



DEMOGRAPHY, THREATS AND COMMUNITY PERCEPTION OF AFRICAN ELEPHANTS (*LOXODONTA AFRICANA*) IN KAFTA-SHERARO NATIONAL PARK, TIGRAY, ETHIOPIA

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ABSTRACT

Study was conducted in Kafta-Sheraro Wereda in Northwest Tigray region of Ethiopia to assess community perception about the African elephants, major threats and demography of African elephants. A total of 240 households were selected from 12 villages using a stratified random sampling. Samples represented six of the villages closer (on average 7.2 km) to the park and the other 6 villages represented samples far (average 39 km) from the park. Demography (Sex and Age) of African elephants was determined through direct observations based on the general appearances of elephants. Individual villages, Land holding, and proximity of the villages to the park were the primary factors significantly ($P < 0.05$) influencing elephant management and conservation in the area. The view of respondents on management problems differed between the sampled villages. The main management problem ranked first by the respondents nearby and far villages were poor patrolling (index=0.26) followed by poor community awareness (0.23=index) closer villages, weak law enforcement (index=0.20) for poor conservation of elephant population in the area. A large proportion of the respondents proximity to the park (index=0.41) identified habitat destruction as major threat followed by illegal hunting (index=0.28), livestock interference (index=0.19), and feed shortage (index=0.13).

KEYWORDS: Age and Sex structure; Community perception; Demography; Village distance.

INTRODUCTION

Ethiopia has diverse wildlife populations which are comparable, species wise to other countries of east Africa. Inventory of the wildlife potential of the country indicates that there are 260 species and sub-species of mammals, 845 species of birds, 78 species of snakes, 54 species of amphibians and 101 species of fish (EWCO, 1988). Among these 28 species of mammals, 28 species of birds, 3 species of snakes, 30 species of amphibian and 4 species of fish are endemic to the country (Ibid). Kafta Sheraro National Park (KSNP) is a newly established park in Ethiopia found in the Tigray region which has great wildlife resources. Preliminary wildlife inventory of the park indicates that Caracal (*Felis caracal*), Leopard (*Panthera pardus*), Greater kudu (*Tragelaphus strepsiceros*), Oribi (*Ourebia ourebi*), Waterbuck (*Kobus ellipsiprymnus*), Aardvark (*Orycteropus afer*), Roan antelope (*Hippotragus equinus*) and the African elephant (*Loxodonta africana*) are some of the larger mammals known in this area (Shoshani and Yirmed, 2008).

During the past few decades, the number of elephants in Ethiopia was decimated to an endangered level. At present, the total number of elephants all over the country is approximate 1,000 and they have been affected to seek sanctuary in pockets of peripheral areas (Yirmed and Afework, 2000). Now a day, nine separate and isolated elephant populations are establish in Ethiopia (Yirmed, 2004) one of them is the elephants of Kafta-Sheraro National Park (KSNP). Elephant population seasonally

migrates between Ethiopia and Eritrea (Shoshanna et al., 2004, Agnew et al., 2005) and number of this elephant is less compared to the other elephant population established in the country (Shoshani and Yirmed, 2008).

For the poor elephant number in the park is associated with different problems. Some of the problems are people with deforestation by different mechanisms like burning and cutting of forests, and using agricultural plots inside the park, death of African elephants due to unknown reasons. Elephants come into conflict with people by destroying agricultural crops and damaging properties. In addition to this, up to now there are no scientific researches has done in KSNP concerning to African elephant's demography this also the main reason for many years to live African elephants in the park without knowing their trends. Therefore, the aim of the study will be to collect data by various observation methods in order to recommend problem solving solutions. In addition to this, the study will provide and explain the trend of African elephants in KSNP through determining their age and sex and the study contribute to the scientific bases for improved management of elephant population and its conservation system.

MATERIALS AND METHODS

Study area

Kafta-Sheraro National Park (KSNP), which was recognized as a Park in 2007 (Letter, No: 13/37/82/611) is situated in the northwest of Ethiopia between 13° 50' and

14° 23' N and 36° 31' and 37° 29' E (Fig.1). It is bordered by Eritrea in the North and it is presumed to have an estimated total area of 5000 km².

In order to reveal information on the threats of African elephants, community perception towards African Elephant both structured and semi-structured questionnaires were designed. For this survey a stratified random sampling technique was used. The stratification was, base on villages distance to the park, sex of the respondents, level of education, land type and years of resided with a total sample size of 240 respondents.

Age and sex description of African elephants in KSNP was made by direct observations based on the general appearances of elephants (Moss, 1996). During the operation of visual assessment age and sex of elephants were estimated using a combination of characteristics such as differences in height, physical development, head and tusk shapes, the length of tusks, and body shape and proportions (Manspeizer and Delellegn, 1992; Moss, 1996). The age classes used during the survey was listed below as: Infant = 0 – 2 years, Juvenile = 3 – 8 years, Sub adult = 9 – 15 years, Adult = 16 years and above.

Data management and analysis

Results from the survey and relevant secondary data were organized, summarized and analyzed based on six independent variables such as; villages, sex, distance to the park, land type, number of years resided and level of education having different levels on each. The data obtained from the survey were collected and structured

using Microsoft Excel before it was subjected to the distribution, fit Y by X, analysis procedures of JMP Version 5 (Business group of SAS). Chi-square test was used for analyzing the relationship and level of significance of the difference data categories. The data was presented using tables, and graphs.

Rank analysis

For management problem and major treats elephants were ranked using preference ranking methods. In preference ranking method, index was computed with the principle of weighted average. The following formula was used to compute index as employed by Musa (2006):

$$\text{Index} = R_n * C_1 + R_{n-1} * C_2 \dots + R_1 * C_n / \sum R_n * C_1 + R_{n-1} * C_2 \dots + R_1 * C_n; \text{Where,}$$

R_n = Value given for the least ranked level (If the least rank is 5th, then $R_n = 5$, $R_{n-1} = 4$, $R_1 = 1$)

C_n = Counts of the least ranked level (in the above example, the count of the 5th rank = C_n , and the count of the 1st rank = C_1)

Data collected for Demography using different techniques was presented using descriptive analysis, including tabular presentations, graphs and percentages.

RESULTS AND DISCUSSION

Community perceptions towards elephant conservation

The perception of respondents in the study area was classified in to positive, negative and neutral based on their support on the conservation of elephants in KSNP.

TABLE 1: Views of respondents towards elephant conservation in KSNP perceived in different villages

Villages	Positive	Negative	Neutral	Test		
	N (%)	N (%)	N (%)	DF	X ² -value	P-value
Adebay*	0(0.0)	20(100)	0(0.0)	22	163.613	<0.0001
Mytemen	20(100)	0(0.0)	0(0.0)			
Tekeze	20(100)	0(0.0)	0(0.0)			
Mykuhli	20(100)	0(0.0)	0(0.0)			
Edris*	5(25)	15(75)	0(0.0)			
Wuhdet*	7(35)	13(65)	0(0.0)			
Adigoshu*	8(40)	12(60)	0(0.0)			
Adiaser*	11(55)	7(35)	2(10)			
Aditsetser*	0(0.0)	20(100)	0(0.0)			
Rawyan	18(90)	0(0.0)	2(10)			
Giyts	14(70)	6(30)	0(0.0)			
Mykeyh	18(90)	0(0.0)	2(10)			
Total	141(58.8)	93(38.7)	6(2.5)			

Note: The symbol (*) indicates villages nearby KSNP

The negative attitudes towards both elephants and the wildlife authorities were developed as a result of crop damage by elephants and the absence of compensation mechanisms. Yirmed (2008) observed that 21.5% of respondents in Babbile Sanctuary had negative attitude due to the destructive action of elephants.

The attitude of respondents towards elephants in different villages differed significantly ($x^2 = 163.613$, $DF = 22$, $P < 0.0001$ showed in Table 2). Of all the respondents in Mykeyh, Tekeze and Mykuhli villages (far to the park) showed 100% positive support. About 90% of the respondents in Rawyan and Mytemen, 80% of the respondents in Giyts had positive attitude towards

elephants. About 55% of the respondents in Adiaser, 40% in Adigoshu, and 35% in Wuhdet showed positive support on the conservation of African elephants in KSNP. Various reasons were suggested for why people had a positive feeling about the elephants, such as the importance of natural resource conservation and management for continuously utilizing, and being amongst God's creatures so they considered them as their cattle. Contrary to this, all respondents from Adebay and Aditsetser, 75% from Edris, 65% from Wuhdet, and 60% from Adigoshu showed negative attitude towards elephant conservation. The respondents considered elephants as valueless because of their crop raiding activities, and the need of cultivation inside the park. The responses from

few of the people interviewed in Adiaser, Rawyan and Mytemen were neutral (10%).

The percentage and number of respondents' perception per independent variable of the study are presented in Table 2. Out of all the studied factors, only land type and distance to the park had a significant influence on perception.

Almost all of the residents in Kafta-Humera were not indigenous to the area, particularly the people in the study sites (Tabias). Some of the communities in the area were settlers from other drought prone areas of the region (TRGBRD, 2003).

TABLE 2: Influence of various factors on community perception.

Parameters	Level	Positive	Negative	Neutral	Test		
		N (%)	N (%)	N (%)	DF	X ²	P-value
Sex	Male	87(62.1)	49(35)	4(2.4)	2	2.04	0.359
	Female	54(54)	44(44)	2(2)			
Land type	Owner	105(70.5)	38(25.5)	6(4)	2	32.5	<.0001
	Landless	36(39.6)	55(60.4)	0(0)			
Distance	Near	31(26)	86(72.3)	2(1.7)	2	126.8	<.0001
	Far	110(90.9)	7(5.8)	4(3.3)			
Year of resided	0-5	72(62.6)	40(38.8)	3(2.6)	6	4.9	0.439
	6-10	45(58.4)	29(37.7)	3(3.9)			
	11-15	19(48.7)	20(51.3)	0(0)			
	>15	5(55.6)	4(44.4)	0(0)			
Level of education	A	25(53.2)	19(40.4)	3(6.4)	6	6.87	0.3325
	B	74(57.3)	54(41.9)	1(0.8)			
	C	26(63.4)	14(34.2)	1(2.4)			
	D	16(69.9)	6(26.1)	1(4.4)			

Note: N = Number of respondents, A = Illiterate, B = Basic education, C = Primary school, D = High school,

Such settlers were allocated a piece of land for farming. However, there were also other groups who settled in the same areas without having access to land (landless). The presence of such a gap in land holding led to significant variation in perception towards elephant conservation. The highest number of the respondents from the landless 60.4% (n = 55) had negative attitude to the conservation of African elephants in KSNP (Table 2). This attitude might be due to the need to have arable land for cultivation. Such group of settlers did not worry for the development of the park, as they didn't live permanently in the area. Their interest was getting high production and develops financial capacity, and return to their original area. However, some of these landless groups 39.6% (n = 36) had positive attitude towards the park and conservation of elephants. Whatever they did not had their own agricultural plot, do not need land for cultivation from the conservation area but they need to use a land by rent from the people who had access to small agricultural plot. Compared to the respondents of land owners, the highest number 70.5% (n = 105) had positive support on the conservation of African elephants. These people did not worry on the additional need of land for cultivation rather they thought about the future development of the park and had better understanding on natural resource conservation. Some of the land owner respondents 25.5% (n = 38) had negative support on the conservation of African elephants in KSNP. This was due to the need of grazing land for their livestock in the park and complained on the penalty of 50 ETH Birr per animal. Dublin (2007) underlines the increasing of human populations and expanding agriculture has increased the potential for conflict between humans and

elephants in many regions. Elephants have been compressed into ever-smaller areas and their traditional migration routes have been cut off. As a result, humans and elephants compete directly for land that is becoming increasingly scarce.

A significant difference ($P < 0.0001$) in peoples' attitudes towards the elephants was shown between the respondents from villages near to or far from the park. Most respondents 72.3% (n = 86) in the near villages had negative support on the conservation of African elephants. Whereas the respondents (n = 110, 90.9%) (Table 1) from the villages relatively far had positive support for the conservation of African elephant in the park. According to findings of Yirmed (2008) HEC largely influenced the attitudes of people living inside and nearby the Silent area of the wildlife conservation areas. Dublin (2007) suggested human elephant conflict (HEC) creates anger towards elephants from the communities who live with them because they can ruin people's livelihoods. Such anger undermines support for elephant conservation, and has lead to farmers killing elephants or turning a blind eye to poaching in retaliation for the damage they have caused. Consequently HEC casts a threatening shadow over the future of elephant conservation outside protected areas. In addition to this, IUCN (1995) reported that, local peoples to nearby elephant conservation pressured on government to find solutions from grassroots level for elephants impinge on people. Demonstration against governments had taken place in Gabon, Cameroon and Kenya demanding the choice between elephants and human being. They challenged their respective government asking whether elephants have become more important than people.



FIGURE 1. People clearing the land through burning inside the park for cultivation

Major problems for elephant conservation and threats to live in KSNP

The view of respondents was divided into five categories based on five independent variables. Respondents in both distance villages (near and far) claimed that poor patrolling (lack of ownership mentality) was responsible for poor elephant’s conservation in the area (Figure 2). This may probably due to delay of development activities, that is starting from resettlement program in 2003, particularly nothing was done except employing scouts

(forest guards) which opened access for illegal participants who are intensively using the resources of the park. Inconsistent boundary demarcation that failed to involve the communities in the description process; they said, this has escalated encroachment of humans and livestock. In addition to this, the number of scouts is very small to look after the huge park. This was in agreement with Yirmed (2008) who noted that lack of owner ship is the main reason for poor elephant conservation in Babbile Sanctuary.

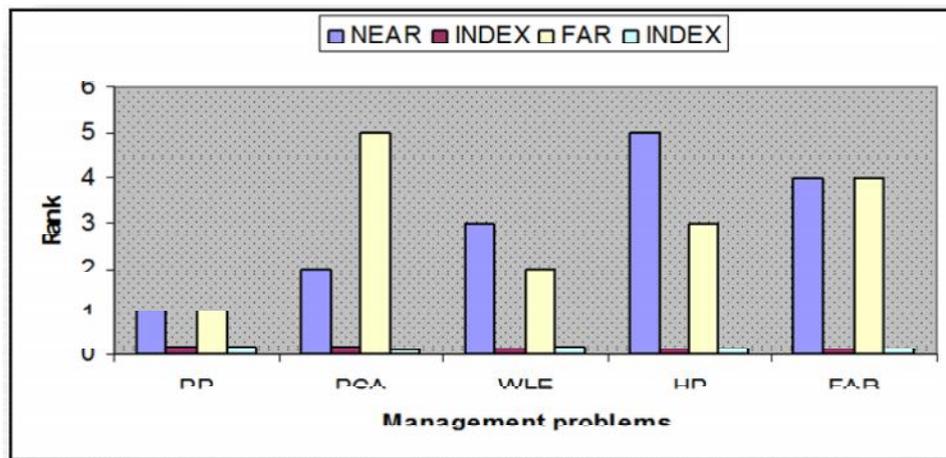


FIGURE 2: Major problems as identified by local communities for effective management of elephants in KSNP. Note: PP=Poor patrolling, PCA=Poor community awareness, WLE=Weak law enforcement, HP=High population, FAR=Free access for resources. (Rank 1 = the most management problem) (Rank 5 = Least management problem).

Unlike respondents in far villages, respondents in nearby KSNP, believe poor community awareness next to poor patrolling. Their belief could be related to the fact that interests of villagers on clearing the bushes for cultivation and deforestation of key species for house construction and sales. In addition to this, the lower understanding of the community on elephants and the priority of the conservation area for the elephants taken as valueless rather using for cultivation. This interest of community concedes with the finding of Teshale (2007) that stated 1174 households brought clearance in Kafta-Sheraro National Park.

View of the community on identification of major threats

Followed the management problem for effective conservation of elephants in KSNP, views from the respondents were collected towards the threats of elephants. Their view was divided in to five categories based on the five independent variables. Respondents in both nearby and far to the park ranked habitat disturbance and illegal hunting consecutively (Table 3). The ranked of respondents habitat disturbance as a major treat is probably due to the ongoing cultivation of their habitats with increasing risk of conflicts of interest with human co-habitants. This result is correlated with others (Stephenson,

1976; Largen and Yalden, 1987; Yirmed et al., 2006) who reported that the greatest threat to the survival of elephants in Ethiopia is habitat loss and the same Shoshani and Yirmed (2008) in their report pointed out habitat disturbance as major threat for the survival of elephants in KSNP due to continuous encroached inside the cultivation of elephant’s habitat.

conservation area and clear bushes for agricultural crops, and the continuous firing. Lahm (1994) also suggested the survival of elephants in Sri-lanka is in question due to the higher conflict of human interest of co-habitants and continuous

TABLE 3. Household ranking of threats of African elephant in NEAR and FAR sample villages to KSNP

Threats	NEAR		FAR	
	N (index)	Rank	N (index)	Rank
HD	48 (0.41)	1	45(0.39)	1
IH	33 (0.28)	2	22(0.19)	3
LI	22 (0.19)	3	35(0.30)	2
FS	17 (0.13)	4	18(0.11)	4

Note: HD=Habitat disturbance, IH=Illegal hunting, LI=Livestock interference, FS=Feed Shortage. (Rank 1 = the major threat) (Rank 4 = Least threat).

The next threat for the African elephant in the park was illegal hunting. Poaching on African elephants for ivory was mentioned as serious threat. The least and as minor threat mentioned by the respondents were feed shortage. This may be true as compared the total area of the park

(5000km²) with the total elephant population in the area, it is more than enough according to the finding of Lindeque (1991a, b) reported that elephants range occurring within protected areas will provide secure habitat for 6000 elephants at an average stocking rate of 0.12 elephants per km².



FIGURE 3. Extensive deforestation of African elephant’s habitat in the park.

Age structure of elephants

The percentage of adults within the population was 66%, 20.9% were sub adults, 14.5 were juveniles and 9% were infants (Table 6). The percentage of infants much correlated with percentages observed in other areas in

normal rainfall years. Yirmed (2008) counted 8% of infants in Babbile Sanctuary in early 2007. Lindeque (1991) observed with 8.5-9.5% of infants in Etosha National Park, Namibia in May 1984 and August 1985



FIGURE 4: African elephants crossing farming areas in the park.

TABLE 6. Age structure of elephant population in KSNP

Adult	Sub adult	Juvenile	Infant	Unknown	Total
>15 yr	9-15 yr	3-8 yr	1-2 yr		
60	23	16	10	1	110
66%	20.9%	14.5%	9%	0.9%	100%

The proportion of adults (>15 yr) varies from 34-38 in increasing population, such as South Africa (Kruger National park) and Tanzania (Manyara), to over 50% for populations that were stable, or recovering from large scale drought mortalities (Owen-Smith, 1988). The higher number of adults and young (combinations of sub adults, juvenile and infants) within the KSNP elephant population thus indicates a relative stable population.

Summary of age class

The age and sex structure of the different family units were compared. The result was similar for all age classes except variations in the site difference. There was also little fluctuation in apparent study site class abundance. There is a sex difference in survival ship in favour of females. There were variations in age class size from month to month, and this is a reflection of the exposure of

the team to the different family units. The nature of the peaks for age classes over the months showed similar trends, high peaks for adult females followed by sub-adults. And the third peak was the same for adult males and juvenile, and lower for infants.

The age classes and sex structure of the elephants are presented in Table 18 and of the total number of elephants, 39% adult females followed by 21% sub-adults, 15% adult males and juveniles per each, and 9% were for infants. The presence of adult females and males were higher as compared to combination percentage of sub adults, juveniles and infants. Thus indicates of the KSNP elephant population with a relative constant population. The number and age classes of elephants observed in the four months are summarized in Figure 5.

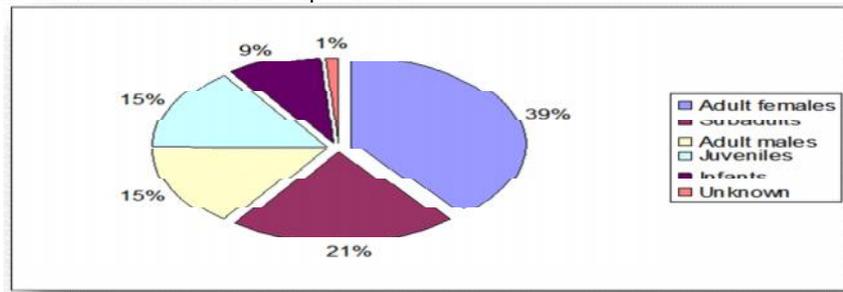


FIGURE 5: Percentage of Elephants Age distribution

The proportion of cows to infants, juveniles, bulls, and sub adult males were: 1:2.3, 1:3.6, 1:3.6, and 1:5.2, respectively. Cows represent 39% of the population. The adult male ratio of adult females was 1:3. Page (1980) suggested that there was a marked skew in adult male: adult female ratio (1:3.9). Hall-Martin (1987) calculated a ratio of 1:3. Elephants shot in the area during the rainy season regularly since they first appeared. Where crop raiding occurred mixed groups were shot, but more frequently males. Yirmed (2008) showed a female-biased population sex ratio, with four times as many cows as bulls. This skewing was greatest for older age classes. The report of Poole (1989) clearly demonstrated that there is a skewed sex ratio in populations of elephants that had experienced high levels of poaching.

CONCLUSION

This study assessed community perceptions and major threats of African elephant, and quantified the various negative impacts made by both humans and elephants. It also indicates that the conflicts between humans and elephants in KSNP have been getting worse over time and underline the need to find a workable solution to stop the progress of encroaching human activities that are core factors in the conflict. The underlying factors were found to be free encroachment into the elephant home ranges, mainly for cultivation and dry wood collection. Most of the factors land holding type and village distance significantly influenced perception of respondents, with relatively high negative attitudes exhibited by landless settlers who look for cultivation land inside the park. The improper demarcation of the park and delayed of developmental activities facilitated to develop negative attitude on local communities towards the conservation of elephants in the area. The factors that contributed to the

poor conservation of African elephant included weak community awareness and understaffed anti-poaching and patrolling team of the KSNP. According to the respondents, the major threat for the survival of African elephants in KSNP consistently is habitat destruction. The on going cultivation of elephant habitats with increasing risk of conflicts of interest with human co-habitation is high, and the occurrence of wildfires. The UN proper land use by host settlers (wefrizemet) as well as legal settlers maximizes the level of habitat disturbance (threat of the elephants in the park) due to illegal cultivation with high number of livestock crossing to the park. Other threats included illegal hunting and poaching. The percentage of adult elephant population is greater than youngsters (a combination of sub adult, juvenile and infants), and the ratio of males are skewed due to previous hunting selection of bull elephants.

RECOMMENDATION

The federal and regional government should pay attention to the park in the enhancement of local prosperity, to generates supplementary income and expands job opportunities as well as acting as a tool for the conservation of the natural environment. In addition to this, the local administration urgently should re-allocate farmers that had legal arable land inside the park. Developmental activities should be put into practice. Wildlife management authorities should encourage ensuring that protected areas with elephants receive adequate patrolling, and that law enforcement staff are well housed, equipped, well trained and led, and adequately remunerated. Improve the extension services and training in awareness creation and knowledge development of the local community on the importance of elephant conservation, and the participation of local

people in design, planning, implementation and evaluation should be encouraged.

To calm down the major threats of African elephant (Habitat disturbance and Illegal killing) involving a wide range of activities that is impossible for the management authority to carry out all conservation related functions by itself, there should be delegation of some duties and broad participation and cooperation from a spectrum of institutions. To ensure laws, coordination is required with the police, and perhaps with the military authorities as well as with the local government.

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