

## Re-straightening the story of *Streblus brunonianus* and *S. pendulinus* (Moraceae)

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### Abstract

The current broad-species concept applied to *Streblus pendulinus* (Endl.) F.Muell. is regarded as not useful taxonomically, and so the narrower, original circumscription is applied here to refer only to the plants restricted to Norfolk Island. The plants previously referred to as *S. pendulinus* in the Mariana Islands, Micronesia, Papua New Guinea, Australia, New Caledonia, south-western and southern Pacific, and Hawai'i are treated as the widespread *S. brunonianus* (Endl.) F.Muell. Comparative morphological characters for distinguishing these two species are discussed.

### Introduction

Although the genus *Streblus* Lour. is placed in the tribe Moreae (Berg 2005; Berg et al. 2006), the circumscription of tribes and genera of Moraceae have undergone major changes (Clement and Weiblen 2009; Datwyler and Weiblen 2004) since that of Corner (1969). The tribal and generic circumscriptions of Clement and Weiblen (2009) are accepted and followed here.

The morphological variation within many species of *Streblus* has resulted in the application of different specific and infraspecific systematic concepts. The three species of this genus occurring in Australia and the Australian Territories are placed in *S.* section *Paratrophis* (Blume) Corner (Chew 1989; Corner 1969). There is widespread agreement that *S. glaber* (Merr.) Corner var. *australianus* (C.T.White) Corner (refer Berg (2005) for an alternative infraspecific taxonomy) occurs in Australia, but the other two species have been treated differently by different authors. Corner (1969) applied a broad species concept to *S. pendulinus* (Engl.) F.Muell. and regarded it as a geographically widespread, morphologically variable species. This view was followed by Berg et al. (2006), with *S. brunonianus* (Endl.) F.Muell. regarded as a synonym. Both Corner (1969) and Berg et al. (2006) concluded that this species occurred in Australia and throughout much of the Pacific (New Guinea, New Caledonia, Norfolk Island, Vanuatu, Fiji, Rapa, Hawai'i, Guam, Saipan, and Rota). In his treatment of Moraceae for the *Flora of Australia*, Chew (1989) applied a narrower species concept to *S. pendulinus*, and regarded this species to be restricted to Norfolk Island. In so doing, he assigned all eastern Australian mainland occurrences of *Streblus* (excluding *S. glaber*) to *S. brunonianus*. Chew did not comment on the distribution of this taxon outside of Australia. The online version of *Flora of Australia* (Anonymous without date [post 2007]) rejected Chew's taxonomic concept, without explanation, but presumably following the more recent work of Berg et al. (2006), by regarding *S. brunonianus* as a synonym of a geographically widespread *S. pendulinus*. In contradistinction to that of Berg et al. (2006), the narrower interpretation of *S. pendulinus* and the broader interpretation of *S. brunonianus*, as used by Chew (1989), are applied to New South Wales plants (Harden

1990, 1999 onwards, 2000; Pellow et al. 2009). Until recently, Queensland material of this taxon also followed Chew's taxonomic concepts (Boland et al. 1984; Bostock and Holland 2010; Forster et al. 1991; Francis 1970; Jessup 2007). However, the broad species concept of *S. pendulinus* (sensu Berg et al. 2006) is currently applied to Queensland plants (Anonymous 2013) in order to align the Queensland taxonomic concepts with the Australian national census of plants (Anonymous 2007).

It is clear that the application of different taxonomic concepts has resulted in uncertainty about the number of *Streblus* species occurring in Australia and Norfolk Island (Australian External Territory). An assessment of the morphological variation within collections of *Streblus* from this region was undertaken to determine whether one or more taxa could be circumscribed within *S. pendulinus* sensu Berg et al. (2006). Since any changes in the taxonomy of these particular *Streblus* within the Australasian region would impact on the application of appropriate nomenclature, a broad sample of collections (as held at LAE and NSW) from across its distribution was evaluated.

### Morphological variation within and between *Streblus brunonianus* and *S. pendulinus*

A combination of several morphological characters for distinguishing the two species are summarised in Table 1. Several of the characters used by Chew (1989) are more specifically defined here, such as the distribution of hairs on the abaxial surface of the leaf lamina of each species, and the number of secondary veins on each side of the primary vein. Likewise, the description of the shape and density of the marginal teeth is enhanced. The characteristics of the secondary veins are described for the first time, such as the angle of divergence from the primary vein and the type of curvature towards the next more distal secondary vein.

The petiole of *Streblus brunonianus* is (2–)4–5(–8) mm long, mostly slightly shorter than typical *S. pendulinus* that is (3–)9–12 mm long; the abaxial lamina surface and venation are usually sparsely hairy (<50 hairs/mm<sup>2</sup>), although with hairs frequently restricted to venation of older leaves (*S. pendulinus* less hairy, with hairs restricted to the primary veins and base of secondary veins of abaxial lamina surface, more or less extended onto the lamina surface near the base of secondary veins); leaf base usually cuneate (*S. pendulinus* usually narrowly rounded); there are 5–8(–12) secondary veins on each side of primary vein, whereas in *S. pendulinus* there are usually more (10–15 secondary veins); the secondary veins are initially diverging at 45–50° from the primary vein (Fig. 1) and then usually distinctly curved towards the next more distal secondary vein, whereas in *S. pendulinus* these secondary veins are diverging at (70–)80–90° from the primary vein (Fig. 1) and are more or less straight throughout much of their length before more abruptly curving distally to the next secondary vein; the teeth of the leaf margin terminate the tertiary (and sometimes quaternary) veins, 2–4(–6) teeth per 10 mm of margin (*S. pendulinus* has teeth terminating the tertiary and quaternary venation, hence these leaves usually have slightly more teeth, namely (5–)6–8 teeth per 10 mm of margin) (Fig. 1). This difference in the number of teeth is due to the density of the tertiary and quaternary venation; *S. pendulinus* has a much denser distribution of these than *S. brunonianus* (Fig. 1). The size of the teeth is variable, but they are typically longer in *S. brunonianus*. Note: in both species, at least one or two of the most basal secondary veins may be straighter, longer than the secondary veins, and at a different angle to the primary vein than other secondary veins.

### Taxonomic conclusion

The states and values of many morphological characters of *Streblus brunonianus* and *S. pendulinus* are variable and appear to over-lap to varying amounts; however, there appear to be sufficient diagnostic characters to re-instate these as two distinct species. *Streblus brunonianus* applies to plants of Mariana Islands, Micronesia, Papua New Guinea, Australia, New Caledonia, south-western and southern Pacific, and Hawai'i, whereas the concept of *S. pendulinus* (*sensu stricto*) refers to those plants of *Streblus* that are restricted to Norfolk Island. The species concepts proposed by Chew (1989) for *S. brunonianus* and *S. pendulinus* are accepted, based on a more precise definition of the morphological characteristics used by him, and with the inclusion of additional characters, such as angle of divergence of the secondary veins to the primary vein, and the number of secondary veins on each side of the primary vein. It is here concluded that the broad species concept applied by Corner (1969) and accepted by Berg et al. (2006) has been directly influenced by the need to classify the many, frequently inadequate, herbarium specimens of plants that are morphologically variable. The status of any localised variation within a widespread, variable species concept is difficult to evaluate and its significance is often over-looked.

***Streblus brunonianus*** (Endl.) F.Muell. *Fragmenta Phytographiae Australiae* 6: 192 (1868). [Full synonymy: refer Chew (1989)]

**Type:** Endlicher, *Atakta Botanica* t. 32 (1835) (as *Morus brunoniana* Endl.)

**Description:** Chew (1989); Mueller (1868)

**Distribution within Australia:** The distribution of *S. brunonianus* is summarised according to the botanical districts of Queensland (Anonymous 1975) and botanical divisions of New South Wales (Anderson 1961).

Queensland (Cook, North Kennedy, South Kennedy, Leichhardt, Port Curtis, Burnett, Wide Bay, Darling Downs, Moreton); New South Wales (North Western Slopes, Northern Tablelands, North Coast, Central Tablelands, Central Coast, South Coast).

**Extra-Australian distribution:** The current author has not assessed the range of morphological variation encountered in the full extra-Australian distribution of this species. However, it is confirmed that this species also occurs in the Mariana Islands, Micronesia, Papua New Guinea, Vanuatu and Fiji. The few collections from New Caledonia that have been examined (e.g. *McPherson 5984* and *Vieillard 3257*, both NSW) are morphologically similar to *S. brunonianus*. *Pseudomorus brunonianus* (Endl.) Bureau var. *obtusata* Bureau (e.g. *Vieillard 3257*) was treated as a synonym of *S. pendulinus* (Berg et al. 2006). Although the status of *P. brunonianus* var. *obtusata* has not been fully evaluated here, it is either a variant of *S. brunonianus* or further study may support the recognition of this as a distinct species endemic to New Caledonia. Typical *Streblus brunonianus* does occur in Hawai'i (Wagner et al. 1999, as *S. pendulinus*); however, the taxonomic status of plants consistent with the circumscription of *Pseudomorus sandwicensis* O.Deg. should be studied further. Collections similar to Hawaiian specimens occur in Samoa. Material from Rapa (South Pacific) assigned to *S. pendulinus* by Berg et al. (2006) was unavailable for study.

**Notes on typification:** Smith (1981) incorrectly concluded that the type collection of this species (as *Morus brunoniana*) was collected by F.L. Bauer from Norfolk Island and deposited at W. Although Mueller (1868, p. 192) does not refer to the type material, he summarises the distribution of this species as “Ab Illawarra proveniens usque ad Rockingham’s Bay, extendens etiam in Novum Angliam”, eastern Australia.

**Conservation status:** this widespread species is not considered to require a conservation category.

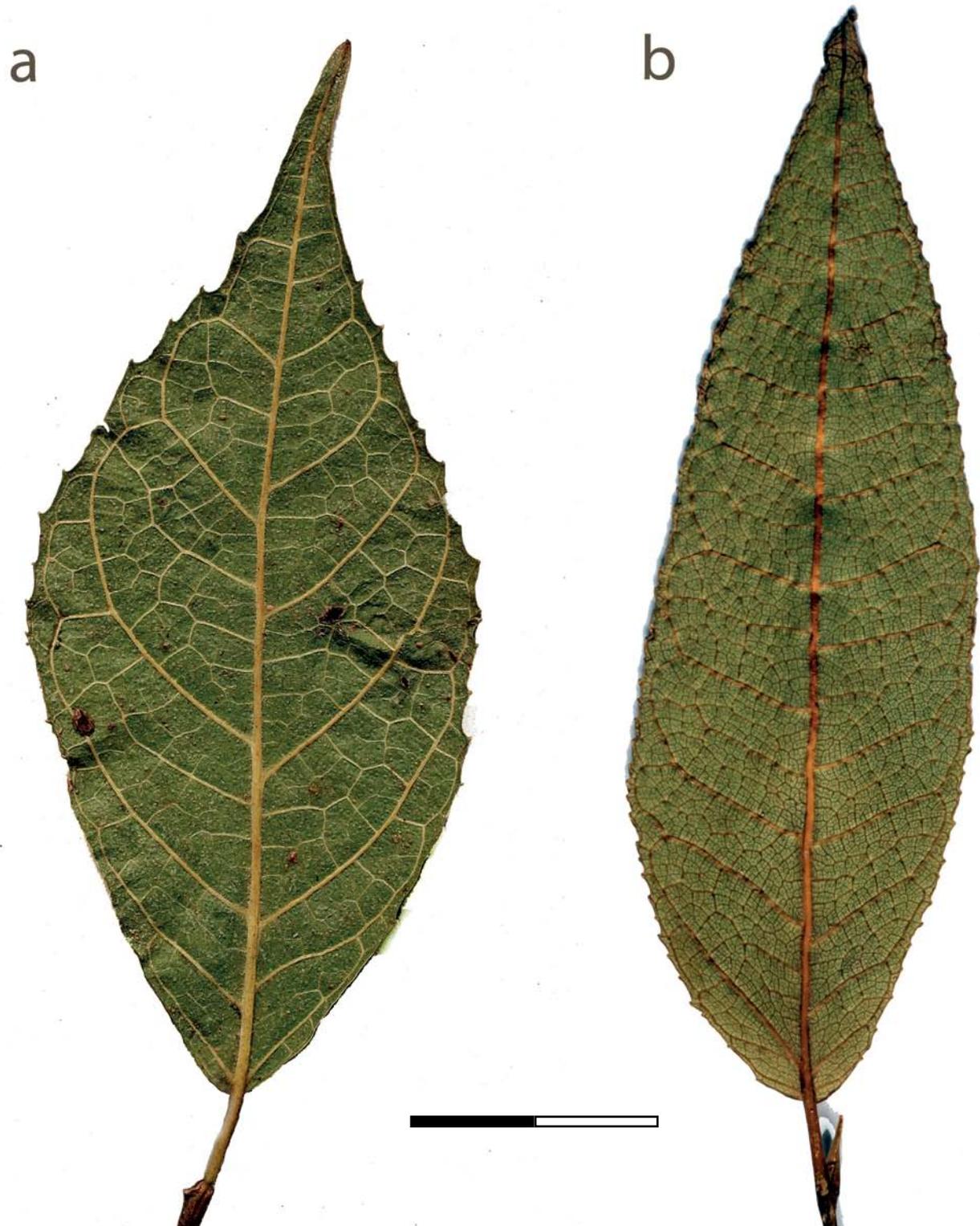
***Streblus pendulinus*** (Endl.) F.Muell. *Fragmenta Phytographiae Australiae* 6: 192 (1868). [Full synonymy: refer Green (1994)]

**Type:** Norfolk Island: *F.L. Bauer s.n.*, without date (W), possibly destroyed (Green 1994).

**Description:** Green (1994); Endlicher (1833)

**Distribution within Australian External Territories:** Norfolk Island.

**Conservation Status:** Endangered, with only 187 individual plants recorded for Norfolk Island (EPBC 1999).



**Fig. 1.** Abaxial surface of leaf showing petiole, lamina, venation and toothed margin. **a.** *Streblus brunonianus* (Forster 30837, 25 Apr 2005, NSW843772); **b.** *S. pendulinus* (Metcalfé s.n., without date, NSW823172). Scale bar = 10 mm.

**Table 1.** A comparison of some morphological characters useful for distinguishing *Streblus brunonianus* from *S. pendulinus*.

Characters	<i>Streblus brunonianus</i>	<i>Streblus pendulinus</i>
Petiole	(2–)4–5(–8) mm long	(3–)9–12 mm long
Leaf indumentum	hairs on abaxial lamina surface and venation; older leaves with hairs tending to be restricted to venation	hairs restricted to primary vein and base of secondary, mostly absent from abaxial lamina surface, except near base of secondary veins
Lamina shape	narrowly ovate, ovate, to elliptic	narrowly ovate to ovate, often slightly oblong
Leaf apex	usually acuminate	obtuse to acuminate
Leaf base	usually cuneate	usually narrowly rounded
Number of secondary veins	5–8(–12)	10–15
Angle of secondary veins to primary vein	45–50°	(70–)80–90°
Number of teeth/10 mm of margin (near midpoint)	2–4(–6)	(5–)6–8
Teeth arrangement	terminating tertiary (and rarely quaternary) venation	terminating tertiary and quaternary venation
Male inflorescence length	short, 2–5 cm long	long, (5–)10–20 cm long

### Acknowledgments

I gratefully acknowledge the assistance of Murray Henwood (SYD) and Trevor Wilson (NSW) for ensuring the succinctness and clarity of the concepts presented in this paper. I thank the curators and staff of LAE and NSW for allowing access to the collections held at their herbaria.

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