

New taxa in *Eucalyptus* (Myrtaceae) for Victoria and notes on Victorian populations of *Eucalyptus calycogona*

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Abstract

Seven new taxa of eucalypts endemic to Victoria are named and described and their distributions, ecologies, affinities and conservation status are discussed. These are *Eucalyptus litoralis* K. Rule, *Eucalyptus pyreneae* K. Rule, *Eucalyptus hawkeri* K. Rule, *Eucalyptus walshii* K. Rule, *Eucalyptus filiformis* K. Rule, *Eucalyptus tricarpa* L.A.S. Johnson & K.D. Hill subsp. *decora* K. Rule, and *Eucalyptus polyanthemus* Schauer subsp. *marginalis* K. Rule. As well, the discovery near Nurcoung in the Wimmera region of a small population of mallees with features consistent with *Eucalyptus calycogona* Turcz. subsp. *calycogona* is discussed.

Introduction

Recent surveys of several regions of Victoria have led to the discovery of many new *Eucalyptus* taxa, all of which are Victorian endemics and some of which are regarded as rare or threatened. *E. litoralis*, a mountain grey gum from the Anglesea area, *E. pyreneae*, a second mountain grey gum from the Pyrenees Range, *E. hawkeri*, a mallee-box from the Mt. Arapiles area, *E. walshii*, a second mallee-box from the Little Desert, *E. filiformis*, a third mallee-box from Mt. Jeffcott between Charlton and Donald, *E. tricarpa* subsp. *decora*, a copiously pruinose form of three-flowered ironbark from the St. Arnaud district, and *E. polyanthemus* subsp. *marginalis*, a depauperate red box from inland Victoria, which are treated below, represent the first installment of papers on these new taxa. Further, a small Victorian population of mallees with features consistent with *E. calycogona* subsp. *calycogona* is discussed.

Taxonomy

SECTION MAIDENARIA: SERIES VIMINALES: THE MOUNTAIN GREY GUM GROUP

It has been widely accepted that *E. goniocalyx* F. Muell. ex Miq., *E. cypellocarpa* L.A.S. Johnson, *E. nortonii* (Blakely) L.A.S. Johnson and *E. banksii* Maiden constitute a small complex of species within the series *Viminales* of the section *Maidenaria*. Features typifying this group include appreciably long adult leaves, buds with a waisted hypanthium and fruits with a descending disc and a more or less cupular shape. *E. cypellocarpa* can be distinguished morphologically from the other three species by its tall rather than stunted habit, its smooth bark, its square rather than terete seedling stems and its shortly pedicellate rather than sessile buds and fruits and ecologically by its preference for deep, fertile soils of wet, sub-coastal slopes and valleys rather than the drier, impoverished, mostly inland sites tolerated by the other species.

In recent years several new taxa regarded as having affinities with *E. cypellocarpa* have been erected. The first, *E. alaticaulis*, a smallish tree or mallee with variable box-like bark, broadly ovate juvenile leaves and winged seedling stems, was described by Watson and Ladiges (1987) to cater for populations of mountain grey gum occurring in

western Victoria in the Grampian Ranges and near Anglesea on the Otway coast. More recently, Johnson and Hill (1990) described *E. volcanica*, a smallish, box-barked tree with orbicular, glaucous juvenile leaves, a basally constricted operculum and pedicellate fruits with deeply recessed valves, and *E. retinens*, a smallish, box-barked, woodland tree with relatively small adult leaves, ovate juvenile leaves and relatively small, obtuse buds. Further, Hunter and Bruhl (1999) described *E. quinniorum*, a mallee-like species with relatively small adult leaves and an operculum that is consistently broader than the hypanthium, and *E. oresbia*, a medium-sized, smooth-barked tree with buds constricted (waisted) at the abscission zone and with relatively small fruits. These species occur in northern regions of New South Wales on the relatively dry, inland side of the Great Dividing Range where the prevailing conditions do not favour the existence of *E. cypellocarpa*. In western Victoria, too, *E. alaticaulis* occurs on drier, poorer soils than those favoured by *E. cypellocarpa* and appears to have had a similar evolution to these northern taxa.

The present author has reassessed *E. cypellocarpa*, with a particular focus on Victorian populations occurring in atypical habitats. A part of this focus was to examine populations attributed to *E. alaticaulis* which Brooker and Slee had included with *E. cypellocarpa*. These investigations have shown the existence of two entities worthy of recognition as new species, each possessing a distinctive combination of features in both seedling and adult stages. The first, a half-barked, stunted tree, comprising the Anglesea populations previously included with *E. alaticaulis* by Watson and Ladiges (1987); and the second, a small tree, which Watson and Ladiges had alluded to as being a part of *E. alaticaulis*, occurs at the eastern end of the Pyrenees Range. The investigations also provided sufficient evidence to support the retention of *E. alaticaulis sens. strict.* (Grampians populations) as a species on the bases of appreciable distinctions in habit, bark, juvenile leaves and adult leaves.

KEY TO MOUNTAIN GREY GUMS

1. Juvenile leaves glaucous*E. volcanica*
- 1a. Juvenile leaves green2

2. Buds conspicuously waisted at the abscission zone.....*E. oresbia*
- 2a. Buds non-waisted or waisted below the abscission zone3

3. Trees to 50 m tall.....*E. cypellocarpa*
- 3a. Small trees to 20 m tall or mallees4

4. Buds with hemispherical or obtuse opercula.....*E. retinens*
- 4a. Buds with acutely conical or rostrate opercula5

5. Buds non-waisted with operculum wider than the hypanthium.....*E. quinniorum*
- 5a. Buds waisted with operculum narrower than or as wide as the hypanthium.....6

6. Peduncles slender, 2–3 mm wide, fruits 5–6 mm long, 5–6 mm diam.*E. pyrenea*
- 6a. Peduncles broadly flattened, 3–5 mm wide; fruits 7–13 mm long, 6–11 mm diam...7

7. Seedling growth tips glaucous; mature operculum 4–8 mm long; fruits 9–13 mm long, 8–11 mm diam.....*E. litoralis*
- 7a Seedling growth tips lustrous; mature operculum 3–4 mm long; fruits 6–10 mm long, 6–9 mm diam.....*E. alaticaulis*

1. *Eucalyptus litoralis* K. Rule, sp. nov.

Eucalypto cypellocarpa affinis habitu minore, cortice persistente buxiforme, foliis juvenalibus latoribus, operculo longiori, fructibus majoribus, et affinis *E. alaticaula* sed foliis juvenalibus pluris sessilibus oppositis, operculo longiori et fructibus majoribus differt.

Type: Victoria, Coalmine Road, Anglesea, K. Rule 0097, 10.vii.2000 (holotype: MEL; isotypes: AD, CANB, NSW).

Smallish, robust, sometimes multi-trunked *trees* to 18 m tall. *Bark* box-like, fibrous, thin, grey-brown, persistent, often extending to the upper trunk, less often forming a short basal stocking; upper trunk and branches smooth, light grey or whitish. *Seedling leaves* broadly ovate, opposite, sessile, lightly pruinose; seedling stems lightly pruinose. *Juvenile leaves* broadly ovate, broadly elliptical, cordate, sub-orbicular, sessile, amplexicaul, opposite for numerous pairs, apiculate, 4–8 cm long, 3–6 cm wide; upper surface lustrous, dark green; lower surface pale green; growth tips lightly pruinose, becoming lustrous with maturity; seedling stems glandular, square in cross-section, moderately winged. *Intermediate leaves* broadly ovate or broadly lanceolate, shortly petiolate, disjunct, slightly discoloured, lustrous, dark green. *Adult leaves* broadly lanceolate, falcate, pendulous, acuminate, concolorous, lustrous, green, 18–35 cm long,

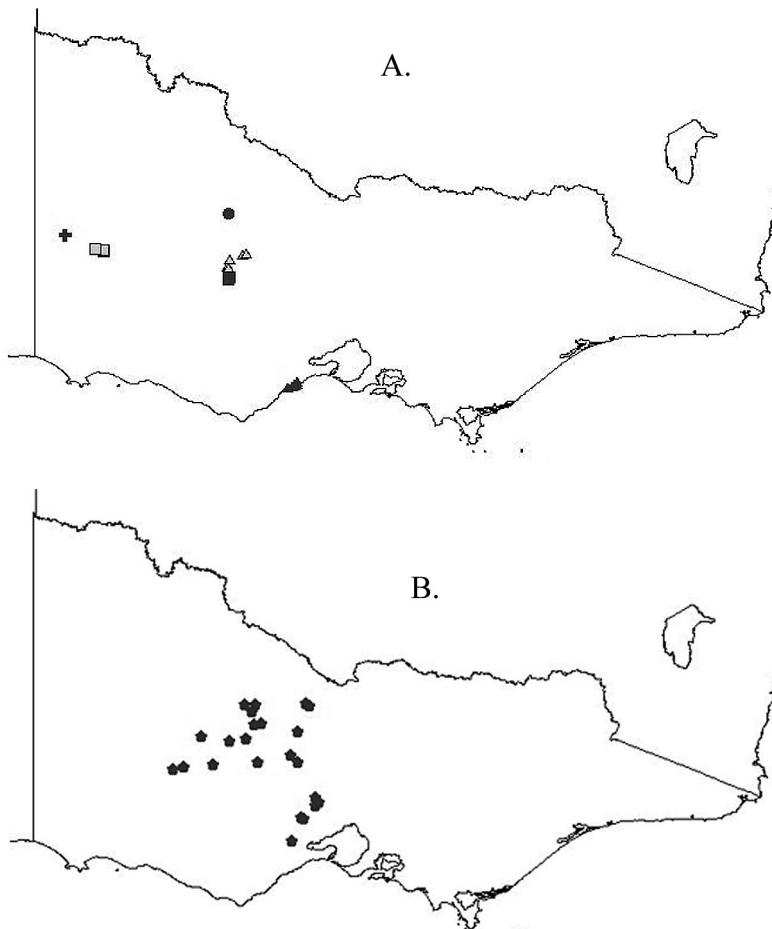


Figure 1. Distribution maps. A. *E. filiformis* ●; *E. hawkeri* □; *E. litoralis* ▲; *E. pyreneae* ■; *E. tricarpa* subsp. △; *E. walshii* +. B. *Eucalyptus polyanthemos* subsp. ◆

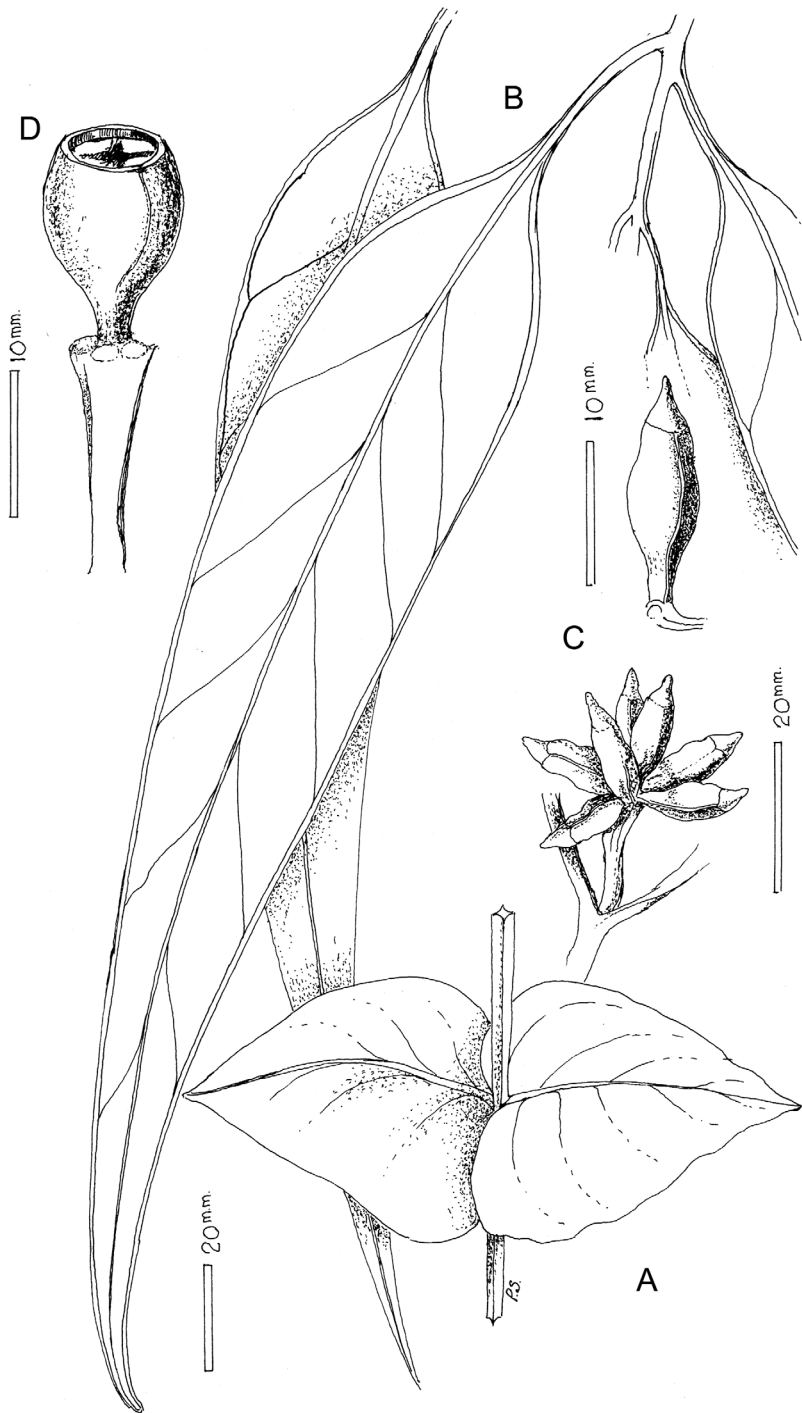


Figure 2. *Eucalyptus litoralis* a juvenile leaves; b adult leaves; c buds; d fruit.

2.5–4.5 cm wide; petioles 2.2–4.1 cm long; venation conspicuous, moderately reticulate; intramarginal vein remote, 3–5 mm from margin; oil glands regular, relatively small, scattered, intersectional and island. *Inflorescences* simple, axillary, 7-flowered; peduncles broadly flattened (strap-like), conspicuously ribbed, erect in orientation, 1.3–2.4 cm long, 3–5 mm wide. *Floral buds* sub-urceolate, 10–14 mm long (excluding pedicel), 4–6 mm diam.; pedicels 1–4 mm long; hypanthium ribbed, basally bulging, slightly waisted above or at the mid-point; scar present; operculum conical to rostrate, sometimes narrower than the hypanthium at the abscission zone but usually flush with the hypanthium at anthesis, 4–8 mm long; stamens inflexed; filaments white; anthers oblong, versatile, dorsifixed, dehiscent through longitudinal slits; ovular rows 4; flowering period autumn. *Fruits* cupular or barrel-shaped, thick-walled, basally tapered, smooth or sometimes moderately ribbed, sessile to shortly pedicellate, 9–12(–13) mm long, 8–11 mm diam.; pedicels thick, often indistinct, to 3 mm long; disc descending; locules 3 or 4; valves enclosed. *Fertile seeds* dark brown or black, 2–3 mm long, flattened, ovoid, pointed at one end, lacunose; hilum ventral. (Fig. 2).

Etymology: The epithet is derived from the Latin *litoralis* “of the shore” in reference to the coastal distribution of the species.

Distribution and habitat: *Eucalyptus litoralis* occurs along the Otway Coast of Victoria from north-east of Anglesea as far as Airey’s Inlet in the south-west, with an outlier occurring close to Lorne (Fig. 1). It favours poor soils on sandstone ridges and slopes which are often exposed to the prevailing ocean winds. The annual rainfall of Anglesea is approximately 800 mm, most of which falls in winter.

Associated species: *E. obliqua* L’Herit., *E. viminalis* Labill. subsp. *viminalis*, *E. aromaphloia* Pryor & Willis, *E. baxteri* (Benth.) Maiden & Blakely, *E. tricarpa* (L.A.S. Johnson) L.A.S. Johnson & K.D. Hill and *E. ovata* Labill. have been observed in association with *E. litoralis* whilst pure stands of *E. willisii* Ladiges, Humphreys & Brooker *sens lat.* occur nearby.

Conservation status: *E. litoralis* is locally abundant but populations close to Anglesea are under threat from housing developments. Some populations are secure within protected reserves including the Angahook-Lorne N.P. A code of 2VCa is recommended in accordance with Briggs and Leigh (1996).

Discussion: Parsons and Kirkpatrick (1972) studied the Anglesea populations in an attempt to determine whether they were hybrids. The authors concluded they were not on the basis of morphological uniformity of seedlings. Watson and Ladiges also recognised the purity of the Anglesea populations but opted to regard them as a minor variant within *E. alaticaulis*. Johnson and Hill (1990) recognised them as being sufficiently distinctive to be regarded as a separate taxon, as did Brooker and Slee (1997). In my opinion Watson and Ladiges’ concept of *E. alaticaulis* was too broad and, thus, the Anglesea populations are treated here as a new species.

The seedling stems of *E. litoralis* and its close relatives are square in cross-section (also often winged), the buds are pedicellate and the fruits usually basally tapered and shortly pedicellate. It is considered here somewhat distantly related to *E. goniocalyx*, despite some box-barked forms resembling that taxon in general appearance.

E. litoralis has a similar bark to *E. alaticaulis*, both types being relatively thin, loose, box-like and forming stockings to various heights. However, *E. alaticaulis* has seedlings whose growth tips are non-pruinose in early development and juvenile leaves becoming shortly petiolate and sub-opposite by about the 10th pair. Further, its buds are smaller and have a shorter operculum (3–4 mm long), with the operculum flush with the hypanthium at the abscission zone, and its fruits are smaller (6–10 mm long, 6–9 mm diam.).

Seedling trials of several provenances of *E. cypellocarpa sens. strict.* across its range have revealed that the species has variable seedlings. Seedling stems may be square in

cross-section and sometimes moderately winged or just round in cross section. Further, the lanceolate juvenile leaves may be strongly amplexicaul or basally obtuse. This may indicate that seedling stem morphology within the mountain grey gums is a less reliable diagnostic indicator than previously thought. Nonetheless, *E. cypellocarpa* can be distinguished from the new species by its taller habit (large, straight forest tree to 50 m tall), its smooth bark (plates and chunks of old bark often persisting on the lower trunk), its longer, narrower (lanceolate), acuminate juvenile leaves, its smaller buds with a shorter operculum (3–4 mm long) and its smaller fruits (6–10 mm long, 6–9 mm diam.).

E. goniocalyx has been compared with the Anglesea populations, for example, by Brooker and Slee (1997). Features which distinguish it from the new species include its pruinose seedlings with glaucous, orbicular juvenile leaves and mostly round, non-winged stems, its consistently smaller adult leaves (to 25 cm long, 3 cm wide), its bark which is short-fibred, thick, compact, sometimes crusty box type, extending to the secondary branches, and its smaller, consistently sessile buds and fruits.

Additional specimens examined: **VICTORIA:** Eumeralla Scout Camp, near coastal cliffs, Anglesea, *L. Costermans*, 4.xii.1966 (MEL); Currawong Falls walking track, 6 km WNW of Anglesea, *A.C. Beaglehole ACB63583*, 19.i.1979 (MEL); Anglesea Road to the west of the sports and recreation camp, *L.A.S. Johnson, K. Wilson & K. Hill 1719*, 10.iii.1986 (MEL); Urquart's Bluff on Great Ocean Road, *K. Rule 0099*, 10.vii.2000 (MEL); 2.3 north-east of Anglesea on the Great Ocean Road, between Forest Road and Coalmine Road, *K. Rule 0202*, 24.i.2002 (MEL); Boundary Road, Airey's Inlet, c. 700 m from Great Ocean Road, *K. Rule 0200*, 24.i.2002 (MEL); at the end of Ellimatta Road, ENE of Anglesea, *K. Rule 0204*, 24.i.2002 (MEL); Harvey Road, adjacent to the intersection with O'Donahue Road, c. 1 km west of Anglesea, *K. Rule 0205*, 24.i.2002 (MEL).

2. *Eucalyptus pyreneae* K. Rule, *sp. nov.*

Eucalypto cypellocarpa affinis habitu minore, caulibus plantarum juvenalibus alatis prominentibus, foliis juvenalibus latioribus, elliptico-ovatis, foliis adulus brevioribus, pedunculis brevioribus, alabastris pedicellatis valde, fructibus minoribus, et affinis *E. alaticaulae* sed cortice laeve, surculis plantularum pruinosis, foliis juvenalibus angustioribus, alabastris pedicellatis valde, fructibus minoribus differt.

Type: Victoria, Pyrenees Range, Mt. Avoca, Mountain Hut Road, 6.8 km from the Pyrenees Hwy., *K. Rule 0101*, 19.iv.2001 (holotype: MEL; isotypes: AD, CANB, NSW).

Smallish, often spreading or erect, slender *trees* to 18 m tall. *Bark* light grey, thin, box-like, forming a short stocking to at most mid-trunk, smooth, light grey or off-white above; all or most of the stocking shed in summer in sheets and strips. *Seedling leaves* broadly ovate to elliptical, blue-grey, pruinose, discolorous. *Juvenile leaves* broadly ovate or elliptical-ovate, sub-crenulate, opposite and sessile for numerous pairs, amplexicaul, apiculate, soft-textured, discolorous, dull or sub-lustrous, blue-green, 6–13 cm long, 5–9 cm wide; seedling stems pruinose, glandular, square in cross-section, prominently winged; growth tips pruinose; advanced juvenile leaves petiolate, disjunct, coarse-textured, lustrous, dark blue-green. *Intermediate leaves* ovate or ovate-lanceolate, shortly petiolate, disjunct, slightly discolorous, lustrous, green. *Adult leaves* lanceolate, sometimes falcate, petiolate, pendulous, acuminate, concolorous, lustrous, green, 12–25 cm long, 2–3.4 cm wide; petioles 1.8–2.9 cm long; venation moderately reticulate; intramarginal vein relatively remote, 2–3 mm from the margin; oil glands regular, scattered, island or intersectional. *Inflorescences* simple, axillary, 7-flowered; peduncles relatively slender, flattened, often becoming slightly angled in the fruit stage, 2–3 mm wide, 10–16 mm long. *Floral buds* ovoid-cylindrical, sometimes slightly waisted at mid-point, 6–8 mm long (excluding pedicel), 3–4 mm diam., often faintly ribbed; scar present; pedicels 5–8 mm long; operculum conical, 3–4 mm long, as wide as the hypanthium at the abscission zone; stamens inflexed; filaments white, all fertile; anthers

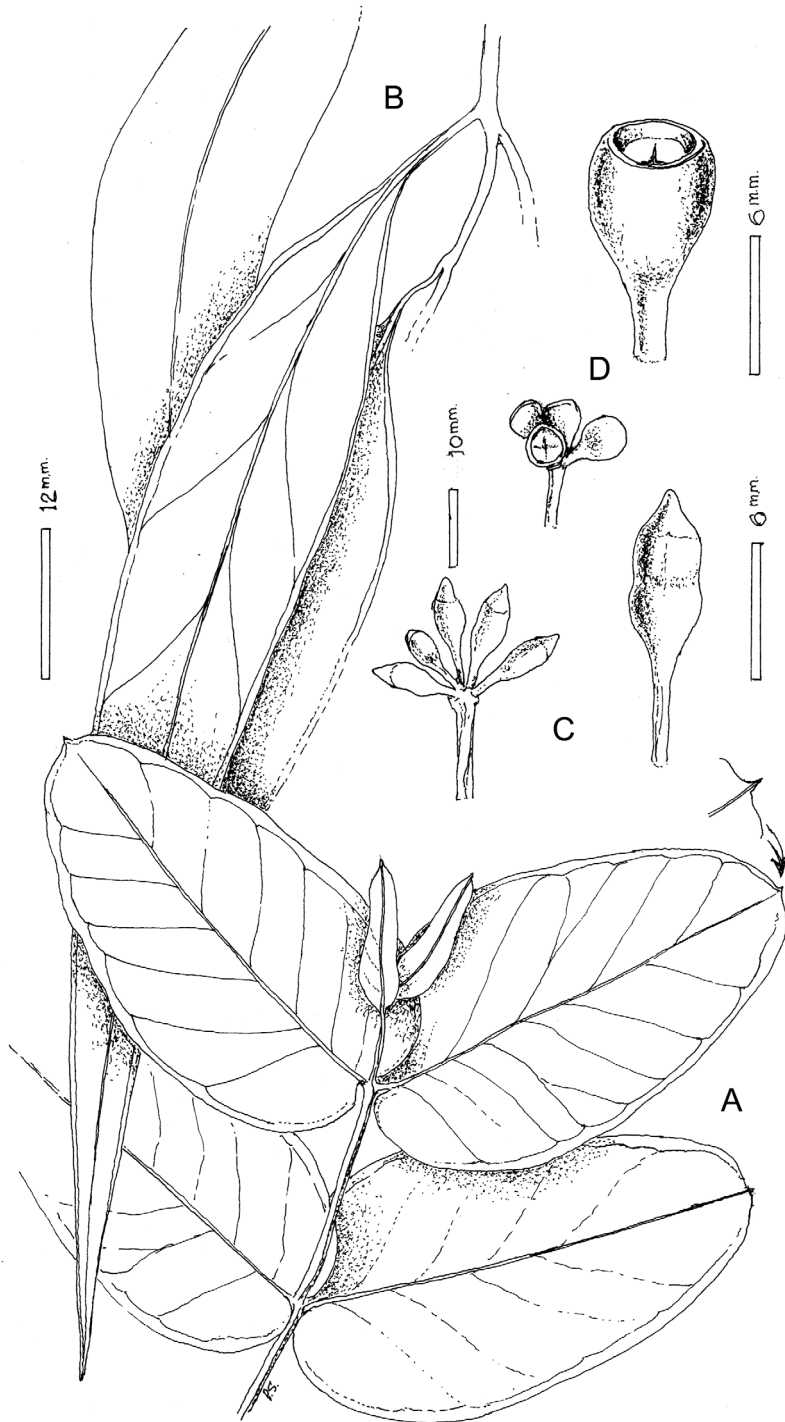


Figure 3. *Eucalyptus pyreneae* a juvenile leaves; b adult leaves; c buds; d fruit.

oblong, versatile, dorsifixed, dehiscing through longitudinal slits; ovular rows 4; flowering period autumn. *Fruits* cupular, thick-walled, smooth or faintly ribbed, basally tapered, 5–6 mm long, 4–6 mm diam.; pedicels 3–6 mm long; disc descending; locules 3 or 4; valves enclosed. *Fertile seeds* dark brown or black, c. 2 mm long, flattened, ovoid, pointed at one end, lacunose; hilum ventral. (Fig. 3).

Etymology: The epithet refers to the species' location which is the Pyrenees Range of west-central Victoria.

Distribution and habitat: The species is known only from Mt. Avoca at the eastern end of the Pyrenees Range in west-central Victoria (Fig. 1). It grows in shallow soils on dry rocky slopes at an altitude of above 600 m. The annual rainfall of the area is approximately 600 mm, most of which falls in winter.

Associated species: *E. aromaphloia* Pryor & Willis and *E. macrorhyncha* F. Muell. ex Benth., *E. bicostata* Maiden, Blakely & Simmonds, *E. nortonii* (Blakely) L.A.S. Johnson, *E. obliqua* L'Herit., *E. radiata* Sieb. ex DC. and *E. dalrympleana* Maiden occur with or adjacent to the new species. The Pyrenees Range is isolated from the occurrences of the new species' nearest relatives, *E. cypellocarpa* L.A.S. Johnson and *E. alaticaulis* R.J. Watson & Ladiges.

Conservation status: The species is relatively abundant across its range. Although in the Avoca S. F., it is considered vulnerable, especially to timber harvesting. In accordance with Briggs and Leigh (1996) a code of 2V is suggested as the current management regime of state forests offers no guarantee of long term protection.

Discussion: Watson and Ladiges (1987) noted that the form occurring in the Pyrenees Range has juvenile leaves similar to *E. alaticaulis* and alluded to it as an outlier of that species. Brooker and Slee (1997) included it within *E. cypellocarpa*. My investigations, including seedling trials and field studies, indicate that this form is distinctive within the mountain grey gum complex by the combination of the following features; a smallish tree habit; smooth summer bark and a light grey, thin, box-like stocking of winter bark; broadly elliptical-ovate or ovate, bluish and later lustrous, blue-green juvenile leaves; squared, prominently winged seedling stems; relatively small adult leaves; narrow, angled or flattened peduncles (particularly in the fruit stage); distinctly pedicellate buds; and relatively small fruits. However, it possesses slightly waisted buds which is a distinguishing feature of the group.

E. cypellocarpa differs from the new species by its seedling stems never being prominently winged, its lanceolate, acuminate juvenile leaves, its taller habit, its bark, which does not feature the seasonal box-like stocking, its longer peduncles (1.3–2.4 cm long), its generally larger fruits (6–9 mm long, 6–8 mm diam.) and its longer adult leaves (to 35 cm long).

E. alaticaulis is distinguished from the new species by its variable habit (robust mallees, small, spreading trees or slender, medium-sized trees), its non-pruinose seedling stems and growth tips, its sub-orbicular or orbicular juvenile leaves, which become petiolate in early development, its broader, more strap-like peduncles (3–5 mm wide) and its larger fruits (fruits 6–10 mm long, 6–9 mm diam.).

Additional specimens examined: **VICTORIA**: Pyrenees S. F. No 2 Creek Road, R.J. & Y.A. Bishop, 6.xi.1982 (MEL); Mount Avoca Road 1.2 km from lookout, K. Rule 00103, 20.viii.2000; Mountain Hut Road, 7 km from Pyrenees Highway, K. Rule 0102, 19.iv.2001 (MEL).

SECTION ADNATARIA: SERIES SUBBUXEALES: THE MALLEE-BOXES

Recent surveys of the Wimmera region of Victoria have yielded several very restricted, unnamed, true-breeding eucalypts. Many are mallee-boxes, three of which are treated here as new species. The pitiful numbers of some of their populations epitomise the plight

of the native flora in this part of Victoria where extensive tracts of land have been cleared for agriculture. What is left of the native vegetation outside protected reserves consists of small remnants on roadsides and farms. These discoveries suggest that a richer diversity of eucalyptus species existed in this part of the state than was previously thought.

Brooker and Kleinig (1990) noted the importance of leaf venation as a tool to segregate Western Australian taxa into natural groups, particularly at the series level. For example, *E. eremophila* (Diels) Maiden and its allies have leaves without visible lateral veins (apparently obscured by excessively crowded oil glands), while *E. occidentalis* Endl. and its allies feature conspicuously reticulate venation. They also isolated *E. pimpiniana* Maiden into a monospecific series because of its distinctive venation and oil gland patterns.

Traditionally the mallee-boxes have formed the series *Subbuxuales* Blakely but were included within the series *Molucanae* Blakely by Brooker (2000) in his reassessment of the eastern boxes. That author used venation patterns to support the segregation of *E. froggattii* Blakely and *E. porosa* F. Muell. ex Miq. into separate monospecific “supraspecies” (subseries). While both *E. froggattii* and *E. porosa* have numerous island glands and a remote intramarginal vein, the former has faint lateral veins which do not intersect with the mid-vein while the latter has conspicuous, widely spaced, unbroken lateral veins.

Within the other the mallee-boxes adult leaves exhibit a variety of venation types and oil gland patterns which not only permit the further identification of some natural groups but serve as useful taxonomic tools. *E. odorata* Behr ex Schlecht., *E. polybractea* R.T. Baker, *E. wimmerensis* K. Rule, *E. aenea* K.D. Hill, *E. castrensis* K.D. Hill and *E. filiformis* K. Rule sp. nov. (described below), for example, have moderately reticulate adult leaves with visible lateral veins, widely-spaced, veinlets and numerous, to sparsely relatively large, irregular island glands. *E. viridis* R.T. Baker is somewhat distinctive by its sparsely reticulate adult leaves, whose lateral veins are obscured or faint and often not intersecting with the intramarginal vein, its lack of veinlets and its relatively large, sometimes indistinct island glands. The somewhat contentious *E. silvestris* K. Rule and the recently described *E. albopurpurea* (Boomsma) Nicolle (formerly *E. lansdowneana* F. Muell. & J.E. Brown subsp. *albopurpurea* Boomsma) have densely reticulate adult leaves with conspicuous lateral veins, crowded, relatively thick veinlets and scattered, variously-sized, irregular intersectional glands. In contrast, *E. hawkeri* K. Rule sp. nov. and *E. walshii* K. Rule sp. nov. (both described below) have densely reticulate adult leaves with crowded, faint, often broken veinlets and numerous, relatively large island and intersectional oil glands. For comparisons of other features of the mallee-boxes see Table 1.

1. *Eucalyptus hawkeri* K. Rule, sp. nov.

Eucalypto odoratae affinis foliis adultis nitentioribus olivaceis pendulis reticulatis dense et fructibus minore differt, et *Eucalypto walshii* affinis habitu elatiore, cortice persistente buxiforme, foliis adultis nitentioribus olivaceis pendulis et fructibus elongatioribus differt.

Type: Victoria, Mt. Arapiles, the southern access track, near the intersection with the south-western access track, *K. Rule 0219* & *P. Hawker*, 6.iv.2002 (holotype: MEL; isotypes: AD, CANB, NSW).

Slender *mallees* or *trees* to 15 m tall, old trees sometimes umbrageous or decumbent. *Bark* dark grey-brown, box type, persistent as a stocking extending to at least mid-trunk, smooth, light grey to red-brown above; old bark decorticating in broad strips. *Seedling leaves* narrowly elliptical, petiolate, opposite for 3 or 4 pairs, blue-green, discolorous. *Juvenile leaves* narrowly lanceolate, lanceolate or narrowly elliptical, rarely falcate, alternate, petiolate, dull, blue-green or sub-glaucous, slightly discolorous, 6–12 cm long,

Table 1. Features of mallee box

<i>Eucalyptus</i>	<i>odorata</i>	<i>polybractea</i>	<i>wimmerensis</i>	<i>aenea</i>	<i>castrensis</i>	<i>filiformis</i>
HABIT	Large mallee or small, spreading tree	Mallee, rarely slender tree	Mallee	Slender, small mallee	Malles or slender, small tree	Semi-effuse mallee
BARK	Box type over most of the trunk	Smooth or with variable box type stocking	Smooth or with box type basal stocking	Smooth	Smooth, often with short box type basal stocking	Box type to major branches
JUVENILE LEAVES Size (length x width, cm)	6–10 x 1.5–2.6	5–10 x 1.0–1.5	4–8 x 1.0–1.6	5–8 x 0.7– 1.8	6–12 x 1.5–4	5–10 x 0.2–0.4
Colour/lustre	Dull, blue-green, rarely faintly pruinose	Dull, glaucous or blue-green	Dull, blue-green or sub-glaucous	Dull, blue-green	Dull, blue-green	Dull, blue-green or sub-glaucous
Petiole length (cm)	To 1.0	To 1.0	To 1.2	To 1.0	To 1.4	To 0.4
ADULT LEAVES Size (length x width, cm)	6–12 x 1.2–2.0	5–9 x 1.0–1.7	5–8 x 1.0–1.5	5–11 x 0.9– 1.8	6–13 x 0.8–2.2	5-8 x 0.7-1.1
Colour/lustre	Dull, or sub-lustrous, blue-green, olive-green or rarely sub-glaucous	Dull, glaucous or sub-glaucous	Sub-lustrous or lustrous, blue-green or green	Lustrous, light-green	Lustrous, green	Dull, or sub-lustrous
Petiole length (cm)	To 1.5	To 1.5	To 1.3	To 1.0	To 1.5	To 1.2
Intramarginal vein (mm from margin)	1-2	c. 1	c. 1	c. 1	1–2	c. 1
INFLORESCENCES	Simple, axillary	Simple, axillary	Simple, axillary	Simple, axillary, rarely paniculate	Simple, axillary	Simple, axillary
Peduncle length (cm)	0.4–1.2	0.4-1.0	0.5-1.3	0.4-0.7	0.7-1.0	0.7-1.0
BUDS Shape	Clavate or slightly diamond-shaped, sometimes angular	Clavate or ovoid	Ovoid or slightly clavate	Ovoid	Ovoid	Ovoid-fusiform
Size (length x width, mm)	6–8 x 4–5	5–6 x 3–4	5–6 x 3–4	4–6 x 2–3	5–6 x 2-3	6-8 x 3-4
Pedicel length (mm)	2–5	4–7	4–6	1–3	2–4	4-6
Pruinosity	Absent	Present	Absent or rarely faint	Absent	Absent	Present
FRUITS Shape	Cupular or barrel-shaped, often basally angled	Cupular, barrel-shaped or sub-cylindrical	Sub-cylindrical or cupular	Cupular	Cupular	Sub-cylindrical or barrel-shaped
Size (length x width, mm)	5–8 x 4–6	5–6 x 4–5	4 -6 x 4–6	3–5 x 3–5	4–5 x 4–6	6-9 x 4-5
Pedicel length (mm)	1–4	3–5	2–4	1–3	1–4	3-5

<i>viridis</i>	<i>hawkeri</i>	<i>walshii</i>	<i>silvestris</i>	<i>albopurpurea</i>	<i>porosa</i>	<i>froggattii</i>
Mallee or small, slender tree	Mallee or slender tree	Slender tree	Large mallee or small spreading tree	Mallee or small tree	Large, spreading mallee or small tree	Mallee or slender tree
Box type stocking to upper stem	Box type stocking to upper trunk	Smooth with basal box type stocking	Box type to at least major branches	Usually box type stocking	Box type to secondary branches	Smooth with short basal box type stocking
4–10 x 0.4–0.8	6–12 x 1.0–1.8	5–10 x 1.2–2.3	5–8 x 1.4–3.2	4–7 x 1.0–3.0	5–9 x 2.5–3.6	5–9 x 1.8–2.8
Lustrous, green	Dull, blue-green	Dull, blue-green	Dull, blue-green	Lustrous, green	Dull, blue-green	Lustrous, green
To 0.2	To 1.2	To 1.0	To 1.2	To 1.2	To 1.3	To 1.0
5–8 x 0.6–0.8	7–12 x 0.8–1.7	7–10 x 1.4–2.6	6–10 x 1.2–2.2	6–2 x 2.0–3.5	7–12 x 1.3–1.9	6–12 x 1.0–1.8
Lustrous, dark green	Lustrous, olive-green	Dull or sub-lustrous, blue-green	Sub-lustrous or lustrous green or olive-green	Lustrous, green	Lustrous, green	Lustrous, green
To 0.6	To 1.6	To 1.4	To 1.4	To 1.4	To 1.4	To 1.5
c. 1	c.1	c. 2	c. 2	c. 2	2– 3	2-3
Simple, axillary or rarely paniculate	Simple, axillary	Simple, axillary	Simple axillary	Simple, axillary and paniculate	Simple, axillary	Simple, axillary and paniculate
0.5–0.9	0.7–1.1	0.7–1.1	0.7–1.0	1.0–1.4	0.4–1.1	0.7–1.4
Ovoid or fusiform	Ovoid or fusiform	Ovoid-fusiform	Ovoid or slightly clavate	Clavate, ovoid or fusiform, often basally angular	Clavate or ovoid	Clavate or ovoid, quadrangular
4–5 x 2–3	6–7 x 3–4	5–7 x 3–	5–6 x 3 – 4	7–11 x 3–5	5–8 x 3–4	7–10 x 4–5
4–6	4–8	2–4	4–6	0–3	3–5	3–5
Absent	Absent	Absent	Absent	Absent	Absent	Absent
Cupular or hemispherical	Cylindrical, sub-cylindrical or barrel-shaped	Cupular	Obconical, cupular or sub-cylindrical	Barrel-shaped to cupular, often basally angular	Barrel-shaped or cupular	Cupular or sub-cylindrical, quadrangular
3–5 x 3–4	6–7 x 3–5	5–6 x 4–5	4–6 x 3–4	6–10 x 6–9	5–7 x 5–6	8–10 x 6–8
3–5	3–6	1–3	3–5	0–3	3–5	2–4

1.0–1.8 cm wide; nodes widely spaced; petioles 0.6–1.2 cm long. *Intermediate leaves* lanceolate, sometimes falcate, pendulous, concolorous, slightly broader than the juvenile leaves. *Adult leaves* narrowly lanceolate or lanceolate, sometimes falcate, pendulous, acuminate, uncinata, glandular, lustrous, olive-green, becoming slightly bluish in winter, 7–12 cm long, 0.8–1.7 cm wide; petioles terete, 1.0–1.6 cm long; venation moderately acute (35–50 degrees), densely reticulate (conspicuous lateral veins and semi-crowded faint veinlets forming small areoles); intramarginal vein c. 1 mm from the margin; oil glands large, numerous, irregular, island and intersectional. *Branchlets* often lustrous, red-brown. *Inflorescences* simple, axillary, 7–11-flowered, along the main axis or along terminal, leafy branchlets; peduncles angular or terete, slender, 0.7–1.1 cm long. *Floral buds* ovoid or fusiform, unscarred (outer operculum intact), often lustrous, red-brown, 6–7 mm long, 3–4 mm wide; operculum conical, c. half the length of the hypanthium; pedicels slender, 4–8 mm long; filaments white; stamens irregularly inflexed, all fertile; anthers adnate, basifixed, globular, dehiscing through lateral pores; ovules in 4 vertical rows; flowering period autumn. *Fruits* sub-cylindrical, cylindrical or barrel-shaped, basally tapered, lustrous, red-brown, 6–7 mm long, 3–4(–5) mm diam.; pedicels slender, 3–6 mm long; disc descending; locules 3 or 4; valves enclosed. *Fertile seeds* ovoid, slightly flattened, finely reticulate, dark brown; hilum ventral. (Figs 4, 7).

Etymology: The epithet honours Mr Peter Hawker of Natimuk, the current park ranger of the Mt. Arapiles-Toosan State Park, and recognises his significant contributions to the understanding of this new species and of several other rare eucalypts of the Wimmera region.

Distribution and habitat: *E. hawkeri* is known only from the Mt. Arapiles area in the southern Wimmera where it is scattered around the northern, south-western and southern bases of the mountain. A small outlier population occurs at Jane Duff Reserve, approximately 8 km to the west of Mt. Arapiles (Fig. 1). It occurs on shallow, often gravely soils derived from lateritic sandstone bedrock. The annual rainfall of nearby Horsham is approximately 500 mm, most of which falls in winter.

Associated species: The new species occurs in pure stands and forms woodland communities with *E. leucoxyloides* F. Muell. subsp. *stephaniae* K. Rule and *E. microcarpa* Maiden and abuts stands of *E. largiflorens* F. Muell. when adjacent to poorly drained, lower sites. It also occurs in mallee communities where it mixes with variants of *E. wimmerensis*, *E. phenax* Brooker & Slee, *E. costata* F. Muell. subsp. *murrayana*, L.A.S. Johnson & K.D. Hill, *E. macmahonii* K. Rule and *E. leptophylla*. F. Muell. ex Miq. In the Mitre Rock area, less than a kilometre to the north of Mt. Arapiles, there is evidence of substantial interbreeding between *E. hawkeri* and *E. microcarpa*. Previously (1990) the current author had interpreted these as hybrids between *E. microcarpa* and *E. wimmerensis*. Other hybrids have been identified around the northern and the north-eastern bases and near the south-western corner of the reserve.

Conservation status: *E. hawkeri* is relatively abundant around the northern, north-western, western and south-western bases of Mt. Arapiles. The survival of these stands appears secure with the park's current management regime. However, the few stands and individuals which exist outside the park may be vulnerable to further clearing. In accordance with Briggs and Leigh (1996) a code of 2RCa is recommended.

Discussion: *E. hawkeri* is distinguished within the mallee-boxes by its tallish mallee or slender tree-like habit, its substantial stocking of box bark, its relatively narrow, bluish juvenile leaves, its narrowly lanceolate, pendulous, densely reticulate, lustrous, olive-green adult leaves and its smallish, sub-cylindrical, cylindrical or barrel-shaped fruits.

E. walshii is tentatively placed adjacent to *E. hawkeri* on the basis of the two having adult leaves with a similarly dense reticulation. *E. walshii*, however, is different by its smaller, more slender habit, its smooth, seasonally whitish bark, its broader, bluish, sub-lustrous adult leaves and its cupular fruits.

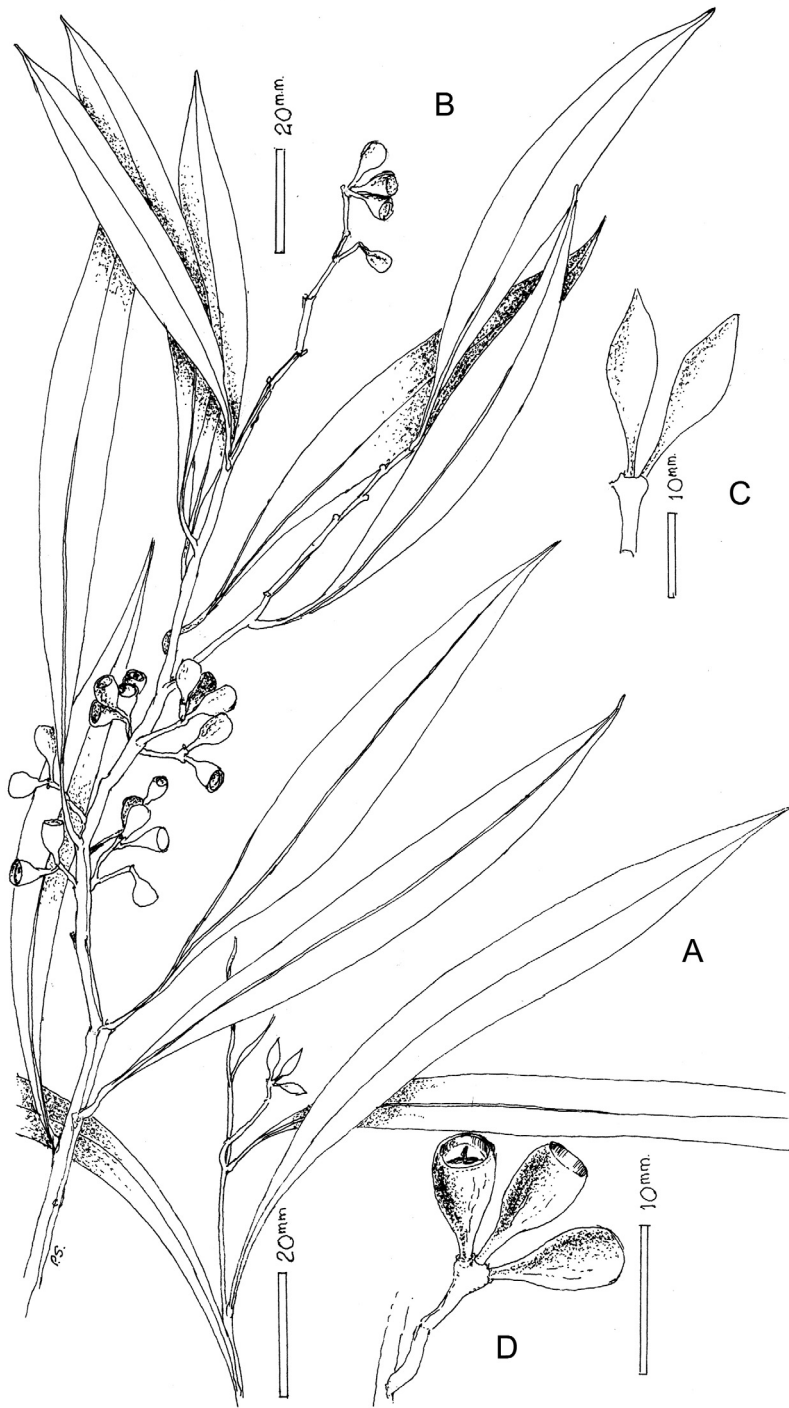


Figure 4. *Eucalyptus hawkeri* **a** juvenile leaves; **b** adult leaves and fruits; **c** buds; **d** fruits.

There are some similarities between the South Australian taxon, *E. odorata*, and *E. hawkeri* in habit and bark but they are different in leaf morphology. In particular, the adult leaves of *E. odorata* are generally larger (to 12 cm long, 2 cm wide), semi-rigid, duller, and moderately reticulate. Also, during growth spurts, its canopy becomes appreciably sub-glaucous whereas the canopy of *E. hawkeri* is appreciably lustrous. It is further distinguished from *E. hawkeri* by its generally larger fruits (5–8 mm long, 4–6 mm diam.).

E. silvestris is a mallee-box of the Wimmera region which also features box bark, simple, axillary inflorescences and smallish buds and fruits. However, it is separable from *E. hawkeri* by its often depauperate habit, its more extensive box bark, which extends to the major branches, and its adult leaves which are different in venation and oil gland patterns. As well, the winter foliage of *E. silvestris* becomes appreciably dull whilst that of *E. hawkeri* remains lustrous and *E. silvestris* has broader, shorter juvenile leaves (to 8 cm long, 3 cm wide). Further, *E. silvestris* has a more northerly distribution where it occurs on dry, loamy rises in the northern Wimmera.

E. microcarpa is also a common box-barked tree in the Mt. Arapiles area, particularly adjacent to its eastern and south-eastern slopes. However, that species can be distinguished from *E. hawkeri* by its taller habit, its usually lighter, more compact bark, its broader juvenile leaves (3.5–9.0 cm wide) and its duller, broader adult leaves (1.8–3.5 cm wide), with venation and oil gland patterns similar to *E. silvestris* and *E. albolpurpurea*, and its paniculate inflorescences.

Additional specimens examined: **VICTORIA:** Mt. Arapiles, along the northern access road, c. 500 m from the north-eastern entrance, *K. Rule 9537*, 9.iv.1995 (MEL); 1.5 km north of the Mt. Arapiles camping ground, *K. Rule 9615 & P. Hawker*, 9.ii.1996 (MEL); the southern access track, on the southern side of Mt. Arapiles, *K. Rule 9856 & P. Hawker*, 28.ix.1998 (MEL); adjacent to the transmitting tower on the north-western slope of Mt. Arapiles, *K. Rule 9858*, 28.ix.1998 (MEL); 1.6 km north of the Mt. Arapiles camping ground, *K. Rule 0004*, 10.iv.2000 (MEL); North-east entrance to Mt. Arapiles Park, *K. Rule 0015*, 10.iv.2000 (MEL); Jane Duff Reserve, *K. Rule 0232 & P. Hawker*, 5.iv.2002 (MEL).

2. *Eucalyptus walshii* K Rule *sp. nov.*

Eucalypto odoratae affinis habitu minore, cortice laeve niveo, foliis adultis reticulatis dense et fructibus minore differt, et *Eucalypto hawkeri* affinis habitu minore, cortice laeve niveo, foliis adultis latioribus impolitibus et fructibus cupularibus differt.

Type: Victoria, c. 400 m north of Broughton's Waterhole, Little Desert, *K. Rule 0231 & P. Hawker*, 5.iv.2002 (holotype: MEL; isotypes: AD, CANB, NSW).

Small, slender, pole-like, *trees*, 4–9 m tall. *Bark* smooth, whitish in summer, light grey in winter; old bark pale, grey-brown, decorticating in thin strips and plates; basal bark box-like, forming a short stocking of < 1 m high. *Seedling leaves* narrowly elliptical, opposite for a few pairs, discolorous, pale green. *Juvenile leaves* elliptical-lanceolate or narrowly lanceolate, disjunct, petiolate, acuminate, dull, blue-grey, becoming lightly pruinose with age, slightly discolorous, 5–10 cm long, 1.2–2.3 cm wide; petioles 0.5–1.0 cm long. *Intermediate leaves* ovate-lanceolate, dull, blue-green, slightly broader than the juvenile leaves. *Adult leaves* lanceolate or ovate-lanceolate, acuminate, uncinata, sub-lustrous, blue-green, 7–10 cm long, 1.4–2.6 cm wide; petioles 0.8–1.4 cm long; venation moderately acute (35–50 degrees), densely reticulate (conspicuous lateral veins and a semi-crowded network of faint veinlets); intramarginal vein 2mm from the margin; oil glands numerous, irregular, island and intersectional. *Inflorescences* simple, axillary, 7–11-flowered; peduncles angular, 0.7–1.1 cm long. *Floral buds* ovoid-fusiform, non-scarred (outer operculum intact), 5–7 mm, long, 3–4 mm diam.; pedicels 2–4 mm long; operculum shortly conical, as wide as hypanthium, 3–4 mm long; stamens regularly inflexed, all fertile; filaments white; anthers adnate, globoid, basifixed, dehiscing through lateral pores; ovules in 4 vertical rows;



Figure 5. *Eucalyptus walshii* **a** juvenile leaves; **b** adult leaves, buds and fruit; **c** buds; **d** fruits.

flowering period autumn. *Fruits* cupular, 5–6 mm long, 4–5 mm diam.; pedicels 1–3 mm long; disc descending; locules 3 or 4; valves enclosed. *Fertile seeds* irregular-oblong, brown, finely reticulate; hilum ventral. (Figs 5, 7).

Etymology: The name honours Mr. Neville Walsh of the National Herbarium of Victoria for his monumental contributions to the understanding of Victoria's native flora.

Distribution and habitat: *E. walshii* is known only from a single population growing in siliceous sands on the north side of a low hill near Broughton's Waterhole in the central section of the Little Desert N.P. in Victoria's Wimmera region (Fig. 1). The annual rainfall of nearby Nhill is approximately 400 mm, most of which falls in winter.

Associated species: The new species grows with *E. wimmerensis* whilst *E. costata* subsp. *murrayana*, *E. arenacea* Marginson & Ladiges and *E. leucoxyton* F. Muell. subsp. *pruinosa* (F. Muell. ex Miq.) Boland occur in the immediate vicinity. *E. sabulosa* K. Rule and *E. leptophylla* also occur in the area.

Conservation status: The known number of mature trees, saplings and seedlings is 36. Despite occurring within the Little Desert N.P., the population is by no means secure due to its size. Searches of the immediate area have located no other populations. However, it is possible that other populations exist, given the vastness of the Little Desert. In accordance with Briggs and Leigh (1996) a status of 2E is recommended.

Discussion: *E. odorata* is type species for the Series *Subbuxaeales* Blakely to which *E. walshii* belongs. However, that species is readily distinguished from *E. walshii* by its usually larger habit, its persistent box bark, its moderately reticulate adult leaves and its generally larger fruits (5–8 mm long, 4–6 mm diam.).

When first discovered in 1997 the new species was thought to be a relative of *E. albopurpurea* on the basis of its relatively broad adult leaves. However, that species has a different leaf venation and has paniculate inflorescences. *E. albopurpurea* is further different by its generally larger, more robust habit, its box type bark, which can extend over most of the trunk, its angled, more elongated buds and its larger, often angled fruits (6–10 mm long, 6–9 mm diam.).

E. walshii is tentatively placed with the newly described *E. hawkeri* on the basis of their similar adult leaf venation and oil gland patterns. However, that species is different by its taller habit, its long stocking of persistent box bark, its narrower, more lustrous, greener, pendulous adult leaves and its generally narrower fruits. Further, *E. hawkeri* occurs on gravelly soils and not siliceous sands.

E. wimmerensis, a common mallee-box throughout the Little Desert, is not readily confused with the new species. Although both species have similar juvenile leaves (in size, shape and colour) and a bluish tinge to the canopy, *E. wimmerensis* differs from the new species by its mallee habit with many stems arising from the lignotuber, its grey or brown rather than whitish bark, and its narrower (1.0–1.6 cm wide), greener and moderately reticulate adult leaves.

Additional specimens examined: **VICTORIA**: c. 400 m north of Broughton's Waterhole, Little Desert N.P., *K. Rule* 97139, 14.ix.1997 (MEL); c. 400 m north of Broughton's Waterhole, Little Desert N.P., *K. Rule* 9866 & *P. Hawker*, 29.ix.1998 (MEL).

3. *Eucalyptus filiformis* K Rule *sp. nov.*

Eucalypto viridio affinis plantulis et foliis repullulantibus, foliis adultis reticulatis moderate et fructibus subcylindricis differt.

Type: Victoria, Southern slope of Mt Jeffcott, *K. Rule* 9933, 8.vi.1999 (MEL: holotype).

Semi-effuse, lignotuberous *mallees* to 6 m tall. *Bark* box-like, light grey, extending to the upper branches. *Seedling leaves* linear, sessile, opposite for a few pairs, slightly



Figure 6. *Eucalyptus filiformis* **a** juvenile leaves; **b** adult leaves and buds; **c** buds; **d** fruit.

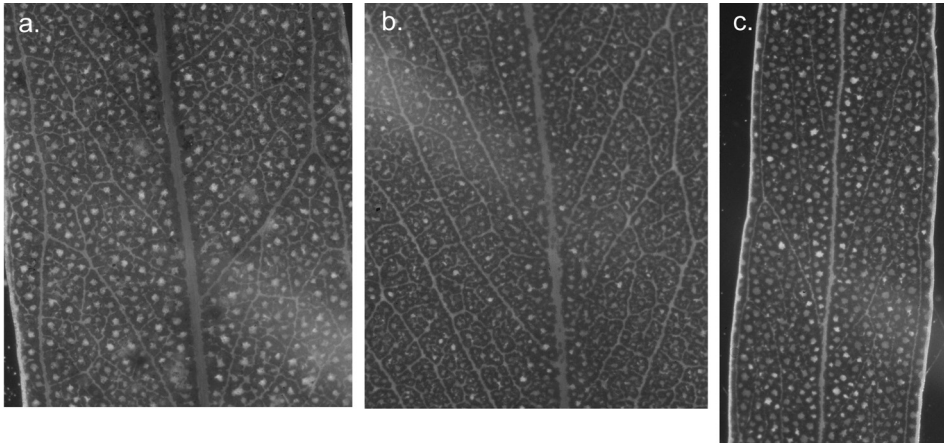


Figure 7. Leaf showing venation and oil glands **a** *E. hawkeri*; **b** *E. walshii*; **c** *Eucalyptus filiformis*.

discolorous, green; nodes crowded. *Juvenile leaves* filiform, broadening in advanced juvenility, crowded, sub-sessile for numerous pairs, disjunct, acuminate, faintly discolorous, blue-green, becoming blue-grey and lightly pruinose with age, 5–10 cm long, 0.2–0.4 cm wide; 0.1–0.4 cm long. *Intermediate leaves* linear-elliptical, shortly petiolate, blue-grey, lightly pruinose. *Coppice leaves* linear-elliptical, crowded, pruinose. *Adult leaves* narrowly lanceolate or narrowly elliptical, crowded, acuminate, uncinata, concolorous, sub-lustrous in summer, dull in winter, blue-green, 5–8 cm long, 0.7–1.1 cm wide; petioles 0.8–1.2 cm long; venation moderately acute (35–45 degrees), moderately reticulate with faintly visible lateral veins extending to the intramarginal vein; veinlets faint; intramarginal vein c. 1 mm from the margin; oil glands numerous, relatively large, irregular, mostly island. *Inflorescences* simple, axillary, 7(–11)-flowered; peduncles slender, angular, 8–10 mm long. *Floral buds* ovoid-fusiform, pruinose, unscarred (outer operculum intact), 6–8 mm long, 3–4 mm diam.; pedicels 4–6 mm long; operculum conical, c. 3 mm long; stamens irregularly inflexed, all fertile, filaments white; anthers adnate, basifixed, globoid, dehiscing through lateral pores; ovules in 4 vertical rows; flowering period late autumn. *Fruit* sub-cylindrical to barrel-shaped, basally tapered, thin-walled, brown, 6–9 mm long, 4–5 mm diam.; pedicels 3–5 mm long; disc descending; locules 3 or 4; valves enclosed. *Fertile seeds* irregularly ovoid, dark brown, shallowly reticulate, c. 1 mm long; hilum ventral. (Figs 6, 7).

Etymology: The epithet is derived from the Latin *filum* “thread” and *forma* “shape” in reference to the extremely narrow juvenile leaves of the new species.

Distribution and habitat: The known clump of *E. filiformis* occurs on the private property on the southern slope of Mt Jeffcott in shallow red soils over a sandstone bedrock. Mt Jeffcott, which is about 20 km to the west of Charlton on the edge of the Wimmera region, marks the southern extremity of the Jeffcott Range (Fig. 1). The annual rainfall of the area is about 450 mm, most of which falls in winter.

Associated species: *E. filiformis* occurs as an under-storey species in a remnant woodland community dominated by *E. leucoxyloides* subsp. *pruinosa*. *Eucalyptus porosa* and *E. microcarpa* occur nearby, as does a single, smooth-barked, whipstick mallee with similar adult leaves to the new species. This mallee, which is a suspected hybrid with *E. filiformis* as one of the parents, in the four years it has been under observation, has not produced seeds.

Conservation status: Reliable information provided by local naturalists and others indicates that the new species exists only at the type locality. The owners of the property, the Mortlock family of Dunolly have expressed concern for the survival of the species

and its small numbers offer no certainty in the long term. In accordance with Briggs and Leigh (1996) a code of 2E is recommended.

Discussion: *E. filiformis* is distinguished within the mallee-boxes by its smallish, semi-effuse habit, its persistent, light grey box bark, its filiform, crowded, sub-sessile, lightly pruinose juvenile leaves, its bluish adult leaves, its pruinose buds and its sub-cylindrical to barrel-shaped, thin-walled fruits. It shares features with both *E. viridis* and *E. polybractea* but is regarded here as having a taxonomic position closer to the former.

E. viridis is similar by its appreciably narrow, sub-sessile, crowded juvenile leaves. However, it differs by its lustrous, green leaves at all stages (the adult leaves in particular exhibiting obscured venation), its green buds and its smaller, hemispherical or cupular fruits (3–5 mm long, 3–4 mm diam.) which are green when immature.

The pruinose features of *E. filiformis* suggest an affinity with *E. polybractea* which is a common species of mallee-box communities of north and west-central Victoria. However, it differs from the new species by its seasonally smooth bark (accumulated box bark is shed in summer), its broader, distinctly petiolate, less crowded juvenile leaves (in *E. polybractea* to 1.5 cm wide and petioles to 1.0 cm long), its broader adult leaves (1.0–1.7 cm wide) and its relatively thick-walled fruits.

The mallees of *E. filiformis* exhibit uniformity in most features, as do their seedlings raised in seedling trials. However, there is slight variation in leaf length and width between but not within the seedlings raised from the sampled seedlots, which suggests that they may not be derived vegetatively from a single clone like the equally rare *E. recurva* Crisp from near Braidwood in south-eastern New South Wales.

Additional specimens examined: **VICTORIA:** southern slope of Mt Jeffcott, *K. Rule* 9849, 29.ix.1998 (MEL); southern slope of Mt Jeffcott, *K. Rule* 0046, 27.vi.2000 (MEL).

SERIES MELLIODORAE: THREE-FLOWERED IRONBARK

The new taxon treated here is a markedly pruinose form of three-flowered ironbark, *Eucalyptus tricarpa* (L.A.S. Johnson) L.A.S. Johnson & K.D. Hill, which occurs in the St Arnaud district and which is here described as a new subspecies.

KEY TO THE SUBSPECIES OF *E. tricarpa*

1. All structures non-pruinose; adult leaves blue-green or green.....subsp. *tricarpa*
- 1a. Seedlings, branchlets, petioles and buds copiously pruinose; adult leaves greyish.....
.....subsp. *decora*

Eucalyptus tricarpa (L.A.S. Johnson) L.A.S. Johnson & K.D. Hill subsp. *decora* K. Rule subsp. nov.

A subspecies typical foliis juvenalibus angustioribus pruinosis, petiolis ramulis et alabastris pruinosis copiose differt.

Type: Victoria, Sunraysia Highway, 42.4 km south of the southern round-about, St Arnaud, *K. Rule* 0250, 10.v.2002 (holotype: MEL; isotypes: AD, CANB, NSW).

Smallish trees to 15 m tall. *Bark* grey to dark grey, impregnated with kino (ironbark type), deeply furrowed, extending to minor branches. *Juvenile leaves* linear-elliptical or narrowly elliptical, often falcate, disjunct, shortly petiolate, apiculate, concolorous, pruinose, blue-grey, 5–9 cm long, 0.5–1.1 cm wide; petioles pruinose; stems pruinose. *Intermediate leaves* lanceolate, narrowly ovate or ovate, pruinose; branchlets pruinose. *Adult leaves* lanceolate, acuminate, pruinose, slate-grey, 11–17 cm long, 1.2–2 cm wide; venation moderately reticulate; lateral veins visible, c. 45 degrees to the mid-vein; intramarginal vein, c. 2 mm from the margin; oil glands small, regular, scattered, island. *Inflorescences* simple, axillary,

3-flowered; peduncles slender, terete or angled, 1–2.2 cm long. *Floral buds* clavate or ovoid, prominently 4-ribbed, pedicellate, unscarred (outer operculum intact), conspicuously pruinose, 12–15 mm long, 5–8 mm diam.; pedicels c. twice as long as buds; hypanthium, tapering into the pedicel; operculum conical or rostrate, narrower than the hypanthium, 6–9 mm long; stamens irregularly inflexed; outer whorls infertile; filaments white, cream or pink; anthers adnate, basifixed, angled in relation to the axis, cuboid, dehiscent through terminal pores; ovules in 4 vertical rows; flowering period autumn. *Fruits* globular-truncate, cupular, urceolate or sub-cylindrical, pendulous, pruinose when immature, 10–15 mm long, 10–14 mm diam.; pedicels 2–4 cm long; disc descending; locules 4 or 5; valves enclosed; staminophore intact. *Fertile seeds* ovoid, flattened, brown, finely reticulate; hilum ventral.

Etymology: The epithet is derived from the Latin *decorus* “beautiful” in reference to the ornamental effect of the copiously pruinose branchlets, petioles and buds and the slate-grey colour of the canopy.

Distribution and habitat: The new taxon is known from two localities in the St. Arnaud district; one to the east of Bealiba and the second in the Redbank area (Fig.1). Its preferred habitat is gravely red loam on shallow laterite rises.

Associated species: *E. tricarpa* subsp. *decora* forms open woodland communities where it is always the dominant eucalypt. *E. tricarpa* subsp. *tricarpa*, *E. leucoxyton* F. Muell. subsp. *pruinosa* (F. Muell. Ex Miq.) Boland, *E. camaldulensis* Dehnh., *E. albens* Benth., *E. nortonii* (Blakely) L.A.S. Johnson, *E. microcarpa* Maiden, *E. macrorhyncha* F. Muell ex Benth., *E. polyanthemus* Schauer. subsp. *vestita* L.A.S. Johnson & K.D. Hill and *E. polyanthemus* subsp. *marginalis* K. Rule subsp. nov. occur with or around the margins of the populations of the new taxon. At both localities where the new subspecies occurs there is no evidence of interbreeding with the typical form or with any other taxon.

Conservation status: The occurrence of the new subspecies in the Bealiba S. F. is relatively large, covering many hectares and consisting of thousands of plants. It, however, is subject to regular firewood harvesting. Despite the site abounding with seedlings and saplings, large numbers of mature trees have been lost. The Redbank occurrence is larger in area; a part of which is protected within the Moyreisk Flora Reserve. Other plants survive along road reserves and on adjacent farms. It is highly likely that other remnant populations occur in the region. A status of 2V is recommended in accordance with Briggs and Leigh (1996), particularly as the taxon appears to be favoured for firewood harvesting.

Discussion: Johnson (1962) erected *E. sideroxyton* subsp. *tricarpa* to accommodate “3-flowered, large-fruited, non-glaucous” ironbark populations occurring in coastal and sub-coastal regions of New South Wales and Victoria and of inland central Victoria. Later Hill & Johnson (1991) raised it to a species rank. The populations of three-flowered ironbark with waxy features were brought to my attention in 1990 and comparative studies showed them to be distinctive from the typical form which is non-pruinose and has green, lanceolate to ovate juvenile leaves and green or blue-green adult leaves.

The precedent of giving pruinose, grey-leaved forms the rank of species has been set by the erection of *E. nortonii*. In the case of this new taxon, although it occurs in pure populations and is distinctive by its heavy pruinosity and relatively narrow juvenile leaves, it is here considered best recognised as a subspecies as it shows no other substantial morphological divergence.

Additional specimens examined: **VICTORIA:** 3 km east of Bealiba township, *G. Wallace*, 23.viii.1984 (MEL666614); 3.5 km east of Bealiba on the Ponderosa Road, *P. Foreman* 200 & *M. Findlay*, 10.vi.1993 (MEL2016610); Bealiba S. F., 4.5 km east of Bealiba by road, *K. Rule* 0248 and *V. Stajsic*, 10.v.2002 (MEL); 4.4 km east of Sunraysia Hwy on Moyreisk-Dunolly Road, north-east of Redbank, *K. Rule* 0249, 10.v.2002 (MEL); Moyreisk Reserve, 45 km south of the southern roundabout, St. Arnaud, *K. Rule* 0251, 10.v.2002 (MEL).

SERIES *HETEROPHLOIAE*: RED BOX

A depauperate, green-leaved form of red box, *E. polyanthemus* Schauer, is described here. It occurs in box-ironbark forests and mallee-box communities of the north-central and west-central regions of Victoria and to the west of Melbourne in the Bacchus Marsh area.

KEY TO THE SUBSPECIES OF *Eucalyptus polyanthemus*

1. Smooth bark over most of the trunk.....subsp. *polyanthemus*
 - 1a. Box bark extending to at least the major branches.....2
2. All juvenile and adult structures non-pruinose.....subsp. *marginalis*
 - 2a. Seedlings, branchlets, adult leaves and buds pruinose3
3. Lanceolate adult leaves present in the outer canopy of mature trees.....subsp. *longior*
 - 3a. Lanceolate adult leaves absent from the canopy of mature treessubsp. *vestita*

Eucalyptus polyanthemus Schauer subsp. *marginalis* K. Rule *subsp. nov.*

A subspecies typica habitu minore non-pruinosa, cortice persistente buxiforme, foliis adultis viridibus et a subspecie *vestita* habitu minore, foliis juvenalibus minoribus, ramulis alabastris et fructibus non-pruinosis differt.

Type: Victoria, Western edge of Tottington S. F. on the Kanya Road, *K. Rule 9824*, 5.vi.1998 (holotype: MEL).

Small, depauperate *trees* or rarely *mallees*, 3–12 m tall. *Bark* grey-brown, box-like, often flaky and loose, rarely peppermint-like, persisting to major branches. *Juvenile leaves* obcordate, sub-orbicular or orbicular, usually emarginate, disjunct, dull, blue-green, 3–5 cm long, 3–5 cm wide; petioles slender, non-pruinose, 2.4–3.6 cm long. *Intermediate leaves* sub-orbicular or broadly ovate, dull or sub-lustrous, blue-green, present in saplings and young trees and persisting in the canopies of mature trees. *Adult leaves* ovate or rarely lanceolate, eventually sub-lustrous or rarely lustrous, blue-green, light green or olive-green, sub-coriaceous (0.25–0.40 mm thick), 5–8 cm long, 2–3.3 cm wide; petioles 1.8–2.6 cm long; venation densely reticulate with conspicuous lateral veins and crowded, unbroken veinlets; intramarginal veins looped, 2–4 mm from the margin; oil glands irregular, small, island or intersectional. *Inflorescences* 7-flowered, within a compound, leafless, branched, terminal panicle; peduncles slender, 10–16 mm long. *Floral buds* ovoid, pedicellate, scarred (outer operculum shed in early bud development), non-pruinose, burnished, 5–6 mm long, 3–4 mm diam.; pedicels slender, slightly longer than the buds; operculum obtuse, c. 3 mm long, narrower than the hypanthium; stamens irregularly inflexed, outer whorls infertile; filaments white, old stamens shed with the staminal ring; anthers adnate, basifixed, globoid, dehiscing through lateral pores; ovules in 4 vertical rows; flowering period spring. *Fruits* cupular or sub-cylindrical, 5–6 mm long, 3–4 mm diam.; pedicels as long as fruits; disc descending; locules 3 or 4; valves enclosed. *Fertile seeds* brown, irregular ovoid, finely reticulate; hilum ventral.

Etymology: The epithet is derived from the Latin *marginis* “border” or “edge” in reference to the populations of the taxon which occur at the south-eastern limits of the red box complex.

Distribution and habitat: The new taxon occurs on the drier margins of the Victorian box-ironbark forests from Kamarooka in the east to Stawell in the west. It also occurs adjacent to or within mallee-box communities, for example, at Kamarooka and Wedderburn. The preferred habitat is dry, gravely, shallow soils, often over laterite rises. Southern outliers occur in the Bacchus Marsh area, for example, in Brisbane Ranges and the Pyrete Range (Fig. 1).

Associated species: Populations of *E. polyanthemos* subsp. *marginalis* occur with both subspecies of *E. tricarpa*, *E. macrorhyncha*, *E. microcarpa*, *E. nortonii*, *E. aromaphloia* and *E. leucoxydon* subsp. *pruinosa*. In mallee-box communities *E. viridis*, *E. polybractea*, *E. behriana* F. Muell. and *E. froggattii* may be present. The new subspecies and the more easterly distributed subsp. *vestita* overlap in north-central Victoria. In areas including the Castlemaine area, at Long Forest near Bacchus Marsh, to the south of Bendigo, to the south of Avoca and in the St Arnaud Range obvious hybrid populations occur. These populations exhibit a wide range of intermediate features, particularly in leaf colour and pruinosity.

Conservation status: The new taxon occurs over a wide area but nowhere is it dominant. All populations are small and many occur in protected reserves, for example, Whipstick S.P., Kamarooka S.P., Tottington S.F., Bolangum S.P., Bealiba S.F., Brisbane Ranges N.P. and Pyrete Range S.P. It is not considered at risk.

Discussion: The new taxon has several morphological forms. The population from which the type specimen has been drawn is typical of populations occurring throughout north and west-central Victoria. This form features a winter canopy dominated by soft-textured, dull, blue-green leaves. However, its summer new growth produces sub-lustrous light green, firm-textured foliage. More southerly forms, such as those in the Brisbane Ranges and the Pyrete Range, develop sub-lustrous intermediate leaves which can often be observed in the sapling stage regardless of the season. The form occurring in the Pyrete Range features an atypical peppermint-like bark. When in association with mallee-boxes, such as around Wedderburn and in the Whipstick, specimens are often only a few metres tall with a typical mallee habit.

E. polyanthemos subsp. *polyanthemos*, which occurs along the western slopes of the Great Divide in central and southern New South Wales, differs from the new subspecies by its usually larger habit (often an umbrageous tree with a stout trunk), its mostly smooth bark, its canopy, which is dominated by greyish, broadly ovate or sub-orbicular intermediate leaves, and its pruinose seedlings, branchlets and buds.

E. polyanthemos subsp. *marginalis* was previously included with subsp. *vestita* by Hill and Johnson (1990), but recent field studies and seedling trials have shown it to be a distinctive geographical and morphological form. From the new taxon subsp. *vestita* differs by its generally more easterly distribution, its generally more robust habit (trees are usually smallish, but with a stout trunk), its canopy being dominated by greyish, broadly ovate or sub-orbicular intermediate leaves, its larger juvenile leaves (to 7 cm long, 7 cm wide) and its pruinose seedlings, branchlets, canopy leaves and buds.

E. polyanthemos subsp. *longior* Brooker & Slee, which is a forest form occurring in East Gippsland and adjacent areas of New South Wales, has a canopy dominated by lanceolate adult leaves. It is also readily separable from subsp. *marginalis* by its taller habit and its pruinose features.

E. polyanthemos subsp. *marginalis* has been erroneously confused with *E. baueriana* Schauer. The typical form of *E. baueriana* features greenish, often slightly glossy adult leaves, not unlike those of the new taxon, but differs by its riparian habitat, its often deltoid, conspicuously undulate canopy leaves, its clavate buds and its obconical fruits. The form of *E. baueriana* occurring in the Melton-Bacchus Marsh area, however, features adult foliage that is dull, grey-green and not is readily confused with the new subspecies.

Additional specimens examined: **VICTORIA:** County of Talbot, *F.M. Reader*, 18.iv.1909 (MEL1616224); Korongvale, *F.W. Wakefield*, 7.vi.1919 (MEL231053); Bullengarook near Gisborne, *K.V.M. Fergusson*, Aug. 1943 (MEL1526773); Coimadai District near Bacchus Marsh, *P. Carolan*, May 1965 (MEL1614725); Waterloo Range near Maryborough, collector unknown, 26.viii.1971 (MEL231046); Melville Caves, off Kingower-Wedderburn Road, *K.L. Wilson 1044 & L.A.S. Johnson*, 15.ii.1975 (MEL1614730); Brisbane Ranges N.P., 5.5 km N. E. of Mt. Wallace P. S., *A.C. Beauglehole ACB56740 & E.G. Emery*, 2.x.1977, (MEL230927); Dalynong S. F., 9 km

WNW of Archdale, A.C. *Beaglehole ACB64701*, 8.ix.1979 (MEL230925); Muckleford Flora Reserve, A.C. *Beaglehole ACB68968* & E.E. Perkins, 31.viii.1981 (MEL230929); 1 km SW of Chewton, 4 km ESE of Castlemaine, T.B. Muir 6713, 6.x.1981 (MEL); Eaglehawk Regional Park, A.C. *Beaglehole ACB69506*, 30.x.1981 (MEL230922); Brisbane Ranges N.P., near the Anakie Gorge car park, D.B. Foreman 1554, 10.iii.1986 (MEL2042461); c. 5 km north of Elmhurst, I.C. Clarke 2008, 13.x.1989 (MEL1582879); 7.3 km from Inglewood towards Kingower, M.H.I. Brooker 11107, 4.vi.1992 (MEL17369); Reids Road, the north-east entrance to the Brisbane Ranges N.P., K. Rule 9815, 8.v.1998 (MEL); c. 7 km south-east of Wedderburn on Calder Hwy., K. Rule 9827, 5.vi.1998 (MEL); 2.1 km along Skinner's Flat-Mt. Kerang Road from Calder Hwy., K. Rule 9903, 26.iv.1999 (MEL); 24.9 km north of Bendigo towards Kamarooka on the Bendigo-Tennyson Road, K. Rule 9970, 11.vii.1999 (MEL); 1.2 km north of Matthews Lane on West Kamarooka Road, K. Rule 9971, 11.vii.1999 (MEL); Western Highway, 9.3 km south-east of turnoff to Stawell City Centre, K. Rule 9973, 12.x.1999 (MEL); southern edge of Pyrete Range S. P., K. Rule 0107, 19.v.2001 (MEL); Bealiba S. F., 3.2 km east of Bealiba by road, K. Rule 0109 & V. Stajsic, 2.vi.2001 (MEL).

NOTES ON VICTORIAN POPULATIONS OF *Eucalyptus calycogona* Turcz.

A recent paper by Nicolle (2000) divided *Eucalyptus calycogona* into three subspecies; subsp. *calycogona* for western populations (Western Australia and the western part of South Australia) with a small mallee habit, smooth bark, relatively small, thin adult leaves and relatively fine buds and fruits; subsp. *trachybasis* Nicolle for eastern populations (eastern parts of South Australia and extending into New South Wales and Victoria) with a more spreading, larger habit, than typical, basal rough bark, relatively large, coarse adult leaves and relatively large buds and fruits; and subsp. *spaffordii* (Blakely) Nicolle for restricted populations on the Eyre Peninsula with a small mallee habit, smooth bark, broad, coriaceous adult leaves and relatively large, conspicuously winged buds and fruits.

Surveys within Victoria have shown that most populations are subsp. *trachybasis*. It is common throughout north-western Victoria and extends to the Wimmera region, mostly to the north of the Little Desert where it is relatively common. Outlier populations occur in North-central Victoria to the south-east of Wedderburn, near Boort and in the southern Wimmera near Natimuk and at Mt. Arapiles. Whilst the Wedderburn and Boort populations are clearly subsp. *trachybasis*, the southern Wimmera populations possess features that are somewhat intermediate between that form and subsp. *calycogona*. The adult leaves of the Natimuk population are appreciably smaller and thinner than more northerly populations (leaves 4–6 cm long), whilst its other features, particularly habit and bark, are consistent with subsp. *trachybasis*. The population occurring at Mt Arapiles also fits the general description of subsp. *trachybasis* except that it has a slender pole-like habit, sheds its basal bark in spring and bears flowers whilst still in the seedling stage. This form of neoteny within the genus is not well documented and at this stage such behaviour is here considered insufficient to warrant the erection of a new subspecies.

A remnant population occurring to the north-east of Kaniva features a slender habit, a short stocking of box bark and relatively broad, coarse adult leaves. A few individuals have buds and fruits approaching those of subsp. *spaffordii* but these are far from being representative of the population and are considered insufficiently divergent to be regarded as that subspecies.

A small population of a several dozen plants occurring in the southern Wimmera in the Nurcoung Nature Reserve, fits Nicolle's general description of subsp. *calycogona*. Its features include the following; smooth bark to the ground; a whipstick mallee habit to about 3 m tall; small, thin-textured adult leaves (4–7 cm long); and small, somewhat slender, lightly ribbed fruits. The buds, however, are subtly distinctive, being finely winged with an operculum that is relatively long, acutely conical and appreciably narrower than the hypanthium.

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