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The age of jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) trees

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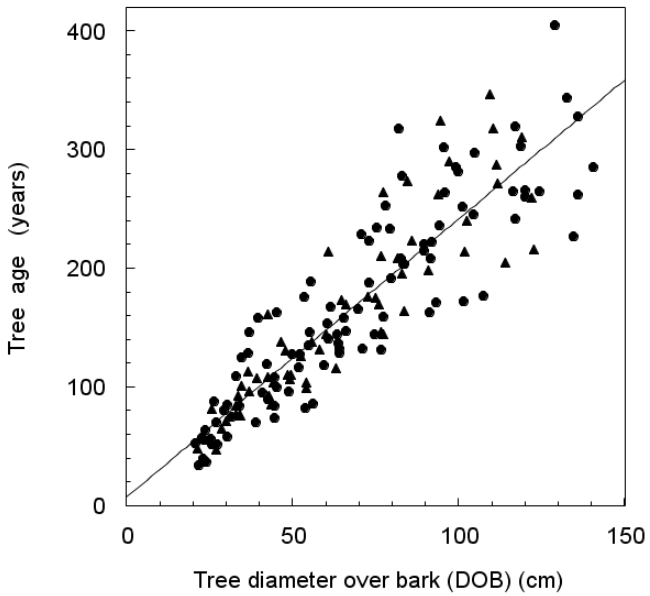
Background

The age of eucalypts and other tree species that experience a regular defined annual growing season can be determined from counts of their annual growth rings. The visible banding of growth rings is caused by regular seasonal variations in the density of the wood as it grows onto the outer edge of the tree. Jarrah produces dense wood in autumn and porous wood in spring. Growth rings can be counted on tree stumps, on cross-sections cut from a fallen tree, or from cores removed from the tree bole. Coring large trees with diameters greater than about 40 cm can be difficult or ineffective, as these trees often contain decaying wood and the central growth ring is not always in the centre of the tree bole. Removing a number of long cores can significantly damage a tree and introduce disease. Some hard timbers are difficult to core. Growth rings are far harder to count on cores compared to cross-sections from a tree bole, particularly for large old trees; however, routinely felling large trees to determine their age is not feasible. This study examined the non-destructive estimation of jarrah and marri tree age from tree diameter.

Findings

The rates of tree diameter growth fluctuate over the life of a tree and can vary widely within a site and between sites, influenced by factors such as soil fertility, rainfall and tree crown dominance. Although growth rates fluctuate and the error in estimating tree age increases as tree diameter increases, the relationship shown below between tree diameter and age determined from growth ring counts provides a reasonable estimate of the age of jarrah and marri trees (Whitford 2002).

Care should be taken in measuring diameter to avoid growths and butt swelling, such as those associated with fire scars. This relationship applies only to unfertilized forest trees and is likely to over-estimate the age of trees with diameters greater than 150 cm. Trees grown in open paddocks, cleared areas, on fertilized agricultural land and mine rehabilitation will typically grow faster than those found in the forests. Trees in harsh environments will generally grow more slowly.



The relationship between the age of trees obtained from counts of annual growth rings and tree diameter (DOB). Data for 99 jarrah (*Eucalyptus marginata*) (●) and 63 marri (*Corymbia calophylla*) (▲) from six sites.

$$\text{Age} = 2.35 \times \text{DOB} + 6.97$$

where: DOB is the tree diameter measured in centimetres over the bark at 1.3 m above the ground.

The relationship between tree diameter and age has been determined for a number of Western Australian eucalypts including karri, jarrah, marri, salmon gum, wandoo and gimlet (Rayner 1992; Whitford 2002; Rose 1993, Gosper *et al*. 2013). Studies of large forest eucalypts in Australia have identified ages of 394 years for *E. regnans* (Helms 1945), 350 years for karri (Rayner 1992), 420 years for wandoo, 465 years for salmon gum (Rose 1993) 405 and 380 years for jarrah (Whitford 2002; Burrows *et al*. 1995) and 346 years for marri (Whitford 2002). Based on ring counts from an adjacent celery-top pine *Phyllocladus asplenifolius*, a stand of old-growth *Eucalyptus delegatensis* in southern Tasmania was estimated to be at least 460 years old (Hickey *et al*. 1999). Recent carbon dating and ring counts of *E. regnans* in the Styx valley in Tasmania suggests ages greater than 500 years at this site (Wood *et al*. 2010). Counts of growth rings indicate that the very large jarrah and marri trees in the south west forests of Western Australia are unlikely to be older than 450 years.

Management Implications

Old and large trees understandably attract interest and attention, occasionally leading to claims of extreme age in eucalypts. Average tree growth rates calculated from all trees in a stand can produce these erroneous estimates of age in large trees. This occurs because, although tree growth rates decline with old age, the largest trees have typically been the fastest growing trees in the stand. Jarrah forest stands usually consist of a few large trees and many more smaller and slower growing trees. This means that the average growth rate determined for a stand of trees will under-estimate the growth rate of the largest trees. Average growth rates can then over-estimate the age of these large trees. Although the age of the largest jarrah and marri trees may not exceed 450 years, these large trees are nonetheless magnificent and their intrinsic value is not diminished by realistic estimates of age.

Some biologically valuable attributes may only develop in trees that are greater than a certain age, as time dependent processes of tree growth and decline may be essential. Large tree hollows used by cockatoos, owls and possums require time for both the growth of a large limb or tree bole and the complex processes of decay and tree decline that lead to hollow formation. Knowing the ages of trees with particular attributes, and determining the age structure of forest stands, assists in managing these forest values.

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