Balancing overpopulation and conservation targets to optimize koala management strategies

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Abstract

The koala (Phascolarctos cinereus) is Australia's largest arboreal folivore that inhabits eastern and south-eastern Australia. While its populations are in decline in areas of New South Wales and Queensland, high and increasing densities in the Mount Lofty Ranges of South Australia raise concerns of overbrowsing. This challenge highlights the need for optimized fertility-control strategies to balance sustainable population management with ecological, ethical, and logistic complexities. Demographic models are valuable tools for predicting population dynamics, but their accuracy hinges on reliable estimates of population density, often influenced by biases in expert-elicited and citizen-science data. We developed and combined a point-process model, an ensemble species distribution model, and a demographic model to project koala populations in the Mount Lofty Ranges over the next 25 years to assess the efficiency and cost-effectiveness of fertility-control interventions. We tested two hypotheses: (1) koala distribution is driven by rainfall, temperature, and native vegetation, with summer rainfall boosting habitat suitability, and (2) spatially targeted fertility intervention is more cost-effective than generalized strategies due to subpopulation connectivity. Accounting for sampling biases and local densities, our models estimate that highly suitable areas in the Mount Lofty Ranges are determined by rainfall, temperature, and vegetation. Without intervention, this population could increase by ˜10% in 25 years. Fertility control focusing on adult females was the most cost-effective (˜AU$28 million) strategy, although this scenario was slower at reducing population size compared to an intervention also sterilizing female back young. While the choice of sterilization scenario has minimal impact on overall costs, ethical considerations and long-term conservation goals such as population density thresholds will have more influence on managing expenses effectively.

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