

A new species of *Callistemon* (Myrtaceae, Melaleuceae) from Victoria, Australia

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Introduction

In Victoria 12 indigenous *Callistemon* R.Br. species are currently recognised (Spencer 1996; Molyneux 1997, 2005; Walsh & Stajsic 2007). Eleven species have been described, including four described by Molyneux (1993, 1995, 1997, 2005). The undescribed species has the informal name *C. sp.* (Wonwondah) in Walsh and Stajsic (2007); this species is the subject of this paper. In the most recent enumeration of *Callistemon*, Craven (2006) recognised 25 Australian species and one variety, which he subsumed under *Melaleuca* L. The four endemic eastern Victorian species described by Molyneux (1993, 1995, 1997, 2005) were not recognised by Craven (2006).

In 2004 one of the authors (N. Marriott) discovered and collected specimens of a new species of *Callistemon* on the banks of the MacKenzie River in the Wimmera region, north-western Victoria. Subsequent investigations by the authors and V. Stajsic (MEL) (the latter jointly with G. Carr) extended the range of the species and enabled data to be collected on its biology, ecology and conservation status. The new species, most closely related to *C. sieberi* DC., is described here. Colour determinations are made according to the 1986 reprint of the Royal Horticultural Society Colour Chart (RHS London, and Flower Council of Holland, Leiden).

Pending resolution of the taxonomy of Melaleuceae and placement of numerous related genera (Ladiges *et al.* 1999; Brown *et al.* 2001), we describe the species as a *Callistemon*.

Taxonomy

Callistemon wimmerensis* N.R. Marriott & G.W. Carr, *sp. nov.

Callistemon sieberi DC. *maxime simile, sed in habitu arborescenti (ad 10 m altum) paucicauli vel multicauli, rigide erecto, dense coronati, foliis rigidis anguste oblanceolatis, conflorescentia densa aphylla ad 6 cm longam, 3.5 cm latam, 12-49 floribus compositis, filamentis roseis 52-56 per florem, ad 13.5 mm longam, fructibus depresso-globulatis, persistentibus, ad 5 mm longam 8.5 mm latam differt.*

Abstract

A new species, *Callistemon wimmerensis* N.R. Marriott and G.W. Carr (Melaleuceae, Myrtaceae) from the Wimmera in north-west Victoria, Australia, is described and illustrated. The distribution, biology, ecology and taxonomic relationships of the species are discussed. It is Critically Endangered according to IUCN criteria.

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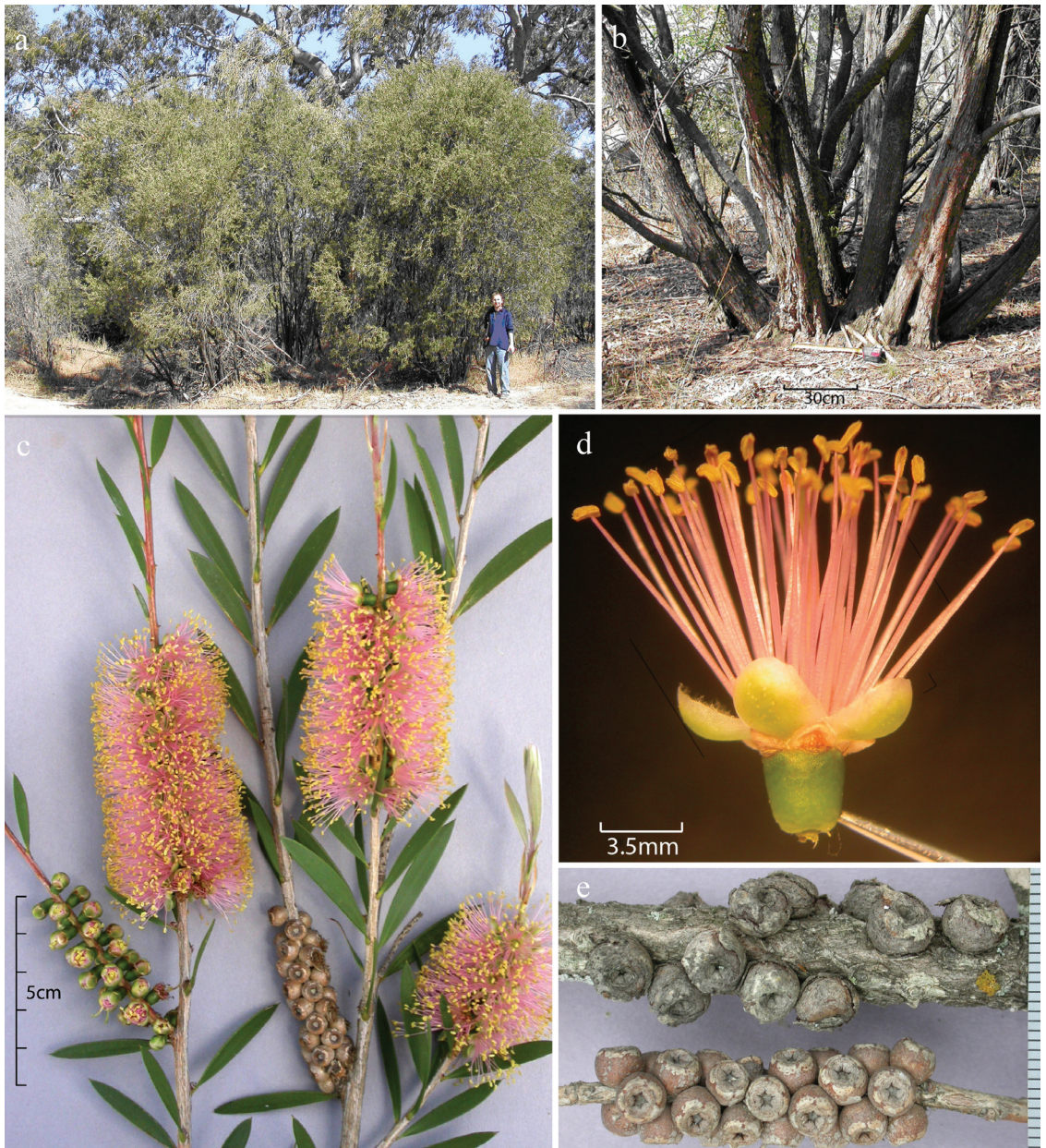


Figure 1a. *Callistemon wimmerensis* in situ at type locality; **b.** Very large *C. wimmerensis* in situ near type locality (scale bar = 30 cm); **c.** Holotype of *C. wimmerensis* (scale bar = 5 cm); **d.** Flower of *C. wimmerensis* from holotype (scale bar = 3.5 mm); **e.** Fruits of *C. wimmerensis* (G.W. Carr 0704-42 and N.R. Marriott, MEL) Fruits on lower infructescence c. 3 years old; those on upper infructescence c. 10 years old. (Scale in mm)

Type: VICTORIA. Wimmera: Wonwondah East, c. 18 km south of Horsham on the west bank of MacKenzie River 142° 12' 1"E 36° 54' 29"S, 28.ix.2004, *G.W. Carr* 0411–343 and *V. Stajsic* (holotype: MEL 2312043, MEL 2312044, MEL 2312045; isotypes AD, BRI, CANB, HO, K, MELU, NE, NSW, NY).

Callistemon sp. (Wonwondah) *sensu* Walsh & Stajsic (2007).

Shrub or small *tree* to c. 10 m high with single-stem (trunk) or up to c. 60 stems arising from a lignotuber; young plants narrowly erect, branches steeply ascending, ultimately a tree with a dense, narrow, crown which is higher than wide, outer branches somewhat weeping. *Bark* grey-brown, tightly adherent and slightly stringy, shallowly fissured longitudinally; bark of young branches slightly flaky with thin platelets. Young stems angular, dull red, densely tomentose-sericeous, indumentum appressed or sub-erect with hairs to c. 2.5 mm long, soon glabrous. *Leaves* moderately densely arranged on stems, steeply ascending and forming an angle of 20–35 (–60°) with stem; petiole and base of leaf blade dextrorsely twisted through 90°, thus blade with vertical orientation; pedicel flattened, 1–2 mm long × c. 1.5 mm wide. *Leaf lamina* narrowly oblanceolate or narrowly elliptic, acute, with a prominent, rigid, pungent mucro 0.6–1.75 m long; lamina (12–) 30–50 (–60) mm long × (2–) 4–7 (–8) mm wide, coriaceous, faintly revolute, dull yellow-green (Green Group 137A), pink when young, smooth *in vivo*, somewhat rough in dried material; midvein raised and prominent on abaxial surface, marginal veins prominent (leaf edges thick), lateral veins obscure *in vivo*, prominent in dried material; immersed oil glands moderately dense and obvious on abaxial surface and leaf edge, obscure on adaxial surface; mature leaves glabrous, young leaves moderately to densely appressed-sericeous with hairs to 2 mm long, young seedling leaves with patent indumentum; crushed leaves *in vivo* emit a faint *Eucalyptus*-like odour when fresh. *Conflorescence* sub-terminal on main axis or short axillary branches, (1.8–) 3.5–5.0 (–6.0) cm long × 3.2–3.5 cm diameter; axis densely pubescent in bud, moderately pubescent at anthesis, densely so at base of flowers; flowers densely arranged (12–) 20–40 (–49) per conflorescence, all flowers subtended by rigid, antrorse, caducous bracts; bracts ±triangular to lanceolate, cucullate at base,

otherwise navicular, acute, 4.8–10.0 mm long × 2.6–3.7 mm wide, increasing in length distally, chartaceous with ±transparent scarious margins, especially in distal two-thirds, pubescent abaxially on margins at base with hairs to 1.0 mm long, bracts sometimes pubescent to apex, ciliate, adaxially glabrous or rarely sparsely pubescent; bracts pale brown dorsally, margins pale brown, apex, at least in proximal bracts maroon-brown, very dark at tip. *Hypanthium* barrel-shaped, 2.0–3.3 mm long × 2.2–3.5 mm wide, glabrous, smooth *in vivo*, green, with abundant but obscure immersed oil glands; ovary 3-locular, summit sunk c. 1.5 mm below hypanthium rim, covered with very dense erect hairs to 1.2 mm long; rim of hypanthium with a dense ring of erect colourless hairs to 0.5 mm long between the base of each petal. *Sepals* orbicular or rounded-triangular, 1.7–2.5 mm long × 2.5 mm wide, cucullate, pale translucent green on margins, thickened-opaque central portion with prominent oil glands, glabrous except for ciliate margins, caducous or somewhat persistent but soon eroding from rim of hypanthium. *Petals* sessile, cucullate, ±membranous, ±orbicular or elliptical-rotund, 4.0–5.0 mm long × 3.0–4.0 mm wide, attached by broad base 1.0–1.3 mm wide, pale translucent green, glabrous or margins sparsely ciliate with hairs to 0.75 mm long. *Stamens* 52–56, filaments wholly free, glabrous, 11.5–13.5 mm long, pink (RHS Red Group 56A); anthers 1.5–1.7 mm long × 0.7–1.0 mm wide, bright yellow. *Style* pink ±straight, 13.5–14.0 mm long; stigma capitate, 0.7–0.8 mm wide. *Capsules* depressed-globular, long-persistent, light brown or grey-brown, in old fruits surface tissue exfoliating in sheets, sunken summit of ovary white-tomentose; year old capsules 3.2–3.5 mm long × 3.5–3.8 mm wide, ultimately increasing to 4.5–5.0 mm long × 8.0–8.5 mm wide. *Seeds* 0.8–1.1 mm long, ±linear, very narrowly deltoid or slightly falcate, somewhat flattened, distal end obliquely truncate, chestnut brown, shining, striate and sharply angular; contents of capsules mostly sterile (Fig. 1. a–e).

Flowering period: Late October to late December.

Specimens examined: VICTORIA. Wimmera: MacKenzie River, 20 x.2004, *G.W. Carr* 0410–21—0410–27 and *V. Stajsic* (MEL); MacKenzie River, 28 xi.2004, *G.W. Carr* 0411–329—0411–331 and *V. Stajsic* [MEL 2312046 & MEL 2312047; MEL 2312048 (AD); MEL 2312049 (AD)]; MacKenzie River, 28 xi.2004,

G.W. Carr 0411–338—341 [MEL 2312053; MEL 2312050 (AD); MEL 2312051 (CANB); MEL 2312052 (CANB)]; MacKenzie River, 28 xi.2004, *G.W. Carr* 0411–342 (MEL 2312041 & MEL 2312042 AD, CANB, NSW); MacKenzie River, 28 xi.2004, *G.W. Carr* 0411–382, 0411–384, 0411–385 [MEL 2312057; MEL 2312054 & MEL 2312055 (AD); MEL 2312056 (CANB)]; MacKenzie River, 7.iv.2007, *G.W. Carr* 0704–41, 0704–42, 0411–43, 0411–44 and *N.R. Marriott* (MEL).

Notes: *Callistemon wimmerensis* is a rigidly erect small tree to 10 m high with a dense canopy, typically higher than wide. In almost all plants examined (several hundred) the trunks were multiple, arising from a lignotuber. Stems numbered up to c. 60 per plant,

indicating that the species is a post-fire lignotuberous resprouter. Stems on a single plant are mostly \pm even-aged but the size (diameter) of stems indicates that fire is a rare event.

Flowering in *C. wimmerensis* occurs from late October to early December with indications of a fairly brief flowering season typical of *Callistemon*. The sympatric *C. rugulosus* DC. is abundant at all sites with *C. wimmerensis* and is assumed to have the same pollinators, but except for one plant we found no evidence of hybridisation. In *C. rugulosus* peak flowering occurs about four weeks earlier (i.e. where they are

Table 1. Comparison of *Callistemon wimmerensis* N.R. Marriott & G.W. Carr and *C. sieberi* DC.

Character	<i>Callistemon wimmerensis</i>	<i>Callistemon sieberi</i>
Habitat	Streamside, rarely extending to upper terraces, not rocky	Streamside, often rocky
Habit	Erect tree to c. 10 m high	Weeping or spreading tree to c. 8 m high
Leaves		
Indumentum	Young leaves densely appressed – sericeous, soon glabrous	Young leaves densely appressed – sericeous, soon glabrous
Length x width	(12–) 30–50 (–60) mm × (2–) 4–7 (–8) mm	(25–) 30–50 (–100) mm × (1–) 2–4 (–5) mm
Texture	Rigid, coriaceous	Rigid, but less coriaceous
Oil glands	Clearly visible abaxially, obscure adaxially	Not or hardly visible on both surfaces
Colour	Dark yellow-green, dull	Dark yellow green, sublustrous
Conflorescence	Not frondose, all flowers subtended by caducous bracts	Partially frondose, 3–9 of the distal flowers subtended by persistent leaves rather than caducous bracts
Length	(1.8–) 3.5–5.0 (–6.0) cm	(2–) 3–7 (–8) cm
Diameter at anthesis	32–35 mm	20–30 mm
Flowering time	Late October-early December	November-February
Flowers		
Arrangement	Conflorescence dense	Conflorescence with relatively distant flowers
Hypanthium	2.0–3.3 mm long × 2.2–3.5 mm wide, glabrous	c. 2.0–3.0 mm long × 2.6–3.5 mm wide, glabrous, or sometimes densely pubescent
Sepals	\pm Orbicular, to 2.5 mm long × 2.5 mm wide, glabrous except for ciliate margins	Semicircular, to 1.5 mm long × 2.2 mm wide, glabrous or (usually) densely sericeous adaxially, margins ciliate
Petals	\pm Orbicular, 4–5 mm long × 3–4 mm wide, glabrous or margins sparsely long-ciliate	Ovate-orbicular, 3.5–4.7 mm long × 3.0–4.2 mm wide, ciliate
Stamens	52–56	48–67
Filaments	11.5–13.5 mm long, pink	7.0–12.0 mm long, cream to pale yellow (occasionally pale pink)
Fruits	To 5.0 mm long × 8.5 mm diam., persisting for up to c. 13 years	To 5.0 mm long × 6.5 mm diam., persisting for up to c. 8 years

sympatric) than in *C. wimmerensis* but there is some overlap. Nothing is known about potential reproductive barriers between these species in a genus which is conspicuously promiscuous, at least in cultivation (Wrigley & Fagg 1993; Spencer 2002). *Callistemon wimmerensis*, as in other *Callistemon*, is ornithophilous (Ford *et al.* 1979) and New Holland Honeyeaters (*Phylidonyris novaehollandiae* Latham) were observed feeding on nectar from flowering plants. Numerous large native wasps (Scoliidae: probably *Campsomeris* sp.) were also observed feeding on nectar from flowers on several visits to the site and these are considered to be important pollinators of Myrtaceae (F. Douglas, pers. comm.). Honeybees (*Apis mellifera* L.) were also observed avidly gathering nectar from the base of the staminal filaments, and as nectar robbers they may adversely influence behaviour of natural pollinators, however abundant fruiting appeared universal in all *C. wimmerensis* plants examined.

Flowers of *C. wimmerensis* are protandrous with filaments lengthening to overtop the style during early anthesis, and then the style lengthens to overtop the anthers in the latter stage of anthesis. The capsules of *C. wimmerensis* are serotinous with fruits retained on branches for up to 13 years, as evidenced by the count of annual terminal shoot increments (spring-summer growth flushes). Capsules increase in length, and especially diameter, after reaching maturity at about one year post-anthesis.

Recruitment in *C. wimmerensis* is assumed to be predominantly an episodic post-fire event with mass seed release and germination to produce even-aged cohorts. This is evidenced by the serotinous fruits and apparently even-aged stems arising from a lignotuber. A low level of recruitment however was observed in localised uneven-aged stands of trees, with some immature plants judged based on their size to be no older than about five years. An environmental flow of water released along MacKenzie River in October–November 2005 (Marriott 2006a) resulted in the recruitment of a small number of seedlings. However all had died by the end of summer 2005–06. Germination *ex situ* takes c. 24–30 days.

The size of the largest *C. wimmerensis* plants indicate that it is very long-lived; the rare dead individuals observed (aside from drought deaths mentioned

below) were all large and old, apparently succumbing to natural senescence. Of particular concern was the observed death of aerial parts of at least 10% of the entire metapopulation during spring-summer of 2006–07 due to the extreme ongoing drought (1996–2007). The pre-European MacKenzie River would have flowed with seasonal regularity, assuming there was not a severe drought. Today the flow to lower reaches is diverted just above the upper limit of the *C. wimmerensis* metapopulation (Distribution Heads) into Burnt Creek as part of the Wimmera/Mallee irrigation scheme. This has had dramatic negative impacts on the riparian shrub layer along the lower MacKenzie River, and now combined with the drought, severely threatens the survival of this species (Marriott 2006a, 2006b).

Callistemon wimmerensis is apparently most closely related to *C. sieberi* DC., which occurs in western Victoria to within c. 170 km of *C. wimmerensis* (Spencer 1996; Victorian Flora Information System database). *Callistemon sieberi* also occurs in South Australia c. 370 km north-west of the *C. wimmerensis* populations (Spencer & Lumley 1986). From *C. sieberi* it is distinct, based on a suite of morphological and other characters (Table 1). *Callistemon wimmerensis* does not seem closely related to the sympatric *C. rugulosus* DC. *Callistemon wimmerensis* is distinguished from *C. sieberi* in its erect habit to c 10 m (c.f. weeping habit to c 8 m in *C. sieberi*), its generally broader leaves (4–7 mm in *C. wimmerensis* c.f. 2–4 mm in *C. sieberi*) with clearly visible oil glands and a dull texture (c.f. indistinct oil glands and almost lustrous leaves in *C. sieberi*), its conflorescence with dense flowers (distant in *C. sieberi*), 32–35 mm diameter at anthesis (20–30 mm in *C. sieberi*) and with pink filaments (mostly cream to pale yellow in *C. sieberi*) and mature fruits 8.5 mm diameter in *C. wimmerensis*, c.f. 6.5 mm in *C. sieberi*.

Distribution and Conservation Status: According to IUCN criteria (IUCN 2001) *C. wimmerensis* is critically endangered, on the basis of its areal extent of less than 10 km², it is confined to one metapopulation, it is at present in decline, and its habitat is highly degraded.

Populations of *C. wimmerensis* occur discontinuously in a narrow band along c. 13 km of streambanks on the MacKenzie River and we estimate that several hundred thousand plants occur in the metapopulation. There is

a gap of c. 7.4 km between upstream and downstream subpopulations. There are however major threatening processes. Of overriding concern is the grossly altered hydrological regime of this stream (see above). Under these modified hydrological conditions, growth, flowering and reproduction are liable to be severely compromised. In the event of fire, the absence of saturated, bare, post-fire substrates required for germination and seedling survival, as observed in other species in post-fire riparian and swamp environments, e.g. *C. citrinus* (Curtis) Skeels (Carr pers. obs.), is liable to lead to recruitment failure (Marriott 2006b).

Weed invasion is also likely to affect recruitment by competition in the germination and seedling stage. *Phalaris aquatica* L., *Ehrharta calycina* Sm., annual grasses and *Asparagus asparagoides* (L.) Druce, are the most seriously invasive exotic species in the current weed flora at the site. Due to the changed hydrological situation, *Ehrharta calycina* in particular is rapidly invading the now-dry river banks.

A further threat is the abundant, twining, leafless hemi-parasite *Cassytha pubescens* R.Br. which has killed many *Callistemon rugulosus* and some *C. wimmerensis*, and damaged canopies of both species. Much more extensive damage seems inevitable.

Habitat: *Callistemon wimmerensis* largely occurs in vegetation most closely agreeing with Plains Riparian Shrubby Woodland (Ecological Vegetation Class 659, DSE 2003) with a shrubby and grassy understorey. Data have been collected from four quadrats to describe the vegetation communities. The vegetation structural dominants or co-dominants include *Eucalyptus camaldulensis* Dehnh., *E. microcarpa* (Maiden) Maiden and *E. melliodora* A. Cunn. ex Schauer, *Acacia provincialis* A. Camus, *A. acinacea* Lindl., *Callistemon rugulosus*, *Leptospermum obovatum* Sweet, *Poa labillardierei* Steud. var. *labillardierei*, *Austrostipa* spp; *Austrodanthonia* spp., *Elymus scaber* (R.Br.) A. Love, *Microlaena stipoides* (Labill.) R.Br. var. *stipoides*, *Lomandra* spp., *Arthropodium fimbriatum* R.Br. sens. lat. and *A. strictum* R.Br. There is a relatively high component of exotic species, mostly annuals and perennial herbs, e.g. *Bromus diandrus* Roth, *Ehrharta calycina* Sm., *Avena barbata* Pott ex Link and *Phalaris aquatica*. At the upper limits of the population on MacKenzie River, *C. wimmerensis* occurs in very different vegetation, most closely conforming with

Plains Swampy Woodland (Ecological Vegetation Class 651) in a broad drainage line without an incised stream channel. In this location the overstorey dominants are *Eucalyptus ovata* Labill. var. *ovata*, *E. camaldulensis* and *E. viminalis* Labill. subsp. *cygnetensis* Boomsma, but with a sedge-rich understorey, including three *Lepidosperma* species. *Callistemon wimmerensis* forms very dense closed stands here with almost no field-layer vegetation.

Callistemon wimmerensis occurs on streambanks and alluvial terraces on pale brown, silty alluvium (over a sandstone bedrock) derived predominantly from Upper Silurian – Lower Devonian quartzose sandstones of the Grampians. Under a normal hydrological regime most *Callistemon* plants would be growing at the edge of the water or the roots would be \pm permanently moist in the zone subject to regular inundation. Plants generally only occur within a few metres of the stream bank and not on the extensive floodplain which is subject to only rare inundation. Where substrates are much more sandy, *C. wimmerensis* may extend upslope to the upper alluvial terrace.

Etymology: Latin rendering of the place-name Wimmera to which the species is endemic.

Recommended vernacular name: Wimmera Bottlebrush.

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