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Understanding wild dog predation dynamics in an Australian arid zone pastoral region

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Introduction

Beef producers throughout Australia's rangelands commonly identify predation by wild dogs as a significant threat to calf survival. Lethal control of wild dogs is often advocated as a means to reduce production losses, although evidence suggests that calf losses may be unaffected or even increased in areas where wild dogs are controlled (Allen 2013). As an apex predator, wild dogs may also play important environmental roles in some situations, including limiting numbers of herbivores that compete with cattle and limiting subordinate predator (mesopredator) populations (Allen 2015, Fleming et al. 2001, Letnic *et al.* 2012). The effects of lethal wild dog control on prey species and mesopredators in the pastoral zone are not well understood, particularly in arid areas where the climate is highly variable and prey availability is often dependent on the "boom or bust" cycles typical of many prey species.

In this study, we examined the effect of repeated wild dog control on predator and prey population dynamics in an arid pastoral district of northern South Australia.

Methods

The study was conducted over a six year period (2008-2014) on four beef cattle producing properties in northern South Australia (Figure 1). Using paired nil-treatment areas, we used sand plot activity indices to examine the relative abundance of predators and prey species in paired areas subjected to twice-yearly broad-scale poison baiting for wild dogs (see Allen *et al.* 2014). In keeping with local baiting procedure in northern South Australia, ground-laid '1080' baits (either fresh meat or DOGGONE[®]) were distributed individually, spaced at least 300m apart near water points, along unformed roads and around prominent landscape features. Paired treatment areas (each >1700 km²) were separated by a buffer distance of at least 30km to improve statistical independence. Wild dog scat samples collected at regular intervals from each treatment area were analysed to assess diet.

Results

Wild dog activity

Within properties, wild dog activity was significantly lower in baited treatment areas than in unbaited treatment areas over the course of the study (Figure 2). However, wild dogs remained present in baited treatment areas at all times.

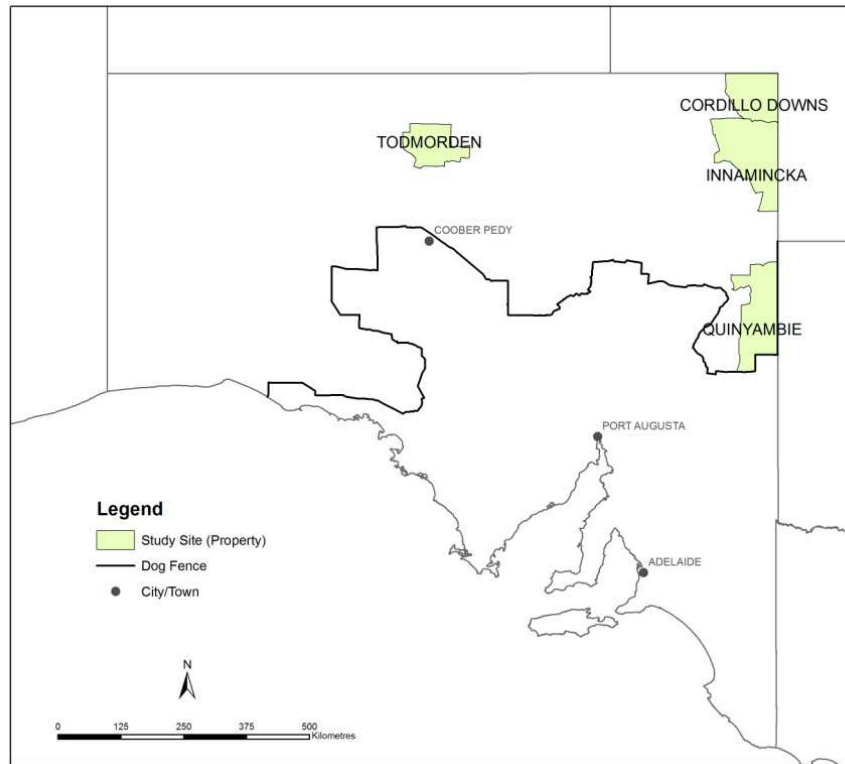


Figure 1. Location of study sites

Temporal variation in wild dog activity within properties was considerable, with multiple peaks and troughs in activity occurring throughout the study. This variation tended to occur across both treatments and was independent of 1080 baiting (Figure 2). A general peak in wild dog activity occurred in late 2011/early 2012. Above-average rainfall across the study area in 2010 and 2011 resulted in a flush of vegetation growth, irruptions in rodent populations and increased pasture production. It is likely that the peak in wild dog activity was in response to an increase in prey abundance resulting from improved seasonal conditions.

Prey populations and diet

Fluctuations in the activity of a number of prey species was closely associated with climatic variation (increasing dramatically following the onset of above average rainfall) but not one species was found to be affected by 1080 baiting.

While the suite of prey species consumed by wild dogs was similar across the entire study area, prey consumption varied considerably between properties. On Todmorden, for example, wild dog diet was dominated by kangaroo while on Quinyambie, rabbits were the most commonly consumed prey. On Cordillo Downs, rodents such as the long-haired rat were of particular importance. Overall, in continually stocked parts of the study area cattle remains occurred in approximately 18% of wild dog scats. This figure varied widely within treatment areas over the course of the study but all variation was independent of 1080 baiting.

Strong evidence of prey switching was observed, with the relative importance of different prey species changing dramatically and rapidly over time. We found a direct correlation between the availability of small mammalian prey (e.g. *Pseudomys* spp., *Notomys* spp.) and the percentage occurrence of these species in wild dog scats. The occurrence of cattle remains in wild dog scats decreased substantially when small mammals were in abundance and returned to previous levels once the population irruption was over. Consumption of small lizards and birds also increased in the flush climatic period.

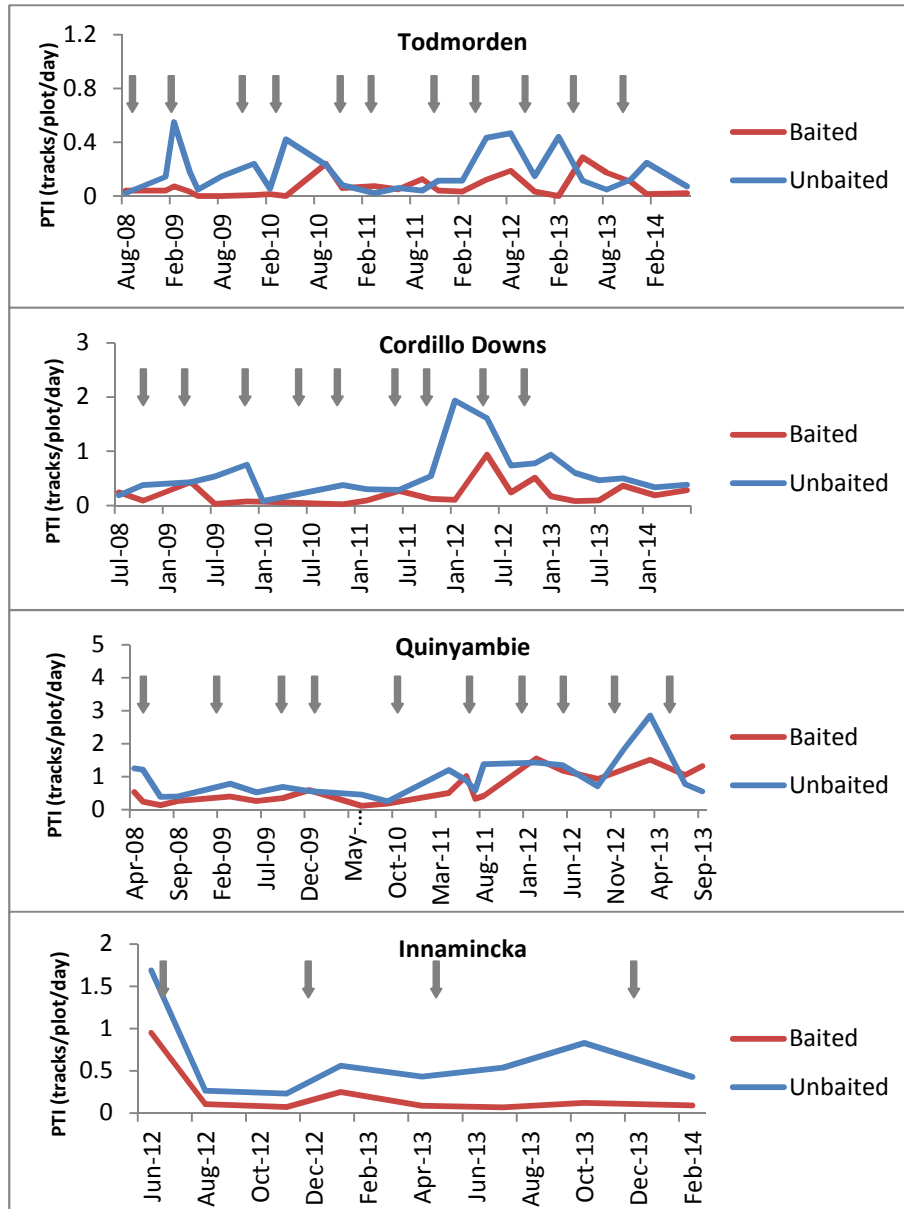


Figure 2. Activity levels of wild dogs on sand plot transects as measured using a Passive Tracking Index (PTI; the number of individual sets of tracks per plot per day). Grey arrows represent baiting events in the baited areas.

Mesopredators

We observed no significant effect of 1080 baiting on the activity of foxes across or within properties. However, correlation between fox activity and small mammal availability was identified on some properties, indicating a response to improved climatic conditions in these areas. Fox activity was correlated with the presence of rabbits on sand plot transects.

The detection rate of cats on sand plots was particularly low across the entire study area, which is likely to have affected the ability of statistical analysis to detect change in cat activity. Consequently we were unable to identify any trends or patterns in cat activity relating to either the baiting treatment or to changes in prey availability.

Fox remains were not detected at all in wild dog scats but cat remains were recorded at very low levels (ranging between 0.2 and 0.8% of scats). There was no obvious relationship between wild dog consumption of cats and alternative prey availability.

Discussion

Results indicate that measurable temporary reductions in wild dog activity can be achieved on individual pastoral properties using the ground-based baiting techniques conventionally employed by cattle producers in arid and semi-arid pastoral country. However, even with twice-yearly baiting and relatively high bait densities, wild dogs remained reasonably active in baited areas and the contrast in activity levels between baited and unbaited treatment areas was somewhat marginal. Such minor reductions possibly explain why the study failed to identify any influence of baiting on mesopredator populations. However, we believe the low rate of cat detection on sand plots affected the reliability of these findings. The absence of a response in cat activity to seasonal changes in prey availability seems unlikely and suggests that techniques employed in this study to assess the activity of cats were sub-optimal. We suggest that broad-scale assessment of baiting impacts on predator and prey populations in the arid zone requires enhancement, perhaps integrating additional techniques with sand plot monitoring to improve detection.

This study demonstrated the dominance of seasonal variation as a driver of predator and prey population fluctuation in the arid zone. We found no evidence that repeated lethal wild dog control affected seasonal fluctuation in prey activity or wild dog diet. Wild dogs at all study sites altered prey consumption according to prey availability. The reduced intake of cattle at times when small mammals were relatively abundant does not necessarily indicate reduced calf predation. The incidence of carrion in the landscape may also vary according to season, thus a higher frequency of cattle in diets during dry times may reflect a higher prevalence of carcass availability.

Differences in staple prey for wild dogs between properties suggest wild dog management programs need to be tailored to individual properties. For example, a property where the preferred prey is kangaroo may need to control dogs when kangaroo abundance declines to guard against a possible switch to calves while a property where rabbits are the preferred prey may need to initiate wild dog control when rabbit numbers are low. Peaks in the abundance of these prey species would not necessarily coincide. This highlights the importance of monitoring as a component of effective wild dog management.

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