Farmer perceptions of carnivores, their culpability for livestock losses, and the protective measures used in Northern Cape Province, South Africa

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Abstract. Livestock losses are often integral to human conflicts over carnivores; these conflicts threaten the livelihoods of many communities, as well as carnivore species survival. To begin assessing livestock depredation and conflict over carnivores in South Africa’s Northern Cape Province, a farmers’ union meeting was used to capture farmer (n = 22) perceptions of carnivores in 2017. Most farmers reported black-backed jackals and caracals (n = 11 and 10, respectively) as most frequently culpable for livestock losses. However, culpability and reported presence on farmlands by these and other carnivore species were not always aligned. Carnivores were generally perceived in a negative manner, with most respondents supporting livestock protection methods involving the removal or separation of carnivores from farmland, as opposed to those facilitating coexistence. Comprehensive socio-ecological investigation of factors relevant to improving human-carnivore coexistence of benefit to both farmers and wildlife is warranted in this region.

Key words: agriculture, coexistence, depredation, human-wildlife conflict, predator

Introduction

Carnivores and humans have increasingly overlapping territories and resource requirements (Atwood & Breck 2012). Consequently, human-carnivore interactions often include threats to human or domesticated animal life, with detrimental consequences to the carnivores, people and/or domesticated animals (Atwood & Breck 2012). The economic costs incurred from livestock loss or injury from predation events, as well as the cost of carnivore control methods (McManus et al. 2015), alongside other social factors (Dickman 2010, Dickman & Hazzah 2016) contribute to the diversity of perspectives and considerations involved in stakeholder conflict over carnivores.

In South Africa, progress has been made towards the promotion of farmer-carnivore coexistence in many areas, but farmer-carnivore interactions remain largely unexplored in some regions. Unprotected areas such as private agricultural land are now host to populations of endangered predator species, including a large proportion of...
South Africa’s remaining free-ranging cheetah (*Acinonyx jubatus*) population (Durant et al. 2017). The engagement of local communities in species recovery is considered paramount (Durant et al. 2017) and, moreover, local ecological knowledge has proven valuable in some areas (Gandiwa 2012) but when overlooked, especially due to an apparent or perceived superiority of scientific knowledge, the consequences for inter-stakeholder conflict can be significant (Terblanche 2020). However, in some areas, very little is known about carnivores on private agricultural land.

To begin to address this need, Cheetah Outreach Trust (South Africa) launched a stakeholder engagement initiative in the Northern Cape Province of South Africa. This region had received little prior attention as regards human-carnivore interactions. Our preliminary survey aimed to begin to explore 1) carnivore presence on livestock farming properties, as reported by farmers (Romañach et al. 2007, Thorn et al. 2011) and 2) perceived stock depredation, including the livestock species lost to depredation, carnivore species considered responsible, and farmer utilization of livestock protection methods.

**Study Area**

The target survey area was the farming community around the town of Van Zylsrus in the John Taolo Gaetsewe district of the Northern Cape (Fig. 1) formerly known as Kgalagadi, a district covering 27,293 km² (John Taolo Gaetsewe Municipality 2019). Land use is predominantly mining (manganese, semi-precious stones, and industrial minerals) and agriculture (John Taolo Gaetsewe Municipality 2019). Agricultural uses include cattle, sheep, goat and game farming and the area is well utilised for commercial hunting in the winter (John Taolo Gaetsewe Municipality 2019). The climate is typical of desert and semi-desert regions, with median temperatures fluctuating from 25 °C to 38 °C and rainfall varying seasonally from 0-50 mm per month (van de Ven et al. 2020).

**Material and Methods**

The data collected for this research were obtained over a one-week period in 2017 by a native Afrikaans speaker who had no previous experience with local stakeholders (M. Basson). We administered a questionnaire (Table S1) at a regional farmers’ union meeting which was planned and arranged independently of this study. This meeting was selected in order to allow for access to multiple stakeholders during a short period of time and provided an opportunity for informal discussions. The chairman of the regional Farmers’ Union introduced the researcher, explained the purpose of the survey (to understand farmer experience with
predators on their land and methods of protecting their livestock from depredation) and encouraged farmers to participate. The questionnaire was then distributed to farmers. Completed surveys were collected at the end of the event or over subsequent days while the researcher remained in the area; participants were made aware of where to submit their completed surveys or how to contact the researcher if they had any further comments or questions.

The questionnaire items covered farm characteristics, carnivores perceived as present, livestock depredation, and methods for mitigating livestock loss. No timeframe was indicated for carnivore presence/absence or for depredation events and responses were recorded in a binary (yes/no) manner for the purposes of analysis. Farmers were able to complete the questionnaire in the absence of the researcher to encourage honest responses and no personal data other than farm identifiers were collected.

Given the preliminary nature of this investigation, alongside the small sample size, survey brevity, lack of prior validity-testing of the questionnaire, and the limited number of variables investigated per farm, only descriptive statistics are reported. The methodology was approved by the Nottingham Trent University ethical review group (ARE861).

Results

Of the 60 questionnaires distributed, 22 were returned, although not all were complete. Incomplete questionnaires were retained for analytical purposes and missing data acknowledged by reporting sample sizes independently. Farms (n = 22) represented a total of 1,546 km² (i.e. 5.7% of the district area). All questionnaire respondents were white, male Afrikaans farmers. All reported raising cattle, but 18 and nine also raised sheep or goats, respectively.

Nine of the farms included some area set aside for game species.

Carnivore species present on the farmlands
A range of carnivore species were reported on farms (n = 20; Fig. 2A), but lions (Panthera leo) and wild dogs (Lycaon pictus) were never seen.

Livestock species lost to depredation by carnivores
All farmers reported losses of sheep, but fewer reported losses of cattle or goats (Table 1). Of the respondents reporting losses of other species, most had lost springbok (Antidorcas marsupialis; n = 7/14), while fewer reported losses of duiker (Sylvicapra grimmia), impala (Aepyceros melampus) and gemsbok (Oryx gazella; Table 1). Verification of the losses or cause of mortality in stock was not possible.

Table 1. Farmer (n = 22) perceptions of carnivores in the Northern Cape, South Africa, assessed by questionnaires during a farmers’ union meeting in 2018.

| Farmer-carnivore conflict statement | n | Response |
|-------------------------------------|---|----------|
| Which species of livestock are lost to carnivores? | 13 (with relevant livestock present) | 13 lost sheep  
| | | two lost cattle  
| | | two lost goats  
| | 14 (reporting losses of other species) | seven lost springboks  
| | | five lost duikers  
| | | one lost gemsbok  
| | | one lost impala  
| Which carnivores are responsible? | 22 (regardless of whether the species was considered present on their property) | 11 blamed black-backed jackals  
| | | 10 blamed caracals  
| | | four blamed brown hyaenlas  
| | | four blamed honey badgers  
| | | one blamed leopard  

Carnivore species perceived as responsible for depredation

Farmers assigned blame for livestock depredation to five of the seven carnivore species reported as present on farms (spotted hyaena *Crocuta crocuta* and cheetah were never considered responsible for depredation; Table 1).

Overall, more farmers reported species as culpable when they were concurrently considered present on farms, compared to when considered absent (Table 2). Likewise, absence from farms was most often associated with species being considered “not culpable”. However, reported presence was not consistently associated with assignment of blame in the case of leopard, caracal (*Caracal caracal*), and black-backed jackal. In contrast, when reported as present, brown hyaenas (*Hyaena brunnea*) and honey badgers (*Mellivora capensis*) were most often considered “not culpable”.

Farmer utilization of livestock protection measures

A range of livestock protection methods were reported with the most common being shooting and electric fencing, followed by gin traps (a.k.a. foot-hold traps; Fig. 2B). Of the 17 respondents completing this part of the survey, five (29%) used only lethal methods, four (24%) used only non-lethal methods, and eight (47%) used a combination of methods.

Sixteen farmers provided additional details about fencing on their property; the majority (n = 12) used a 1 m apron fence (these include a buried section of fence (“apron”) to prevent burrowing under the fence), five farmers used this in combination with other game fencing, while three farmers used game fencing without an apron.

Twelve farmers responded to the question about possible solutions to predators such as cheetah on farmlands, many offering more than one solution (23 responses in total). Most (n = 10; 83%) respondents suggested translocation to protected areas to be a solution. Five (42%) considered compensation (for live captures, as opposed to compensation for stock loss which was not available in this region) to be a solution, and five considered

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Table 2. Farmer responses to carnivore species perceived to be present on farms and their associated culpability for livestock depredation (no responses provided for lions or wild dogs) in the Northern Cape Province (South Africa) in 2018.

| Species                  | Perceived as present | Perceived as absent |
|-------------------------|----------------------|---------------------|
|                         | Culpable  | Not culpable | Culpable  | Not culpable |
| Brown hyaena            | 3         | 8           | 1         | 10          |
| Spotted hyaena          | 0         | 1           | 0         | 21          |
| Cheetah                 | 0         | 1           | 0         | 21          |
| Leopard                 | 1         | 1           | 0         | 20          |
| Caracal                 | 9         | 8           | 1         | 4           |
| Black-backed jackal     | 10        | 10          | 1         | 1           |
| Honey badger            | 4         | 7           | 0         | 11          |

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Fig. 2. A) Carnivores perceived as present on farms owned by respondents (n = 20) and B) Livestock protection methods used by farmers in our survey (n = 22, multiple responses per person were accepted), Northern Cape, South Africa, in 2018.
translocation to another farm to be a solution. One respondent (8%) suggested ecotourism, another suggested local hunting, and another suggested captive breeding to be the solution. None of the farmers indicated trophy hunting to be a solution.

**Discussion**

Our survey elicited a number of preliminary insights into human-carnivore interactions in a farming area of South Africa that is relatively unexplored in this context. As private agricultural land outside of formal protection is considered important for conservation of vulnerable large carnivores such as the cheetah (Durant et al. 2017), the views of the owners and managers of these areas provide a useful starting point for future ecological and social research and community engagement.

Firstly, farmer-perceived carnivore presence was largely aligned to current scientific understanding of species’ presence in the wider landscape surrounding the study site, suggesting good local ecological knowledge as previously shown elsewhere (Gandiwa 2012). Although empirically determined estimates of carnivore occupancy or population status in our study area do not yet exist, to our knowledge, data from neighbouring North West Province suggests black-backed jackals and caracal are likely to be widespread and abundant (Thorn et al. 2011), aligning with farmer-perceived presence in our study. Likewise, cheetahs were perceived as absent from most (but not all) farms, which tallies with their being considered resident but not common or abundant in the neighbouring province (Thorn et al. 2011). However, leopards and brown hyaenas were considered as absent by most farmers, whereas in the neighbouring province these species are reported to be widespread residents or to have high occupancy estimates, respectively (Thorn et al. 2011). This may reflect the elusive and often more nocturnal nature of these species.

Farmers most commonly blamed black-backed jackal for livestock losses, which is similar to other South African studies (Terblanche 2020, Thorn et al. 2012), as well as findings in Botswana (Gusset et al. 2009) and Namibia (Rust & Marker 2013). It will be important to consider this assignment of blame in the context of carnivore population densities and/or the occurrence of meso-predator release in future studies in this region. Moreover, in another part of the Northern Cape (the Karoo), jackals have political as well as social and ecological meaning, whereby they may represent, reflect or reaffirm farmer frustration and grievance with other stakeholders (Terblanche 2020). Caracal were the second most frequently reported cause of predation in South Africa (our survey and an earlier study in the North West Province (Thorn et al. 2012)) but were rarely blamed in Botswana (Gusset et al. 2009) indicating a context-specific response to this species. Under the hypothesis that assignment of culpability influences stakeholder behaviour or tolerance towards a species (Kross et al. 2018), this finding may indicate persecution of both jackal and caracal in our study area and warrants more detailed investigation.

Previous research has also highlighted the potential risk that blame is assigned in the absence of confirmed causes of livestock loss (i.e. overlooking other possible explanations such as disease, theft, or escape) or where scavenging behaviour is incorrectly equated with predation (Marker 2002). In our survey, farmer perception of hyaena culpability was misaligned with the two species’ feeding ecologies. Brown hyaenas were blamed by four farmers as being responsible for livestock losses, while spotted hyaenas were never blamed. These perceptions of brown hyaena predation are at odds with their known foraging strategy, which predominantly involves scavenging (Burgener & Gusset 2003, Mills 1987). Although carnivore identification skills were not assessed in our study, they are typically considered proficient (Rutina et al. 2017), such that it is possible that brown hyaenas may have been seen scavenging on livestock carcasses and incorrectly assumed to have been responsible for the livestock’s death.

Interestingly, a small number of farmers assigned culpability to species they considered to be absent from their properties, perhaps reflecting a hypothetical culpability for the species rather than a specific experience by the farmer. This raises the question of what information or factors may be shaping farmer perceptions of carnivores, especially if personal experience of the species is not involved. Alternatively, this may simply reflect misinterpretation of survey questions in these few cases.

Most of our respondents reported using lethal activities against carnivores (either solely or in combination with non-lethal methods). Of the
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lethal methods reported, only poisoning is illegal. Although the reporting rate of poisoning was not lower than legal methods such as electronic devices (e.g. alarms, auditory or visual deterrents), overnight kraaling or guarding dogs (these were often used in combination), poisoning may still have been under-reported given its prohibited status. Similarly, most farmers listed fencing as a form of livestock protection, indicating a desire to exclude carnivores from their properties. Nearly half of respondents providing responses to questions about solutions provided support for compensation schemes, potentially reflecting acceptance of carnivore activity on their properties was dependent on the mitigation of economic losses (rather than direct protection of livestock themselves). However, methods aimed at reducing livestock losses without the exclusion of carnivores (and potentially more likely to facilitate true coexistence), such as livestock guarding dogs or livestock protection collars, were rarely reported to be used.

Farmers were suspicious and reserved, anecdotally reporting a concern about the involvement of local authorities. This potentially explains the low response rate and urges a cautious interpretation of these data. However, it nonetheless confirms previous concerns raised regarding barriers to human-carnivore coexistence (Durant et al. 2017) and is similar to findings in other parts of this province, where inter-stakeholder conflict is substantial (Terblanche 2020). Although an independent researcher familiar with the language and culture conducted the survey, future efforts to understand farmer perspectives should focus on first obtaining greater integration within the community prior to data collection.

Other limitations to our survey include the use of only binary response options which failed to characterize the frequency of carnivore sightings. Likewise, culpability was not characterized or verified in terms of severity or frequency of depredation events. Additionally, no validation or reliability testing of the psychometric properties was performed for our survey instrument such that further research is required in this region.

In conclusion, we found a general preference for the separation or removal of carnivores from livestock farming areas, albeit with some support for non-lethal control methods. Elucidating the perception-behaviour interface and understanding factors influencing farmer perceptions of carnivore culpability and predator control method effectiveness will be important when promoting farmer-carnivore coexistence.

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Supplementary online material

Table S1. Questions asked of farmers in the Northern Cape Province of South Africa (https://www.ivb.cz/wp-content/uploads/JVB-vol.-70-2-2021-Whitehouse-Tedd-K.-et-al.-Table-S1.docx).