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Conservation Challenge: Human-herbivore Conflict in Chebera Churchura National Park, Ethiopia

Demeke Datiko and Afework Bekele
Department of Zoological Sciences, Addis Ababa University, P.O. Box 1176, Addis Ababa, Ethiopia

Abstract: An investigation on human-herbivore conflict was carried out in CCNP between 2011 and 2012 in seven randomly selected villages (Chebera, Serri, Yora, Shita, Delba, Chuchra, Chewda) around the Park. A total of 312 household samples were identified for interview. Group discussion and field observation were also carried out. Among the respondents, the majority (83.9%) faced crop damage. African elephant (*Loxodonta africana*), Hippopotamus (*Hippopotamus amphibious*), African buffalo (*Syncerus caffer*), Desert warthog (*Phacochoerus aethiopicus*), Wild pig (*Sus scrofa*), Porcupine (*Hystrix cristata*), Vervet monkey (*Cercopithecus aethiops*) and Anubis baboon (*Papio anubis*) were identified as the most problematic animals in the area. However, buffalo, monkey and warthog were considered as the notorious pest. Crop damage and threats to human safety were the major problems encountered resulting in conflict between human and wildlife. Most respondents had a negative attitude towards the problem-posing animals. This will lead to a change in public attitude from one that supports wildlife conservation to sees wild herbivores as a threat and a potential negative consequence for wildlife conservation. Active measures have to be implemented to solve the problems and safeguard the future of the wildlife management in the park.

Key words: Conflict, conservation, Ethiopia, herbivore, pests

INTRODUCTION

Human-herbivore conflict is more intense in developing countries, where agriculture is important components of the livelihood and income of the rural populations (Boer and Baquete, 1998). Rural Africans generally do not want to see wildlife or have wildlife nearby due to damage and lack of benefits from the sector (Newmark *et al*., 1994). Wild animals move from their restricted natural habitat into agricultural land to feed on the produce that humans grow for their own consumption (Ojo *et al*., 2010). Crop damage affects farmers directly through loss of their primary food and cash resources and indirectly through a variety of social costs such as costs for school and hospital (Hill, 2000). Farmers themselves are sometimes, the causes for crop loss because they continuously change the vegetation structure of the land closer to the protected areas and intrude into the wildlife habitats (Weladji and Tchamba, 2003; Madden, 2004). This decreases the habitats of the animals and attracts the potential crop raiders from nearby habitats. As a result, it increases the probability of human-herbivore conflict (Hill, 2000). In addition to crop damage, the animals cause loss of sleep during the crop protection at night and they pose threats to human movement (Conover, 2002; Treves and Karanth, 2003). For instance, as noted by Kimega (2003) from Kenya, pest herbivores and primates damage many crops and fruits. The same is true in Ethiopia. As a result, for the poor country like Ethiopia, the situation can be very severe.

Ethiopia is a large and ecologically diverse country with unique environmental conditions. Its topography varies from vast plains to high mountains having an altitudinal range of 110 m below sea level (Kobar sink) in the Afar depression to the highest peak over 4500 mL (Ras Dejen) in the Simien Mountains (Abune, 2000). Ethiopia consists of 284 species of mammals (Hillman, 1993). Since many years ago, the natural vegetation of the country has been destroyed both by human and natural catastrophic factors. As a result, of the highlands and some of the lowlands have been converted into agricultural and pastoral land. Moreover, its vegetation has been deforested for various purposes (Datiko and Bekele, 2011). As a result, wildlife resources of the country are now largely restricted to a few protected areas (Hillman, 1993; Kumssa and Bekele, 2008). However, as in other parts of the world, in Ethiopia, large herbivore mammals have been causing damage to agricultural crops and plantations. The extent of damage varies depending on the species of the pest mammal in different parts of the country (Kingdon, 1997). There are wide varieties of pest herbivores, primates and small mammals. These mammals

Corresponding Author: Demeke Datiko, Department of Zoological Sciences, Addis Ababa University, P.O. Box 1176, Addis Ababa, Ethiopia

cause serious damage to agricultural crops in different parts of the country. However, in Ethiopia only few studies were carried out on human-wildlife conflict in some specific regions of the country (Kumssa and Bekele, 2008). The same is true in Chabera Churchura National Park (CCNP) in southwestern Ethiopia. As a result, the present study attempts to identify large herbivore pest species, determine the human-herbivore conflict that may lead a problem on conservation of wildlife around the park. Moreover, it provides a baseline for measures to mitigate conflicts between people and wildlife in the region.

MATERIALS AND METHODS

The study area: Chebera Curcuma National Park (CCNP) is located along the southwestern part of Ethiopia (Fig. 1). 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. CCNP 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 (Woldeyohans, 2006). There are four small crater lakes found the Park. The natural vegetation of CCNP is highly diverse and dominated by various plant species. For instance, the ground water forest type of vegetation dominated with *Podocarpus juniperus* and broad-leaved tree species. The riverine forest occurs along the course of the rivers. This habitat is characterized by mixed vegetation dominated by plant species such as *Albizia grandibracteata, Chionantus mildobradii, Grewia ferrugunea, Aspilia mosambicensis, Arundo donax* and *Ehretia cymosa.* The grassland has scattered trees and covers the largest part of the Park. It is dominated by elephant grass (*Pennisetum purpureum*) and few scattered trees. Notable species in woodland are *Acacia brevispica, Maytenus arbutifolia, Vitex doniana, Terminalia brownii, Combretum colinum* and *Combretum mole.* In the agricultural land, the people

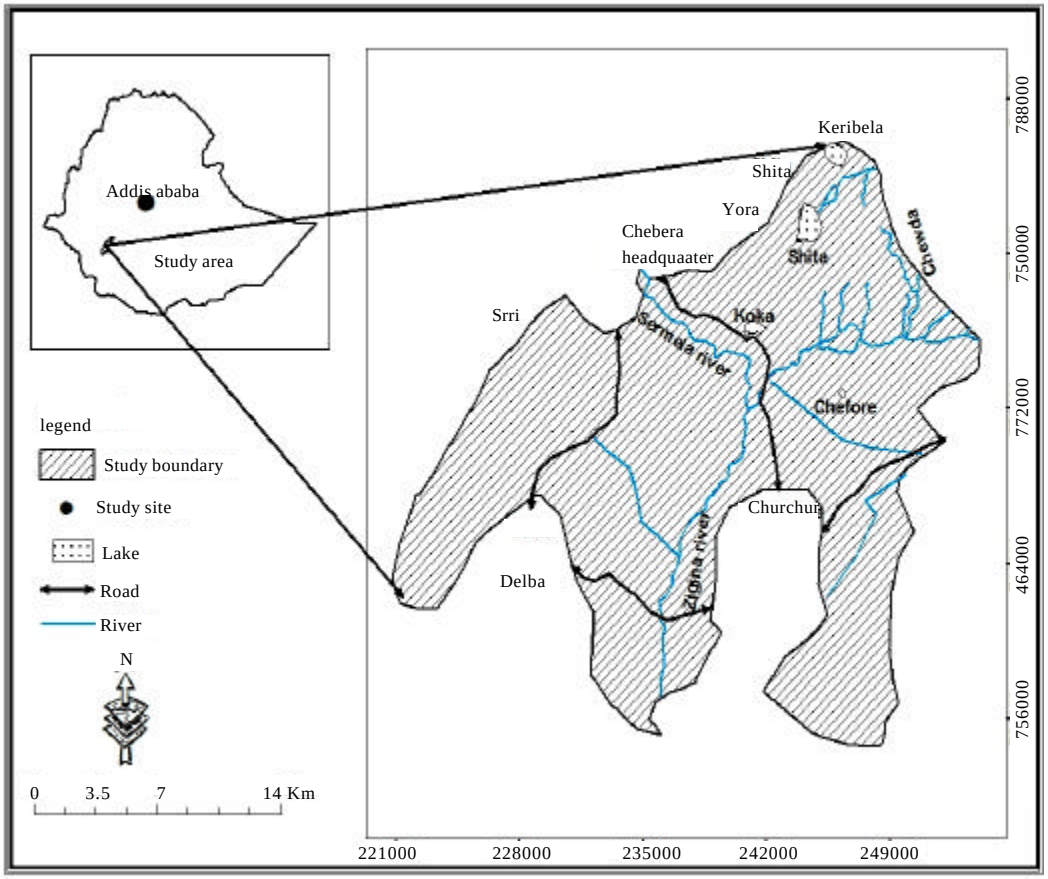

Fig. 1: Map of the study area with location of the study sites/villages

practice traditional agricultural system around the Park. They cultivate cereals, coffee and root crops (Timer, 2005). The altitude of the park ranges from 550-1700 m.a.s.l 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.

Methods of data collection: 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-herbivore conflict) in CCNP 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 on the over all 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 based on the information gathered using the pilot survey and the distance from the Park and problems related to crop damage and livestock loss. These villages were Chebera, Serri, Yora, Shita, Delba, Chuchra 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: (1) Village distance from the Park boundary, (2) Identification of problematic wildlife responsible for crop damage, (3) Trends in population of problematic animals and their effect in the last recent years, (4) Protection measures adopted and the period of damage, (5) Attitudes of people towards wildlife and the Park management and (6) Level of awareness about the value of wildlife.

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 at 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-herbivore conflict and to convey information on knowledge about wildlife in the area. These was used as a complement for the questionnaires. In addition, agricultural fields were visited to assess the crop fields damaged by wild animals. Moreover, the faecal samples of some herbivore pests were also observed to determine the presence or absence of locally abundant seeds in the study area. The data collected were analyzed using SPSS version 18 computer software programme and descriptive statistics to compute the variation of the relationships among the variables.

RESULTS

A total of 8 animal species (six herbivores and two omnivores) were recoded as pests (Table 1). These were African elephant, hippopotamus, African buffalo, desert warthog, wild pig, porcupine, vervet monkey and anubis baboon. Among the respondents, 61.9% noted these animals to cause a major problem, while 25.8% noted as a minor problem and 12.3% noted as no problem. This difference was statistically significant ($\chi^2 = 38.47$, df = 2)

Table 1: Hazardous animals in terms of ranking (N=312)

		Problem ranking (%)		
Common name	Species	Major	Minor	No problem
African elephant	*Loxodonta africana*	60.8	20.6	17.6
Hippopotamus	*Hippopotamus amphibious*	40.2	30.9	28.9
African buffalo	*Syncerus caffer*	83.0	13.8	3.2
Desert warthog	*Phacochoerus aethiopicus*	70.9	19.1	10.0
Wild pig	*Sus scrofa*	47.0	42.4	10.6
Porcupine	*Hystrix cristata*	62.1	30.4	7.5
Vervet monkey*	*Cercopithecus aethiops*	41.3	39.7	19.0
Anubis baboon*	*Papio anubis*	89.5	9.2	1.3
Total/average	8	61.9	25.8	12.3

*Omnivore ($p<0.05$)

Table 2: Reasons given by respondents for considering as hazardous animals (n = 312)

	Respondents (%)			
Hazardous species	Threat to crops	Threat to livestock	Threat to humans	Disease
African elephant	81.4	18.7	35.4	0.0
Hippopotamus	67.1	0.0	22.3	0.0
African buffalo	92.4	25.9	65.8	4.9
Desert warthog	85.0	0.0	0.0	0.0
Wild pig	79.4	0.0	0.0	0.0
Porcupine	90.5	0.0	18.9	9.3
Vervet monkey	77.6	0.0	0.0	0.0
Anubis baboon	97.8	44.2	26.6	19.5
Average	83.9	11.1	13.6	4.2

Table 3: Opinions on population status of vermin animals since the last 5 years (N = 312)

	Population status of pest animals (%)			
Species	Increased	Decreased	The same	Don't know
African elephant	59.4	10.0	19.1	11.5
Hippopotamus	44.6	15.7	28.9	10.8
African buffalo	77.3	8.2	9.9	4.6
Desert warthog	65.1	13.9	10.1	10.9
Wild pig	49.2	24.3	13.3	13.2
Porcupine	58.0	14.2	17.4	10.4
Vervet monkey	49.5	22.4	20.5	7.6
Anubis baboon	81.2	4.9	7.8	6.1
Average	60.6	14.1	15.9	9.4

Table 4: Desired population change of surveyed farmers towards pest animals in the study area (N = 312)

	Desired population change (%)			
Species	Increase	Decrease	Stay the same	Don't know
African elephant	25.6	35.2	32.7	6.5
Hippopotamus	24.5	33.5	35.2	6.8
African buffalo	14.3	60.6	20.5	4.6
Desert warthog	16.0	51.1	25.0	7.9
Wild pig	29.1	30.3	34.4	6.2
Porcupine	18.4	36.6	35.6	9.4
Vervet monkey	25.3	35.0	32.1	7.6
Anubis baboon	0.0	92.3	7.7	0.0
Average	19.2	46.8	27.9	6.1

among these animals, buffalo, baboon and warthog were grouped to cause more hazardous in crop damaging. However, hippopotamus, wild pig and vervet monkey were recorded as less hazardous animals.

Threats of different animals are given in Table 2. the threats included crop damage, livestock depredation and human safety and cause diseases. Among the problematic animals, elephant, buffalo, baboon and porcupine caused threats both on crops and humans. These animals (except porcupine) also cause a problem on livestock. Eighty three point nine percent of the respondents reported crop damage, while 11.1% reported loss of livestock and 13.6% reported effect on human life. Only 4.2% responded as they might cause diseases. The difference was statistically significant (χ^2 = 148.38, df = 3, $p<0.05$), among average reasons of respondents citing the main reasons.

The opinion of local people towards population status of vermin animals in the Park is given in Table 3. When asked about population trends, 60.6% of the respondents felt that most animal populations have increased over recent years. However, 15.9% of the respondents remarked that the wildlife populations are the same and 14.1% reflect as decreased. Only few (9.4%) of the respondents were unsure on problematic wildlife population status. The average view of respondents on the population status of pest animals shows a statistically significant among the feelings of the local people (χ^2= 69.09, df = 3, $p<0.05$) around the park.

Table 4 shows the opinion of local people towards population of pests in the Park. Most (46.8%) of them stated that the desired population sizes of the animals should decrease. However, 6.1% did not respond to this question. The difference in the opinion was statistically significant (χ^2= 34.99, df = 3, $p<0.05$).

Distance from the Park and trend in crop damage by pest animals are presented in Table 5. The respondents noted that, in all villages crop damage has been increased during the last 5 years. Out of the 312 respondents, 83.2% responded as the trend is increasing. The views of the respondents did not differ significantly among study villages (χ^2 = 0.71, df = 6, $p>0.05$). Only, 8.7% noted as the trend is decreasing. The level of damage was severe. More people from Chebera, Serri, Yora and Chewda faced more crop damage than the other three villages. People who live close/near the Park area generally faced many problems than those living far above 3 km of the Park.

Farmers utilized various methods to keep their farms against pest animals in the study area (Table 6). These are physical barriers (fence, walls); guarding (watching eyes, dogs); fear-provoking stimuli (visual: scarecrows, lighting fires; auditory: exploders, distress calls and chemical repellents (chillies) around the Park. Most respondents reported guarding was a very effective method in all villages (Chebera (91.6%), Serri (92.1%), Yora (88.4%), Shita (89.5%), Delba (86.9%), Chuchra (90.7%) and Chewda (85.8%) followed by fear-provoking stimuli

Table 5: Approximate distance from the Park, trend of crop damage by pest animals in the last 5 years

			Trends of crop damage (%)		
Villages	N	Distance from the Park (km)	Increased	Decreased	Unknown
Chebera	63	1-2	82.1	8.7	9.2
Serri	31	0-2	84.3	9.1	6.6
Yora	84	0-2	88.7	6.0	5.3
Shita	35	3-5	80.6	10.8	8.6
Delba	32	3-5	79.9	9.6	10.5
Churchura	43	1-3	81.1	10.3	8.6
Chewda	24	0-2	85.5	6.4	8.1
Total/Average	312		83.2	8.7	8.1

Table 6: Methods of minimizing crop raid among different villages (N = No. of sampled households)

		Type of crop protection			
Villages	N	Guarding	Fear-provoking stimuli	Physical barriers	Chemical repellents
Chebera	63	91.6	29.4	20.9	10.6
Serri	31	92.1	34.5	25.6	9.1
Yora	84	88.4	33.9	27.1	7.5
Shita	35	89.5	31.8	19.8	8.0
Delba	32	86.9	29.4	21.0	11.2
Churchura	43	90.7	30.6	23.9	9.8
Chewda	24	85.8	35.3	22.4	7.7
Total/Average	312	89.3	32.1	22.9	9.1

(32.1%). However, using chemical repellents was not well known. There was a insignificant difference (χ^2 = 97.12, df = 3, $p<0.05$) in use of minimizing crop damage around the Park.

DISCUSSION

In the study area, a wide range of animals cause problems for people. During the present study, eight problematic species were recoded as pests of cereal crops (maize, teff and sorghum), fruits and vegetables on the farmlands around the Park. Chhangani *et al.* (2008) also noted as a wide variety of vertebrate pests come into conflict with humans in Africa. As noted by Conover (2002) and Treves and Karanth (2003), conflict between people and wildlife undoubtedly ranks amongst the main threats to conservation in Africa. During the study period, more than 80% of the respondents indicated that the most pressing problem was crop raiding. These animals raid on a variety of crops around the Park. In Chewda and Delba, the problems of hippo was not recorded. These might be due to the villages are far from the lakes and big rivers. In addition, the topographic features determine the movement of hippo in the area. In Chebera, Churchura and Serri, the effect is less. In case of elephants, it depends on seasonal movement of the animals. However, as also noted by Chhangani *et al.* (2008), elephants are able to destroy a field in a single night raid. So, the prevention action should be targeted based on the seasons. Baboons are the most destructive crop raiding animals around CCNP. They can come at any time during the day and consume whatever crop in the field. Solitary adult male baboons also have the ability to intimidate people. In addition, injuries to people mostly occur as a result of chance contact between man and elephant, buffalo and hippo, usually along paths to and from the dwellings and water source.

Rainfall, season, variety and characteristics of crops, food availability, distance from forest, nearest farm or village and farm protection methods will have an impact on raiding (Hill, 1998; Naughton-Treves *et al.*, 1998). The present investigation also revealed the availability, variability and type of food sources in the natural habitats might be the important factors. The raiding frequency and intensity influence the attitude of local people towards pests. Local peoples' perception of conflict does not always correspond to reality (Siex and Struhsaker, 1999). In the present study, it involved crop raiding and sometimes on the human welfare and livestock damage. This also caused farmers to develop a negative attitude and view wildlife as a nuisance rather than an asset. The most probable reason might have been linked to the establishment and management activities carried out in the last few years in the Park. It minimized illegal poaching and hunting as well as habitat distraction by the local people in the Park. But, the conflict has been increasing since the establishment of the Park.

In many parts of Africa, the conflict between local people and wildlife is the most serious problem if they are adjacent to nature reserves (Newmark *et al.*, 1994). This study also shows close proximity between farms and the Park resulting in high levels of conflict. Those who live close to the habitat of the pest animals encounter high problems. As a result, those who live near to the Park

faced frequent crop damage. This indicated that conflicts are particularly common in reserve buffer zones where healthy wildlife populations stray from the protected area into adjacent cultivated fields or grazing areas (Woodroffe and Ginsberg, 1998). This is an increasing phenomenon because the growth rate of the cultivated area is very high at the periphery of protected areas (Clerici *et al*., 2005). Some food items/crops might be found particularly palatable and attract wildlife. For instance, according to Barnes (1996), among the crops planted outside the Kakum National Park (Ghana), maize and cassava attract particularly elephants. The present study also confirmed the same situation in the study area, in which maize and sorghum were highly preferred by most pest animals.

Farmers utilized various methods to protect their farm from the damage caused by pests. Parker and Osborn, 2006 stated that deterrents were likely to be more effective against pests. This was also true in the study area. However, the deterrent techniques are temporary because animals soon learn and ignore the threat (Bauer, 2003). The same situation was observed in the present study. The effectiveness of methods to prevent damage by animals remains unclear. The behavior and preference of each pests are quite different. However, for larger animals, guarding was the sole resort to prevent crop-losses in the area. It is thus, recommended that a combination of techniques be employed in order to minimize the risk of wildlife becoming used to any single method. Shivik *et al*. (2003) also noted that to reduce the ability of wild animals becoming accustomed to the device, it is good to use a variety of different recorded sounds and other alternative responses. Moreover, as noted by Parker and Osborn, 2006 alternative crops such as ginger and chilli have been encouraged in Zimbabwe. As a result, farmers who were considered to be in high-conflict areas have shifted from cultivating food crops to growing cash crops. In addition, applying fences or thorny or spiny hedges and removing nearby cover and habitat for wildlife have been recommended (Norton-Griffiths and Southey, 1995).

CONCLUSION

This study highlights the complexity of human-herbivore conflict in the area. Improving and combinations of guarding techniques are likely to be the most viable method of conflict resolution in this area. Moreover, there is a need to develop schemes where local people perceive tangible economic benefits to tolerate wildlife on the surroundings. Besides this, with careful study on animal population and extent of their effect, problem-causing animals could be offered to trophy hunters and there is a need to develop schemes where local people perceive tangible economic benefits from tolerating wildlife. Moreover, it is important to monitor conflict situations over time in the area. It will help to pinpoint where the worst conflict occurs and direct deterrent efforts to where they are most needed. It needs urgent action to solve the problems, otherwise the Park will no longer act as a conservation area for the wildlife as most of the National Parks of the country.

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