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

LI HE, SHUAI LIAO & ZHIXIANG ZHANG*

*College of Nature Conservation, Beijing Forestry University, 35 Tsinghua Eastern Road, Beijing 100083, China*

*Author for Correspondence. E-mail: zxzhang@bjfu.edu.cn*

**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 Du2449 (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, 3700 m, July 1908, Wilson 2139 (A, BM, CAS, US, ♀ only, digital image examined); Luding County, Yajiajeng, 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, ♀); Médog County, 4000 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 austrotiibetica**: 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, ♀); Médog County, Duoxiongla, 2800–3500 m, 26 August 1977, T.P. Yi 77201 (SCFI, ♀, paratype of S. austrotiibetica); 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, 4000–4100 m, 7 August 2012, L. He & S. Liao PH20120807-02 (BJFC, ♂), PH20120807-05 (BJFC, ♀), PH20120807-06 (BJFC, ♀), PH20120807-07 (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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