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People and Spotted Hyena (Crocuta-Crocuta) Interaction: The Case of Kembata Tembaro Zone Damboya Woreda, Southern Ethiopia

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Abstract
The interaction between people and spotted hyena (Crocuta crocuta) was studied in Kembata Tembaro Zone Demboya Woreda Southern Ethiopia from November 2012 – February 2013. The data was collected using household questionnaire survey (n=200), field observations and scat analysis (n=235 sample out of 47 scats). The objectives of the study were to obtain information on hyena habitat use, its diet composition and assessing people attitude and hyena indicating its impact on their livelihood. The questionnaire survey recorded a total of 498 domestic animals killed by hyena during 2011 - 2013 which resulted in economic loss of 480, 151 ETB (25,271 US$). Of hyena depredations on sheep, goat, cattle, pack animals, dog, and poultry, the highest loss was recorded on sheep (47.5%). The depredations on livestock including domestic animals accounted for 81.6% and wild animals for 19.4%. As a result, the majority of local community (78.96%) developed a negative attitude towards hyena. Livestock depredations and hyena being threat to human safety were the main causes for the development of such attitudes. The local community argued that habitat destruction (76%), rapid increase in human population (19%), decline in wild prey (5%) were probably the causes for such behavioural development of hyena. Mitigation measures being used presently by the community included early arrival to livestock enclosures , guarding animals and their children, driving hyena when attacking livestock, covering their den, burning and clearing off their habitats, retaliatory killing and diverting their livestock rearing system. Recommendations of the study for resolving conflict between people and hyena in the area include both short term and long term measures; Providing diversionary feeding sites, to hyena increasing awareness of wildlife benefits and wildlife laws of the country, inculcating importance of living in coexistence with wildlife, selective harvesting depending on situation.Further, research is required on behavioural ecology of hyena including population dynamics and their movement patterns in the study site for formulating sound management plan for conflict mitigation.
Keywords: Depredation, human safety, hyena-livestock, Interaction, Kembata Tembaro Zone, scat, Spotted Hyena.

INTRODUCTION

Earth is provided with plenty pleasant, shy, aggressive and attractive, common and rarer wildlife, which encompasses from smaller bacteria which can live anywhere to those the bigger like lion and elephant which can live from bare land to an impenetrable thick forest. Wildlife has traditional and customary value for man. Wildlife is used by community as food, luxury, medicine, source of income generation etc. In a natural habitat, wildlife is living by performing various activities by minimizing and balancing the unnecessary increase of its numbers, cleaning environment and maintaining ecology. The existence of one can make life suitable for others. There is prey - predator relation in all kinds of wildlife. The predator can check unwanted increase of the prey and the prey can serve as survival for the predator, this activity going well if the wild life protected and conserved. However, this process is highly disturbed by increase in human population. The rapidly growing population needs to feed itself. This results in competition between human population and wildlife for natural resources. The habitat of wildlife may range from strictly protected area to open land in a farm land and more close to human settlement.

The local communities have been encroached to wildlife habitat and start destructing the residence of wildlife and use these grazing land, farm land and settlement area in many parts of the world. This results in competition between human population and wildlife for natural resources and results in human wildlife conflict. A conflict between human and wildlife is not a recent phenomenon but which had started dawn of humanity (Hill, 2002). They occur on all continents, in developed as well as developing countries, but the magnitude of the problem varies form one region to the other according to the particular environment and people's way of life (FAO, 2009).**A**s it is witnessed in literatures HWC is described as any situation where wild animals because problems for people, wild animals may damage crops, destroy houses and property, and their livestock, and they may even endanger lives of man. There are many different forms of conflict, but they are all similar in that they have a negative effect upon the people involved. Wild animals that cause conflict with people are often called 'problem animals'. Wherever people and wildlife come into contact there is potential for occurrence of negative

interaction if interest overlapping. However, the people who are most likely to be affected are those living in remote villages surrounded by woodland where many animals live. In Africa, rural farmers suffer from conflict with wildlife because they share the landscape with wild animals particularly carnivores (Alan Hesse, 2002).

Hyenas are largely scavengers that consume the remnants of body discarded by carnivores. However, this is not solely right; studies demonstrate that hyena is efficient predator in its own right and opportunistically kill the prey that they eat (Cooper *et al*., 1999). It has been recorded eating almost any mammal, bird, fish or reptile, irrespective of size (Mills, 1990; Herschel and Skinner, 1990; Sillero-Zubiri and Gottelli, 1992). It may also pick up carrion and human-associated organic material, including cooked porridge, garbage, a variety of vegetable matter, and different wildlife. It is the most common large carnivore in the highlands and lowlands of Ethiopia, Eritrea, and Somalia, and has occupied both a scavenging niche and a predatory position at the top of the food chain (Gade, 2005). The total world population size is more than 10, 000 individuals and its range well exceeds 20,000 km^2 (IUCN, 2000).

The spotted hyenas detect live prey by sight, hearing, and smell, carrion by smell, by noise of other predators feeding on the carcass, or during daytime, by watching vultures descending on a carcass. Its hearing is acute enough to pick up noises emanating from predators killing prey or feeding on carcasses over distances of up to 10 km (Mills, 1990). Hyenas observed in many parts of Ethiopia but prey population appears generally lower (Gidey and Hans, 2012). This pattern leads hyena to compete with human in order to survive which inturn leads to negative effect on people. Local community in Kembata Tembaro Zone, Demboya *Woreda,* complains of livestock losses by spotted hyena and being threat for people. Nothing is known about -the level of the impact on livestock depredation caused by hyena. The major focus of this -study is to concentrate on economic impact caused by hyena, asses the conflict mitigation measures taken by the resident of the study area and to recommend further measures to reduce conflict.

Description of the Study Area

The proposed study area is situated in the southern Ethiopia's, North East of SNNPRS in Kembata Tembaro zone. It is located 350 km South of A.A. It lies between 0720'17''N and 03756'52.5''45''E having 81000 populations, 98.5% are rural residents. The altitude ranges from 800 m a s l to 3058 at the peak on mount Ambarcho. The annual minimum and maximum temperatures range from 15 to 40 c^o. The rainfall is bimodal occurring mid-February - April (small rains) and June – August (main rainy season). The landscape of the study area is mainly mountainous; Mt Dato 2nd highest peaks in the area, plateau, gorge and plains are also seen. Most of the area is known to have fertile soil, which is suitable for agricultural activities. Livelyhood strategy of the community is mainly based on mixed farming i.e. raring animals and cultivating crops. The area experiences alpine (wurch), Temperate (dega) subtropical (Weynadega), and tropical (kola) climatic type.

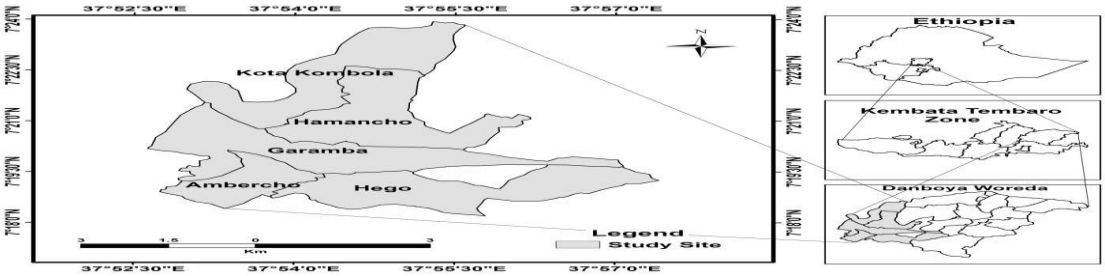

Figure 1: **Map of the study site**

Methods

Both primary and secondary data sources were included. The primary data are those data's which are obtained from the main source. The secondary data, on the other hand, are those data which have already been collected by other investigators in the prior periods (Kothar, 2004). **Preliminary study :T**he preliminary survey was conducted during September to October 2012. During this period, all the available and relevant literature on the human wildlife conflict mainly spotted hyena and people interaction were reviewed. Attempts were made to find information on accessibility, climate, vegetation, fauna, topography, infrastructure and approximate size of the core area of hyena damage in the kebeles. **Sampling:** The study site has 19 Keble, of which, five were taken on the basis of the severity of the problem. Of total households in the study site, 200 i.e. 8 % of the population from each Kebeles (Israel, 1976) were taken as a sample population (Table 1).

Table 1: Household and sample size across the five Kebles

Sample Keble	Total house hold	Sample size
Ambaricho	456	36
Geremba	520	42
Hameancho	565	45
Hego	530	42
Kota kombolla	435	35
Total	2506	200

Systematic sampling was followed to get representative samples from the study. The data was also collected using Focus Group Discussions (FGD) from key informants those who were working in government institutions such as teachers, police, and rural development office workers.

Data collection

House hold questionnaire survey

The questionnaires contained both closed and open type questions which were distributed to systematically selected households (See appendix I,-V). This invites respondents to give response freely using their own opinion (Kothar, 2004). FGD were also held with villagers severely affected by hyena with Community leaders, Agriculture and animal health officers and Woreda government officials like Security and administrators to gain additional information on people hyena interaction.

Hyena scats : To strengthen the study hyena scats were collected (n=47) to investigate what hyena has eaten in the kebeles in the study area. A total of 12 sctas were collected from Ambaricho, Geremba (9), Hameancho (13) Hego (7) and Kota kombolla (6). Appropriate procedure was followed (Ramakrishnan *et al*., 1999; Gidey and Hans, 2012)

Figure 2: Photo of hyena faeces collection from field and analysis in the laboratory

3.1.8 Data analysis

After collection of the faeces the samples were mixed with water for 6.00 hours. Then washed by hot water and hairs were extracted and dried in hot/sunny air for one day, to remove any mucous accumulation and other contents of the moisture. These hairs were then washed by ethanol for further clarty and finally, the hairs were put into slides to check the structure of the hairs wether it has relationship with the hairs of livestock of different species or not. The hairs were analysed on form, appearance and colour with the naked eye in collaboration with expertise as well as on a scale patterns microscope at 10X magnification. The hairs were then compared with original hair collected from sheep, goat, cattle, hoarse, mule donkey and dog, from domestic and common ducker, porcupine and mongoose from wild. This reference hair group was hairs from different species of the victim livestock that are commonly reared in investigation area. By comparing and contrasting the hairs that were obtained from the droppings it was found that domestic livestock's were killed and eaten by spotted hyena. To find out the preferable species of spotted hyena among the domestic animals Jacobs's selectivity indices of 1976 were used

$$\frac{r - p}{r + p - 2rp}$$

Where r stand for the proportion of the total kills on the study area by spotted hyena, and **p** is the proportional accessibility of the victim animals, if the calculated value lies between positive one and negative one (+1 to –1), in order to demonstrate selection of prey and avoidance of prey +1 indicates maximum preference and _1 indicates maximum avoidance (Jacobs, 1974). The quantitative and qualitative information collected through questionnaire survey were organized, checked, coded and entered into the computer. The statistical package for social science (SPSS) version 16 was applied for analysis of the data. Cross tabulations, frequencies and percentages were used. The x^2 test to examine the attitudinal difference between educated and non-educated households towards wildlife in general and spotted hyena in particular. The results were presented in charts graphs tables and diagrams. The analysis employed descriptive statistics.

3.1.9 Materials used during the data collection process

To simplify the data collection process and to come up with successful result the use of field work materials has a paramount importance. Therefore GPS, photo camera, bag, Video camera, binoculars, an umbrella flash disk,

laptop computer for the analysis of hairs compound microscope were used.

4. Results

4.1. Demography, socio-economic status and livelihood strategies

A total of 200 individuals participated in the study, of the respondents, majority were males (85%) & (15) females. The major age class of the respondents ranged between 41-50 years (41%) followed by 31- 40 years (30%). Mass of respondents was permanent residents (88%) and only 12% had settlers both here and elsewhere. Majority of respondents was found to be married (85%). About 57% of respondents were literate and 43% were illiterate. There was no Significant difference in terms of education level across the Kebles (x^2=19.41, df =4, p>0.05) (table, 9), probably age, distance, and lack of awareness are major factors that played role. Hego had 61% literates, Germba 68%, Hameancho 58%, Kota 49% and Ambarcho 46%.

Table 2: back ground &socio economic characteristic of the respondents

Variables	House holds	N=200	%
Sex	Male	17	75
	Female	29	24.5
Age	16-30	32	16
	31-40	60	30
	41-65	108	54
Residence:	Rural	184	92
	Urban	16	8
Education	Illiterate	86	43
	Informal	7	3.5
	Elementary	70	35
	High school	20	10
	College	17	8.5
Marital status:	Single	22	11
	Married	170	85
	Divorced	1	0.5
	Widowed[1]	7	3.5
	1-5	60	30
Family size:	6-10	90	45
	11-15	50	25
Occupation:	Farmer	165	82.5
	Trader	19	9.5
	Others	17	8.5

1males and females who lost their life partner

The majority of households (72%) held <1 hectare of land and only 28% had relatively more land (x^2=1.475, df=4, p<0.05).The variation was due the dense population of the area. Livelihood of majority of community depended on mixed farming (82.5%) followed by local trades, cash crop farming, and employment in government and non-government institutions. Mixed farming (83), Trade (10%) Cultivating crops only (3.5%), Rearing animals only (2%), others employed (1.5%) (Table2). The main types of crops people growing in the Kebles were wheat (*Triticum* sp.), barely (*Hordeum-vulgare*), Maize (*Zea mays*), Teff, (*Eragrostis tef*), Potato (*Solanum-tuberosum*), Enset (*enset.*sp.) and cash crops like Sugarcane (*Saccharum*),Coffee (*coffee canephora*), Tobacco (*Nicotiana Tabacum*), khat (*Catha edulis*). The local community were rearing livestocks such as Cattle (*Bos primigenial)*, Sheep (*Ovis aries)*, Goat (*Capra aegagrus hircus*), Donkey (*Equus asinus)*, Horse (*Equus ferus caballus)*, Mule, and Poultry. Of these, the cattle rearing accounted for 49.4% followed by 18.2% sheep 13.7goat, 11.3donkey 7.5horrse (Table, 3). The livelihood activities of local community similar across the Kebles(x^2=14.11, df=4, p>0.05).

Table 3: Major economic activity ranking, Table4 livestock preference in ranking order

Economic activity	%	Rank
Mixed farming	83	1
Trade	10	2
Cultivating crops only	3.5	3
Rearing animals only	2	4
Others(employed)	1.5	5
Total	100	

No. of livestock record in preference order			
Species	Stock no.	%	Rank
Cattle	21830	49.4	1
sheep	8050	18.2	2
goat	6043	13.7	3
donkey	4985	11.3	4
horse	3300	7.5	5
Total	44,208	-	

4.2. PEOPLE- HYENA INTERACTION

4.2.1. Hyena habitats

When asked about hyena habitat, the local community informed that hyenas now are found in highly fragmented forest habitat and also commonly sighted in close proximity to people. 63.5% respondents said spotted hyenas used fragmented natural forest, 28.5% said now hyenas used any habitats where they got concealment such as holes, thick plantation especially sugarcane and made their dens, about 5% replied plantations, 3% said riverbanks.

4.3. ABUNDANCE

When asked about occurrence and population fluctuation pattern of hyena in the Keble's, 99% of the respondents informed that hyena population now is increasing. In the past about 5-10 years back, the hyena sighting during day was rare and it was rarely conflicting with communities' interests. When asked about the maximum numbers of hyena sighted at one spot these days, about 74% responded that the numbers ranged between 3 – 15 individuals, 13.5% said 16-25 individuals, 5% said > 25 individuals and only 8% said they did not see hyena. Five line transect counts were made to record hyena numbers from Ambarcho – Geramba to Hameancho, about 1 km transect for an hour in the evening between 1830 – 1915 during February 2013 (11 Feb, 13 Feb, 15 Feb, 21 Feb, and 27 Feb) and the results correspond with the local communities observations. The hyenas counted during our counts ranged between 3 –13 individuals. Maximum individuals were sighted together at garbage between Ambarcho and Geramba.

Table 4: prey killed by spotted hyena on the study site

Prey species	Count	Precent
Sheep	112	47.4
Cattle	41	17.5
Goat	30	12.8
Horse	3	1.3
Dog	6	2.6
Common ducker	12	5.1
Porcupine	16	6.8
Mongoose	15	6.4
Unidentified	3	1.3
Total	235	100

4.4. HYENA DIET AND PREY PREFERENCE

Both questionnaire survey and scat analysis was exercised to get information on the diet composition of hyenas in these Keble's. It was found that hyenas in the study area were dependent on domestic livestock for their survival more and less on wild prey. Of 47 scats (n= 235 samples), 81.6% accounted for domestic diet and 19.4% from wild. Among livestock's the hyenas' prey was 47.5% on Sheep, 12.8% was Goat, 17.5% Cattle, 2.9% Donkey, 1.3% Horse and 2.6% Dog. From wild animals, 5.1% was crested porcupine, 6.8% common ducker, 6.4% mongoose (Table 4). Jacobin's prey preference index also showed that hyenas in the study area preferred on sheep and goat respectively (Table 5). It was on one occasion hyena was sighted targeting on sheep (personal direct observation). The questionnaire survey revealed that the hyenas targeting livestock's more (58%) followed by small wild animals (18.5%), sheep is the most vulnerable for the attack of hyena, leftovers at garbage, carrion (15%) and crops such as maize and sugarcane 6.5% (Fig. 3).

Diet selection of hyena

Table 5: prey preference of hyena on the study site

Species	Stock	kills	Index
Sheep	8050	112	0.54
Goat	6040	46	0.11
Cattle	21830	29	-0.69
Donkey	4985	7	-0.55
Horse	3300	3	-0.67
Total	44205	197	

Figure 3: Left overs of sugarcane in Hameancho Keble chewed by hyena.

4.5. OPINIONS AND VALUES

Majority of community agreed on the right of wild animals to live (60.5%). 64.5% of respondents showed willingness to learn about wildlife role in nature and for people. Large number of respondents (80.5%) had opinion that wildlife should benefit local communities much more economically. When asked 'do you want to live in co-existence with hyena' the most (47 and41%) were not interested to coexistent to live in areas where hyena lives and replied (strongly disagreed and disagreed) respectively. Only (3 and9%) of the respondents agreed to live in co-existence with hyena, it was found that there was significant statistical variations across the variables regarding the opinion of respondents to wards wildlife management of the area**.** (p<0.05) (Table,7).

Table 6: prey preference of hyena on the study site

Opinion	Strongly disagreed%	Disagreed %	Strongly Agreed %	Agreed %	Mean	Sd	Sig.
Wildlife have right to live	9.5	7	23	60.5	3.34	0.970	0.001
Wild life -value Awareness	7	4	24.5	64.5	3.46	0.867	0.003
Human – hyena coexistence	47	41	3	9	1.74	0.892	0.001
Wildlife benefit community	6	5	8.5	80.5	3.64	0.834	0.001

4.6. ATTITUDE OF RESPONDENTS

Majority of respondents had negative attitude towards wildlife and its conservation, about 66.3% had negative attitude, only 36.7% of the respondents showed positive attitude. All the Kebles showed similar attitude towards wildlife and its conservation, (x^2, 11.891, df, 4, p>0.05) (Table7).

Table 7 : Attitudes of people towards wildlife and hyena on the study site this table does not distinguish between wildlife and hyena.

	Attitude towards wild life		Attitude towards Hyena	
Study site	Positive (%)	Negative (%)	Positive (%)	Negative (%)
Ambaricho	44.4	55.6	30.6	69.4
Hameancho	22.2	77.8	15.6	84.4
Geremba	33.3	66.7	14.3	85.7
Hego	31	69	19	81
Kotakombolla	31.4	68.6	25.7	74.3
Total	32.46	67.54	21.04	78.96

Concerning spotted hyena in the study area, majority (78.9%) had negative attitude towards hyena and its conservation and only 21.1% showed positive attitude to hyena. Across the kebels similar attitude was found towards hyena, since the effect is high in all Keble is more or less similar, majority held negative attitude (x^2=15.73, df=4 p>0.05). In terms of sex 97% of male and 2% of female respondents held negative view towards hyena, of the total 45% of educated respondents held negative outlook towards hyena. Of the total 76% of the households who held land below one hectare had negative attitude and only 8.5% whose land is more than one hectare had negative approach to hyena which showed no significant difference in their attitude to hyena, however livestock loss (62.5%) held negative view, regarding their own safety 25% of the respondents informed that they had negative view towards hyena , concerning family safety about 90.5% of the respondents had negative and relating to the size of family out of the total 78% had negative towards the already identified problematic animal were found to have significant difference in their views to hyena . People confronting high stock loss probably developed more negative attitude towards hyena. Similarly those who had more attacks on them and their family developed more negative views of hyena and had showed statistically strong significance. (Table, 8).Apart from sex, age, education and land holding the rest of the factors are statically strongly

significant and the rest are weakly significant (table, 8).

Statistical value for factors affecting the attitude of local communities to wards hyena in particular and wildlife in general in the study site.

Table 8: Factors affecting attitude of local community towards hyena and wildlife in general.

Statement	X^2	df	P
Family size	88.006	4	0.000
Own safety	56.219	4	0.000
Safety of family	1.1126	4	0.000
Stock loss	34.798	4	0.000
Sex	2.076	4	0.913
Age	14.563	4	0.104
Education	19.409	4	0.248
Land holding	14.932	4	0.875

4.6.1. CAUSES FOR THE DEVELOPMENT OF NEGATIVE ATTITUDE

When asked "what was the reason for the conflict between hyena – people' responded that about 75% said that the reason for conflict between people and hyena was accelerated by the miss use of natural habitat by the people, 20% replied that the conflict was occurring because of decline in the natural wild prey in the area, over 5% believed that it was because of encroachment and formation of settlements in areas which was previously untouched and served as natural habitats for hyenas. (Fig3).

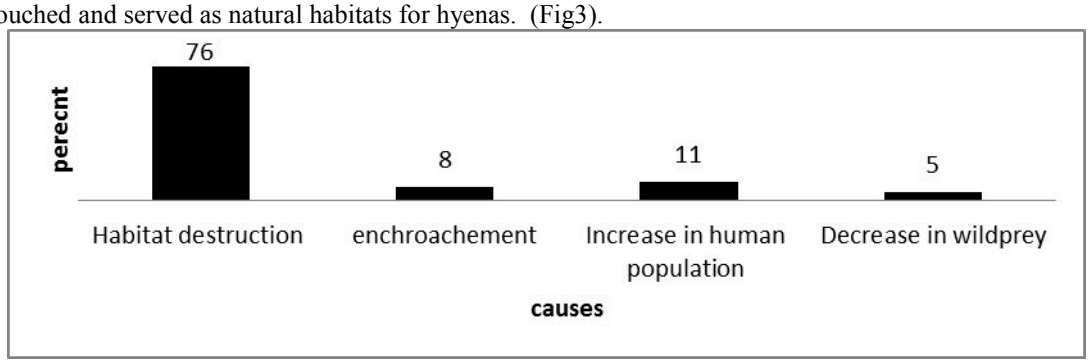

Figure 4: Causes of conflict between spotted hyena and local communities on the study site.

4.6.1.1. LIVESTOCK DEPREDATION

One of the major causes for developing the negative relationship with hyenas was the livestock depredations which increased to intolerable level to local community from 2009 onwards. A total of 498 livestock depredations were reported during 2011- 2012 by all respondents. This had negatively affected the economy of the local community and they formed negative attitude to wildlife in general and spotted hyena in particular in the study area. Data obtained from the respondents revealed a loss of 480,151 Ethiopian Birr (US $ 25,271.11)[2] of the time), during past two years due to spotted hyena livestock depredations (fig. 4). The highest loss recorded was on sheep with its relative estimated market value of 280,915 Eth.birr, followed by loss on goat (62,639 Eth.birr), pack animals (49,497Eth.birr) and cattle involving diary and beef with a maximum market value of (47,100eth.birr).

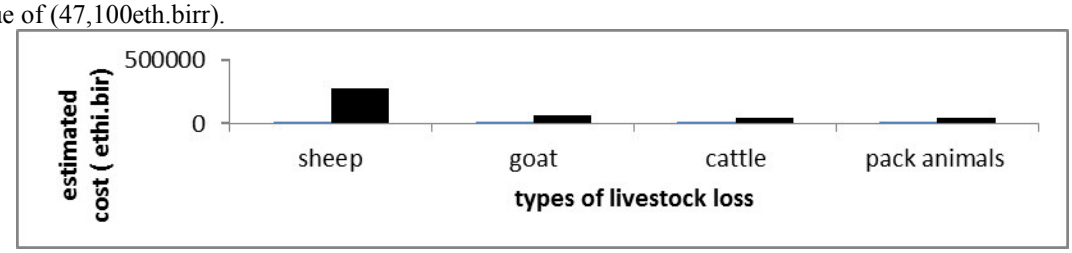

Figure 5: Total loss with in study site

[2]values in bracket shows estimated market price

As reported by the majority of respondents that hyena of the area is becoming food specialist than food generalist. Even if there is the Probability to scavenge, it is preferring sheep than any others species. Obviously hyena is a nocturnal wild animal and the probability to see hyena during the day time is very rare outside protected areas/ national parks. However, it seems that the trend was now changed and contradicts its nocturnal nature on the area, it was reported that, of the total of livestock loss 66% of the respondents informed that the attack was happened during the day time when they were herding their livestock. Only 34% reported that they encountered the attack at night where spotted hyena forcefully picks out stocks from their enclosures. The conflict between hyena and people on the study site got worst from few years back. The attack from hyena on the livestock is not season specific, the majority of the respondents (53.5%) reported that the problem is common

through the year. Only 5% and 41.5% of the respondents said that the conflict had occurred during winter and summer respectively. The impact caused by hyena varied across Kebles in terms of species types and quantity. It was found that the maximum loss in sheep recorded from Geremba having a market value of (97,875) followed by Hameancho (63,600) Ambarcho (53,650), from Hego (47,480) from Kota kombolla (28,310) Eth birr. (Values in bracket shows the estimated market value of each individual species at the time).The maximum and minimum loss in horse was recorded from Hameancho and kota-kombolla (17,650&1,800). The highest recorded in loss was obtained from Garemba Keble and the minimum loss was recorded in Kota kombolla) respectively. The highest loss in goat is obtained from Hameancho and Ambaricho (21,617& 9900) estimated market value respectively.

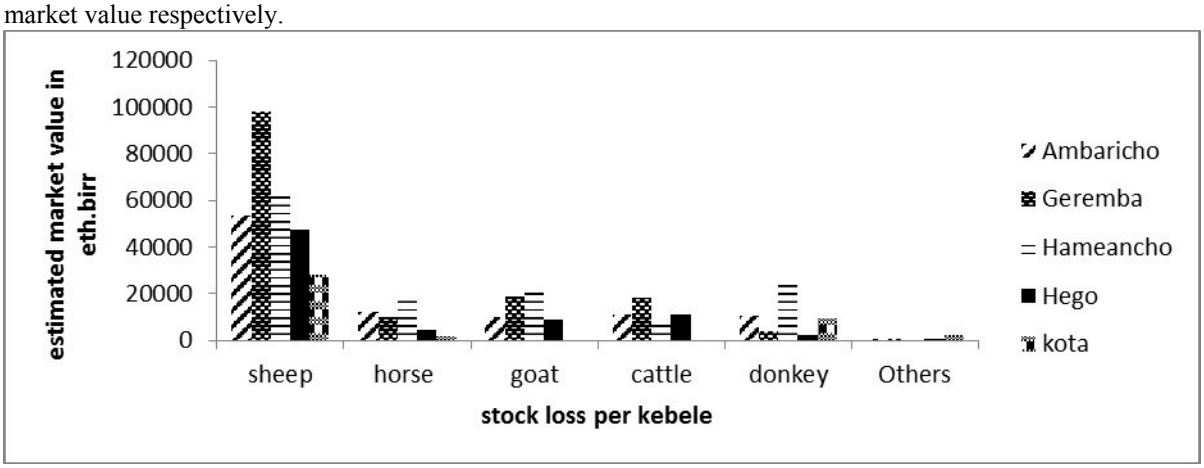

Figure 6: shows livestock loss by hyena per Keble (2011 to 2013)

4.6.1.2. THREAT FOR HUMAN SAFETY

Beside the daily loss of livestock, the second reason that developed negative interaction between people and hyena was concern for human safety. According to the information obtained from FGD, questionnaire survey and direct observations, people considered hyena now a serious threat for human lives especially for their children. The households reported that they have lost their freedom and so much time just to safeguarding their children when they go to school and come back to home. This time otherwise could have been invested in other economic activities. Police Department, Woreda and Keble security guards confirmed this that hyena became a threat to daily activity of farmers on the study area. They informed that there had been 7 attacks on human beings during past two years; 3 people killed and 4 injured. Of these, except one which was a drunk others took place while rescuing livestock from hyena. When asked, "Is hyena threat for human being safety?" the majority responded 'Yes' (78.5%), only 22% said 'No'. When asked regarding the safety of their family, 93% replied hyena as a big threat to their family safety (Fig. 6). 90.5 % of the respondents get worried much more for their family than themselves, only 25 % precent of respondents little afraid to their own safety.

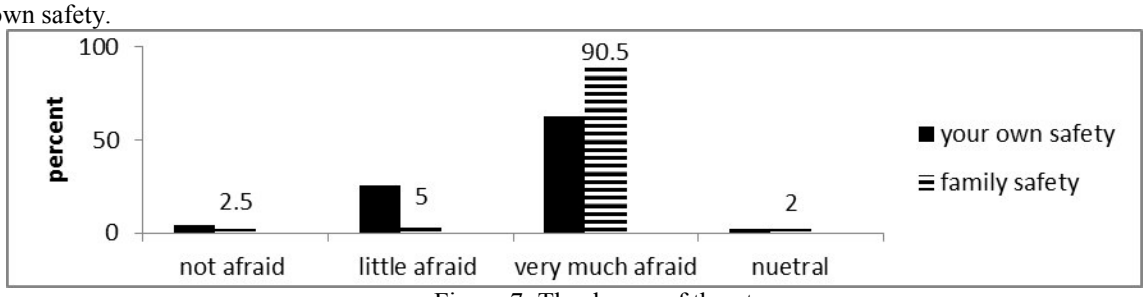

Figure 7: The degree of threat

This condition in in turn has a negative impact on wild life and vice versa. The figure above shows the degree of fear in the house hold and family level. 90.5 % of the respondents get worried much more for their family than themselves, only 25 % precent of respondents little afraid to their own safety.

4.7. Measures adopted to mitigate people-hyena conflict

4.7.1. Change in rearing system

The result showed that the communities exercising change in rearing techniques were shifted to cattle herding than sheep and goat, having a belief that cattle can relatively resist the impact of hyena, 74% of the households changed the stock to cattle, and stopped sheep and goat, 26% of the respondents are still rearing all types of live stocks. As reported that the change made by respondents are not well effective. For question raised "how effective" the change is, about 77% forwarded that the change helped not at all, 23% informed

that to some extent the change in rearing system helped the households.

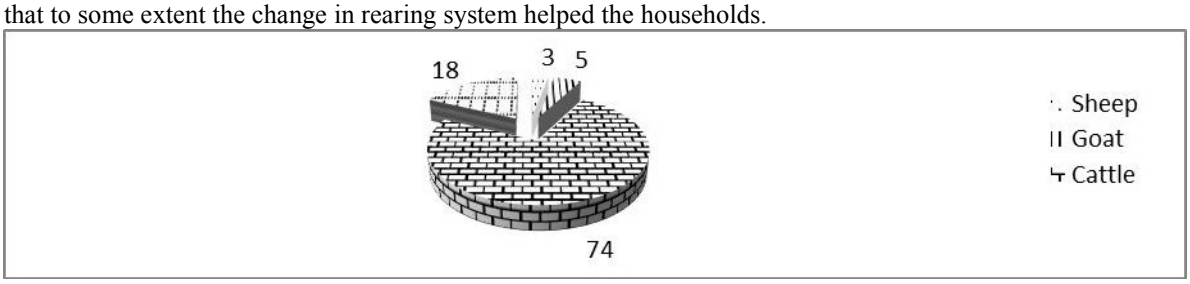

Figure 8: Change in rearing system

When asked, what measures being adopted when confronted hyena, they reacted differently. About 72% of respondents said they would first try to drive it away, about 14% would report the incidence to the Wildlife Department of the area, 3% said they would poison the carcass and tried to revenge hyena. So far, retaliatory actions have resulted in the death of 9 hyenas in study area. All community including Demboya woreda Rural Development Administration and Police Department showed grievances over conflicts with hyena and looking forward for a solution. The other mitigation strategies adopted by the community are shown in the fig. 7. , guarding their livestock and protecting children(3%), getting to enclosure in time(40.5%), clearing and burning the already fragmented natural and anthropogenic shelters(19.5%) and buried the garbage and all the left overs of meat(2%) and trapping (8%).

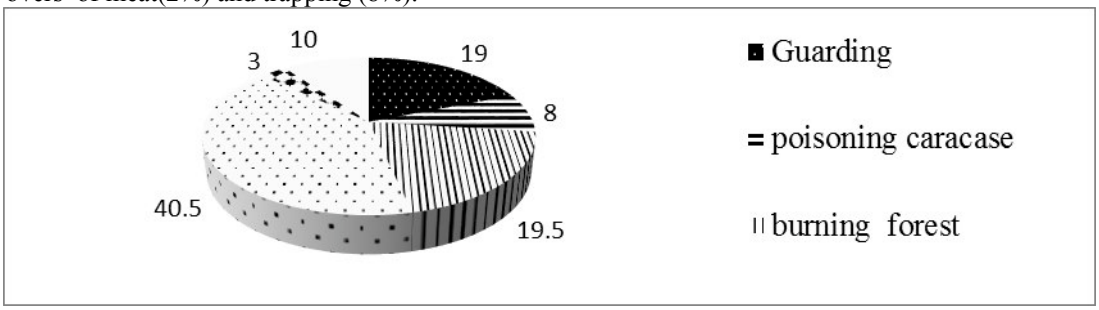

Figure 9: Other Mitigation Measures adopted by local community

Guarding and fencing the area in which the livestock's are reared and getting to home in time, burning of hyena natural habitat of hyena. 8% of the respondents informed that the problem is beyond their control

5. DISCUSSION

5.1. Hyena -people interaction

People and wildlife interaction is not a recent phenomenon over the globe; rather its history goes back to the down of humanity (Hill *et.al,* 2002). Wild, large and medium sized herbivores and humans have had long history of interaction. (Gordon, 2009**).** Large carnivores, humans and their livestock have coexisted for millennia, but modern decades have seen remarkable increase in the frequency of human–carnivore conflict, resulting mainly from an exponential increase in the human population, (Kolowski & Holekamp, 2005). Increased contact with wildlife often leads to increased conflict between people and wildlife, because crop riding, livestock depredation and being threat to the safety of human population (Simon Thirgood & Steve Redpath, 2008).Parallel studies have shown that, Demographic and social changes place more people in direct contact with wildlife as human Populations grow, settlements expand (IUCNWPC, 99). Fast growing human populations move further into previously uninhabited areas construct infrastructures, and colonise parts of wildlife habitat and escalated human wildlife conflicts.(Dickman,2010).Humans have greatly modified habitats and landscape through agriculture and industries with far reaching and typically negative impact on Wildlife population.(Simon,*et al*., 2005, Trondheim, 2006).People are coming more close to wildlife habitat, In Africa, human population growth has led to encroachment into wildlife habitats, restriction of species into marginal habitat and direct competition with local communities become a common phenomenon. (Siex *et al*., 1999*).*

The interaction can either be positive or negative; if there is homogeneity with the interest of local community and wildlife, it is inevitable to experience competition (IUCN, 2005**).** To secure survival both parties (people and wildlife) engaged on use of similar resources and which resulted on ''people and wildlife interaction''. The negative interaction between people and carnivores is not unique to the study site. However, different communities living in and around protected areas, fragmented habitat as well as open grassland of the world had encountered directly or indirectly such problem. As research witnessed that carnivores killed and causes series injuries to people, the manifestations HWC are, and the negative impact on humans across the world. For instance, wolves, lion, and bears, have injured people**,** (Ninafascione *et.al.* 2004). Mega herbivores were reported for invade of fields during the rainy season (Gandiwa, *et al*.,2005) and causing food shortages

which leads to the displacement of settlements (Barnes,1996).Conflicts comprise several ingredients, major ones are, needs, perceptions and values, as a result conflict between people and wildlife is more series in many parts of the world and become nuisance to nature and BD conservationists (Newmark *et al,* 1994).

The history of interaction between spotted hyena and people in Africa has had long history. Spotted hyena which is commonly found in sub-Sahara Africa is known to attack people (Nowack, 1991).It had encountered a number of actual and potential attacks on children and adults in Africa, as research demonstrated that hundreds of people in Africa were killed by spotted hyena (Treves & Naughton -Treves, 1999). Spotted hyena in Africa is accused for livestock loss and economic impact. The majority who were the victim of the impact were farmers who were leading their life by mixed farming. Once stocks encountered an attack, it seriously damage the economy of the communities and resulted in a retaliatory measure by the people, which in turn harm the long lasting sustenance of wildlife, which leads to conflict. Ethiopia, being a huge store of biodiversity, has large number of spotted hyena which are interacting and coexisting. Coexistence observed in town areas & eastern parts of the country, hyena men of harar- (BBC, 2009, MOCTE, 2009**),** conflict in northern Ethiopian high lands because of depredation by spotted hyena (Bauer, *et. al.,* 2010).

The feeding nature of carnivores, in juxtaposition with their greedy habits, frequently brings them into conflict with humans. Such conflict has resulted in anger by humans which pave the way for population to decline, range slimming down, and in a few cases, extermination to the animals (Mills and Hofer 1998; Woodroffe 2001). The investigation of this study has shown that there is negative interaction between spotted hyena and local communities. The majority of the sampled households had lost their livestock by spotted hyena. Spotted hyena on the study site is considered as main adversary of livestock and causing economic loss to farmers. Spotted hyena is known as livestock killing predator, which kills cattle, pack animals like donkey, horse mule with no segregation). On the study site spotted hyena exclusively attacking all the domestic animals, sheep, goat cattle pack animals and even there is a report on human attack, correspondingly with the result of this study, it was also identified that spotted hyena is a predominant predators of sheep and goat in northern parts of Ethiopia (Gidey *et al.,* 2012). It was also reported that hyena is known for the loss of domestic animals in and around Bale Mountain, and Simen Mountain National park (Mesele, 2006). Study elsewhere in strengthening this idea described that Spotted Hyena is responsible for More than 80% Sheep and goat loss and cattle depredation in Kenya (Kolowsk & Holekamp, 2005).

As it was evidenced by scat analysis, hyena of the study area is dependent on domestic stock. From the scat analysis 47.5 % of the result had showed depredation on sheep followed with cattle and goat (17.5, 12.8%) respectively. It was reported that across the five Keble's of the study site, hyena damage on 498 livestock were recorded within two years period and resulted on estimated economic loss of 480,151 Ethiopian birr (US$29,008.33). Regarding damage from wildlife the previous study had found that, Each year in the United States it's estimated that approximately 5,000 people are injured and 415 people die due to wildlife-related incidents and resulted in a losses of $1.9 billion, and home owners have spent over 260 million hours trying to prevent damage caused by wildlife (Messmer, 2009). Correspondingly, study had depicted that spotted Hyenas were responsible for the estimated loss of 6049 USD (460,000ksh) and 45% monetary loss for livestock herders in Kenya (Kolowski, 2005). Similar study in northern parts of Ethiopia in tigray region found that spotted hyena resulted in a estimated economic loss of 19,618US$, (Gidey, et.al, 2012). Animals damage by hyena cause large financial fatalities (Bauer, De Iongh & Sogbohossou, 2010). It was reported Livestock depredation in Kenyan was resulted in estimated economic worth of $8749 per annum (Patterson *et al.,* 2004). Likewise, (Butler 2000) demonstrated that 12% of each household's in Zimbabwe had lost net annual income of ($13). It seems that livestock depredation by large carnivore enlarge intolerance of farmers against large carnivores.

Research thought that, spotted hyena is technical scavenger, opportunistic feeder, its feeding niche is very wide, and it exclusively consumes animals of various types and sizes, wild and domestic stocks, even hyenas which are outside their clan, Carrion, bones, vegetable matter and leftovers, the strong tooth and its internal digestive system permit it to suck nutrients from bones the only parts of prey which are not fully digested are hair, horns and hooves (Paul Janssen, 2003). Spotted hyenas do not exhibit a significant preference for any prey species and avoid very few, to some extent prey preference is seen and calculated by Jacobs prey selectivity index which showed preference on sheep, goat and cattle.(Hayward, 2006).The depredation by this carnivore over the domestic animals is probably initiated by running down of wild prey. Findings demonstrates that prey base for spotted hyena is shrinking on the study site, studies revealed that, the decline in natural prey is one of the reasons why carnivores shift their diets to livestock, which are easier to capture and have limited possibilities of escape (Mishra *et al.,* 2003; Patterson *et al.,* 2004).

Spotted hyena being the top predator of in the study area there is nothing to minimize its number rather it is the only checker of the wild prey. In line with this study it was found that, Livestock depredation by these predators could be attributed to depletion of the natural prey, loss of habitat and proximity to human settlements. Dense settlement leads for the decline of natural prey base for hyenas and it became highly dependent on similar source of prey with anthropogenic source of food (Abay *et al.,* 2011). It was found that the population growth,

crop production and land holdings of the households are by far inconvenient, land is highly fragmented daily people are forced to push up to wildlife habitats. The land holding across the house holds haven't shown significant difference, the majority hold land below one hectare. The family size of the respondents is also very high (in average7), According to (CSAE.2007) the area is one of the top ten densely populated regions of Ethiopia having a density of 502 p per km^2 and had shown that the population of the area is rapidly growing, resulted on destruction of previously untouched land, covered by forest and conversion of those habitats in to farm land. As a result hyenas, in its way to search shelter & food, causes damage on livestock. Since the economic activity of the communities relayed on mixed farming, at the expense of loss farmers were revenge hyena. Consistently human population growth is reducing and fragmenting the available habitat for large carnivores (Holmern, Nyahongo &Roskaft, 2007).

One of the causes for HWC is fear of being killed, attacks on man reported from different corners of world by bear, wolves' big cat, lions and hyenas, in the historical and contemporary time (kruuk, 2002, Quammen, 2003**).** Carnivores are traditionally seen as threat to humans and responsible for HWC (WWFSARPO, 2005).Hyena impact was not only restricted to livestock loss, However, it also attacks man, it was reported that there was seven damages on man (3kills and 4 injuries) study elsewhere in northern Ethiopia showed that ten man were attacked, (Bauer *et.al*, 2010), similarly 60 in Malawi (Kruuk, 1972). If habitat of wildlife is altered, wildlife also searches for place to hide from predator and to get necessary requirements. The findings of the study had shown that there is destruction of natural habitat and hyenas engaged in livestock and man attack. Majority of the respondents informed that they were able to see hyena on a fragmented habitat, farmland area, and rivers banks. It is known that population growth and wildlife habitat destructions are positively correlated, the increase in one damage the others and vice versa**.** Previous study had found that densely settled areas & agricultural land are not compatible with wildlife. (KWS, 2013).

5.2. AWARENESS AND ATTITUDE

According to the information from the house holds majority have awareness about wild life. Even if the wildlife's are causing so many damages they have a consideration on procedural resolution of the conflict. However, regarding the wildlife laws of their country, more than half of the citizens who had participated on this study have no knowledge about wildlife laws of their country and have deficiency of information regarding the contemporary news about wildlife. Since wildlife management is working with animals, habitat and people, people's attitude are preconditions, their interest in wildlife problems and their stand on issues ,effectiveness of management program depends up on how well they fit peoples need and desire,(Kellert, 1976). The attitude of respondents' to wild life and its conservation in general and spotted hyena in particular on the study site needs deep understanding, because respondents with negative attitudes were higher than the respondents with positive attitude towards wildlife and its conservation i.e. (66.7&34 %) respectively. If People are not well informed about wildlife issues people make decisions from their own point of view rather than from sound information. 52.5% of the respondents were not conscious about wildlife and wildlife related rules and regulations of the country. At the expense of damage, either to livestock/human beings they were taking retaliatory measure by killing the hyena by poisonous chemicals. This in turn had disturbed the environment. In nature hyena feed Caracas of poisons dead. It is found that nine hyenas were died by this way. Other wilds which feed on the carcase also died which seriously harm the environment, it brought health problem to the community. In a synonymous study in Kenya Nine spotted hyenas were killed at the expense of livestock attacks. (Kolowski & Holekamp, 2005).

Of the total of respondents across the study site 66.3% have negative attitude towards hyena, only 34.7% had positive attitude towards hyena. The respondents with negative attitude said that their positive attitude was shaped to negative because of hyenas attack on their livestock and the increasing sense of fear by hyena to their lives and the occurring consequences to their economy. Being exposed for education is one way ford to think and care for sustainable and wise utilization of the environment with its resources. Educating people about wildlife issues, Public reactions to problems are conditioned by their attitudes uninformed publics respond with attitudes based on background, media information sources, and factors can changed attitudes by educating the public about wildlife issues, Public support of programs is affected by their attitudes (Kellert, 1976).It creates awareness for the local community how to coexist and exploit natural or cultural resources wisely. It was found that those the respondents with secondary and tertiary academic back ground had better understanding towards wildlife in general and spotted hyena in particular than those the respondents who were the graduate of elementary and informal, there was significant deference across the respondents in education the increase in education had resulted in moderately positive attitude towards wildlife.

The respondents with positive attitude emphasised on management concern rather than persecution of hyena, but does not denied the presence of conflict between hyena and people, they agreed that hyena-people interaction is negative, if managed and the problem can be minimized, there was no much difference in attitude, this was highly consolidate by the statistically Pearson chi-square shows that there was no significant variation in

attitude across the Keble's in connections to wildlife. This is probably the attitude of local communities to wildlife is highly influenced by the problems associated with wildlife. The previous study had demonstrated that People living in areas which are more close to wildlife habitat have frequently host wild animal induce damage on their property and themselves even that are unable to control the losses caused by wildlife are likely to develop negative attitude towards wildlife (Newmark 1993, 1994).

5.3. MITIGATION STRATEGIES

Taking into consideration human population growth, increasing interest for resources and the mounting force for access to land, it is an unambiguous that human wildlife divergence will not be eradicated easily, in many places, human–wildlife conflicts are increasing, as growing human populations move further into previously uninhabited areas, and as some species colonise parts of their range result in competition; this on the other hand needs to be managed immediately unless the long lasting sustenance of wild resource will diminish. So as to resolve HWC there should be arrange of approaches and techniques to reduce depredation problem. (Breitenmoser, *et al.,* 2005).

Once any kind of problems occurred, search for solution either to minimize or avoid the issue directly or indirectly is inventible. It was found that there is negative interaction between people and spotted hyena in the study site. Daily there was record of hyena damage on livestock. Even if it is not curative, and Preventative mitigation strategies to avert the occurring conflict by addressing its root causes is quite necessary (Distefano, 2010).It was investigated that people on the study site are taking different reaction to overcome the problem animal at the expense of its damage, The measures taken by the community comprise driving it away when come close to home, guarding and getting to home in time to enclosure, clearing and burning habitat, waste management and cover den, in a parallel study, it was found that Humans can efficiently diminish the jeopardy of wildlife by better caring their assets, using dogs, herders and enclosures to protect livestock from predators (Woodroffe *et al.,* 2007). Based on the magnitude of the problem the negative interaction can be solved by taking common response, in strengthening this idea (Treves and Naughton-Treves, 2005) agreed that, lethal control may be considered a necessary component of conflict mitigation between people and wildlife. Effective mitigation strategies are urgently needed to resolve HWC, and a wide range of technical approaches should be used to minimize wildlife damage (Dickman, 2010). These techniques can undoubtedly help decrease conflict, as they can significantly reduce the magnitude of wildlife damage incurred (Dickman & Macdonald 2005, Woodroffe *et al*. 2007). Technical measures and approaches used to mitigate human–wildlife conflict, were proposed by different writers approaches like Physical separation of conflicting species and resources, Guarding assets, Habitat use and behaviour modification of humans responsible for resource, Use of buffer resources and techniques like enclosing resource, Guarding and warning animals, Physical devices on livestock, Habitat manipulation to reduce, conflicts, Livestock management, Relocation of people, Education and awareness were some of the mitigation measures **(**Dickman, 2010).

6. CONCLUSION AND RECOMMENDATION

6.1. Conclusion

Assessing people and wildlife interaction is one step forward to identify the existing situation between wildlife and the local community to bring sustainable solution. Results from this investigation have shown that there is realistically negative interaction between spotted hyena and local communities in Kembata Tembaro zone Demboya woreda. The type of interaction is out of co-existence, spotted hyena of the area is accused for causing harm to the economy of the households by attacking the livestock's, it is found that there was estimated loss of US$ 25,271(484,115 Eth Birr) recorded from the findings. It seems that the natural prey base for this top predator of the area is dwindling from year to year. The prey preference index of Jacob's 1974 have demonstrated from laboratory analysis that, there was depredation on domestic animals mainly on sheep, goat, cattle, horse, donkey, mule and poultry respectively. 80.6% of the hairs from the scat analysis have shown that domestic animals were killed by spotted hyena. This doesn't mean that its prey is only the mentioned stock, it exclusively attack all prey and has wide scavenging niche.

Spotted hyenas do not exhibit a significant preference for any prey species and avoid very few, and this reflects their ability to hunt cooperatively in groups, to hunt alone or to satisfy their dietary requirements through scavenging and hunting, it has been absorbed that feeding on vegetation matter, sugarcane, crops like maize, Caracas, carrion bone and all garbags with no segregation. At the expense of loss of the local communities were taking retaliatory measures, which inturn causing damage to the sustenance of spotted hyena of the area. As the findings of the study have emphasized that the immediate reason for the occurrence of people hyena negative-interaction was the activity of man than hyena that had aggravated the situation. The hyenas are doing what the animals naturally do. Due to rapid increase in human population, previously untouched forests were converted into farm land and invaded by human settlements, as a result the wildlife in general and spotted hyena in particular has lost shelter and their interest becoming overlapped with those of man. From the result of this study

it is concluded that the livelihood of the community is dependent on mixed farming, single loss of the livestock and little loss of crop causes series damage on the daily survival of the households. Same recourse utilization and their scarcity probably are the major factors which lead them to conflict with each other.

The attitude of respondents towards wildlife conservation in general and spotted hyena in particular is negatively correlated. Majority of the respondents 66.3% have negative attitude, and only 33.7% respondents have had positive attitude. The greater part of the respondents are not aware about wild life laws of the country, only 47.5% of the respondents were aware of wildlife laws of the country and reported that there is prohibition of illegal killing of wildlife and believe on the natural right of the existence of wildlife. In order to overcome the problem the local communities are taking several measures, such as guarding their livestock and children, getting to enclosure in time, destructing and burning the natural forest, covering its holes or burrows by shocking materials, driving it away and frequently making it restless and when cause attack either on human population or livestock killing it by any means (, i.e. killing it by poisonous chemicals) were the mitigation measures from local community point of view. Educating and creating awareness how to co-exist with wildlife, legal harvesting to its density were some of the conflict mitigation measures by the woreda administrative unit and rural development office of the area.

6.1 RECOMMENDATIONS

- All the local communities and concerning Governmental and Nongovernmental organization should cooperatively work generally towards wildlife management and specifically to spotted hyena in a way that does not harm the interest of both the wildlife and local communities.
- Provisions of food at a divisionary site or at different fixed places from which people can generate income in the form of eco-tourism. Educating and training activities should be done to build local capacity in conflict prevention and resolution and increasing public understanding of HWC.
- Government should establish protected area for wildlife and made it relevant to the communities, creating awareness for those who are not conscious about the intrinsic value of wildlife with special focus to spotted hyena in regulating the ecosystem, educating people not to destruct the natural habitat of hyena and rehabilitating the already fragmented habitat of hyena .
- Developing community based wildlife management (CBWM), formulating and announcing rules and regulations of wildlife authority of the country and teach the people to act in accordance with the already formulated laws.
- Woreda rural development office the study site should strengthen the wildlife department by employing trained workers and should have budget in order to promote sustainable wildlife conservation and to solve unexpectedly occurring negative interaction between people and spotted hyena in the study area. Recommended Wildlife Department of the area should selectively harvest the problematic animals only by expertise that can take care about the long-lasting sustenance of the animals.
- Government, Non-governmental organisations and Local community associations (locally called eder[3]) cooperation should attempt to develop compensation scheme for communities who had lost their livestock by spotted hyena.
- Deep further investigation in all aspects of wildlife should be carried out, on the nature of people wildlife interaction, habitat assessment, the number and type of problem wild animals and their feeding habit alternative mitigation measures that were taken by the local community should be studied.

[3] Eder is traditional institution established to help a person who encountered problem.

REFFERENCE

Abay G. Bauer H, Gebrihiwot K, Deckers J. (2010). Peri-urban spotted hyena (*C. Crocuta*) in northern Ethiopia: diet, abundance and economic impact.

Alan Hesse (2002). Living with Wildlife action sheet lists organizations involved in W.C.O.

Andelt, W.F. (1987). Novak, M., Baker, J.A., Obbard, M.E and Malloch, B. Wild furbearer management and conservation in North America.

Baba, M., Doi, T., Ikada, H., I wamoto, T., and Ono, Y. (1982). Census of large mammals in Omo National Park, Ethiopia. African Journal of Ecology.

Balestra, F.A. (1962). Man- eating hyenas of Mlanje, African Wild Life.

Barnes. R. F.W. (1996).Conflict between humans and elephants in the central African forests. Mammal review.

Bauer, H., De Iongh, H.H and Sogbohossou, E. (2010) Assessment and mitigation of human-lion conflict in West and Central Africa.

Begg C, Keith Begg, & Oscar Muemedi (2007) Preliminary data on human - carnivore conflict in Niassa National Reserve, Mozambique, particularly fatalities due to lion, spotted hyena and crocodile. http://www.niassalion.org.

Breitenmoser, U., Angst, C., Landry, J.-M., Breitenmoser-Wursten, C., Linnell J.D.C. & Weber, J-M**.** (2005). Non-lethal techniques for reducing depredation. *In* R. Woodroffe, S. Thirgood & A.R. Rabinowitz. *People and wildlife: conflict or coexistence?* pp. 49. Cambridge, UK. Cambridge University Press.

Brown, L.H. and Root, A. (1971). The breeding behaviour of the lesser flamingo Phoeniconaias Minor.

Butler, J.R.A, (2000).The economic costs of wildlife predation on livestock in Gokwe communal land, Zimbabwe.

C.R. Kothar (2004).Research methodology methods and techniques, new age publications, India.

Child, G. and Robbel, H. (1975) Drowning of lechwe by spotted hyena, Mammalian.

Cooper, S.M., Holekamp, K.E., Smale, L., (1999). A seasonal feast: long-term analysis of feeding Behaviour in the spotted hyena.

Daniel W. Gade, (2006).Hyena and Human in the Horn of Africa American Geographic Society. Donham and Donald Lewis, (1999). Marxist modern: an ethnographic history of the Ethiopian Revolution, University of California Press.

Dickman A.J., (2010). Complexities of conflict: the importance of considering social factors for effectively resolving human–wildlife conflict Department of Zoology, Wildlife Conservation Research Unit, University of Oxford.

Elisa Distefano. (2010) Human-Wildlife Conflict worldwide: collection of case studies, analysis of management strategies and good practices.

Eloff, F.C. (1964) on the predatory habits of lions and hyenas Koedoe.

F.A.O, (2009). Human wildlife conflict in Africa causes, consequences and management.

Federal Democratic Republic of Ethiopia Ministry of culture and tourism. (2009).Discover Ethiopia Camerapix publisher international.

Funk Holger (2010). Hyena: On the Naming and Localisation of an Enigmatic Animal.

Gade, D.W. (2006) hyenas and humans in the horn of Africa. http://www.everythingharar.com)

Gidey Yirrigan, Hans Bauer, (2010) "Diet of spotted hyena (*C. Curocuta)* in S Tigray, N Ethiopia", Journal of Science, Technology and Sustainable Development: pp.391

Gidey Yirga and Hans Bauer,(2010) Prey of Peri-urban Spotted Hyena (*C. crocuta*) in South eastern Tigray, Northern Ethiopia Department of Biology, Mekelle University

Gidey Yirga1, Hans Bauer, Yowhans Worasi1 and Simret Asmelash.(2011) Farmers' perception of leopard (*Panthera pardus*)Conservation in human dominated landscape in northern Ethiopian highlands, Department of Biology, Mekelle University,

Gidey Yirga, Hans H. De Iongh, Herwig Leirs, Kindeya Gebrehiwot,G.Berhe, Tsehaye, Asmelash, Haftu, G. Hans Bauer, (2012).The ecology of large carnivores in the highlands of northern Ethiopia.

Gidey Yirga, Hans H. De Iongh, Herwig Leirs, Kindeya Gebrihiwot, Jozef Deckers and Hans Bauer (2012).Adaptability of large carnivores to changing anthropogenic food sources: diet change of spotted hyena (C. crocuta) during Christian fasting period in North Ethiopia.

Giles, R.H.G. (1978).Wildlife Management. W.H. Freeman, San Francisco.

Glickman SE, Cunha GR, Drea CM, conley AJ and Place NJ,(2006).Mammalian sexual Differentiation lesson from the spotted hyena, mammals of S. African Sub region.

Hayward, M.W. (2006). Prey preferences of the spotted hyena (C. Crocuta) and evidence of dietary competition with lion Panthera Leo.

Herschel, J.R., Skinner, J.D. (1990a). The diet of spotted hyenas' (C. crocuta) in Kruger National Park, African Journal of Ecology.

Holekamp, K.E. and Smale, L. (1992). Human hyena relation ship in and around the Masai mara National reserve, Kenya. IUCN SSC Hyena Specialist Group.

Holmern.T. Nyahongo, J. and Roskaft, E. (2007) Livestock loss caused by predators outside the Serengeti National Park, Tanzania. Biol. Conserv.

Honer. O .Holekamp, K.E. and Mills, G. (2008). Global Mammal Assessment Team C.crocuta IUCN Red list of threatened Species Strategies. www.iucnredlist.org

Hofer, H. and East, M.L. (1993a). The commuting system of Serengeti spotted hyaenas: how a predator copes with migratory prey. I. Social organization. Animal Behaviour

IUCN. (2000). Hyena Specialist Group: Spotted Hyena: Status and Conservation.

Johnson, R (2006). Epizootiology and ecology of Anthrax. USDAW.DC

King Don, Jonathan. (1988). East African mammals: an atlas of evolution in Africa Chicago University Pr

Kellert, S. R. (1976). Perceptions of animals in American society, transactions of the 41st North American W. Conference.

Koehler, C.E. and Richardson, P.R.K. (1990). Protect cristatus mammalian Species.

Knight.(2000).Natural enemies People wildlife conflicts in anthropological perspective

Kay E. Holekamp and Stephanie M. Dloniak,(2010) Intra specific Variation in the Behavioural Ecology of a

Tropical Carnivore, the Spotted Hyena, department of zoology, Michigan state university, east Lansing, Michigan, USA.

Kruuk, Hans (1972). The Spotted Hyena: A Study of Predation and Social Behaviour, University of California Press.

Kruuk, Hans (2002). Hunter and hunted: relationships between Carnivores and People Cambridge University Press, pp. 64 65.

Kruuk, Hans (1972). The Spotted Hyena: A Study of Predation and Social Behaviour University of California Press.

Kurten, Bjorn (1968). Pleistocene mammals of Europe, Weidenfeld and Nicolson.

Lise Hanssen.(2009). Report, Spotted hyena ecology and human wildlife conflict in the Caprivi Region, N.

Liu, J., Z. Ouyang, Z. Yang, W. Taylor, R. Groop, Y. Tan, and H. Zhang. (1999). A framework for evaluating human factors on wildlife habitat: The case of giant pandas.

Lydekker, Richard (1908). Game animals of Africa . London, R. Ward.

Macdonald, David (1992). The Velvet Claw: Natural History of Carnivores. New York Park w.

Melese Y. (2006).Human wildlife conflict (Gelada baboon and Ethiopian wolf) in SMNP Msc thesis AAU.

Messmer, Terry A.(2009).Human- Wildlife Conflicts :Emerging Challenges & Opportunities Human-Wildlife Conflicts.

Mills MGL. (1990). Kalahari hyenas: comparative behavioural ecology of two species. London: Unwin Hyman.

Mills, Gus Hofer, Heribert (1998). Hyenas: status survey and conservation action plan. IUCN/SSC Hyena Specialist Group.

Mishra, C. (1997). Livestock depredation by large carnivores in the Indian Trans Himalaya: conflict perceptions and conservation prospects. Environmental Conservation, 24(4):

M. W. Hayward (2005). Prey preferences of the spotted hyena (C. crocuta) and degree of dietary overlap with the lion (Panthera Leo).Terrestrial Ecology Research Unit, Department of Zoology, Nelson Mandela Metropolitan University, Eastern Cape, South Africa.

Nowack, R. (1991). Walker's mammalians of the world. JH University press 338–343.

Nowell. K and Jackson, (1996). Status survey and Conservation Action plan of wild cat.

Nina, fascione, Guy Ballard (2006) .Social drivers of invasive animal control. Proceedings of the Invasive Animals CRC workshop on the social drivers of invasive animal control

OSCAR,(2000). Preliminary data Niassa National reserve, Mozambique, particularly fatalities Due to lion, spotted hyena and Crocodile.

Peterzell, P. (1995). Hyena's terrifying attack .Marin Independent Journal.

Patience Gandiwa, Wadzanai Matsvayi, Mary M. Ngwenya and Edison Gandiwa (2005) Assessment of livestock and human settlement encroachment into the northern: Gonarezhou national park, Zimbabwe By: *Clarion University of Pennsylvania, Clarion, and Pennsylvania.*

Patterson, B. D., S. M. Kasiki, E. Selempo, and R. W. Kays. (2004). Livestock predation by lions and other carnivores on ranches neighbouring Tsavo National Parks, Kenya.

Quammen, D. (2003). Monastery of God: Man eating predator in the Jungles of history and the mind .New York www.Norton

Paul Janssen, (2003).Hyena fact files African wildlife foundation.

Rainy, M. and Rainy, J. (1989). High noon on the Maasai Mara. New Scientist pp: 48-52.

Ramakrishanan, U., Coss, R.G. & PelkeY, and NW. (1999) Tiger decline by reduction of large ungulate prey: evidence form study of leopard diets in S India.

Roosevelt and Theodore, (1910). African Game Trails: An Account of the African Wanderings of American Hunter, Naturalist, Ne York, C.Scribner's sons.

Samia Zekaria Gutu, (2007). Population and housing census of Ethiopia: central statistical agency of Ethiopia

Siex, K.S. and Struhsa, (1999) Colobus Monkeys and Coconuts: a study of perceived Human–Wildlife conflicts. Journal of Applied Ecology.

Smithers, R.H.N. (1971). The mammals of Botswana. Salisbury: Trustees of the National Museums of Rhodesia

Simon Thirgood, Rosie Woodroffe and Alan Rabinowitz, (2005).The impact of human wildlife conflict on human lives and livelihoods.

Sillero-Zubiri, C.&Laurenson, M.K. (2001).Interactions between carnivores and local communities: conflict or co-existence? Cambridge University Press, Cambridge.

Simon Thirgood &Steve Redpath, (2008) Hen harries and red grouse: Science, politics and human wildlife conflict. Aberdeen centre for environmental sustainability, Macaulay institute and university of Aberdeen.

Salnicki, J. (2004) Home range area dynamics of spotted hyaenas (C. crocuta) in the Woodland habitat of Hwange National park, Zimbabwe. M.Phil. thesis, University of Zimbabwe.

Tilson, R.L. and Henschel, J.R.(1986). Spatial arrangement of spotted hyena in a desert Environment, Namibia.

African Journal of Ecology.
Tilson, R.L., von Blottnitz, F., and Henschel, J.R. (1980). Prey Selection by spotted hyena (Crocuta crocuta) in the Namib Desert Madoqua.
Trondheim, November, (2006) Conservation and local land use conflicts in Western Serengeti Corridor, Tanzania.
Treves.A and Naughton -Trves, L (2005). Evaluating lethal control in the management human -wildlife conflict. People and wildlife conflict or coexistence?
Treves, A. and Naughton-Treves, L. (1999) Risk and opportunity for humans coexisting with large carnivores. Journal of human evolution.
Yamane, Taro. (1967). Statistics: An Introductory Analysis, 2nded, New York: Harper and Row.
Yalden, D. W., M. J. Largen, and D. Kock. (1980). Catalogue of mammals of Ethiopia.
Woodroffe, R., Thirgood, S. & Rabinowitz, A. (2005).People and wildlife: conflict or coexistence? Cambridge: Cambridge University Press.
WWF, (2004). Food for thought: the utilization of wild meat in eastern and Southern Africa.