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Predators, livestock losses and poison in the South African Karoo

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ABSTRACT

A panel study of 66 sheep farmers in the South African Karoo, in the years 2012, 2013 and 2014, revealed that farmers cull predators (black-backed jackals, caracals and baboons) in response to livestock losses. Those whose entire livelihood came from sheep farming culled predators in greater numbers. Killing predators, however, is probably counter-productive as culling is associated with greater livestock losses the following year. This finding is robust to the inclusion of a set of socio-economic and farm-level characteristics and is consistent with predator ecology (killing territorial predators can create vacancies for dispersing juveniles to move in to, resulting in greater stock losses later). Farmers also reported that both lethal and non-lethal methods to control predators were becoming less effective over time. This is in line with evidence highlighting the capacity of caracals and especially black-backed jackals to adapt to persecution. Poison use is widespread and unrelated to socio-economic status. Reported poison use increased over the study period. Poison has unintended effects on wildlife (killing non-target animals, especially scavenger species) and poses challenges for cleaner production and sustainable development.

1. Introduction

Livestock production is an important issue for cleaner production as it is associated with soil degradation, groundwater pollution, greenhouse gas emissions (notably with regard to cattle), deforestation and destruction of natural habitat (see Abbasi and Abbasi, 2016; Rivero and Daim, 2017). The use of poison against predators poses additional environmental threats through its adverse impact on wildlife and biodiversity. This paper discusses the challenges posed to sustainable sheep farming and wildlife conservation by the lethal management of predators in South Africa – especially the use of poison.

The caracal (*Caracal caracal*) and black-backed jackal (*Canis mesomelas*) are long-standing foes of South African sheep farmers (Nattrass et al., 2017a). These meso-predators were controlled through most of the twentieth century with the assistance of subsidized fencing and government support for lethal management including the provision of poison and support for hunting with dog packs (Beinart, 2003). Such support declined from the 1980s and since the early 1990s, predation re-emerged as a problem for sheep farmers (especially in the dry interior Karoo), resulting in significant contestation over how best to manage them (Nattrass and Conradie, 2015). Ecologists favour non-lethal methods to deter predators and otherwise protect livestock, warning that killing territorial predators can make problems worse for farmers as it creates vacancies for dispersing juveniles to enter the territory, potentially worsening the level of livestock depredation. Farmers, however, argue that lethal control worked in the past and that as predator numbers are a function of food supply, co-existing with predators on the land is not a stable or sustainable solution.

Increased predation on South African sheep farms appears to be a consequence of natural 'rewilding' or recolonisation, a process driven by the rise of 'life-style' farmers with little interest in making a living solely from farming and an increase in land allocated to nature reserves (Reed and Kleynhans, 2009). Declining government support for agriculture and shrinking employment on farms (exacerbated by increases in legislated minimum wages) has also made it more difficult for sheep farmers to allocate resources to protecting their sheep (Nattrass and Conradie, 2015). Already buckling under longer term cost pressures and falling input prices (Conradie et al., 2013), South African sheep farmers understandably

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regard predation as a dangerous final assault on their already marginal livelihoods.

This paper presents findings from a panel study conducted in 2012, 2013 and 2014 amongst sheep farmers in the Karoo about their living standards, experiences and attitudes regarding predation and control of predators. We show that the median farmer earned about as much as a typical artisan, and that those who were totally reliant on income from sheep culled predators in greater numbers. We present evidence suggesting that culling of predators is retaliatory, but that this might also be counter-productive as it is associated with increased livestock losses in the following year. We go on to demonstrate that farmers engage in a range of control measures – both lethal and non-lethal – but that over time, farmers regard most methods as becoming less effective. A worrying trend has been widespread and probably rising use of poison to kill predators. Although illegal, agricultural pesticides are used against predators around the world because they are cheap, silent and effective, but with potentially devastating consequences for non-target species especially scavengers such as vultures, crows, hyenas and mongooses (Allan, 1989; Ogada, 2014). Promoting cleaner production – in the sense of more environmentally friendly predator control methods – is essential. This paper discusses the socio-economic correlates of poison use as a first step towards understanding the nature of the challenge involved with regard to sheep farming in the South African Karoo.

Part 2 introduces the Central Karoo Panel Study and discusses the key variables and hypotheses used in the paper. Part 3 discusses the results and provides additional information about the socio-economic status of the sheep farmers and some of the factors (notably rainfall) affecting some of the trends over time. Part 4 concludes.

2. Materials and methods

The panel study of Karoo sheep farmers interviewed the same sample of sheep farmers in 2012, 2013 and 2014 to investigate management decisions, economic outcomes and control of predators over time. It thus offers a unique opportunity to situate wildlife management choices within an economic understanding of the farm. The analytical approach adopted here is exploratory, applying multivariate regression analysis to panel data to investigate choices and potential socio-economic correlates.

2.1. The Central Karoo panel survey

The plains of the Central Karoo (longitude 22.238402, latitude −32.814620) between the Swartberg Mountains in the south and the Great Escarpment in the north was chosen as the study area because it is both relatively accessible (<400 km from Cape Town) and is a long-standing sheep farming area. The region experiences less than 150 mm of rain per annum. Landscape use has been shifting from sheep farming to lifestyle farms and nature reserves (Reed and Kleynhans, 2009) and the remaining commercial sheep farmers consider predation and drought to be the biggest threats to the survival of their businesses (Conradie and Piesse, 2016).

According to the most recent farm census for the Western Cape, as of 2014/15 there were 155 farms in the Central Karoo (Western Cape Department of Agriculture, 2017: 17). The census did not report on the type of farm, but most of these would have been sheep farms and a minority would have been game, cattle and seed farms. We were able to approach 98 sheep farmers through agricultural associations and successfully recruited 71 for the study. From this data set we extracted a 'balanced panel' of 66 sheep farmers who participated in the survey in each of the three years, although not all of them answered all the questions.[1] Given that 72% of those we approached agreed to participate in our study, we are confident that the sample is broadly representative of those farmers who both live in the study site and are members of farmers associations (which we are reliably informed, amounts to almost all the commercial sheep farmers).

The survey instrument was a semi-structured questionnaire administered in face-to-face interviews. Some farmers kept detailed accounts pertaining to farm management whereas others relied on memory and informal dairies. The livestock module of the panel survey recorded the number of sheep by breed as well as the number of lambs tagged at six weeks old and what happened to each of them (retained as replacement breeding stock or sold or died). Some variables are more reliable than others; stock sheep numbers are, in our estimation reliable, and the number of lambs tagged and sold are judged to be reasonably accurate. Pregnancy checking with ultrasound methods was not widely used which means that the first estimate of reproductive performance is available when lambs are tagged at age six weeks. The number of lambs lost to predators before this time is unknown, which implies that estimates of predation rates based on this data are probably an under-estimate of actual predation (Conradie and Nattrass, 2017). Losses through theft or disease were reported separately from predation – though these data were inevitably associated with large-scale events. To the extent that isolated deaths and petty pilfering was attributed incorrectly to predation, the estimate of losses to predation would, correspondingly, have been over-estimated.

The number of predators killed by farmers is difficult to determine with any precision because where poison is used as one of the methods to control predators, farmers cannot know for sure the number of predators (and other animals) killed in this way. Our variable 'predators culled' only includes predators known to be killed in traps or shot (or found dead near poisoned carcasses). Since farmers sometimes pay bounties to farmworkers and hunters on jackals and caracals shot or trapped, there is reasonably accurate data on this aspect of control. Farmers do not typically record livestock losses according to which predator was responsible (sometimes it is impossible to tell) hence the effect of culling on future livestock losses had to be modelled in aggregate (in other words total predators killed was used to explain total livestock losses the following year). Farmers were also asked to state their assessment of various wildlife threats in each wave of the panel study and to comment on the perceived effectiveness of various control strategies usually involving a 5-point Likert scale.

2.2. Regression modelling

Table 1 provides an overview of the key aspects of the regressions presented below. Models were evaluated using a combination of overall goodness of fit ($p \leq 0.05$), the sign and significance level of important coefficients (various levels), Pseudo-R,[2] log likelihood and Akaike and Bayes' information criteria (minimised). A combination of logarithmic transformations with zeros retained and limited dependent variable models were used to accommodate the fact that a small but significant minority of farmers reported no losses to predators and did no culling. The tobit

[1] The attrition rate in the sample was relatively low for a panel study (7.1%). Missing answers were due primarily to insufficient records and/or interview fatigue. Some farmers declined to answer questions about the lethal management of predators.

[2] Sheep revenues were calculated as reported sales multiplied by average slaughter prices (assuming a lamb weighed 10 kgs and a sheep 15 kgs) plus a wool clip estimated at 3 kg of wool per wool sheep multiplied by the average merino wool price.