

# Livestock Predation and its Management in South Africa: A Scientific Assessment

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## SUMMARY FOR POLICYMAKERS

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### CONTEXT

*This summary provides a narrative overview on Livestock Predation and its Management in South Africa, highlighting policy relevant aspects in a non-technical fashion. The assessment was undertaken by a team of experts, led by the authors of this summary, and provides extensive details, and a knowledge base of the diverse fields relevant to livestock predation in South Africa, and should be consulted for such details (and the identified gaps in our knowledge).*

### LIVESTOCK PREDATION AS THE SUBJECT OF A SCIENTIFIC ASSESSMENT

**T**HE arrival of domestic animals over two millennia ago heralded the emergence of livestock predation as a source of human-wildlife conflict in South Africa, and this conflict has yet to be resolved. This is despite the virtual elimination of the largest predators (lion, leopard, spotted hyaena, African wild dog and cheetah) from much of the country, and numerous management and policy attempts to eliminate or reduce livestock predation. The persistence of this conflict reflects its complexity, with many species of predators (although currently jackal and caracal are the most prominent) playing a role in a broad variety of ecological, socio-economic and socio-political settings. Actions to address this conflict, particularly lethal control of predators, commonly elicits strong emotions in various sectors of society. Such complex issues (sometimes called “wicked problems”) may be usefully addressed by a formal Scientific Assessment, a process whereby a group of experts are mandated by key role players (in this case,

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both government and industry) to provide a policy-relevant synthesis of what is known (and not known) about an issue. Importantly, in the assessment process, a multiplicity of views and values are incorporated in order to ensure that the outcome resonates within society. The assessment of livestock predation in South Africa

summarised here represents a global first in terms of bringing the authority of a scientific assessment to bear on this source of human wildlife conflict. A key feature of this summary is that it aims to inform policy makers but avoids being policy prescriptive.

### Defining livestock

The term 'livestock' generally refers to animals that are managed for human food or fibre production or that serve as draught animals. Although typically applied to conventional agricultural settings and domesticated animals (e.g. cattle, sheep, pigs, horses), the term can be extended to cover a diversity of taxa such as fenced wildlife, fish, managed game birds such as pheasants, or even silk moths. The objectives of their management can extend to providing sport or to satisfy cultural practices.

For the purposes of this assessment, livestock have been broadly defined as comprising 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.

### Focusing the assessment findings on policy

In considering the issue of livestock predation it is necessary to bear in mind that predation is a natural process. It is not only important as a driving factor in the evolution of the landscapes within which we live, and the biota that inhabit them, but is also important in maintaining the ecosystems on which humans rely for many goods and services.

This assessment therefore highlights two key high-level points:

- » There are (poorly understood and quantified) costs to society when predation interfaces with human livelihoods.
- » There are also (poorly understood and quantified) costs to eliminating predation from many of our landscapes and ecosystems.

The interface between predation and human livelihoods, together with the consequences of individual acts or grouped common acts of predation are complex and changes to individual components of that interface may have unintended consequences. This

means that predicting the outcomes from specific policy interventions are difficult to make with any degree of confidence.

In complex situations relating to the natural environment and its components, adaptive management is commonly advocated as an important tool in the broader decision-making process. Science has a role to play in providing evidence which can inform policy at the interface of agriculture and the conservation of biodiversity, but this policy is also driven by other factors such as values and economic/financial conditions. Previous livestock predation management policy in South Africa has relied less on verifiable evidence and more on sentimental or financial considerations. The history of South Africa has resulted in a number of land-holding and management regimes (e.g. private, commercial vs communal subsistence farming) and policy needs to be relevant to all of them. Moreover the landscapes within which we currently function are considerably different from those of 300 years ago. This requires that consideration of both historic and present conditions are appropriately articulated for policy determination.

## Historical understanding

An historical overview highlights the long, inconsistent, and vacillating past policies towards predation management in South Africa. These have oscillated between governance in the provinces and nationally, and have been led variously by individuals, interest groups and by the state. One consequence is that the policy environment is unclear, and there are conflicting and unresolved points of view. At no stage in the South African past has there been a single, coherent national policy environment providing guidance to provincial or local scale regulators or to industry operators with regard to the management of livestock predation.

This is relevant to future policymakers who need to provide consistency and clarity in policy and practice. In order to achieve this, detailed study is required because the wide variety of South Africa's environmental conditions means that a single policy cannot be applied equally to the various landscapes, physical and climatic, across the country. Any policy on predation management in South Africa is likely to benefit from accounting for both top-down and bottom-up drivers, determined on the basis of their ecological and socioeconomic rather than their administrative context. This might be done, for example, by considering bio- or eco-regions, rather than provincial or other political boundaries. Moreover, operational differences between subsistence and commercial farmers and between privately owned and communally managed land need to be accounted for and integrated into a flexible policy that is well-informed by the biological and agricultural sciences.

## Socio-economic perspectives around livestock predation

As predation on livestock is ubiquitous in rangelands in which predators abound, the traditional response often includes a level of investment in predator control and/or stock protection in order to minimise economic losses. In the past, commercial farmers in South Africa received significant levels of government assistance in this regard in order to bolster an important economic sector. In general however, livestock farming has become increasingly difficult over time, as a consequence of declines in the relative prices of livestock products, increasing input costs, and decreasing government assistance. The

difficulties of stock farming have been exacerbated by a resurgence in predator numbers and by increased rates of predation. These are attributed, at least in part, to a reduction in co-ordinated control efforts by the state. Farmers now have to take individual decisions about how much to invest in predator control, and the choices will vary according to livestock types, the nature of land ownership, and cultural factors that include perceptions of predator behaviour and neighbour behaviour.

Approximately 38,500 commercial livestock farmers produce about half of South Africa's agricultural GDP (see estimates below) and provide about 245,000 jobs. The sector is dominated by small livestock (sheep and goats) in the western half of the country, and cattle in the east. Game farming occurs throughout the region, but particularly in the east and north. Some two million farmers operate in the communal rangeland areas. The communal areas tend to be heavily stocked, and contribute relatively little to market production, but contribute to food and cultural security. Sheep and goats have decreased to 68% and 72% of their 1980 numbers, respectively, while cattle numbers have remained relatively stable. Wildlife ranching has grown exponentially since the 1980s, assisted by the fact that landowners can acquire property rights over wildlife under defined legal conditions. Concomitantly, the number of employed farm workers has declined markedly with the consolidation of farm properties and the imposition of stricter labour laws. The decline in domestic stock husbandry and the need for less labour may well have contributed to the increased levels of poverty and inequality. On the other hand, the increasing financial challenges of farming of all kinds threaten to impede the successful establishment of emerging black farmers.

Until recently, there were few studies to quantify the rates of livestock predation. Older estimates are relatively unreliable, and while recent large scale surveys have been an improvement, they still typically rely on how a particular farmer judges the rate of predation and the species involved, and not on formal observation conducted in a scientific manner that can be replicated. It seems that there are many incentives for individual farmers to over-report livestock predation. Comparative data suggest that there are differences in rates of predation between small and large livestock on commercial farms. For example, reported rates of livestock loss to predation

are an order of magnitude higher on small stock than on large stock farms (provincial averages range from 3-13% vs 0.1-0.9%, respectively), and intermediate for a mixed sample including game farms (1.4-2.8%). There are no comparable studies from communal farming areas, but reported household losses are around of 0.5-19% of small stock and 8-11% of cattle.

Reported losses from predation also have to be considered in the light of other possible losses such as through poisoning, theft, disease and drought. In the communal farming areas in particular, these may result in significant loss of stock. Moreover, little attention is given to analysing what stock loss there might have been in the absence of predators, particularly as it is known that predators often target weaker animals. The reanalysis of data from a controlled study suggests that a reduction in predation losses could lead to approximately half that reduction in total losses, while the reanalysis of data from another controlled study even suggests that predation loss accounts for only half of total losses experienced by farmers. Further work is required to increase our understanding before these insights are used to formulate policy.

The presence of free-ranging predators in rangelands has two kinds of costs: viz the cost of taking action to reduce predator threats to livestock, and the losses of animals on account of predation. To date, we have little reliable knowledge about the cost of avoiding predation. We can, however, estimate that the gross production value in 2016 of free-ranging livestock in the country was c.R40 billion and yielded direct GDP value of c.R12.3 – R14.7 billion. Losses in the formal livestock sector (estimated to be approximately R3 billion annually) amount to about 7.5% of gross production value. Assuming that in the absence of predators about 50% of these animals would be lost to other causes (see above), the loss due to livestock predation amounts to about 0.5% of the Agriculture Forestry and Fishing Sector GDP and 0.01% of national GDP, or 0.02% if multiplier effects are included. Even if game losses and livestock predation losses in the small scale and subsistence sectors were taken into account, and if expenditures on predator control were included, the overall impacts would remain small when viewed in the context of the national economy. Nevertheless, these losses may be of local economic and social significance, particularly

in the arid areas of the Karoo and in certain communal rangeland areas. In areas where farming is marginal and households are poor, high levels of predation could have significant welfare impacts to the extent that they could also contribute to local levels of social disharmony.

In the future, any studies on livestock predation should include a strong social research element so that farmer motivations and responses when managing livestock and predation can be better understood. In addition, such research should consider the broader consequences on society as a whole. For instance, while yet unknown, it may be that the optimum solution for farmers could align with the optimum solution for the environment and society. It has been suggested that this alignment might occur through establishing 'predator-friendly' production systems that reduce risk by pursuing a more natural ecological balance, and returning management emphasis to stock protection, not predator eradication, measures. Such initiatives require understanding and addressing institutional, informational, financial and social obstacles to innovation of this kind. An alternative would be that appropriate policy instruments will need to be put in place that encourage farmers to engage in practices that benefit broader society.

### Ethical principles

One of the key elements in the livestock predation issue is that it generates conflicts of interest between various stakeholders, and conflicts of interest have ethical implications. This means that guidelines, or policies, for resolving conflicts of interest are needed. Those responsible for policy need to examine competing interests and moral obligations as they seek the optimum outcomes, not only for all the different stakeholders, but also to find sufficient consensus between stakeholders once their interests have been taken into account. According to social contract theory, the laws or policies to be applied are those that rational agents would agree to and, in order to achieve this practically, a process of broad engagement and consultation will be necessary.

Policymakers, however, also need to bear in mind that not all stakeholders have an equal voice, and future generations of people have a stake in the choices that are made today. Moreover, there is an argument that non-human living entities, especially sentient animals, have interests in the avoidance of pain, hardship and death.

## POLICYMAKERS

A variety of views exist in respect of human ethical obligations to other animals. Nonetheless, there is a broad consensus among ethicists, as well as among the general population, that cruelty towards non-human animals is not morally justifiable. Policy makers have therefore to justify, ethically, any action that may cause suffering or death. The welfare of individual non-human animals is not the only matter to be considered: the ecosystem itself, according to holists, can be harmed and that loss of range and habitat, climate change, pollution and other factors can lead to unethical extinctions and biodiversity loss.

Thus it is the responsibility of government to mediate between competing interests and to facilitate the formulation of clear, workable policy and even legislative reform, where necessary. In a constitutional state, there is an obligation to ensure that all stakeholders' interests are considered and that solutions are found that are fundamentally fair. This includes acknowledging that humans are responsible for human-predator conflict and therefore have a responsibility to seek solutions to it; adopting management methods that seek to be effective and to minimise unnecessary harm (to individual animals, species, the environment in general and to societal sensitivities and values) by utilising the best available evidence; and aiming to solve the problems in a manner that is affordable and where the costs are fairly distributed. The methods of predator management that are most suitable in terms of the social contract may not be practicable without the participation and intervention of the state and the use of state resources.

### Legal perspectives

At present, there is no clear legal framework for the management and control of predators by landowners for either communal land or privately owned land across South Africa. Rather, there is a plethora of anachronistic and disconnected legislation and policy which can be difficult to access, is outdated, and has conflicts between local and national scales. The provincial nature conservation ordinances, formulated for pre-1994 South Africa under the previous dispensation, of the Cape, Orange Free State, Transvaal and Natal provinces, as well as some former homelands, still apply in some of the nine current provinces alongside the post-1994 national and provincial legislation.

This makes it difficult for regulators, law enforcement officials and livestock managers dealing with predators to know whether they are acting within the law.

By way of example, in the North West Province, the hunting regulations must be read in conjunction with the following legislation:

- » Nature Conservation Ordinance 12 of 1983 (Transvaal Province)
- » Bophuthatswana Nature Conservation Ordinance Act 3 of 1973
- » Nature and Environmental Conservation Ordinance 19 of 1974 (Cape Province)
- » National Environmental Management Biodiversity Act 10 of 2004

In addition, there are draft regulations and policies that may also be applicable (North West Extraordinary Gazette on 20 June 2013, Provincial Gazette No. 7121). These are:

- » Draft Norms and Standards for the Import, Export, Transport, Capture and Keeping of Birds in the North West Province.
- » Draft Guidelines for the Development of Protected Areas Management Plans in the North West Province.
- » Draft Alien Species Regulations for the North West Province.
- » Draft Amendments to the North West Fencing Policy.

Although the stated purpose of the draft Norms and Standards for the Management of Damage-Causing Animals in South Africa is to introduce a uniform approach to appropriate and effective interventions and the application of minimum standards, the current draft requires comprehensive revision in order to achieve this. The proposed permit system is administratively burdensome and impractical and for this reason runs the risk of livestock managers failing to comply. Approaches to policy that promote compliance are more likely to result in effective regulation of human interactions with stock predators. Attention therefore needs to be paid to developing mechanisms within these Norms and Standards to encourage compliance, particularly with the

National Environmental Management: Biodiversity Act 10 of 2004, and relevant provincial legislation relating to wild animals.

### Management practices

Humans have employed a range of strategies to manage the cost of livestock losses they may incur from predators. While many have demonstrated some success in reducing livestock losses, the negative consequences of predation management have also been shown. Without predation management, the economic viability of livestock farms may be threatened and can adversely affect local and regional economies. The ideal outcome would be one that makes it possible to ensure a sustainable livestock industry and to promote biodiversity and ecosystem conservation, while being sensitive to important cultural norms relating to the specific area where predation management is applied.

Historically, efforts to control predation have seldom been tested in a rigorously scientific or appropriately adaptive manner, and we thus continue to work with a paucity of reliable evidence relating to the overall efficacy of the majority of these methods. Indeed, it is the absence of sufficient reliable evidence that means that we remain scientifically unable to support or refute any specific method.

An effective predation management method is widely understood to be context-specific and the applicability of any one method will vary depending on *inter alia* the targeted damage-causing species, the type of livestock operation, season, location, and environmental conditions. Effective predation management is likely to consist of a range of complementary methods/activities (including selective, humane lethal methods where necessary) and no single approach should be regarded as a “silver bullet solution” to the problem. There is a strong and urgent need for applied research of high scientific standards (i.e. randomised with repeats and controls) to better inform policy development around predation management. The development of any policy should include careful consideration of local conditions, the cultural context, ethical imperatives as well as the socio-economic position of the landowner(s) before any management intervention is prescribed or implemented.

Any management of a predator will rely on interventions about which we have imperfect knowledge.

Thus any intervention should be implemented in an adaptive manner. This requires collecting baseline information on predator biology, and ecology in the precise landscapes where they live e.g. nature reserves, commercial livestock farms, game farms and communal areas. Without baseline information of this kind, predator management activities will continue to be haphazard and probably ineffective at reducing livestock damage. It will also contribute little to developing policy for effectively managing these predators.

Principles that may assist policy makers include: a) Encouraging and supporting multi-sector collaborative research (e.g. scientists, wildlife managers, interest groups, farmers and government officials) to address important knowledge gaps, and b) promoting the use of an adaptive management framework that will allow for predator management in conjunction with collating baseline information and increasing a formal body of evidence relating to individual interventions and their outcomes. This may be best implemented through a joint venture in which both policy-focused and research-focused groups collaborate on a joint learning/research project.

### Jackal and caracal as the leading role players

The effective management of any predator's risk to livestock requires a basic understanding of the predator's biology and ecology that assists in predicting its responses (at individual or population levels) to human intervention. Black-backed jackals and caracals are the dominant predators of livestock in southern Africa today, and are the primary cause of financial losses to the livestock production industry. Despite over 300 years of lethal management, people have been relatively unsuccessful in eliminating livestock losses caused by these two species. This may, in part, be due to the fact that predation management has focused on reducing mesopredator population size, with limited consideration of the ecology and biology of the target predator(s) (e.g. it has been shown that jackals and caracal can respond to persecution through compensatory immigration and reproduction). The fact that these mesopredators have been able to switch from wildlife to livestock predation is evidence of behavioural and ecological plasticity that has



enabled them to persist despite centuries of attempted population reduction by humans.

Despite their role as the dominant livestock predators in southern Africa for over 300 years, there has been relatively little research on the biology and ecology of these mesopredators. What is known has been biased towards the feeding ecology of the two species, with comparatively little information on social behaviour, activity patterns, reproduction, home range and habitat selection, dispersal, and population densities. Our knowledge is also spatially biased, focusing on limited areas (typically such research is focused in protected areas). Given the adaptability of these mesopredators, research needs to be replicated across several habitats and land uses to allow for more accurate predictions that incorporate spatial and temporal variability in their biology and ecology. Importantly, there is very little known about the size and trends in size over time, of the populations of black-backed jackal and caracal, even for relatively small regional sub-populations.

### The role of the mesopredators

Ecological systems are complex, and such environments are composed of interconnected links in food chains. Due to their complexity, small alterations in these food chains can have important (and in many cases unpredictable) cascading effects on other organisms and thus on the ecosystem as a whole. The anthropogenic eradication of most apex predators across most of South Africa has created the opportunity for mesopredators to expand their ecological niche. Analogous to our knowledge of the individual species, we have a very limited understanding of the cascading effects of changing (elevated or reduced) numbers of mesopredators on co-occurring biodiversity. This limitation is, in part, a consequence of previous research being focused on larger charismatic species (for which the majority of funding is earmarked), with few or no multi-trophic investigations into the mesopredators and their primary prey species. This is further exacerbated by the limited basic ecological data available on the roles of many small mammals across South Africa.

Additionally, most of our insights into the important mechanisms that may mediate the impact (or lack thereof) of mesopredators, and the data that supports these insights, are derived from northern temperate

regions, oceanic islands and tropical rainforests. The local situation may be slightly or starkly different, but these mesopredators undoubtedly have an important role influencing regional and local biodiversity. Therefore, the only firm prediction that can be made is that management of these species can precipitate a broad spectrum, ecological effect. The policy implications are that, with so many unknowns hampering our ability to predict management outcomes (and therefore determine policy), it is unwise to prescribe an all-encompassing predictive directive for policy development.

It is further likely that ecosystem responses to management (i.e. policy) of mesopredators will vary among habitat types and biomes. Thus, what is potentially prescribed as effective for the Karoo landscape may not necessarily apply to the other biomes. Ecosystem level responses that result from mesopredator management are likely to be context dependent and will vary in their extent and intensity.

### Other predators of livestock

Other than black-backed jackals and caracals, species responsible for livestock predation (generally less than 10% of such impacts) include leopards, lions, cheetahs, servals, African wild dogs, side-striped jackals, Cape foxes, free-roaming dogs (feral or managed), spotted hyenas, brown hyenas, honey badgers, bushpigs, chacma baboons, crocodiles, and various corvids and raptors. The relative significance of these predators varies locally.

Predation on livestock by predators other than black-backed jackals and caracals is influenced by a number of factors. They include intrinsic (habitat, home range, movement patterns, dispersal, social structure, activity patterns, density, habitat quality and prey species) and extrinsic factors (prey density, other predators, distance from water sources, distance from protected areas, elevation and surrounding vegetative cover) that vary for each predator species. The nature and extent of these factors, and how they can be used to manage livestock predation risk, is poorly known. There are also numerous gaps in our understanding of the economic importance of predation by most species.

There is no coordinated predator conflict monitoring across all provinces. A risk model of livestock predation by predators based on environmental and livestock management variables (or any other variables that can

be identified), which allows for identification of high-risk zones to define mitigation strategies needs to be developed, based on such a monitoring programme.

Predator research is predominantly carried out in formally protected areas. Thus, to better inform policy development, it is essential to increase research into non-protected or production landscapes. Furthermore, the main determinant of predator survival in non-protected areas is human-wildlife conflict and lack of tolerance of predators by livestock producers; it is essential that research address these issues. There is also a bias in research focus across species, such that some species (e.g. leopards) are relatively well studied while others (e.g. free-roaming dogs and side-striped jackals) are not. The focus of research therefore needs to be informed by the extent of the challenges presented by each species, not by their degree of charisma.

### Way forward

It is clear from this assessment, summarised here, that astute political and scientific leadership is required effectively to develop, and then to apply, appropriate policy to manage the costs and conflicts arising from livestock predation in South Africa. As the first of its kind, this assessment has identified numerous gaps in our knowledge in relation to livestock predation, as well as highlighting the urgent need for the application of an adaptive management framework to better use and build on existing knowledge. This will require both a strategic national research programme to provide evidence for policy development, as well as closer cooperation between policy developers, livestock managers and researchers. Based on these insights, the much-needed adaptive management framework may be best implemented by employing a transdisciplinary approach where both policy-focused and research-focused groups work together with livestock managers throughout the process on a joint research project.



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**CAPE WOOLS SA**



Predators are valued as part of South Africa's natural heritage, but are also a source of human-wildlife conflict when they place livestock at risk. Managing this conflict ultimately falls to individual livestock farmers, but their actions need to be guided by policy and legislation where broader societal interests are at stake. The complexity of the issue together with differing societal perspectives and approaches to dealing with it, results in livestock predation management being challenging and potentially controversial.

Despite livestock predation having been a societal issue for millennia, and considerable recent research focussed on the matter, the information needed to guide evidence-based policy and legislation is scattered, often challenged and, to an unknown extent, incomplete. Recognising this, the South African Department of Environmental Affairs together with the Department of Agriculture, Forestry and Fisheries, and leading livestock industry role players, commissioned a scientific assessment on livestock predation management. The assessment followed a rigorous process and was overseen by an independent group to ensure fairness. Over 60 national and international experts contributed either by compiling the relevant information or reviewing these compilations. In addition an open stakeholder review process enabled interested parties to offer their insights into the outcomes. The findings of the scientific assessment are presented in this volume.

“Livestock Predation and its Management in South Africa” represents a global first in terms of undertaking a scientific assessment on this issue. The topics covered range from history to law and ethics to ecology. This book will thus be of interest to a broad range of readers, from the layperson managing livestock to those studying this form of human wildlife conflict. Principally, this book is aimed at helping agricultural and conservation policymakers and managers to arrive at improved approaches for reducing livestock predation, while at the same time contributing to the conservation of our natural predators.

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