International Journal of Ecology and Environmental Sciences 44 (3): 217-226, 2018
ISSN: 2320-5199 (Online)

Assessment of Crop-Raiding in and Around the Bale Mountains National Park, Ethiopia

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ABSTRACT

The present study focused on human-herbivores conflict in around the Bale Mountain National Park, Ethiopia. Data were collected from selected sites between July, 2016 and April, 2017, by using questionnaire survey of sample households, direct observation on crop damage by different herbivores and key informant interview. Descriptive statistics was used to analyze socio-economic status of respondents. Chi-square test, correlation and one-way ANOVA were also used to investigate the relationship between different variables. Majority of respondents (82.6%) had reported crop damage by different vertebrates. Olive baboon (*Papio anubis*), warthog (*Phacochoerus aethiopicus*), common mole rat (*Tachyoryctus splendens*), porcupine (*Hystrix cristata*), grey duiker (*Sylvicapra grimmia*), mountain nyala (*Tragelaphus buxtoni*) and bohor reedbuck (*Redunca redunca*) were mentioned as important crop raiders. Many (73.65%) of the respondents reported olive baboon and warthog together as major crop raider. Significant number (80%) of respondents reported the loss of barley. There was also (16.1%) the damage of oat, barley, wheat and bean in together. There was positive correlation between distance from the Park and degree of crop damage ($r = 0.71$, $P < 0.05$) so that the conflict was not occurred for local people are lived in or near to the Park. The conflict is highly due to the wildlife live outside the parks' range. Therefore, outside the park border, the population status and distribution of crop-raiders is recommended to be studied so that the management plan would be made easy.

Key Words: Bale Mountains National Park; Crop Raiding; Human-Wildlife Conflict

INTRODUCTION

Several wildlife species including primates, ungulates and rodents are major groups of conflict causing animals (Hill et al. 2002, Hockings 2007, Marchal and Hill 2009). The damage or conflict caused by herbivores involves crop-raiding that happens whenever an herbivore consumes or mechanically destroys food crops and sometimes injure or kill those people trying to protect their agricultural products. A large proportion of the human population in Africa is greatly dependent on food crops for their survival on the land, coupled with the presence of many species of large mammals. This in turn creates increasing friction between protected area managers, and local communities living in the regions of protected areas (Hill et al. 2002). Many African countries such as, Kenya and Namibia experience high level of conflict (Smith and Kasiki 2000). Crop-raiding animals would present significant problems to communities by consuming or damaging food crops around different protected areas of the continent include buffaloes (*Syncerus caffer*), porcupines (*Hystrix cristata*), olive baboons (*Papio anubis*), elephants (*Loxodonta africana*), bush pigs (*Potamochoerus porcus*) and chimpanzees (*Pan troglodytes*). On the other hand, smaller animals such as rodents and birds can cause great cumulative damage over time (Hill et al. 2002). Additionally, gelada baboon (*Theropithicus gelada*), Swayne's hartebeest (*Acelaphus buselaphus swaynei*), warthog (*Phacochoerus aethiopicus*) and porcupine raid and damage important crops including maize and potato (Kumssa 2006, Yihune et al. 2009, Andarge 2010).

The number of people and their livestock has been increasing in the BMNP since its establishment. This led to conflict that is between wildlife and humans living in and around the National Park as it is seen during preliminary survey. Human-wildlife conflict is not a unique phenomenon of BMNP (Gashaw 2015). It occurs whenever an action by humans or wildlife has an adverse impact upon the other (Conover 2002). Agricultural encroachment leads to habitat fragmentation and increased human wildlife conflict, such as crop raiding by Mountain Nyala (*Tragelaphus buxtoni*), Bush Pigs (*Potamochoerus larvatus*) and Olive baboons (*Papio anubis*) (Vial 2010).

Therefore, the major objective of the study is to investigate the status of human-herbivores conflict in and around Bale Mountains National Park. Major conflict-causing animals were clearly identified. Local people's attitude towards conflict causing herbivores was also investigated.

MATERIALS AND METHODS

The Study Area

Bale Mountains National Park is located in the Oromia regional state. The area lies within geographical coordinates of 6˚29'N - 7˚10'N and 39˚28'E - 39˚57'E (Fig. 1). The Bale Mountains are situated in the south-east highlands of Ethiopia, geographically separated from the western and central highlands of the country by the Rift Valley. The National Park contains a landscape ranging from 1500 m to 4377 m above sea level (Yalden 1983). Temperatures vary widely throughout the Park and fluctuate little through the year. At 3000 m a.s.l., the mean monthly temperature is close to 10^0C in all months. Frost occurs above 2700 m particular in the cloud free nights of the dry season. On the plateau, daytime temperatures hover around 5°C (41°F) although winds are relentless, and can drop below zero at night (Malcolm and Evangelista 2005). Annual rainfall varies from 600 to 1,150 mm, increasing with altitude up until 3,850 m, after which it begins to decrease again (Marino 2003). The Bale Mountains are important residence for a number of threatened Ethiopian endemic species. Especially the northern woodlands around the park headquarters at Dinsho are highly concentrated with largest mammals of the Park (Anteneh Gezahegn et al. 2014) including Serval (*Felis serval*), Menelik's bushbuck (*Tragelaphus scriptus meneliki*), as well as Bohor reed buck (*Redunca redunca*), and eight species of rodents, including the Giant mole rat (*Tachyoryctes macrocephalus*), which is found exclusively in the area. In the southern forests below the southern escarpment, Bushpig (*Potamochoerus porcus*) and Colobus monkeys (*Colobus guereza*) dwell (Alers et al. 2007, Tefera 2011, Amare 2015). The study area is characterized by five distinct vegetation zones each of which harbor its own flora, Afroalpine Meadows (Sanetti plateau and upper Web Valley), Ericaceous moorlands and forest, Harenna Forest, Juniper Woodlands (Park Headquarters) and Northern grasslands (Gaysay Grasslands) (Kinahan et al. 2011).

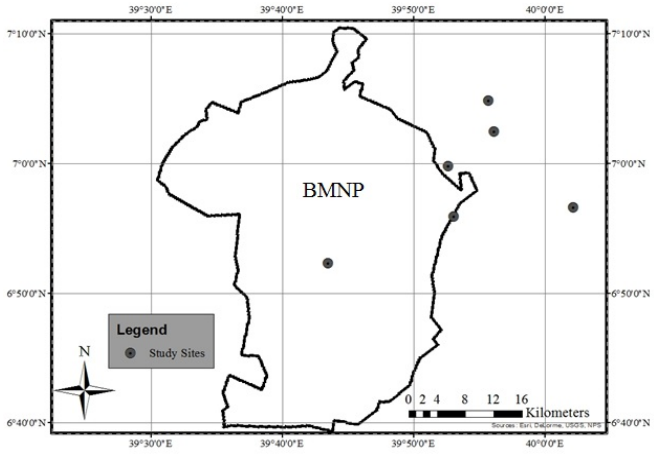

Figure 1. Map of Bale Mountains National Park and sample sites

Sampling Design

Preliminary survey was conducted on July and August, 2016, to explore the exact location of the study area according to the Park position and to notice the actual human-wildlife conflict situation of the area. Pilot survey was conducted around the Park on September, 2016, based on the information gathered during preliminary study to check the applicability and understandability of the questionnaire by the local people. Data were collected from selected villages in and around the park between November, 2016 and April, 2017, by using questionnaire survey of sample households, direct observation on crop damage and key informant interview. Questionnaires were partially structured to find out socio-economic status of the local people and their attitude towards wildlife conservation. In study sites, from a total number of households of each kebele

334 households were chosen based on the sample size selection formula of Cochran (1977). Study sites were stratified based on the distance from the Park as to inside the Park, <1 km, 1-5 km and >5 km and then households were selected randomly from each Kebele.

Respondents from each household were randomly selected for interview on a first-come, first-served basis (Tessema et al. 2007). Farmers were asked to report the stage of plant growth at which crop raiding occurs. According to Yihune et al. (2009), plants were classified as planting, seedling, vegetative and harvesting. Study sites were randomly selected from five Kebeles to observe crop damage by vertebrates. Representative grids were constructed in each study site based on the size of agricultural farmlands of study sites (Naughton-Treves 1998). Generally all five grids covered 150,000 m^2. Each grid was visited two times per day for 3 days at two days interval. Once the size of each cell is known, proportion of damaged crop was estimated in m^2 (Sukumar 1989). Responsible animals were detected by field observers. Key informants were interviewed with some open-ended questions designed to gather information about local people reaction for wildlife conflict, how they used and were benefited from resources within the Park and their coexistence with wildlife. Interviewees were selected based on their age, duration of abidance in the study area and mainly their position in the community (Marshall 1996).

Data Analysis

Using descriptive statistics, socio-economic status, academic level and age class were analyzed. Categorical responses were compared using chi-square test and one-way ANOVA. Tukey and Scheffé tests were used interchangeably based on the sample size differences to identify the real difference between single variables after analysis of variance. Pearson correlation was used to determine the relationship between distance of the Park and the damage caused.

RESULTS

Most (79.04%) of the respondents had positive attitude towards wildlife conservation. Great proportion of Aloshe Tilo (AT) (87.5%), Welti Tosha (WT) (84.21%), Fassil Angaso (FA) (84.09%) and Rira (90.24%) respondents told that wildlife conservation is important. Generally about 20.96% respondents had negative thought against wildlife conservation (Table 1).

Table 1. Respondents' attitude about wildlife conservation

Study sites	N	Variables Positive (%)	Negative (%)
AT	80	87.5	12.5
WT	57	84.21	15.79
FA	44	84.09	15.91
WA	48	62.5	37.5
IS	64	65.63	34.37
Rira	41	90.24	9.76
Total	334	79.04	20.96

AT = Aloshe Tilo, WT = Welti Tosha, FA = Fassil Angaso, WA = Welti Azira and IS = Ititu Sura

Respondents' attitude about wildlife conservation was statistically different across the study sites (χ^2 = 25.7, df = 5, $P < 0.05$). There was also significant difference between male and female respondents in their attitude toward wildlife conservation (χ^2 = 75.5, df = 1, $P < 0.05$). Many male respondents (90.1%) had positive attitude. But female respondents (45.12%) who had positive attitude toward wildlife conservation were dominated by those who had negative attitude. But there was no statistical difference among 7 age classes in their attitude of wildlife conservation (χ^2 = 3.24, df = 6, $P > 0.05$). There was statistical difference in attitude of wildlife conservation among educational levels (χ^2= 25.62, df = 3, $P < 0.05$). Scheffé test revealed that more illiterate respondents had negative attitude when compared with respondents who had better academic background from informal education to above secondary school ($P < 0.05$). Therefore, there was association between education and wildlife conservation attitude of the respondents.

Most (82.6%) of the respondents had reported crop damage by different vertebrates. Many respondents (~93%) of WT were the highest victims of crop raiding (Table 2). Problem caused by crop raiders was statistically different across Kebeles (χ^2 = 20.86, df = 5, $P < 0.001$). There was positive correlation between distance from the Park and degree of crop damage (r = 0.71, $P < 0.05$) so that the conflict was not occurred for local people are lived in or near to the Park.

Respondents reported wild mammals that cause damage to their crop. Olive baboon, warthog, common mole rat, porcupine, grey duiker, mountain nyala and bohor reedbuck were mentioned as important crop raiders. Many (73.65%) of the respondents reported olive

Table 2. Respondents' proportion in accordance of facing crop damage.

Study sites	N	No conflict (%)	Crop raiding (%)
AT	80	11.25	88.75
WT	57	7.02	92.98
FA	44	22.73	77.27
WA	48	12.5	87.5
IS	64	34.38	65.62
Rira	41	17.07	78.05
Total	334	17.37	82.04

baboon and warthog together as major crop raider. Some (22.45%) reported all raiders including common mole rat, grey duiker, mountain nyala and bohor reedbuck. Olive baboon was mentioned alone by 8.4% respondents (Table 3). There was small difference among study sites in the number of raiders mentioned ($F_{5\ 328} = 3.87$, $P < 0.05$).

Pearson correlation ($r = 0.26$, $P < 0.05$) revealed that there was no good correlation between the number of crop raiders mentioned and distance from the Park. Wildlife conservation attitude and number of raiders mentioned by respondents were negatively correlated ($r = -0.64$, $P < 0.001$). Those respondents who were highly attacked by more raiders than others had negative attitude against wildlife conservation.

There was statistical difference among crops which were raided ($F_{5\ 328} = 20.65$, $P < 0.05$). Significant number (80%) of respondents reported the loss of barley. There was no statistical difference between study sites in mentioning barley as a major targeted crop of raiders ($\chi^2 = 4.8$, df = 5, $P > 0.05$). About 38% respondents reported the loss of both barley and wheat. Generally 16.1% respondents told the damage of oat, barley, wheat and bean in together. There was statistical difference among respondents across study sites in mentioning oat, barley, wheat and bean damage ($\chi^2 = 67$, df = 5, $P < 0.05$). Many respondents were convinced on olive baboon (79.6%) and warthog (75.1%) attack of barley. Some (37.7%) agreed on olive baboon attack of wheat (Table 4).

Tukey test identified major crop items that were highly damaged (Figure 2). There was high statistical difference when barley ($P < 0.001$) and wheat ($P < 0.001$) are compared with other crops and vegetation. According to tukey test barley became highly damaged crop first by olive baboon and then by warthog ($P < 0.05$). Wheat is the second crop to be damaged by the same animals ($P < 0.05$). Other crops (lentil, linseed and pea) became least crops raided, since these crops were not totally attacked by olive baboon and warthog. All mentioned raiders damaged barley and wheat.

Many (65.5%) of the respondents reported that olive baboon attacks crops at all stages. But 11.05% and 4.09% did tell that the raider became very dangerous at harvesting and post-harvesting stages respectively. Many (75.15%) respondents reported that warthog does not come during planting, seedling and vegetative stages, but during maturity and post harvesting. Some (16.26%) and (9.7%) of the respondents blamed common mole rat and porcupine for the damage almost at all stages, respectively. Mountain nyala (5.69%), bohor reedbuck (3.59%) and grey duiker (13.17%) were blamed for the damage during only seedling stage.

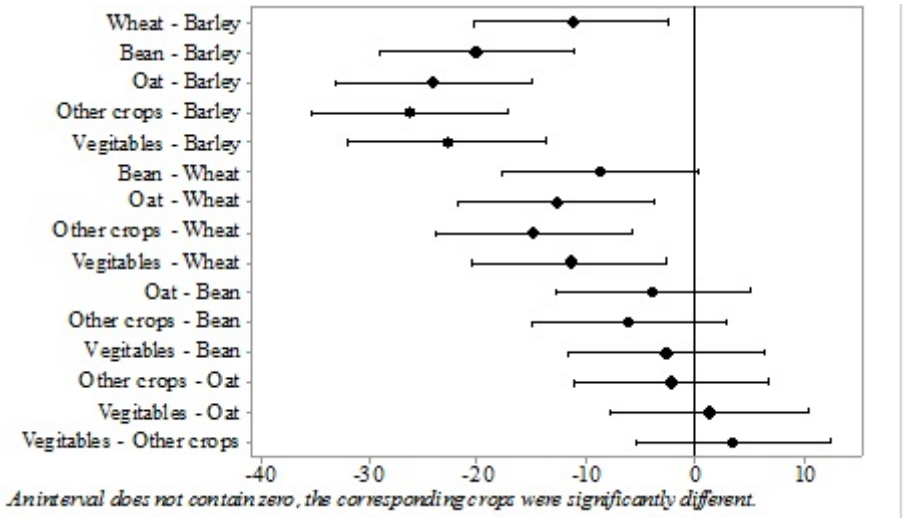

Figure 2. Tukey comparison among crops to check the target of damage.

Table 3. Percentage of crop raiders in the study area

Study sites	N	Olive baboon	Olive baboon + warthog	Olive baboon + warthog + grey duiker	Olive baboon + mountain nyala	Mountain nyala + warthog + bohor reedbuck	All
AT	80	10	78.75	26.25	48.75	0	12.5
WT	57	10.5	82.5	29.8	0	0	15.8
FA	44	11.4	77.3	31.8	0	15.9	11.4
WA	48	4.2	83.3	66.7	0	0	22.9
IS	64	6.25	60.9	0	0	0	21.8
Rira	41	9.8	68.3	0	0	0	68.3
Total	334	8.4	73.65	25.15	3.4	2	22.45

Table 4. Crop raiders in terms of major crop type they damaged.

Raiders (wildlife)	Barley (%)	Wheat (%)	Bean (%)	Oat (%)	Other crops (%)	Vegetable (%) (lentil, linseed and pea)
Olive baboon	79.64	37.72	25.75	16.17	0.00	12.87
Warthog	75.15	36.83	20.36	4.19	0.00	11.38
Common mole rat	21.26	5.39	5.39	0.00	0.00	5.69
Porcupine	13.17	16.17	0.00	0.00	3.59	7.19
Grey duiker	13.17	12.87	5.69	0.00	5.39	0.00
Mountain nyala	2.10	5.69	0.00	3.59	1.20	0.00
Bohor reedbuck	3.59	3.59	0.00	3.59	1.20	0.00
Total	79.64	37.72	25.75	16.17	6	12.87

There was increasing trend of crop raiding in the study area along with statistical differences across Kebeles in their response about the trend of crop raiding ($\chi^2 = 39.2$, df = 15, $P < 0.05$). The increasing rate of crop raiding was positively correlated with the distance from the Park ($r = 0.62$, $P < 0.05$). Crop raiding rate is increasing outside the Park than within and nearby.

Different controlling methods were applied by local people to reduce crop loss. There were four major techniques used to control crop raiding. Guarding a crop field was highly used way of controlling crop raiders. Different controlling methods were applied by local people to reduce crop loss. There were four major techniques used to control crop raiding. Watching and defending a crop field was highly used way of controlling crop raiders. And Kebeles were differed in their preventing mechanisms of crop raiding ($\chi^2 = 62.5$, df = 20, $P < 0.05$). Most (83.8%) of respondents used watching and defending technique (Table 5).

Respondents (28%) who live in and near to the park used the Park as a grazing place. Respondents were differed in using the Park as a grazing field across kebeles ($F_{5\,328} = 94.46$, $P < 0.05$). Scheffé test revealed a significance difference between Rira and other kebeles ($P < 0.001$). There was strong negative correlation between livestock grazing and distance from the Park ($r = -0.98$, $P < 0.001$) (Fig. 3). There was also negative correlation between time spent for grazing in the park and distance from the Park ($r = -0.67$, $P < 0.05$). According to the report of kebele administration showed there were about 23,000 livestock and 2,000 equines in Rira by 2016. These livestock grazed in the Park.

Great proportion of respondents (89.5%) did exploit some plant species for different purpose. Respondents were extremely different in using the Park plant resource ($F_{5\ 328} = 267.8$, $P < 0.001$). Rira was differed when compared with other Kebeles ($P < 0.05$). Many plant species such as, Erica, bamboo, pines, heto hagenia,

Table 5. Crop raiding controlling techniques used

Methods	AT	WT	FA	WA	IS	Rira	Total
Watch-defend (WD)	21.56	11.68	10.18	14.07	15.57	10.78	83.83
WD and fence	11.38	21.00	2.69	10.78	8.68	0.00	39.82
WD and scarecrow	4.49	12.00	5.09	6.89	7.49	5.09	32.63
WD and using Dogs	19.16	42.00	11.68	8.68	15.27	11.08	78.44
All methods	3.89	7.00	2.69	1.80	5.69	0.00	16.17

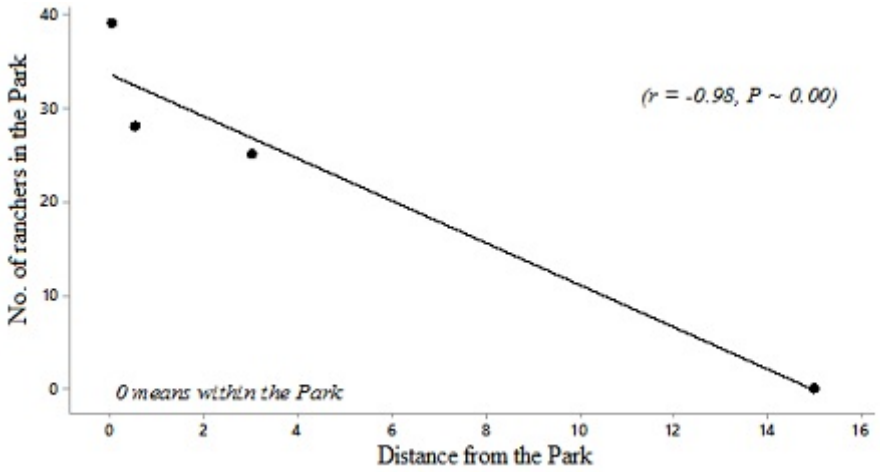

Figure 3. Correlation and regression between number of ranchers and distance from the Park.

giant lobelia, olive tree and eucalyptus were directly used in Rira and then in FA and IS.

All respondents of Rira, 81.25% of IS and 90.9% of FA did collect firewood from the Park. Collected firewood was either sold as one of economic inputs or used for their own purpose. Kebeles were differed in the area of collection of firewood ($\chi^2 = 210.9$, $P < 0.001$). There was negative correlation between distance from the Park and firewood collection ($r = -0.51$, $P < 0.05$).

The plain of the Park was also used by respondents for agricultural purpose. Respondents were differed in using the Park as field for agriculture ($F_{5\,328} = 414.3$, $P < 0.001$). And Scheffé test was showed significant difference when Rira was compared with other kebeles ($P < 0.001$). In Rira 874 ha of the land was used for farming. According to the direct observation, 243.6 ± 36.56 kg annual crop loss of four major grains (wheat, barley, oat and bean) was recorded per household. There was no statistical difference among study sites in loss of crop grains ($F_{4\,16} = 2.1$, $P > 0.05$). Tukey test showed no difference among kebeles ($P > 0.05$) except between WA and IS ($P < 0.05$). In another way difference was noticed among crops in their damage extent ($F_{4\,16} = 10.14$, $P < 0.05$). Barley was highly damaged crop. The mean number of damaged barley per household was 124.5 ± 18.3 kg, and 18.5 ± 4.3 kg oats was damaged to the lowest degree per household (Figure 4). There was a positive correlation between size of damaged farmland and distance from the Park ($r = 0.4$, $P < 0.05$) noted that more damage was occurred away from the Park than near and inside.

Olive baboon and warthog were frequently seen while damaging all parts of crops. Olive baboon ate grain that was sowed, newly grown, softer upper part of the stalk and matured grains while warthog ate newly grown grains and the softer upper part of the stalk. Based on respondents' report, grey duiker, mountain nyala and bohor reedbuck ate the softer upper part of crops before the growth of grains started. Common mole rat cut the stalk of crops and took them down to their burrowing

system. And the hull was found on the mouth of their burrow system.

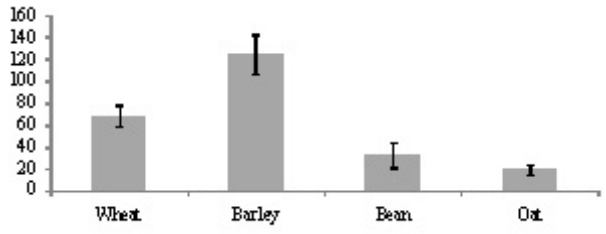

Figure 4. Mean ± SE weight (kg) of each damaged crop per household in the study sites.

All informants including district officials, kebeles' headers and Park staffs, agreed on the presence of crop raiding. Some of the informants were also victims of wildlife conflict. Interviewees explained the importance of the park for the surrounding people such as firewood collection, promotion of their product, services for visitors and tourists and scenic advantage of the Park. But they claimed local people had not yet been benefited from the resource. Some interviewees considered firewood collection and grazing as legal and doubtless activities. But many condemned illegal activity of the people against the park resource in the form of firewood, timber collection, over-grazing and firing.

DISCUSSION

Local people who live in and near to the park have imposed strong influence upon natural resource of the park. Wildlife also strikes local people in the form of crop raiding. Many respondents have a good attitude towards wildlife conservation because they are knowledgeable about them. The attitude did not have any correlation with the distance from the Park. Because without going to the Park they were able to interact with different wild animals found outside the Park. Several researches conducted in Africa revealed that majority of local people have good attitude towards wildlife conservation. Infield (1988), Mhlanga (2001) and Jones and Barnes (2006) noticed that many respondents had positive attitude towards wildlife conservation in Zimbabwe, South Africa and Namibia, respectively. However according to Hill et al. (2002) the positive attitude of local people may be changed due to high level of conflict. In the same manner, conflict mitigation methods are very important to keep local people attitude positive. Positive respondents would be willing to support wildlife conservation and management efforts.

Majority of the respondents reported experience of crop damage. Crop raiding was a major way where by wildlife attacks the local people. Yihune (2006) and Andarge (2010) also reported that crop raiding was the major impact of wildlife in and around Simien Mountain National Park and in Guassa, respectively. Olive baboon, warthog, common mole rat, porcupine, grey duiker, mountain nyala and bohor reedbuck were mentioned as important crop raiders. Hill et al. (2002) reported ultimately baboons and warthogs are the most crop raiders in Africa. Hill (1997) also reported baboon as a figure crop raider and porcupines as a minor crop raider in western Uganda. Naughton Treves (1998) also found olive baboon as crop raider in Kibale National Park, located in western Uganda. In the same manner, great proportion (73.65%) of local people attention was laid up on olive baboon and then on warthog attack. These two raiders were frequently mentioned wild animals. The endemic mountain nyala and bohor reedbuck were also mentioned as minor raiders in Aloshe Tilo which is far from the Park and Fassil Angaso which is very near to the Park.

There was no good correlation between crop raiding and distance from the Park. Many raiders were mentioned outside the Park than inside. Respondents of Rira mentioned only two raiders, olive baboon and warthog. Yihune et al. (2009) and Joseline (2010) found negative correlation between crop raiding and distance from the Park in Simien Mountains National Park and around Bugoma Forest Reserve in Uganda, respectively. And many other reports showed the presence of many animal species within the Park boundary (UNAID 2008; Vreugdenhil et al. 2012) even though the distribution of olive baboon and warthog was noticed to be wide.

Many respondents from all kebeles reported the damage of barley. This is because barley was the most cultivated crop species in the study area. Because other crops were also mentioned to be eaten by raiders such as, wheat, oat, bean, linseed with potato and vegetables. Generally it is not the preference of raiders, but it is due its availability. Andarge (2010) and Yihune (2006) did also report the damage of barley was higher than others. Both results agreed that it is because barley was the most cultivated crop in the study area. Gemechu et al. (2016) reported the damage of cereals, such as maize tef, wheat, barley, field beans, peas and vegetables in Gera district

of the Oromia region of Ethiopia. Many cultivated crop species are raided by crop raider. The most abundant crops can be highly targeted by raiders.

Olive baboon, warthog, common mole rat, porcupine, grey duiker, bohor reedbuck and mountain nyala attack were mentioned for the loss barley and wheat. Gemechu et al. (2016) also found many raiders including olive baboons, bush pigs, giant forest hogs, vervet monkeys, porcupines, warthogs, colobus mokeys and blue monkeys. In addition to olive baboon common mole rat and porcupine were made responsible for the damage almost all stages. Warren et al. (2007) reported olive baboon attack of crops at all stages in Nigeria. Baboons were noticed while digging up seed following sowing. Therefore, farmers should be always carful to guard their crop fields.

Many people live in and around the Park did not have to have their own private grazing land. Their livestock all graze in the Park. Many of them graze around sanetti with guard dogs where the rarest canid of the world, Ethiopian wolf, is occurred. This non-ecological interaction between domestic animals and wildlife of the Park would probably cause resource shortage need by wild animals (Alers et al. 2007) and disease incidence. Due to these unwanted interaction wild animals may choose to flow out of their natural home range that would maximize their interaction with man outside the Park. Flintan et al. (2008) reported the linear population growth of both human and livestock in BMNP as a result of population expansion within the Park and of the immigration of pastoralist communities from the lowlands. This maximizes the number of livestock graze within the Park. Stephen et al. (2001) reported that competition between livestock and wildlife affected mainly the two endemic species of, mountain nyala and Ethiopian wolf. But there was no any impact of livestock grazing from other study sites.

Another impact of local people to the Park was using the land resource of the Park for agricultural purpose. A total of 874 ha land were used for agriculture to the in lower region of Rira. Several reports have showed the impact of agriculture in BMNP. Forests have been cleared mainly for wheat, barley and garlic production. Totally about 10,000 ha land area inside BMNP is being for agriculture (ETFF 2007). And right now agricultural expansion extends at 3,300m a.s.l. on the afroalpine grasslands region of the Park (Vial 2010). Large (60%) part of the land above 3,200 m has been converted into agricultural places. This would reduce the density of flora community, and then herbivores. Due to agricultural expansion, the space and habitat quality of Ethiopian endemic species such as, Ethiopian wolf, mountain nyala and giant mole is reduced.

Direct observation confirmed the presence of crop raiding in the study sites. And local people are facing great challenge from wildlife. Economical crisis of crop raiding would alter the positive attitude of people towards crop raiders (Hill 2002). There was some variation in crop raiding pattern of dry and wet season. The damage during dry season was somehow higher. According to Naughton-Treves (1998) crop raiding by primates can be seasonal as it is influenced by availability of both crops and wild food resources. Similarly Kate (2012) also found much crop raiding by olive baboon during dry season in Uganda. This might happen due to wildlife competition on natural food available during dry season. Wildlife may come to farmlands to reduce competition for food.

Human-wildlife conflict has not been a new phenomenon for countries like Ethiopia where high level of biological diversity occurs in and around protected areas. There are always certain ranges for organism to live within. As both mankind and wildlife is part of the living world, our need might overlap with that of wildlife need. This issue might have gathered human beings within wildlife in certain regions. Another plausible reason is the living system of local people has been highly associated with vegetation. Therefore, the occurrence of man and wild animal in a confined place is usual. Due to resource limitation or behavioral change ones' resource would be taken by another interchangeably, and then conflict happened. Strong human-herbivores and olive baboon conflict was studied in and around BMNP. Olive baboon was found to be expendable raider. Another frequently reported crop raider was warthog. Very important species of animals that have been figure in Ethiopian biodiversity resource are found in BMNP. The action of local people against the Park is very extensive. Even both human and their livestock population number are increasing within the Park. Trend analysis of crop raiding is also increasing. There for immediate solution are needed.

ACKNOWLEDGEMENTS

We are grateful to Ministry of Education of Ethiopia (MOE) for its provision of fund. We also thank Bale Mountain National Park management office staffs and Ethiopian Wildlife Conservation Authority (EWCA) for

allowed us to work within the Park. First author contributed to data collection from the field and second author devised the study design and data collection technique and then helped prepare the manuscript for publication.

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Annex I

List of species with Authorities

African buffalo (*Syncerus caffer* Sparrman, 1779)
Porcupine (*Hystrix cristata* Linnaeus, 1758)
Olive baboon (*Papio Anubis* Lesson, 1827)
African elephant (*Loxodonta Africana* Anonymous, 1827)
Bush pig (*Potamochoerus porcus* Cuvier, 1822)
Chempazee (*Pan troglodytes* Johann Friedrich Blumenbach, 1776)
Swayne's hartebeest (*Alcelaphus buselaphus swaynei* Sclater, 1892)
Warthog (*Phacochoerus aethiopicus* Cuvier, 1826)
Serval (*Felis serval* Schreber, 1776)
Meneliks bushbuck (*Tragelaphus scriptus meneliki* Sparrman, 1780)
Bohor reedbuck (*Redunca redunca* Pallas, 1767)
Giant mole rat(*Tachyoryctes macrocephalus* Rüppell, 1842)
Colubs monkey (*Colobus guereza* Rüppell, 1835)

Received 6 March 2018
Accepted 31 May 2018