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Conservation challenge: Human-carnivore conflict in Chebera Churchura National Park, Ethiopia

By

Demeke Datiko
Afework Bekele

Research Article

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Demeke Datiko* and Afework Bekele

Department of Biology, Addis Ababa University, PO Box 1176, Addis Ababa, Ethiopia.
Emails: datikodeme@yahoo.com, afeworkbekele@hotmail.com

*Corresponding Author's E-mail: datikodeme@yahoo.com

ABSTRACT

An investigation on human-carnivore conflict was carried out between 2011 and 2012 around Chebera Churchura National Park. Totally 312 household samples were identified for interviews. Structured interviews were carried out in seven purposefully selected villages. Eight problematic species such as lion, leopard, jackal, wild dog, hyena, caracal, serval and anubis baboon were identified and considered as the most hazardous animals in the area. Domestic animal loss was the major problems encountered resulting in conflict between human and carnivore. Farmers reported significant problems with wild carnivores. A total of 997 individual losses of domestic animals were reported in the last three years. Predation peaked was observed during the wet season (56.3%). Most respondents reported use of guarding as very effective method in the villages. The level of conflict was increased in the recent years. The close proximity of the villages to the Park and time of a season influenced predation intensity. A combined strategy aimed at both improving husbandry techniques and education will reduce conflicts and contribute to improve conservation of these predators and reduce the loss of livestock in the area.

Key words: Conflict, Carnivore, Ethiopia, Livestock and Predator.

INTRODUCTION

Human-carnivore conflict has been in existence since humans domesticated wild ungulates (Kruuk, 2002). These conflicts happen because of competition between human and carnivores for shared and limited resources (Graham et al., 2005). Human-predator conflict causes significant economic losses (Palmeira et al., 2008). Many large carnivore species are adapted to predate on ungulate. However, some individuals readily kill domesticated ungulates (Treves and Karanth, 2003). They may be opportunistic to rely on domestic species (Treves and Karanth, 2003). Domestic livestock do not have anti-predatory strategy; hence, they are easy to kill with little effort (Vos, 2000). Literature indicated that the depletion of wild prey forces the predators to switch to livestock as their food source in Kenya (Kolowski and Holekamp, 2006), and in northern Botswana (Gusset *et al*., 2009). Prey selection depends on the availability of its potential prey. Moreover, morphological, behavioral and physiological adaptations allow the individual to locate, capture, ingest and digest a variety of prey taxa (Vos, 2000; Ogada et al., 2003). Human population growth and associated increase in rates of resource use, habitat modification and fragmentation is forcing wild animals to live in increasing proximity to humans (Treves and Karanth, 2003). However, due to enormous livestock depredation, pastoralists have developed a strong negative attitude towards the involved carnivores (Michael et al., 2006).

Human-carnivore conflicts have intensified in most African countries in recent decades, because of exponential human population growth and economic activities (Conover, 2002). The highest intensity of conflicts tends to occur where humans live adjacent to protected areas (Conforti and deAzevedo, 2003). In Africa there are a number of larger predator species, including the lion Panthera *leo, leopard Panthera pardus*, spotted hyaena *Crocuta crocuta*, baboons *Papio sp*., cheetah *Acinonyx jubatus*, African wild dog *Lycaon pictus*, *Caracal caracal* and black-backed *jackal Canis mesomelas* (Kolowski and Holekamp, 2006; Holmern et al., 2007). However, livestock predation often follows a seasonal pattern (Patterson *et al*., 2004; Kolowski and Holekamp, 2006) and influenced by environmental conditions and husbandry practices (Ogada et al., 2003). Chebera Churchura National Park (CCNP) is one of the best recently established protected areas in the region (south-west Ethiopia), with one of the highest wildlife densities in Ethiopia (Timer, 2005; Weldeyohans, 2006). However, the Park is located in an important livestock area and poorest parts of the country. Livestock losses thus potentially affect the livelihood of local people. Therefore, the aim of this study was to assess attitudes toward predators and factors influencing these attitudes, by rural people living adjacent to the Chebera Churchura National Park. Moreover, quantitative scientific data concerning human-carnivore conflict are largely absent in the area. To address this deficit, we interviewed farmers around the protected area.

MATERIALS AND METHODS

The study area:

The study area, Chebera Churchura National Park is located along the southwestern part of Ethiopia. It is partly located within Dawro zone and in Konta special district, about 300 and 580 km southwest of Awassa and Addis Ababa, respectively. It covers an area of 1250 km^2 and lies between the coordinates 36°27'00''- 36°57'14''E longitude and 6°56'05''-7°08'02''N latitude (Fig. 1). Chebera Churchura National Park is bordered by Konta special district to the north, Omo River to the south, Dawro zone to the east and southeast and Agare high mountains and Omo River to the west (Weldeyohanes, 2006). There are four small crater lakes distributed in different parts of the Park. The natural vegetation of the study area is diverse. These include montane forest occurs in the eastern and northwestern highlands, riverine forests along the river, woodland vegetation is found in the southern part of the Park and the grassland covers the largest area of the Park (Timer, 2005; Weldeyohanes, 2006). The altitude of the park ranges from 550-1700 m asl and a highest peak being at a Mecha hill on the western boundary (Timer, 2005). The climate of the study area is characterized by a relatively hot climatic condition. The rainfall distribution is unimodal between April and August. The average annual rainfall in the area varies from 1000 to 3500 mm.

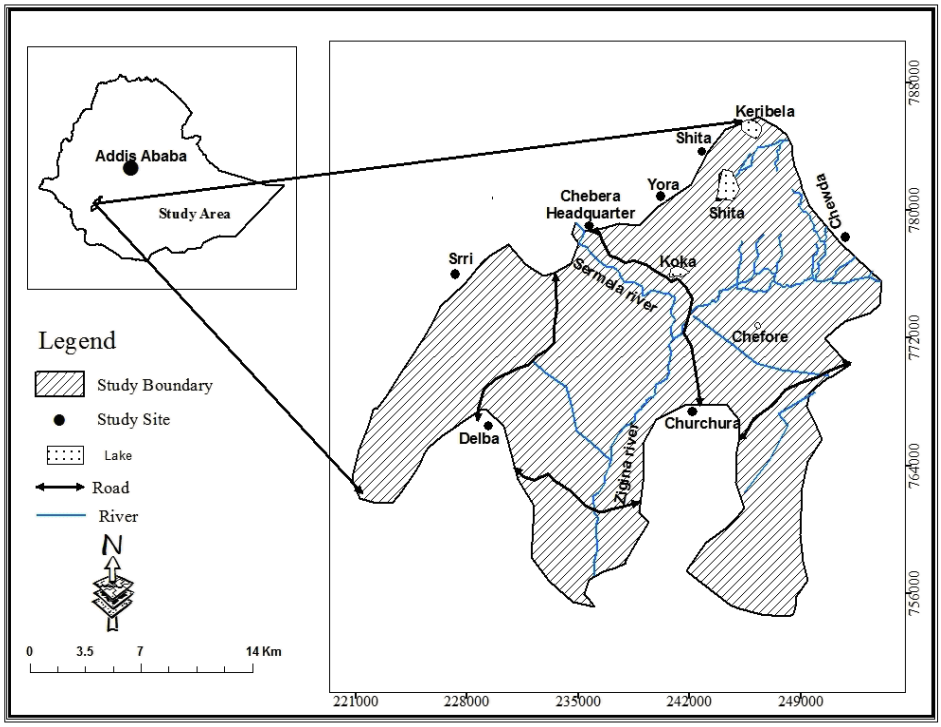

Figure 1: Map of the study area with location of the study sites/villages

Methods of the survey:

The present study was carried out by means of a questionnaire and focus group discussion modified from Newmark et al. (1994) and Maddox (2003). The study was aimed to assess conservation challenges (human-carnivore conflict) in Chebera Churchura National Park between 2011 and 2012. Before the start of the actual data collection, preliminary survey was conducted during mid-September in 2010. This helped us to identify the boundaries and to decide the number of villages/sites and to have a general understanding of the overall situations of the National Park. The questionnaire was pre-tested among some group of a population, which is not included in the main sample group. This helped to identify the most problematic animals in the area and modify the questionnaires accordingly. Seven villages were selected purposefully based on the information gathered using the pilot survey and the distance from the Park and problems related to livestock loss. These villages were Chebera, Serri, Yora, Shita, Delba, Churchura and Chewda (Fig. 1), ranging from 0 to 5 km apart from the boundary of the Park.

Totally, 312 households (about 15% of the total number of households) were included in the interview, of which 215 (68.9%) and 97 (31.1%) were males and females, respectively. The questionnaire was designed to understand the situation of human-carnivore conflict towards the conservation challenges in the area. The survey assessed the attitudes of people towards wildlife in general, as well as towards 8 large problematic species, which were chosen due to their tendency to cause intense conflict with the local people. The questionnaire consisted of a series of structured questions focusing on six main areas of interest. These include:

(i) Which species are responsible for livestock depredation;
(ii) Trends and seasonality of predation;
(iii) Patterns of livestock predation and distance from the Park;
(iv) Protection measures adopted and the period of loss;
(v) Number of livestock losses;
(vi) and any other factors that influence the occurrence of predation in the area.

The data were collected using a semi-structured survey design, following a similar format to that used by Maddox (2003). The questionnaire was administered to farmers within their area of farming and/or residence (Hill, 2000). The structured questionnaire was administered to members of the household in a random manner based on first come first serve basis (Newmark et al., 1994), and alternating adult male and female respondents as much as possible. In addition, focus group discussions were also held in the villages to discuss the experience in the human-carnivore conflict and to convey information on knowledge about wildlife in the area. These were used as a complement for the questionnaires. All statistical tests were two-tailed, with the significance level set at P = 0.05 and were run using SPSS version 18 computer software programme (SPSS Inc., Chicago, Illinois, USA), Chi-square test, descriptive analysis and a correlation analysis was used to determine the nature of the relationships among the variables.

RESULTS

A total of 8 species (seven carnivores and one omnivore) were recoded as predators of domestic animals (cattle, sheep, goats, donkeys, chicken) surrounding the Park (Table 1). These animals were: Lion, leopard, caracal, jackal, wild dog, hyena, caracal, serval, and Anubis baboon. Among these hyena, Anubis baboon and leopard were considered serious animals, while lion and caracal posed limited problem.

The threats they pose to domestic animals and human safety are given in Table 2. These carnivores caused threats both on livestock and humans. These predators were threats to livestock (67.7%), chickens (19.2%), human safety (20.2%) and disease causing agents (3.1%). There was a significant difference in the mean percentage of threat scores (χ^2 =55.33, df =4, P<0.05). The risk of livestock depredation was the main reason for disliking focal carnivores.

When asked about population trends, the respondents felt that all populations of carnivores had increased over the recent years (Table 3). About 48.3% of the respondents remarked that carnivore populations have increased in their respective areas. The mean score of respondents' opinions towards the population status of carnivores was different (χ^2 =37.27, df=3, P<0.05).

The population change of carnivores is given in Table 4. About 50%, the interviewees suggested a decrease in the number of carnivores. The view of respondents was shows variation on the mean desired population change (χ^2= 44.36, df=3, P<0.05).

A total of 997 predator attacks were reported in the last 3 years (Table 5). The number of predation events was different between the villages and the type of livestock around the Park. There was a significant difference among villages in the total number of domestic animals killed (χ^2 =82.79, df = 6, P < 0.05). Livestock predation intensity increased around the National Park relative to the distance. A total of 172 sheep, 198 goats, 152 cattle, 447 chickens, 15 donkeys and 13 dogs were killed by predators. These showed a big difference (χ^2 = 760.69, df = 5, P < 0.05). Distance to the park and the frequency of domestic animals loss by predators were positively correlated (r = 0.46) in respect to the number of sampled households.

A predator impacts on domestic animals is given in Table 6. Predation intensity also varied by season (χ^2 = 15.67, df = 1, P < 0.05). This peaked during the wet season (561 individuals). Of 312 interviewed households, the proportions of domestic animals killed varied; sheep (17.3%), goats (19.9%), cattle (15.2%), chicken (44.8%), donkeys (1.5%) and dogs (1.3%) in the last three years. This showed a difference (χ^2 = 77.93, df = 5, P < 0.05) among the loss of animal types. As can be seen in Table 6, leopard, hyena and baboon were responsible for most livestock mortalities recorded. The highest number of livestock by hyena (126 animals), anubis baboon (117 animals) and leopard (107 animals). Many of the cattle were attacked by lion 49 (59.8%) and most dogs (76.9%) were taken by caracals. However, chickens were killed mostly by serval 276 (61.7%) and Anubis baboon 55 (12.3%).

Methods of minimizing livestock loss are given in Table 7. Farmers used various methods to keep their livestock against predators. These are: using physical barriers; guarding and fear-provoking stimuli around the farmland. Most respondents reported use of guarding as very effective method in the villages. There was variations in the use of major methods used between villages as physical barriers (χ^2 =2.23, df = 6, P > 0.05), guarding (χ^2 =0.64, df = 6, P > 0.05) and fear-provoking stimuli (χ^2 =1.48, df = 6, P > 0.05), of type of livestock protection. However, there was a difference between the average type of domestic animals protection (χ^2 =72.06, df = 3, P < 0.05).

Table 1: Carnivores by rank in terms of livestock predation (N=312, *=omnivore)

Common name	Species	% of problem		
		Major Problem	Minor Problem	No Problem
Lion	*Panthera leo*	55.4	29.6	15.0
Leopard	*Panthera pardus*	70.2	21.8	8.0
Wild dog	*Lycaon pictus*	25.9	41.5	32.6
Spotted hyena	*Crocuta crocuta*	80.3	19.7	0.0
Jackal	*Canis mesomelas*	29.5	49.8	20.7
Caracal	*Felis caracal*	51.6	36.5	11.9
Serval	*Felis serval*	28.8	45.2	26.0
Anubis baboon*	*Papio anubis*	83.5	16.5	0.0
Total/average	8	53.1	32.6	14.3

Table 2: Reasons given by respondents for considering species as threats (n=312)

Species	Percentage of respondents and the threats scale				
	Threat to large livestock	Threats to small livestock	Threats to Chickens	Threat to humans	Diseases
Lion	65.0	69.6	0.0	51.9	0.0
Leopard	24.9	74.1	5.8	33.1	0.0
Wild dog	18.8	33.5	0.0	15.6	12.8
Spotted hyena	31.2	60.4	11.9	27.4	5.8
Jackal	4.8	41.8	10.5	5.8	0.0
Caracal	17.3	66.7	0.0	19.5	0.0
Serval	0.0	6.4	75.3	0.0	0.0
Anubis baboon	0.0	53.2	49.9	8.0	6.4
Average	17.0	50.7	19.2	20.2	3.1

Table 3: Respondents' opinions about the status of carnivores during the last 5 years (N=312)

	Population status of carnivores			
Species	Increased (%)	Decreased (%)	The same (%)	Don't know (%)
Lion	45.9	20.2	30.1	3.8
Leopard	56.5	16.4	22.4	4.7
Wild dog	31.4	29.1	30.7	8.8
Spotted hyena	70.2	12.0	14.6	3.2
Jackal	31.9	27.7	33.0	7.4
Caracal	40.3	21.5	29.2	9.0
Serval	29.9	23.2	38.4	8.5
Anubis baboon	80.5	5.8	10.5	3.2
Average	48.3	19.5	26.1	6.1

Table 4: The perception of surveyed farmers towards population change of hazardous carnivores (N= 312)

Species	Desired population change (%)			
	Increase	Decrease	Stay the same	Don't know
Lion	25.4	38.5	30.6	5.5
Leopard	11.5	65.3	18.4	4.8
Wild dog	26.9	33.4	29.8	9.9
Spotted hyena	11.7	77.1	11.2	0.0
Jackal	28.4	32.3	30.2	9.1
Caracal	25.2	40.5	27.6	6.7
Serval	16.2	41.0	38.0	4.8
Anubis Baboon	10.3	80.4	9.3	0.0
Average	19.4	51.1	24.4	5.1

Table 5: Number of livestock lost in the last three years and estimated distance of the villages from the Park (N= No. of sampled households)

Villages (Distance to the Park in km)	N	Type of domestic animals attacked						Total loss
		sheep	goat	cattle	chickens	donkeys	dogs	
Chebera (1-2)	63	24	41	24	75	1	1	166
Serri (0-2)	31	19	20	21	61	2	2	125
Yora (0-2)	84	49	52	35	82	3	3	224
Shita (3-5)	35	18	16	17	55	2	1	109
Delba (3-5)	32	15	18	19	60	3	1	116
Churchura (1-3)	43	27	32	23	73	3	3	161
Chewda (0-2)	24	20	19	13	41	1	2	96
Total	312	172	198	152	447	15	13	997

Table 6: Total loss of domestic animals between seasons and number of incidents per predator type in the last three years surrounding the Park (n=312)

Livestock type	Seasons		Total loss	Domestic animal loss per predator type in the last 3 years								
	Dry	Wet		1	2	3	4	5	6	7	8	9
Sheep	73	99	172	12	31	11	47	20	15	-	21	15
Goat	85	113	198	18	40	16	33	17	24	-	27	23
Cattle	63	89	152	49	35	-	14	-	11	-	12	31
Chicken	200	247	447	-	-	-	28	-	-	276	55	88
Donkeys	8	7	15	3	1	-	4	-	3	-	-	4
Dogs	7	6	13	-	-	-	-	-	10	-	2	1
Total	436	561	997	82	107	27	126	37	63	276	117	162

1 = Lion, 2 = Leopard, 3 = Wild dog, 4 = Hyena, 5 = Jackal, 6 = Caracal, 7 = Serval, 8 = Baboon, 9 = unknown predator, - = not recorded.

Table 7: Ways of minimizing livestock loss caused by predator among different villages (N= No. of sampled households)

Villages	N	Type of livestock protection			
		Physical barriers	Guarding	Fear-provoking Stimuli	No idea
Chebera	63	39.3	83.4	30.5	6.4
Serri	31	45.0	85.7	28.4	8.0
Yora	84	38.3	80.1	32.9	7.4
Shita	35	44.8	77.8	35.2	6.4
Delba	32	40.5	79.3	29.0	9.6
Churchura	43	37.2	82.1	27.6	6.9
Chewda	24	42.7	84.6	32.3	7.4
Total/Average	312	41.1	81.9	30.8	7.4

DISCUSSION

During the present investigation, 8 species are identified and causing loss on domestic animals. Predators such as hyena, leopard and baboon often kill numerous domestic animals in the area. The reduction of the natural prey may be one of the major causes of carnivores shifting their diets to livestock (Mishra et al., 2003; Patterson et al., 2004). Moreover, hyenas and baboons may attack people occasionally in the area. These cause negative attitude towards the animals. The number of livestock lost to predators showed a positive relationship with the problem score assigned to focal carnivores. As a result, the survey revealed that livestock losses caused by predators represent an economic concern for livestock owners. Studies elsewhere have also shown that tolerance of predators depends on the extent of predation on their livestock (Kolowski and Holekamp, 2006).

The respondents noted that the effect of carnivores has been increasing since the establishment of the Park. As the number of wildlife increases around the Park, conflict may arise. For all focal species, most respondents wanted the number to decline and disliked the species. A desire for total elimination was expressed most commonly with regard to hyenas and baboons. Breitenmoser (1998) and Marker et al. (2003) stated similar findings especially with large carnivores. However, even if carnivores cause a problem on livestock and human welfare, they also perform a vital role in controlling wildlife pests on crops. For instance, leopards and lions may also kill baboons, warthogs and wild pigs for food and in doing so control the size of their population. Therefore, if the leopards and lions were to be minimized/disappeared, other herbivore pests would increase in number and would cause more damage to crops. As a result, it is very important to recognize the pest control service they provide.

Village distance from the Park and damage caused by wildlife were important factors to determine livestock loss by predators. Increasing distance from the park boundary, predation on livestock decreased except chicken intake by serval. Similar findings were observed in Serengeti National Park, Tanzania (Holmern et al., 2007) and Tsavo ranches in Kenya (Patterson et al., 2004). In the present study, distance to the Park was strongly correlated with predation risk. For instance, in villages such as Chebera, Serri, Yora and Chewda high predation was observed. These villages are near to the Park more than the other villages and therefore affected more by predators. Predators will take domestic ungulates when the opportunity arises (Treves and Karanath, 2003). The exact reasons why carnivores prey on domestic animals are poorly understood. In some areas, it is thought that livestock are easy prey (Maddox, 2003). Other factors, such as age and sex of the predator may also play an important role. Saberwal et al. (1994) showed this for lions and Sukumar (1991) for tigers in India. Many authors also recognize that when wild preys are abundant, predators prefer them to livestock. Sometimes predation increases during calving period as calves are easier to attack than adult cattle (Michalski et al., 2006). Selection of livestock species corresponds to the size of the predator in accordance with the size of their natural prey (Hayward et al., 2007). This can also be related to the ease and limited escape abilities of the livestock (Mishra et al., 2003).

Livestock predation usually follows seasonal patterns, although there are some exceptions (Michalski et al., 2006; Holmern et al., 2007). During the present study, it was recorded a peak in predation/loss of most livestock during the wet season. This was similar to what had been observed in Tsavo National Park, Kenya (Patterson et al., 2004). This might be related to the variation in prey dispersal with season. In addition to a good habitat cover for protection, the prey animals might secure their food nearby and limit their movement. As a result, they minimize exposure to predators during the wet season. However, during the dry season, wild herbivores tend to concentrate near water sources and probably easier for predators to prey on them (Kays and Patterson, 2002). As the wet season progresses and water is more

readily available, prey populations disperse widely. In areas with low mean prey density, it may be easier for predators to prey upon livestock. As a result, livestock in villages bordering the Park thus become an alternate source of food.

The present study suggests that leaving livestock, particularly goats and sheep, unattended during daylight increases the likelihood of livestock predation. Predation may be reduced by kraaling livestock at night, if adjusted for the type of livestock kept and predator involved (Ogada et al., 2003). Most households visited had at least one thorn bush kraal to enclose livestock during the night. However, kraal quality was often poor and improvements could help reduce livestock depredation. A good kraal construction has been associated with reduced losses to large carnivores (Ogada et al., 2003). Husbandry techniques may have a great impact on livestock predation (Holmern et al., 2007). Guarding herds and active defense are essential features of animal husbandry. Where herdsmen are present, predation rate is generally lower than free-ranging herds (Breitenmoser, 1998). The present study also supports these findings. Moreover, in the study area, many of the herders were quite small children, reducing their effectiveness. Dogs were reported to be efficient against serval and baboon attacks but not against lions or caracal. Usually, in the absence of herders, baboons also attack dogs. Caracal also prefers dogs. Similar cases were reported from Serengeti National Park, where hyenas kill dogs (Holmern et al., 2007). However, guarding dogs have proved to be successful elsewhere (Gehring et al., 2010).

CONCLUSION

This study highlights the complexity of human-carnivore conflict. Therefore, improving the technique of livestock protection is likely to be the most viable method of conflict resolution in this area. A combined strategy aimed at both improving livestock husbandry such as herding during the day, keeping the livestock in an enclosure during the night might minimize predation risk. Improving awareness creation on local people about predators would also be advantageous by helping people correctly identify species causing losses and decide upon the most effective techniques for preventing depredation. Reducing losses is unlikely to be enough alone, however there is a need to develop schemes where local people perceive tangible economic benefits from tolerating wildlife.

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