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NOTES ON CHINESE SILVER FIRS 2*

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ABSTRACT. Examination of type and other material of *Abies recurvata* Masters and *A. ernestii* Rehder shows that the former is a distinct species but that *A. ernestii* is referable to *A. recurvata* as a variety: the appropriate new combination, *Abies recurvata* Masters var. *ernestii* (Rehder) Rushforth, is made. *A. salouenensis* Bordères-Rey & Gaussen is reduced to a subspecies of *A. chensiensis* Tieghem, *A. chensiensis* subsp. *salouenensis* (Bordères-Rey & Gaussen) Rushforth, and a new subspecies of *A. chensiensis* from the Lijiang range, Yunnan, *A. chensiensis* subsp. *yulongxueshanensis* Rushforth, is described.

Abies recurvata Masters, J. Linn. Soc. Bot. 37:423 (1906)

var. **recurvata**

SICHUAN. Valley of the Min Jiang, south of Songpan, 2300–3000 m, ix 1903, *Wilson* 3021 (**holo**. K, iso. BM); ibid., x 1910, *Wilson* 4057 p.p. (K, BM); ibid., ix 1931, *Cheng* 3237 (K, BM); Kwa-Tize-Ling, west of the Min Jiang, 2800–3300 m, *Wilson* 4057 p.p. (K); without locality, *Wilson* 4057 p.p. (BM); West and near Wenchuan Xian, 3000–3600 m, x 1910, *Wilson* 4051 (K).

A. recurvata var. *recurvata* has a restricted distribution along the Min Jiang from Wenchuan to south of Songpan. It was first collected by E. H. Wilson in September 1903 under his Veitch Expedition number 3021 from one day's journey south of Songpan. It was introduced into cultivation under *Wilson* 4051 and *Wilson* 4057.

The type specimen at Kew consists of vigorous shoots, on which the leaves are remarkable in pointing backwards along the shoot, hence the specific epithet; on other shoots under the same collecting number the leaves are assurgent and only slightly recurved. On cultivated trees the second type of foliage arrangement is usual except on the most vigorous sterile shoots.

Descriptions of *A. recurvata* var. *recurvata* usually state that the bract-scales of the mature cones are completely included within the cone and only one-half to three-quarters the length of the ovuliferous scales (Rehder & Wilson, 1914; Liu, 1971; Cheng & Fu, 1978). However, on cultivated material the cusp is often exserted 1 or 2 mm in the lower half of the cone. This character appears to be variable, but in the type collection at Kew and also in Cheng's topotype, *Cheng* 3237, the cusps are also exserted up to 2 mm.

Cheng 3486 collected at Mowkung, Sichuan province in October 1931, has been placed here by Cheng but is probably better referred to the following variety.

*Part 1. Abies chengii. A previously overlooked Chinese Silver Fir. *Notes RGB Edinb.* 41:333–338 (1983).

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Abies recurvata Masters var. **ernestii** (Rehder) Rushforth, **comb. nov.**

Syn.: *A. ernestii* Rehder in J. Arn. Arb. 20:85 (1939).

A. beissneriana Rehder & E. Wilson in Sarg., Plantae Wilsonianae 2:46 (1914), non Mottet in Rev. Hort. 1902:162 (1902).

A. chensiensis Tieghem var. *ernestii* (Rehder) Liu, A monograph of the genus Abies 135 (1971).

Type: Sichuan, *Wilson* 2090 (holo. AA; iso. E, K).

SICHUAN. NE of Kangding (Tachien-Lu), 2400–3000 m, vii & x 1908, *Wilson* 2090 (AA, E, K); ibid., 3000–3500 m, vii 1908, *Wilson* 2091 (AA, K); Fei-Yueh-ling, Ching-Chi-Hsien, 1904, *Wilson* (*Veitch exped.*) 3020 (BM); ibid., 2500 m, x 1908, *Wilson* 2095 (AA, K); Baoxing Xian (Mupin), 3300 m, x 1908, *Wilson* 2094 (AA); SW of Kangding (Tachien-Lu), 29 v 1930, *Cheng* 1031 (E, BM); NE of Mowkung, 11 x 1931, *Cheng* 3486 (K, BM); Tanpa (Romichango) district, Maoniu (Ndrone), 3100 m, 3 x 1934, *H. Smith* 12698 (E).

GANSU. Upper Tebbu-Yiwaku, between Drakana and Boho Gomba, 2890 m, x 1926, *Rock* 15087 (E, K).

A. recurvata var. *ernestii* is recorded in W Sichuan from Baoxing Xian, through Kangding to Mowkung, with a further record in SW Gansu. It was first found by Wilson on his second expedition for the nursery firm of Veitch, when in 1904 he collected his no. 3020 and introduced seed from the same locality under his seed number 1570. These collections, assigned to *A. firma* Siebold & Zuccarini by Masters (1906) were included in *A. beissneriana* when described by Rehder & Wilson (1914). Rehder (1939) substituted the name *A. ernestii* when *A. beissneriana* was found to be illegitimate. When describing *A. beissneriana*, Rehder & Wilson compared the taxon with both *A. chensiensis* Tieghem and *A. firma* but made no reference to *A. recurvata.*

Liu (1971) reduced *A. ernestii* to a variety of *A. chensiensis.* The strongly recurved foliage of the type specimen of *A. recurvata* var. *recurvata* (which, as discussed, is not the usual foliage arrangement for the variety) appears to have masked the similarity of *A. recurvata* var. *recurvata* to var. *ernestii,* particularly for Rehder & Wilson who use almost identical terms to describe both taxa without making any comparison between them.

When discussing *A. recurvata* var. *recurvata,* Rehder & Wilson (1914) state: 'The cones.....are short stalked, oblong-ovoid, from 5 to 9 cm long, and from 3 to 4 cm wide, they abruptly taper to the peduncle, and are flattened or somewhat pointed at the apex, smooth, with bracts completely hidden and are slightly resinous and intense, violet-purple in colour when growing, but change after they are ripe and dry to grey-brown.' Whereas in the Latin diagnosis of *A. ernestii* (as *A. beissneriana*) they state: 'strobili pedunculati, cylindrici, rarius ovoideo-cylindrici, apice truncati. saepe leviter angustati. basi rotundati. 5–8 cm longi et 3–3·5 cm diam. juvenate violaceo-purpureo deinde griseo-vivides sub maturitate griseo-brunnei. The descriptions of the bark, shoots and buds are also alike and the general similarity of the two descriptions is striking.

A. recurvata var. *ernestii* can be distinguished from var. *recurvata* by the longer, often bloomed, leaves up to 3·5 cm on sterile shoots (cf. around

2·5 cm on sterile shoots of var. *recurvata*), by the notched or bifid apex of the leaves on sterile shoots (cf. the acute or pointed, rarely notched, apex of var. *recurvata*), by the shoot being straw-brown in the first year and then ash-grey in the second or third year (cf. pinkish-brown in the first year, becoming ash-grey in the second or third year in var. *recurvata*), and by the more cylindrical cones without the mucronate apex often found in the type variety.

In *Wilson* 2090 (type of var. *ernestii*), *Wilson* 2091 and to a lesser extent *Wilson* 2095, there are stomata on the upper surface of the needles on strong shoots but these are not consistent differences from var. *recurvata*.

I do not consider these differences justify treating *A. ernestii* as more than a variety of *A. recurvata*. *Rock* 15087 from SW Gansu is somewhat isolated from the remainder of the population of var. *ernestii*. Wilson (1928) referred this collection and the adjoining *Rock* 15088, for which only cultivated material has been seen, to var. *recurvata*. However, on the basis of the above characters it is var. *ernestii*.

Another Rock collection from Gansu, *Rock* 14831 (E, K), is only a sterile epicormic shoot; it may belong to either *A. recurvata* var. *ernestii* or to *A. chensiensis* where Wilson assigned it (Table 1 shows the diagnostic characters of *A. recurvata* var. *ernestii* and the *A. chensiensis/salouenensis* complex).

The type collection of *A. recurvata* var. *ernestii, Wilson* 2090, was collected from the Tapao Shan. This was recorded by Rehder & Wilson (1914) as NE of Kangding (Tachien-Lu) but subsequent maps, e.g. Ku & Cheo (1941), place the Tapao Shan north-west of Kangding.

Wilson 2090 was collected in July 1908 in immature fruit, and mature cones were added in the autumn. The July collection is the type and it has cones 5 × 1·5 cm, with the bract-scales slightly exserted. The mature cones from the autumn collection are 6 × 2·5–3 cm with the bract-scale hidden. *Wilson* 2091 also from the Tapao Shan but at greater altitude, has 5 × 2·5 cm cones with bract-scales nearly but not exserted. However, in *Wilson* 2095 from Ching-Chi-Xian, at 2600 m, the bract is only half the length of the ovuliferous scale. *Rock* 15087 from SW Gansu has 7–9 cm cones with the tips of the bracts just exserted. The relative size of the

TABLE 1

	A. recurvata var. ernestii	A. chensiensis/salouenensis complex
Cone	5–9 × 2·5–3·5 cm	8–14 × 4–5 cm
Ovuliferous scales	kidney-shaped, approx. 2 cm broad	cuneate or flabellate, approx. 3·5 cm broad
Rachis	fusiform, rarely cylindric-conical	conical
Immature cone	violet-purple	green
Leaves on coning shoots	1–2·3 cm	1·5–4 cm
Leaves on sterile shoots	to 3·5 cm	to 8 cm
Buds	ovoid, resinous	conical, not or slightly resinous

bract-scale ranges from approximately half to slightly longer than the covered part of the ovuliferous scale.

Abies chensiensis Tieghem, Bull. Soc. Bot. France 38:413 (1891)
subsp. **chensiensis**
SHAANXI. Qin Ling shan, xii 1872, *David* 918 (**holo.** P).
HUBEI. Fang Xian, x 1907, *Wilson* 647 (AA, E, K); ibid., v 1901, *Wilson* 1895a (K).

Abies chensiensis was described on the basis of the leaf section by van Tieghem (1891) in a key to the internal leaf characters of *Abies*. The type collection, *David* 918, was made from the Qin Ling (Tsin Ling) range in central Shaanxi (Shensi) province in December 1872; it is a weak sterile specimen and is probably an epicormic shoot.

Wilson collected material of *A. chensiensis* from Fang Xian in NW Hubei under *Wilson* 647 in October 1907. This included both sterile and coning material and allowed Rehder & Wilson (1914) to amplify van Tieghem's meagre description. The leaf section of the sterile parts of *Wilson* 647 fit the description given by van Tieghem but the coning material has leaves with median resin canals. This change of position of the resin canals of leaves in mature female coning shoots of *A. chensiensis* appears to be a feature of the species in the Shaanxi-NW Hubei region and it is included in the key to Chinese *Abies* in Cheng & Fu (1978).

Collections closely related to *Abies chensiensis* subsp. *chensiensis* have been made in Yunnan, SW Sichuan, SE Xizang and E India. They have been referred to *A. chensiensis* (Orr, 1933; Clinton-Baker & Jackson, 1935; and Dallimore & Jackson, 1966), and to *A. pindrow* Royle (Kingdon-Ward, 1934), *A. ernestii* Rehder (Wilson, 1926, as *A. beissneriana* Rehder & Wilson), *A. salouenensis* Bordères & Gaussen (Bordères-Rey & Gaussen, 1947) and *A. ernestii* var. *salouenensis* (Bordères & Gaussen) Cheng & Fu (Cheng & Fu, 1978).

The material in herbaria consists of either cones and coning material collected from the upper crown or sterile and almost certainly epicormic material from the base of trees up to 40 m tall. The only exception to this is *Yu* 7952, the type of *A. salouenensis*, which includes both fertile and epicormic material, and two collections by Kingdon-Ward from E India and SE Xizang (*KW* 7647, *KW* 10412) which include sterile epicormic foliage with seeds and scales collected from the forest floor.

The material shows no substantive characters of the cones by which it can be readily separated from the Shaanxi-Hubei material (subsp. *chensiensis*) but is distinguishable into two groups upon the basis of foliage characters.

The first element is centred in the Lijiang range in NW Yunnan, extending across the Chang Jiang (Yangtse) into SW Sichuan. This material is close to the Shaanxi-Hubei specimens but can be distinguished on the basis of the internal leaf structure of the coning shoots and the generally longer cones. As this material is geographically distant and morphologically separable from *A. chensiensis* subsp. *chensiensis* it is here described as another subspecies, subsp. *yulongxueshanensis*.

The other element has a much wider distribution, including Yunnan

east and west of the Lijiang Shan, SE Xizang and E India. It is readily differentiated by the sterile foliage and is usually very distinct. However, in the absence of carpological characters it is here considered a subspecies and the combination *A. chensiensis* subsp. *salouenensis* (Bordères & Gaussen) Rushforth is made.

Key to subspecies of Abies chensiensis

1a. Longest leaves of sterile branches less than 4·5 cm . . . 2
1b. Longest leaves of sterile branches to 7·5 cm, occasionally longer . . . . . subsp. *salouenensis*
2a. Resin canals in leaves of coning shoots median; cones 8–10 cm . . . . . subsp. *chensiensis*
2b. Resin canals in leaves of coning shoots marginal; cones 10–14 cm . . . . . subsp. *yulongxueshanensis*

Abies chensiensis Tieghem subsp. **yulongxueshanensis** Rushforth, **subsp. nov.**

A subspecie typica speciei canalibus resiniferis marginalibus (nec in mediis) foliorum ramulorum strobiliferorum et strobilis maturis 10–14 cm (nec 8–10 cm) longis recedit; a subsp. *salouenense* (Bordères & Gaussen) Rushforth foliis ramulorum sterilium brevioribus (usque ad 4·5 cm nec ad 7·5 cm) differt.

Distinguished from the type subspecies by the marginal (not median) resin canals in the leaves of the coning shoots and by the 10–14 cm (not 8–10 cm) mature cones; differs from subsp. *salouenensis* by the shorter leaves of the sterile shoots (to 4·5 cm not 7·5 cm).

Type: Yunnan, Lijiang Shan, tree 50–70 ft, amongst woods, 3000 m, 25 v 1937, *T. T. Yu* 15050 (holo. E, iso. BM).

Found in mixed forest of oak and pine at about 3000 m. The Yulongxue Shan is the main massif in the Lijiang (Likiang) range.

YUNNAN. Lijiang Shan, *T. T. Yu* 15050 (E, BM); ibid., *Forrest* 10281 (E, K), *Forrest* 22280 (E), *Rock* 10886 (E); Lijiang to Yongming, *Rock* 18487 (E), *Rock* 18488 (E); mountains NE of the Lijiang range, *Forrest* 30663 (E).

Abies chensiensis Tieghem subsp. **salouenensis** (Bordères & Gaussen) Rushforth, **comb. et stat. nov.**

Syn.: *A. salouenensis* Bordères & Gaussen, Trav. Lab. For. Toul. Tome 1, 4(15):4 (1947).
A. ernestii Rehder var. *salouenensis* (Bordères & Gaussen) Cheng & Fu., Fl. Reipubl. Pop. Sin. 7, 93 (1978).

Type: Yunnan, Mekong valley, Atunze to Doker-la, *T. T. Yu* 7952 (E, AA, BM).

YUNNAN. Atunze to Doker-la, *T. T. Yu* 7952 (E, AA, BM); ibid., *T. T. Yu* 7957 (E); Ngaitschekou, across the Yalung from Yenhuan, *Handel-Mazzetti* 2601 (E); Yangtze-Mekong divide, *Handel-Mazzetti* 7913 (E); Mekong-Salween divide, *Forrest* 19796 (E); Yonming to Yongpeh, *Schneider* 1648 (E); Chung Valley, *Kingdon-Ward* 258 (E); E of the Yangtze bend, *Kingdon-Ward* 3942 (E); Chien-Chuan-Mekong divide,

Forrest 23202 (E); Mt Kenyichunpo and Champutong, Salween-Irrawady divide, *Rock* 11518 (E).

XIZANG. Rongto valley, Zayul, *Kingdon-Ward* 10412 (BM); Zayu Xian, *Tsinghai-Tibet exped.* 73. 1008 (B).

INDIA. Arunachal Pradesh, Gorge of the Di Chu, *Kingdon-Ward* 7647 (K); ibid., *Kingdon-Ward* 19324 (BM).

The taxonomic category of subspecies has been adopted here, after discussion, to encompass populations of wild conifers with a distinct geography and morphology of greater scale than that of a variety, but in which differentiation has proceeded to an insufficient degree to permit satisfactory treatment as separate species. Although the rank of subspecies has not been widely used in conifers, it is felt here to be a useful category for these plants, equating more exactly with established tradition and usage in flowering plants (Davis & Heywood, 1963:99–100).

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