Jackal ecology on reserves and farms

Researcher: Graham Kerley PhD

Team members: Dr Liaan Minnie PhD

Research Institute: Animal Production Institute, Agricultural Research Council (API-ARC)

Research focus area: Predation management

Final report approved: 14 September 2017

Full Title of the project

Ecology and population dynamics of black-backed jackal (Canis mesomelas) on reserves and farms

Aims of the project

To determine dispersal direction between subpopulations

To compare demographic structures between subpopulations

To compare resource use between subpopulations

Executive summary

Lethal carnivore management, aimed at reducing carnivore impacts, threatens the persistence of carnivores globally. The effects of killing carnivores will depend on their life histories and social structures. Smaller canids, like black-backed jackals (Canis mesomelas), are highly adaptable and display variable population-level responses to mortality sources, which may contribute to their success in fragmented landscapes. Jackals, the dominant predator of livestock in South Africa, are widely hunted to reduce this predation. This hunting is heterogeneous across the landscape, focussed on livestock and game farms, with nature reserves acting as refuges. The aim of this research was to investigate the ecology and population dynamics of jackals in response to heterogeneous anthropogenic mortality. I hypothesized that the spatial variation in hunting results in the formation of a source-sink population structure, which contributes to the persistence of jackals. I addressed this hypothesis by evaluating two criteria, essential for the formation of a source-sink system in larger mammals. Firstly, I confirm that hunting pressures result in the formation of distinct subpopulations with asymmetrical dispersal (i.e. compensatory immigration) from unhunted

reserves to neighbouring hunted farms. Secondly, I show that jackal subpopulation display asynchronous demographics, with farm populations displaying a relatively younger age structure and an associated increase in reproductive output (i.e. compensatory reproduction). This confirms the formation of a hunting-induced source-sink system. Additionally, I show that jackals have a catholic diet, which confers a level of adaptability to direct (anthropogenic mortality, prey provisioning) and indirect (alteration in prey base) habitat modifications. This dietary flexibility allows jackals to obtain the appropriate resources to achieve reproductive condition. The relatively better body condition of younger jackals in sink habitats allows for compensatory reproduction which contributes to the success of jackals on hunted farms.

Based on my findings, I hypothesize that the compensatory life history responses of jackals to anthropogenic mortality may be ascribed to two interconnected mechanism. Dispersal is presumably driven by density-dependent interference competition, as dominant territorial pairs outcompete subordinates in high-density reserve areas, forcing them to disperse onto low-density farms (i.e. ideal despotic model). Additionally, farms likely represent attractive habitats, owing to a reduction in conspecifics and a concomitant increase in resource availability (including anthropogenic resource provisioning).

Therefore, dispersing subordinates presumably select for farms which are perceived as good quality habitats, as the high risks of anthropogenic mortality cannot be perceived by dispersing individuals. This results in the formation of an attractive sink or ecological trap. These compensatory processes will continue to counter population management actions as long as recruitment from unmanaged areas persists.

This hypothesis provides a conceptual framework for future research directions in understanding jackal persistence and management (i.e. specifically focussing on controlling dispersal) of jackal populations. Brine injected samples tended to show higher initial (day of injection) total aerobic micro-organism counts (0.5 – 0.7 of a log) likely due to the recirculation of the brine during application. However, microbial growth was later (day 6 on the shelf) inhibited, probably by the potassium lactate in the brine mix, eventually leading to the brine injected samples having lower total aerobic bacteria loads (between 0.5 and 0.8 of a log) than Control samples. Also because of recirculation of brine, yeasts and molds were higher in injected samples (0.8 to 1.0 log) after injection, but differences between Controls and injected samples became insignificant after 6 days on the shelf.

Both Warner Bratzler shear force and sensory tenderness showed beneficial effects due to brine injection even at levels as low as 5 %. A slight linear increase (lower shear force and higher tenderness score) was observed with increasing level of injection although the effect was not statistically significant above 10 % injection level. The taste panel also scored injected samples higher for juiciness and although these scores increased slightly with level of injection, no significant effect was observed above 10% levels. As expected, the taste panel also scored injected samples higher for saltiness, but no off-flavours were identified.

Another advantage of brine injection was a reduction in thawing and total cooking losses. The maximum effect was observed at 5 % injection level and cooking loss slightly increased as injection level increased.

In conclusion, it seems that the advantages and disadvantages of brine injection is correctly balanced by the 10% brine injection limit enforced by the Agricultural Product Standards Act, 1990 (ACT No. 119 of 1990; 30 January 2015) for beef. Brine injection levels above 10% showed no additional effect on eating quality. Likewise, the negative effect on colour of freshly displayed meat deteriorated at levels above 10%, while the protein dilution effect also became evident at 10% level. Higher salt irrespective of injection level may be a health concern.

Please contact the Primary Researcher on the project if you need a copy of the comprehensive report – E-mail: graham.kerley@mandela.ac.za