Submission No 291

INQUIRY INTO HEALTH AND WELLBEING OF KANGAROOS AND OTHER MACROPODS IN NEW SOUTH WALES

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Date Received: 23 April 2021

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23 April 2021

Dear Committee,

Re: Submission to the inquiry into the health and wellbeing of kangaroos and other macropods in NSW

Thank you for the opportunity to provide a submission to the Committee on this important issue. I have read the Terms of Reference, and wish to provide the Committee with some information regarding the following issues:

- The effects of agricultural exclusion fencing on kangaroo abundance
- The effects of agricultural exclusion fencing on kangaroo health and wellbeing
- The effects of agricultural exclusion fencing on kangaroo habitat

I have also offered some additional, general observations on the current status and management of kangaroos. All of the information presented below is sourced from long-term experimental research programs conducted in western Queensland, New South Wales and South Australia, with direct application to kangaroo management in New South Wales and the particular issues prioritized in the Terms of Reference.

Background to the data and other information provided below

The first modern agricultural exclusion fences (or 'cell fences', or 'cluster fences') were completed in 2015. These were erected in Queensland and are known as the 'Morven cluster' and the 'Tambo cluster', though there are now over 100 such cluster fences covering more than 65,000 km^2 in Queensland alone (Smith et al. 2020b). We have been monitoring kangaroo and other wildlife populations inside and outside these two fences since 2013, enabling an experimental assessment of fauna populations before, during and after fence construction. We have also monitored ground cover or 'kangaroo food and habitat' during this period. We still monitor these two fences and are likely to continue monitoring them until at least 2025.

This experiment is one of the largest of its kind and is the 'strongest inference' study ever conducted on the subject. In other words, the scientific data from this experiment is the most robust data available. Portions of it have been published or presented publically over the last few years as the study unfolds (for details see Allen 2017; Clark et al. 2018; Allen 2019; Smith and Allen 2019; Smith et al. 2020a; Smith et al. 2020b; Smith and Allen In press; Smith et al. In review), though the information contained below has not yet been published.

The effects of agricultural exclusion fencing on kangaroo abundance

Some people have claimed that agricultural exclusion fencing is a threat to kangaroo populations. Our data does not support this view, but rather shows the exact opposite.

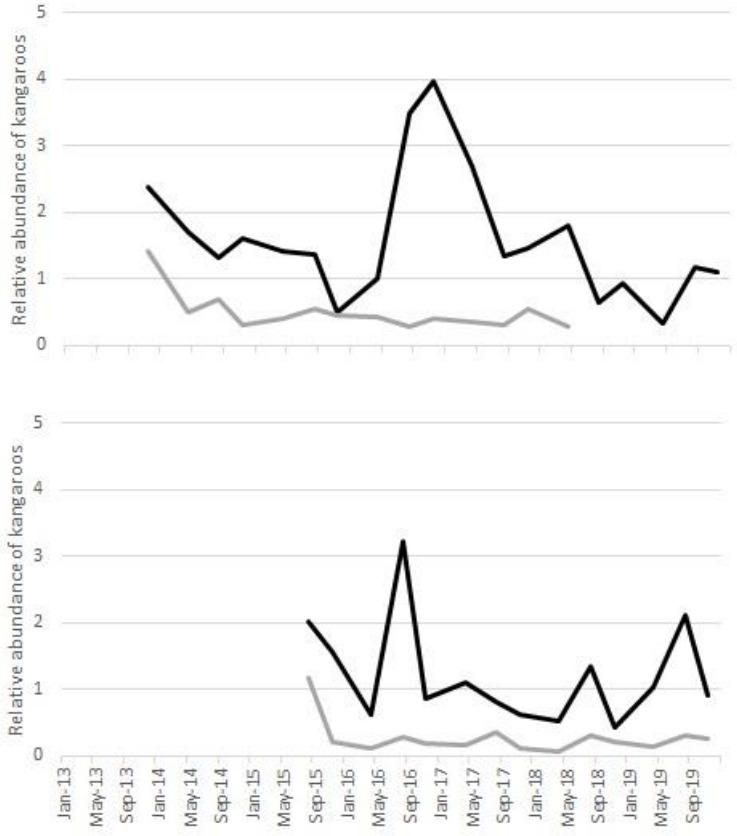

Figure 1. Kangaroo abundance trends inside (black lines) and outside (grey lines) the agricultural exclusion fences at Morven (top) and Tambo (bottom) in western Queensland, 2013–2019. *Source: Benjamin Allen, University of Southern Queensland, unpublished data from research in progress.*

Kangaroo population abundance is, on average, 3–4 times higher inside these fences than outside (Figure 1). Population trends have naturally fluctuated over time and have declined marginally both inside and outside the fences due to the recent widespread drought. However, population trends at each site have not diverged and these fluctuations were similar inside and outside the fences, demonstrating that exclusion fencing has not caused any observable declines of kangaroos over this period. Moreover, kangaroo abundances spiked at various times over the period inside the fences

but not outside (Figure 1), following localised rainfall events, indicating that exclusion fencing gives kangaroo populations a greater ability to recover following favourable rainfall conditions; without fences, kangaroo populations remained depressed despite good rainfalls.

The effects of agricultural exclusion fencing on kangaroo health and wellbeing

Some people have claimed that agricultural exclusion fencing is detrimental to kangaroo health and wellbeing. However, this is not the case for several reasons.

The ultimate measure of population health and wellbeing is population abundance (Kershaw 1969; Caughley and Sinclair 1994; Krebs 2008; Molles 2012; Smith and Smith 2015) which, for kangaroos, is far higher inside exclusion fences than outside (Figure 1). Regardless, there are a variety of additional, more subtle health and wellbeing benefits of exclusion fences on kangaroo populations and individuals.

The most of obvious of these is a reduction of dingo predation and stress effects on kangaroos. The purpose of agricultural exclusion fences is to facilitate the eradication of dingoes and other wild dogs from inside the fences, thereby enabling sheep production, which would be otherwise non-viable in the presence of dingoes (Clark et al. 2018). But sheep are not the only species that benefit from the removal of dingoes – kangaroos, too, are supressed by dingo populations and the removal of dingoes has been widely shown to result in kangaroo population increases (Figure 1, but see also Caughley and Grigg 1981; Pople et al. 2000; Newsome et al. 2001; Pople et al. 2010; Choquenot and Forsyth 2013; Allen 2015; Prowse et al. 2015). Kangaroo populations inside exclusion fences are freed from dingo attack and predation. They are also freed from the substantial sub-lethal stress or fear effects associated with dingo predation risk (see Brown et al. 1999; Creel and Christianson 2008; Creel 2018).

The removal of dingoes and other wild dogs within fences further conveys additional health and wellbeing benefits to kangaroos and other macropods. Hydatid tapeworms (*Echinococcus granulosus*) are an intestinal parasite common to kangaroos and macropods and hydatidosis can cause a variety of serious sub-lethal and lethal clinical effects (Durie and Riek 1952; Jenkins and Macpherson 2003; Jenkins 2006; Barnes et al. 2008). Hydatids are primarily transmitted to kangaroos by dingoes, and are maintained within kangaroo populations by the presence of dingoes. The removal of dingoes within cluster fences breaks the lifecycle of hydatids, which should disappear from kangaroo populations sometime after dingoes have been removed, freeing them from the debilitating effects of hydatidosis disease. Cluster fences thereby indirectly benefit kangaroo health and wellbeing through multiple pathways (i.e. reduction in predation, reduction in stress, and reduction in disease) which ultimately enable kangaroo populations to increase and thrive at levels 3–4 times higher than background levels (Figure 1).

The effects of agricultural exclusion fencing on kangaroo habitat

Some have claimed that the erection of exclusion fences reduces the habitat available to kangaroos, or that fences exclude kangaroos from suitable habitat. Our data does not support this view, but rather shows the exact opposite.

Kangaroos are present and in far greater abundance inside fences than outside (Figure 1), so there is no evidence that exclusion fences are preventing kangaroo populations from accessing suitable habitat. Kangaroos outside the fences obviously cannot get inside, but the great many kangaroos already inside the fences are not excluded by them.

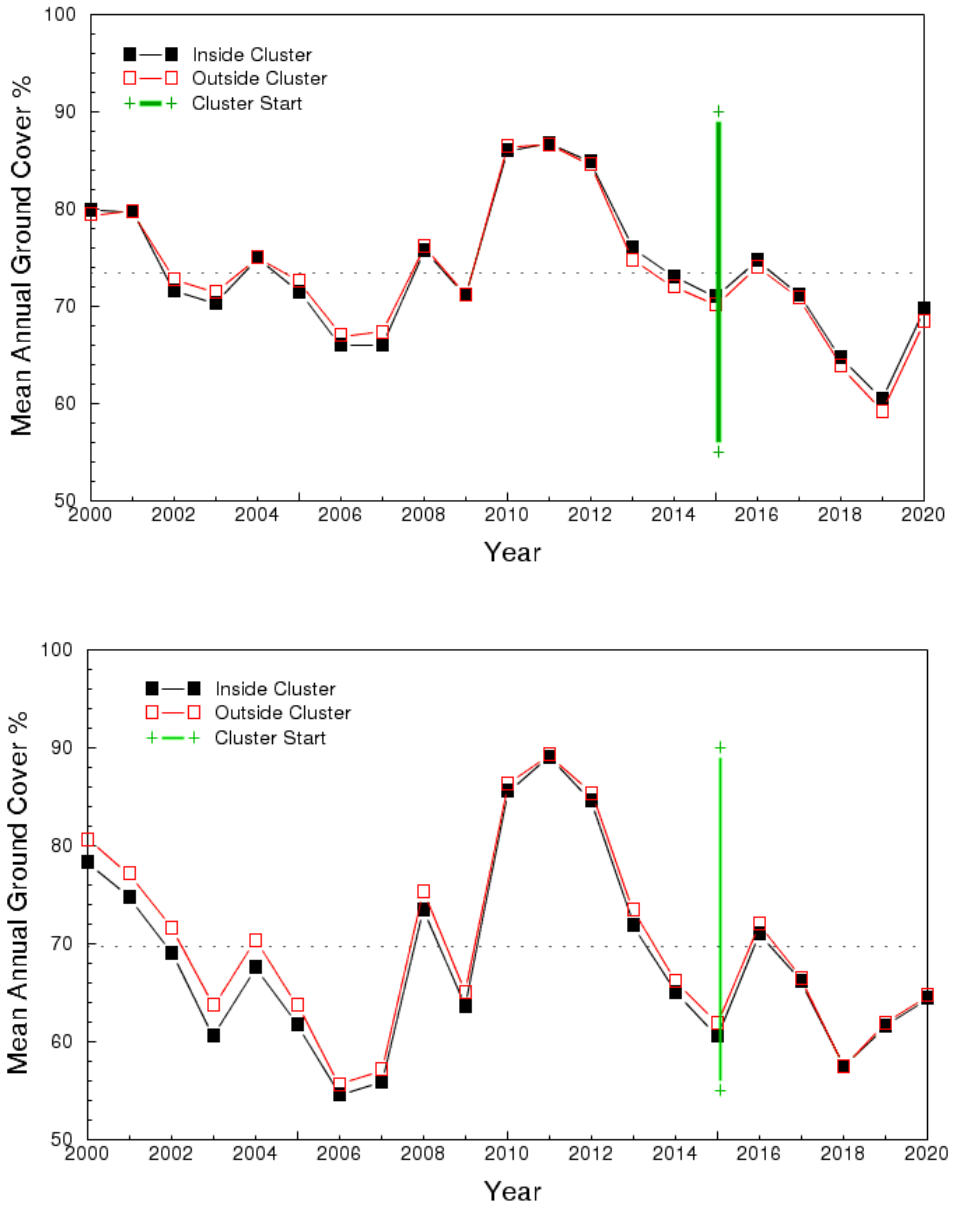

Figure 2. Mean annual ground cover trends inside (black lines and marks) and outside (red lines and marks) the agricultural exclusion fences at Morven (top) and Tambo (bottom) in western Queensland, 2000–2020. *Source: John Carter, Queensland Government Department of Environment and Science, unpublished data from research in progress.*

Remotely-sensed and ground-truthed vegetation monitoring inside and outside the Morven and Tambo cluster fences further demonstrates that food and habitat resources inside the fences are not being depleted by the extant livestock, kangaroos and other grazing animals. Green and total ground

cover inside and outside the fences are virtually identical over time with no evidence of any divergence post-fencing (Figure 2). This suggests that since fencing, average total grazing pressure (sheep, cattle, goats, and kangaroos) inside and outside fences is likely to have been similar, and that rainfall variability dominates the ground cover signal. Put simply, available kangaroo habitat and food resources are the same inside and outside agricultural exclusion fences. Similar data from additional cluster fences is available on request.

Summary and conclusion

There is strong evidence that agricultural exclusion fencing is beneficial to kangaroo health and abundance at the population level, as described above, but we do acknowledge the potential for some negative effects to individuals or to populations at smaller spatial scales.

There are anecdotal reports of unauthorised large-scale culls of kangaroos within fences resulting in population declines of up to 95% (Allen 2019), and some of the means described to achieve these culls certainly sound very concerning. Some individual kangaroos will also undoubtedly become entangled in fences and die. Fences prevent the movement of kangaroos from one side to the other, and hence inhibit long-distance dispersal through fenced regions (like western Queensland). These are important issues, and so far as they are true, will obviously have some sort of negative effect on individual kangaroos populations at small spatial scales.

But in spite of these issues, the available data does not suggest that they rise to a level that compromises the health or abundance of kangaroo populations are larger spatial scales. Two things can be true at the same time: there may well be some negative effects of fences on kangaroos in some contexts and reports of such negative effects are not unexpected, but there is also no evidence that the health and abundance of kangaroos is compromised at the population or regional level. At the large scales relevant to kangaroo conservation and management, kangaroo populations are not harmed by fences, but are rather benefitted by them in a variety of ways.

Based on long-term, large-scale, experimental and robust evidence from a variety of sources, we report that there is demonstrable scientific evidence that agricultural exclusion fencing:

1. does not cause widespread declines in kangaroos, but rather supports substantial population increases;
2. does not compromise or harm the health and wellbeing of kangaroos, but rather frees them from the lethal and debilitating effects of predation, stress, and disease;
3. does not reduce the amount of food or habitat available to kangaroos, but rather maintains available food and habitat for kangaroos and other fauna.

We conclude that despite the potential for some negative effects of fences to individual kangaroos or kangaroo populations at small spatial scales, there is robust evidence that agricultural exclusion fences actually create healthier and more abundant populations of kangaroos. This is good news for those concerned about kangaroo health and abundance, but it also points to potential problems of kangaroo overpopulation, requiring government agencies to develop and provide evidence-based

advice and management options that prevent the serious and harmful effects of overpopulation (Wilson and Edwards 2019).

The presence of exclusion fences is growing rapidly across Queensland, New South Wales and Western Australia (Smith et al. 2020b), and the environmental effects of such fences will become more widespread in the future. Accordingly, we encourage the continued interest in kangaroo health and management and support efforts to further investigate the outcomes of exclusion fencing on populations of kangaroos and other fauna.

Sincerely,

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