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Population Status towards Ethiopian Wolf (*Canis simensis*) in Bale Mountains National Park, South Easter, Ethiopia

Author:- ***ZERIHUN DEMISSIE***

Madda Walabu University College of Agriculture and Natural Resources

Department of Eco-Tourism and Biodiversity conservation

Abstract

The Ethiopian wolf is the most endangered carnivore scattered throughout the highlands, are in a dangerous situation on the verge of extinction. This study assessed the population status towards Ethiopian wolf (Canis simensis) in Bale Mountains National Park in 2016. Total count method was used in the population census of Ethiopian Wolf. Data on local community perception have been collected through semi-structured interview and a total of one hundred eighty household samples were identified. Moreover, Focal group discussion was also used with local people. The result of the study indicated that total of 60 Ethiopian wolves during wet season whereas 110 during dry season. The estimated total population of Ethiopian wolf in Bale Mountains National Park has been decreasing in the last ten years. Majority of respondents (51.11%) had positive feelings whereas (34.44%) showed negative feelings. Most of uneducated individuals showed negative feelings towards the management and protection of Ethiopian wolf in Bale Mountains National Park. Livestock grazing, free movement of dogs and high number of

new settlement in Bale Mountains National Park are the major problems. Therefore, active measures should implement to control the human impact and prevent towards the management and protection of Ethiopian wolf in Bale Mountains National Park.

***Keywords**: Ethiopian wolf, population status, perception of community*

1. INTRODUCTION

The Ethiopian Wolf (*Canis simensis*) (Rüppell, 1835) is one of the most endangered and endemic species of Ethiopia. It is not only the rarest canid in the world but also holds the unenviable position of being Africa's most endangered carnivore. The Ethiopian wolf is probably the rarest canid in the world with fewer than 500 adult individuals surviving (Sillero-Zubiri and Macdonald, 1997). It occurs in a few mountain ranges of the Ethiopian highlands, the Simien Mountains, mountaintops of the Wollo highlands and in north Shoa area of Menz (Guassa). It also occurs in Arsi and the Senatti Plateau of Bale Mountains (Marino, 2003, Ashenafi *et al*., 2005).

Bale Mountains National Park is home to 20 Ethiopian endemic mammals as well as five mammals that are found only in the Bale Mountains. Mammals of paramount importance in BMNP include the Ethiopian wolf (*Canis simensis*) and bigheaded mole rat. The Afro-alpine area is home to over half of the global population of Ethiopian wolf, with fewer than 500 individuals live in highly human-dominated landscapes (EWCP, 2014). More than half of the species' population lives in the Bale Mountains, where wolf density is high for a social carnivore of its size, and is positively correlated with density of rodent prey and negatively with vegetation height. It mainly lives in the Afro-alpine habitats that are characterized by short grasslands (Sillero Zubiri and Gottelii 1995). It feeds on small mammals, mainly rodents such as the Giant mole rat *Tachyoryctus macrocephalus (*Ruppell, 1842), the common mole rat *T.splendens* Ruppell, 1836) and the grass rat species *Arvicanthis abyssinicus* (Ruppell, 1842) *Lophuromys melanonyx* (Petter, 1972) and *Otomys typus* (Heuglin, 1877). This type of feeding behavior makes the species unique compared to the other carnivores. Besides the rodent species, the

Ethiopian wolf rarely observed chasing and feeding on young antelopes, lambs and hares (Sillero-Zubiri, 1994).

The Ethiopian wolf (*Canis simensis)* is endemic and has important economic benefit for the country through best attraction of tourists and its role as a flagship for the conservation and sustainable use of the Afro alpine ecosystem and biodiversity on which present and future generations of Ethiopia depend. The Ethiopian wolf has the potential to attract tourists and bring income to their respective areas (Dejene, 2003). However, increasing grazing on afro alpine ranges implies that human activities have been expanding into wolf habitat leading to loss of diet and decline of their population.

1.2 Statements of the Problem

The Ethiopian wolf (*Canis simensis*) found in only six isolated habitat fragments in the highlands of Ethiopia, the wolves have become victims of their own specialization. Feeding predominantly on high altitude rodents ,and therefore relying heavily on intact afroalpine habitats to support their rodent prey, Ethiopian wolves are increasingly under pressure from human expansion into their high land enclaves. Encroaching agriculture brings with it various other threats, such as habitat degradation through cattle and crop farming, diseases carried by domestic dogs, and the possibility of direct persecution in retribution for real or perceived livestock predation (IUCN/SSC, 2011).

With less than 500 adult wolves surviving today, conservation actions to ensure the persistence of this species are crucial. The species is less common and has a more reduced range now than in the past. It is listed as Endangered on the IUCN Red List of Threatened species. The largest population of wolves is found in the Bale Mountains; while elsewhere the wolves are found in significantly smaller, less robust populations subject to loss of genetic viability and extinction. In 1997, the IUCN Canid Specialist Group compiled a detailed action plan outlining a strategy for the conservation and management of Ethiopian wolves. This plan called for improved management and expansion protected areas, the control of domestic dog population in wolf habitats, a greater focus on environmental education, and the need for further research into the remaining wolf populations. Now, 14 years later, it was felt the time was right to review the

status of Ethiopian wolves, to evaluate current conservation measures, and to reassess priorities with regards to their management and future conservation (IUCN/SSC, 2011).

The Ethiopian wolf is the most endangered carnivore scattered throughout the highlands, are in a dangerous situation on the edge of extinction. The persisting human impacts upon natural resources affected settlers, by free livestock grazing and firewood extraction. One of the biggest threats to the park is rearing livestock animals around and/or in the park and using free grazing. These have been affecting the endangered Ethiopian wolf in the BMNP (EWCP, 2016).

The conservation attitude of local community living adjacent and in the protected areas is highly influenced by the problems they face in association with the Ethiopian wolf. Based on the EWCP works education campaign seeks to involve local communities in the protection of afro alpine natural resources, and their critical wolf areas. Knowing these trends in population allows us to make reliable management decisions and take corrective action when necessary. They may be used to determine if the current Ethiopian wolf management practices are producing or sustaining the species. Therefore, the purpose of this study was to investigate the current population status and local community's perception towards Ethiopian wolf in Bale Mountains National Park.

1.3 Objectives

1.3.1 General objective

The general objective of this study was to investigate the current population status on Ethiopian wolf.

1.3.2 Specific objectives

- To assess the current population status of Ethiopian wolf in the study area.

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1.4 Research Questions

1. What is the population status of Ethiopian wolf in BMNP?

2. METHODOLOGY

2.1. Description of the Study Area

2.1.1 Geographic Location and Topography

The Bale Mountains National Park (BMNP) is situated in the southeastern highlands of Ethiopia, in the Oromia National Regional State. The Park encompasses 2,200 km^2 of mountains and forest. Geographically, BMNP is located between 06°41'N, 39°03'E and 07°18'N, 40°00'E (Fig.1) about 400 km from Addis Ababa (Michael, 2009). Bale Mountains National Park contains the largest continuous area (over 1,000 km^2) of afro-alpine habitat in Africa (Yalden, 1988). It covers an altitudinal range from 1,500 to 4,377 masl (Fishpoll and Evans, 2001). Tullu Dimtu (at 4,377 m asl) in the Bale Mountains is the highest peak in southern Ethiopia and the second highest in the country (Michael, 2009).

The Bale Mountains National Park surrounded by priority forest areas, mountains and valleys, grasslands and agricultural land, represents the largest area of Afroalpine habitat on the African continent (BZFEDO, 2014).This area forms the watershed of the Bale massif, which is critical for the livelihoods and well-being of hundreds of thousands of people in the highlands of southeast Ethiopia and an estimated 12 million people in the lowlands of southeast Ethiopia, northern Kenya and Somalia (BZFEDO, 2014). The forests together with the Afro-alpine plateau are host to globally unique and diverse fauna and flora, including a significant number of rare and endemic species (BZFEDO, 2014).

Map of the study area

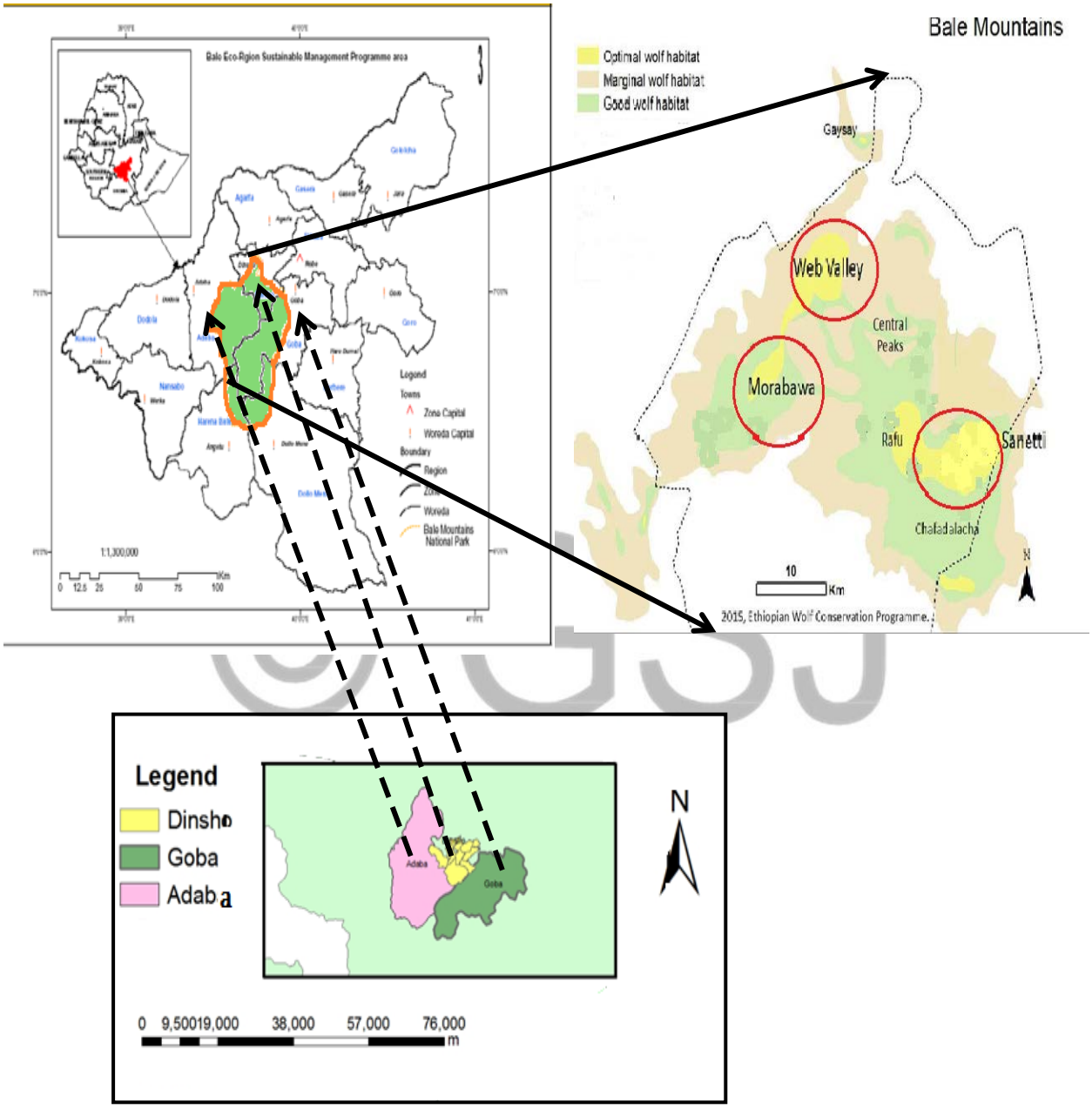

Figure 1:- Map of the Study area

(Source: - FA, SOS Sahel and FZS, 2008)

2.2 Methods of the study

2.2.1 Sampling design

In this study, two stage-sampling techniques were employed to select the sample farmers. In the first stage, six rural Kebeles were purposefully selected from three adjacently associated districts (Goba, Dinsho and Adaba) found in and around BMNP area, on the basis of the Ethiopian Wolves high population living area. These purposively selected Kebeles are two Kebeles from Adaba district (Weggii Arena and Bucha Raya), from Dinsho (Gojera and Geremba), and from Goba (Rirra and Shedem) selected for household survey where the density of settlement and/or agricultural activities integrity applied and Ethiopian Wolves high population living area in and around the park.

In the second stage, farmers in the purposively selected six sampled kebeles were listed down and prepared. Then, the sample respondents from each kebeles were selected proportionally from each kebeles. Then, samples of 180 farm households were drawn using the formula calculating proposed by Yamane (1967) reviewed by Israel (2012).

$$n = \frac{N}{1 + N(\alpha)} 2 \qquad (1)$$

Where:-

n = is the sample size,

N = is the population size and

α=is the level of precision. For this study, α =10% precision level was used due to financial constraint.

N = 180

Accordingly, a total of 180 sample household were randomly selected from 6 purposively selected Kebeles using the equation (1) and adds 83 sample households on the calculated n's (sample size) to decrease the error term and distribute proportionally on 6 Kebeles. Table-1 shows the sample size along purposively selected 3 districts and 6 Kebeles

Table 1:- Number of Households and Sample Size

S.No	Name of District	Name of Kebeles	Total HH in Kebeles	Sampled households
1	Adaba	Bucha Rayya	784	36
		Weggii Arena	641	29
2	Goba	Shedem	898	41
		Rirra	536	24
3	Dinsho	Geremba	687	31
		Gojera	428	19
Total		**6**	**3,974**	**180**

HH = Household

2.3 Data Collection

2.3.1 Animal survey

A preliminary survey in the study area has been carried out between February-March, 2016. All wolf packs in three habitats (Sanetti, Web valley and East morebewa) were counted using total count methods by the help of binoculars. Counting were carried out during early morning at 6:00 AM and late afternoon at 3:00-6:00 PM at 20-50ms distance, while during animals are active for feeding both during the dry season and wet season. Keeping all records of Wolves seen around the den during social greetings and patrols until new individuals observed. Total counts were facilitated by the inherent stability of packs and territories (Sillero-Zubiri and Gottellii, 1995b), the concentration of pack members around the den during the reproductive season and recognition of the dominant pair and age/sex of other individuals from behavioral observations. During the counting, sex and age structures were identified by their color and size.

2.3.2 Questionnaire survey

In order to assess the impacts of anthropomorphic activities towards Ethiopian wolf in BMNP a structured and semi structured interview were designed and carried out in six selected Kebeles of the local people based on the distance and their settlement in the park. The interview survey was

conducted within and around 0 to 5 km of series. A total of 180 households were selected. The questionnaires were designed to understand the local community perception in the BMNP towards Ethiopian wolf. The questionnaire was administered to farmers within their area of farming and/or residence (Hillman, 2000), at a random manner basis (Newmark *et al*., 1994), and alternating male and female respondents as much as possible and different age groups.

Likert scale rating (A 5-point rating scale, Strongly Agree (SA) = 5, Agree (A) = 4, moderately agree = 3, Disagree (D) = 2 and Strongly Disagree (SD) = 1)

was employed to evaluate their attitude towards Ethiopian Wolves Conservation in study area. A rating scale is a psychometric scale and bipolar scaling method (Wuensch, 2005) and a set of categorized response items used in survey research to elicit information about a quantitative or a qualitative attribute from respondents. In the social sciences, common examples are the Likert scale and 1-10 rating scales in which a respondent selects the number which is considered to be a true reflection of the perceived quality or opinion of the respondent on an item statement (Andrich, 1978).

2.3.3 Focus Group Discussion (FGD):

Focus group discussions were held in the villages to discuss on the issues (Appendix 3). Six FGDs one from each Kebele were held focusing on the benefit from BMNP, settlement in BMNP, coexist of humans and Ethiopian Wolves, the challenges of Ethiopian Wolves to be inclined in number and their propositions to solve the problem. During group discussions, the researcher initiated the discussion by stating some of the observation and responses from people interviewed and questionnaires. Group discussions were used as a complement for the questionnaires.

2.4 Data analysis

The collected data were analyzed using SPSS version-20 and descriptive analysis (frequencies, mean rating /Likert scale rating /, t-test and chi square test) for analysis of attitude towards Ethiopian Wolves conservation.

3. RESULTS

3.1 Population Status of Ethiopian Wolf

Table2:- Total count of Ethiopian Wolf in the year, 2016

Name of focal site	Population Count		
	Wet season	Dry season	Mean
Sanatii	20	35	27.5
WebValley	25	45	35
East Marebowa	15	30	22.5
Total	**60**	**110**	**85**

Source: Survey data, 2016

The total numbers of Ethiopian wolf observed were 60 during the wet season and 110 in dry season Additionally, Sex and age structure were categorized based on the observations during the total counts (Table 3). Similarly, out of the total numbers of Ethiopian wolf, 30.6 % were adult males, 19.5% adult females.12.4% sub-adult males and 11.8% sub -adult females. The difference was statistically significant (χ^2=21.515, df = 3, P < 0.01).

Table3:- Number, sex and age Category of Ethiopian Wolf Population.

Count	Season	Total number	sex category				Age category		
			AM	AF	SAM	SAF	SAU	UJV	PUPS
1st	Wet	60	20	15	9	11	5	0	0
2nd	Dry	110	32	24	12	9	0	3	30
Average (%)		85	26	19.5	10.5	10	2.5	1.5	15

AM = adult male, AF = adult female, SAM = sub adult male, SAF = sub adult female, SAU = sub adult unknown, UJV= unknown Juveniles

That result indicated that the total number of Ethiopian Wolves increased in 2007/8 as compared to 2006/7 by 40.13% and decreased in 2008/9 by 37.56% as compared to 2007/8 year. High CDV outbreak registered during 2010/11 and affects the population of Ethiopian Wolves in the

BMNP which decrease 43.71% of the population of Ethiopian Wolves as compared to the previous year 2009/10 population but in 2011/12 and 2012/13 the population of Ethiopian wolves increased by 28.55% and 7.27% respectively due to conservation effort carried out. In general, the population of Ethiopian Wolves counted in last end of 2016 decreased by 2.33% as compared to last year (2014/15) and decreased by 46.74 as compared to 2006/7. Figure-2 also illustrates the trends of estimated total population of Ethiopian Wolfs in BMNP in last 10 years. The difference was statistically significant (t-test = 10.055, df = 9, $P < 0.01$) and the mean of population of Ethiopian wolf counted in the last 10 consecutive years have been 136.

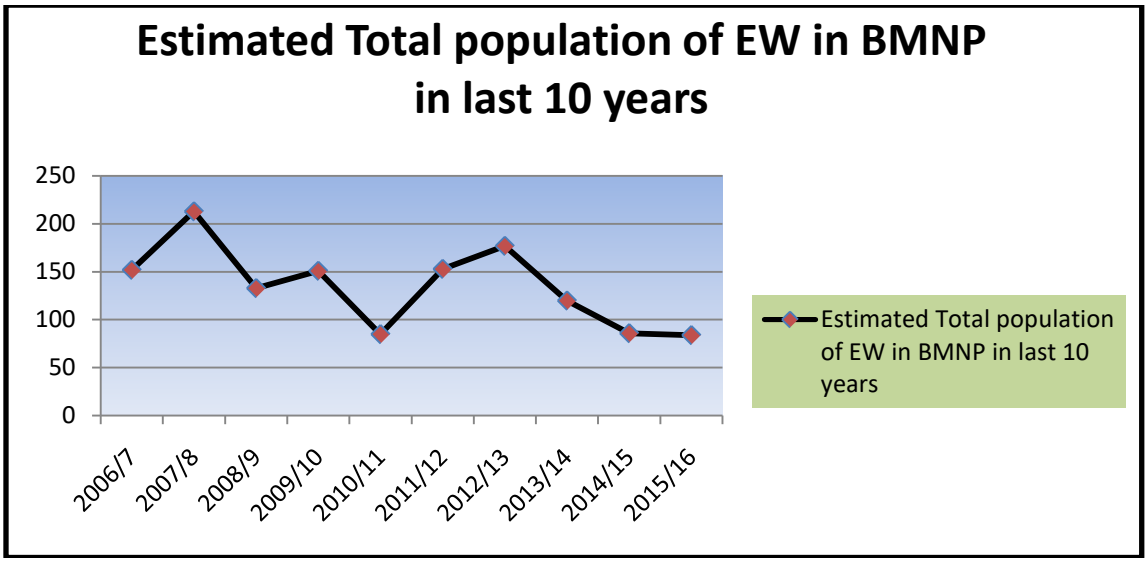

Figure2:- The estimated total population of Ethiopian Wolfs in BMNP in last 10 years (Source: EWCP, 2016)

3.2 Surveyed villages

3.2.1 Surveyed villages

A total of 180 sample household were randomly selected from 6 purposively selected Kebeles using the equation (1) and adds 83 sample households on the calculated n's (sample size) to decrease the error term and distribute proportionally on 6 Kebeles. Table-1 shows the sample size along purposively selected 3 districts and 6 Kebeles.

As shown below, the results of the study revealed that the educational level of the respondents has shown significant variation (χ^2 = 57.44, df = 2, p < 0.01). From the total 138 (76.67%) respondents were uneducated, 20 (11.11%) were attended primary education. 14 (7.78%) attended high school education and the remaining 8 (4.44%) have certificate. The respondent attitude towards the Ethiopian Wolves based on their educational level, about 52(28.89%) have positive attitude as compared to 92(51.11%) of the respondents with negative attitude. Most respondents with negative attitude are uneducated. Relatively literate respondents have positive attitude towards the Ethiopian Wolves in the study area. The rest 36(20%) of the respondents have no ideas about the Ethiopian Wolves. (Table -5)

Table 5:-Frequency distribution of Educational level and outlook towards the Ethiopian Wolves

			Educational level and Attitude towards the Ethiopian Wolves hartebeest					
			Positive		Negative		No idea	
Education level	No	%	Count	%	Count	%	Count	%
Uneducated	138	76.67	22	15.94	91	65.94	25	18.12
Elementary	20	11.11	12	60	1	5	7	35
High school	14	7.78	10	71.43	-	-	4	28.57
Others	8	4.44	8	100	-	-	-	-
Total	**180**	**100**	**52**	**28.89**	**92**	**51.11**	**36**	**20**

Table- 6 shows that, feeling of the farmers about the population change of Ethiopian Wolves of in the BMN. The study showed that the feeling of the respondents about the population change of Ethiopian Wolf has significant variation. From the total respondents 24(13.33%) feel population of Ethiopian Wolf increase in the park. Whereas 124(68.89%) said decrease, 20(11.11%) of the respondents observe there is no change in the number of population, and the rest 12(6.67%) of the respondents do not consider their number. However, feelings of respondents on the change of Ethiopian Wolfe population have significant difference (χ^2 = 186.578, df = 3, p < 0.01).

Table -6: - Respondents Feeling about the population change of Ethiopian wolf.

			Feel of respondents about the population change of Ethiopian wolf in the park							
	Total		Increase		Decrease		The same		Don't know	
Kebele	No	%	Count	%	Count	%	Count	%	Count	%
Bucharaya	36	20.00	7	19.44	24	66.67	3	8.33	2	5.56
Wegiarena	29	16.11	4	13.79	17	58.62	5	17.24	3	10.34
Shedam	41	22.78	5	12.20	31	75.61	3	7.32	2	4.88
Rirra	24	13.33	3	12.50	18	75.00	1	4.17	2	8.33

Geremba	31	17.22	3	9.68	21	67.74	6	19.35	1	3.23
Gojera	19	10.56	2	10.53	13	68.42	2	10.53	2	10.53
Total	**180**	**100**	**24**	**13.33**	**124**	**68.89**	**20**	**11.11**	**12**	**6.67**

From all the respondents regarding on the living area of them, depend on the park. However, all 168(93.3%) live inside the park and 171(95%) the respondents fetch fire wood from inside the BMNP.

Human settlement expansion in the park is one of the problems in the study area.

Table-7 shows that the survey assesses the idea of sample household respondents about trends of human settlement expansion in the park in the last 10 years in the study area. Accordingly, 112(62.22%) of the respondents said increase, 27(15%) said decrease, 18(10%) said there is no change, and the rest 23(12.78%) responds unknown. However, there has been statistically significant deference between respondents (χ_2 =133.911, df = 3, p < 0.01).

Table7:-Trends of human settlement expansion in the park

Kebele	No	Total	Trends of human settlement expansion in the park in the last 10 years (%)			
			Increasing (%)	Decreasing (%)	The same (%)	Unknown (%)
Bucharaya	36	20.00	44.44	16.67	16.67	22.22
Wegiarena	29	16.11	62.07	10.34	3.45	24.14
Shedam	41	22.78	73.17	9.76	9.76	7.32
Rirra	24	13.33	58.33	12.50	8.33	20.83
Geremba	31	17.22	74.19	16.13	9.68	-
Gojera	19	10.56	57.89	31.58	10.53	-
Total	**180**	**100**	**62.22**	**15.00**	**10.00**	**12.78**

3.2.3 Livestock Ownership

Another important component of the farming system in the study area, like in any other parts of rural households in Ethiopia, is animal rearing. They use as sources of food, draft power, income, and energy. Moreover, livestock are indices of wealth and prestige in rural areas. All of the sample households reared livestock's.

Newly born sheep and goats eaten by Ethiopian Wolves in the last 10 years in BMNP has no significant difference (χ_2 = 1.44, df = 3, p >0.01). Accordingly, from the total respondents, 38(21.11%) said increase, 72(40%) said decrease, 52(28.89%) said there is no change, and the rest 18(10%) said do not know about the trends of newly born sheep and goats eaten by Ethiopian Wolves in the last 10 years in BMNP.

Table 8:- Trends of new born sheep and goats eaten by EW in the last 10 years in the study area.

			Trends of new born sheep and goats eaten by Ethiopian Wolves in the last 10 years							
	Total		Increase		Decrease		The same		Don't know	
Kebele	No	%	Count	%	Count	%	Count	%	Count	%
Bucharaya	36	20.00	7	19.44	16	44.44	10	27.78	3	8.33
Wegiarena	29	16.11	4	13.79	12	41.38	11	37.93	2	6.90
Shedam	41	22.78	10	24.39	14	34.15	10	24.39	7	17.07
Rirra	24	13.33	4	16.67	8	33.33	7	29.17	5	20.83
Geremba	31	17.22	8	25.81	14	45.16	9	29.03	0	0.00
Gojera	19	10.56	5	26.32	8	42.11	5	26.32	1	5.26
Total	**180**	**100**	38	21.11	72	40	52	28.89	18	10.00

Livestock rearing is the major source of income for the respondents. Pastoralist, Crop production, and both activities are important income sources for the sample respondents. The entire sample farmers reported that they rear livestock for their economic benefit. Table -9 shows that, 112 (62.22%) sample household respondents depend on livestock for their income about 3.89% (7) of the respondents reported crop production on their main income for their. The remaining 61(33.89%) of respondents depend on both livestock rearing and crop production for their livelihood. They sold livestock for their livelihood particularly to purchase food grains and consumption goods, inputs used for livelihood, social benefits, to replace old or disabled animals, and for other purposes. The average economic dependence on livestock income has statistically significant difference on crop production and/or both at 5% probability level (χ_2 = 91.9, df = 2, p < 0.01).

Table 9: -The economic dependency of respondents

			HH Economy					
	Total		Pastoralist		Crop producer		Both	
Kebele	No	%	Count	%	Count	%	Count	%
Bucharaya	36	20	17	47.22	2	5.56	17	47.22
Wegiarena	29	16.11	17	58.62	2	6.90	10	34.48
Shedam	41	22.78	26	63.41	1	2.44	14	34.15

Rirra	24	13.33	16	66.67	1	4.17	7	29.17
Geremba	31	17.22	22	70.97	-	-	9	29.03
Gojera	19	10.56	14	73.68	1	5.26	4	21.05
Total	**180**	**100**	**112**	**62.22**	**7**	**3.89**	**61**	**33.89**

Most of the respondents' household economy is based on livestock rearing. This is because, there is grass and water in the park and the household can use free grazing for their cattle. The agro ecology is very suitable to fatten sheep. That is why the number of sheep for each respondent is high. In general, trends of livestock grazing in the park in last 10 years has statistically significant difference (χ_2 =180.311, df = 3, $p < 0.01$). According to the data obtained from the respondents regarding the trends of livestock, grazing in the BMNP in last 10 years revealed on Table -10. From all respondents 123(68.33%) said the trend of grazing in the BMNP increased, 18(10%) said the trend of grazing has been decrease, 20(11.11%) of the respondents react that there was no change. The rest 19(10.56%) do not consider about the year-to-year trend of livestock grazing in the BMNP.

Table 10:- Trends of livestock grazing in the park in the last 10 years

			Trends of livestock grazing (%)				
	Total		Increase	Decrease	The same	don't know	Values
Kebele	No	%	%	%	%	%	
Bucharaya	36	20	58.33	5.56	19.44	16.67	
Wegiarena	29	16.11	65.52	10.34	3.45	20.69	
Shedam	41	22.78	75.61	7.32	9.76	7.32	
Rirra	24	13.33	62.50	8.33	12.50	16.67	
Geremba	31	17.22	77.42	12.90	9.68	-	
Gojera	19	10.56	68.42	21.05	10.53	-	
Total	180	100	68.33	10	11.11	10.56	

Crop production is one of the economic pillars for the households living in and around the BMNP. The sample households also reveal the trends of farmland expansion in last 10 years in BMNP. Cereal crops like Barley and vegetables (potato, shallot and garlic) are the most grown crops in the area. Sample household respondents requested about the trends of farmland expansion in last 10 years in the BMNP. Accordingly, as Table -11 shows, 133(73.89%) of sample household respondents responds increase, 14 (7.78%) said decrease, 22(12.22%) answered no change, and the rest 11(6.11%) said do not know about the trend of farmland

expansion in last 10 years in the BMNP. However, the result obtained has been statistically significance difference on trends of farmland expansion in the last 10 years in the BMNP (χ_2 = 230.899, df = 3, $p < 0.01$).

Table 11:- Trends of Farm land expansion

			Trends of Farm land Expansion in the last 10 years							
	Total		Increase		Decrease		the same		don't know	
Kebele	No	%	Count	%	Count	%	Count	%	Count	%
Bucharaya	36	20	23	63.89	3	8.33	8	22.22	2	5.56
Wegiarena	29	16.11	23	79.31	2	6.90	1	3.45	3	10.34
Shedam	41	22.78	32	78.05	2	4.88	4	9.76	3	7.32
Rirra	24	13.33	18	75.00	-	-	3	12.50	3	12.50
Geremba	31	17.22	24	77.42	4	12.90	3	9.68	-	-
Gojera	19	10.56	13	68.42	3	15.79	3	15.79	-	-
Total	**180**	**100**	**133**	**73.89**	**14**	**7.78**	**22**	**12.22**	**11**	**6.11**

Most of the people and all livestock live in the study area. The respondents requested about the magnitude of effects of Ethiopian wolves on the livestock production. Table- 12 shows that from all sample respondents 159(88.33%) said there is no change what the Ethiopian wolf in the park did on the livestock rearing around BMNP. Only 1(0.56%) respondent said the effect has decrease. The rest of the respondents 11.11% said that they do not know the effect of Ethiopian Wolf on livestock predation. Accordingly, their answer has been significantly difference regarding on the effect of Ethiopian Wolf in livestock predation in last 10 years in the BMNP (χ_2 =248.033, df = 2, $p < 0.01$).

Table12:- Respondents expectation regarding the effect of Ethiopian Wolf in livestock predation in last 10 years

			Respondents expectation regarding the effect of Ethiopian Wolf in livestock predation in last 10 years							
	Total		Increase		Decrease		the same		don't know	
Kebele	No	%	Count	%	Count	%	Count	%	Count	%
Bucharaya	36	20	-	-	-	-	28	77.78	8	22.22
Wegiarena	29	16.11	-	-	-	-	26	89.66	3	10.34
Shedam	41	22.78	-	-	-	-	37	90.24	4	9.76
Rirra	24	13.33	-	-	-	-	22	91.67	2	8.33
Geremba	31	17.22	-	-	1	3.23	29	93.55	1	3.23
Gojera	19	10.56	-	-	-	-	17	89.47	2	10.53
Total	180	100	-	-	1	0.56	159	88.33	20	11.11

Table-13 shows that the respondents feel about the domestic animals and Ethiopian Wolf can live together has shown significant variation (χ_2 =1.810, df = 4, p > 0.01). Towelve (6.67%) of the respondents strongly agree, 21(11.67%) agree, 17(9.44%) moderately agree, and the rest 29 (16.11%) and 101 (56.11%) were said disagree and strongly disagree, respectively. Finally, the respondents opinion on the willingness to leave out from the park if the government arranges a resettlement out of the park has shown significant variation (χ_2 = 71.778, df = 4, p < 0.01). Accordingly, 14(7.78%) respondents strongly agree on leaving the park, 59(32.78%) respondents agree, 67(32.22%) moderately agree, and the rest 27(15%) and 13(7.22%) were reluctant to leave the park if the government arranges a resettlement place with said disagree and strongly disagree, respectively.

3.3 Focus group Discussion

Discussions with focus groups and key informants concerning the Ethiopian Wolf conservation in BMNP showed that increment of human settlement, expansion of crop production , free grazing of livestock rearing, transmit of rabies disease due to un tie dogs live , fire and cutting forest are the challenges of Ethiopian Wolf in BMNP which are increasing from time to time. However, in all type of discussion the majority had a positive attitude towards the conservation of Ethiopian Wolf in BMNP. Few of them had a negative attitude towards the Ethiopian Wolf who are rearing large amount of sheep and goats in the BMNP. Newly born sheep and goats were eaten by Ethiopian Wolf when there was a shortage of feed for Ethiopian Wolf in the

BMNP during wet season is the cause of negative attitude by the local community towards the Ethiopian Wolf conservation in the park; but it is too rare case. Though, to mitigate the problem, it should be given continuous awareness creation, education about conservation of Ethiopian Wolfs and protection for the dweller.

Directly and indirectly, one of the incomes for the community is from foreigners tourists coming to visit the area and watching the Ethiopian Wolves. They know and understand that the tourists pay money for the country and for guide. They know when these foreign tourists come to visit BMNP particularly Ethiopian Wolves.

The consequence of disappearance of Ethiopian Wolf from the BMNP may cause that no tourist come to high land Ethiopia that means decrease the foreign currency obtained from for the country and local communities, and lost endemic habitat from the nation and glob. Thus, interviewee agreed and suggests each community and stakeholder should responsible for the conservation and management of Ethiopian Wolfs in the BMNP as follows. The local people should be ready to cooperate for change. Farmers have to practice conservation agriculture like diversifying crop production and should have engaged in agro-forestry through the community forestry program. The conservationist should take strong measure to manage Ethiopian Wolf and coordinate to benefit the community, should maintain natural areas and protects threatened species, and teach more about the species and the benefits of conservation. The government should take action to build strong policy and should give great attention for conservation education.

In general, in order to bring sustainable development for BMNP and communities exist in and around the park, all concerned bodies should take action to stop new settlement, settlers should take measure to decrease their livestock number, and should tie their doges at home. Protecting and conserving Ethiopian Wolves are become important environmentally and economically for BMNP and Ethiopia alike. For the conservation of Ethiopian Wolf and its habitat, through the protection and management of species, the initiation and support of community conservation and development program implementation should take up with, and the education of neighboring areas in the value of Ethiopian Wolf should be applicable. Therefore, the focal group agreed on

the discussion that BMNP's Ethiopian Wolf should continue to be a focus of attention on the development and protection with the communities.

Therefore, from the all types of discussions conducted in the study area, it can be understood that despite the commitment limitations of stakeholders involved in conservation, protection and management of Ethiopian Wolf in BMNP, communities should committed to keep these resource as it is and committed to take action to preserve these endemic habitat. This is because of the comparative benefits of Ethiopian Wolf than the settlers to exist alive.

4. DISCUSSION

4.1 Population status of Ethiopian Wolf and trends in BMNP

The viable population number of a species should be assessed in order to take appropriate management and conservation decision in its natural habitat (Buckland *et al*., 1993; Groves, 1996). Based on such assumptions, the population status of endangered Ethiopian Wolf carried out by EWCP. The present investigation showed that the number of Ethiopian Wolf has became decreasing. Ten years ago, the population abundance of Ethiopian Wolf was 213 (EWCP, 2015). The population size during the study period is higher during the dry season than during the wet season. The scarcity of resources especially mole rats during the wet season might make the animals dispersed. During the survey time, relatively the number of adult females is less than the males.

The study shows that there has been a problem of human population pressure on the BMNP, and as a result, an endemic Ethiopian Wolves are endangered. This study tried to identify the presence of 85 individuals of Ethiopian Wolf. However, the total number of Ethiopian Wolf found in BMNP counted during this study was relatively smaller when compared with past-recoded data. This may enforce to better attention and management practice in this study area. The survey result shows that the population counted in different selected area varied during a record of this study. This might be due to the effects of transmitted disease caused by domestic dogs like Rabies and canine distemper virus (CDV) from the settlers in and around BMNP. Similarly, Jorgelina *et al.*, (2016) showed that this population declined as comparable to that recorded during the CDV outbreaks of 2005 and 2010. During survey, few number of adult wolfs

population were observed in Morabawa, Sanetti Plateau and Web Valley and the number of young is very limited. This shows less population growth in the future.

The dominancy of livestock competition with wildlife habitat and spoil of habitat corridors in the park could be due to the illegal extraction of resources and presence of heavy grazing by livestock conducted by the settlers. This study is similar to the study conducted by Kiringe and Okello, (2007) in Kenya in which most of the threatened protected areas such as natural forests and mountainous ecosystem protected areas degraded through livestock grazing and deforestation. The effect also revealed through competition with wildlife, deterioration of their habitats and environmental degradation. Increased farmland and livestock in the park greatly changed and affected the park. Such influence may need high commitment to reverse the situation and keep the natural resource as it is (Tewodros Kumssa and Afework Bekele, 2014).

4.2 Human settlement expansion in the BMNP

Major identified problems and trends/extents in the park in the last 10 years were identified and the respondents respond their feelings. The high dependency of the local people on the BMNP and settlement affect the survival and existence of the habitat and ecosystems of the natural phenomena found in BMNP. Agricultural expansion (crop production), livestock encroachments, fire, grasses and trees cuttings, and water shortage (during dry season) are increased more than 80% in the BMNP. In general, from identified major factors averagely 73.73% increased in last 10 years in the study area. Correspondingly, the local peoples rely on the surrounding park resource to meet the needs of their livestock. This is particularly the case in dry seasons due to shortage of water and other resources, and leading to disturbance of the park and its biological resources. Fetching fire wood collection from forest tree observed at BMNP. The local communities observed when they involve in clearing of forests for various purposes. Collection of wood caught from illegal activities in local administrative Kebeles and mass livestock grazing in the park observed during the field visit.

4.3 Challenges of Ethiopian Wolves in BMNP

Careful management will be required if the dual goals of wildlife conservation and economic livelihood for communities are to be met Winterbach *et al.,* (2013). Ethiopian wolves are

specialized rodent hunters, the study illustrated by Marino *et al.,* (2010) shows that in the heavily populated highlands of North Ethiopia they are common predators of livestock, possibly a reflection of dietary adjustments to less abundant rodent prey and high livestock availability. The same is true in few parts of BMNP where the population of livestock large and when the Ethiopian Wolfs could not get rodents might be attack newly born sheep and goats at the grazing area. Results from the Simien Mountains National Park (Mesele Yihune *et al*., 2008), also indicated that predation was the highest close to the Afroalpine habitats where wolves live, and that predation will vary with the prevailing grazing regimes and guarding techniques.

Studies conducted particularly on the social aspect of interconnection between Ethiopian Wolf and communities found in BMNP regarding conservation to ensure access to natural resources while promoting long-term sustainability will contribute to maintain positive attitudes among people in BMNP, and continued willingness to co-existence with carnivores (Dickman, 2010). Considering that, demand for land in itself is a major threat to the conservation of Afroalpine ecosystems particularly for Ethiopian Wolfs in BMNP, opportunities for alternative income always promoted to ensure positive attitudes toward conservation among landless households in BMNP, of which tourism is a good example by hire horse, guidance and sell some cultural and traditional equipment.

Some of the respondents 38 (21.11%) said that the effect caused by Ethiopian Wolf on newly born sheep and goats increased and those who have negative attitude towards Ethiopian Wolf are illiterate 91(65.94%) and whose age is more than 46 years (85.56%) . Communities who have far distance from extension service, did not get extension service from nearest Farmers Training Center 152 (84.44%) had played a role to be negative attitude. This might be due to lack of awareness, level of education, and lack of benefit from the Ethiopian Wolf in the park. According to Newmark *et al.,* 1994 stated that in many parts of Africa, the conflict between local people and wildlife is the most serious problem if they are adjacent to nature reserves. This study also shows close proximity between farms and the park resulting in high levels of conflicts. This is because of according to the survey result, trends of settlement in the BMNP increased in last ten years112 (62.22%).

However, if such situation continues conservation and management of the Ethiopian Wolf as well as other wildlife in the BMNP will be challenging. Kideghesho *et al., (*2006), revealed the

loss of wildlife habitats to cultivation in other African country. According to the response of respondents, almost all communities used the resource from the BMNP. This dependence of local people on the resources of the park might affect the life of the Ethiopian Wolf and management practices. Demeke Datiko and Afework Bekele (2011) observed similar problems from Nechi Sar National Park. However, as noted by Sunquist and Sunquist (2001), to quantify the impact of threats requires long-term research and monitoring activities on each of the issues. Moreover, the local people besides imposing pressure on the protected area disturb the vegetation through uncontrolled fire during the dry season. Generally, crop damage, lack of free access and grazing livestock in the sanctuary were the major problems in the study area. Therefore, as noted by Tjibae (2001), it is advisable to compensate the local people by allowing proper utilization of the resources of the BMNP and sharing income from tourists than direct payment of money.

5. CONCLUSION AND RECOMMENDATION

5.1 Conclusions

The present study tried to show the population trends and perception of local people towards Ethiopian wolf in the study area. The specific locations for population of Ethiopian Wolf in BMNP were clearly identified. This specific location is Web Valley, East Morabawa and Sanetti Plateau. The livelihoods of the highland people of Ethiopia are a mixture of small-scale subsistence agriculture and pastoralism, with strong dependence on Afro-alpine habitats for firewood, pastures, construction materials and water. Understanding the ecological and socio-economic aspects of natural resources uses is central to achieving a balance between the immediate needs of people and the long-term provision of ecosystem services in highlands.

There is high distance between the respondents residence and nearest FTC and the awareness given about the Ethiopian Wolf protection and management in the study area by stakeholders were low. The perception of respondents towards the management and conservation of Ethiopian Wolves have been affected by the settlement of people in the park. The outlook of local people towards conservation is diverse and complex. Negative perceptions were more acute among people living closer to Afro-alpine habitat, for fear of losing access to natural resources and

among landless families who aspire to own land. Families with more livestock perceived conservation as a way to ensure extra fodder in difficult years, but also developed a more negative attitude towards Ethiopian wolves due to livestock predation, than families with smaller herds and living far away from Afro-alpine habitat.

These threats are causing different impacts in the park. Many factors are responsible for the intensification of the threats. Inadequate participation of communities, socioeconomic factors and absence of direct incentives provided for communities are the major ones. Therefore, it needs attention from concerned bodies (local people and government)

5.2 Recommendations

Based on the findings of the study, the following points are recommended to improve the population status of Ethiopian wolf.

- Consistent awareness and training should be giving to the communities to improve the attitude towards the management and protection of Ethiopian Wolf in BMNP.
- The conservationist/government should take strong measure to manage Ethiopian Wolf, as the animals are threatened and endemic species.
- The government should take action to build strong policy, for conservation education as a vital component of the education programme.
- Planned and regular surveys should be carried out by ecologists with particular attention in order to prepare a soundly based management program for Ethiopian wolf.
- Provision of appropriate conservation education is important for the local communities/children at different levels (primary, secondary and high schools). This needs great attention to empower the local people.
- Continuous monitoring and evaluation process of effects of human activities in the park are needed for better measures

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