Spotted hyaena ecology and human wildlife conflict in the Caprivi Region, Namibia

2009 Report

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Acronyms

AWT	African Wildlife Tracking
BNP	Bwabwata National Park
CVL	Central Veterinary Laboratory
DVS	Directorate of Veterinary Services
FMD	Foot and Mouth Disease
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HWC	Human Wildlife Conflict
IRDNC	Integrated Rural Development and Nature Conservation
KA	Kyaramacan Association
KAZA	Kavango-Zambezi
MET	Ministry of Environment and Tourism
MNC	Mudumu North Complex
NDF	Namibia Defense Force
NGO	Non-Government Organisation
NNF	Namibia Nature Foundation
PCT	Predator Conservation Trust
SMS	Short Message Service
TA	Traditional Authority
TFCA	Trans Frontier Conservation Area
VHF	Very High Frequency
WWF	World Wide Fund for Nature

Background

Globally, many large carnivore populations are in decline. In most cases, the persistence of these species is linked to their relationship with humans (Lichtenfeld 2005). Large carnivores clash with the interests of humans to a greater extent than do many other groups of animals (Mills 1998). Some of these large carnivores prey upon livestock, causing economic damage and ill will (Hemson 2003).

Spotted hyaenas are the most abundant of all large carnivores in sub-Saharan Africa, occurring in a wide variety of habitats. However their range, especially in southern Africa, has become drastically reduced in this century (Kruuk 1972). This reduction in the number and distribution of spotted hyaenas has been accelerating as human population increases (Nowell & Jackson 1996), resulting in an increase in conflict with human development. This problem is accentuated in areas of high human density, such as the Caprivi and Kavango Regions.

The future for spotted hyaenas outside protected areas remains precarious. It is difficult to reconcile the presence of spotted hyaenas in agricultural areas, and there is little point in attempting to do so (Mills, 1990). They are formidable livestock killers and are actively persecuted. Hyaena social structure is complex and the removal of a number of key individuals is likely to lead to the breakdown of the social group. Once a spotted hyaena social group has disappeared, it is difficult to repopulate the area (Kruuk, 1998). The spotted hyaena is unable to inhabit agricultural areas successfully and its future is tied to the long-term future of conservation areas (Mills 1990).

Most Namibians depend on the land for their subsistence, but the presence of many species of large mammals, combined with settlement patterns of people, leads to conflict between people and wildlife (Human Wildlife Conflict Management report). Large carnivores occur throughout the Caprivi and Kavango regions and frequently cross international borders. Their population dynamics, movements and conservation status are poorly understood despite ongoing conflict with local people. In the Caprivi region, between 1996 and 2001, 246 predator incidents were reported, resulting in the death of 694 livestock equivalents (Mulonga *et al*., 2003). As the number of communal conservancies increased so has the systematic reporting of problem animal incidents through the event book system (Natural Resource Management Working Group), highlighting the fact that in previous records livestock damage was most likely under-reported. Event book records show that between 2001 and 2006 some 2766 large carnivore incidents were reported, of which 1401 were of spotted hyaenas, resulting in damage to 3125 livestock equivalents.

Whether problem-causing hyaenas are resident within the communal area or originate from the park is unknown. Human-wildlife conflict (HWC) is an issue of pressing conservation concern, particularly when it involves threatened species, and accurately identifying the causes of such conflict is fundamental to developing effective resolution strategies (Dickman, 2005). Long-term conservation of spotted hyaenas in the Caprivi and Kavango depends on their persistence in protected areas like Bwabwata National Park and in resolving human-wildlife conflict with the communities on the periphery.

Hyaenas are unique and vital components of most African ecosystems (Mills, 1998) and understanding the mechanisms that regulate or limit their population should be taken into consideration when developing management plans for protected areas. For example, in a study in Etosha National Park, 71% of hyaena mortality was due to lions (Trinkel *et al.,* 2005). Diseases in spotted hyaenas may play an important role as a limiting factor in populations inside protected areas. Blood samples taken from these animals throughout their range have tested positive for antibodies for a wide range of viral diseases, including rabies and anthrax (Hofer 1998).There is some evidence that rabies may depress the southern Kalahari population (East *et al*., 2001; Mills, 1990) and, in the Serengeti, cubs under the age of six months succumbed to the 1993 canine distemper outbreak. There is little data from the Namibian population and none from the Caprivi region. Additionally, spotted hyaenas could have a substantial effect on less abundant prey species and on the establishment of new species in protected areas (Kruuk,1972) and can even affect other carnivore populations (Mills, 1990).

Home-range sizes and densities in spotted hyaenas vary considerably in different habitats. In Etosha National Park, hyaena home ranges of up to 360 km^2 have been recorded (Gasaway *et al*., 1988; Trinkel *et al*., 2004). No study of spotted hyaenas has yet been undertaken in the Caprivi region, but it is likely that home ranges fall across international boundaries which could have strong implications for trans-boundary conservation strategies

Problem-causing animals are and always will remain a challenge in Africa wherever people and wildlife live together (Esterhuizen, 2004). Sound ecological data, such as reliable population estimates, distribution and population demography, are crucial in the implementation of conservation strategies and conflict resolution.

Study Area

(Adapted from Mendelsohn and Roberts 1998)

The Caprivi Region lies in north east Namibia and stretches 450 km from east to west and ranges between 32 km and 100km in width from north to south and covers a surface area of approximately 20 000 km2. Its highest elevation in the west is 1100 metres which drops to 930 metres in the east. The landscape is shaped by thick deposits of Kalahari sands and perennial rivers with their associated floodplains.

The Caprivi has a mean annual rainfall of 550 mm (range 400 mm to 700 mm) which falls in the summer months from September to March. The majority of the area, i.e. the Mukwe district, the west Caprivi and the sandy plains of the east Caprivi consists of sand dunes which are dominated by Kalahari woodland vegetation type. This includes tree species like Burkea (Burkea Africana), Leadwood (*Combretum imberbe*) Teak (*Baikiaea plurijuga*) Mopane (*Colophospermum mopane*), Camelthorn (*Acacia erioloba*), False Mopane (*Guibourtia coleospermia*) and Terminalia (*Terminalia sericea*).

The study is taking place in the west Caprivi, which is now known as the BNP and the MNC. BNP is bordered by two perennial rivers, the Kavango in the west and Kwando in the east, by Angola in the north and Botswana to the south. Approximately 6500 people reside inside the

park in multiple use areas focused around Cheto, Omega and Omega 3. The MNC is in the east Caprivi which is bordered by Zambia to the north, Zimbabwe to the east and Botswana to the south. MNC consists of four conservancies, i.e. Mayuni, Mashi, Kwandu and Sobbe and falls between BNP and MNP. Approximately 13000 people (*NACSO 2006)* reside in villages within the MNC.

Training

Two individuals, Calicious Kulabone and Euster Kumana, from the Mayuni Conservancy received field training in various techniques. They have acquired essential skills to assist in field work as well as long term monitoring of large carnivores. This training will be extended for 2010 as well as learning skills required for the decision making and management of problem carnivores that kill livestock outside protected areas.

Field activities

Field work took place from September 2008 to October 2009 with a break during the peak wet season from November to mid February. Capture efforts were focused on the Kwando Core Area in an attempt to collar at least one spotted hyaena, which would further lead to the identification of one study clan.

Procuring meat for bait was a particular problem due to the quarantine restrictions in the north east following an outbreak of FMD. Trophy hunting within BNP has been put on hold so immediate sources of game meat were unavailable. With permission from MET and DVS in Katima, meat was obtained from a FMD free source and permitted for transport through the Kongola checkpoint for use within BNP.

Baiting and sound call ups in various combinations were the main methods employed to attract hyaenas. The sound file of approximately five minutes in length was made up of a squealing pig, feeding hyaenas, territorial fights and individuals vocalizing. Sound was played from two horn speakers placed at 180 degrees from each other on top of the research vehicle. The amplifier was powered by a car battery. The speakers are rotated twice at ninety degrees during the calling exercise.

It was necessary to semi-habituate a group of hyaenas in order to capture and mark/collar them. This was done by hanging large bait high in a tree out of reach. Bait was always visible, but unavailable to hyaenas due to the height above the ground. The baiting tree was abandoned once the majority of the Kwando Clan was marked so as not to influence hyaena movements. Ongoing baiting even if food is unavailable is likely to affect nightly movement and possibly even home range size (*Kolowski, et al. 2007).* Habituation to the research vehicle appeared to be relevant to the baiting area only as encounters with hyaenas while driving in the park at night would result in them fleeing into thick vegetation.

The baiting tree was monitored around the clock for hyaena activity by a remote infrared camera. The camera was setup approximately five metres from the baiting tree and

programmed to take a photograph every five seconds once it has been activated by movement. Additional data like temperature, moon phase, date and time and are also recorded.

The photos were downloaded onto a laptop computer every one to three days. Photos enabled the identification of individual hyaenas through natural markings and/or scars.

CCC-5 photographed with remote camera clearly showing large identifying scar on neck. Other information like moon phase, date, time and temperature are also recorded.

Based on direct observations and photographic records from the remote camera (n = 1188) six individual hyaenas were identified. After a period of three months, no new hyaenas were photographed. It was established through observing groups and associations that all six hyaenas belong to the same clan, which was termed the Kwando Clan.

Visual observation during the habituation period was done at night with a red filtered spot light to illuminate the eyes of hyaenas, which were counted to determine group size. Hyaenas are easily identified by spot light due to the green reflection of their eyes and their loping gait.

Even after semi-habituation, the hyaenas remained exceptionally wary. In order to immobilize hyaenas they first needed to be sedated with Midazolam (Dormicum, Roche) at a dose of 75 mg per animal. Mild sedation and the marked increase in tolerance of observers were exhibited within a period of 10 minutes to one hour. They were immobilized with Tiletamine and Zolazepam (Zoletil, Virbac) at a concentration of 5 mg/kg injected with a disposable 2 ml dart from a Pneudart rifle at a distance of 30 metres. Recumbency took fifteen to twenty minutes. An additional 100 to 200 mg dose was hand injected intramuscularly within 20 minutes to half an hour after initial darting. A cloth was placed over the ears and eyes of the immobilized hyaena to reduce visual and audible stimuli.

Between April and October 2009, five members of the “Kwando Clan” were captured. One individual was captured three times. Samples were collected which included whole blood, blood smears, tissue and hair. Natural markings and scars were photographed and body and tooth measurements were recorded. Teeth wear and condition was recorded for to establish age class and the general condition was assessed and the gender noted. Ear notching was used to visibly mark all five hyaenas where the position of the notch on the ear represents a number. Study animals can be counted by combining various notches. Body weight was estimated.

Three adult hyaenas (two females and a male) were collared with GSM/GPS collars which incorporate a VHF tracking facility manufactured by AWT. The collars receive setting instructions via SMS from AWT. The hyaena collars were set to take 5 locations per 24 hours drifting by one hour. At this frequency, the battery life will produce 18 months of location data per hyaena.

Field work takes place between 18.00 pm and 05.00 am with observations sessions at the baiting tree ranging between half an hours to five hours in one sitting.

Results

Clan size and structure

Spotted hyaena clans contain multiple adult females, their offspring and one to several immigrant males that join the clan as adults (Boydston, 2003).

The Kwando Clan consists of five adults of which four are female. There is one adult and one sub-adult male. Two females are lactating therefore I assume there are dependant den dwelling cubs. As hyaenas give birth to two cubs per litter, it is likely that there is a minimum of two and maximum of four cubs. The Kwando Clan could potentially be made up of 8 to 10 individuals.

Most males born within the clan disperse shortly after puberty (East, *et al* 2001). It is likely that CCC-2, a sub-adult male of approximately 15 to 18 months will emigrate and the only adult male (CCC-4) of two to three years of age is an immigrant. Based on the above, the sex ratio of adult spotted hyaenas within the Kwando clan is 1:4.

Hyaena ID	Sex	Age	Reproductive status	Marking method
CCC-1	Female	3 years (adult)	Lactating	Collar Ear notch Photos
CCC-2	Male	15 months (sub-adult)	n/a	Ear notch Photos
CCC-3	Female	2.5 – 3 years (adult)	Not presently lactating, but has suckled cubs.	Collar Ear notch Photos
CCC-4	Male	3 years (adult)	n/a	Collar Ear notch Photos
CCC-5	Female	3 years (adult)	Never lactated	Ear notch Photos Large scar
No ID	Female	adult	Lactating	Photos

Table 1: ID, sex and age structure of the Kwando clan.

Home range size

The approximate home range size for each collared hyaena as well as a collective home range for the clan are presented below. The lactating female has the smallest home range. It is likely that the entire clan range is larger than the figure presented here as home range increases with the number of collars placed on hyaenas (*Gasaway, et al. 1989*). In addition, it is likely that home range size will increase over time as the hyaenas have only been collared for a period ranging from 6 weeks to 6 months. Seasonal changes in prey abundance results in hyaenas becoming more flexible in foraging and land-use strategies (Trinkel, *et al* 2006) and clan territories increase in size during wet season as a response to migratory movement of prey (Hofer, *et al* 1995). Data is only available for the dry season which is when game congregates at high density along the flood plain.

Hyaena ID	Sex	Home range size in km^2	Time period
CCC-1	Female (lactating)	321.64	6 months
CCC-3	Female (not lactating)	351.65	6 weeks
CCC-4	Male	426.71	6 weeks
Kwando Clan		483.73	

Table 2: Home range sizes of spotted hyaenas in the Kwando Core Area

Hyaena movements

The Kwando Clan territory is bordered by the Kwando River in the east and stretches for a distance of approximately 20 km to the west. The north south distance measures approximately 25 km. Hyaenas move in groups ranging in size from 1 to 5. There is no evidence of trans frontier movement from this clan. The collared hyaenas are rarely found (n = 5) north of the trans-Caprivi highway. They venture just south of Horse Shoe on the southern side of their territory. By far the majority of their time is spent along the floodplain area where the collared male is located approximately 50% of the time and each collared female approximately 25%. Time of activity can range between 19.00 pm and 09.00 am.

Although hyaenas are partial to water they have been observed keeping a safe distance from crocodiles (Kruuk,1972), which is possibly the reason why the Kwando clan do not venture far into the presently flooded floodplain of the Kwando River. They have not crossed the Kwando River into the adjacent conservancies within the MNC. CCC-3 has been located only once in the shallow water of the floodplain.

Den sites

One active den and two inactive dens were located by displaying the location data from CCC-1's collar visually on Google Earth. Three areas of concentration were pinpointed as possible den sites and the approximate locations put onto a GPS. The dens were approached during the day time from downwind by walking 1.8 km on foot.

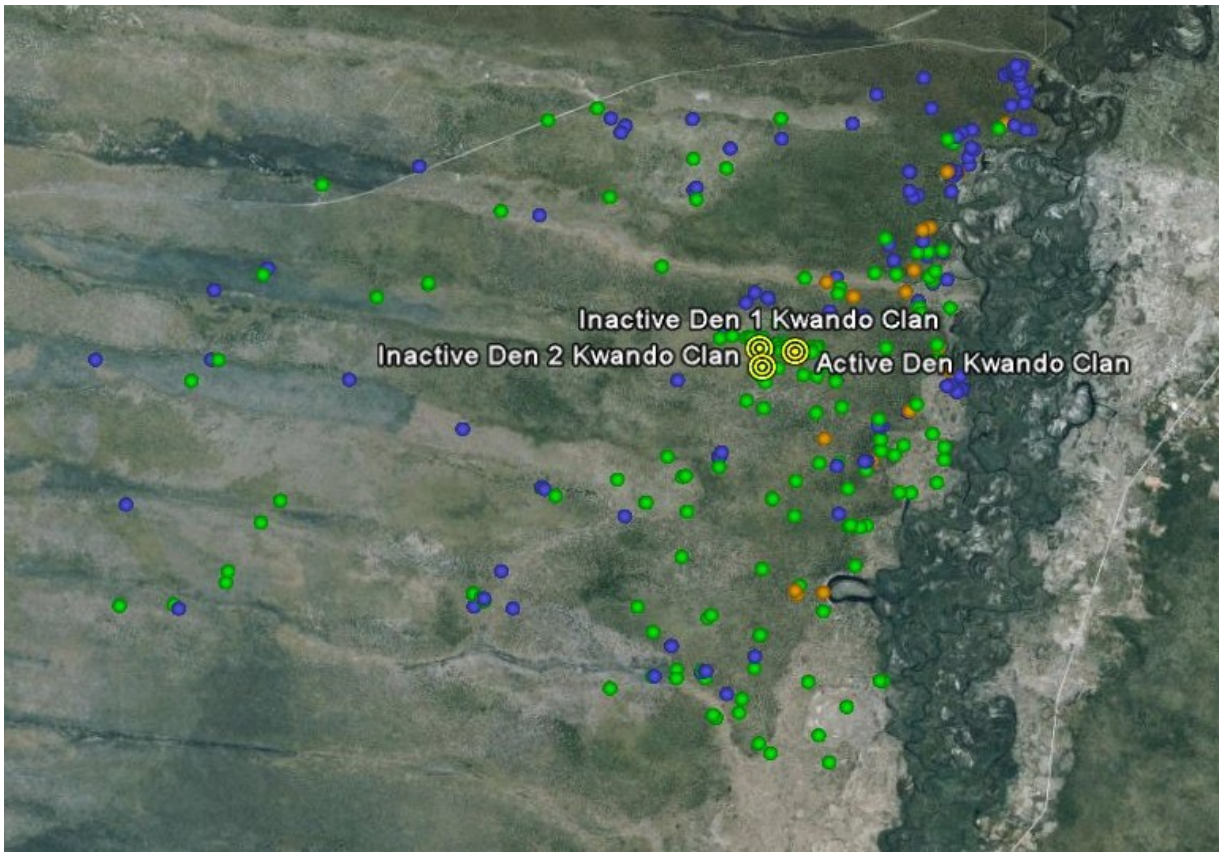
The two inactive dens were 0.45 km apart and both had three entrance holes, which had caved in. There was one latrine and some old bones scattered in the general area as well as fresh hyaena tracks throughout the area. Both dens were located among Mopane scrub with very little shade. Fresh tracks showed that adult hyaenas were recently lying in the shade provided by some tall trees approximately 20 metres away.

The active den was found at a distance of 830m and 840 m respectively from each of the inactive dens. It was high up a sand dune at an elevation of 981 metres surrounded by large Mopane trees which provided shade. One young adult hyaena was present at the den, but ran away at our approach and continued to observe us from a distance of about 100 metres. There

were two groups of holes, one of three and one of five which were set approximately 20 metres apart. The den holes had smooth sides around the entrance. There were fresh hyaena spoor and a latrine in the vicinity.

The active den is situated 3.44 km from the closest territory boundary (Kwando floodplain) and 16.6 km from the furthest. The closest permanent water (Kwando) is located at a distance of 3.83 km from the den and during the wet season, water in a seasonal pan is located at a distance of 1.18 km from the den.

Approximately 25% of GSM collar data for both CCC-1 and CCC-3 is located within the vicinity of the dens.

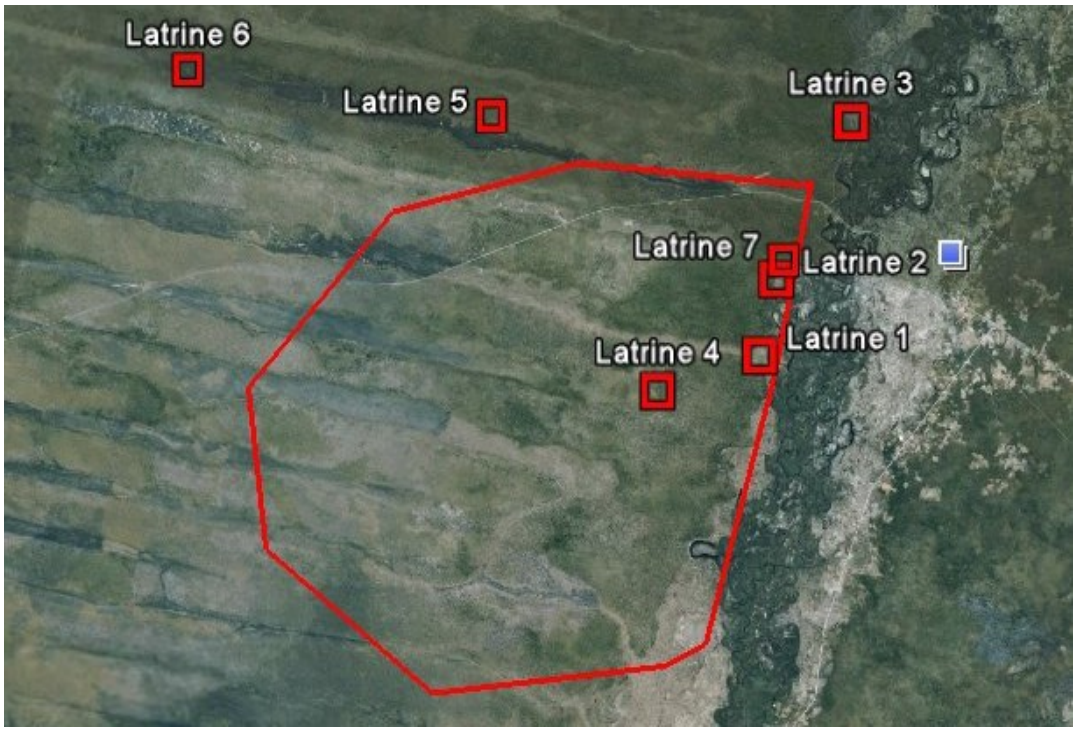


Position of active and inactive dens in relation to the Kwando Clan home range

Latrines

All latrines that were found were marked with a GPS in order to establish whether they correspond with any territory boundaries. Half of the latrines were located alongside the well used track which runs adjacent to the floodplain. This is also the eastern boundary of the Kwando Clan home range, but it is too early in the study to tell whether these latrines are a function of territory marking. Latrine 4 was located within the vicinity of the active den and

Latrines 5 and 6, located west of Malombe Pan by D. Ward and Latrine 3 fall outside the known home range of the Kwando Clan.



Position of 7 latrines in relation to clan territory boundary

Diet

Much of the Kwando core area is inaccessible to vehicles due to thick riverine vegetation and sand dunes. Vehicle movement is restricted to the dirt tracks which run alongside the floodplain stretching from the Botswana border past the Susuwe Ranger Station into Angola in the north and a limited road network running past Immelmann airstrip and the surrounds of Malombe Pan.

This makes direct observations of hyaena kills difficult even though hyaenas favour roads and tracks to transverse an area (Kruuk,1972). Caprivi spotted hyaenas are also vehicle shy and rapidly run for cover into the surrounding thick bush on seeing headlights or detecting an approaching vehicle.

There is limited human activity within BNP at night, when hyaenas are active, apart from MET ranger patrols and tourism game drive vehicles returning to lodges in the early evening. Observations of feeding hyaenas are limited to those seen scavenging on larger carcasses like elephant and hippos found close to areas of public access (F. Alpers, S. Braine, E. Kumana, D. Ward, pers. comm.). This has also led to the perception that the core areas sustain large numbers of hyaenas where between 7 and 30 hyaenas have been seen eating together (C.

Kulabone, D. Stephens) Hyaenas will readily forage outside their home ranges when large amounts of food are available elsewhere so these observation are likely to include several clans that travel over large distances(Hofer *et al.* 1995)

Spotted hyaena scat is distinctive in that it is large and smooth , totally white or occasionally grey in colour and is found in latrines. The latrines (n = 7) found within the Kwando Core Area contained up to 13 scat samples each.

Investigation into Kwando Spotted hyaena diet was based on the analysis of 35 scat samples picked up opportunistically within the Kwando Core Area as well as observations reported by the public. Parts of each scat sample was collected by hand and some left behind at the latrine. Each scat sample was broken down to a fine consistency on a dark surface. All evidence of prey remains like hair, bone fragments, pieces of horns and hooves were removed by hand and with tweezers. Food items were identified by recognition of components like bird feathers and the colour and texture of animal hair. Not all components were identifiable. Each sample was placed in a labeled container for later analysis using more accurate methods like identifying the follicle mosaic patterns.

Food items identified include the following: Impala, Kudu, Elephant, Hippo, Buffalo, Warthog, Scrub hare, Baboon, Tortoise and elephant and buffalo dung. Other items include bird feathers, insect pupa casings, insect carapaces, tooth fragments, bone fragments, seed casings, wax wrap and brown glass.

Objectives for 2010

Spotted hyaenas play a major role in HWC especially within the conservancies of the east Caprivi and occasionally within BNP. HWC is a threat to the future conservation of hyaenas due to their vulnerability to persecution. Efforts will be focused on repeating field techniques developed within the core areas within the human settlement areas. Attempts will be made to establish where problem animals originate from (either park or conservancy) as well as what drives livestock predation and address possible solutions.

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