Can the Absence of the Dingo Lead to a Significant Transformation of Arid Vegetation?

Nicholas Chu

Nicholas is our 2018 Australian Wildlife Society University of New South Wales Wildlife Ecology Research Scholarship Recipient.

Ecosystems depend on apex predators to create ecological balance; however, they have been historically persecuted as they present a risk towards the livelihoods and safety of people. In many places around the world, the apex predator has been culled, which has created significant ecosystem-wide changes and an overall decline in biodiversity.

In Australia, dingoes (*Canis lupus dingo*) are the native apex predator, and they are still actively culled today. In regions where the dingo has become functionally extinct, there has been a cascading effect, where animals from lower trophic levels experience alternating increases and decreases in population. For example, with the dingo being the primary apex predator and population regulator of the kangaroo the removal of dingoes from an ecosystem that contains kangaroos will affect kangaroo populations – creating an increase in numbers as their predator is no longer present. As kangaroos become overabundant, this increase leads to the overgrazing of vegetation palatable to those kangaroos. Overgrazing causes progressive degradation of soil structure and, in grazed sites, potential regrowth is impeded in periods following rainfall due to a loss of soil nutrients.

But where do these nutrients go? Kangaroos are known to be vectors that transport nutrients across landscapes by consuming, moving, and egesting waste/nutrients. While this interaction is a feature of all ecosystems that contain herbivores, the overabundance of kangaroos may result in nutrients being unsustainably moved from grazing sites (i.e., swales) to resting sites (i.e., mulga trees), especially in a semi-arid environment that has limited supply/access to water and nutrients.

The project investigated whether the overabundance of red kangaroos (*Osphranter rufus*) can alter the distribution of 'productivity hotspots' in an arid environment mediated by the presence or absence of mistletoe. The project

Above: L to R: Nicholas Chu, Raimundo Garib, and Matias Garib collecting soil samples and seeking shade beneath a mulga tree (*Acacia aneura*) infected with pale leaf mistletoe (*Amyema maidenii*).

Red kangaroos (*Osphranter rufus*) resting in the shade.

examined the resting behaviour of red kangaroos and predicted that the kangaroos would preferentially rest beneath mulga trees (*Acacia aneura*) infected with the pale leaf mistletoe (*Amyema maidenii*) as they provide more adequate shade. The project predicts that this type of resting behaviour would lead to nutrients being disproportionately delivered to these trees with mistletoe. The project argues that the strength of this interaction would be more significant in apex predator-free environments, as red kangaroos occur in a higher density and are required to move less often due to the loss of fear of predation.

So far, the project has conducted a mistletoe removal experiment and has shown that mistletoes create a cooler understorey microclimate and that red kangaroos preferentially rest beneath trees where mistletoes are present, when compared to where mistletoes are removed. To determine whether this increase in red kangaroo activity equates to an increase in soil nutrients, the project will utilise plant-root simulator probes that passively uptake plant-available nutrients mobilised by water.

The results of the project seek to describe a mechanism for how culling the dingo can lead to kangaroos transforming the vegetative landscape, beyond the immediate effect of overgrazing. The project also offers additional insight into how mistletoes that are previously underappreciated as being ecologically important can structure species interactions and more broadly influence ecosystem processes and functioning.

Pale leaf mistletoe (*Amyema maidenii*) parasitising a mulga tree (*Acacia aneura*).

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