

AUTHORS:

Graham I.H. Kerley¹ 
Kevin G. Behrens²
Jane Carruthers³
Marius Diemont⁴
Jurie du Plessis⁵
Liaan Minnie¹
Philip R.K. Richardson⁶
Michael J. Somers⁷ 
Craig J. Tambling⁸ 
Jane Turpie⁹
Hermias N. van Niekerk¹⁰
Dave Balfour¹¹

AFFILIATIONS:

¹Centre for African Conservation Ecology, Nelson Mandela University, Port Elizabeth, South Africa

²Steve Biko Centre for Bioethics, University of the Witwatersrand, Johannesburg, South Africa

³University of South Africa, Pretoria, South Africa

⁴Webber Wentzel, Cape Town, South Africa

⁵Department of Mammalogy, National Museum, Bloemfontein, South Africa

⁶Human Wildlife Solutions, Cape Town, South Africa

⁷Centre for Wildlife Management, Centre for Invasion Biology, University of Pretoria, Pretoria, South Africa.

⁸Department of Zoology and Entomology, University of Fort Hare, Alice, South Africa

⁹Environmental Policy Research Unit, School of Economics, University of Cape Town, Cape Town, South Africa

¹⁰Unit for Livestock and Wildlife, Department of Agricultural Economics, University of the Free State, Bloemfontein, South Africa

¹¹Independent Researcher, East London, South Africa

CORRESPONDENCE TO:

Graham Kerley

EMAIL:

graham.kerley@nmmu.ac.za

KEYWORDS:

evidence-based policy; legislation; transdisciplinary; wildlife

HOW TO CITE:

Kerley GIH, Behrens KG, Carruthers J, Diemont M, Du Plessis J, Minnie L, et al. Livestock predation in South Africa: The need for and value of a scientific assessment. *S Afr J Sci.* 2017;113(3/4), Art. #a0198, 3 pages. <http://dx.doi.org/10.17159/sajs.2017/a0198>

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Livestock predation in South Africa: The need for and value of a scientific assessment

Predation of livestock in South Africa has been estimated to cost in excess of ZAR1 billion in losses per year¹ and has complex social, economic and ecological drivers and consequences. In this context, livestock can be broadly defined as domesticated animals and wildlife (the former excluding poultry and the latter including ostrich, *Struthio camelus*) managed for commercial purposes or human benefit in free-ranging (or semi-free ranging) circumstances that render them vulnerable to predation. This conflict between livestock producers and predators, and the attempts to manage it, has persisted for over 350 years, with the most notable outcome being the eradication of the majority of the apex predators across much of South Africa.² In contrast, the mesopredators, black-backed jackal (*Canis mesomelas*) and caracal (*Caracal caracal*) are by all accounts thriving, at least as measured by their impact on livestock production. Increasingly, attempts to manage livestock predation give rise to deep polarisations, particularly between animal rightists and livestock producers, which further confounds an already complex situation. This complexity hampers the development of policy and regulations with regard to managing livestock predation. A recent global review of the scientific merit of studies on the efficacy of various predator control interventions highlighted the paucity of adherence to acceptable scientific methods in these studies, and recommends 'suspending lethal control methods' while appropriately designed studies are undertaken.³ Treves et al.³ did not identify any valid (by their criteria) studies undertaken in South Africa. This example highlights the need for a scientifically robust basis for policy and management of livestock predation issues.

We support the principle of evidence-based policy and management, and propose that a formal scientific assessment^{4,5} will provide scientifically robust and policy-relevant insights to address this challenge. Here we provide the framework for such an assessment on livestock predation in South Africa, and anticipate some of the emergent values of this assessment.

The Nelson Mandela University, through the Centre for African Conservation Ecology, has partnered with the Department of Environmental Affairs; the Department of Agriculture, Forestry and Fisheries (through the Red Meat Research Development Planning Committee); Cape Wools; and the SA Mohair Growers Association, and initiated the process of undertaking a scientific assessment on the issue of predation on livestock in South Africa (hereafter PredSA). PredSA was formally launched in June 2016 when it received the endorsement of the Minister of Environmental Affairs and the Department of Agriculture, Forestry and Fisheries. Approximately ZAR2.5 million has been committed to the assessment, which is anticipated to be 18 to 24 months in duration, starting May 2016.

PredSA will be conducted as an independent, science-based assessment, along the lines of the Elephant Management Scientific Assessment.⁶ The assessment process will be grounded in five driving principles: *legitimacy*, *saliency* and *credibility*, which are underpinned by *transparency* and which is broadly *participatory*.

An independent six person Process Custodian Group has been appointed with the sole function of ensuring that the process of conducting the assessment is fair. The lead authors have been identified and the first workshop, which deals with the scoping and structure of the assessment, has been conducted. The next step, that of crafting an initial First Order Draft, is underway with the full complement of authors anticipated to be about 50 individuals.

PredSA will be compiled by recognised experts from academia and management who volunteer their input. The coverage will be comprehensive and include diverse topics in order to provide the context and detail that are relevant to policy development.

Understanding an issue requires a historical perspective, and thus the historical background to the longer-term predator–livestock interactions – contextualising historic socio-political and economic changes – within what is now the Republic of South Africa will be addressed. From the pre-colonial era onwards, human activities – specifically around pastoralism – have been negatively impacted by predation on domestic livestock with conflict as the usual consequence. This long-term perspective will also highlight how views, policy and approaches to livestock predation have changed.

Knowing the role players is key to managing them. Black-backed jackal and caracal are the dominant predators of livestock in South Africa.¹ Thus, PredSA will, in particular, explore the specific biological and ecological aspects of these two species that determine their role as livestock predators. A cornucopia of other species is implicated in livestock predation in South Africa, including lion (*Panthera leo*), leopard (*Panthera pardus*), cheetah (*Acinonyx jubatus*), Cape fox (*Vulpes chama*), African wild dog (*Lycaon pictus*), side-striped jackal (*Canis adustus*), spotted hyena (*Crocuta crocuta*), brown hyena (*Hyaena brunnea*), serval (*Leptailurus serval*), baboon (*Papio ursinus*), honey badger (*Mellivora capensis*), bushpig (*Potamochoerus larvatus*), crocodile (*Crocodylus niloticus*), feral domestic dogs (*Canis lupus familiaris*), and various corvids and raptors. For all these species (and any others that may be identified through PredSA processes), we will evaluate the evidence of them attacking livestock (excluding poultry), identify which livestock are attacked, and categorise the severity of this predation. The ecology and behaviour of the main livestock predators will be reviewed to determine how these affect the interaction with livestock. PredSA will allow us to determine which factors play a role in livestock predation, as well as to identify any potential gaps in the knowledge base which require future research.

What predation control methods are available and what are their outcomes and desirability? Historically, and currently, predation management has focused on ways to remove (so-called lethal control) or exclude the problem species from a specific area.⁷ However, emerging evidence suggests that not all predators are problem animals, and that territorial individuals may act as a catalyst to exclude potential problem individuals.⁸ Public opinion against lethal control has grown⁹, while new insights have been gained into the environmental or ecological effects of such control (for example see Minnie et al.¹⁰). As a result, there seems to be a shift from attempts to eradicate predators to non-lethal methods to reduce predation, and to approaches in which only problem individuals are removed. These interventions, their efficacy and trends in their application need to be analysed and presented in a policy-relevant framework.

South Africa is not alone in experiencing problems with predation of livestock, as this phenomenon emerges across the world wherever livestock and predators co-occur. It is therefore fitting to identify and assess the various management strategies and internationally recognised best practices employed beyond our borders, and identify those that are most likely to be effective under South African circumstances. Special attention will be paid to those studies which replicate our semi-arid conditions and the types and sizes of predators involved, e.g. comparing coyotes (*Canis latrans*) and dingoes (*Canis lupus dingo*) to jackals. Given that South Africa lags behind the rest of the world in terms of scientifically evaluating the efficacy of livestock predation interventions^{3,11}, these lessons should extend to the design and implementation of sound scientific experiments, so that the outcomes are credible and applicable.

Although black-backed jackal and caracal are heavily persecuted in South Africa, we lack a clear understanding of the ecosystem-level consequences this persecution may have. Both these species vary in their roles in food webs, ranging from mid-ranking mesopredators that regulate small mammal and rodent communities¹² to apex predators that impact on a wide range of prey¹³. PredSA will review the functional role of black-backed jackal and caracal across a range of landscapes, from those inclusive of apex predators to those dominated by humans and livestock. In the western USA, coyote persecution resulted in a reduction of available forage for cattle because of high levels of competition with abundant lagomorphs.¹⁴ Therefore, understanding the functional role of mesopredators in agro-ecosystems provides a more holistic basis for management actions and predicting their outcomes.

The basis of conflict around livestock predation is the impact this predation has on human well-being, or perceptions thereof. The presence of carnivores on rangelands can lead to losses of stock, expenditure on measures to prevent these losses, or, depending on the level of investment in and/or efficacy of the latter, costs incurred through a combination of the former and latter. Both stock losses and investments in predator control measures translate into a reduced bottom line for farmers. This affects wildlife-based operations as well as small and large stock farmers. Economic theory suggests that predator control efforts would be expected to kick in once losses reach a certain level, but actual investment decisions are influenced by a range of social factors and perceptions. The consequences of predation mitigation interventions are not well understood, which results in the investments in these actions not necessarily delivering intended outcomes. Livestock predation is widespread, thus losses incurred by farmers are believed to have a significant impact on the economic value of the industry, which translates into loss of employment opportunities as well as income, and, for some, their livelihoods. Conversely, changes in biodiversity brought about by changes in the relative abundance of livestock predators may impact on producer and consumer surplus associated with rangeland-based activities, as well as on society in less tangible ways. There are distributional issues too. While predator-control activities can provide direct income-earning opportunities in rural areas, the well-being of other members of society may be negatively affected by these activities.

A review of the legal framework in terms of the law relevant to management and control of predators in South Africa, and an analysis of its shortcomings that may impact on the efficacy of management

practices and policy, is required. PredSA will outline the current status of South African law applicable to the management and control of predators, and assess the legislative gaps and contradictions in order to assist the relevant authorities in the development of policy and regulations. In making policy decisions, the regulatory authority is often confronted with differing interpretations of the law that appear to present options or alternative approaches. This review is intended to assist policymakers to develop legislative mechanisms that are in accordance with the law, or, when the law is seen to be lacking, to provide a sound legal basis to implement policy or legislation that is aligned with the constitution and legislation. The conclusions and recommendations will be drawn from legislation as it is generally accepted to be, and on interpretations of common law, as well as a consideration of customary law.

From an ethical perspective, the key issue with respect to livestock and predation is that it entails conflict. There are obvious conflicts of interest between livestock owners and predators. Furthermore, local communities, wildlife conservationists, ecotourists, and farmers have interests that differ and may clash. Conflicts of interest often lead to more worrying kinds of conflict, with those seeking to protect their interests ending up at loggerheads with one another. We also often find ourselves torn between competing moral obligations: our duties to our fellow humans may conflict with our duties to other species or the environment as a whole. This dilemma represents a significant challenge for policymakers. In such situations, the best that they can do is to try to carefully weigh up all of the ethical obligations and the competing interests, to come up with approaches that result in the best overall outcomes for all relevant stakeholders. This goal cannot be achieved without being in possession of the most relevant information required to be able to do this kind of weighing up. The better equipped decision-makers are with all of the relevant data, facts, perceptions, points of view and other relevant information, the better the policies they will be able to devise. In fact, it is an ethical obligation for policymakers to ensure that they have done their best to gather all of the necessary information to be able to make the most appropriate decisions. This is why this scientific assessment is not just important – it is also imperative.

In addition to bringing together the information and views relevant to livestock predation and its management in South Africa in a policy relevant fashion, this scientific assessment will deliver a number of further benefits. PredSA also provides an opportunity for those with conflicting views on predator management approaches to recognise and understand the alternative perspectives, and the broader implications of management approaches. This assessment process should therefore turn this area of tension into a commitment to finding a shared solution to the problem. This relaxation of tension is one of the outcomes of the scientific assessment on elephant management in South Africa.⁶ Prior to this assessment, the so-called elephant debate was driven by strong views and tensions, whereas much of this acrimony has subsequently declined. The Norms and Standards for Elephant Management¹⁵, developed in parallel with the assessment, have now been implemented.

Another emergent aspect of the PredSA assessment is that it will identify agreed-upon gaps in our knowledge. Such gaps may reflect specific hypotheses that require testing, or information that is required to test such hypotheses. Other gaps in our knowledge may relate more to the social dimensions of the issues related to predation, establishing a need for exploratory, qualitative research. These identified areas can be used to guide research needs and priorities in predation management – for both researchers and research funders. Given the multidisciplinary of the assessment process, it can be predicted that novel and stimulating areas of research will be identified, and research synergies previously not thought of will be generated.

Adaptive management – the approach whereby management interventions are treated as experimental tests of predictions arising from hypotheses of complex systems' behaviour¹⁶ – has the ability to advance the understanding of such systems and thereby assist managers to achieve desired goals. The management of livestock predation is ideally undertaken through such adaptive management approaches, as the system is complex and we have much to learn, including the validity of prevailing hypotheses or hypotheses emerging from PredSA. Thus,

outcomes of PredSA will guide adaptive management approaches and strengthen relations between livestock managers and scientists, as the former can be seen as running a series of experimental manipulations which yield data for the latter to interpret. This relationship adds a further opportunity for the strengthening of research capacity in South Africa, where every livestock farmer may become a 'citizen scientist'.

We conclude that science can and must provide valid inputs into the challenges and policy needs of livestock predation management in South Africa through the PredSA scientific assessment process. Furthermore, we predict that PredSA will give a much needed boost to building transdisciplinary research capacity and raise the standards of research on livestock predation and management in South Africa.

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