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Source: Willdenowia, 50(2) : 159-163

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: https://doi.org/10.3372/wi.50.50201

Willdenowia
Annals of the Botanic Garden and Botanical Museum Berlin

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Untangling two Chinese *Salix* species (*Salicaceae*) published by C. K. Schneider, with lectotypification of four names

Version of record first published online on 23 April 2020 ahead of inclusion in August 2020 issue.

Abstract: *Salix rhoophila* C. K. Schneid. was originally described based on three collections. The specimens in these collections belong to two different taxa: *S. rhoophila* as currently recognized and a species that until now has usually been called *S. alfredii* Goerz ex Rehder & Kobuski. The original material of *S. polyclona* C. K. Schneid. and *S. mictotricha* C. K. Schneid. also represent the same two species. The names *S. alfredii, S. mictotricha, S. polyclona* and *S. rhoophila* are lectotypified. The orthography of *S. wuana* K. S. Hao ex C. F. Fang & A. K. Skvortsov is corrected (originally spelled as "*Wuiana*"). *Salix alfredii*, *S. mictotricha* and *S. wuana* are recognized as synonyms of *S. polyclona*.

Key words: China, lectotypification, new synonym, nomenclature, *Plantae Wilsonianae*, *Salicaceae*, *Salix*

Article history: Received 28 October 2019; peer-review completed 22 January 2020; received in revised form 24 February 2020; accepted for publication 11 March 2020.

Citation: Liu L.-J., He L. & Applequist W. L. 2020: Untangling two Chinese *Salix* species (*Salicaceae*) published by C. K. Schneider, with lectotypification of four names. – Willdenowia 50: 159–163. doi: https://doi.org/10.3372/wi.50.50201

Introduction

Working within the framework of the *Flora of Pan-Himalaya* project, we have examined much relevant literature on *Salix* L. (*Salicaceae*) since 2010. In *Plantae Wilsonianae*, Schneider (1916) described 32 new Chinese taxa in *Salix*, including 30 species and two varieties based on E. H. Wilson's collections during the years 1907, 1908 and 1910. We examined the protologues of these taxa and all the original material that we could trace. We found that the original material of the names *S. mictotricha* C. K. Schneid., *S. polyclona* C. K. Schneid. and *S. rhoophila* C. K. Schneid., which Wilson collected from two neighbouring counties of Hubei Province (Xingshan County and Fang County), represent two currently recognized species: *S. alfredii* Goerz ex Rehder & Kobuski and *S. rhoophila*. This issue has been almost completely overlooked by previous taxonomists (Hao 1936; Chou & al. 1984; Fang & al. 1999). A. K. Skvortsov examined the original material of *S. polyclona* (*Wilson 2116* and *2116*^{bis}), and labelled *Wilson 2116* (A barcode 00031199) as *S. hylonoma* C. K. Schneid. and *Wilson 2116*^{bis} as *S. rhoophila*. Unfortunately, he did not discuss this issue in his publications. The purpose of the present work is to clarify the application of the names *S. alfredii*, *S. mictotricha*, *S. polyclona* and *S. rhoophila* as well as their taxonomy.

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Material and methods

We examined the protologues, relevant herbarium specimens in BJFC, E, FJFC, HIB, K, P, PE and WUK, and high-resolution digital images of specimens in A, BM, S and US (herbarium codes according to Thiers 2020+).

Taxonomic and nomenclatural treatment

1. *Salix rhoophila* C. K. Schneid. in Sargent, Pl. Wilson. 3(1): 54. 1916. – **Lectotype (designated here):** China, Hubei, Fang Hsien [Fang County], 7000–8000 ft [2300–2600 m], 16 May 1909, *E. H. Wilson 2117* [♀] & *2117[a]* [♂] (A barcode 01536135 [♀]!; isolectotypes: A barcode 00404477 [♂]!, BM barcode BM000958022 p.p. [♂]!, US barcode 00105210 [♂]!).

Description — *Shrubs* to 3.5 m tall. *Branches* dull brown, glabrous; branchlets pubescent, glabrescent, or glabrous. *Petiole* 0.5–1.4 cm, pubescent, glabrescent or glabrous; *leaf blade* elliptic or elliptic-oblong, rarely obovate-elliptic, 2.9–6.8 × 1.2–3.3 cm, abaxially glaucous, pubescent when young, glabrescent, or glabrous, adaxially dull green, glabrous, base broadly cuneate to rounded, margin entire, apex acute; veins raised abaxially. *Catkins* flowering as leaves emerge, moderately densely flowered. *Male catkin* 1.1–2.9 × 0.2–0.5 cm; peduncle 0.2–0.7 cm, with (0 or)1 or 2 leaflets; rachis pilose. *Female catkin* 1.7–3.4 (to 6.8 cm at maturity) × 0.3–0.5 cm; peduncle 0.3–0.7 cm, with (0 or)1 or 2 leaflets; floral bract brown, obovate, glabrous or subglabrous. *Male flower*: adaxial gland oblong, c. ½ as long as bracts, apex retuse, abaxial gland absent; stamens 2; filaments distinct, villous proximally; anthers yellow, globose. *Female flower*: gland adaxial; sessile or shortly stipitate; ovary long ovoid; styles 2-cleft; stigmas short. *Capsules* ovoid.

Phenology — Flowering from mid-April to mid-May; fruiting in May and June.

Distribution — Hubei and Shaanxi provinces of China.

Habitat — Mountain slopes, roadsides and valleys at altitudes of 1345–2300 m.

Remarks — Schneider (1916) described *Salix rhoophila* and cited *Wilson 2117* as the "type", *Wilson 2117[a]* as the "cotype", and another collection with sterile plant fragments, *Wilson 2117[bis]*, which had mature leaves. Three duplicates of *Wilson 2117* were found: A barcode 01536135 (♀), BM barcode BM000958022 (♀) and E barcode E00301602 (♀). In addition, three duplicates of *Wilson 2117[a]* were traced: A barcode 00404477 (♂), BM barcode BM000958022 (♂) and US barcode 00105210 (♂); and one duplicate of *Wilson 2117[bis]* was located: A barcode 01536133 (sterile). A barcode 01536135 and A barcode 0404477 are mounted together on a single sheet, and BM barcode BM000958022 includes material of both sexes. In *Plantae Wilsonianae*, Schneider (1916) always cited one gathering as the "type" and another gathering with branch(es) of the opposite sex as the "cotype"; if he had material of only one sex, he always only indicated one gathering as the "type". Because *Wilson 2117* and *Wilson 2117[a]* were collected by the same collector at one place and time, they belong to a single gathering as defined by Art. 8.2 footnote of the *International Code of Nomenclature for algae, fungi, and plants* (Turland & al. 2018, hereafter *"Code"*), even though they were given different numbers. Hence, all the specimens (duplicates) of *Wilson 2117* and *Wilson 2117[a]* are syntypes of *S. rhoophila* (Art. 9.6 of the *Code*).

Our examinations indicated that duplicates of the type gathering (*Wilson 2117* and *Wilson 2117[a]*) belong to two different taxa as currently recognized: *Salix rhoophila* and *S. polyclona*. Schneider (1916) was uncertain whether the sterile *2117[bis]* with mature leaves belonged to *S. rhoophila* as he defined it; we tentatively identify it as a hybrid of *S. rhoophila*. However, that specimen collected on a different date is not part of the gathering to which the syntypes belong. The duplicates of *Wilson 2117* (A barcode 01536135 [♀]) and *Wilson 2117[a]* (A barcode 00404477 [♂], BM barcode BM000958022 [pro parte], US barcode 00105210 [♂]) represent the species to which the name *S. rhoophila* is usually applied and best correspond to the description in the protologue. The other two duplicates of *Wilson 2117* (BM barcode BM000958022 [pro parte], E barcode E00301602 [♀]) have hairy bracts that are not in agreement with the protologue of *S. rhoophila* ("Amenta ♀, … bracteae late ovatae, … brunneae, glabrae") and are identified as *S. polyclona*. Schneider noted that *S. rhoophila* appeared closely related to *S. hypoleuca* Seemen, which better applies to the former group of sheets (A barcode 01536135 [♀], A barcode 00404477 [♂], BM barcode BM000958022 [pro parte], US barcode 00105210 [♂]). Schneider (1916) did not specify that typifications were restricted to the existing material at A, so the A, BM and US duplicates of *Wilson 2117* including *Wilson 2117[a]* (A barcode 01536135 [♀], A barcode 00404477 [♂], BM barcode BM000958022 [pro parte], US barcode 00105210 [♂]) are all candidates for the lectotype of *S. rhoophila*. We designate *Wilson 2117* (A barcode 01536135 [♀]) as the lectotype, considering it is in good condition with Wilson's handwritten label. The isolectotypes are limited to those duplicates belonging to the same species; the duplicates identified as *S. polyclona* are excluded.

Representative specimens examined — China: Hubei: Fang County, 1700–2300 m, 16 May 1909, *E. H. Wilson 2116[2118]bis* (A barcode 00055980 [♀]); Shennongjia, 2280 m, 20 Jun 1976, *E Shennongjia Botany Expedition 10456* (HIB, PE); Shennongjia, Dayanwu, 3 May 2015, *L. J. Liu 20150503-1 & 2 & 3 & 4 & 11 & 12 & 13 & 18*

& 19 & 21 & 26 & 27 & 28 & 30 & 32 & 33 & 35 & 38 & 39 (BJFC). — Shaanxi: Zhenping County, Shangzhu, 1345 m, 11 Apr 2004, *Y. S. Chen, Z. H. Wu, B. Li & X. S. Guo 376* (WUK).

2. *Salix polyclona* C. K. Schneid. in Sargent, Pl. Wilson. 3(1): 55. 1916. – **Lectotype (designated here):** China, Hubei, Fang Hsien [Fang County], 7000–8000 ft [2300–2600 m], 16 May 1909, *E. H. Wilson 2116* (A barcode 00031199 [♀]!; isolectotype: US barcode 00105232 [♀]!).

= *Salix mictotricha* C. K. Schneid. in Sargent, Pl. Wilson. 3(1): 56. 1916, **syn. nov.** – **Lectotype (designated here):** China, Hubei, Hsing-Shan Hsien [Xingshan County], 4000–5000 ft [1300–1700 m], 14 May 1907, *E. H. Wilson 2118* (A barcode 00404476 [♂]!).

= *Salix alfredii* Goerz ex Rehder & Kobuski in J. Arnold Arbor. 13: 403. 1932, as '*Alfredi*', **syn. nov.** – **Lectotype (designated here):** China, Gansu, Diebu County, 11000 ft [3300 m], Jun 1925, *J. F. Rock 12522* (A barcode 00031139 [♀]!; isolectotypes: P barcode P00760894!, S No. S13-9538 [♀]!, PE barcode 00704548 [♀]!).

= *Salix wuana* K. S. Hao ex C. F. Fang & A. K. Skvortsov in Novon 8: 469. 1998, as "*Wuiana*", **syn. nov.** – Holotype: China, Shaanxi, Tai Pei Shan [Taibai Mountain], 1910, *W. Purdom 979* (A barcode 00056025 [♀]!; isotype: US barcode 00503929 [♀]!).

Description — Shrubs or trees. *Branches* purplish brown or yellowish green, thin, glabrous, shiny; branchlets pilose when young, glabrous. *Petiole* 0.2–0.9 cm; *leaf blade* elliptic, ovate-elliptic or lanceolate, 3.4–6.4 × 1.3–2 cm, abaxially greenish or greyish blue, white villous when young, glabrescent, adaxially green, pubescent when young, glabrescent, base convex to rounded, margin entire, rarely gland-dotted, apex acute or acuminate. *Catkins* flowering as leaves emerge, moderately densely flowered. *Male catkin* 1.2–4.8 × 0.2–0.8(–1) cm; peduncle 0.2–0.3 cm, with 1 or 2 leaflets. *Female catkin* at maturity to 4.4 cm; peduncle 0.4–0.9 cm, with 0–3 leaflets; bracts obovate, c. 1 mm, abaxially pilose, long ciliate, adaxially subglabrous, hairs white and ferruginous. *Male flower*: abaxial gland small or absent, adaxial gland narrowly ovate, c. 0.4 mm, rarely divided; stamens 2; filaments distinct, c. 2 mm, puberulent on proximal half; anthers yellow or reddish, globose. *Female flower*: gland adaxial, 0.4–0.5 mm, shortly ligulate; ovary ovoid, c. 2.2 mm, pubescent or subglabrous, shortly stipitate; styles c. 0.3 mm; stigmas 2-lobed. *Capsules* subglobose, c. 3 mm, puberulent or subglabrous; stipe short (c. 0.2 mm).

Phenology — Flowering from late April to early June; fruiting in June and July.

Distribution — Gansu, Henan, Hubei, Qinghai, Shaanxi and Sichuan provinces of China.

Habitat — Mountain slopes, at altitudes of (?1300–) 1880–3300 m.

Remarks — Schneider (1916: 56) described *Salix polyclona* based on *Wilson 2116* and *Wilson 2116*^{bis} and stated the former gathering to be the type, expressing doubt about the identity of the latter ("I do not know if No. 2116bis really belongs to *S. polyclona*"). We traced two specimens of *Wilson 2116* (A barcode 00031199 [♀], US barcode 00105232 [♀]) and one sheet of *Wilson 2116[2118]*^{bis} (A barcode 00055980 [♀]). Schneider's (1916) work was based on material collected by Wilson "for the Arnold Arboretum". However, the publication did not specify that typifications were restricted to the existing material at A, so the A and US duplicates of *Wilson 2116* were syntypes under Art. 9.6 of the *Code*. The duplicate A barcode 00031199 is designated as the lectotype of *S. polyclona* because it is in far better condition, with several inflorescences, whereas the duplicate US barcode 00105232 is fragmentary and has no intact inflorescences.

As for the other cited gathering, *Wilson 2116*^{bis} (A barcode 00055980), we note some confusion as to its numbering. Wilson originally wrote "*2118* Bis" in grey on the label of the sheet, which someone later changed to "*2116* Bis", scrawling "6" over "8" in black pen on the label without any note of explanation. Skvortsov noted on the sheet in 1997 that the collecting number on that sheet should be *Wilson 2118*^{bis}. However, we do not know who changed the number, when or why; Wilson himself might have made an error and later corrected it. The two numbers, *Wilson 2116* and *Wilson 2116[2118]*^{bis}, were collected on the same date, 16 May 1909, but on Wilson's labels of the two specimens at A the altitude of *Wilson 2116* was given as "7-8000 ft" and that of *Wilson 2116[2118]*^{bis} was given as "5-7000 ft"; therefore, they were not from the same gathering.

Skvortsov observed part of Schneider's original material in 1997 and labelled *Wilson 2116* (A 00031199) as "*Salix hylonoma* Schneid." and *Wilson 2116[2118]*^{bis} (A barcode 00055980) as "*Salix rhoophila* Schneid." However, this was not mentioned in the subsequent *Flora of China* treatment (Fang & al. 1999) or other publications. By comparing the original material (*Wilson 2116* and *Wilson 2116[2118]*^{bis}) of *S. polyclona* with all recognized taxa of the genus *Salix* previously described from relevant regions of China, we concluded that Schneider's type *Wilson 2116* does not correspond to *S. hylonoma* C. K. Schneid. *Salix polyclona* differs from *S. hylonoma* by its shortly ligulate flower glands (shorter than the floral bracts), abaxially white villous young leaves, and entire leaf blade margins. By contrast, *S. hylonoma* has a narrowly terete flower glands (as long as the floral bracts), golden downy indumentum on the young leaves, and indistinctly serrulate leaf margins. Instead, *Wilson 2116* corresponds to *S. alfredii*, while *Wilson 2116[2118]*^{bis} appears to be identifiable as *S. rhoophila*. We consider *S. polyclona* to be the correct name for the species formerly

called *S. alfredii*, because it has priority over that name. In addition, *S. alfredii* has not previously been typified as far as we know. In the protologue, Rehder & Kobuski (1932) cited three gatherings (*J. F. Rock 12147*, *J. F. Rock 12149* and *J. F. Rock 12522*) as original material for *S. alfredii*, but they did not designate a type from among them. We traced several duplicates of these gatherings: *J. F. Rock 12147* (A barcode 00031138 [♂], P barcode P00760893 [sterile], S No. S13-9540 [sterile]), *J. F. Rock 12149* (A barcode 00055783, P barcode P00760895, S No. S13-9539, US barcode 00105058 [all ♀]) and *J. F. Rock 12522* (A barcode 00031139, P barcode P00760894, S No. S13-9538, PE barcode 00704548 [all ♀]). All these duplicates are syntypes, and all appear to belong to the species now called *S. alfredii.* The specimen *J. F. Rock 12522* (A barcode 00031139) is designated as the lectotype of *S. alfredii* because it is fertile and has mature leaves, and there is a duplicate in a Chinese herbarium (PE).

Schneider (1916) described *Salix mictotricha* and indicated *Wilson 2118* as "type" and *Wilson 2118*[a] as "cotype". These specimens belonged to a single gathering, because they were collected by the same person at one time and place. One specimen of *Wilson 2118* was traced: A barcode 00404476 (♂). Four duplicates of *Wilson 2118*[a] were found: A barcode 00055963, BM barcode BM000958023, E barcode E00301605 and US barcode 00105201 (all ♀). The single sheet at A includes fragments with inflorescences of both sexes: the main label gives the number *2118* and is marked "♂" and the barcode above it is 00404476, while elsewhere on the sheet, near a female fragment, is the annotation "♀ *2118*[a]" and the barcode 00055963. Our examination shows that the four duplicates of *Wilson 2118*[a] are identifiable as *S. rhoophila* and the single fragment of *Wilson 2118* is identifiable as *S. polyclona*. However, Hao (1936) overlooked this issue when he published an image of the sheet at A (i.e. A barcode 00055963 [♀] + barcode 00404476 [♂]) in his monograph. The protologue of *S. mictotricha* (Schneider 1916: 57) says of the male catkins: "bracteis obovato-rotundis utrinque fulvo-sericeis (pilis albis intermixtis)" and adds "This species may be easily distinguished by the brownish silky bracts of the ♂ plant" and "The specific name is derived from μικτός, mixed, and θρίξ, hair." Therefore, *Wilson 2118* (A barcode 00404476 [♂]) best fits Schneider's concept of *S. mictotricha* and is designated as the lectotype of that name. *Salix mictotricha* and *S. polyclona*, now synonyms, were described simultaneously by Schneider in the same monograph and therefore have equal priority. No choice between the two names has previously been made under Art. 11.5 of the *Code*. We choose to adopt the name *S. polyclona* because the original material for this name is in better condition.

Chou & al. (1984) treated "*Salix Wuiana* K. S. Hao" (Hao 1936, not validly published) as a synonym of *S. alfredii* before it was validated by Fang & Skvortsov (1998). However, the validly published name *S. wuana* K. S. Hao ex C. F. Fang & A. K. Skvortsov was not recorded in *Flora of China* (Fang & al. 1999). After examining the type specimens of *S. wuana* and *S. polyclona*, no relevant differences between these taxa were found. Therefore, the name *S. wuana* is synonymized with *S. polyclona*. Neither Hao (1936) nor Fang & Skvortsov (1998) specified an etymology for the epithet. However, Hao (1936: 13, 95, fig. 72) gave the epithet as "*Wuiana*", proving that it was named for a person, because throughout this work he capitalized the first letter of epithets only when they were based on people's names. Wu is a very common surname in China, shared by dozens of botanists, while "Wui" is not a Han name nor indeed a syllable normally used in Mandarin Chinese. Therefore, we assume that the species honoured a person named Wu and that the original spelling of the epithet is to be treated as an error to be corrected to *wuana* in accordance with Art. 60.8(c) of the *Code*.

Representative specimens examined — China: Gansu: Diebu County, Sangbagou, 2961 m, 20 Jun 2012, *L. He & X. X. Mao PH20120620-02* (BJFC); Lianhua Mountain, 3103–3234 m, 11 Jun 2014, *L. He, Q. Guo & Z. X. Zhang PH20140611-12 & 18* (BJFC). — Henan: Luanchuan County, Laojun Mountain**,** 1880 m, 28 May 1957, *Anonymous s.n.* (NAS barcode NAS00281514). — Hubei: Shennongjia, Laojun Mountain, 2540 m, 6 Jun 2019, *F. Y. Guo & C. L. Yang 060611* (BJFC). — Qinghai: Menyuan County, Xianmiqi, Hankegou, 2850 m, 14 Jun 1960, *Chinese Academy of Sciences Qinghai-Gansu Expedition 2485* (PE). — Shaanxi: Xi'an, Guangtou Mountain, 2458 m, 17 Jul 2016, *L. He & J. Zhao HL 38* (FJFC). — Sichuan: Jiuzhaigou, Changhai to Wucaichi, 2995–3085 m, 26 Jul 2017, *L. He & J. Zhao HL 114-2 & 3 & 4 & 5* (FJFC); Jiuzhaigou, Yuanshisenlin, 2974 m, 26 Jul 2017, *L. He & J. Zhao HL 115* (FJFC).

Acknowledgements

This study was financially supported by the National Natural Science Foundation of China (grant no. 31800466) and the Natural Science Foundation of Fujian Province of China (grant no. 2018J01613). We are grateful to the curators and staff at the herbaria A, BJFC, BM, E, FJFC, HIB, K, P, PE, S, US and WUK for providing facilities and assistance or making high-quality specimen images available. We also thank John H. Wiersema (Smithsonian National Museum of Natural History), an anonymous reviewer and the editor for providing helpful suggestions and comments on the manuscript.

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Willdenowia
Open-access online edition bioone.org/journals/willdenowia
Online ISSN 1868-6397 · Print ISSN 0511-9618 · 2018 Journal Impact Factor 1.156
Published by the Botanic Garden and Botanical Museum Berlin, Freie Universität Berlin