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Validation of two informally named species of *Melichrus* (Ericaceae: Epacridoideae) from north-eastern New South Wales

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Abstract

Two narrowly endemic, endangered species of *Melichrus* R.Br. from north-eastern New South Wales currently bearing phrase names are formally named and described. *Melichrus hirsutus* J.B.Williams ex H.T.Kenn. & I.Telford is validly published more than 50 years after the first herbarium specimens were collected. *Melichrus gibberagee* J.B.Williams ex H.T.Kenn. & J.J.Bruhl is also described as new. Notes are provided on the distribution, habitat and conservation status of both species. An updated key to the species of *Melichrus* in New South Wales is provided.

Introduction

Melichrus R.Br. (Ericaceae: Epacridoideae) is a genus of four described eastern Australian species of shrubs. In addition, eight phrase-named species are accepted by the Australian Plant Census (CHAH, accessed 23 May 2020), five in eastern Australia and three in Western Australia. The eastern Australian species occur in Queensland (7 species), New South Wales (6) and Victoria (1) and are distributed from the coast to drier regions well inland.

Initial work towards describing two new species of *Melichrus* from the north coast of New South Wales was conducted by botanist John Beaumont Williams (1932–2005). Williams had diverse botanical interests, and many of his collections and research notes, including those on *Melichrus*, are retained in his home herbarium, 'New England Herbarium' (NE), renamed in 1997 to the 'N.C.W. Beadle Herbarium.'

Williams considered some of the collections he made near Glenreagh, north-eastern New South Wales in 1965 to be an undescribed species of *Melichrus*. In his unfinished manuscript, Williams (unpub. data, 1993–1998) distinguished the new species from its congeners on the basis of:

> "…densely hirsute leaves, sepals and bracts and by the red corolla which is much shorter than the long acuminate sepals…the ascending habit and pungent-pointed leaves."

The entity was listed under the informal name *Melichrus* species A in the 'Flora of New South Wales' (Harden 1993) and later under the manuscript name, *Melichrus hirsutus* J.B.Williams MS (NSW Scientific Committee

1995). Since 2005 the phrase name *Melichrus* sp. Newfoundland State Forest (P.Gilmour 7852) has been applied to this taxon (CHAH, accessed 4 April 2019).

Williams also recognised, as an undescribed species, specimens sent to him by Andrew Benwell who collected a *Melichrus* in Gibberagee State Forest, south of Casino, New South Wales, in August 1997. Williams noted several distinctive morphological features including that the specimens had the narrowest leaves and flowers in the genus and a distinctive distribution of the indumentum on the internal surface of the corolla tube (J.B. Williams, unpub. data 1997). Since 2005 the phrase name *Melichrus* sp. Gibberagee (Benwell 97239) has been used for this taxon (CHAH, accessed 4 April 2019).

Materials and methods

The species described here are delimited from their congeners on the basis of morphological evidence.

Morphological data

Morphological characters were scored from fresh, dried and 70% ethanol-fixed specimens collected by the authors as well as specimens seen by J.B. Williams and housed at NE (herbarium codes follow Thiers 2016). Floral measurements were obtained from ethanol-fixed specimens only. Micromorphology was examined using a Leica WILD MZ8 stereomicroscope with a WILD445355 PLANAPO 1.0x lens and measurements were made either by steel rule or eyepiece reticule at 20 or 50 times magnification, calibrated against a steel rule.

Diagnoses provided for *Melichrus hirsutus* and *M. gibberagee* were made by comparison with *M. procumbens* (Cav.) Druce and *M. urceolatus* R.Br. respectively, as they are more morphologically similar to these species than other congeners. Both *M. procumbens* and *M. urceolatus* exhibit considerable morphological variation across their geographic ranges, and are part of an ongoing taxonomic revision of the genus by the authors. We therefore have used the protologues (Cavanilles 1797; Brown 1810), high-definition photographs of type specimens (Global Plants 2020), and recent topotype collections (herbarium sheets and material fixed in 70% ethanol) for comparison with the newly described species.

Definitions of terminology used in the descriptions follow the *Flora of Australia* (1999) glossary or if absent there, then Radford *et al.* (1974).

We have not distinguished sterile bracts, fertile bracts and bracteoles in the descriptions. The organs are not morphologically differentiated but rather grade in size and shape from the outermost bracts to those that immediately subtend the calyx. A developmental study is required to confidently identify the bract homology in *Melichrus* and related genera.

Figures 1–4 were constructed using paint.net v.4.2.12 and Inkscape v.0.92.4

Distributional data

Distributional data for the taxa are recorded in bioregions following *Australia's bioregions* IBRA7, (Department of the Environment 2013) to convey biogeographical information. Whereas, in the citation of specimens, botanical districts in use by the relevant herbaria are used to facilitate curation.

The distribution map (Fig. 5), was constructed using ArcMAP 10.4.1.

Taxonomy

Melichrus hirsutus J.B.Williams ex H.T.Kenn. & I.Telford *sp. nov.*

Type: NEW SOUTH WALES: North Coast: Kremnos Creek, 7.5 km N of Glenreagh, 14 Aug. 1993, *J.B. Williams s.n.* (holo: NSW; iso: BRI, CANB, CNS, K, MEL, MO, NE 85839) (Fig. 1).

Melichrus sp. Newfoundland State Forest (P.Gilmour 7852); CHAH 2005, Australian Plant Census

Melichrus hirsutus J.B.Williams MS; NSW Scientific Committee (1995), *Schedules 1, 2 & 3 (1995). Threatened Species Conservation Act 1995*: 178

Melichrus species A; Harden, G.J. in Harden, G.J. (ed.) (1993), Additions and Corrections. *Flora of New South Wales* 4: 669.

Diagnosis: Similar to *Melichrus procumbens,* differing by stems ascending (*v.* decumbent), branchlet indumentum pilose (*v.* sericeous), leaf apex pungent (*v.* non-pungent), lamina margin and abaxial surface densely pilose (*v.* scattered–few hairs), corolla cup-shaped (*v.* rotate) (Fig. 2B).

Description: *Shrub* 0.2–0.7 m tall, many-stemmed from base; stems ascending, erect at ends. *Branchlets* densely pilose, hairs (0.35–)0.8–1.2 mm long. *Leave*s ascending, sub-sessile; petiole broad and compressed, 0.5–1.1 mm long, 0.8–1.5 mm wide, adaxially concave, appressed to stem, adaxial surface sericeous, hairs (0.2–)0.8–1 mm long; lamina lanceolate, (12–)16.9–22.5 mm long, (1.5–)2–3.5 mm wide, ±straight; apex aristate, pungent, 0.5–1.2 mm long, distal $^{2}/_{3}$ translucent; margins entire, yellow-green, ciliate, hairs (0.3–)0.8–1.2 mm long; adaxial surface light green, sericeous at base, hairs (0.4–)0.8–1 mm long, venation indistinct; abaxial surface slightly paler, pilose, hairs (0.3–)0.65–1.25 mm long, veins 9 or 11 obvious, parallel, separated by deep, narrow grooves bearing dense papillae <0.2 mm long. *Inflorescence* a solitary, bisexual, axillary flower, ascending, up to $^{2}/_{3}$ the length of subtending leaf. *Bracts* 9–11, strongly imbricate, spirally arranged, grading distally from widely ovate to ovate, from 0.5–0.75 mm long, 0.4–0.7 mm wide to 4.2–4.9 mm long, 2.8–3 mm wide; apex acute, sometimes rounded, upper 2–3 bracts acuminate; margins entire, densely ciliate, hairs 0.5–1.2 mm long; abaxial surface densely pilose, hairs to 1.2 mm long; surfaces green at the base turning pink distally. *Calyx*, sepals 5, chartaceous, imbricate, lanceolate, 6–7 mm long, 1.5–3.5 mm wide, exceeding open corolla; apex caudate; margin entire, densely ciliate, hairs to 0.9 mm long; adaxial surface pilose near apex; abaxial surface densely pilose, hairs to 0.9 mm long, surfaces green at the base turning pink distally. *Corolla* cup-shaped, deep pink; tube 2.8–3 mm long 3.8–4 mm wide; lobes 5, widely ovate, 2.5–2.8 mm long, 2–2.3 mm wide, held erect and in the same plane as the corolla tube for up to $^{1}/_{2}$ their length, distally spreading and recurved; apex acute and exceeded by a sub-apical process 0.5–0.75 mm long, translucent pink fading to white distally, tip with a few hyaline hairs 0.6–0.9 mm long; external surface glabrous; internal surface hispid, hairs hyaline c.1.3 mm long. *Glandular hairs* arranged in 5 tufts, adnate to the base of the corolla tube, alternate with stamens; tufts ±rectangular 0.5–0.8 mm long, 0.5–0.75mm wide; hairs turbinate, c. 0.15 mm long, c. 0.1 mm wide, apex rounded or acute. *Anthers* 5, inserted just below sinuses, ±enclosed by corolla tube, ovate, 1–1.4 mm long, 0.75–1 mm wide, papillose with a soft hook-shaped appendage distally, <0.5 mm long. *Filaments* compressed, inserted at the base of the corolla tube adnate to tube for at least ¾ of their length, 1.8–2.5 mm long. *Ovary* pyriform, c. 0.9 mm diam., 4- or 5-locular; style tapering to stigma, c. 0.35 mm long, terete, glabrous; stigma slightly expanded. *Nectary* fleshy, annular with 5 broad lobes, lobes ±undulate. *Fruit* enclosed by or exceeding persistent calyx at maturity, fleshy, globose, 3.8–8 mm diameter, red-purple at maturity, style persistent.

Additional specimens examined: NEW SOUTH WALES: North Coast: 'Punchbowl', c. 30 km NW of Grafton, 24 Aug. 1994, *J. Westaway RP228* (CFSHB): Shannon Creek, c. 9 km W of Coutts Crossing. Clarence Valley Council land, 16 Oct. 2020, *H.T. Kennedy 112* (NE 110909, NSW); Shannon Creek, c. 11 km WNW of Coutts Crossing, 25 June 1998, *D.M. Bell s.n.* (NE 89344); Clarence Valley Council land adjacent to Chambigne Nature Reserve, c. 22 km SW of Grafton, 4 Nov. 2004, *C.L. Gross 2004-14* (NE 83432); Flaggy Creek Nature Reserve, c. 7 km from Glenreagh, 100 m along fire trail from Orara Way, 27 May 2019, *H.T. Kennedy 8* (CANB, NE 109319); Flaggy Creek Nature Reserve, 1 km N of Flaggy Creek on Glenreagh–Grafton road, 2 Sep. 2000, *L.M. Copeland 2610* (CANB, NE 72316, NSW.); Glenreagh, 8 Jul. 1992, *W. Sheather s.n.* (NE 85837); 5.9 miles [c. 9.5 km] north of Glenreagh on the Grafton–Glenreagh road, 17 Apr 1969, *C. Burgess s.n.* (NE 22086); Kremnos Creek, 7.5 km N of Glenreagh, 27 Nov. 1993, *J.B. Williams s.n.* (NE 85838, TENN.); Glenreagh, Aug 1965, *J.B. Williams s.n.* (NE 56169); 8 km N of Glenreagh, 8 Jul. 1992, *J.B. Williams s.n.* (BRI, CANB, CNS, K, MEL, MO, NE 56538, NSW); Kremnos Creek, 7.5 km N of Glenreagh, 21 Apr. 1993, *J.B. Williams s.n.* (AD, HO, M, NE 57598, NSW, US); 8 km N of Glenreagh, 4 Apr. 1993, *J.B. Williams s.n.* (NE 57597); Yuraygir National Park, 150 m SE of intersection of Wooli and Diggers Camp Roads, 10 Sep. 2004, *L.M. Copeland 3783* (BRI, CANB, MEL, NE 83330, NSW); c. 100 m E of Bald Knob on Bald Knob Fire Trail, Yuraygir National Park, 24 Nov 2008, *R. Johnstone & A.E. Orme 2453* (K *n.v.* NE 105528, NSW).

Distribution: *Melichrus hirsutus* occurs in the South Eastern Queensland bioregion. It is known from six localities between c. 30 km north-west of Grafton and Glenreagh and east to Wooli Road, New South Wales (Fig. 5).

Habitat: *Melichrus hirsutus* grows on gentle to moderate slopes at altitudes of 20–150 m in sandy soils with conspicuous sandstone outcrops on the Mesozoic Grafton and Kangaroo Creek Sandstone formations (Geoscience Australia 2020). The species occurs in eucalypt shrubby open forest with combinations of *Eucalyptus planchoniana, E. psammitica, Angophora robur* and *Corymbia gummifera* as dominants. Many shrub species are associated with *M. hirsutus* including *Dodonaea crucifolia, Hibbertia acuminata*, *Banksia collina, Hakea laevipes* subsp. *laevipes* and *Doryanthes excelsa* (Fig. 2A).

Melichrus hirsutus is part of an endemic flora restricted to the Kangaroo Creek and Grafton Sandstones, see Telford and Bruhl (2020) for an overview of this important area of endemism.

Fig. 1. *Melichrus hirsutus*; isotype *NE 85839.*

Fig. 2. *Melichrus hirsutus*, **A.** habitat; dry sclerophyll forest at Flaggy Creek Nature Reserve (collection site of *H.T. Kennedy 8*). **B.** Fertile stem. Scale= 2 mm. Images by J.J. Bruhl.

Phenology: Flowers March to August. Fruits recorded August to November.

Conservation status: *Melichrus hirsutus* is currently gazetted as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* and the *NSW Biodiversity Conservation Act 2016,* under the phrase name *Melichrus* sp. Newfoundland State Forest (P.Gilmour 7852). Small populations of *M. hirsutus* are conserved in Yuraygir National Park, Yuraygir State Conservation Area and Chambigne Nature Reserve. The largest population of several hundred plants is conserved in Flaggy Creek Nature Reserve, north of Glenreagh. Plants of *M. hirsutus* are fire-sensitive and short fire intervals would likely threaten the species. Under the IUCN Red List criteria (IUCN Standards and Petitions Committee 2019) a status of 'Vulnerable B2(a&c)' is recommended because of the small number of populations (less than 10) within a narrow range (less than 250 km^2) combined with reported severe fluctuations in population size of mature individuals, post fire (Quinn *et al.* 1995).

Etymology: The specific epithet is a Latin adjective meaning 'covered with fairly coarse and stiff long erect or ascending straight hairs' (Stearn 1992). This name was used by J.B. Williams.

Notes: Observations made by J.B. Williams in the early 1990s indicated that *Melichrus hirsutus* likely does not produce fertile pollen (Quinn *et al.* 1995). Further study is needed to verify Williams' observations.

Melichrus gibberagee J.B.Williams ex H.T.Kenn. & J.J.Bruhl *sp. nov.*

Type: NEW SOUTH WALES: North Coast: c. 13 km NNW of Maclean, Tullymorgan - Jackybulbin road, c. 2 km N of junction with Cavanaghs Rd, adjacent to private driveway to house, 25 July 2019, *H. T. Kennedy 28* (holo: NSW; iso: BRI, CANB, CNS, K, MEL, MO, NE 109335) (Fig. 3).

Melichrus sp. Gibberagee (Benwell 97239); CHAH (2005) 'Australian Plant Census.'

Melichrus sp. Gibberagee (A.S.Benwell & J.B.Williams 97239); NSW Scientific Committee (1995), *Schedules 1, 2 & 3 (1995). Threatened Species Conservation Act 1995*: 178

Diagnosis: Similar to *Melichrus urceolatus*, differing by rhizomatous growth (*v.* non-rhizomatous), branchlet indumentum pilose (*v.* dense matted hairs), lamina margin hyaline only at the base and ciliate (*v.* hyaline entire length and scabrous), fruit broadly ellipsoid (*v.* obloid) (Fig. 4B).

Description: *Shrub* 0.3–1.2(–1.8) m tall, rhizomatous, stems erect, branching often in pseudo-whorls producing a candelabra-like habit. *Branchlets* pilose, hairs (0.2–)0.75–1.1 mm long. *Leaves* ascending to

divergent, sub-sessile; petiole broad and compressed, 0.5–0.9 mm long, 0.5–1 mm wide, adaxially concave, appressed to stem, ±glabrous; lamina narrowly trullate or lanceolate, (8.5–)12.5–19.1 mm long, 1.1–2.0 mm wide, ±straight; apex narrowly aristate, translucent and sub-pungent, 0.5–0.9 mm long; margin entire, hyaline at lamina base, ciliate, hairs 0.05–1 mm long, longer and more numerous in basal half of lamina; adaxial surface green, ±glabrous with occasional hairs near margin, venation indistinct; abaxial surface slightly paler, sparsely pilose with hairs 0.1–0.8 mm long, hairs longer and more numerous in basal half of lamina, veins 7 or 9 obvious, parallel, separated by deep, narrow grooves bearing dense papillae <0.1mm long. *Inflorescence* a solitary, axillary flower, ascending, up to $^{3}/_{4}$ the length of subtending leaf. *Bracts* 8–10, strongly imbricate, arranged spirally, grading distally from widely ovate to narrowly ovate, from 0.3–0.5 mm long, 0.2–0.4 mm wide to 3.9–6.7 mm long, 2.5–3 mm wide; apex acute, upper 2 or 3 bracts mucronulate; margins thin and translucent, ciliolate near apex; surfaces ±glabrous, green to cream coloured. *Calyx*, sepals 5, chartaceous, imbricate, ovate to lanceolate 6.4–8 mm long, 2.3–2.8 mm wide, ±equal to open corolla, caudate, ciliolate, surfaces ±glabrous, cream coloured, translucent. *Corolla* narrowly urceolate, white; tube 2–3 mm long, 2–3 mm wide; lobes 5, ovate to lanceolate, 4–5.2 mm long, 1.7–1.9 mm wide, held erect and in the same plane as the tube for at least $^{2}/_{3}$ of length, distally slightly spreading and recurved, apex acute and exceeded by sub-apical process c. 0.5 mm long, ciliate, hairs 0.1–0.4 mm long; external surface mostly glabrous with scattered hairs apically; internal surface hispid, hairs hyaline 0.3–1 mm long. *Glandular hairs* in 5 dense tufts, adnate to the base of the corolla tube, alternate with stamens; tufts ±rectangular 0.5–0.9 mm long, c. 0.4 mm wide; hairs turbinate, c. 0.15 mm long, c. 0.1 mm wide, apex rounded or acute. *Anthers* 5, inserted below sinuses, completely enclosed by corolla tube, ovate, 1–1.5 mm long, 0.75–1 mm wide, papillose sometimes with a soft pointed appendage distally, <0.3 mm long. *Filaments* compressed, inserted at the base of the corolla tube adnate to tube for at least ¾ of their length, 1.5–2.5 mm long. *Ovary* ellipsoid, c. 0.75 mm diam., 4- or 5-locular; style terete, tapering smoothly to stigma, c. 1 mm long, glabrous; stigma slightly expanded. *Nectary* fleshy, annular, margin crenate. *Fruit* enclosed by or exceeding persistent calyx at maturity, fleshy, broadly ellipsoid, 4.8–5.1 mm long, 3.4–4.1 mm wide, apex rounded, surface smooth, red-brown at maturity, style persistent.

Additional specimens examined: NEW SOUTH WALES: North Coast: Gibberagee State Forest, Compartment 118, c. 40 km S of Casino, Sep. 1997, *A.S. Benwell 97239* (NE 85832); Gibberagee State Forest, near Mangrove Creek Rd, c. 16 km NNW of Maclean, 27 May 2019, *H.T. Kennedy 10* (BRI, NE 109321, NSW).

Distribution: *Melichrus gibberagee* occurs in the South Eastern Queensland bioregion (Department of the Environment 2013). It is known from one locality in the Gibberagee area c. 50 km south of Casino, New South Wales (Fig. 5). The population covers less than 15 km^2.

Habitat: *Melichrus gibberagee* grows in relatively deep and loamy soils on ±flat terrain on the Mesozoic Grafton Sandstone formation (Geoscience Australia 2020) at c. 50 m altitude. The species inhabits medium to layered tall open forest with combinations of *Corymbia henryi, C. intermedia* and *Eucalyptus siderophloia,* as dominant species. Associated species include *Allocasuarina littoralis, Lophostemon suaveolens, Syncarpia glomulifera, Acacia leiocarpa, Dodonaea triquetra, Notelaea longifolia, Melaleuca nodosa, Gahnia aspera,* and *Entolasia stricta* (Fig. 4A).

Phenology: Flowers March to August. Fruits recorded July to September.

Conservation Status: *Melichrus gibberagee* is currently gazetted as Endangered under the *Environment Protection and Biodiversity Conservation Act* 1999 and the *NSW Biodiversity Conservation Act* 2016 under the phrase name *Melichrus* sp. Gibberagee (Benwell 97239).

The distribution of *Melichrus gibberagee* as documented in 2019 prior to the 2019–2020 included an area of less than 15 km^2, the majority of this range occurs within Gibberagee State Forest. In 1998 c. 600 plants of *M. gibberagee* were recorded in Gibberagee State Forest (*pers. comm.* Janet Cavanaugh, NSW NPWS, on behalf of Dr Chris Dickman; 'Determination for provisional listing of an endangered species on an emergency basis,' 26 May 1998). In 2019 approximately 150 plants remained (*pers. comm*. J. Brown, NSW Forestry corp., 18 June 2020). Several reports indicate that this reduction may be due to the effects of forestry activities (Pugh 2017; NSW EPA 2019). A much larger population of at least 2,564 plants was surveyed in 2019 on private property immediately to the east of the State Forest (Copeland 2019) (Fig. 5). This population is not currently formally protected under a conservation stewardship agreement (Copeland 2019).

The bushfire season of 2019–2020 burned most known plants of *Melichrus gibberagee* except for c. 10 plants close to a private residence. Six months post-fire, it was observed that all fire-effected *M. gibberagee* plants were dead, mostly with no remaining evidence of the plant (Copeland 2020 and pers. comm. J. Brown, June 2020), indicating a 'high temperature' fire. Only two shoots, unverified, but possibly root suckers or seedlings of *M. gibberagee* have been observed since the fire (pers. comm. J. Brown, June 2020), despite significant rainfall. The fire-response of *M. gibberagee* is currently being monitored (Copeland 2020) but the post-fire

recovery prospects for this population are uncertain. Under the IUCN Red List criteria (IUCN Standards and Petitions Committee 2019) a status of 'Critically Endangered B1(a&c)' is recommended because *M. gibberagee* is only known from one area of less than 15 km^2 where it has 1 to 3 more-or-less contiguous subpopulations, combined with the recent extreme fluctuation in population size of mature individuals due to fire and other threatening processes.

Fig. 3. *Melichrus gibberagee*; isotype *NE 109335*. Seconds deliberately obscured.

Etymology: 'Gibberagee' is a local area name. Its etymology is no longer known, but it is likely rooted in Bundjalung language (*pers. comm.* M. Sharpe, 21 May 2020).

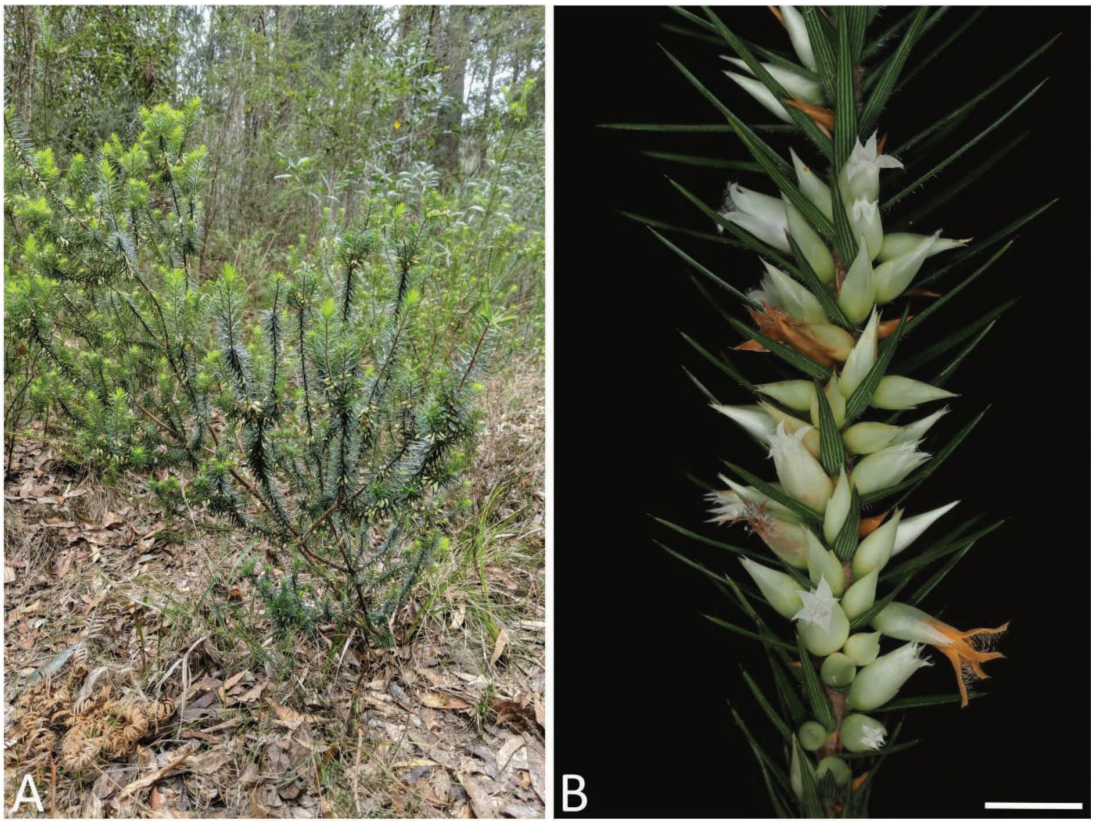

Fig. 4. *Melichrus gibberagee,* **A.** habitat; layered open forest at the type locality (collection site of *H.T. Kennedy 28*) **B.** Fertile stem. Scale= 10 mm. Images by H.T. Kennedy.

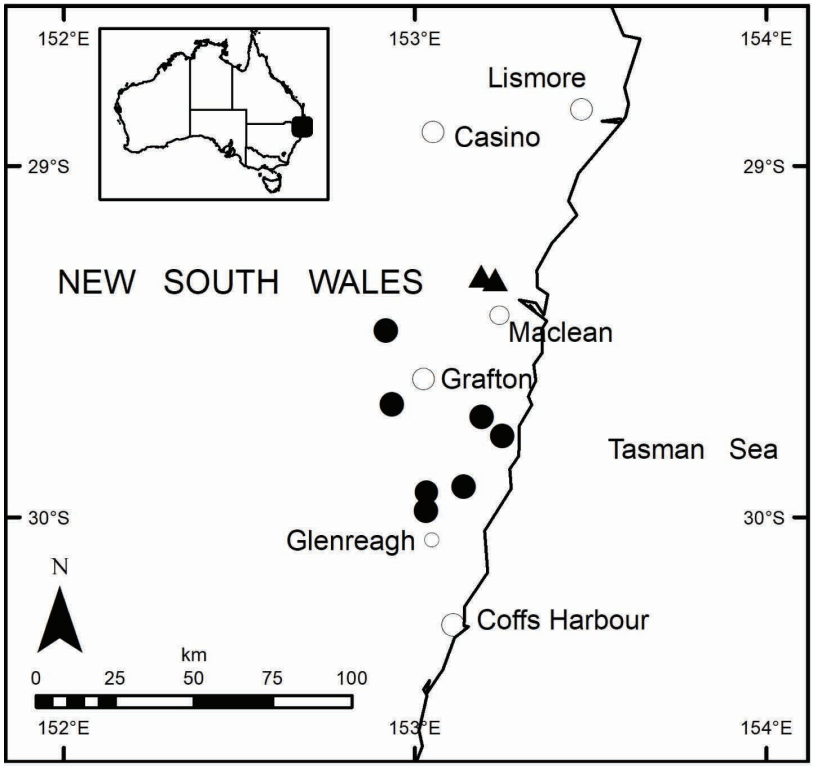

Fig. 5. Distributions of • *Melichrus hirsutus;* ▲ *Melichrus gibberagee.*

Modified identification key

A revised key to *Melichrus* in NSW FloraOnline (PlantNET 2020), modified to the minimum extent required to accommodate the two new species, is as follows:

1	Leaves with margins partly or entirely long-ciliate, abaxial surface with long hairs on at least part of the surface.	**2**
	Leaves with margin and abaxial surface glabrous or scaberulous.	**4**
2	Lamina apex 1.3–2.6 mm long, fine, often broken, not pungent. Corolla rotate. Branchlets sericeous.	***Melichrus procumbens***
	Lamina apex 0.5–1.2 mm long, rarely broken, pungent or sub-pungent. Corolla cup-shaped or urceolate. Branchlets pilose.	**3**
3	Ascending shrub. Lamina abaxial surface evenly pilose all over. Corolla pink, cup-shaped.	***Melichrus hirsutus***
	Erect shrub. Lamina abaxial surface sparsely pilose, with hairs distinctly longer and more numerous in the basal half of the lamina. Corolla white, urceolate.	***Melichrus gibberagee***
4	Leaves densely imbricate, erect and appressed over much of branch; margins more or less entire and broad-hyaline towards base; fruit more or less globose, apex rounded	***Melichrus adpressus***
	Leaves mainly erect to subreflexed; margins evenly toothed, narrow-hyaline; fruit depressed-globose, flat-topped	**5**
5	Sepals always tinged pink or red, glabrous except for ciliolate margins; flowers pink to deep red, corolla tube 2.5–3.8 mm long; fruit cherry-red overall when ripe	***Melichrus erubescens***
	Sepals greenish white, more or less glabrous to velvety and with ciliate margins; flowers white, cream or yellow-green, corolla tube 4–5 mm long; fruit 2-toned, whitish or purplish green, lower half darker and matt, the upper lighter and subglossy	***Melichrus urceolatus***

A comprehensively reworked key will result from our revision of the genus.

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References

Brown, R (1810) 'Prodromus florae Novae Hollandiae et Insulae Van-Diemen, exhibens characteres plantarum.' (Johnson & Co: London)

Cavanilles, AJ (1797) 'Icones et descriptiones plantarum, quae aut sponte in Hispania crescunt, aut in hortis hospitantur.' (Regia typographia: Madrid)

CHAH (continuously updated) 'Australian Plant Census.' Available at https://biodiversity.org.au/nsl/services/APC

Copeland, L (2019) The distribution, abundance and threats of the endangered shrub *Melichrus* sp. 'Gibberagee' at 'Tullymorgan Lodge,' Eco Logical Australia.

Copeland, L (2020) *Melichrus* sp. Gibberagee post-fire survey, Eco Logical Australia.

Department of the Environment (2013) 'Australia's bioregions (IBRA), IBRA 7 (Commonwealth of Australia: Canberra, ACT).' Available at http://www.environment.gov.au/land/nrs/science/ibra#ibra [Accessed 04 April 2020].

Flora of Australia (1999) 'Introduction.' (ABRS/CSIRO Melbourne, Australia)

Geoscience Australia (2020) 'Australian and Region Surface Geology ' Available at http://maps.ga.gov.au/interactive-maps/#/theme/minerals/map/geology [Accessed 16 May 2020].

Harden, GJ (1993) Additions and Corrections. In 'Flora of New South Wales ' (Ed. GJ Harden.) Vol. 4 pp. 66.

IUCN Standards and Petitions Committee (2019) 'Guidelines for Using the IUCN Red List Categories and Criteria. Version 14.' Available at http://www.iucnredlist.org/documents/RedListGuidelines.pdf. [Accessed 22 June 2020].

NSW EPA (2019) 'EPA fines Forestry Corp $16,500 for Gibberagee State Forest offence.' Available at https://www.epa.nsw.gov.au/news/media-releases/2019/epamedia190410-epa-fines-forestry-corp-$16500-for-gibberagee-state-forest-offence [Accessed 24 November 2020].

NSW Scientific Committee, 1995. Schedules 1, 2 & 3 (1995). Threatened Species Conservation Act 1995: 178

PlantNET (2020) 'The NSW Plant Information Network System.' Available at http://plantnet.rbgsyd.nsw.gov.au

Pugh, D (2017) 'Preliminary Audit of the Endangered Narrow-leaf Melichrus in Gibberagee SF.' Available at https://d3n8a8pro7vhmx.cloudfront.net/ncec/pages/187/attachments/original/1487758139/Gibberagee_Melichrus_Audit_1_reduced.pdf?1487758139

Quinn, FC, Williams, JB, Gross, CL & Bruhl, JJ (1995). Report on rare and threatened plants of north-eastern New South Wales. Report prepared for New South Wales National Parks and Wildlife Service and Australian Nature Conservation Agency.

Radford, AE, Dickison, WC, Massey, JR, Bell, CR (1974) 'Vascular plant systematics.' (Harper & Row: New York)

Stearn, WT (1992) 'Botanical Latin.' (Timber Press: Portland, Oregon)

Telford, IRH, Bruhl, JJ (2020) *Dodonaea crucifolia* (Sapindaceae, Dodonaeoideae), a new species from north-eastern New South Wales, Australia. *Telopea* **23**, 119–125.

Thiers, B (2016) 'Index Herbariorum: A Global Directory of Public Herbaria and Associated Staff.' Available at http://sweetgum.nybg.org/science/ih/

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