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Coexistence of human and hyena and associated impacts in Haramaya district of Eastern Ethiopia

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Coexistence of human and hyena, associated impacts, and feeding habit was studied in Haramaya district of Eastern Ethiopia from October, 2011 to December, 2013. A total of 110 households from four sub-districts (Tinike, Finkile, Kerensa and Bocheke) were selected randomly for interview. The questionnaire was designed to assess various parameters including eliciting information on the knowledge of local people about spotted hyena in the area, identify the habitat that were disturbed by human activities, number of domestic animals owned and its management and number of livestock lost, incidences of human attack and death, and susceptible domestic animal species to predation by hyenas for the past 10 years. The household's survey result showed that 1578 domestic animals were lost due to predation for the past 10 years. The economic cost of livestock lost due to predation from hyena was about US$ 7527.8 per year. Scat analysis used to study diet of spotted hyena showed that the prey from domestic origin were dominating except for dikdik (*Madoqua saltiana*), klipspringer (*Oreotragus oreotragus*) and porcupine (*Hystrix cristata*), which were observed from Kerensa sub-district. Sheep was considerably more preferable prey among domestic animals and constituted 37.4%, followed by 35.4% goats and 10.47% dogs. Improvements of livestock management system and west disposal practices can substantially reduce human-hyena conflicts and loss of livestock.

Key words: Human-Hyena conflicts, Haramaya district, predation, spotted hyena.

INTRODUCTION

Globally, many large carnivores are found at low abundances, with large territories of conflict with humans (Croes et al., 2011; Yirga et al., 2012). In Africa, the acceptance level of local people towards large carnivores is very low and they believe that retaliatory killing after livestock attack is acceptable. Therefore, large carnivores avoid themselves from populated villages and urban areas (Croes et al., 2011). Conflicts between human and wildlife populations are emerging as a major conservation issue worldwide. Crop raiders including elephants, many primates, several bird species, and rodents can diminish or destroy the farmers' food and cash crops. The loss that conflict can cause has gain a considerable attention for the past ten years, particularly, conflict between carnivores and people (Sillero-Zubiri and Laurenson, 2001; Macdonald and Sillero-Zubiri, 2002). In Africa, very

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few researches were conducted to demonstrate conflict between human and hyenas as well as associated impact. This is particularly true in case of Eastern Ethiopia where human and hyena coexist in a higher density.

Spotted hyaenas (*Crocuta crocuta*) are the most common among all large carnivores, found all over sub-Saharan Africa, including tropical forests, alpine areas and true deserts (Yalden et al., 1996; Mills and Harvey, 2001; Gade, 2006). The species is commonly seen as hunter of domestic animals. Moreover, spotted hyena is also known to attack and kill humans, particularly at the time of disease outbreaks (Kingdon, 1977; Hofer, 2002; Gade, 2006). In Africa, the total population of *C. crocuta* is estimated to be about 27,000 and 47,000 (Mills and Hofer, 1998). Most of the population are found in Tanzania of the Serengeti ecosystem (Kruuk, 1966; Schaller, 1972; Ray et al., 2005) and South Africa of the Kruger National Park (Ray et al., 2005). The abundance, distribution and population structure of spotted hyena in South African region are stable, whereas in other region of Africa (East, Central and West Africa) many populations are considered to be declining (Hofer and Mills, 1998; Ray et al., 2005). The main reasons for decline of spotted hyena distribution and populations in the area is because of the habitat degradation, poison, low number of natural pray, and persecution and disease. These factors make spotted hyenas dependent on the continued existence of conservation areas (Mills and Hofer, 1998).

In Ethiopia, the great dependence of a large proportion of the human population for their survival on the agriculture, coupled with the presence of large numbers of livestock led to sources of conflict between people and wildlife. Human population growth coupled with expansion of agriculture resulted in habitat degradation through the loss of vegetation cover of the country. Therefore, the natural forest areas of the region are overexploited. In eastern part of Ethiopia, humans have coexisted with high abundance spotted hyenas. This species is one of the few large carnivores found in the area that survive in the habitats with dense human populations. The natural habitat available in the area for natural prey base for carnivores is degraded and fragmented. Therefore, existence of spotted hyena as other large carnivores mostly relies on the predation of livestock and domestic waste disposal. In El Kere and Bare of South Eastern Ethiopia, 50 people were attacked by hyena in the year 1998/1999, of which majority of them (35 0ut of 55) were children. In the same year at Fedis which is located at 30 km from Harer city, hyena killed 3 people and injured 3 others (Sapa-AFP, 1999). After a year, in 2000 in the northern part of Somalia Region, 4 people died because of hyena. In 2005/2006, hyenas killed 11 people and more than 40 were wounded in the same region (IRIN, 2000; Somalil and Times, 2006).

However, studies dealing with human hyena conflict and addressing problems associated with the conflict in the region were unknown. The impact of human-hyena conflict in relation to livestock loss, its economic impact for the livelihood of the local peoples, problem associated with the death of peoples and feeding habit and preference of spotted hyena are poorly known, not yet quantified and documented. Domestic animal owners are challenged by losses of their animals from spotted hyena. Therefore, assessing human hyena conflict and quantifying associated impacts are fundamental to implement appropriate conflict mitigation techniques so as to minimize domestic animal loss and to safe guard the conservation of the species. In this paper the actual proportion of domestic animal predation by spotted hyena, was determined; the economic losses of livestock depredation associated with human hyena conflict over the past ten years were quantified; asses human attack; identify vulnerable animal species to spotted hyena predation and quantify the feeding habit of spotted hyena in Haramaya distract, Eastern Ethiopia.

MATERIALS AND METHODS

Location of the study area

This study was conduct in Haramaya district (Tinike, Finkile, Kerensa and Bocheke sub-district), which is located in Eastern Hararge Zone of Oromia, Eastern Ethiopia. The district covers 52,163 hectares. The altitude of the area ranged between 1600 and 2100 m above sea level (asl). The climate of the district is tropical, with two rainfall peaks; first from June to September, which is the long rainy season and a short rainy season from February to May. The annual rainfall is between 118 and 866 mm. The dry seasons of the area are December to January and June to August; the latter being more severe and longer. The temperature ranges from 9 to 24°C (DMoA, 1999). According to the 2006 population census (CSA, 2007), the total human population of the district was 166,597 of which 18,582 are urban living and 148,015 are rural population. 71,205 cattle, 15,294 sheep, 28,990 goats, 11,755 donkey and 250 camels are found in the district (Figure 1).

Preliminary study

A preliminary survey was conducted in August, 2011. During this survey, all the available and relevant data on the area (climate, topography and the habitats modified by the impact of human interference) were gathered. Different vegetation types, representative habitat sites and the place where the local people live and keep their livestock were observed.

Data collection

The method of data collection mainly includes household questionnaire, focus group discussions, field observations and participatory rural appraisal (PRA). This data collection dealt with 110 respondents selected randomly in four sub-districts (Tinike, n = 35; Finkile, n = 23, Bocheke, n= 28 and Kerensa, n = 24). Respondents were asked questions related to history of human hyena conflict, coexistence of spotted hyena and human and associated problems, particularly the loss of domestic animals and

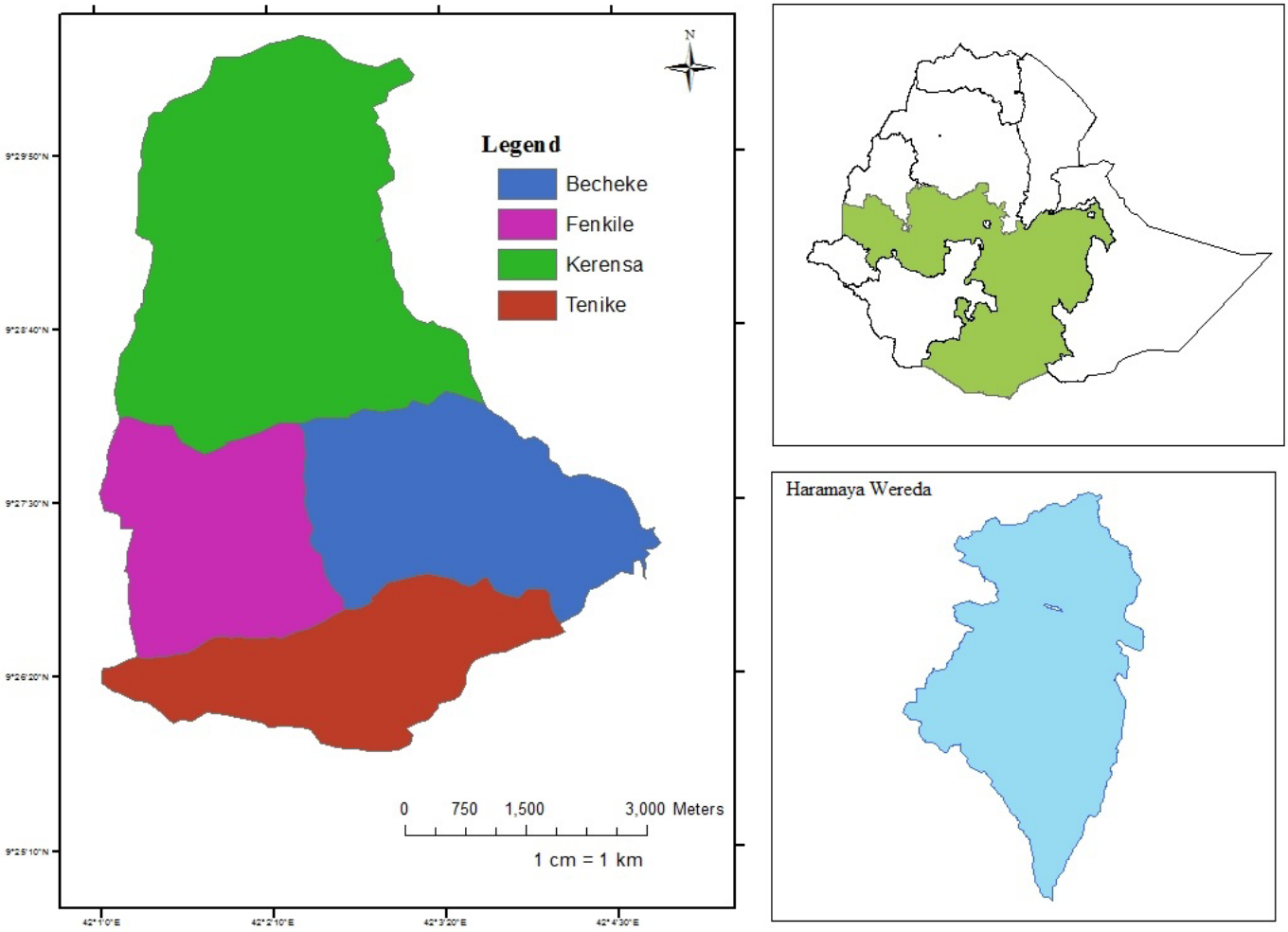

Figure 1. Map of the study area.

the number of people that died because of hyena and its economic impact from 2003 to 2012. The economic impact as a result of domestic animal loss due to predation of spotted hyena was estimated based on the record of species, age, number and sex of domestic animals losses for the past ten years. The current average market prices of the species of different categories of domestic animals by age and sex were obtained from buyers and sellers and averaged, then converted to US$ at the average exchange rate of the time of the study. The secondary data were collected from district Agricultural Office and Animal Veterinary Center.

Feeding habit and preferences

Feeding habit of spotted hyena was characterized using Scat Analysis. 85 spotted hyena drops were obtained from four sub-districts: Tinike, n = 22; Finkile, n = 19; Bocheke, n= 16; and Kerensa, n = 28. Samples were preserved in 5 to 10% formalin solution in individual plastic bottle and brought to the Animal Physiology Laboratory of Haramaya University for examination. Samples were washed by distilled water for proper identification, and then hairs were extracted from washed sample and observed under a microscope, the comparison was done using hair in our reference collection to analyze prey species composition. Reference collection was prepared from hair of all domestic animals, human and selected wild species found in the study area. Style, form, length and color of the hair were used to identify the hair of the prey using a microscope.

RESULTS

Production system

Dominant mode of production in the district was small mixing farming of livestock and crop production. Sorghum (*Sorghum bicolor*) and maize (*Zea mays*) are the most commonly cultivated cereal crops in the district. Agricultural production business is supported by cultivation of vegetables through both rain fed and irrigation. Chat (*Catha edulis*), is the most commonly grown as source of cash crop. In some extent, they also planted coffee as a cash crop. Animal production is also importance source of income in the district; however, livestock production mainly cattle production is dominated

Table 1. Number of domestic animals lost and estimates of economic cost by spotted hyena in Tinike, Finkile, Bocheke and Kerensa sub-districts (n = 110), Eastern Ethiopia.

Species	Depredation	Percentage	USD
Cattle	98	6.25	25257.73
Sheep	590	37.4	24329.90
Donkey	33	2.08	1020.62
Goat	559	35.4	23051.55
Chicken	133	8.4	342.78
Dog	165	10.47	1275.77
Cat	0	0	0
Camel	0	0	0
Mule	0	0	0
Horse	0	0	0
Total	1578	100%	75278.35

by traditional, and communal grazing with coarse pasture and crop-residue.

Livestock feeding management

Cattle, sheep, donkey and goats are the common livestock in the district. The grazing system is dominated by grazed on natural pastureland in the care of herdsmen, who are usually children except fattening animals. All groups of domestic animals usually graze together on communal grazing land except the fattening animals. Overgrazing or over stocking is commonly seen in the district due to shortage of communal grazing area available for livestock resulting from increasing human population and intensive cropping. Animals grazed in the grazing land up to 9 h, grazing time rarely exceeds this hours. Animals remain around the backyard until 9 am and are moved to the grazing fields. The grazing animals stay in communal grazing area until 6:00 pm local time. The animals move a distance 0.5 to 2 .0 km from the farmers' residence to the grazing area. In dry season, there is shortage of feed for animals, the leaves of indigenous fodder trees serve as a feed for livestock.

Livestock housing

During day time, all animals stay outside and then during the night they are kept in housing. In relation to the housing type, the house is divided in to three parts, one is for keeping the animals, one part for the farmer and his family, and the last one for a kitchen.

Wildlife in the district

The respondents listed 4 wild mammals that occur in the study area. Spotted hyena (*C. crocuta*), kdik (*Madoqua saltiana*), klipspringer (*Oreotragus oreotragus*) and porcupine (*Hystrix cristata*) were known to all respondents.

Domestic animal loss

Farmers reared different type of livestock. Respondents claimed that spotted hyena came to the village and attacked their domestic animals. Spotted hyena killed 1578 domestic animals for the past ten years in the district, of which 3337.4% (n=590)] were sheep and 34.4% (n=559) were goat (Table 1). The annual monetary loss was US$ 75278.35 (Table 1). The loss of domestic animals per house-hold per annum was 14.34 domestic animals with the economic loss of US$ 68.43, which is about 0.57% of the average annual income of individual households of the district. The economic loss of cattle and sheep, because of hyena accounted for a loss of US$ 25257.73 (33.55%) and 24329.90 (32.3%), respectively (Table 1).

Domestic animals species vulnerable to predation of spotted hyena

Among domestic animals, sheep were more significantly taken by hyena predation, accounting for about 37.4%, followed by goats (35.4%) and dog (10. 47%) (Table 2). Among domestic animals existing in the district, two species have been reported as the most susceptible species to predation of spotted hyena (Table 2).

Human attacks

Twenty four human attacks (eighteen males and six female) were recorded during the survey. In 2010 to 2012, twelve peoples were killed because of hyena, of

Table 2. Domestic animal species ranking based on their vulnerability to predation of spotted hyena in Haramaya district (Tinike, Finkile, Bocheke and Kerensa sub-districts, n = 110), Eastern Ethiopia.

Species	Respondents	Rank	Percentage (frequency)
Sheep	85	1	37.4
Goat	68	2	35.4
Dog	32	3	10.47
Chicken	24	4	6.25
Cattle	11	5	2.08
Donkey	7	-	-
Cat	0	-	-
Camel	0	-	-
Mule	0	-	-
Horse	0	-	-

Table 3. Feeding habit and analysis of spotted hyena in four sub-districts (Tinike, Finkile, Kerensa and Bocheke) of the Haramaya district.

Prey species	Count	Relative frequency (%)
Poultry	32	29.1
Goat	5	4.55
Donkey	4	3.64
Sheep	2	1.82
Cat	11	10.00
Dik dik	21	19.10
Dog	19	17.27
Cattle	4	3.64
Porcupine	1	0.91
Unidentified	11	10.00
Total	110	100

which 58.3% (n=7) were children below the age of twelve. 50% of human attack was made when they go to toilet during evening, whereas the rest of them occurred when people sleep outdoors at night and move from one village to the other during night. The others attacked by hyena, when they gave support for others during a hyena attack, or when hyenas enter into homestead to attack livestock or human. The result showed that most of (98%) of the attack were occurred at night.

Diet analysis

The feeding analysis of spotted hyenas result showed that prey of domestic origin dominated the feeding type. Dikdik (*M. saltiana*), klipspringer (*O. oreotragus*) and porcupine (*H. cristata*) were observed from scat of Kerensa sub-district (Table 3). A significant difference was observed in the frequency occurrence of hair among species ($P < 0.05$), but there is no significant difference between sub-districts. Goat, sheep, cattle, chicken and donkey were the commonly observed species of domestic animals in the feed analyzed.

DISCUSSION

Agriculture was the main activity of the people around in the district. Farmers reared different types of livestock such as cattle, sheep, goat and pack animals. Respondents claimed that spotted hyena came to the village and attacked their domestic animals. The result of the study showed the losses of 1587 domestic animals because of existence of hyena over the past ten years (Table 1). Human coexist with many large carnivores in several parts of Africa (O'Connell-Rodwell et al. 2000). However, one of the main reasons for many carnivores changing their diets is impoverishment of prey populations, due to their hunting competence (Woodroffe et al., 2005; Kolowski and Holekamp, 2006). For instance Polisar et al. (2003) in Venezuela of Hato Pinero cattle ranch, the very high number of livestock loss have been recorded in this area, but the area is known by its low abundance and diversity (Polisar et al., 2003). The

respondent pointed out that hyena found around in the district often preyed on livestock, causing economic loss to farmers. Compared to studies conducted in other area, the economic loss caused by predation of hyena in the study area is significantly low (Holmern et al., 2007; Kissui, 2008; Yirga and Bauer, 2010). In this study, the economic loss was 0.57%, whereas Holmern et al. (2007) and Kissui (2008) found 19% of yearly monetary loss households in other area (Holmern et al., 2007; Kissui, 2008). However, this variation might be because of the variation in relation with the country's living standard.

In Haramaya district, the natural vegetation was degraded, because of land for human settlement, farming and grazing, cutting of forest for charcoal or fire wood production and other development projects. This has resulted in the deterioration of wildlife habitat and vegetation cover in the area and depletion of the natural prey species. Therefore, diet of hyena was predominantly dependent on domestic origin, because the habitat where hyenas live support inadequate food resources, however for survival, hyenas require 3.8 to 4.0 kg of food per day (Henschel and Tilson, 1988). Therefore, in the area where the abundance of wild prey is very low, domestic animals serves as prey buffer (Litvaitis, 2000; De Iongh et al., 2004; Abay et al., 2011) and starts to attack peoples and their domestic animals. This result proved that spotted hyenas and human can exist together in the area, because hyena is dependent on anthropogenic food in his diet. The population of hyena is very high; therefore, domestic waste and predation of domestic animals are sources of food and can substantially support the existence of a viable spotted hyena population in the district.

The present killing of domestic animals is the major cause of conflict between human wildlife conflicts in the district. Frank (1998) and Ogada et al. (2003) also confirmed livestock loss by wildlife as a cause for human wildlife conflict (Frank, 1998; Ogada et al., 2003). Wildlife is accountable for the loss of 3% of livestock per year (Jackson and Nowell, 1996). This study revealed that loss of domestic animals because of coexistence of human and spotted hyena is a great economic concern for the poor farmers whose economy is dependent on agriculture in Eastern Ethiopia. Studies analyzing human wildlife conflict in many part of the world showed that the rate of tolerance among local communities toward predators mostly depends on the degree of predation on their domestic animals (Kolowski and Holekamp, 2006; Holmern et al., 2007).

Between 2011 and 2012, 24 people were attacked by spotted hyena. The study showed that 50% of the incidence happened during the dark when they go to toilet, while the rest was induced when people sleep outdoors at night or travel from one village to the other or from one house to the other house predominantly during night or dark time. This is because of the fact that the species are nighttime predators, probably due to their better night vision relative to their prey which is domestic animals (Bertram, 1979). The results are also supported by other studies elsewhere. For instance, a boy was attacked by a spotted hyena when he was sleeping in Northern Kenya (Flying Doctors Society of Africa, 2002). Kruuk (1972) reported the attack of sleeping peoples by spotted hyena in Malawai. In our investigation, majority (75%) of the people that faced a problem with spotted hyena were males. This is due to the fact that males are involved to support human or domestic animals when hyena bites them rather than women or children to protect victims. However this finding obtained during the present study is inconsistent with other records from Tanzania. Kruuk (1972) recorded that spotted hyena attacked 60 people in Tanzania, among which majority of them were women and children. However, the number of humans that died or got injured by spotted hyena occurred rarely and did not occur regularly. Even though the number of people affected or died by hyena was low, its impact with regard to the local people perception was large.

Conflict of Interests

The authors have not declared any conflict of interests.

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REFERENCES

Abay GY, Bauer H, Gebrihiwot K, Deckers J (2011). Peri-urban spotted hyena (*Crocuta crocuta*) in northern Ethiopia: diet, economic impact, and abundance. Eur. J. Wildl. Res. 57:759-765.

Bertram BC (1979). Serengeti predators and their social systems. Pages 221-285, In: Sinclair, A.R.E. and Norton-Griffiths M (Editors) Serengeti: Dynamics of An Ecosystem. University of Chicago Press, Chicago.

Croes BM, Funston PJ, Rasmussen G, Buij R, Saleh A, Tumenta PN, De Iongh HH (2011). The impact of trophy hunting on lions (*Panthera leo*) and other large carnivores in the Bénoué Complex, northern Cameroon. Biol. Conserv. 144:3064-3072.

De Iongh HH, Bauer H, Hamling P (2004). Nine years on research on lions (*Panthera leo*) in the Waza National Park (Cameroon); a review. Game Wildl. Sci. 21:433-444.

Flying Doctors Society of Africa (2002). Flying Doctors Society of Africa: a life saving air ambulance service, Flying Doctors Society of Africa, place https://www.flyingdoctorsafrica.org/

Frank LG (1998). Living with lions: carnivore conservation and livestock in Laikipia District, Kenya. Unpublished Report. Development Alternatives, Inc. Nairobi.

Gade DM (2006). Hyenas and Humans in the Horn of Africa. Geogr. Rev. 96(4):609-632.

Henschel JR, Tilson RL (1988). How much does a spotted hyaena eat? Perspective from the Namib Desert. African J. Ecol. 26:247-255.

Hofer H (2002). Spotted Hyaena (On-line). IUCN Species Survival

Commission Hyaenidae Specialist Group. http://www.hyaena.ge/spotted.htm.
Hofer H, Mills MGL (1998). Population size, threats and conservation status of hyaenas. In: Mills, M.G.L., Hofer, H. (compilers) (Eds.), Hyaenas: Status Survey and Conservation Action Plan. IUCN/SSC
Hyaena Specialist Group, Gland, Switzerland, pp. 64-79.
Holmern T, Nyahongo JW, Røskaft E (2007). Livestock loss caused by predators outside the Serengeti National Park, Tanzania. Biol. Conserv. 135:518-542.
IRIN (Integrated Regional Information Networks). (2000). Somalia: Four People Reported Killed by Man-Eating Hyenas in Puntland. IRIN News, 8 June.
Jackson P, Nowell K (1996). Problems and possible solutions in management of felid predators. J. Wildlife Res. 1:304-314.
Kingdon J (1977). East African Mammals: An Atlas of Evolution in Africa. Academic Press, New York. 146 pages.
Kissui BM (2008). Livestock predation by lions, leopard ds, spotted hyenas, and their vulnerability to retaliatory killing in the Maasai steppe, Tanzania. Anim. Conserv. 11:422-432.
Kolowski JM, Holekamp KE (2006). Spatial, temporal, and physical characteristics of livestock depredations by large carnivores along a Kenyan reserve border. Biol. Conserv. 128:529-541.
Kruuk H (1972). The Spotted Hyena: A study of predation and social Behavior. University of Chicago Press, Chicago, 352 pages.
Kruuk H (1966). Clan-system and feeding habits of spotted hyenas (*Crocuta crocuta*). Nature 209:1257-1258.
Litvaitis JA (2000). Investigating food habits of terrestrial vertebrates. In: Boitani, L., Fuller, T.K. (Eds.), Research Techniques in Animal Ecology. Controversies and Consequences. Columbia University Press, New York, pp. 165-190.
Macdonald DW, Sillero-Zubiri C (2002). Large carnivores and conflict: lion conservation in context. Pages 1-8, In: Loveridge AJ, Lynam T, Macdonald DW (Editors). Lion Conservation Research Workshop 2: Modelling Conflict Wildlife Conservation Research Unit, Oxford.
Mills GGL, Harvey M (2001). African Predators. Cape Town, Struik.
Mills MGL, Hofer H (1998). Hyaenas. Status Survey and Conservation Action Plan. IUCN/SSC Hyaena Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK (compilers).
O'Connell-Rodwell CE, Rodwell T, Rice M, Hart LA (2000). Living with the modern conservation paradigm: can agricultural communities co-exist with elephants? A five year case study in East Caprivi, Namibia. Biol. Conserv. 93:381-391.
Ogada MO, Woodroffe R, Oguge NO, Frank LG (2003). Limiting depredation by African carnivores: the role of livestock husbandry. Conserv. Biol. 17:1521-1530.
Polisar J, Maxit I, Scognamillo D, Farrell L, Sunquist ME, Eisenberg JF (2003). Jaguars, pumas, their prey base, and cattle ranching: ecological interpretations of a management problem. Biol. Conserv. 109:297–310.
Ray JC, Redford KH, Steneck RS, Berger J (Eds.) (2005). Large Carnivores and the Conservation of Biodiversity. Island Press, Washington, DC.
Sapa-AFP [Sapa-Agence France-Presse] (1999). Three Ethiopians Eaten by Hyenas. Top Secret Animal Attack Files, 29 October.
Schaller GB (1972). The Serengeti Lion. University of Chicago Press, Chicago.
Sillero-Zubiri C, Laurenson MK (2001). Interactions between carnivores and local communities: conflict or co-existence? Pages 282-312, In: Gittleman JL, Funk S, Macdonald DW, Wayne RK (Editors). Carnivore Conservation. Cambridge University Press, Cambridge.
Woodroffe R, Thirgood S, Rabinowitz A (Eds.), 2005. People and Wildlife: Conflict or Coexistence? Cambridge University Press, New York.
Yalden DW, Largen MJ, Koch D, Hillman JC (1996). Catalogue of the mammals of Ethiopia and Eritrea. Trop. Zool. 9:73-164.
Yirga G, Bauer H (2010). Livestock Depredation of the Spotted Hyena (*Crocuta crocuta*) in Southern Tigray, Northern Ethiopia. Intl. J. Ecol. Environ. Sci. 36:67-73.
Yirga G, De Iongh HH, Leirs H, Gebrehiwot K, Deckers J, Bauer H (2012). Adapt-ability of large carnivores to changing anthropogenic food sources: diet change of spotted hyena (*Crocuta crocuta*) during Christian fasting period in northern Ethiopia. J. Anim. Ecol. 81:1052-1055.