. Yu 19761 (PE, ♂); *ibidem*, 3800 m, 7 August 1938, T.T. Yu 19762 (KUN, PE, ♀); Weixi County, Yezhi, 3600 m, August 1935, C.W. Wang 68541 (KUN, PE, ♀).

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