

Prey of Peri-urban Spotted Hyena (*Crocuta crocuta*) in Southeastern Tigray, Northern Ethiopia

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Abstract: In Tigray, regional state of Ethiopia, spotted hyenas are sources of conflict with livestock-owning people. The present study was conducted in southeastern Tigray to investigate diet and economic impact of hyena predation on livestock. To obtain information about the actual diet of hyenas, hyena droppings were collected in the field. A total of 180 hyena droppings were collected, washed, hairs extracted and were then compared with a prey species hair reference collection. Economic impact of livestock predation was investigated through household survey with randomly selected households. The species, age, number and sex of livestock killed by spotted hyena were recorded. Annual loss due to livestock depredation was 2.2 per household in the village, with an estimated total commercial value of about US\$ 6,116. Hyenas attack livestock exclusively at night and solitary. Of the respondents 97.5% indicated predation exclusively solitary. Attacks were both day and night times preferring small livestock like goats and sheep as well as donkey. Over 97.5% of respondents in the village reported that they faced problems of depredation. The extent of the loss varies greatly between farmers. 97.87% of the droppings were identified of which donkey; cattle, sheep, goats, mule and horse accounted 84.66%. Predation on livestock seemed to be of great economic importance and was more a problem in the village. Spotted hyena preyed mainly on domestic animals may be due to the reduction of wild prey species in the area.

Key words: Livestock, predation, prey, spotted hyena

INTRODUCTION

Spotted hyenas (*Crocuta crocuta*) are the most abundant large carnivore in sub-Saharan Africa (Frank, 1986), feeding on a wide array of prey (Cooper *et al.*, 1999) and frequently interact with other predators and scavengers at kills (Kruuk, 1972). It is still widely regarded as a scavenger that picks up leftovers at the kills of other carnivores or feeds on carrion. However, this is not correct: all studies demonstrate that the spotted hyena is an efficient predator in its own right. Although spotted hyenas will scavenge opportunistically, they kill as much as 95% of the food they eat (Cooper *et al.*, 1999). It can be very opportunistic and has been recorded eating almost any mammal, bird, fish or reptile, irrespective of size or species (Mills, 1990; Henschel and Skinner, 1990; Sillero-Zubiri and Gottelli, 1992). It may also pick up carrion and human-associated organic material, including cooked porridge, offal, garbage, a variety of vegetable matter, and buffalo and wildebeest dung.

It is the most common large carnivore in the highlands and lowlands of Ethiopia, Eritrea, and Somalia, and has occupied both a scavenging niche and a predatory position at the top of the food chain. The total world population size is well above 10,000 individuals, several subpopulations exceed 1000 individuals and its range well exceeds 20,000 km² (IUCN, 2000).

The spotted hyenas detect live prey by sight, hearing, and smell. It detects carrion by smell, the noise of other predators feeding on the carcass, or during daytime, by watching vultures descending on a carcass. Its hearing is acute enough to pick up noises emanating from predators killing prey or feeding on carcasses over distances of up to 10 km (Mills, 1990).

Hyenas can be observed in many parts of Ethiopia but prey population appears generally lower. This pattern was also observed in Tigray, a region in the north of Ethiopia. One of the most serious human-carnivore conflicts in Tigray is that of livestock losses. The spotted hyena has a reputation for killing and scavenging domestic stock, mostly cattle, sheep and goats, but also poultry, cats, dogs, horses, donkeys and camels. These predatory activities have actually been observed. Yet little is known about the diet and economic impact of livestock depredation in the region. The present study was initiated and concentrated to study the diet and economic impact of predation on livestock and assess the protection measures taken by the resident communities.

MATERIALS AND METHODS

Study area: The study was conducted in Randa sub district located 15 km from the regional capital of Mekele (200,200 inhabitants), within the Endrta district. It is

Situated at about 2,281 m.a.s.l with a total of 256 households and 1,616 livestock. The rainfall of the area is bimodal with a short rainy season occurring between January and April, and a long rainy season from June to August. The average annual rainfall of the area is 530 mm. with maximum and minimum temperatures of 26.52 and 11.92°C, respectively. Human population is about 1,392, 38 female and 221 male households engaged in subsistent farming (Bureau of agricultural and natural resources development, 2009). The area is dominated by Eucalyptus (*Eucalyptus camaldulensis*) and cactus (*Opuntia ficus indica*). Mixed crop and livestock farming system is the mode of agriculture in the district. This village was chosen due to the known presence of spotted hyena with relatively high levels of reported livestock losses to predation.

The study was conducted in 2009 in Randa sub district, southeastern Tigray, northern Ethiopia. Hyena diet was analyzed by scat analysis, following Ramakrishnan *et al.* (1999). A total of 180 hyena droppings were collected. After collection of the faeces the samples were washed and hairs were extracted. These hairs were then washed in acetone and then dehydrated in 98% ethanol and dried on filter paper. Hair was analyzed on form, length and color with the naked eye as well as on a scale patterns using a stereomicroscope at 10X magnification. The hairs were then compared with a prey species hair reference collection. This reference hair collection was hairs from the species of livestock that live in and around the study area and the potential wild animals. By comparing the hairs from the faeces with the hairs in the references collection we investigated the prey eaten by the spotted hayena and obtained an overview of the diet of that particular carnivore species.

To assess the economic cost of hyena predation on livestock, a household survey was conducted among 40 households. This survey asked people to recollect livestock losses. The species, age, number and sex of livestock killed by spotted hyena were recorded. Farmers' perception of the spotted hyena, preventive measures, frequently targeted animals; threats etc. were collected through the survey. To estimate the current average market values of different classes of livestock species, livestock traders were interviewed. Local economic values of livestock were ascertained from households. Values were translated in to US\$ at the exchange rate of the time of the study.

RESULTS

Hyenas of the study area heavily rely on domestic animals for their food sources (Table 1). The diet of hyenas contain only prey item of domestic origin. No prey item of wildlife was found in the faeces. Frequencies of prey remains of cattle, mule, man, sheep, donkey and

Table 1: Diet of the spotted hyena in the village of Randa in 2009 based on analysis of 180 scats expressed as the number of prey items observed and their relative frequency of occurrence

Prey species	Count	Relative frequency
Cattle	60	34.09
Mule	23	13.07
Man	20	11.36
Sheep	18	10.23
Donkey	16	9.09
Horse	16	9.09
Goat	16	9.09
Dog	6	3.41
Cat	1	0.57
Poultry	0	0
Unidentified	4	2.22
Identified	176	97.78
Total	180	100

horse were highest in decreasing order (Table 1). About 11% of the scat contains human hair. We can not differentiate hairs from kills from hairs from scavenging. It is likely that most of the human hairs were from scavenging at cemeteries and garbage dumps.

Hyenas attack livestock exclusively at night and solitary. However, groups of two have and daytime attacks also been observed. Of the respondents 97.5% indicated predation exclusively solitary. Attacks both day and night times preferred small livestock like goats and sheep as well as donkey. Over 97.5% of respondents in the village reported that they faced problems from hyena predation on livestock. The extent of the loss varies greatly between farmers. A poor farmer having 1 donkey and 1 hen that lost 1 donkey to spotted hyena has suffered a dramatic loss (100%) of his donkey and 50% of his livestock.

Respondents were asked the place and time of livestock predation; majority (80%) indicated that the animals have been taken from their homes. In contrast 20% of the respondent's indicted that the livestock has been killed in field. Thirteen human attacks were reported during the survey. Exclusively attacks were at night. Most (85%) attacks were reported to have occurred inside traditional kraals. Kraals and livestock guarding dogs are predominantly the protective measures to protect predation. However, habitat destruction, burning, killing and poisoning were used to mitigate depredation. According to the informants, the spotted hyenas preferred goats, sheep and donkey. There is a significant economic damage due to hyena depredation of livestock in the study area (Table 2).

Predation on livestock seemed to be of great economic importance and was more a problem in the village. Surveyed households contained a total of 698 domestic animals and reported losses of 87 due to hyena depredation causing an estimated financial loss of about US\$ 6,116 (Table 2). Annual loss due to livestock depredation was 2.2 per household in the village.

Table 2: Stock, depredation and economic impact of spotted hyenas in 2009 in Randa (n = 40)

Species	Stock	Depredation	Estimated economic lost in US\$
Cows	52	4	606.2
Oxen	72	10	2227.3
Bull	33	0	0
Calves	15	3	95.5
Donkeys	42	20	1640.6
Sheep	4	0	0
Goats	164	33	1486.3
Mules	2	0	0
Horses	2	0	0
Camels	6	0	0
Hens	245	6	21.8
Dogs	30	11	39.1
Cats	31	0	0
Total	698	87	6116.8

DISCUSSION

Hyenas seem to consume exclusively domestic prey species in the study area indicating the virtual absence of wild prey species. Spotted hyena preyed mainly on domestic animals as was expected considering the whole extirpation of medium-sized natural prey in the area. In Tigray, wild prey species have been greatly reduced in the past decades mainly due to intensive agriculture, habitat loss, human settlements and other factors associated with human population growth. Human-wildlife conflicts arise mainly because of the loss, degradation and fragmentation of habitats through anthropogenic activities. As habitat gets fragmented, the length of 'edge' for the interface between humans and wildlife increases, while the animal populations become compressed in insular refuges. Consequently, it leads to greater contact and conflict with humans as wild animals seek to fulfill their nutritional, ecological and behavioral needs (Sukumar, 1990).

Respondents reported losses of 87 domestic animals due to hyena depredation representing 12.5% of their stock (Table 2). Annual loss due to livestock depredation was 2.2 per household in the village. In the current study hyenas have been observed to feed on carrion as well to prey on livestock. The spotted hyena is still widely regarded as a scavenger that picks up leftovers or feeds on carrion. Studies demonstrate that spotted hyenas are efficient predators in their own right. Although spotted hyenas will scavenge opportunistically, they kill as much as 95% of the food they eat (Cooper *et al.*, 1999).

The question of paying compensation for livestock losses as a way of encouraging livestock owners or local communities to tolerate the presence of predators needs to be carefully considered. This will make local communities more likely to cooperate with nature and biodiversity conservation. Many methods have been tried throughout the world to reduce conflicts over predation on livestock without eradicating carnivores (Cluff and Murray, 1995; Dolbeer *et al.*, 1996; Kaczensky, 1996;

Linnell *et al.*, 1996; Bangs and Shivik, 2001; Rigg, 2001; Sillero-Zubiri and Laurenson, 2001; Fritts *et al.*, 2003). One of the most rational and effective approach" (Boitani, 2003) is involving use of payment of compensation for damages.

Frequencies of prey remains of cattle, mule, man, sheep, donkey and horse were highest in decreasing order (Table 1). About 11% of the scat contains human hair. But it is difficult to exactly determine through dietary analysis how much of the observed items are from scavenging or predation. It is likely that most of the human hairs were from scavenging at cemeteries and garbage dumps. While hyenas, in general, do not hunt humans, some attacks have occurred and have even caused human death. Spotted hyenas are widely feared in the study area where they have been known to occasionally attack people at night, particularly during the hot season when people sleep outside. In the study area five deaths and 11 attacks were recorded. Attacks occurred most commonly when people defecate outside or when they slept outdoors.

Protection measures put in place to reduce livestock depredation include kraals, livestock guarding dogs, herder and burning of hyenas' habitat as indicated by the respondents. Killing and poisoning were also used to mitigate depredation. This implies that there is little awareness on carnivore conservation. The spotted hyena has, and still is, being widely shot, poisoned, trapped, and killed. The main sources of conflict in the area are livestock predation and direct attacks on humans. These conflicts are likely to cause a reduction in the populations of the spotted hyena. Livestock predation of spotted hyena is serious in the village. Non-lethal preventive measures are likely to enhance population of the spotted hyena and should be implemented and practiced to alleviate livestock predation. Killing, firing and poisoning are proposed and practiced preventive measures. These measures are likely to cause a significance reduction of the viable population of the spotted hyena in the area. Kraals are a widely used method of protecting livestock from hyena predation. This is an enclosure that is used to keep livestock safe. The height and coverage of these kraals differ from farmer to farmer. Wood or stonewalls are the construction methods of kraals in the village. However, for safety purposes they recommended to be high in length so that the hyena could not jump over it and should be strong enough. The kraal is sited near a home for assisting during attacks. Such protection measures are most effective if its sides are thick enough or constructed in such a way that the spotted hyena cannot see through the walls of the kraal.

Depredation of domestic animals by hyenas reflects some type of imbalance in the local ecosystem. The environment in which hyenas live consists of areas with insufficient food resources and great human influence.

The depletion of natural prey animals can provoke the onset of attacks on domestic animals. We believe our results are adequate for the purposes of proving our hypothesis 'hyenas consume exclusively domestic prey species in the study area indicating the virtual absence of wild prey species'.

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