

# **Life in the countryside: How human behaviour shapes fear in eastern grey kangaroos**



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## CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Caitlin Maree Austin declare that this thesis, is submitted in fulfilment of the requirements of the award of Doctor of Philosophy, in the School of Life Sciences, Science at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any academic institution.

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## LIST OF PAPERS AND STATEMENT OF AUTHOR CONTRIBUTION

This thesis is a compilation of chapters and three published/publishable manuscripts. Chapters 3 - 5 use the language required for destination journals. This explains the disparity in the use of American English in Chapter 5. However, referencing styles were standardised throughout the thesis in accordance with the referencing style for the journal *Ecology*.

### Chapter 3 - Published

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<b>Contributor</b>	<b>Statement of contribution</b>
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## THESIS ABSTRACT

The expanding human population has reduced the space for wildlife to exist without the influence of humans. Human disturbances can elicit fear responses in wildlife, often leading to avoidance and adjustments to antipredator behaviour. These responses can be justified when human activities are harmful but can be misplaced if human actions pose little threat. The ability of wildlife to accurately interpret risk associated with anthropogenic activities can be instrumental in facilitating persistence in landscapes shared with humans. In rural or countryside environments, landscapes comprise a mosaic of tourist locations, wildlife-friendly farms, or farms where acceptance and tolerance of wildlife can vary greatly.

This study aimed to determine whether eastern grey kangaroos (*Macropus giganteus*) were capable of assessing different kinds of behaviours engaged in by humans towards them in these shared landscapes and explore the behavioural adaptations they might utilise to persist in complex countryside landscapes. I studied a population of free-ranging kangaroos in a contiguous landscape of national parks and private properties where they encounter human disturbances that vary in intent (benign or harmful) and frequency (low or high).

I found strong evidence that eastern grey kangaroos respond to the intent and frequency of human disturbances and appear to be habituated to human disturbances in areas where interactions with humans are frequent and of benign intent.

Desensitisation to benign disturbances was readily developed, as animals experiencing low encounter frequencies with humans displayed flight responses similar to those that encountered them at higher frequencies. Through the analysis of behavioural activity patterns and transitions, I found no indication that individuals experiencing benign disturbances were likely to incur fitness costs as a result of benign human disturbance. In comparison, when kangaroos experience hunting or harassment, typical antipredator behaviours, like forming larger groups when further from cover, was not observed. However, they were fearful of humans and spent less time grazing, which may negatively impact on their energy intake and associated fitness.

Furthermore, pouch young at these sites were restricted to the pouch more often than at sites of benign disturbance, reducing the amount of time young interacted with the environment and conspecifics, potentially impacting juvenile development and survival.

In this thesis, I have been able to show that behavioural plasticity in kangaroos to human behaviour is contributing to their persistence in the complex countryside landscapes shared with humans. Learning from previous interactions with humans informed the expression of behaviours and fostered coexistence. However, coexistence comes at a cost, and the harmful effects of hunting extended well beyond the lethal consequences of being shot, as living in fear can reduce individual fitness and juvenile survival.