# The ecology of the koala (*Phascolarctos cinereus*) in over-browsed habitats on Kangaroo Island, South Australia

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Soolim Carney

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"Latin binomials do not simply eat other Latin binomials..."

Janzen 1979

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# Abstract

Over-abundant koala populations and resultant over-browsing of vegetation has presented an ongoing challenge for wildlife managers in many areas of south-eastern Australia for almost a century. In 1996 over-browsing by koalas became evident in many areas of Kangaroo Island, and in riparian areas where preferred tree species occurred; the majority of food trees were severely defoliated. This project was one of a number of concurrent research projects which focussed on key aspects of koala ecology in order to better inform development of koala management strategies on Kangaroo Island. The main focus of the project was to investigate:

- koala foraging behaviour
- tree response to extent and pattern of defoliation
- habitat use and tree preference in preferred and non-preferred habitats
- regenerative potential of over-browsed tree species,
- effect of sterilisation and translocation of koalas on tree health.

The first part of the project involved conducting observations of the foraging behaviour of free-ranging koalas to better understand the spatial pattern of tree defoliation. Ten individually tagged and radio-collared koalas were observed for 24-hour periods on 34 occasions between August 1997 and December 1998. Koalas were found to restrict feeding bouts to one or two locations within the outer canopy of each tree they visited. Feeding was concentrated at these locations with browsed branches being almost completely defoliated. Based on these results artificial defoliation experiments were developed and used to determine the effect that pattern and extent of defoliation had on leaf production and recovery of trees.

Defoliation treatments were applied to 50 manna gum trees at Flinders Chase National Park and Victor Harbor. Manna gum trees showed strong compensatory growth following artificial defoliation. New leaf production was particularly high on trees that where subjected to canopy-wide defoliation. In contrast, branches which experienced localised damage produced comparatively fewer leaves than branches on trees which had experienced canopy-wide defoliation. It appears that manna gum can be highly tolerant of one-off defoliation of the entire canopy, even when substantial quantities of foliage are lost, but that branches may not be as tolerant of high levels of herbivory if defoliated in isolation. This is a crucial consideration when determining carrying capacities of riparian habitats both during the recovery phase of already heavily defoliated trees and the long-term carrying capacities of these habitats and suggests that carrying capacity may not correlate directly with the 'standing crop' of leaves on trees within a given area of habitat.

Between 1997 and 2000 koala numbers and tree health were monitored at Mine Creek to determine the effectiveness of sterilisation and translocation in reducing koala numbers and improving tree condition. Mine Creek has been the site of an intensive koala population control program since 1997 and presented an opportunity to test the effect of koala management techniques on tree health.

There was a decline in koala population density at Mine Creek; principally in response to translocation rather than sterilisation. The reduction in koala density at Mine Creek was short-term and did not reach the target density of 1 koala/ha. Subsequently, tree canopy condition, particularly for the preferred browse species *Eucalyptus viminalis cygnetensis*, did not improve substantially. Two years after the commencement of the management program 59% of *E. viminalis cygnetensis* trees at Mine Creek remained

severely defoliated. An increase in the population size of koalas was observed from mid-1999 onward, representing a potential doubling in the population every three years. Immigration of animals from surrounding uncontrolled areas is a potentially important mechanism of localised population recovery. An increase in koala numbers subsequent to control was unlikely to be due to *in situ* breeding, but instead immigration from surrounding uncontrolled areas of habitat (or areas where only sterilisation was undertaken and population densities remained high).

Eucalypts have a high capacity for compensatory growth and recovery if browse pressure is removed. Where over-browsing occurs the imperative for successful restoration of defoliated trees is to substantially reduce the density of koalas in the short-term and maintain reduced population levels in the long-term. Sterilisation may be usefully applied to maintain low koala densities after an initial population reduction via alternative control methods, but sterilisation alone is unable to affect much change in severely over-browsed habitats in the immediate term.

Utilisation of habitat by koalas in preferred and non-preferred tree associations on Kangaroo Island was investigated using radio-telemetry. A total of 25 koalas were radio-collared and tracked between 1997 and 2000. Preferred areas of habitat comprised of vegetation associations containing *E. viminalis cygnetensis* and non-preferred habitat typically consisted of an *E. baxteri, E.obliqua, E.cosmophylla* tree association. Observations indicated that a potentially viable, low density population of koalas occupied non-preferred habitat on Kangaroo Island. Koalas were found to use a wide range of eucalypt species and many individual koalas survived solely on a diet of tree species that were previously considered to be non-preferred by koalas on Kangaroo Island. The results of this study indicate that non-preferred areas of habitat

have significant conservation and management value, just as areas that sustain high-density populations of koalas do.

A comparison of estimated home range areas between koalas in preferred and non-preferred habitat showed that koalas in non-preferred habitat had significantly larger home ranges than koalas in preferred habitat. This was also the case within sexes with male koalas in non-preferred habitat having significantly larger home ranges than males in preferred habitat and females in non-preferred habitat having significantly larger home ranges than female koalas in preferred habitat.

The presence of a resident population of koalas in non-preferred habitat on Kangaroo Island was generally discounted until the commencement of this study. Koala management targets on Kangaroo Island were originally based on a population estimate of 3000 - 5000 koalas and the understanding that the majority of koalas occurred in the Cygnet River valley and Flinders Chase National Park. Today, methods of estimating population size on Kangaroo Island incorporate populations of koalas within high-, medium- and low quality habitats according to composition of eucalypt species. The revised koala population estimate based on this more comprehensive stratified sampling approach is ~ 27,000. It is now estimated that over half the Island's koala population resides in areas of low-quality habitat outside of Flinders Chase National Park and the Cygnet River catchment.

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