

The identity and taxonomic status of the rare *Angophora/Eucalyptus exul* (Myrtaceae) from the Northern Tablelands of New South Wales

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Abstract

Since its description in 1997, the taxonomic status of *Angophora/Eucalyptus exul* has been contentious, partly due to the uncertain identity of the type specimen, which was collected in 1996 from Gibraltar Rock on the Northern Tablelands of New South Wales. Through careful observations at the type location in association with some luck, we have been able to positively identify the type tree in the field. This tree is regarded by us to be a hybrid individual of two other *Angophora* species that are common at the site, *A. floribunda*/*E. florida* and *A./E. leiocarpa*. On this basis, we recommend that *A./E. exul* be removed from New South Wales threatened species legislation.

Introduction

Angophora exul K.D.Hill was described in 1997 from a 'single small stand on Gibraltar Rock, west of Tenterfield' on the New England Tableland in New South Wales (Hill 1997). The new species was compared to other narrow-leaved, rough-barked *Angophora* species such as *A. bakeri* E.C.Hall, *A. crassifolia* (G.J.Leach) L.A.S.Johnson & K.D.Hill, *A. paludosa* (G.J.Leach) K.R.Thiele & Ladiges, and *A. inopina* K.D.Hill (Hill 1997), none of which are known from the Northern Tablelands in NSW. In addition to the type specimen (K.D. Hill 4788, L.C. Stanberg & K.L. Wilson, Figure 1), Hill (1997) cited another specimen from the same locality (Roberts s.n., 29 Jul 1992), as well as attributing another specimen from the same locality as an *A. floribunda* – *A. exul* intergrade (K.D. Hill 4785, L.C. Stanberg & K.L. Wilson).

Subsequent to its description, the taxonomic status of *A. exul* has been contentious. Slee *et al.* (2015) included *A. exul* in *A. bakeri* subsp. *bakeri*, despite it being geographically quite isolated from populations otherwise attributable to *A. bakeri*.

Through careful observations at the type location, we have been able to positively identify the type tree in the field. In March 2021, one of us (DN) photographed two trees at the type location that matched the type description and specimens of *A. exul*. We were later able to match the photographs of one of these trees with a photograph of the type tree taken by Karen Wilson at the time the type was gathered in 1996 by Ken Hill, who is in the photo with the tree. Luckily, the site has not been burnt by wildfire in modern history (NSW NPWS 2024), which allowed the tree photographed by Wilson in 1996 to be identified and matched with our 2021 photographs (Fig. 2).

We regarded all angophora taxa are best included in *Eucalyptus* L'Her., within *E.* subg. *Angophora* (following the recommendations of Nicolle *et al.* 2024). To avoid confusion, we have used dual names for angophora taxa herein, using both their traditional binomial

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within genus *Angophora* Cav., and our preferred binomial within genus *Eucalyptus*, following Brooker (2000) and Nicolle (2024)

and using the recommended genus-level classification of Nicolle et al. (2024).

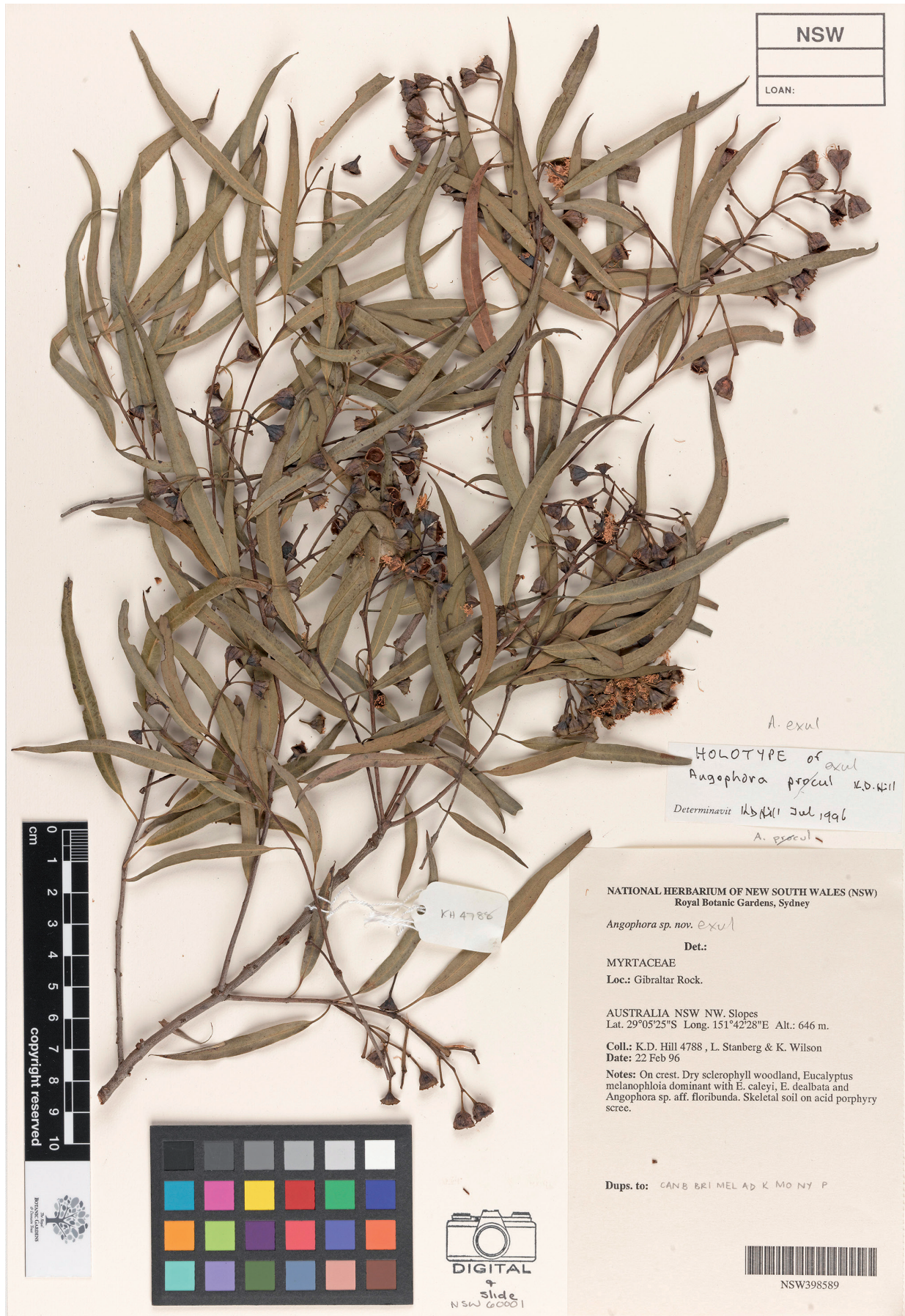


Fig. 1. Holotype of *Angophora exul* (NSW 398589).

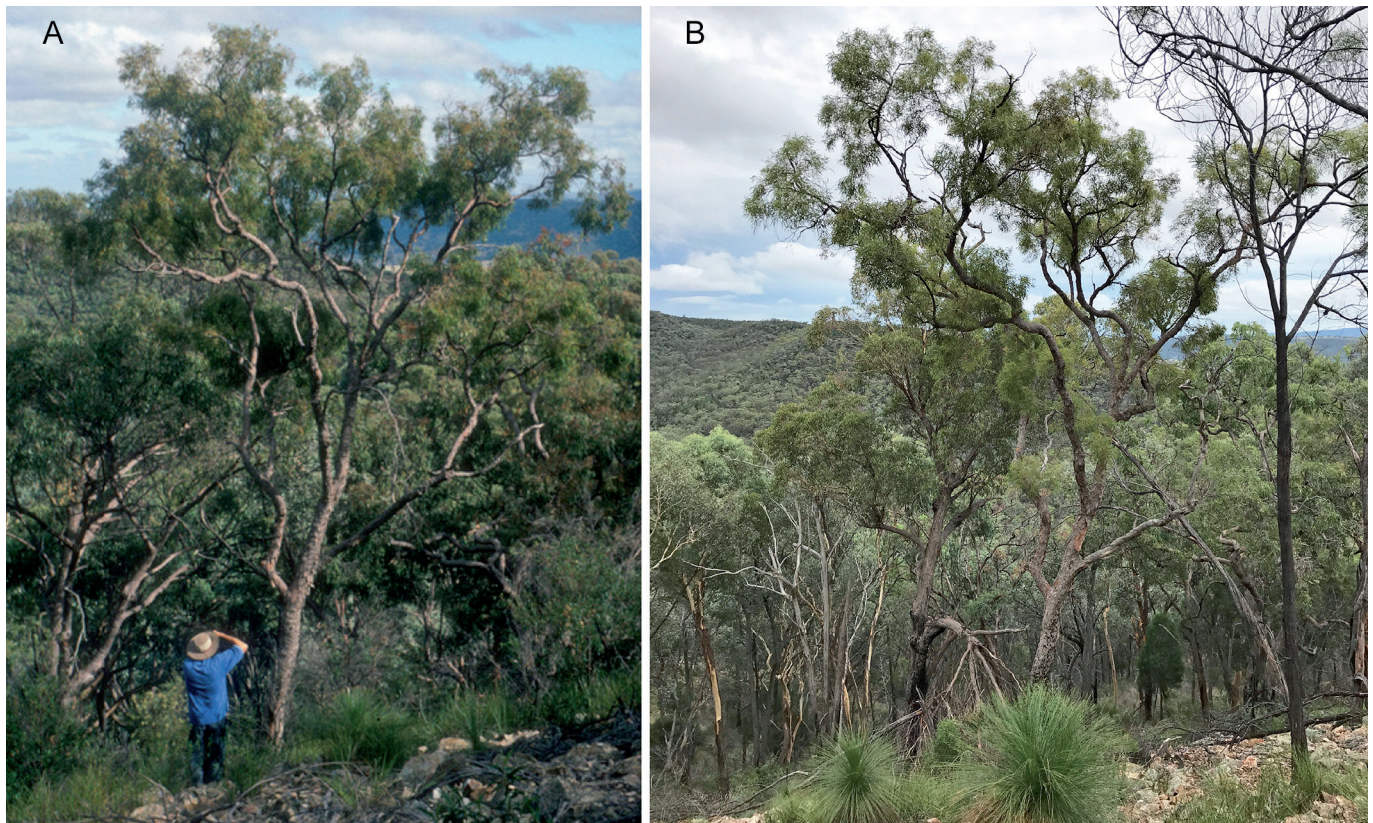


Fig. 2. The type tree of *Angophora exul* (Hill 4788, L.C. Stanberg & K.L. Wilson). A. Photographed by Karen Wilson on the 22nd February 1996, on the day that the type specimens were gathered by Ken Hill, who is pictured with the tree. B. The same individual tree photographed by Dean Nicolle 25 years later on the 17th of March 2021 (D.Nicolle 8065).

Discussion

The type location of *Angophora/Eucalyptus exul* (K.D.Hill) Brooker was cited as 'Gibraltar Rock, W of Tenterfield' where it was described as 'occurring only on open scree on a ridge of acid volcanic outcrops' (Hill 1997). The type site, located off Silent Grove Road at 29°05'17"S, 151°42'30"E, consists of remnant woodland dominated by *Angophora floribunda* (Sm.) Sweet / *Eucalyptus florida* Brooker, *E. albens* Benth., *E. caleyi* Maiden subsp. *caleyi*, *E. dealbata* A.Cunn. ex Schauer and *E. laevopinea* R.T.Baker, and with scattered trees of *A. leiocarpa* (L.A.S.Johnson ex G.J.Leach) K.R.Thiele & Ladiges / *E. leiocarpa* (L.A.S.Johnson ex G.J.Leach) Brooker. *Angophora floribunda/Eucalyptus florida* and *A./E. leiocarpa* are easily distinguished at the site, with the former being fully rough-barked and having relatively broad adult leaves, and the latter being completely smooth-barked and having relatively narrow adult leaves. In addition to these species, there are two individual trees at the site which are clearly hybrids of *A. floribunda/E. florida* × *A./E. leiocarpa*, having morphology that is intermediate between these two species, which is especially evident in the field due to their intermediate bark morphology and adult leaf width.

The type material of *A./E. exul* matches one of the two *A. floribunda/E. florida* × *A./E. leiocarpa* hybrid individuals at the site. While this is only partly evident in the plant material on the type specimen sheets, the accompanying photograph of the type tree is more telling, and confirms with certainty that the type tree of *A./E. exul* is one of the two hybrid individuals identified on the site by one of us (DN) in March 2021.

We conclude that only two *Angophora/E.* subg. *Angophora* species occur at Gibraltar Rock, viz. the rough-barked, relatively broad-leaved, rib-fruited *A. floribunda/E. florida*, and the smooth-barked, relatively narrow-leaved, more-or-less smooth-fruited *A./E. leiocarpa*. Rare hybrids between these two species also occur at the site and are distinctive in their intermediate bark and foliage characteristics. The type tree of *A./E. exul* is representative of one of these rare hybrids, as is the other specimen cited by Hill (1997) as *A. exul* (Roberts s.n., 29 Jul 1992, see Fig. 3).

We regard the specimen cited by Hill (1997) as an *A. floribunda* – *A. exul* intergrade (K.D. Hill 4785, L.C. K.L. Stanberg & Wilson) as being typical *A. floribunda/E. florida* (Fig. 3).

Three other specimens at NSW have been determined by their original collectors to be *A. exul*. These are *Johnstone 3494 & Catelotti*, which was gathered approximately 260 metres south-west of the type tree of *A./E. exul*; *Copeland 3495, Gilmour & Wall*, which was gathered approximately 1.6 km north-west from the type tree of *A./E. exul*, and *Copeland 3548 & Telford*, which was gathered approximately 1.6 km north-north-west from the type tree of *A./E. exul*. Based on their intermediate bark morphology (as described on the label data), and their intermediate but variable foliage and bud/fruit morphology, we regard these three specimens as second- or later-generation backcrosses of the hybrid to *A. floribunda/E. florida*.

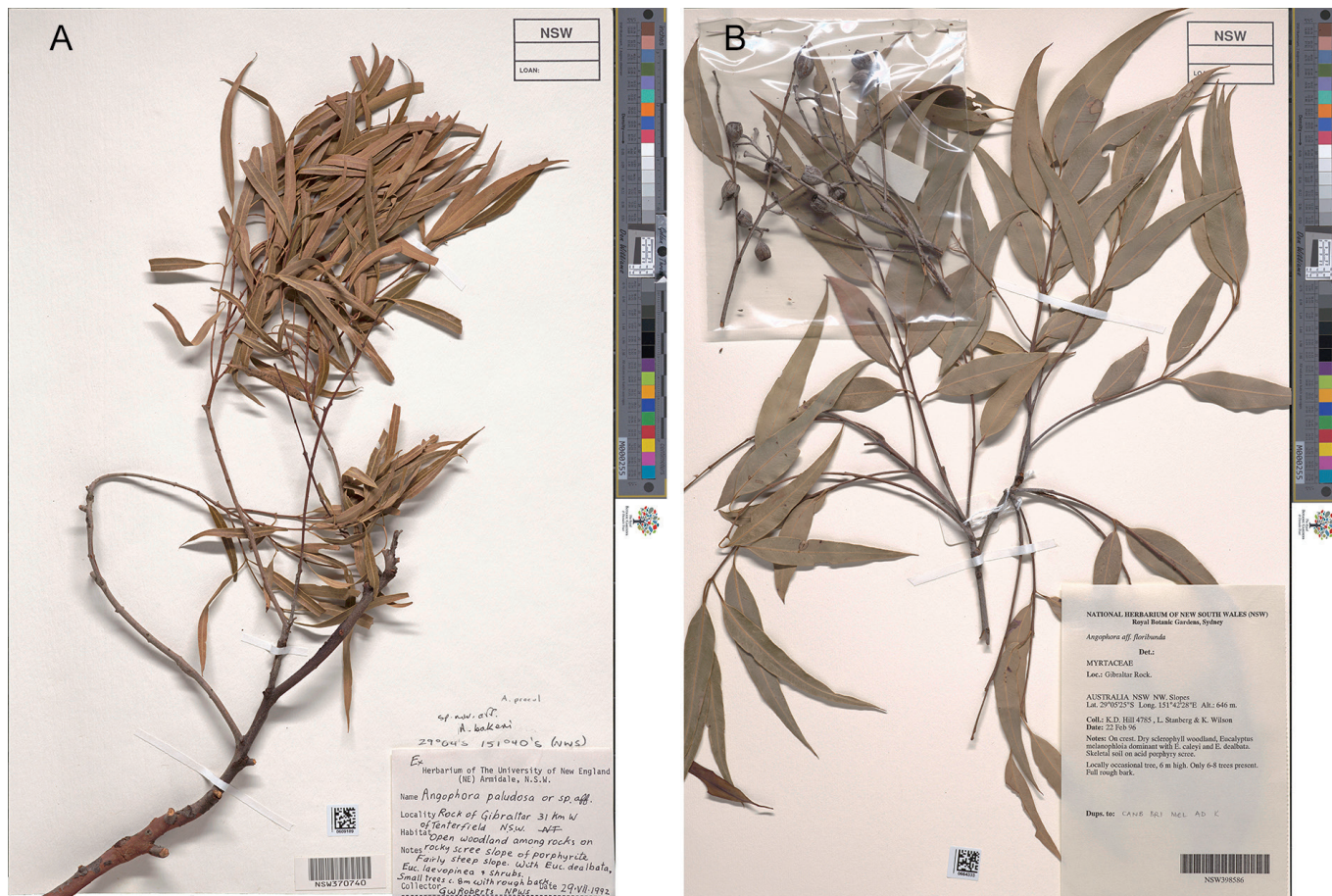


Fig. 3. Specimens cited by Hill (1997). A. *Roberts s.n.*, cited as *Angophora exul* (the only cited specimen of this species other than the type); B. Hill 4785, Stanberg & Wilson, cited as an *A. floribunda* – *A. exul* intergrade. We regard these two specimens as *A. floribunda*/E. *florida* × *A./E. leiocarpa* (A) and *A. floribunda*/E. *florida* (B) respectively.

Another specimen at NSW has been determined by their original collectors to be '*Angophora exul* × *floribunda*' (Johnstone 3436, Errington & Cardwell, gathered within 50 metres of the type tree of *A./E. exul*). Based on its description (on the label data) and morphology, we also regard this specimen to be a second- or later-generation backcross of the hybrid to *A. floribunda*/E. *florida*.

A recent genetic study of the angophoras (Rutherford *et al.* 2020) identified numerous hybrids between species in the group, including probable hybrids between *A. floribunda*/E. *florida* and *A./E. leiocarpa* at Tooloom (north-east of Tenterfield on the Northern Tablelands of NSW) and at Tarong (east of the Bunya Mountains in Qld). Unfortunately, the Rutherford *et al.* (2020) study did not include any material attributable to *A./E. exul* nor include any individuals from the Gibraltar Rock area (the type location of *A./E. exul*).

Angophora exul is currently listed as Endangered on the New South Wales *Biodiversity Conservation Act 2016*. Given the conclusion reached here that *A./E. exul* represents a hybrid, its eligibility to remain listed as a threatened species should also be reviewed. Hybrids are not accommodated in the definition of a species on the *Biodiversity Conservation Act 2016*. This makes *A./E. exul* no longer eligible to be listed as a threatened species in New South Wales, and in this regard the species should be considered for removal from conservation legislation.

Taxonomy

Eucalyptus × *exul* (K.D.Hill) Brooker, *Austral. Syst. Bot* 13: 136 (2000).

Basionym: *Angophora exul* K.D.Hill, *Telopea* 7(2): 100 (1997).
 Type: New South Wales: North Western Slopes: Gibraltar Rock, W of Tenterfield, 22 Feb 1996, K.D.Hill 4788, L.C.Stanberg & K.L.Wilson (holo: NSW 398589; iso: AD, BRI, CANB, K, MEL, MO, NY, P).

[= *Eucalyptus florida* × *E. leiocarpa*]

Specimens examined: New South Wales: Northern Tablelands: Rock of Gibraltar 31 km W of Tenterfield, 29 Jul 1992, *Roberts s.n.* (NSW); east of Rock of Gibraltar off Silent Grove Rd, 29°05'17"S, 151°42'30"E, 17 Mar 2021, D.Nicolle 8065 (photograph only).

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