

***EUCALYPTUS RADIATA* GOES FORTH: A “NEW” NAME FOR THE FORTH RIVER PEPPERMINT**

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ABSTRACT

A peppermint species restricted to the Forth River valley and nearby catchments in the central north of Tasmania has a confused taxonomic and nomenclatural history. This paper clarifies the position of the ‘forth river peppermint’, until recently recognised as *Eucalyptus radiata* subsp. *robertsonii*, but now regarded as a disjunct population of the southern Victorian form of *Eucalyptus radiata* subsp. *radiata*.

INTRODUCTION

Tasmania has 30 indigenous species of *Eucalyptus* (Buchanan 2009), four of which are represented by infrataxa bringing the total number of taxa in the State to thirty-four. New taxa continue to be described, the most recent being *Eucalyptus nebulosa* A.M.Gray (Gray 2009), an endemic species of the peppermint group restricted to the serpentinite soils of the west coast region.

Eucalyptus radiata is one of eight “peppermint” eucalypts occurring in Tasmania, all but one of which are endemic (Buchanan 2009). The identity of the odd one out, the tall peppermint-barked forest tree from the middle and upper reaches of the Forth River catchment in northern Tasmania, has been open to debate for a number of years. These plants were first recorded by William (Bill) Jackson of the University of Tasmania in 1953. For many years the entity was recognised as *Eucalyptus radiata* subsp. *robertsonii* (Blakely) L.A.S.Johnson & Blaxell. The vernacular name ‘forth river peppermint’ has been applied to the species (e.g. Duncan 2000), in recognition of the distinct distribution of the taxon, a name that is now accepted as the preferred common name (Wapstra *et al.* 2005). On mainland Australia *E. radiata* is usually called ‘narrow-leaved peppermint’, as it has narrower leaves than *E. dives* (not present in Tasmania) but this name is not appropriate here as its leaves are broader than our more common endemic peppermints, *E. amygdalina* and *E. pulchella*.

TAXONOMIC AND NOMENCLATURAL HISTORY OF *EUCALYPTUS RADIATA*

Eucalyptus radiata Sieber ex DC was described in 1828 by Swiss botanist Augustin Pyramus de Candolle (1778–1841), in his *Prodromus Systematis Naturalis Regni Vegetabilis*, from specimens collected by Franz Sieber in New South Wales, presumably from the Blue Mountains, in 1823. Prior to this, narrow-leaved peppermints from New South Wales and Victoria were identified (along with various other mainland species such as *E. dives* Schauer, *E. elata* Dehnh. and *E. regnans* F.Muell.), as *E. amygdalina* Labill.

Bentham (1867) described a mainland peppermint as *E. amygdalina* var. *radiata*. However, this taxon and *E. radiata sensu* Woolls (1880) confusingly describe a smooth-barked ‘river white gum’ and refer to what is now recognised as *E. elata*. *E. amygdalina* var. *radiata sensu* Mueller (1879) does describe the ‘narrow-leaved peppermint’, rather than the ‘river white gum’ but Maiden (1904) did not consider this variety to warrant recognition and again referred to the ‘narrow-leaved peppermint’ of mainland Australia as *E. amygdalina*, considering these plants to be conspecific with the ‘black peppermint’ of Tasmania.

Baker & Smith (1912) described the ‘narrow-leaved peppermint’ of New South Wales and Victoria as *E. amygdalina* var. *australiana* and later elevated this taxon to species level as *E. australiana* (Baker & Smith 1915), while applying *E. radiata* to the ‘river white gum’. Maiden (1917) recognised the ‘narrow-leaved peppermint’ as *E. radiata*, having previously accepted *E. numerosa* for the ‘river white gum’ over *E. radiata* or *E. amygdalina* var. *radiata* (Maiden 1904). However, this was not followed by Baker & Smith (1920), and for a number of years the ‘narrow-leaved peppermint’ was known as both *E. radiata* and *E. australiana*, and the ‘river white gum’ as *E. radiata* and *E. numerosa*.

Baker & Smith (1920) subsequently recognised a further species of ‘narrow-leaved peppermint’, *E. phellandra*, distinguished from *E. australiana* solely on volatile oil composition. More important to this discussion, Blakely (1927) described the ‘narrow-leaved peppermint’ from the Southern Tablelands of New South Wales with glaucous foliage and buds as *E. robertsonii*. This new species included both *E. australiana* (in part) and *E. phellandra* (in part), *E. robertsonii* having populations with both the cineole-rich oils typical of *E. australiana* and the phellandrene-rich oils typical of *E. phellandra* (Rankin 1998).

Blakely (1934) subsequently reduced *E. australiana* (in part) to a variety of *E. radiata*, var. *australiana*, also describing var. *subplatyphylla* from the New England Tablelands of New South Wales, with *E. radiata* subsequently becoming accepted over *E. australiana* for this species. Pryor & Johnson (1971) absorbed these varieties and *E. phellandra* (in part) into *E. radiata*. Johnson & Blaxell

(1973) reduced *E. robertsonii* to a subspecies within *E. radiata*, while Johnson & Hill (1990) later returned it to species level with two subspecies, subsp. *robertsonii* representing the majority of the distribution of the taxon, and subsp. *hemisphaerica* being applied to a small population near Orange in New South Wales.

Johnson & Hill (1990) also described *E. radiata* subsp. *sejuncta* from the New England Tablelands of New South Wales, encompassing *E. radiata* var. *subplatyphylla* of Blakely, as well as describing *E. croajingolensis* for the glaucous narrow-leaved peppermint of Gippsland in eastern Victoria, previously inconsistently regarded as either *E. radiata* or *E. robertsonii*. With the publication of Johnson & Hill (1990), apart from some quibbling about the specific or subspecific status of the 'monaro peppermint' (as *E. robertsonii* or *E. radiata* subsp. *robertsonii* is commonly known in Victoria), the systematic delineation and nomenclature of the taxa within the *E. radiata* complex was mostly resolved.

Eucalyptus radiata Sieber ex DC is now recognised as a group of either four closely related taxa (two species, one with three subspecies, following Brooker & Kleinig 1999) or five closely related taxa (three species, two with two subspecies, following Johnson & Hill 1990).

Eucalyptus radiata Sieber ex DC subsp. *radiata* occurs on the ranges and coastal plains of southern and central Victoria and disjunctly in the Central and Southern Ranges and South Coast of New South Wales. *E. radiata* subsp. *sejuncta* L.A.S.Johnson & K.D.Hill occurs on the Northern Tablelands of New South Wales, just crossing into Queensland. *Eucalyptus croajingolensis* L.A.S.Johnson & K.D.Hill occurs on the ranges and coastal plains of Gippsland in eastern Victoria and adjacent parts of southeastern New South Wales. The remaining taxon, referred to as *E. radiata* subsp. *robertsonii* (Blakely) L.A.S.Johnson & Blaxell or *E. robertsonii* Blakely occurs in northeastern Victoria and on the western fall of the Southern Tablelands of New South Wales, except for the disjunct Orange population (subsp. *hemisphaerica*), mentioned above. However, this population appears to be founded on hybrid material (Rankin 1998) and may not warrant formal recognition.

The 'monaro peppermint' is most commonly recognised as a subspecies of *E. radiata* (e.g. Brooker & Kleinig 1999; Brooker & Slee 1996; Ross & Walsh 2003), and in light of the extensive introgression between this taxon and *E. radiata* subsp. *radiata* throughout northeastern Victoria (Rankin 1998), this taxonomic level seems most appropriate and is followed here.

While these taxa occur primarily along the Great Dividing Range and adjacent plains towards the coast of mainland southeastern Australia, the disjunction of plants currently recognised as *E. radiata* in northern Tasmania is a puzzle and is the topic of this paper.

TAXONOMIC POSITION OF THE FORTH RIVER PEPPERMINT

The presence of a tall mostly rough-barked peppermint from the forests of the middle and upper Forth River valley and nearby catchments in northern Tasmania, with affinities to other well known indigenous peppermints, has been long recognised. The entity now known as the ‘forth river peppermint’ was first noted by W.D. Jackson in 1953 and identified as *E. robertsonii*. Allowing for the systematic whims of taxonomists over the years, these plants have been mostly regarded as *E. robertsonii* (Jackson 1965) or *E. radiata* subsp. *robertsonii* (Curtis & Morris 1975; *sensu Census of Vascular Plants* versions prior to 2008). It has also been suggested that they may represent an undescribed species with affinities to *E. amygdalina* (e.g. Johnson & Blaxell 1973; Curtis & Morris 1975; Kirkpatrick & Backhouse 1997) and were regarded as *E. aff. radiata* by Williams & Potts (1996) pending further investigation. These plants were regarded by Rankin (1998) and Brooker & Kleinig (1999) as *E. radiata* subsp. *radiata*. Elsewhere *E. radiata* has been applied with no subspecific distinction (Duncan & Hopkins 2000; Hopkins 2000; Reid & Potts 1999). The ‘forth river peppermint’ is currently recognised by the Tasmanian Herbarium in the *Census of Vascular Plants* as *E. radiata* subsp. *radiata* (Buchanan 2009). Good examples of these plants can be observed in the immediate vicinity of the Lemonthyme power station.

In a similar manner to the patterns of subspecific variation found within *E. globulus*, the southern and central Victorian *E. radiata* subsp. *radiata* gradually intergrades with *E. radiata* subsp. *robertsonii* over a wide area in northeastern Victoria. In fact, wherever two members of the complex meet, similar widescale introgression is observed (Rankin 1998), blurring boundaries between the taxa. Such introgression, coupled with incomplete knowledge of the taxonomic status of individuals within this complex, led to the taxonomic confusion about the disjunct Tasmanian occurrence.

The name *E. robertsonii* was initially applied to these plants by Jackson in 1953, presumably in recognition of the tall nature of these trees, the description of *E. robertsonii* available at the time describing a tall tree to 55 m (Blakely 1927) – much taller than the available description of *E. radiata* (Blakely 1934).

However, with the recognition of the glaucous peppermints from Gippsland as *E. croajingolensis* (Johnson & Hill 1990) and the introgression between the taxa, *E. radiata* subsp. *robertsonii* is recognised as a tree to 50 m tall with peppermint bark to the smaller branches. The leaves are glaucous with a thin “papery” feel. The glaucous buds are the most distinguishing feature of the taxon, having a conical operculum that is longer than the hypanthium. The fruit are typically cup-shaped with a depressed disc and a long, delicate pedicel.

The Tasmanian plants, while growing to 45 m (Duncan & Hopkins 2000), do not possess any of the morphological features characteristic of *E. radiata* subsp. *robertsonii*. The leaves and buds are green rather than glaucous, the disc of the fruit is level rather than depressed, and the buds have a short, rounded operculum, rather than a long conical operculum. It is therefore hardly surprising that these plants have often been considered an undescribed entity as it would be difficult to “shoe horn” them into *E. radiata* subsp. *robertsonii* as currently described.

These Tasmanian plants are, however, most similar to the morphologically variable *E. radiata* subsp. *radiata*. With the exception of tree height, they are morphologically indistinguishable from populations of this taxon from southern Victoria. *E. radiata* subsp. *radiata* ranges in height from small trees and mallee-form shrubs to 3m tall on northern Wilsons Promontory and on the coast at nearby Cape Liptrap, to tall trees in excess of 35 m on the Great Dividing Range.

Rankin (1998) reported five groupings within *E. radiata* based on a combination of adult and seedling morphological characters as well as the two chemical characters of leaf flavonoids and volatile oils. While these generally follow the currently recognised subspecific patterns based on morphology, the chemical characters further divide *E. radiata* subsp. *radiata* into three groups: populations from central eastern New South Wales, including plants from near the type locality; populations from far southeast New South Wales; and populations from central and southern Victoria within a radius of approximately 150 km of Melbourne. It is these latter plants from which the ‘forth river peppermint’ cannot be distinguished.

The Forth River plants have leaf volatile oils rich in phellandrene, common in the Victorian populations of *E. radiata* subsp. *radiata* rather than the cineole-rich oils found in the populations from New South Wales. They also have a leaf flavonoid composition identical to that found in the Victorian populations, quite distinct from that found in the populations from New South Wales.

Interestingly, the less fire-prone situations along watercourses in relatively high rainfall areas occupied by the tall *E. radiata* subsp. *radiata* in Tasmania is occupied in eastern Victoria and southeastern New South Wales not by *E. radiata* subsp. *radiata*, but by the related ‘river peppermint’ or ‘river white gum’, *E. elata*, a tall (to 30 m) mostly smooth-barked tree.

Of the 30 indigenous species of eucalypt found in Tasmania, 17 are endemic (with several species with endemic infrataxa). The non-endemic species (and one subspecies) also occur in Victoria (and usually extend into New South Wales). The wider distribution of these species on the mainland suggests an origin there and that they have migrated into Tasmania across Bass Strait during one of the long periods of lowered sea levels during glacials.

The more restricted northerly distribution of *E. radiata* subsp. *radiata* in Tasmania suggests that it has “gone forth” across Bass Strait from Victoria into Tasmania comparatively recently, perhaps during the most recent glacial period, to become established in the Forth River enclave. It is yet to be seen if the ‘forth river peppermint’ will expand its range to become more widespread in Tasmania, or contract in range as it becomes genetically swamped by *E. amygdalina*.

CONSERVATION AND MANAGEMENT IMPLICATIONS

The recent change in taxonomic recognition of the ‘forth river peppermint’ has no implications for the conservation status of these plants, with *E. radiata* (as the parent entity) still regarded as threatened in Tasmania (irrespective of the taxonomic position of infrataxa).

Eucalyptus radiata is known to hybridise with *E. amygdalina* and *E. nitida** (Duncan 2000), and individuals will be found exhibiting characteristics intermediate between these taxa that will be difficult to assign to either species. The difficulty in being able to definitively assign specimens to a described taxon has implications for the conservation management of the entity in Tasmania. *E. radiata* is listed as a threatened species but its co-occurring relatives *E. amygdalina* and *E. nitida* are widespread and common. In the case of *E. radiata*, a Public Authority Management Agreement between the State government and Forestry Tasmania under the provisions of the Tasmanian *Threatened Species Protection Act 1995*, is in place for the management of the species on State forest, the tenure on which the species almost exclusively occurs. Non-forestry activities that disturb the species require permits under the Act.

This paper has deliberately focussed on clarifying the taxonomic and nomenclatural issues associated with *E. radiata* in Tasmania. A follow-up paper will examine the broader ecology, reservation and conservation status, threats and mitigation strategies surrounding the management of this taxon.

* *Eucalyptus nitida* Hook.f., *Fl. Tasman.* 1(2): 137 (1856), widely known as the ‘smithton peppermint’, has recently been provided with its historically correct name of *Eucalyptus ambigua* DC., *Prodr.* 3: 219 (1828) by Bean (2009).

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