Findings

Summary

It is difficult to generalise about the venation in eucalypts other than to say that patterns are mostly consistent within taxa and are highly diagnostic for many taxa, from the genus level (widely angled and closely spaced secondary venation in *Angophora* and *Corymbia*) to the species and even subspecies level (*E. leptopoda* subsp. *leptopoda* – intramarginal vein present and subsp. *arctata* – intramarginal vein absent; p. 110).

Of course, within each taxon (at any level), observable variation is apparent, just as is the case for any other morphological character. However, in most cases, the variation in leaf venation and oil gland patterns within a species is not great. For example, in the continentally most widespread species, *E. camaldulensis* (river red gum), which has seven subspecies (McDonald *et al.* 2009), the densest reticulation is seen in populations from low latitudes (tropical areas), while those from higher latitudes (temperate regions) have relatively sparser reticulation (see images from McDonald *et al.* 2009). Nevertheless, this variation in the tertiary reticulation of *E. camaldulensis* is not extreme, with the three samples of this species which we have included in this study (subspp. *acuta*, *arida* and *camaldulensis*; p. 67–68) all having moderate reticulation as defined here. Interestingly, the frequency of oil glands in these three same samples is also very similar (between 1400 and 1600 cm^{-2}).

Intramarginal vein

The position of the intramarginal vein, relative to the primary vein (midrib) and leaf edge, is highly diagnostic in certain species, especially where the intramarginal vein is confluent with the leaf margin and therefore appears to be absent. The apparent lack of an intramarginal vein is unique and diagnostic for *E. exilipes* (p. 171) within the box/ironbark group (*E.* sect. *Adnataria*) and for *E. leptopoda* subsp. *arctata* (p. 110) within *E.* sect. *Bisectae*. Additionally, a number of *Corymbia* species apparently lack an intramarginal vein, particularly those from the subtropical desert regions.

In the vast majority of species, the intramarginal vein it situated at between 80% and 95% of the distance between the primary vein and the leaf edge (intramarginal vein ratio 0.80 to 0.95). In some species, the intramarginal vein is situated relatively remote from the leaf edge, up to around two-thirds of the distance between the primary vein and the leaf edge (ratio 0.66). An intramarginal vein situated remote from the leaf edge is notable and diagnostic in some species including *E. froggattii* (p. 165), *E. halophila* (p. 118), *E. argophloia* (p. 169), *E. porosa* (p. 165) and species of *E.* ser. *Lehmannianae* subser. *Conjunctae* (p. 78).

The intramarginal vein may be difficult to determine in some species where two or more veins run more-or-less parallel to the leaf edge. This is notable in *E. piperita* (p. 207) and *E. elata* (p. 188) and to a varying degree in numerous other taxa. In such cases, the 'true' intramarginal vein can be distinguished as being more conspicuous (presumably thicker in diameter) and by being the vein at which the secondary veins terminate. Less distinct veins which are parallel with the leaf edge and occur between the 'true' intramarginal vein and the leaf edge have not been used to measure the relative position of the intramarginal vein.

Secondary vein angle and spacing

The angle and spacing of the secondary veins (side veins) is variably diagnostic in the eucalypts, and can be powerful in characterising certain taxa. *Angophora* and *Corymbia* generally have wide-angled, closely-spaced secondary veins (penni-veined), with differences between taxa in these