Understanding Koala (*Phascolarctos cinereus*) Population Dynamics to Inform Conservation Management Interventions | Charlotte Rigolot

Due to a range of declining processes, koalas (*Phascolarctos cinereus*) in the Australian Capital Territory, New South Wales, and Queensland are endangered and require urgent conservation management. Human impact, through land clearing, road collision or climate change, is a significant driver of decline. As a highly specialised species, the koala is particularly vulnerable to sudden changes caused by habitat loss or climate change. Consequently, there is a need for urgent action to protect this iconic Australian species and its habitat.

Over the past twenty years in eastern Australia, human pressure and indirect threats to koalas have become increasingly significant. Housing and road development have significantly impacted koala habitat through fragmentation and loss of high-quality areas. This habitat loss has made the species more vulnerable and less resilient to threats like domestic dog attacks, diseases, road collisions, and natural system modifications, such as bushfires. Habitat fragmentation can also make small, isolated populations more susceptible to inbreeding and loss of genetic diversity.

During the 2019-2020 black summer, the New South Wales Legislative Council estimated that more than twenty-five percent of the most suitable koala habitat in the state was impacted by fires, and more than 5,000 koalas died. To effectively protect the species, it is essential to understand which management method will be the most efficient and how to implement it. Several methods have been proposed to halt population declines, such as road border fences, the creation of corridors, the protection of high-value habitats, and conservation translocations. Translocation for population reinforcement is one approach that aims to boost population numbers and provide genetic supplementation. However, before implementing such actions, we must learn about the local population dynamics, such as population structure, movement, and behaviour.

This project aims to estimate the extinction risk of endangered koala populations in the Hunter region and on the north coast of New South Wales and identify the most effective conservation strategies. Extinction risk and the likely effectiveness of management alternatives will be evaluated by building population viability models incorporating data on individual health conditions, genetics,

A koala (*Phascolarctos cinereus*) fitted with a GPS collar climbing a tree. Image: Charlotte Rigolot.

demography, and movements. Fitting individuals with GPS collars will assist us in examining the fine-scale movement of koalas, enabling us to explore the relationship between population structures, individual home ranges and habitat preferences.

A vital aspect of this project is to investigate the dynamics of New South Wales koala populations, including their genetic diversity and dispersal patterns. The causes and rates of mortality will also be examined to gather more comprehensive data on these populations. It is crucial to understand which threats are most significant in these habitats and how to manage them.

To achieve this, our research team, in partnership with Taronga Conservation Society Australia, is employing new technologies that are highly efficient in the field. These include drone thermal imagery, GPS/VHF collars, and Bluetooth ear tags. We obtain near-real-time movement and behavioural data on each collared koala thanks to these collars. We can retrieve data on koala activity levels and access their precise GPS locations, allowing us to conduct field checks if the collars fail to transmit data for several days. The Bluetooth ear tags enabled the identification of individual koalas from the ground and a distance of approximately 100 metres using a tablet or smartphone equipped with a Bluetooth reader app.

This research explores four fundamental questions for the conservation of koalas in New South Wales:

Dr Larry Vogelnest and Charlotte Rigolot are looking at dentition charts in the field. Image: Jodie Lardner-Smith.

1. What is the current risk of extinction of local koala populations?,

2. What is the impact of changes in the environment and the population structure on home ranges?,

3. How does the impact of predation-related deaths in koalas compare to fatalities caused by human activities or diseases?, and

4. What are the most significant current threats to koalas in New South Wales, and how can they be effectively managed?

Charlotte Rigolot releasing a koala (*Phascolarctos cinereus*) fitted with a GPS collar. Image: Charlotte Rigolot.

Since the 2019-2020 bushfires, koalas have become a primary focus of conservation efforts in Australia. Identifying the most effective management strategies for the species across different habitats will enhance conservation outcomes. Furthermore, as an umbrella species, protecting the koala habitats will safeguard many other threatened species that share the same environment.
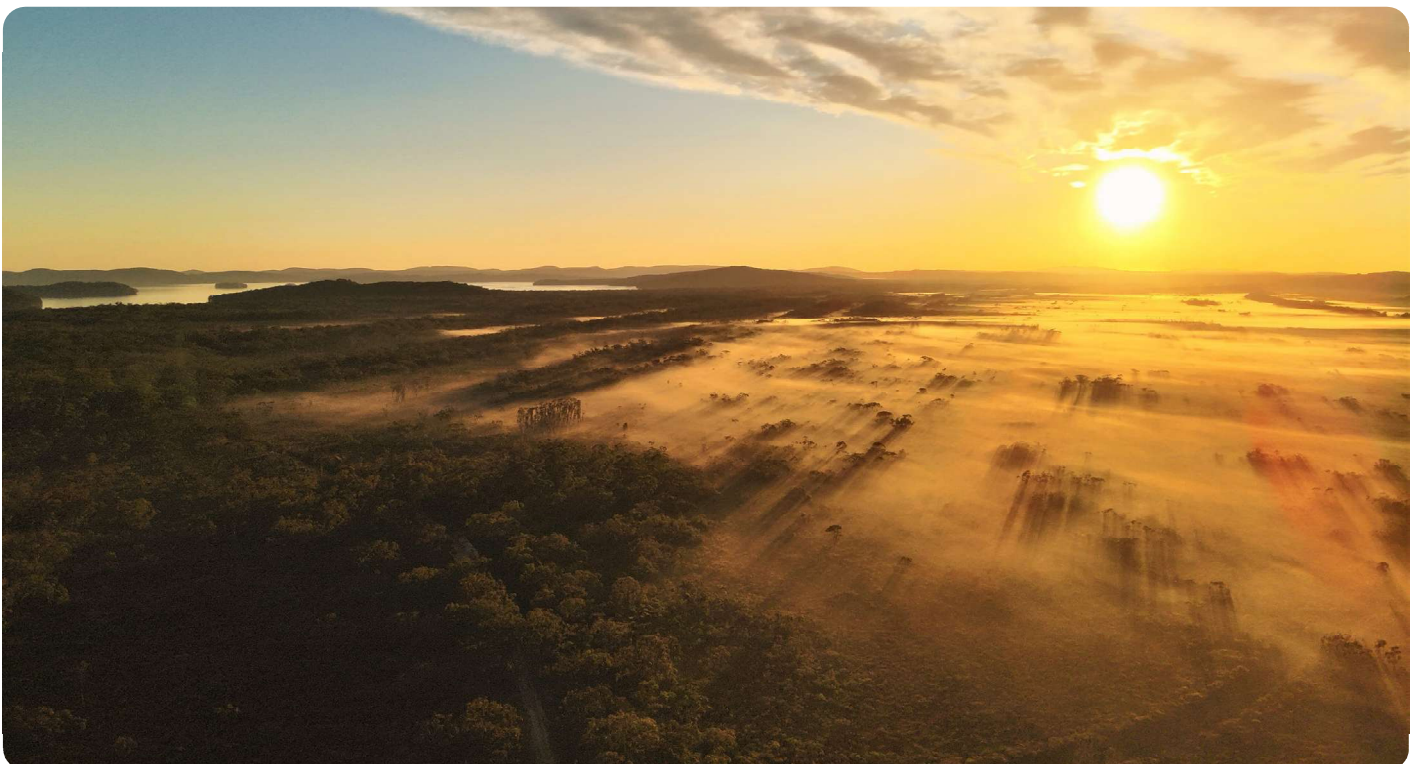
A sunrise on Myall Lakes National Park, New South Wales, one of the study sites. Image: Charlotte Rigolot (a drone view).