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NOTES ON CHINESE SILVER FIRS 3

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ABSTRACT. In an examination of type and other material of *Abies* from NW China, *Abies fargesii* Franchet, *A. fabri* (Masters) Craib and *A. squamata* Masters are accepted as valid species and *A. minensis* Bordères-Rey & Gaussen is treated as a subspecies of *A. fabri*. *A. sutchuenensis* (Franchet) Rehder & E. Wilson, *A. kansouensis* Bordères-Rey & Gaussen and *A. faxoniana* Rehder & E. Wilson are found to be within the variation of *A. fargesii*.

In addition to *Abies* taxa treated in Rushforth (1984a) six species have been described from the Chinese provinces of Hubei, Shaanxi, Gansu and East, North and West Sichuan. These are *Abies fargesii* Franchet, *A. fabri* (Masters) Craib, *A. squamata* Masters, *A. faxoniana* Rehder & E. Wilson, *A. sutchuenensis* (Franchet) Rehder & E. Wilson and *A. kansouensis* Bordères-Rey & Gaussen.

1. Abies fargesii Franchet in J. Bot. (Morot) 13:256 (1899).

Syn.: *A. fargesii* var. *sutchuenensis* Franchet in J. Bot. (Morot) 13:256 (1889).

A. sutchuenensis (Franchet) Rehder & E. Wilson in Sarg., Plantae Wilsonianae 2:48 (1914).

A. faxoniana Rehder & E. Wilson in Sarg., Plantae Wilsonianae 2:42 (1914), **syn. nov.**

A. kansouensis Bordères-Rey & Gaussen in Trav. Lab. For. Toul. I, 4(5):6 (1944).

Type: E Sichuan, *Farges* 908 bis. (holo. P, iso. K).

SICHUAN. Cheng-kou, *Farges* s.n. (type of *A. fargesii* var. *sutchuenensis*: holo. P); NE of Songpan, 2600–3800m, x 1910, *Wilson* 4060 (type of *A. faxoniana*: holo. AA; iso. E, K, BM); ibid., viii 1928, *Fang* 4114 (E, K); ibid., viii 1931, *Cheng* 3200 (K); ibid., *Cheng* 3199 (K).

HUBEI. Fang Xian, *Henry* 6881 (E, K, BM); ibid., *Wilson* 1895 (E, K); ibid., 2300–3300m, *Wilson* 2088 (E, K, BM).

SHAANXI. Teou Mon Kong, *Licent* 2862 (BM, K); Miao Wang Shan, vii 1899, *Hugh* s.n. (BM); Cho-toe Miao Hu-Shien, s.d., *Hugh* s.n. (BM).

GANSU. Tao River, 1911, *Purdom* 823 (AA, BM, K); vicinity of Labrang, 3000–4000m, viii 1923, *Ching* 806 (E); Archuen, S of Jone, 4100–4500m, ix 1923, *Ching* 954 (E, BM-photo); Kagoba, x 1914, *Meyer* 1813 (K); Jone Xian, 2700m, *Wang* 5319, (B); ibid., 3000m, *Wang* 5456 (B); Sigue Xian, 3400–3800m, *Wang* 15234 (B); Jone Xian, 2700m, vi 1957, *Tao River Expedition* 3180 (B); ibid., 3400m, *Tao River Expedition* 3282 (B). Also, the following collections by J. F. Rock [details in Rehder & Wilson (1928)]: *Rock* 12145, 12539, 12678, 12940, 12977 (E, K); 12979, 13422 (E); 13435 (E, K); 13466 (K); 14636, 14809, 14837 (E, K); 15084 (K).

Pére Farges collected three specimens under his No. 908 from Cheng-kou in NE Sichuan, although the number remains attached only to the

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second specimen, which Franchet cited as the type of *A. fargesii*. Franchet described another specimen as *A. fargesii* var. *sutchuenensis*, which is said to differ from var. *fargesii* as follows—'Folia obtusa, obscure emarginata vel acuta (in eodem ramo) plana, subtus albo faciata'. Unfortunately he did not indicate a type for his var. *sutchuenensis* but it must have been one of the other specimens collected by Farges at Cheng-kou as it is described as 'cum praecedente'. In the protologue of *A. fargesii* Franchet noted that the whiteness of the leaf undersides does not constitute a specific character and that in cone characters the two taxa are similar.

In March 1974 I had the opportunity to study all three specimens of *Abies* collected by Farges from Cheng-kou, when they were kindly loaned by the Director of the Muséum National d'Histoire Naturelle, Paris to the RBG Edinburgh.

Farges 908 bis (A) is marked as the type specimen of *A. fargesii*. It consists of sterile and male (microsporangiate) strobili bearing shoots, as well as female (megasporangiate) coning shoots. All the shoots are relatively weak in appearance, comparable with material from the lower to middle portion of mature cultivated trees of *A. fargesii*.

The next specimen (B), which had been annotated as *A. fargesii* var. *sutchuenensis* by V. Komarov in June 1911, consists of sterile and male coning shoots. The leaf tips are rounded notched whilst the stomatal bands are very glaucous. This specimen cannot be the type of var. *sutchuenensis* as it does not have an acute leaf tip, nor does it have female cones to be comparable with the cones of var. *fargesii*.

The remaining specimen (C) consists of strong shoots, both female coning and vegetative, as are exhibited in the top third of vigorous cultivated trees of *A. fargesii*. This specimen fits the description of var. *sutchuenensis* as given by Franchet in both his Latin diagnosis and French discussion; it is annotated as the type of *A. fargesii* var. *sutchuenensis* and in the absence of evidence that Franchet had before him other specimens from Cheng-kou it must be assumed to be the holotype of var. *sutchuenensis*.

All three specimens of Farges' collection were made in the spring as the buds are flushing. The characters by which var. *sutchuenensis* is said to differ from var. *fargesii* are not of any value in themselves. The type specimen (A) of var. *fargesii* has some needles which are glaucous below, and others in which the wax appears to have been rubbed off. In the diagnosis Franchet states '... etiam juvenilia utraque facie concoloria ...', but the wax covering of the needles is not always apparent as the shoots flush.

Specimen B has the glaucous white undersides of var. *sutchuenensis* but the leaf apex of var. *fargesii*. This character of the leaf apex on strong shoots becoming acute or acuminate can be observed in other Chinese *Abies*, such as *A. forrestii* C. C. Rogers, and is common in *A. fargesii*. The var. *sutchuenensis* is, therefore, part of the normal variation of *A. fargesii*. The variation between these three shoots collected by Farges is consistent with the specimens being taken from different parts of the same tree. Similar variation, correlated with position in the tree, is shown by most cultivated trees of *A. fargesii*. Alternatively two or three separate trees could be represented.

Rehder & Wilson (1914) considered that material collected by Purdom under his 805 and 823 equated with *A. fargesii* var. *sutchuenensis* but justified specific status. They raised Franchet's variety to *A. sutchuenensis* (Franchet) Rehder & E. Wilson but also gave a description based on *Purdom* 805. Bordères-Rey & Gaussen (1944) agreed that Purdom's material constituted a distinct species but considered that it was different from var. *sutchuenensis*. Accordingly, they introduced the name *A. kansouensis* with *Purdom* 805 as type and used Rehder and Wilson's latin description. *A. kansouensis* was said to differ from *A. fargesii* in the yellowish petiole and in the bract scales being slightly shorter than the reniform ovuliferous scales. Rock's ample collections from Gansu (formerly Kansu) show that *A. kansouensis* is not specifically distinct from *A. fargesii*.

Rehder & Wilson (1914) described *A. faxoniana* with *Wilson* 4060, from NE of Songpan, as the type. Also cited were three Wilson collections, 4052, 4069 and 4070, from further south in Sichuan. *Wilson* 4060 is not identical to these paratypes. It has small cones, short needles glaucous beneath with acuminate, acute or rounded notched tips, and purple shoots of *A. fargesii*. The other three Wilson numbers are not referable to *A. fargesii* and are discussed below under *A. fabri* subsp. *minensis*.

A. fargesii is said to be glabrous, or nearly so whilst *A. faxoniana* is allegedly always densely pubescent. *Wilson* 4060 (holotype) has strong shoots which are either glabrous or densely pubescent, and weak shoots which are very densely pubescent. Cultivated trees of *A. fargesii* show that the strong shoots of the upper and outer crown are glabrous or nearly so, whilst the weaker side shoots and those from the lower crown are generally pubescent, sometimes very densely so.

Wild collected herbarium material of *A. fargesii* rarely includes both strong and weak material under the same number. *Rock* 13422 at Edinburgh has both strong and weak shoots represented, on separate sheets. The difference between these two sheets is striking, but consistent with the variation within single cultivated trees of *A. fargesii*.

Bordères-Rey & Gaussen (1944) discussed a sterile specimen collected by David in Shaanxi, and described it as *A. fargesii* var. *tieghemi* Bordères-Rey & Gaussen. I have not seen the specimen, which is apparently a weak shoot, probably an epicormic. The taxon is very weakly differentiated: Liu (1971) and Cheng & Fu (1978) both regard it as synonymous with *A. fargesii* var. *fargesii*.

The Hubei collections of *A. fargesii* differ slightly from the type material in the incomplete layer of hypoderm in the leaf and in the more pectinate foliage arrangement. This variation does not appear to be significant.

Site studies of natural populations of *A. fargesii* may justify the acceptance of one or more infraspecific taxa within the species but the herbarium material available does not make clear how the variation within the species is correlated.

2. Abies squamata Masters in Gard. Chron., ser. 3, 39:299, fig. 121 (1906), and in J. Linn. Soc. Bot. 37:423 (1906).

Type: West of Tachien-lu (Kangding), 3650–4250m, vi 1904, *Wilson* (Veitch No.) 3019 (K).
SICHUAN. Kangding, 3700m, *Tsiang* 36709 (B); ibid., vi 1930, *Cheng* 1097 (BM); ibid., viii 1930, *Cheng* 1783 (BM); NE of Kangding, x 1931, *Cheng* 3545 (E, K); Taofu (Dawu) district, 3900m, ix 1934, *H. Smith* 12407 (E); Inter Taining (Ngata) and Taofu (Dawu), 3700m, ix 1934, *H. Smith* 13661; ibid., 3800m, ix 1934, *H. Smith* 13664 (E); ibid., 3700m, ix 1934, *H. Smith* 13665 (BM).

Abies squamata is easily distinguished by its flaky bark, which on vigorous shoots begins to break into papery scales during or after the fourth growing season. In the absence of four year old shoots the invariably acute needles with a broad band of stomata on the upper surface, the red-brown shoots and the large globose resinous buds characterize it. The shoots are usually glabrous but in *Cheng* 1783 and in *Wilson* 3019 they are pubescent. The resin canals in the leaves of mature coning specimens are median but, as noted by Florin (1948), they may be marginal in young trees.

Cheng & Fu (1978) record that *A. squamata* extends from NW Sichuan into SE Qinghai and SE Xizang (Tibet). I have not seen specimens from the last two provinces.

3. Abies fabri (Masters) Craib in Notes RBG Edinb. 11:278 (1919).
Syn.: *Keteleeria fabri* Masters in J. Linn. Soc. Bot. 26:555 (1902).

3a. subsp. **fabri**
Type: Mount Omei (Emei), 1887, *Faber* 984 (K).
SICHUAN. Emei Shan, 2000–3100m, x 1910, *Wilson* 4086 (K); ibid., 3000m, viii 1928, *Fang* 2970 (E, K); ibid., vii 1937, *Chien* 6158 (E); ibid., 2400m, x 1980, *Rushforth* 168 (E); ibid., 2900m, *Rushforth* 192 (E). Wa Shan, 2500–3500m, vii 1903, *Wilson* 3022 (K, BM); ibid., vii 1903, *Wilson* 3021 (K, BM) [the type of *A. recurvata* Masters is also under this number, although collected in September 1903 from S of Songpan in the north of the province]; Wa Shan and Wa-Wu Shan, vii and x 1908, *Wilson* 2089 (E, K, BM); Tianquan, 2400m, v 1936, *Chu* 2558 (E, BM); Baoxing, 2600m, vi 1933, *Yu* 1926 (B); ibid., 2800–3200m, vi 1933, *Yu* 2084 (B); ibid., *Soong* 38610 (B); ibid., 1954, *Soong* 38930 (B); ibid., 3400m, iv 1959, *Anon.* 00228 (B); SE of Kangding, 3000–4000m, x 1910, *Wilson* 4078 (K); Kangding, 2750–2900m, ix 1928, *Fang* 3585 (E, K); S of Kangding, v 1930, *Cheng* 806 (E); Kangding, viii 1930, *Cheng* 1772 (K); ibid., x 1930, *Cheng* 3547 (K); Zheduo (Cheto) Shan, W of Kangding, 3600–4000m, x 1910, *Wilson* 4082 (BM).

Abies fabri subsp. *fabri* was first collected by the Rev. Ernst Faber from the Emei Shan, and originally described by Masters in the genus *Keteleeria*. Rehder & Wilson (1914) considered it part of *Abies delavayi* Franchet but Craib (1919) showed that the two species are clearly distinct. In addition to the characters given by Craib, several further differences are discussed by Rushforth (1984b).

A. fabri subsp. *fabri* is restricted to central west Sichuan province. It is characterized by the small conical or rounded buds that are greenish

purple with whitish resin, the usually shiny, yellow-brown shoots and the needles with margins distinctly rolled down at the sides which are set on the shoot with a narrow V-shaped groove above.

3b. subsp. **minensis** (Bordères-Rey & Gaussen) Rushforth, **comb. et stat. nov.**

Syn.: *A. minensis* Bordères-Rey & Gaussen in Trav. Lab. For. Toul. 1, 4(15):10 (1947).

A. faxoniana Rehder & E. Wilson, pro parte, excluding typus.

Type: Sichuan, Songpan, 3200m, ix 1933, *Yu* 2586 (holo. TLF, photo. and fragment at E).

SICHUAN. Songpan, ix 1928, *Fang* 4441 (E, K); West and near Wenchuan, 3000–3600m, x 1910, *Wilson* 4052 (E, BM); ibid., ix 1931, *Cheng* 3406 (E, K); NE of Monkung, x 1931, *Cheng* 3482 (K); Panlan Shan, W of Guan Xian, 3000–3600m, x 1910, *Wilson* 4069 (BM); ibid., 3000–3600m, x 1910, *Wilson* 4070 (BM); Zheduo (Cheto) Shan, Kangding, 2980m, viii 1934, *Liu* 1036 (B); Kangding, 3600m, vii 1953, *Liu* 36228 (B); ibid., 3920m, viii 1953, *Tsiang* 36631 (B); ibid., 3500m, viii 1963, *Tsien* 1321 (B).

Abies minensis was described by Bordères-Rey & Gaussen from *T.T. Yu* 2586, collected in the vicinity of Songpan, in northern Sichuan Province. As described, it was scarcely to be differentiated from *A. faxoniana* (as then understood) except by the marginal leaf resin canals, and it has generally been considered a synonym of that species (Cheng & Fu, 1978; Liu, 1971; Dallimore & Jackson, 1966). However, as I have shown above, *A. faxoniana*, when originally described, included two elements. The type, *Wilson* 4060 from north east of Songpan, lies within the variation of *A. fargesii*, but the specimens from the other localities cited by Rehder & Wilson belong to a separate taxon. According to Bordères-Rey & Gaussen (1947) the type of *A. minensis* was collected from west of Songpan.

Wilson 4052, 4069 and 4070 differ from *Wilson* 4060 in the less densely pubescent shoots, which are honey or fawn-brown in colour (cf. purple or red-brown), the more pectinate leaf arrangement of the longer leaves, the ovoid buds (cf. conical) and the cones with generally reflexed, shortly exserted bract scales (cf. erect and somewhat more exserted). In these characters they match the type specimen of *A. minensis*.

A. fabri subsp. *minensis* is variable in the position of its leaf resin canals. Cheng & Fu (1978) in their key to *Abies* give the resin canals of their *A. faxoniana* as marginal on nutritional (vegetative) shoots and median on fruiting shoots. However, they also cite *A. minensis* as synonymous with their *faxoniana*, thereby including specimens with coning shoots with marginal resin canals in their *faxoniana*. Rushforth (1972) found that the position of the resin canals in cultivated trees raised from Wilson seed varied from marginal to median. Florin (1948) and Roller (1966) have noted changes in resin canal position within individual taxa. The position of the resin canals may be of value but is not an absolute character in determining taxa in *Abies*.

A. fabri subsp. *minensis* can be separated from the type subspecies by the honey-brown shoots (cf. yellow-brown), the usually longer leaves to 3·5cm (cf. about 2·5cm) which are plane beneath (cf. distinctly rolled

down at the margins) and with stomatal bands which are greenish white (cf. silver-glaucous). The foliage arrangement is more widely parted above and pectinate below the shoot.

A. fabri subsp. *minensis* is quite distinct from subsp. *fabri* at the two extremes—particularly as exhibited by cultivated *minensis* from *Wilson* 4069 and *fabri* from the Emei Shan type locality. However, many of the other specimens are less easily assigned; for example, those from the Zheduo Shan and Wenchuan areas, where both taxa appear to occur in the same or adjoining forests. In the Zheduo Shan, H. Smith made three collections—*Smith* 13653 (E, BM), 13657 (E) and 13659 (E)—which suggest a degree of genetic mixing. Florin (1948) referred 13653 and 13659 to subsp. *fabri*, and 13657 to *minensis* (as '*faxoniana*'). *Wilson* 4082 (here cited as subsp. *fabri*) from the same region appears close to subsp. *minensis*. From the Wenchuan area, *Wilson* 4049 (BM) appears to be intermediate between *fabri* and *minensis*. In view of these intermediates I consider that *minensis* is better treated as a subspecies of *A. fabri*.

Subsp. *minensis* occurs in north central Sichuan to the north of the area where subsp. *fabri* is found. There are a number of specimens, such as *Cheng* 3482, which seem to be approaching *A. fargesii* but the shoot and bud characters adequately separate them. Subsp. *minensis* generally seems to come from slightly drier areas than subsp. *fabri*. This may explain the distribution of the two taxa in the Zheduo Shan and Wenchuan regions, but collectors' notes are not sufficiently explicit.

Both subspecies of *A. fabri* and *A. squamata* are cited from specimens whose locality is given as 'Kangding'. As Cox (1945) pointed out, Kangding is the only significant town in a vast region of W Sichuan, and specimens collected many miles from it have been described as coming from there. It does not necessarily imply that the three taxa are more or less sympatric.

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