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Eucalyptus macmahonii, a New and Rare Mallee Species from Western Victoria

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Abstract
Eucalyptus macmahonii K. Rule sp. nov., is a recently discovered Western Victorian species of mallee of the series Rufispermae with a sepaline operculum that is shed uncleanly. The species is described and its affinities, distribution and conservation status are discussed.

Introduction
The Mt Arapiles-Tooan State Park and a few adjacent reserves of mallee vegetation are located on the south-eastern side of the Little Desert in western Victoria, a region where semi-arid and temperate climates merge. Tragically, from a scientific view-point, they and meagre roadside and farm remnants are all that remain of the natural vegetation after vast tracts of land were cleared for wheat farms. As far as is known, the taxon described below is confined to two extremely small populations, one at Mt Arapiles and the other to the north-west of Mitre township near Nurcoung. Discovered by Dr Don McMahon in 1994, it is one of a few undescribed eucalypts in this region which occur as remnant populations in these small island reserves.

Taxonomy
Eucalyptus macmahonii K. Rule, sp. nov.
Eucalyptus dumesae A. Cunn. ex Oxley affinis sed fragmentis indiuis operculorum sepalinorum persistentiisus, alabastris laevibus, et foliis adultis angustioribus nitidioribus differt.

Type: Victoria, southern side of Mt Arapiles, Mt Arapiles-Tooan State Park, 36°46' S, 141°50' E, K. Rule 9512 and D. McMahon, 26.iii.1995 (holotype MEL; isotypes AD, NSW, CANB).

Mallee to 5 m tall, usually erect and slender, lignotuberous. Canopy open or moderately dense with semi-erect, lustrous foliage. Bark red-brown, smooth throughout; old bark dark brown, deciduous in long ribbons. Oil glands present in pith of branchlets. Cotyledons reniform. Seedling leaves elliptical, shortly petiolate, opposite for 3 or 4 pairs, discolorous; upper surface dull, blue-green; lower surface pale green. Juvenile leaves alternate, lanceolate or elliptical-lanceolate, acuminate, 4–8 cm long, 1.4–2.5 cm wide; dull, grey-green, slightly discolorous, glandular; base tapered; venation densely reticulate; lateral and intramarginal veins somewhat obscure; petioles to 1 cm long. Intermediate leaves ovate-lanceolate, dull, blue-green, sometimes grey-green or lightly
waxy, slightly discolorous, slightly broader than both juvenile and adult leaves. Adult leaves narrow-lanceolate or lanceolate, often slightly falcate, uncinate, semi-erect, 7–11 cm long, 0.8–1.5 cm wide, lustrous, green, concolorous; venation faint, densely reticulate with numerous island and intersectional oil glands; intramarginal vein approximately 1 mm from margin; petioles angular, to 1.3 cm long. Inflorescences simple, axillary, 7–11-flowered; peduncles slightly flattened, dilated, relatively slender, to 1.2 cm long, 1.5–2 mm in diameter. Floral buds ovoid or slightly clavate, usually angular, shortly pedicellate. 0.7–0.9 cm long, 0.4–0.5 cm in diameter; operculum conical, approximately one-third the length of the hypanthium, non-striate; operculum scar present, the sepaline operculum shedding early, either from the abscission zone or splitting downwards from the apex of the bud, persisting most often as a tattered, small necrotic fragment adhering to the inner operculum. Stamens inflexed; anthers all fertile, versatile, sub-basifixed, oblong, dehiscing longitudinally; filaments white. Ovary 4-locular; ovules in 4 rows per locule. Fruits cupular or sub-cylindrical, smooth, tapering into a short pedicel or less often sessile, 0.6–0.9 cm long, 0.5–0.8 cm in diameter; walls thick; disc descending; valves 4 (rarely 3), below rim level. Fertile seeds lustrous, red-brown, reticulate, flattened. (Fig. 1)

Distribution and Habitat

Eucalyptus macmahonii occurs in mallee communities on sandy soils adjacent to the southern base of Mt. Arapiles and to the north-west of Mitre near Nurcoun on the southern edge of the Little Desert in western Victoria. The nearby town of Horsham has an average annual rainfall of c. 550 mm, with a winter maximum. Flowers spring.

Etymology

The epithet honours Dr Don McMahon who is credited with the discovery of this new species and has been an active participant in the subsequent study. It is further to Dr McMahon’s credit that he recognised that the species’ floral buds possess a feature rare in the genus (see discussion below).

Associated Species

At Mt Arapiles, E. macmahonii grows in pure clumps. Other mallee species occurring in the immediate vicinity include E. incrassata, E. leptophylla, E. dumosa, E. wimmerensis and E. leucoxylon subsp. stephaniae. Near Nurcoun, E. wimmerensis, E. leptophylla and E. froggatti are associated species, and at one collection site a single mallee with features consistent with E. polybractea was present. At Mt Arapiles an individual has been located that appears to a hybrid between the new species and E. wimmerensis. No other interbreeding with any of the associated taxa has been observed.

Conservation Status

This species is one of Victoria’s rarest and was uncollected prior to this study. The Mt Arapiles population, which occurs in two segments, is located in a nature reserve; on the southern side of the mountain several dozen plants are concentrated in six known clumps, and on the south-western side a single clump contains c. ten plants. In contrast, the population near Nurcoun is confined to small roadside remnants extending over a distance of more than 2 kilometres and its continued existence is extremely precarious. Searches for additional remnants in the district are required, particularly on private land around the south-eastern perimeter of the Little Desert. Eucalyptus macmahonii is considered vulnerable and a status of 2V using the coding method of Briggs and Leigh (1989) is suggested.
Fig. 1. *Eucalyptus macmahonii* (K. Rule 9512 and D. McMahon): a seedling, x1; b adult leaves and immature buds, x1; c young bud shedding sepaline operculum, x2.5; d bud with necrotic remnant of sepaline operculum, x4; e mature buds, x1; f fruits, x1.
Specimens Examined (all at MEL)

VICTORIA: Type locality, K. Rule 9533, 10.iv.1995, K. Rule 9535, 10.iv.1995, K. Rule 9636, 10.ii.1996, K. Rule 9665, 8.vii.1996; on the SW side of Mt Arapiles, K. Rule 9534, 10.iv.1995; 9.3 km E of the Nhill-Harrow Rd towards Mitre, K. Rule 96106, 26.ix.1996; 10.2 km E of the Nhill-Harrow Rd towards Mitre, K. Rule 9663, 8.vii.1996; 11.7 km E of the Nhill-Harrow Rd towards Mitre, K. Rule 9513 and D. McMahon, 26.iii.1995, K. Rule 9662, 8.vii.1996.

Key to Victorian species in the series Rufispermae
1. Adult leaves lustrous, green .................................................................................................................. 2
2. Peduncles markedly thick, 2.5–3.5 mm in diameter; operculum ribbed, slightly less than half the length of the hynanthium ................................................. E. phenax
3. Adult leaves blue-grey; operculum prominently ribbed ................................................................. E. cyanophylla
4. Adult leaves blue-green; operculum faintly ribbed ........................................................................ E. dumosa

Discussion

The known populations of E. macmahonii are relatively uniform except for limited variation in the size of their juvenile leaves, and an occurrence of lightly waxy intermediate leaves in the case of one individual at Mt Arapiles. Despite the small number of individuals, the new species has not lost its capacity to reproduce sexually: a moderate number of seedlings were present at each site, and viable, reasonably vigorous seedlings resulted from a series of seedlot trials. It is suspected that its rarity is the result of recent clearing rather than genetic decline.

When E. macmahonii was first brought to my attention, I assumed it to be a hybrid involving E. wimmerensis and E. dumosa. Subsequent seedling trials using seedlots collected from both the Mt Arapiles and Nurcung sites showed no evidence of segregation towards either of the suspected parents. Furthermore, searches in the field located sufficient numbers of mallees at both sites which were regarded as being appreciably uniform in their morphology. This, and an absence of anomalous individuals (except for the apparent hybrid at Mt Arapiles) with features intermediate between E. macmahonii and either of the suspected ancestors, suggest that individuals are not of hybrid origin.

The condition where the sepaline operculum is not shed cleanly but persists as tattered remnants is rare in the genus and known in four other taxa belonging to the informal subgenus ‘Symphyomyrtus’ and two Northern Australian paper-fruited bloodwoods of the unrelated informal subgenus ‘Blakella’. Three of the ‘Symphyomyrtus’ species, E. sturgissiana L.A.S. Johnson & Blaxell, E. denticulata Cook & Ladiges and E. benthamii Maiden & Cambage, although not closely related, belong to section Maidenaria where the sepaline operculum is usually shed cleanly well in advance of flowering. The fourth is an undescribed taxon occurring at Devils Peak in the southern Flinders Ranges, South Australia, which Brooker and Kleinig (1990) placed with the mallee-boxes (section Adnataria) and tentatively called E. ‘desquamata’. In the mallee-boxes, the sepaline operculum is normally retained until anthesis and shed with the petaline operculum. Eucalyptus macmahoni belongs to the section Dumaria (also ‘Symphyomyrtus’) where, as in section Maidenaria, the sepaline operculum normally is shed cleanly well in advance of flowering. Obviously, the phenomenon of the fragmented sepaline operculum is a development which provides no basis for linking any of these taxa genetically. Most certainly it is a useful diagnostic
character. Johnson and Hill (1990), for example, used it as one of their criteria for separating *E. dorrigoensis* (Blakely) L.A.S. Johnson & Hill from *E. benthamii*.

In their comments on *E. benthamii*, Johnson and Hill (1990) suggested that the expanding, immature bud of that species appeared to burst through its sepaline operculum to leave irregular dried remnants attached to petaline operculum. Observations of *E. macmahonii* are consistent with this. In addition, it has been found with this species that the shedding process and the fragmentation of the sepaline operculum follows no particular pattern. Fragmentation may occur in conjunction with abscission, the operculum splitting upwards from the base or by the operculum splitting downwards from the apex before abscission occurs.

*Eucalyptus macmahonii* is placed within the section *Dumaria*, characterised by juvenile leaves that are petiolate and alternate, adult leaves with densely reticulate venation and numerous intersectional and island oil glands and floral buds with an abscission scar, four ovular rows per locule, strongly inflexed stamens and oblong, basifixed, versatile anthers with longitudinal slits. Further, within this section, the new species is a member of the series *Rufispermae* whose features include oil glands in the pith of the branchlets and fertile seeds that are lustrous, red-brown, oblong and flattened and with a shallow reticulum. However, as discussed above, *E. macmahonii* differs from other members of this series in the unclean shedding of its sepaline operculum.

The relationship between *E. macmahonii* and other members of the series *Rufispermae* (Table 1), particularly those occurring in Victoria, is unclear. However, it is most similar to the widespread *E. dumosa*, from which it differs in its narrower juvenile leaves, its narrower, green, lustrous adult leaves, its shorter, thinner peduncles and its smooth operculum. Whilst its fruit sizes overlap those of some populations of *E. dumosa*, particularly in the Victorian Mallee, the associated form has appreciably larger fruits (to 10 mm long and 9 mm in diameter). Another similar species of limited occurrence in north-western Victoria is *E. phenax* Brooker & Slee (formerly *E. anceps*) (Maiden ) Blakely). It also has lustrous, green adult leaves, but differs from the new species in its green juvenile leaves, its longer, striated opercula (slightly less than half the length of the bud), its thicker peduncles and its mostly sessile fruits with valves extending above the rim. A third relative, *E. cyanophylla* Brooker, is confined to the State’s extreme north-west and is easily distinguished from *E. macmahonii* by its relatively broad, blue-grey foliage, its longer, thicker peduncles, its larger, prominently striated buds and its larger, rugulose or ribbed fruits (to 10 mm long and 9 mm in diameter).

**Table 1. Diagnostic features of Victorian species in the series *Rufispermae***

| Character      | *E. macmahonii* | *E. dumosa* | *E. phenax* | *E. cyanophylla* |
|----------------|-----------------|-------------|-------------|------------------|
| **Bark**       |                 |             |             |                  |
| Texture        | smooth throughout | smooth throughout | smooth throughout | smooth throughout |
|                | or box-barked on lower trunk | white, pink or grey | or basally box-like | or basally box-like |
| **Colour**     | red-brown       | white or light grey | white or light grey | brown, white or light grey |
| **Juvenile leaves** |                 |             |             |                  |
| Shape          | lanceolate to elliptical-lanceolate | broad-lanceolate to ovate | broad-lanceolate or ovate | lanceolate, broad-lanceolate or ovate-lanceolate |
| **Length (cm)**| 4–8             | 8–14        | 6–10        | 8–14             |
| **Width (cm)** | 1.4–2.5         | 2–6         | 2–3.5       | 5–8              |
| **Colour**     | blue-green or grey-green | blue-green or grey-green | light green | blue-green or grey-green |
Table 1. Continued

| Character              | E. macmahonii | E. dumosa | E. phenax | E. cyanophylla |
|------------------------|---------------|-----------|-----------|---------------|
| **Adult leaves**       |               |           |           |               |
| Shape                  | narrow-lanceolate to lanceolate | narrow-lanceolate to lanceolate | lanceolate | broad-lanceolate or slightly ovate, often slightly falcate |
| Length (cm)            | 7–11          | 6–10      | 7–13      | 7–16          |
| Width (cm)             | 0.8–1.5       | 1.5–2.5   | 1–2.0     | 1.5–3.2       |
| Colour                 | green         | blue-green or grey-green | green     | blue-green    |
| Lustre                 | lustrous      | dull or sub-lustrous | lustrous | dull          |
| Petiole length (cm)    | up to 1.3     | up to 1.8 | up to 2   | up to 2.2     |
| **Peduncle**           |               |           |           |               |
| Length (cm)            | up to 1.2     | up to 2.0 | up to 1.4 | up to 1.2     |
| Diameter (mm)          | 1.5–2         | 2–3       | 2.5–3.5   | 2.5–3.5       |
| Shape                  | angular       | angular to slightly flattened | cylindrical, slightly flattened | cylindrical |
| **Buds**               |               |           |           |               |
| Shape                  | ovoid, not constricted at abscission zone | ovoid-cylindrical, not constricted at abscission zone | conical, slightly flattened | cylindrical |
| Length (cm)            | 0.7–0.9       | 0.8–1.0   | 0.6–1.0   | 0.8–1.1       |
| Diameter (cm)          | 0.4–0.5       | 0.4–0.5   | 0.4–0.5   | 0.5–0.9       |
| Length relative to hypanthium length | c. 1/3 | usually c. 1/3 | slightly shorter | slightly shorter |
| Operculum shape        | conical       | conical, sometimes beaked | conical, sometimes beaked | conical |
| Operculum ornamentation| smooth        | slightly ribbed | slightly ribbed | prominently ribbed |
| Outer operculum shedding| uncleanly       | cleanly | cleanly | cleanly |
| Pedicel                | sub-sessile or shortly pedicellate | sub-sessile or shortly pedicellate | sessile or less often sub-sessile | sub-sessile or shortly pedicellate |
| **Fruits**             |               |           |           |               |
| Shape                  | cupular or sub-cylindrical | cupular or sub-cupular | cupular | cupular |
| Length (cm)            | 0.6–0.9       | 0.4–1.0   | 0.6–0.9   | 0.8–1.0       |
| Diameter (cm)          | 0.5–0.8       | 0.4–0.9   | 0.5–0.7   | 0.7–0.9       |
| Pedicel                | sessile or sub-sessile | sessile or shortly pedicellate | mostly sessile | sessile or sub-sessile |
| Ornamentation          | smooth        | smooth or slightly ribbed | faintly ribbed | ribbed or rugulose |

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