



DREPANOSTACHYUM FALCATUM VAR. SENGTEEANUM: IDENTITY AND ORIGINS (POACEAE: BAMBUSOIDEAE)

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ABSTRACT

Drepanostachyum falcatum var. *sengteeanum* Stapleton, a variety of bamboo thought to have originated from the Himalayas and cultivated in the west for over a century is discussed. The application and the typification of the name under which it was once grown, *Arundinaria falcata* var. *glomerata* Gamble, are considered, along with the application of the name *Arundinaria falcata* Nees. *Arundinaria falcata* var. *glomerata* is lectotypified in accordance with the protologue and current use of the name in India, placing it in synonymy of *Drepanostachyum falcatum* (Nees) Keng f., for which an epitype is designated to support its own incomplete lectotype.

RESUMEN

Se discute *Drepanostachyum falcatum* var. *sengteeanum* Stapleton, una variedad de bambú que se piensa que se originó en el Himalaya y se ha cultivado en el oeste durante más de un siglo. Se consideran la aplicación y la tipificación del nombre bajo el que fue cultivado, *Arundinaria falcata* var. *glomerata* Gamble, junto con la aplicación del nombre *Arundinaria falcata* Nees. Se tipifica *Arundinaria falcata* var. *glomerata* de acuerdo con el protólogo y el uso actual del nombre en la India, colocándolo en la sinonimia de *Drepanostachyum falcatum* (Nees) Keng f., para el que se designa un epítipo para apoyar su lectotipo incompleto.

A bamboo with a prominent and distinctive ring of hairs around the culm sheath base and on the young culm nodes was in cultivation at Kew around 1900, without any record of its provenance. It was misidentified (Bean 1907) as *Arundinaria falcata* Nees var. *glomerata* Gamble, a little-known variety from Uttar Pradesh in the NW Indian Himalaya, described on the basis of a very dubious floral characteristic. *Arundinaria falcata* is currently placed in the genus *Drepanostachyum* Keng f. A bamboo with very similar characteristics started to flower in California in 1994, and its seed has been widely distributed, under different names.

Although initially identified as *Himalayacalamus falconeri*, this graceful Californian bamboo was later distributed as *Drepanostachyum glomeratum* Hort., based on *D. falcatum* var. *glomeratum*, and then as *Drepanostachyum sengteeanum* Hort. It is proving somewhat hardier than all other bamboos in the genus *Drepanostachyum*, and is thus of considerable horticultural merit. It has recently been described as *D. falcatum* var. *sengteeanum* (Stapleton 2006), but a detailed nomenclatural treatment is required for the application of names, *D. falcatum* and *D. falcatum* var. *glomeratum*, to both wild and cultivated plants.

Drepanostachyum falcatum

When describing *Arundinaria falcata*, Nees (1834) cited 'Nepalia' collections made by Royle. Chao and Renvoize (1989) designated a Royle collection labelled 'NW India' from Hooker's Herbarium (K) as lectotype of *Arundinaria falcata*. Although this appears contradictory, no Royle collection from Nepal is extant, and it is actually quite unlikely that Royle or his collectors ever entered Nepal, as they concentrated their collecting activities

to the north and west of their base in Saharanpur, Uttar Pradesh (Edmondson, pers. comm.). The Himalayan passes further to the east were little-known, except to some 17th Century Jesuits, because of the 'jealous policies' of Chinese and Nepalese powers (Royle 1839).

For identification of species of *Drepanostachyum*, culm sheath characters are critical, but the culm sheaths of *D. falcatum* are not well represented in the original material at K, nor in the Roylean Herbarium (LIV). One small, glabrous culm sheath is present in the lectotype. Munro (1868), Gamble (1896), Tewari (1993) and Negi and Naithani (1994) all record the culm sheath of *D. falcatum* as glabrous, reflecting the characteristics of a large number of later collections, made from Himachal Pradesh to Nepal, with which the lectotype collections agree in other characters. *Drepanostachyum falcatum* in the wild is clearly interpreted as a bamboo with glabrous culm sheaths (which actually have sparse, inconspicuous, white hairs when young).

Plants of *Drepanostachyum falcatum* introduced into western cultivation on different occasions also have essentially glabrous culm sheaths. Stapf (1904) was the first to identify these plants correctly. They were initially cultivated in S Europe as *Bambusa gracilis* A. & C. Rivi re, while the name *A. falcata* was misapplied to the hardier species now known as *Himalayacalamus falconeri* (Munro) Keng f., known then as *Arundinaria nobilis* Mitford. Stapf (1904) concluded that early introductions probably came from Naini Tal or Mussoori in Uttar Pradesh around 1840.

The consensus is clear that the name *A. falcata* applies to a species found in the Himalayas from Himachal Pradesh to Kathmandu, and also found in cultivation in Europe, where it was known as *Bambusa gracilis*. This species has almost completely glabrous culm sheaths, although the culm nodes may initially have sparse, short hairs below. A specimen from Uttar Pradesh is selected here as epitype, to support the incomplete Royle lectotype by indicating culm sheath characteristics.

***Arundinaria falcata* var. *glomerata* Gamble**

Arundinaria falcata var. *glomerata* Gamble was initially distinguished solely on the basis of agglomeration of 3–4 spikelets in close racemes or panicles. This followed an earlier, identical distinction (Munro 1868) between two unnamed developmental forms of *A. falcata*, listed as var. a and var. b. Munro clearly explained that these forms merely represented different stages of inflorescence development. He observed that as the season advances branch proliferation leads to compound rather than paniculate forms, with shorter racemes of 3–4 spikelets (var. b), totally unlike those seen earlier on younger shoots (var. a). He cited a December collection, Wallich 5035 (K-W), from Chisapong, near Kathmandu, Nepal as representative of the later developmental form, var. b.

It is not clear whether Gamble (1896) followed Munro's interpretation of the developmental nature of this distinction. Gamble's brief description repeated that of Munro for var. b. He indicated in a plate caption that illustrations of var. *glomerata* were from collections made by Bagshawe in 1879. This action was interpreted by Chao and Renvoize (1989) as designation of a type for *A. falcata* var. *glomerata* Gamble, and they cited a Bagshawe collection at K as holotype, albeit a collection made in 1878 not 1879. They listed var. *glomerata* in synonymy of *Sinarundinaria falcata*.

Tewari (1993) subsequently gave the variety full recognition, providing a detailed description attributed to Pandey ined. This, however, differed little from that of the type variety. Culm sheath hairs were not mentioned at all. The description of the culm sheaths

as shining below probably meant having a glossy adaxial, internal surface, rather than being basally glabrous, but there was certainly no mention of any prominent basal ring of hairs. Naithani and Chandra (1998) and Seethalakshmi and Kumar (1998) merely included it in synonymy of *Drepanostachyum falcatum*.

The name *A. falcata* var. *glomerata* has thus been applied to two taxa, one a bamboo of unknown origin cultivated at Kew, the other an Indian bamboo from the borders of Himachal and Uttar Pradesh. The principal diagnostic character of the cultivated plants is a prominent ring of hairs around the base of the culm sheath and the culm node. This is not seen convincingly in any of the collections of wild material. Other characteristics of the cultivated plants include long sparse hairs on only one side of the base of the leaf midrib (costa) rather than both sides, densely scabrous lemmas and paleas, and pubescence only at the tips of rhachilla segments. These characteristics are also not present in the wild material, which therefore cannot be considered the same taxon as the cultivated plants.

Typification of var. *glomerata*

Original material consists of three differently labelled collections at K from Gamble's herbarium, all annotated by him as *Arundinaria falcata* var. *glomerata*. To complicate matters, as is usually the case with older bamboo collections including both fertile and sterile material, these collections represent at least two, and possibly three different species, with mixed collections mounted together on the same sheets.

Only one collection, from Jaunsar Bawa, *Bagshawe s.n.* in 1879, was literally cited in the protologue. The culm nodes and persistent portions of the culm sheath bases are almost completely glabrous.

A second, different collection includes the specimen actually illustrated by Gamble, and this, therefore, can be construed as part of the protologue. This sheet, annotated as type by Chao, is simply labelled 'Comm. Brandis, Jaunsar'. As 'specimens' collected by Bagshawe' was the citation this could be a further Bagshawe 1879 collection, sent by Brandis. It is clearly mixed, with old, unidentifiable flowers of a *Drepanostachyum* species as well as leaves of a different species, probably *Himalayacalamus falconeri*, with smooth culms, entire leaf sheath ligules and distinguishable tessellation of veins on some of the leaves, which are broader, glabrous, and less cuneate than those of *D. falcatum*.

Gamble dissected spikelets from these two collections. His drawings remain attached to the Bagshawe 1879 collection, with the recognisable spikelets he illustrated remaining in capsules on the two sheets. These drawings were reproduced when describing his var. *glomerata*, but interestingly were used for the plate of the type variety, not that of var. *glomerata*, suggesting that Gamble himself actually had scant regard for any difference between the two varieties.

The third collection from Gamble's herbarium annotated as var. *glomerata*, also from Jaunsar Bawa, but in 1878, is *Bagshawe* 6608. This was cited as holotype of *A. falcata* var. *glomerata* by Chao and Renvoize (1989), and is annotated as type by Renvoize. It again has no culm sheaths, but like the second collection, has some short hairs below the culm node.

To summarise 'specimens collected by C. Bagshawe, ... in 1879' was the citation in the protologue. A collection labelled thus is at K. A second, mixed collection, sent by Brandis, was actually illustrated in the protologue, and annotated as type by Chao, while a third collection, *Bagshawe* 6608 in 1878, a date that conflicts with the protologue, was cited as

'holotype' by Chao and Renvoize (1989). The collection cited in the protologue has completely glabrous culm nodes, while the other two collections have distinct, though very short, hairs below the nodes.

It seems more appropriate for the collection bearing the details cited in the protologue to be taken as holotype, rather than the collection stated as 'holotype' by Chao and Renvoize (1989). Although that collection was part of the original material, as it was neither cited nor illustrated in the protologue, their citation of it as holotype cannot be considered an acceptable lectotypification.

The designation here as lectotype of the only sheet actually labelled *Bagshawe*, Jaunsar Bawa, 1879, is in accordance with both the protologue, and with current application of the name in India (Tewari 1993). As the collection actually illustrated in the protologue is recognisable, and citation of *Bagshawe*, 1879 was merely indicating (possibly incorrectly) which collection was illustrated, there would appear to be two elements to consider as syntypes.

The name *D. falcatum* var. *glomeratum* Gamble is misleading, and seems merely to represent a later stage of inflorescence development, as Munro originally intended (1868). There is indeed no separate variety of *D. falcatum* with agglomerated spikelets. It might be considered more appropriate for Gamble to have followed the typification of Munro's earlier unnamed variety. However, *Wallich 5035* is one of the worst bamboo specimens ever preserved in a herbarium, being so decrepit that it has practically no spikelets left at all.

Drepanostachyum falcatum var. *glomeratum*, as interpreted and described in Tewari (1993) and lectotypified here according to the protologue, differs little if at all from the type variety. The precise origin of this type is not known, but it is probably from the same district as the epitype of *D. falcatum* designated here. Culm sheaths are not known, but basal portions remaining attached to the culm nodes of the lectotype are completely glabrous.

Drepanostachyum falcatum (Nees) Keng f., J. Bamboo Res. 2:16. 1983. TYPES: INDIA: 'N.W. India,' Royle (LECTOTYPE: K, selected in Chao and Renvoize 1989); INDIA. UTTAR PRADESH: Chakrata, Sep 1898, Gamble 27256 (epitype designated here: K).

Arundinaria falcata Nees, Linnaea 9:478. 1834.

Chimonobambusa falcata (Nees) Nakai in, J. Arnold Arbor. 6:151. 1925.

Fargesia falcata (Nees) T.P. Yi, Fl. Xizangica 5:33. 1987.

Sinarundinaria falcata (Nees) C.S. Chao & Renvoize, Kew Bull. 44:357. 1989.

Pleiolblastus falcatus (Nees) Nguyen To Quyên, Bot. Zhurn. 75:225. 1990.

Bambusa gracilis A. & C. Rivière, Bull. Soc. Acclim. sér. 3, 5:682. 1878.

Drepanostachyum falcatum (Nees) Keng f. var. *glomerata* Gamble, Ann. Bot. Gard. Calcutta 7:13. 1896; emend. Pandey, D.N. Tewari, Monogr. Bamboo 84. 1993. TYPE: INDIA. UTTAR PRADESH: Jaunsar Bawa, 1879, *Bagshawe* s.n. (LECTOTYPE designated here, K, superseding previous citation of type by Chao & Renvoize, Kew Bull. 44:358. 1989).

Further collections. **INDIA. Uttar Pradesh:** Jaunsar, Aug 1878, *Bagshawe* 6608(K); Jaunsar, *Comm. Brandis* s.n. a (flowers) only, b (leaves) excluded (K).

***Drepanostachyum falcatum* var. *sengteeianum* and other similar bamboos**

Having excluded the name *Drepanostachyum falcatum* var. *glomeratum* from the plants once cultivated at Kew and currently in horticultural use in the USA, it is necessary to consider other possible names.

Arundinaria interrupta Trin. from Nepal has variable development of light, white hairs on the culm nodes, noted in the description. Culm sheaths are not present in the

type, but recent collections from Nepal from a similar location have, in addition to similar white hairs on the culm nodes, the distinctive sparse white hairs on most of the culm sheath and the mainly glabrous culm sheath bases of other collections of *D. falcatum*. Even the lectotype of *A. falcata* has some white hairs on the persistent culm sheath base, and this character was also given in Tewari (1993) for the type variety. The possibility of *Arundinaria interrupta* Trin. representing a separate species was raised (Stapleton 1994), but the new collections suggest that it should remain a synonym of *D. falcatum*.

Other bamboos with hairs at the base of the culm sheath have been collected elsewhere in the Himalayas. *Himalayacalamus fimbriatus* Stapleton also has culm sheaths with a basal ring of hairs and a fimbriate ligule, but the larger stature, the much larger leaves, as well as the asymmetry of the culm sheath with its broader ligule and less scabrous interior distinguish it clearly. *Drepanostachyum annulatum* Stapleton from Bhutan also has a ring of hairs at the base of the culm sheath, but the hairs are darker, longer, more upright and in a narrower ring. That species also differs in having dark brown culm sheath hairs, especially on the distal third of the culm sheath, which also bears erect, basally scabrous oral setae when young, as well as darker brown, longer cilia of up to 1.5mm on the edges. It also has well-developed leaf sheath auricles, and thicker culm wax. In addition the ligules are neither as delicate nor as lacinate, and the culm sheath is less pubescent on the inside at the base of the ligule and below it. Although it shares the possession of a basal ring of culm sheath hairs with *H. fimbriatus* and *D. annulatum*, the bamboo currently cultivated in the US, recently described as *D. falcatum* var. *sengteeanum* (Stapleton 2006) is clearly much closer to the type of *D. falcatum*.

The 2-3 flowered florets and the densely pubescent culm sheath interior apex of var. *sengteeanum* are sufficient to place this cultivated bamboo indisputably in *Drepanostachyum*. The absence of oral setae and the distribution of hairs on the culm sheaths are sufficient to separate it clearly from all previously described taxa. Following current taxonomic concepts in bamboos, culm sheath pubescence and presence of oral setae are important and consistent specific characters. They are usually supported by minor differences in spikelet or floret detail, while leaf sheath and blade characters are inherently more variable. However, in *Drepanostachyum* more variety is seen within species than in most other bamboo genera, and it was felt inappropriate to describe this taxon as a new species, especially as its origin remains unknown. The florets and spikelets of *D. falcatum* var. *sengteeanum* are more scabrous than those of the type variety and the palea is less bifid. The rachilla segments are slightly longer and have rather different apical pubescence: the beard is mainly restricted to the distal 0.25mm of the rachilla, while in the type of *D. falcatum* the distal 1mm becomes progressively more puberulent. The lemma and palea are more densely scabrous than any other material of *D. falcatum* from the Western Himalayas, and approach the state seen in other species from the Eastern Himalayas, suggesting a Nepalese or Sikkimese origin.

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REFERENCES

- BEAN, W. J. 1907. The flowering of cultivated bamboos. Bull. Misc. Inform. Kew 1907:228–233.
- CHAO, C.S. and S.A. RENVOIZE. 1989. A revision of the species described under *Arundinaria* (*Gramineae*) in southeast Asia and Africa. Kew Bull. 44:349–367.
- GAMBLE, J.S. 1896. The *Bambuseae* of British India. Ann. Roy. Bot. Gard. (Calcutta) 7:1–133.
- MUNRO, W. 1868. A monograph of the *Bambusaceae*. Trans. Linn. Soc. London 26:1–157.
- NAITHANI, H.B. and S. CHANDRA. 1998. Flowering of a bamboo (*Drepanostachyum falcatum*). Indian Forester 124:663–666.
- NEES AB ESENBECK, C.G. 1834. *Bambuseae Brasilienses*. Linnaea 9:461–494.
- NEGI, S.S. and H.B. NAITHANI. 1994. Handbook of Indian bamboos. Oriental Enterprises, Dehra Dun, India.
- ROYLE, J.F. 1839. Illustrations of the botany of the Himalayan Mountains. Allen, London.
- SEETHALAKSHMI, K.K. and M.S. MUKTESH KUMAR. 1998. Bamboos of India: A compendium. Kerala Forest Research Institute & INBAR.
- STAPF, O. 1904. Himalayan bamboos. Gardeners' Chronicle May 14:305–306; May 21:325–326; June 4:356.
- STAPLETON, C.M.A. 1994. The bamboos of Nepal and Bhutan Part III: *Drepanostachyum*, *Himalayacalamus*, *Ampelocalamus*, *Neomicrocalamus*, and *Chimonobambusa* (*Gramineae*: *Poaceae*, *Bambusoideae*). Edinburgh J. Bot. 51:301–330.
- STAPLETON, C.M.A. 2006. New taxa and combinations in cultivated bamboos (*Poaceae*–*Bambusoideae*). Sida 22:331–332.
- TEWARI, D.N. 1993. A monograph on bamboo. International Book Distributors, Dehra Dun, India.