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Sitting on the Fence? Policies and Practices in Managing Human-wildlife Conflict in Limpopo Province, South Africa

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Abstract

Human-wildlife conflicts are the product of socio-economic and political landscapes and are contentious because the resources concerned have economic value and species are often high profile and legally protected. Within a governance framework, we detail institutional roles and the effectiveness of policies and practices of controlling damage-causing animals (DCAs) at Kruger National Park (KNP) and Limpopo Province along KNP's western border. Most DCAs originate from the park, significantly affecting its long-term legitimacy among local communities. Between 2002 and 2004, over 12% of households within 15 km of the park experienced DCA damage, with incidents significantly correlated with being located closer to KNP and having higher numbers of mammalian livestock. These incidents are affecting opinions concerning KNP, as those who experienced damage were less likely to believe that the park would ever help their household economically. According to 482 DCA incident records from 1998 to 2004, the most problematic species are buffalo, lion, elephant, hippo and crocodile. Limpopo Province utilised professional hunters in DCA control, however, widespread abuses including the direct luring of lion led to a national moratorium on specific hunting practices. DCA procedures are highly flawed due to ambiguity concerning species and movement of DCAs, poor reporting, inadequate response times, overlapping responsibilities, and corruption. These are exacerbated by weak and, in some cases, competing institutions. Further, the controversial issue of undelivered compensation is determining negative attitudes by communities towards institutions who have historically promised it. Drawing on good governance principles, we offer recommendations on alleviating DCA conflicts in such contexts.

Keywords: compensation, conservation policy, human-wildlife conflict, Kruger National Park, Limpopo Province, poaching, trophy hunting

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INTRODUCTION

Conflicts between humans and wildlife are the product of socio-economic and political landscapes and the institutional architecture designed to manage these conflicts, and are controversial because the resources concerned have economic value and the species involved are often high profile and legally protected (Treves & Karanth 2003; McGregor 2005). While humans and wildlife have a long history of co-existence, the frequency of conflicts involving damage-causing animals (DCAs) has grown in recent decades, mainly because of the

exponential increase in human populations and consequential expansion of human activities (Woodroffe 2000; Woodroffe *et al.* 2005), expansion of some wildlife distributions (Breitenmoser 1998; Zedrosser *et al.* 2001; Bisi & Kurki 2005), as well as a frequent inability of institutions that are meant to mediate such conflicts to respond effectively.

The investigation of DCAs and their control is important for a number of reasons. Firstly, attitudes towards Protected Areas (PAs) are often influenced by perceived or real damage caused by wildlife (Els 1995; de Boer & Baquete 1998; Hill 2004; Anthony 2007). Secondly, wildlife damage represents

a very real and tangible threat to livelihoods in terms of personal injury, crop and livestock losses, and property damage (Happold 1995; Emerton 2001; Choudhury 2004; Dublin & Hoare 2004; Hill 2004; Graham *et al.* 2005). Thirdly, active persecution by humans based on wild predator threats to livestock has been identified as an important factor in observed carnivore declines (Mishra 1997; Woodroffe 2001; Hazzah *et al.* 2009). Finally, DCA conflicts are potentially socially corrosive, creating and reflecting larger conflicts of value and class and other interests (McGregor 2005). Especially in poorer countries and countries in transition, such conflicts have the potential to undermine human security and further weaken the effectiveness and legitimacy of state institutions.

As a country that has undergone a transition from one political system to another, South Africa has initiated rapid reform of many of its governance institutions since the end of Apartheid. Reform has not been uniformly effective and should be seen more as a continuous process rather than a series of discrete events in which governmental agencies are reorganised once and then left to do their jobs. This situation reflects many new collaborative and multi-level approaches in PA governance around the world, in which governance institutions and policies are required to be flexible and innovative in response to rapidly changing environmental and social conditions (Lockwood 2010). Conflict over DCAs along the border of South Africa's Kruger National Park (KNP) is, we will argue, the outcome of a misfit between new institutions and old ones, where responsibility has been diffused, capacities neglected, and in which learning has been slow to occur. In other words, DCAs are as much a conflict over institutions as over animals. Here, we draw upon Lockwood's (2010) seven principles of good governance for terrestrial PAs, i.e., legitimacy, transparency, accountability, inclusiveness, fairness, connectivity, and resilience. Indeed, such good governance "is a prerequisite for effective management, and is fundamental to securing the political and community support essential to the development, indeed the survival, of the global protected area system." (Lockwood 2010: 755). This paper aims to provide an analysis of where the institutional structures and functions now in place to deal with DCAs break down, and how they can be reformed, based upon good governance principles, in order to produce a DCA control regime that is efficient, effective, and has social legitimacy. We will argue that in this dynamic, polycentric governance environment, this will require the creation of hybrid, participatory institutions that draw on the strengths of the various stakeholders and provide a context within which they can learn from each other and adapt practices to new knowledge and changing conditions on the ground. In short, we will argue that effective and efficient DCA control requires the creation of inclusive, adaptive, learning institutions appropriate to the needs and capacities of the stakeholders in and around KNP.

Despite more than a decade of active engagement between KNP and its neighbouring communities, little is known about how those relationships have developed and what factors influence their success or failure in fostering cooperation.

The historical background of these communities, which forms part of the former Gazankulu homeland, is characterised by a general dissatisfaction with park authorities (Els 1994), in part due to damage to crops, livestock and property caused by wildlife (Cock & Fig 2000; Freitag-Ronaldson & Foxcroft 2003). Incidents of human-wildlife conflicts that are not adequately resolved assure the maintenance of a tense relationship between the park and communities, which has undesirable social consequences and poses risks for the park and its resources in the longer-term. Developing an adequate response to the problem of DCAs should be a high priority for park authorities and other governmental bodies.

In Limpopo Province, which encompasses the study area, Environmental Affairs is a branch within the Department of Finance and Economic Development (DFED/EA), whose primary role and function is '[t]o stimulate, promote and maintain an enabling environment conducive to sustainable economic growth, social justice and a decent quality of life for all' (Limpopo Provincial Government 2005). DFED/EA activities are largely governed by the Limpopo Environmental Management Act (LEMA) No. 7 of 2003, which is consistent with national legislation. The DFED/EA is operationally subdivided into municipal districts that provide conservation extension services, regulate and monitor the use of natural resources, and is the lead agency in controlling DCAs outside KNP in Limpopo Province. In addition to DFED/EA field rangers, DCA control involved tenders issued by the province to professional hunting outfitters from 2001 to 2004.

The DFED is an institution that was created by the post-Apartheid regime as a part of new provisional governmental structures that were intended to introduce greater democracy and representativeness to South Africa. Until that time, Traditional Authorities based upon traditional clan authority systems were the effective representatives of the communities. However, the Traditional Authorities cooperated closely with the Apartheid regime and are thought by some to be tainted by this association (Hendricks 1990; van Kessel & Oomen 1997). The legal competences of the Traditional Authorities are ambiguous, because while they are recognised in the constitution as legitimate centres of authority their actual rights and responsibilities are not spelled out (Ntsebeza & Hendricks 1998). Growth of provincial government is usually viewed by the Traditional Authorities as an incursion upon their spheres of decision making and discretion (Ntsebeza 1999). There is therefore an inherent rivalry between the provincial government, in this case represented by DFED/EA, and the Traditional Authorities. It is therefore difficult to establish trust between these two actors, though in DCA cases as well as other issues cooperation and trust would be required in order to effectively deal with problems. In order to minimise conflict between stakeholders and maximise conservation outcomes, progress towards building trust and cooperation between the various stakeholders will be necessary, a topic we take up again later.

Further complicating matters from a conservation perspective is the fact that the environmental authority within DFED is

marginalised, and has little influence on the agenda of the larger organisation, which is oriented towards development and economic growth (Anthony 2006). The DFED/EA suffers from under-funding and under-staffing, and is therefore a weak actor with little capacity to solve local problems (Anthony 2006), but also an actor that cannot be side-stepped by the local actors—the park, communities, and Traditional Authorities—most affected by the problems themselves. Previously KNP itself was responsible for pursuing DCAs that originated in the park, but this authority was transferred to DFED/EA in the late 1990s. Tension and problems are therefore inherent in the institutional arrangements within which DCAs are dealt with.

The location of our study area (Figure 1) shows that KNP and some communities are in close proximity, thereby increasing the incidence of DCAs and creating conflicting interests between the park's conservation priority, human safety and agriculture. The areas are demarcated from the KNP by way of a boundary fence, maintained by the Department of Animal Health—State Veterinary Service, and originally intended to control the spread of foot-and-mouth disease. However, many sections of the fence are dismantled and/or need repair (Bigalke 2000; SANParks 2000, 2009). A combination of factors contributes to the poor condition of the border fence: sub-standard construction; poor maintenance; theft and vandalism; actions of persons illegally crossing into South Africa from Mozambique (Anthony 2006); and a growing KNP elephant population exacerbated by park policies to decommission artificial waterholes in the park (Grant *et al.* 2008). In the interim between the all-race elections of 1994 and the present, KNP policies have changed and now incorporate social dimensions, including a concern with the interests of neighbouring communities and an attempt to integrate biodiversity conservation and socio-economic objectives.

Although there have been extensive studies on the interrelationships between PAs and people regarding wildlife damage in other areas (Lindsay 1987; Heinen 1993; Fiallo & Jacobson 1995; Studsrod & Wegge 1995; Emerton & Mfunda 1999; Infield & Namara 2001; Kaswamila *et al.* 2007; Warren *et al.* 2007), little is known about the dynamics of DCAs and their control along KNP's western boundary and how these influence interactions between the park and its neighbouring communities. This paper is based upon innovative research in which the perspectives, interests, constraints and capacities of the various stakeholders—the communities, the park, and governmental institutions—were examined to produce an analysis that seeks to provide practical, feasible and socially legitimate solutions to the DCA problem. Finally, we propose recommendations on alleviating DCA conflicts. We apply a governance framework for addressing the DCA problem along KNP's boundary that is adaptable to other cases where parks and communities conflict over DCAs.

METHODS

In order to understand the complexity of the DCA issue, we utilised a multi-method approach including a face-to-face

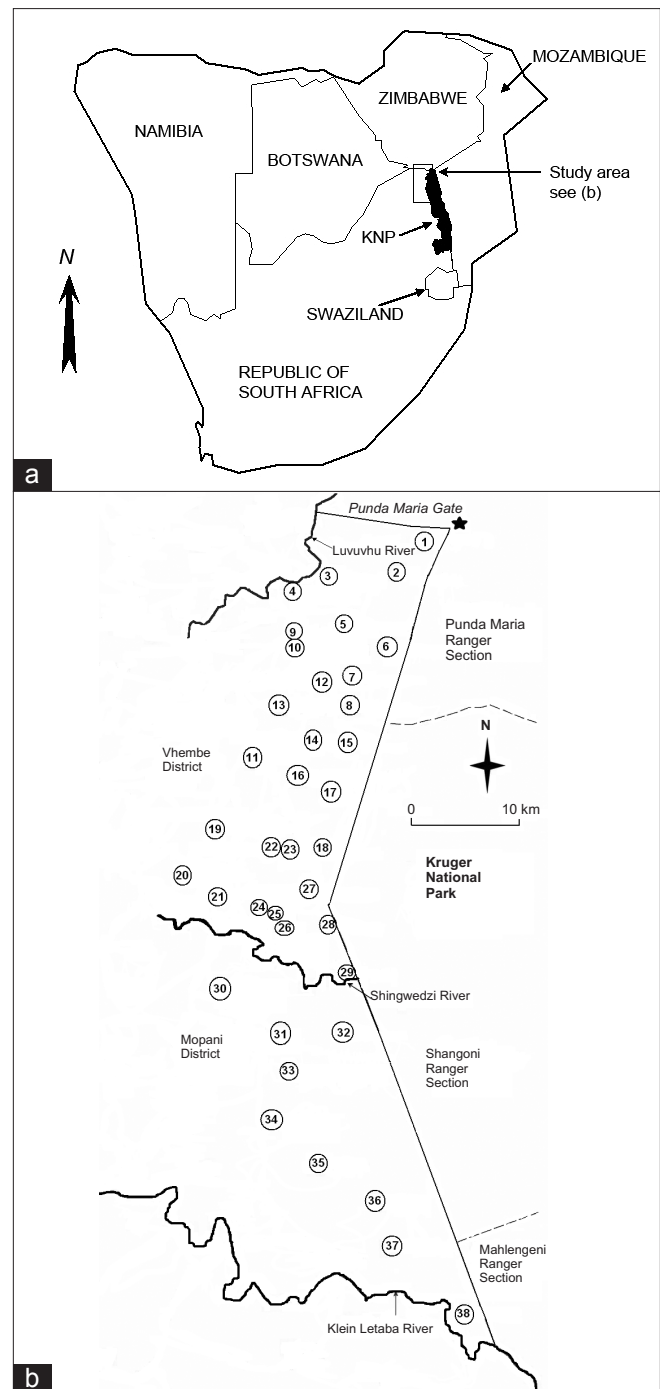


Figure 1

(a) Location of Kruger National Park in Southern Africa, (b) Study area with villages (listed below with associated *de jure* Traditional Authorities) [Mhinga TA: Matiyani (1), Josepha (2), Mhinga (3), Botsoleni (4), Maphophe (5), Maviligwe (6), Makuleke (7), Makahlule (8); Shikundu TA: Ximixoni (9), Saseleman (10), Nkovan (11); Bevhula TA: Nthaveni D (12), Nkavela (13), Makhubele (14), Bevhula (15); Magona TA: Nghomunghomu (16), Mashobye (17), Magona (18); Madonsi TA: Gijamhandzeni (19), Matsakali (20), Halahala (21), Peninghotsa (22), Govhu (23), Merwe A (24), Shisasi (25), Jilongo (26); Mtititi TA: Lombaard (27), Plange (28), Altein (29); Xiviti TA: Mininginisi Block 3 (30), Mininginisi Block 2 (31), Muyexe (32), Shitshamayoshe (33), Khakhala (34), Gawula (35), Mahlathi (36), Ndindani (37), Hlomela (38)]

Source: Anthony (2007); reproduced with permission from Cambridge University Press.

questionnaire, analysis of archival records, and interviews. Data collection was conducted between February and November 2004.

Questionnaire

In keeping with KNP's commitment to involve villages within 15 km of its border in community fora, a household face-to-face questionnaire was administered to randomly selected households of 38 villages within seven *de jure* Traditional Authorities, extending from the Punda Maria gate, south of the Luvuvhu river, to the Klein Letaba river (Figure 1). Based on available village household numbers from Traditional Authority offices, simple random sampling was used to obtain a sample of 240 households (sampling error ± 6.28 ; confidence level of 95%). The questionnaire was administered within 32 days in May–June 2004, extending from north to south through the study area. Whenever possible, household heads were surveyed at each selected household. Data on socio-demographic variables including age, gender, household income, household size, *de jure* Traditional Authority affiliation, education level and number of years the family has resided in the village were collected by trained local field assistants to minimise researcher bias inherent in cross-cultural studies, specifically concerning differences in race and language (Barrett & Cason 1997). A series of both closed and open-ended questions concerning costs and benefits of the KNP to local communities was also incorporated.

Archival Research

Limpopo Province DFED/EA DCA records from October 1998 to October 2004 were compiled from both Mopani district, which extends from the Shingwedzi river south through the study area, and Vhembe district, which includes the northern section of the study area. In addition, relevant records of the KNP and monthly meeting minutes were reviewed of the Hlanganani Forum, which has been the primary liaison between KNP and neighbouring communities in the northern part of the park since 1994.

Interviews

Informal and unstructured interviews were conducted with key informants including community leaders, Traditional Authorities, Hlanganani Forum representatives, and fence maintenance staff. Secondly, semi-structured interviews were conducted with staff of the Department of Animal Health, KNP field and administrative staff, and DFED/EA managerial and field staff.

CURRENT CONDITIONS

DCA Procedures

According to the DFED/EA, Figure 2 illustrates the

procedures to be followed if DCAs exit KNP. Numbered insertions in the diagram indicate stages in which we argue the process breaks down or faces specific constraints. We discuss each numbered point below, showing that current DCA procedures are caught up in institutional complexity and procedural ambiguity and inefficiency, leading to a situation in which neither are communities nor is wildlife conservation well served.

Different Procedures Must be Followed Depending on Species Involved (Figure 2, i)

The procedures involving buffalo and other cloven-hoofed animals are governed by a different process as KNP senior rangers and/or Department of Animal Health can bypass DFED/EA in controlling these animals outside the KNP to minimise disease transfer, including foot-and-mouth disease. When multiple species exit the KNP concurrently (e.g., buffalo and lion), then two sets of procedures apply, leading to the necessity for clearly defined roles and responsibilities, indeed enhanced cooperation, in controlling the DCAs.

*Wildlife Has *res nullius* Status (Figure 2, ii)*

Regarding DCAs and neighbouring communities, a quandary exists. As wildlife has *res nullius*¹ status in South Africa (Gibson 1977), the Limpopo Province is the legal entity responsible for controlling DCAs outside the park. Until the late 1990s, KNP section rangers had authority to deal with DCAs themselves, but currently their agreement with DFED/EA stipulates that the park can only assist in DCA control after first obtaining permission from the Limpopo Province government *in each case*. To complicate matters, the border fence is under the responsibility of the Department of Animal Health, which is obliged to maintain it in order to prevent transmission of disease from wild animals to domestic stock (Figure 3). Furthermore, the communal lands where most of the DCAs are reported are owned by the Department of Land Affairs and have yet to be officially returned to the communities under the Communal Land Rights Act (No. 11 of 2004). Confusion in current land tenure and potential wildlife custodianship in lieu of its *res nullius* status has far-reaching implications for current and future wildlife use, including DCA control.

Not All Animals Exiting KNP Cause Damage (Figure 2, iii)

Although animals that exit KNP and those that naturally reside outside the park have the potential to cause damage, not all do. Thus, defining both DCAs, and the damage they could cause, should be at the forefront of any policy being formulated to control DCAs. For example, the DCA procedures make no accommodation for leopards which may traverse back and forth between the park and neighbouring areas, yet not cause damage whilst outside the park.

Not All DCA Damage Is Discovered (Figure 2, iv)

A DCA may damage crops, but the damage may be so minimal that it is never detected. In the case of livestock, a DCA may

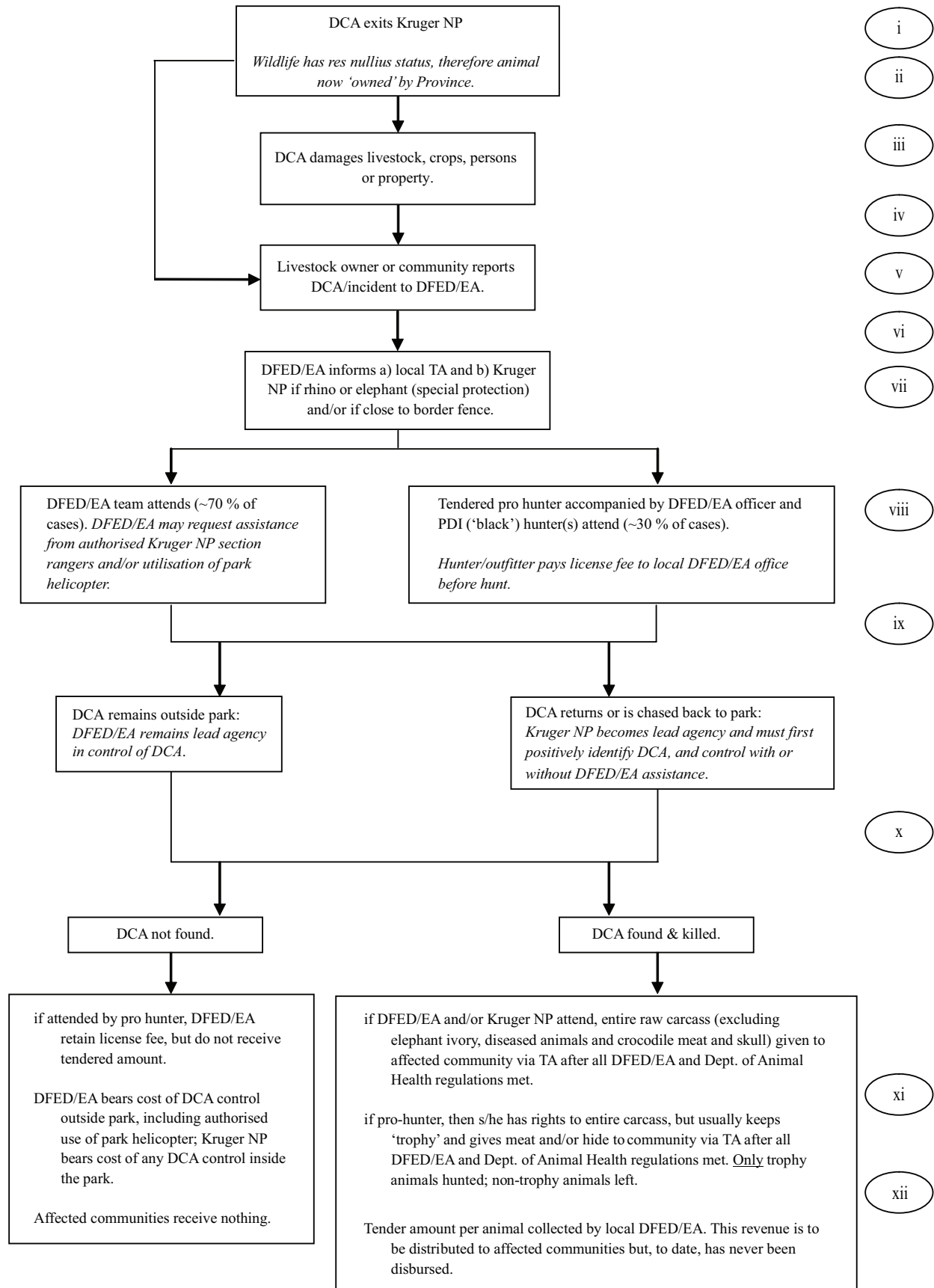


Figure 2
DCA procedures (excluding buffalo and other cloven-hoofed animals)

destroy a domestic animal but the carcass may never be found and the owner may be left to speculate as to its fate. In such cases, a DCA has caused damage but the damage itself is undetected.

Not All DCAs Are Reported (Figure 2, v)

When respondents in the household survey were asked ‘What



Figure 3

Male elephant stepping from communal area on right (DFED/EA responsibility), over border fence (Department of Animal Health responsibility) into KNP (KNP responsibility)

should someone do if they experience a DCA?’ a total of 245 responses were elicited (respondents could provide more than one answer). Twenty six different responses were provided, including 24 separate channels of reporting. These include up to three levels of information flow and seven different institutions (Figure 4).

Based on these results, respondents who indicated that an institution must be notified when encountering DCAs believed that in 53.9% of the cases, action is taken to control DCAs at the first level of reporting. This is followed by 42.9% after information reached a second institution and 3.2% after reaching the third. It is believed that KNP takes action to control DCA in 53.9% of cases, followed by Traditional Authorities (17.5%), DFED/EA (15.7%), South African Police Services (4.6%), Hlanganani Forum (1.8%), civics (0.9%), ‘those in charge’ (5.1%), and self (0.5%). Moreover, it is noteworthy that no respondents believed that the KNP passes DCA report information on to another institution, including the DFED/EA, the primary agency responsible for DCA control outside the park.

Due to experiencing ineffective action or inaction by provincial rangers, a number of key informants from the neighbouring communities and KNP indicated that they simply do not report DCAs to the DFED/EA. These include Maviligwe village members whose behaviour was affected by

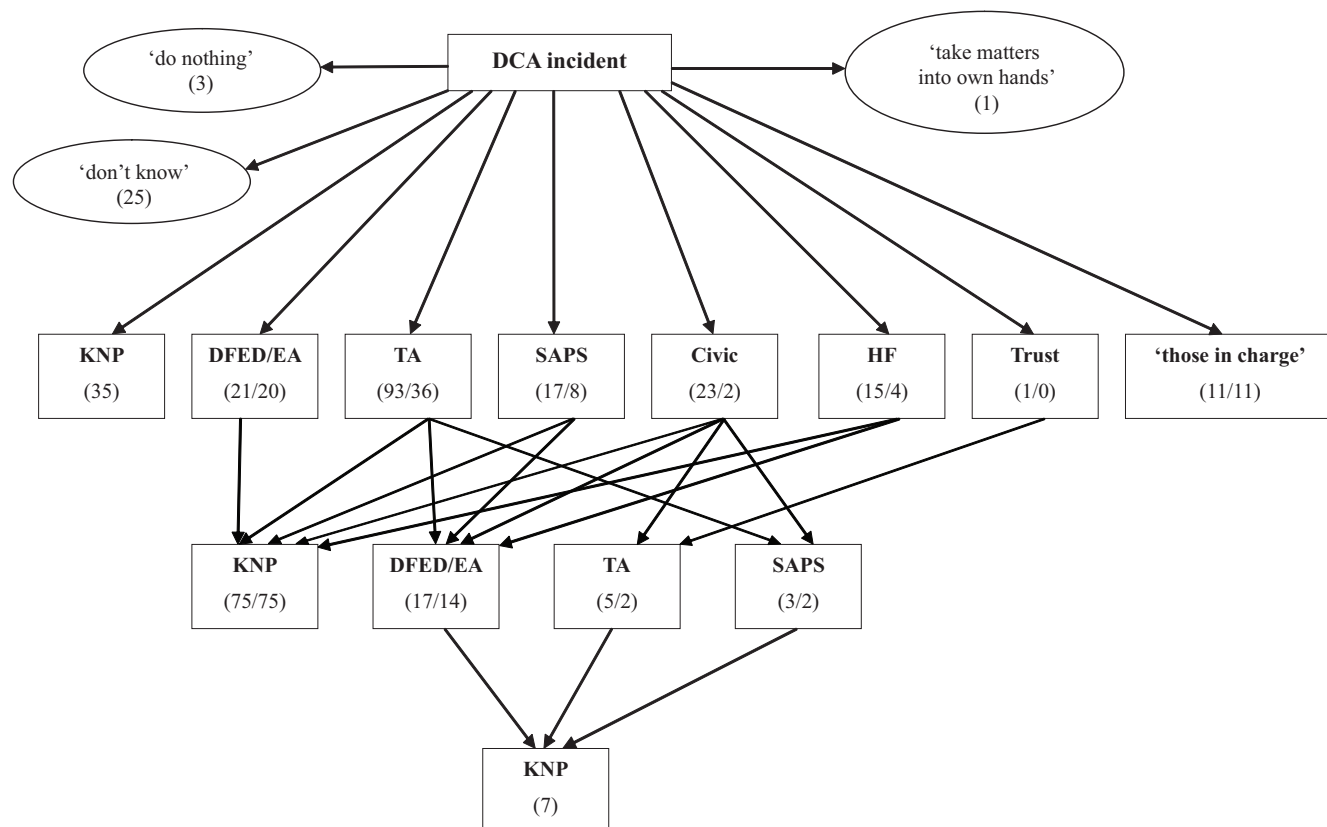


Figure 4

Information flow for DCA reporting [frequency of information to institution / frequency that institution controls DCA (N=245)].

KNP=Krug National Park; DFED/EA= Department of Finance and Economic Development – Environmental Affairs; TA=Traditional Authority; SAPS=South African Police Services; HF=Hlanganani Forum

the broken promise by a provincial ranger to return to kill a lion after he had been shown partly eaten cattle. In the end he didn't return, the lions ate the rest of the cattle, and nothing was done. A second case includes a KNP ranger who, after repeatedly attempting to locate damage causing lions who had returned to the park, stated that a provincial officer had phoned him to ask, "What should we do about these lions?" The ranger was furious and stated that he had been out for five nights trying to get the lion and was "wondering what on earth the province is doing about it outside." The officer replied that they had tried for one night. The KNP ranger further stressed that he is "sick of the province's unwillingness and lack of dedication to deal with these problems", and now "only rarely reports DCAs to the province." Finally, one professional hunter operating in the study area remarked that "Many locals do not even report DCAs to the DFED/EA anymore, because in the past, there was such a poor response from the province." He believes this is why many locals were using snares to handle the problem themselves. In addition to snares, carcasses have often been laced with poison to indiscriminately kill lions and hyenas, which has had lethal consequences for other species, including vultures, which are specially protected in Limpopo Province (LEMA No. 7 of 2003; Schedule 2).

Despite this under-reporting, of 482 available reports of DFED/EA DCA incidents or DCAs being destroyed in Mopani district from October 1998 to October 2004, 16 taxa were involved (Table 1). DCA reports were handwritten and largely incomplete, therefore the values indicated in Table 1 may be gross underestimates, i.e., reports often include more than one animal (indicated only by the plural form of the word, not exact numbers) and may be multi-species. Conversely, sometimes more than one report may have been recorded for the same animal(s), especially if reports were temporally and spatially proximate. There are also cases where the data

were not available (e.g., all of 2000), either because they were never transcribed or not centrally compiled at DFED/EA offices. From the data that were available, however, species most frequently reported (91.2%) were buffalo, lion, elephant, hippopotamus, and crocodile.

Although records were incomplete, an increasing number of DCA incidents were reported to the DFED/EA over the six years, with over 115 reports from January to October 2004 alone. However, reports of DCAs being destroyed have not significantly increased relative to the number of reports, especially since 2001. Similar to Mopani district, Vhembe district records are largely incomplete, limiting interpretation and analyses. However, compared to Mopani district, Vhembe district to the north appears to have either fewer DCA incidents or less reporting, or both. Moreover, the success of attending to and destroying buffalo appears to be greater than that of other DCA species reported.

Not All DCA Reports Are Communicated Between Relevant Parties (Figure 2, vi)

According to the procedures outlined above, when a DCA is reported or encountered, all relevant parties should be contacted and informed on the course of action to be followed. However, in practice, this doesn't always occur. Examples include lack of, or poor, communication between DFED/EA and a) other DFED/EA staff, b) local communities, c) local Traditional Authorities, and d) relevant KNP staff.

Prior Permission Required Before Attending To Any DCA Incident (Figure 2, vii)

Success in hunting DCAs is partially associated with the speed in attending to incidents. With the observed practice, field rangers accompanying professional hunters are required to first obtain licenses from field offices before a hunt. Moreover, DFED/EA district staff require authorisation from the head

Table 1
Mopani District DFED/EA DCA reports from October 1998 to October 2004

English name	Latin name	Incident report	Report of animal(s) destroyed
Buffalo	<i>Syncerus caffer</i>	152	55
Lion	<i>Panthera leo</i>	83	23
Elephant	<i>Loxodonta africana</i>	56	8
Hippo	<i>Hippopotamus amphibius</i>	41	5
Crocodile	<i>Crocodilus niloticus</i>	20	1
Snake	<i>Serpentes</i> suborder	12	2
Leopard	<i>Panthera pardus</i>	6	1
Honey badger	<i>Mellivora capensis</i>	3	1
Zebra	<i>Equus burchelli</i>	3	-
Hyena	<i>Crocuta crocuta</i>	2	-
Monkey	<i>Cercopithecus aethiops</i>	2	-
Honey bee	<i>Apidae</i> family	2	-
Rhino	<i>Ceratotherium simum</i>	1	-
Baboon	<i>Papio ursinus</i>	1	-
Impala	<i>Aepyceros melampus</i>	1	-
Duiker	<i>Sylvicapra grimmia</i>	1	-
Total (16 taxa)		386	96

office in Polokwane (Pietersburg) prior to controlling any DCA. This time consuming process has often prevented resolution of DCA incidents.

Not All DCA Reports Are Attended To (Figure 2, viii)

Due to a number of factors, including lack of staff and transport, inaccurate reporting, poor response time and tracking abilities, even when reports are received by DFED/EA, not all of these are attended to. Capacity constraints within DFED/EA were highlighted as early as 1994 when the Gazankulu Nature Conservation (GNC) (predecessor of DFED/EA) admitted to the KNP that they “could not attend to every DCA report.” More recently, a Mopani district DFED/EA staff member emphasised that “DCAs take up about 70% of our staff’s time. To compound problems with understaffing and poor transport, 3–4 staff are needed for each DCA reported... We sometimes do not attend to DCA complaints because the people do not give us enough information, the damage is days old, or we must attend another complaint.” Not surprisingly, this has led to negative attitudes and practices from many local Traditional Authorities and community members, including ‘taking matters into their own hands’ and admitting to destroying the animal(s) themselves.

Not All DCAs Remain Outside the Park (Figure 2, ix)

Not all DCAs that cause damage outside KNP remain outside the park. Rangers from both DFED/EA and KNP, and Department of Animal Health fence maintenance staff stated that animals, especially lion and elephant, will venture outside the park during the night but return by dawn. Professional hunters who were unsuccessful in finding individual animals also echoed this observation. One hunter expressed his frustration that “Elephants, lions and buffalo often return to Kruger by the time we get the report and are able to get there.” Once inside KNP, the park becomes the lead agency in finding the animal(s), and must decide whether it needs to be destroyed. Conversely, fence breakages facilitate the movement of not only wild animals in and out of the park, but also of domestic livestock. KNP rangers stated that due to fence breakages, stray and unattended cattle were entering the park and posing a major risk in terms of disease transfer between domestic and wild animals. In some cases, rangers were chasing cattle out of the park on a weekly basis.

Not All DCAs Are Found or Destroyed (Figure 2, x)

Even if a DCA causes damage, is reported to the DFED/EA and attended to, the animal is not always found and/or destroyed. This has repercussions for repeated incidents, especially with lions which may habituate to taking cattle as prey, and for potential DCA compensation schemes. Interviews with field rangers and others show that this drawback is not only a result of poor communication and slow response time in getting to the scene, but also due to poor tracking and shooting capabilities of field rangers and/or professional hunters. In some cases, DCAs were shot and wounded outside the park, and later wandered back into the park and died.

Community Reactions (Figure 2, xi)

Community perceptions of DCAs are an important aspect of KNP’s interaction with its neighbouring communities, and have great potential in shaping attitudes towards the park and its objectives. Based on the questionnaire, 12.1% of respondents claimed that they had experienced DCA damage within the previous two years. A negative and significant relationship ($r=0.170$, $p<0.01$, $N=240$) exists between distance from the park border and the incidence of damage caused by DCAs in the adjacent areas.

Distance values were divided into three bands for further analyses (0–3 km, 3.1–7.0 km, and 7.1–15 km). Percentage of sampled households experiencing DCA damage was then calculated for each of these bands, and multiplied by the total number of households within the bands in the study area (Figure 5). Within 3 km of the park’s border, almost 1 in 5 households claimed to have suffered DCA damage within the past two years. If extrapolated to the entire population within the study area’s 0–3 km band, this would amount to approximately 1,100 households. If one considers all households in the study area, an estimated 2,216 households have suffered some DCA damage within the previous two years.

Logistic regression analysis revealed that households that had higher numbers of mammalian livestock ($B=0.109$, $p<0.001$) and are closer to the park ($B=0.231$, $p<0.01$) could predict occurrences of DCA damage. Moreover, those who had suffered DCA damage were significantly less likely to believe that KNP would ever help their household economically ($\chi^2=7.295$, $df=2$, $p<0.05$).

According to the Mopani district DFED/EA Environmental Manager, if an animal is destroyed by the DFED/EA, then the following process for each species is carried out:

- Lion: skin and meat is given to the community via the Traditional Authority. Historically, the skins of all lions killed by KNP rangers were treated/cured within the park, and the money generated when sold was paid to the communities via the Hlanganani Forum.
- Elephant: tusks are retained by DFED/EA; carcass is given to community.

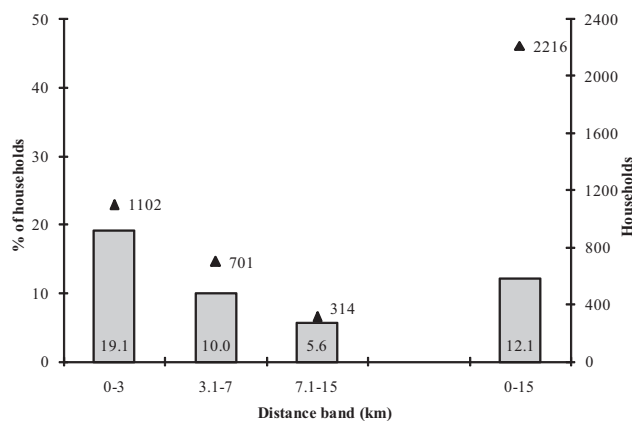


Figure 5
Percentage (bars) and total households (▲) experiencing DCA damage within last two years within three distance bands from KNP ($N=240$)

- Buffalo: head and hooves (foot-and-mouth disease) and lungs (bovine tuberculosis) are removed by the Department of Animal Health and returned to KNP for disposal. After certification by Department of Animal Health officials, carcass is given to communities for consumption. If diseased, carcass is incinerated on the spot.
- Hippo: after certification by Department of Animal Health officials, carcass is given to communities for consumption. If diseased, carcass is incinerated on the spot.
- Crocodile: usually captured and relocated. If and when animal is destroyed, meat and skull (brains considered poisonous by local communities) is taken by DFED/EA to be incinerated or buried. Community receives the hide.

However, discussions with both Traditional Authorities and allegations during Hlanganani Forum meetings revealed that meat from destroyed DCAs is not always given to the communities as promised. As early as 1998, a Forum meeting reported that “There is concern from forum members that the province only attends to DCAs when they are buffaloes and not lions”. This may be due to the high risk of disease transfer between buffalo and cattle, which warrants increased efforts and, thus, a greater incentive for control. More recently, a Gawula Traditional Authority representative remarked that the DFED/EA are “not trustworthy; however, villagers are bound by the law to report all DCAs to them. When provincial rangers do come and kill DCAs, they leave the meat, although there are occasions when they themselves have left with buffalo meat [assumed to be of greater protein value].”

DFED/EA DCA records from 2001 to 2004 were organised

monthly to determine if significant temporal patterns exist across all species or between species. Within this time frame, data were missing for: June (2002), November (2001, 2004), and December (2001, 2002, 2004). Nevertheless, a total of 315 incident reports for the five most problematic species were recorded including 137 buffalo, 72 lion, 55 elephant, 33 hippo, and 18 crocodile. Total monthly incident reports combined for all years for each species are shown in Figure 6.

Documented DCA incidents from 2001 to 2004 primarily occur during the wet summer months, and are less frequent in winter. Species-specific data show that incidents of hippo and crocodile are distributed relatively evenly throughout the year. However, there are peaks for both buffalo and elephant in March which, at least for elephant, is likely associated with the local marula (*Sclerocarya birrea caffra*) harvesting season, and raiding of other mature crops (Hoare 1999; Jacobs & Biggs 2002; Ferguson 2009), which increases the likelihood of conflicts with local communities. High reports of buffalo in the late wet season may be explained by the fact that herds are expanding their ranges at this time due to increased water availability, or simply due to the state of the fence. Concurrent herd movements and calving may also explain slightly higher incidents of lion during this period, although determining these relationships were beyond the scope of our research.

Only ‘Trophy’ Animals Hunted by Professional Hunters (Figure 2, xii)

According to records obtained from the Mopani district DFED/EA office, one formal and four informal professional hunting

Table 2
Trophy hunting tenders issued to control DCA with tender prices (in USD) for species and sex between August 2001 and August 2004 by Limpopo Province

Species/sex	Informal tenders				Formal tenders
	23 August 2001 – 31 October 2001	16 November 2001 – 31 January 2002	22 April 2002 – 20 July 2002	4 April 2003 – 4 July 2003	11 May 2004 – 11 August 2004
Elephant	13,199	13,665	15,839–18,634	11,646–26,630	15,839
Buffalo/M	4,658			6,988	6,988
Buffalo/F	4,658			6,366–6,988	6,211
Lion/M	5,435	3,494	2,717–12,578	17,391	9,084
Lion/F	5,435	3,494	2,717–12,578	6,988	5,590
Hippo	4,037			3,882	1,863
Crocodile	3,261				932

Table 3
Species-specific statistics for tenders issued to control DCAs in Limpopo Province between August 2001 and August 2004

Species	Licenses issued	Animals successfully hunted	% of hunts successful	Total tender payments (ZAR)	Mean price paid per animal ^a (ZAR)	Mean price paid per animal (2004 rate: USD)
Lion	40	14	35.0	439,000	39,909	6,197
Elephant	20	13	65.0	1,320,000	110,000	17,081
Buffalo	18	7	38.9	296,000	42,286	6,566
Hippo	5	4	80.0	89,000	22,250	3,455
Crocodile	2	1	50.0	21,000	21,000	3,261
Total	85	39	45.9	2,165,000	61,857	9,605

^aOne tender payment was not paid for a successful elephant hunt. A second case exists in which three excess lions were shot apparently for no tender cost. Thus, mean prices are calculated for animals hunted where a payment was received.

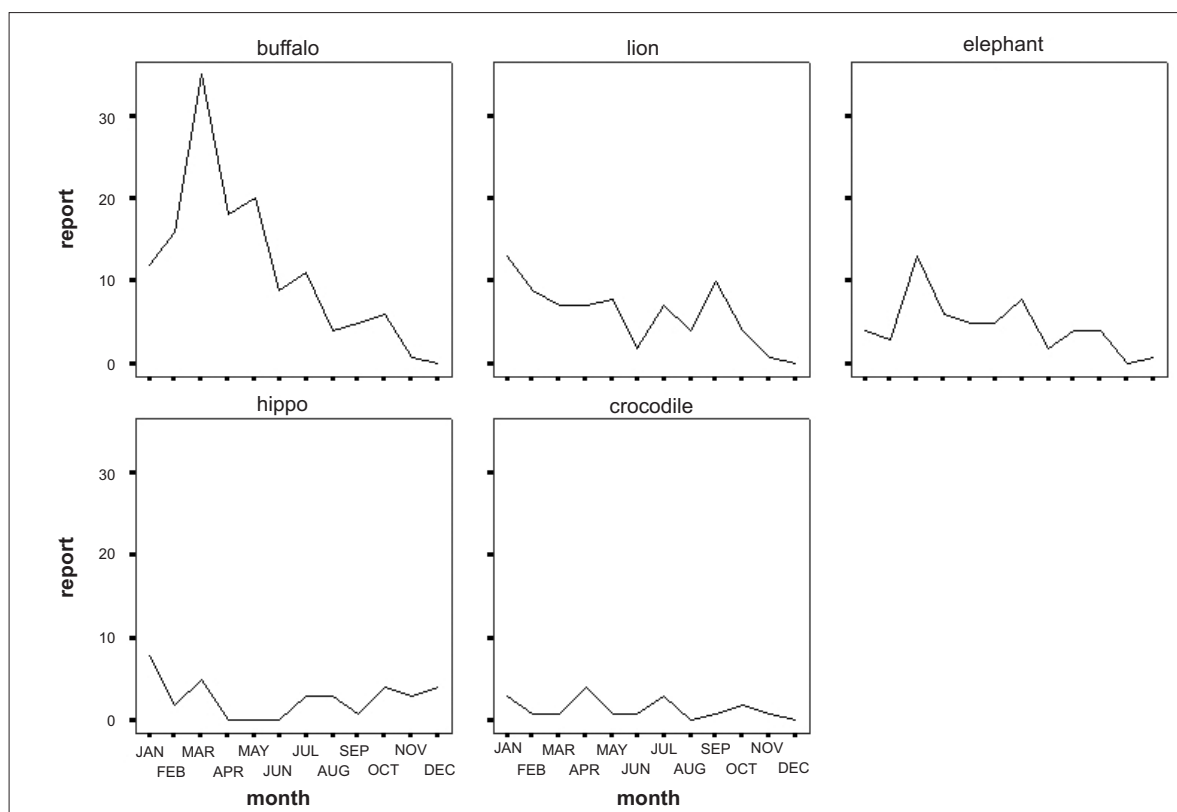


Figure 6
Temporal variation of DCA reports for buffalo, lion, elephant, hippo, and crocodile in Mopani District (2001-2004)

tenders to control DCAs were issued by the DFED from August 2001 to August 2004, representing approximately 36% of the period (Table 2).

These tenders were generally for two to three month periods and, in addition to 90,900 ZAR (2004 rates: 14,115 USD) in license fees, generated 2,165,000 ZAR (~336,180 USD) in tender payments for successful hunts (Table 3). As a broad estimate, this represents approximately 62,000 ZAR/animal hunted (~9,627 USD). These records also show that 78.7% of the hunters involved were foreigners, 14.8% were South African, and the rest unknown. The recorded hunts were successful in slightly less than half (45.9%) of the occasions.

The challenges of trying to satisfy the demands of trophy hunters in DCA control was voiced by a professional hunting outfitter, who was awarded one of the tenders to control DCAs. When asked why he terminated his tender, he stated that “The bottom line is that it was just not profitable. This is because my overseas clients want trophy animals and most of the DCAs are not trophy animals. Only about 20% of problem lions are trophy animals. I clocked over 20,000 km on my vehicle, often just trying to investigate problems for the DFED/EA guys.” To rectify the situation, he believes that “It’s just impossible to involve pro hunters if they can only shoot trophy animals. I know that there are many local South African hunters would be willing to pay a lower price for a non-trophy animal but cannot afford the full trophy fees. In these cases, more DCAs would be dealt with and communities would be able to get

more meat.” Overseas hunters also voiced their frustration in the low success rate, claiming that the problem with many DCAs is that “they are not trophy animals, i.e., they are too small or the wrong sex.” They also believed that constraints in communication and licensing inhibited their success, declaring “by the time we could attend to the report, in 70-75% of the cases, the animals were long gone. There were also occasions where the supposed lion problem turned out to be hyena.”

The need to supply professional hunters with trophy animals has also led to unethical and illegal activities of a related nature. Accusations, supported by over 90 documented cases and photographic evidence, have surfaced of professional hunting outfitters with permanent camps located along the KNP border luring lions out of the park with recordings, by cutting the fence and/or using bait, including donkeys, and poached zebra (Figure 7). According to the Manager of Terrestrial Biodiversity and Wilderness Management at KNP, lion luring is a man-induced population sink, which “may have an effect on biodiversity over the long-term.” Although he believes that this activity can be worrying on a localised scale, it has minimal impact over the park as a whole. On the other hand, he added that lions may develop a change of prey preference if they have increased cattle-killing opportunities (see also van Dyk & Slotow 2003).

The incorporation of professional hunters in controlling DCAs by the Limpopo Province has been vehemently criticised by the KNP and the Panel of Experts (PoE) on Professional

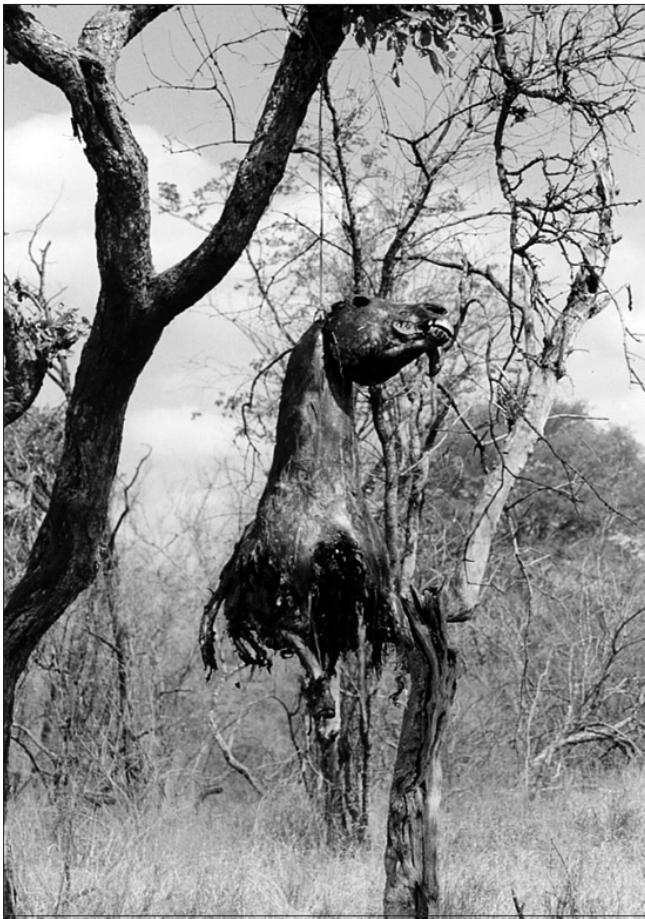


Figure 7

Use of poached zebra carcass to lure lions from KNP

and Recreational Hunting in South Africa. On 6 April 2005, the Minister of Environment Affairs and Tourism appointed a PoE to review existing professional and recreational hunting activities in South Africa and recommend guiding principles for the drafting of national norms and standards for the hunting industry. The impetus for this initiative was driven in part by media reports of hunting practices adjacent to KNP, 'canned hunting'², and the recognition that the draft norms and standards for the sustainable use of large predators gazetted in February 2005 were insufficient. The findings and advice of the PoE were informed by both public input and commissioned research and resulted in the PoE's *Final draft report to the Minister of Environmental Affairs and Tourism* (25 October 2005). The Executive Summary of the PoE's Report emphasises that the hunting industry is currently regulated on a provincial basis and 'every province has its own legislation and policies resulting in a complex and fragmented system resulting in gaps, loopholes, and use of provisions that are outdated.' They further recognise low capacity at the provincial level, and that some provinces are struggling to manage, administer, monitor and enforce their own hunting regulations. The PoE believes that DCAs should be totally decoupled from commercial hunting due to abuses by provincial systems to manage DCAs with private operators. Further, it strongly recommends that '...DCAs, which is a

provincial wildlife management issue, be dealt with under a separate policy process, and that no DCA should be hunted or be dealt with through a commercial hunting agreement.' These recommendations have also led to developing national Norms and Standards for the Management of Damage-Causing Animals, a process which is still ongoing.

These DCA procedures result in a piecemeal approach to controlling DCAs in communal areas. The process is fraught with gaps and loopholes that result in increased opportunities for corruption and illegal activity. Moreover, it demonstrates the need for an improved and streamlined system of control that minimises risk and damage. Currently, the process results in the following institutional outcomes:

- KNP: bears cost in terms of biodiversity loss, manpower and other resources required in searching for DCAs inside park, and deteriorating relationships with neighbouring communities.
- Department of Animal Health: bears cost in terms of fence maintenance, increased disease transfer risk, and poor public image.
- DFED/EA: bears cost in terms of manpower and other resources required to search for DCAs outside park, increased conflict with neighbouring communities; yet has received revenue from tenders issued to professional hunting outfitters.
- Communities: bear cost in terms of loss of life and limb, crops and livestock, psychological damage, increased conflict with conservation agencies, and receive no compensation except occasional meat.

Compensation

In addition to DCA control, compensation for damage caused by DCAs continues to be a controversial and sensitive topic. The issue of compensation is grossly confused at all levels, and across the relevant institutions. This confusion concerns unmet promises, differing expectations, and the lack of clear and coherent policy. Examples of KNP social ecologists promising compensation, and later the DFED, to affected livestock farmers that never materialised have had serious repercussions in the study area. These include village withdrawals from the Hlanganani Forum (Anthony 2006), and an increasing belief by the Forum and a number of Traditional Authorities that the Limpopo Province is deliberately and illegally withholding money from affected livestock owners. Concerns are also rising internally within the DFED. An internal document from the DFED Auditor (dated March 2004) indicates that some 319,000 ZAR (~49,534 USD) were received from 1 April - 19 July 2003 from DCA control. The auditor is concerned as to why communities have not received this money, and questions why the Province is not assisting communities to become organised and collect finances.

On the other hand, DFED/EA District Managers allege that confusion exists as to whom compensation should be channeled through. According to the Mopani District Manager, the Hlanganani Forum Executive met with the DFED in

2003, at which time the Executive was asked to produce an audited financial statement. They couldn't produce one, nor could they adequately address the DFED's concerns regarding their representativeness. The Vhembe District Environmental Manager added in a Forum meeting on 6 August 2004 that it is still unclear as to who should be compensating; the DFED, the Hlanganani Forum, or KNP as 'they are the owners of the animals', and what amounts should be assigned for various types of damages. He stated that the provincial government is unlikely to forward money to the Hlanganani Forum as it has serious concerns about the Forum's legitimacy and representativeness, and there are other institutions in the area wanting the same money vis-à-vis community trusts.

The General Manager of Parks, Tourism and Community Environment Development stated that all disbursement of government funds must adhere to the Public Finance Management Act (1999) which has regulations regarding how funds can be dispensed. Revenues from tenders utilising professional hunters to control DCAs (Table 3) have been placed into a separate government account, but the DFED 'are still formalising a foolproof mechanism to allow for equitable distribution.' The challenge is to know whom to pay, and for what. There is still concern over community institutions (e.g., trusts, forums, Traditional Authorities) and how they might be able to handle such transactions and subsequent financial management. The General Manager admitted that communities are frustrated with the lack of compensation, and added that the DFED should work on a proper and coherent policy and benefit-sharing model to disburse funds to the 'relevant structures' in the communities. To date however, this has not materialised.

The confusion about whom to pay and the lack of a coherent compensation policy is also exacerbated by changing legislation regarding land ownership. The Department of Land Affairs Director of Public Land Support Services, when asked about the long-term strategy for DCA control, stated that once the communal areas are legally titled to the communities and they become the true landowners under the Communal Land Rights Act (2004), they will be able to handle control of DCAs themselves, including tendering out professional hunters and having their own DCA control associations. Until such time, however, they must abide by the current practices of the provincial government.

Meanwhile, DCA victims and Hlanganani Forum members cannot understand the lengthy delay, with one village representative exclaiming that "we are sick and tired of the talk about procedure and are angry that the province and the park are delaying the compensation." He cannot understand why they must "suffer so much to get back such a relatively small amount of money."

THE WAY FORWARD

Mhaka a yi bori. / A Case Does Not Rot

(Meaning: When a matter has been raised, it won't vanish until it has been properly settled.)

As this local Tsonga proverb illustrates, the very serious problem of DCAs, their control, and the need for compensation identified in this research demands a solution in order to improve relationships between communities and management institutions, and to arrive at better outcomes for communities and conservation alike. Fostering communication and trust, demonstrating effort and a willingness to address the issue, and following through can lead to improved governance (Lockwood 2010) and have a positive effect on the attitudes and actions of people in conflict with wildlife (Madden 2004). However, with such a complex issue, one cannot rely on any one solution alone but is more likely to succeed by employing a battery of flexible instruments and policies. Based on our study, we suggest that in order to manage human-wildlife conflict more effectively in such contexts, four components of the conflict must be addressed: a) baseline research, b) evaluation of damage, c) conflict management, and d) evaluation of control.

Baseline Research

Understanding local perceptions of affected communities, and the ecology of 'problematic' species, including their life histories and propensity for causing damage should be at the forefront of any research designed to minimise human-wildlife conflict. Knowledge on the spatial and temporal variation of conflicts, as well as the behaviours of involved individuals/institutions is a critical first step in planning any intervention (Treves *et al.* 2006). Where this is lacking, research capacities and efforts need to be increased, not only in culturally-sensitive social science research on and with neighbouring communities (Pollard *et al.* 2003), but also in the areas of livestock and crop depredation (Bauer & Karl 2001; Macandza *et al.* 2004; Kolowski & Holekamp 2006), and DCA deterrent measures (Newmark *et al.* 1994; Ogada *et al.* 2003; Sitati & Walpole 2006).

Evaluation of Damage

Systematic and effective reporting and monitoring, record keeping, and quick responses are required to ensure that the human-wildlife conflict is being tracked, comprehended, and adequately addressed (Treves *et al.* 2006). Both the design and implementation of policies formulated to manage human-wildlife conflict are dependent on the availability of *current*, *accurate*, and *long-term* information on the problem. In the absence of good information, the scale and nature of human-wildlife conflict becomes a matter of personal opinion (Anthony & Wasambo 2009). Conflict between people and wildlife is an emotional issue and, as a result, reports and opinions can be biased, creating a false impression of the size of the problem. The systematic and objective gathering of information allows stakeholders to put the problems and threats caused by human-wildlife conflict into context and perspective with other problems faced by local communities. It also ensures that resources are correctly directed, that is, at solving the real issues rather than the perceived problems (Mishra 1997).

In cases where record keeping is unsystematic and attending to incidents is hampered by overlapping and/or weak institutional arrangements, valuable data concerning the nature and extent of damage can be left wanting. Consequently, measures to minimise real or potential loss of life or livelihoods will remain unrealised and negative attitudes towards PAs from affected communities will persist (Anthony 2007; Hazzah *et al.* 2009), and may include retaliatory killings as evidenced in our case, and elsewhere (Mishra 1997). Appropriate new, existing, or traditional systems and institutions need to be developed or empowered locally, and be evidence-based to ensure good management (Madden 2004; Thirgood & Redpath 2008). Such a system, we believe, must be mutually agreed upon and be clearly and broadly communicated to the relevant institutions, including local communities.

Conflict Management

As discussed, the distribution of competencies between KNP and the DFED/EA as well as the tense relationship between the Traditional Authorities and the DFED/EA undermine the legitimacy of the latter and hamper efforts to control DCAs and promote goodwill and conservation in the region. We recommend that a system be created that, at least insofar as the issue of DCAs is concerned, helps establish the credibility and legitimacy of the DFED/EA and decreases the sense of competition between DFED/EA and the Traditional Authorities while at the same time improving response to DCAs. In order to achieve these objectives the authority to control DCAs in such cases should be decentralised following the subsidiarity principle, in which 'the goal is to have as much local solution as possible and only so much government regulation as necessary' (Berkes 2004). In our case, this may also offer opportunities for local South African hunters to legitimately hunt valuable wildlife. Decentralisation of authority should also include allowing joint teams of KNP and DFED/EA rangers to be permanently stationed at strategic border points with the authority to respond to DCA activity as the need arises. Ranger teams should also be authorised to respond to DCAs that do not originate from the park in order to meet the primary objective of protecting human life and property. These measures would go a long way in ironing out the procedural and practical difficulties rangers now encounter in responding to DCAs under the current institutional framework.

We believe that in contexts where overlapping and/or competing institutions have a shared goal in mitigating, alleviating and eventually minimising human-wildlife conflict, these changes, in combination, will create a situation in which inherent institutional rivalries will be minimised due to cooperation on the ground as well as shared responsibility for oversight and low-level policy adjustments. A process of social learning in which the various stakeholders understand the viewpoints of others and take some responsibility for meeting the core interests of their partners is likely to lead to greater mutual sympathy, a decrease in conflict, and more effective management in the long term.

In addition to these basic institutional arrangements, we recommend a number of other measures be taken, which are more unique to our case. These include steps that KNP can take unilaterally to improve relations with neighbouring communities, such as maintaining and upgrading the fence along the entire western boundary of the park. The fence is viewed by communities as essential in protecting their interests by keeping both disease carrying and/or damage causing species in the park and away from livestock, people, and property. It is also important for KNP to reduce damage caused by elephants. This is currently being pursued within the Department of Environmental Affairs and Tourism and South African National Parks, and has direct relevance to the park's relationship with its neighbours. The initial steps to understanding this issue and exploring options involved stakeholder forums in 2004-2005 and the production of a scientific assessment for elephant management in South Africa (Scholes & Mennell 2008).

Evaluation of Control

Monitoring and adaptive management is imperative to evaluate the effectiveness of interventions to minimise conflict (Curtin 2002). To ensure performance improvement and provide a forum for timely feedback, an 'audit committee' of all relevant stakeholders should review DCA cases on a monthly or bi-monthly basis and recommend changes in practice, if necessary. However, institutional improvements must also be accompanied by a functioning compensation scheme for damage caused by wild animals (Nyhus *et al.* 2003; Graham *et al.* 2005; Schwerdtner & Gruber 2007; Ogra & Badola 2008). Although compensation schemes are generally not a good long-term solution as they may create continuing financial burdens and increase expectations (Crawshaw Jr. 2004; Graham *et al.* 2005) and be counter productive to conservation by stimulating agricultural expansion (Bulte & Rondeau 2005), the legitimacy of institutions may be enhanced where following through on long-standing promises are made. Again, the Department of Environmental Affairs and Tourism and South African National Parks are developing such a scheme but, to date, have not implemented it. Until this is in place, the current situation will continue to foster resentment within the affected communities.

CONCLUSION

DCAs on the border of KNP represent a significant threat to the lives and property of local communities, undermining livelihoods and damaging relations between the communities and the park. Conflicts between the park and communities can be significantly reduced by addressing the weaknesses of the institutional structures within which DCAs are controlled. The current system, in which DFED/EA bears primary responsibility for controlling animals but lacks the capacity to do so effectively in many cases while KNP shoulders the blame but cannot act upon its greater capacities, can and should be remedied in the near-term. Putting into place a

sustainable, adaptive system of DCA control composed of baseline research, damage evaluation, conflict management, and control evaluation would be a significant innovation and may evolve into a model that can be adapted and applied in other settings where DCA conflicts occur. While the response teams that we propose are meant to enhance efficiency with which authorities can respond to the problem, the system of research, management, evaluation and ultimately adaptation is meant to enhance the overall effectiveness of the DCA control regime by facilitating communication, information exchange, and learning among the stakeholders.

The system we propose is based on the principles of good governance (Lockwood 2010). It is transparent insofar as information is disseminated to all stakeholders and the multi-stakeholder audit committee oversees practices on the ground. Legitimacy is enhanced through the development of more reliable information and greater responsiveness on the part of authorities, as well as the inclusiveness of the audit committee, where accountability between the stakeholder institutions is enhanced through regular consultations and review of practices on the ground. Linking KNP and DFED rangers creates the kind of on-the-ground institutional connectivity that is needed in the region to ensure consistency and effectiveness of response. Fairness is enhanced by giving local people more direct access to management level decision making through the participation of the Traditional Authorities on the audit committee, which ensures that their concerns will be heard. It is expected that this system will be more resilient and adaptable because of the added information feedback loops, which are linked to the capacity of the rangers to act on the ground.

Human-wildlife conflict is significant and growing with the increase of human populations and encroachment of settlements into once uninhabited areas. DCAs pose threats to people and property as well as conservation, as community attitudes towards PAs can be significantly shaped by the real or perceived dangers from wildlife, and may result in retaliation by people against wildlife that threaten local livelihoods. Conflicts between conservation professionals and local people over DCAs may also exacerbate existing social conflicts as well as conflicts with PAs over other issues. Our study shows that managers and decision makers must not only work with local communities to measure the impacts of DCAs, but should also investigate and be sensitive to how local people perceive the adequacy of the responses by the authorities to DCA incidents. Only with this knowledge can managers and decision makers shape appropriate institutions that effectively control DCAs and mitigate or prevent conflicts between people and PAs over DCAs. Designing institutions that meet the criteria for good governance for PAs is a challenging process that requires significant investments of time and resources for knowledge production and stakeholder cooperation. In a world in which biodiversity is under increasing pressure from human encroachment and increasing populations, and in which people's rights to justice and secure livelihoods must be respected, such investments should be treated as mandatory.

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Notes

1. This means that no wild animal in a free-roaming state has a legal owner, i.e., belongs to no one in particular but to everyone in general. The state therefore acts as a custodian to all wild animals in the best interest of the public.
2. Canned hunting is defined by the Panel of Experts on Professional and Recreational Hunting in South Africa as 'the hunting of species that are not self-sustaining (meaning they are unable to feed themselves and produce healthy offspring), or are not able to exercise their natural escape mechanisms (as reflected in the fair chase principles)'.

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