

**Factors influencing food availability for the endangered south-eastern Red-tailed  
Black Cockatoo *Calyptorhynchus banksii graptogyne* in remnant stringybark  
woodland, and implications for management**

(ELECTRONIC COPY: Please be advised that the maps in this document are of a lower  
quality than the original)

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**A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy**

**Declaration**

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university, and to the best of my knowledge and belief, it contains no material previously published or written by any other person except where due reference or acknowledgement is made.

I give my consent for the photocopying and loan of this thesis.

Paul Koch

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## Abstract

The problems associated with habitat loss and habitat fragmentation are largely responsible for a decline in biodiversity around the world, yet there are relatively few studies targeting declining populations to determine which aspects of resource availability actually limit population size.

The endangered south-eastern Red-tailed Black Cockatoo *Calyptorhynchus banksii graptogyne* is highly specialised, feeding almost entirely on seeds of the closely related stringybark eucalypts *Eucalyptus arenacea* and *Eucalyptus baxteri*. The primary objective of the present study was to assess the effects of prescribed burns on food availability to the cockatoos. The problem was approached by first, identifying the key components of food availability (capsule quantity, food value per capsule and tree characteristics) influencing the selection of trees and sites for foraging by the cockatoos, and second, by assessing the impact of prescribed burns on these components and levels of habitat use by the cockatoos. The issue of fire management was thus considered in the context of food availability for the cockatoo population, and in relation to other factors such as periodicities between seed crops and edge effects.

Phenology was monitored at six sites to assess patterns of seed production for the two species of stringybark, within and between years. Years of high seed production were followed by years of negligible seed production for both species, but the two species did not produce seed crops in the same year. *E. baxteri* fruited on an approximate two-to-four year cycle while *E. arenacea* fruited more consistently on a three year cycle. Sighting records for the south-eastern Red-tailed Black Cockatoo population indicated that the cockatoos moved from regions dominated by *E. arenacea* into those dominated by *E. baxteri* following the production of a new seed crop on the latter species. These results suggest that the cockatoos fed almost entirely on the species that had fruited most recently, presumably because new seed crops were depleted to a lesser extent than old seed crops.

Comparison of various resource characteristics between feed trees and other trees suggested that aspects of capsule quantity such as capsule density (capsules per branch), crop size (capsules per tree) and cluster size (capsules per pedicel) were more important than aspects of capsule profitability (food value per capsule) in determining food supply for the cockatoos. Foraging observations further demonstrated that cockatoos feeding on branches with high capsule density (>100 capsules per branch) processed 17% more capsules per unit time than those feeding on branches with low capsule density (<100 capsules per branch). These results confirmed that the cockatoos forage less efficiently when feeding on branches with low capsule density. Moreover, the percentage of the day spent foraging

increased as the seed crop aged from 52% for February 2001 to 73% for February 2002 and 88% for July 2002, suggesting that foraging efficiency declined as the seed crop aged and was depleted.

An extensive survey comparing aspects of capsule availability and levels of habitat use between sites varying in time since fire (3, 5, 6, 7, 9, 11 and >25 years since fire) was used to assess the effects of prescribed burns on food availability. The survey indicated that prescribed burns have a prolonged and substantial impact on all measures of capsule availability, with effects lasting approximately ten years. It was estimated that trees burnt in the last ten years produce approximately half as much seed as those in long unburnt areas. Correspondingly, the percentage of trees used by cockatoos was much lower in burnt areas than unburnt areas, increasing steadily as time since fire progressed.

An additional survey comparing measures of capsule availability between trees with different levels of canopy scorch (100%, 50%, 10-20% and unburnt groups) was used to determine the effect of fire intensity on subsequent capsule availability. The standing crop of trees (crop size) was approximately inversely proportional to the percentage of canopy scorched. This finding suggests that reducing canopy scorch by lowering the intensity of prescribed burns is an effective way to reduce the effects of prescribed burns on seed availability to the Red-tailed Black Cockatoo.

Comparisons of edge trees with interior trees showed that trees at edges produced approximately twice as many capsules per tree. However, the edge effect was restricted to the outermost fringes of remnants, and the cockatoos only used edge trees slightly more intensively than interior trees. Trees at edges would be likely to be more profitable for foraging cockatoos than interior trees, but the effect would provide little compensation for the extensive loss of feeding habitat previously incurred.

There was substantial evidence in the present study to suggest that food availability may be limiting the south-eastern Red-tailed Black Cockatoo population. This evidence was as follows: (1) the high percentage of time spent foraging when compared with other Black Cockatoo species, which increased as the seed crop aged and was depleted; (2) the high rates of habitat use (100% of unburnt sites were used by cockatoos; 64% of trees were used per site); (3) the use of nearly all burnt sites, despite their generally lower productivity; and (4) the observation that individual sites were re-visited by flocks of cockatoos several times over the course of the study. Therefore, it is essential that the habitat be managed to maximise seed availability. In particular, the study demonstrated that reducing the intensity of prescribed burns has the potential to significantly increase food supply to the cockatoos.

Improvements to fire management, when combined with strategic revegetation programmes, have the

potential to secure and improve the conservation status of the endangered south-eastern Red-tailed Black Cockatoo.

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