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Attitudes and Perceptions of Local People Towards the Borena Sayint National Park and its Wildlife Conservation, Wollo, Ethiopia: Implications for Biodiversity Conservation

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ABSTRACT

Background and Objective: Protected areas are crucial for the conservation of biological diversity. Aside from these benefits, protected areas can also generate significant economic resources for a country. However, people's attitudes and perceptions toward wildlife and their habitat can significantly affect the success of conservation initiatives in protected areas. Here, this study examined the attitudes and perceptions of local people and possible mitigation measures proposed by the local people at the Borena Sayint National Park (BSNP) in Wollo, Ethiopia. **Materials and Methods:** A questionnaire-based interview was conducted with the household head, the household head's wife, or other adult ≥18 years old. The proportion of the respondents' answers regarding the impacts of BSNP on the livelihoods of local farmers was analyzed using Chi-square goodness-of-fit tests. **Results:** Many (57.6%) respondents felt that crop damage and livestock predation by wild animals was the biggest problem living near the park. Geladas (*Theropithecus gelada*), hamadryas baboons (*Papio hamadryas*), grivet monkeys (*Chlorocebus aethiops*) and leopards (*Panthera pardus*) are the main problematic wild animals that affect local people's livelihood. Most (79.6%) respondents claimed that local communities didn't benefit as they expected from the BSNP. **Conclusion:** The results indicated that the attitudes of local people affect the success of the biodiversity conservation of BSNP. Therefore, it is imperative to benefit the local community from the park to secure it.

KEYWORDS

Wildlife conservation, crop damage, farmers' attitude, protected areas, thatch collection, ecotourism

INTRODUCTION

Protected areas are crucial for conserving global biodiversity, preventing species loss and stemming the extinction crisis. They are also cornerstones for sustainable development and conservation strategies[1]. Protected areas serve to protect major ecosystem services essential to human being. These ecosystem services include regulation of climate, disturbance (e.g., storm protection, flood control), hydrological flow and pest populations, erosion control, sewage purification, pollination of crops, habitat for wildlife, source

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of raw materials (e.g., fossil fuels and timber) and recreation (e.g., ecotourism and outdoor recreation) cultural (e.g., aesthetic and educational value)[2,3]. Aside from their environmental and cultural benefits, protected areas can also generate significant economic resources through the tourism and pharmaceutical industries.

Currently, about 12.0% of the global land area is under some form of protection[4]. There are more than 100,000 separate protected areas, with more added daily[4]. However, as the human population grows and the demands on natural resources increase, effective management of protected areas becomes a challenging task. In addition, the wildlife of the park may damage local people's crops as well as predate their livestock. Thus, in the vicinity of parks, humans and managers can arise conflicts that result in negative consequences for both human communities and biodiversity conservations[5,6]. When the interaction becomes negative, it creates one of the greatest threats to biodiversity conservation in protected areas. The conflict between wildlife and local people can also shape people's attitudes toward protected areas[7-10].

Ethiopia has a diverse set of ecosystems ranging from humid forest, afroalpine and wetland types to the desert of the Danakil Depression. The country also possesses great geographical diversity with high and rugged mountains, flat-topped plateaus and deep gorges and valleys and plains. These diverse sets of geographical regions harbor different varieties of animal and plants and remarkably contain distinctive endemic species[11,12].

Ethiopia has a wide variety of protected areas (i.e., 27 national parks, two wildlife sanctuaries, six wildlife reserves, 25 controlled hunting areas, five biosphere reserves and eight community conservation areas) that have a crucial role in the conservation of wildlife[13]. The number of protected areas is still increasing in Ethiopia. However, most of these protected areas are under high pressure due to anthropogenic pressures like the expansion of human settlements, agricultural encroachment, livestock grazing, timber production, firewood collection and others[13,14]. As the human population grows (currently, there are over 120 million people in Ethiopia, 78% in rural areas) the demands on natural resources both within and adjacent to protected areas with high biodiversity value will increase, threatening their future existences. In addition, due to poor management systems and low capacity for managing them, almost all of these protected areas are vulnerable to human impacts.

Borena Sayint National Park (BSNP) is one of the newly established national parks in Ethiopia. It is one of the most important protected areas for the conservation of biodiversity in the North Central Ethiopia highlands. The park comprises ecosystems from Afromontane to Afroalpine types. This makes the park unique in terms of plant and animal composition and diversity. However, BSNP is highly vulnerable due to the impacts of local people from the surrounding areas. The park is surrounded by dense human settlements and intense agricultural activities. The narrow width vs. long length shape/strip of the park also contributed to being impacted by local people. In addition to crop damage and livestock predation by wildlife, resource restriction from the park may affect local people's attitudes towards the conservation activities of the region. Therefore, information on the attitudes and perceptions of local farmers living in the adjacent and vicinity of parks is crucial to identifying and reforming conservation management strategies and plans to protect the biodiversity of the area[15,16]. The attitudes and feelings of people concerning protected area development and management affect their behavior and understanding this is critically important in conservation planning and decision-making processes. Only a few studies have been conducted on attitudes and perceptions of local farmers regarding the protected areas in Ethiopia and for that matter, such view of people towards parks is poorly documented in the country. In particular, there has been no systematic study on the attitudes and perceptions of local people towards the BSNP and the conservation of its wildlife in the Northern Central highlands of Ethiopia. Therefore, this study

aimed to examine the attitudes and perceptions of the local community towards BSNP and its wildlife to devise effective conservation management and mitigation strategies in the region. This study also helps to address problems that evoke negative attitudes to improve local people's relationships with the park and reduce their antipathy toward wildlife conservation.

MATERIALS AND METHODS

Study area: This study was conducted in local communities around Borena Sayint National Park (BSNP). The BSNP is the only protected area in the North-Central highlands of Ethiopia. The park is largely surrounded by subsistence farming populations. The BSNP is managed by the Environment and Forest Protection Authority (EFPA). The BSNP lies at Latitude between 10°51' 8.12"-10°53'48.06"N and Longitude 38°40'16.42"-38°51'1.06"E. The park's flora can be classified into three vegetation types: The Afromontane forest, the Sub-Afroalpine forest at intermediate elevations and the Afroalpine grassland. The BSNP is an important protected area for the biodiversity conservation in Ethiopia. In addition, this park contributes to carbon sinks, ecosystem services and wildlife conservation. It is one of the water towers from which different rivers drain to the Abbay River. However, park's biodiversity has been subjected to big anthropogenic pressure.

The flora of the park comprises *Juniperus procera*, *Ekebergia capensis*, *Myrica salicifolia*, *Prunus africana*, *Podocarpus falcatus*, *Olea europaea*, *Olinia rochetiana*, *Carissa spinarum*, *Acokanthera schimperi*, *Clematis simensis*, *Convolvulus kilimandschari*, *Hagenia abyssinica*, *Dombeya torrid*, *Erica arborea*, *Hypericum revolutum*, *Festuca* spp., *Lobelia rhynchopetalum* and *Kniphofia* spp., However, the forests of the region are highly threatened by local people through deforestation for firewood and timber production. The BSNP is also home to different mammalian and avian species[17].

Ethical considerations: This study was carried out according to the guidelines of the review board of Bahir Dar University (BDU) of the human ethics research. The interviewer fully informed to the respondents on the aim of the research and how the data obtained from them would be used. Confidentiality of information was assured by the investigator. Participants gave their consent verbally after being explained the aim of the survey and how the interview would proceed. Consent was obtained by having participants state that they agree to participate.

Data collection: A questionnaire interview was conducted with the household head farmer, the household head's wife, or any adult $\geq$18 years between April and May, 2016. Respondents were chosen opportunistically on the basis of chance encounters[18,19]. The semistructured questionnaire was designed to collect information on respondents' socioeconomic and demographic characteristics (education, livestock holdings, land ownership, income sources), local community attitudes and views towards BSNP and wildlife conservation and possible suggestions as mitigation measures for farmers. The questionnaire included both open-ended and closed-format questions. All interviews were conducted by the author (i.e., Zewdu Kifle) with the aid of local field assistants.

Data analysis: The collected data was presented as the percentage frequency of respondents giving each response in each question. The data was analyzed using the statistical IBM SPSS software version 20 (IBM SPSS Inc., Chicago, USA). All tests were two tailed with 95% confidence interval and level of rejection set at $p = 0.05$. The Chi-square goodness-of-fit tests was used to compared the proportion of the respondents' answers.

RESULTS

Socioeconomic background of the respondents: In this study, a total of 191 individuals participated in the questionnaire survey (Table 1). All respondents had houses outside but near the park. Most (77.5%) respondents attended formal school. Almost all (97.9%) of the respondents lived in both crop production

Table 1: Socioeconomic profile of the respondents

Characteristics	Frequency	Percentage (%)
Sex		
Male	170	89.0
Female	21	11.0
Age groups (years)		
<35	55	28.8
36-50	59	30.9
>50	77	46.7
Education level		
No education	148	77.5
Primary school	25	13.1
Secondary school	5	2.6
Religion	13	6.8
Livelihood source		
Crop production and livestock	187	97.9
Crop production	4	2.1
Harvesting enough crop for a year		
Yes	101	52.9
No	90	47.1
Household size		
Five person or less	89	46.6
Six person and above	102	53.4
Livestock size		
<10	117	61.3
>10	74	38.7
Home distance from the park		
<100 m	19	9.9
100-500 m	68	35.6
500-1000 m	85	44.5
>1000 m	19	9.9
Farmland distance from the park		
100-300 m	90	47.1
300-500 m	24	12.6
500-700 m	55	28.8
700-900 m	14	7.3
900-1000 m	8	4.2

and livestock rearing. Many (61.3%) respondents had less than ten livestock numbers. Additionally; many respondents had farmland distances from 100 to 300 m from the park boundary proximate.

Livestock number after the development of BSNP: Most (69.1%) respondents claimed that their livestock numbers declined after the development of BSNP. The other (25.5%) reported that their livestock numbers were relatively stable and a few (5.2%) respondents stated that their livestock numbers increased. When asked to elaborate further on their livestock numbers, many of these respondents reported that the restriction of grazing inside the park caused their livestock to decline and they couldn't get enough grazing land for their livestock husbandries. Based on respondents' responses, the trends of livestock varied significantly from an even distribution of the expected value (χ^2 = 121.96, df = 2, $p<0.001$).

Many (45.5%) respondents reported they stayed their livestock grazing in the buffer zone of the park. Other (41.4%) respondents reported that they had private grazing land for their livestock. While few (13.1%) respondents said that they stayed their livestock in the communal grazing area.

Most (86.9%) respondents reported that they didn't attempt to graze their livestock inside the park. These respondents stated that they feared penalties in terms of money if they grazed their livestock inside the park. Few (13.1%) respondents said that they tried to graze their livestock inside the park when the scouts were not available in that particular area and time.

Table 2: Negative outcome/impact of the BSNP on local farmers' livelihood

Impacts of the BSNP	Concern	Non concern
Hindering agricultural expansion into the park	90 (47.1%)	101 (32.9)
Livestokck grazing restrictions inside the park	55 (28.8%)	58 (30.4)
Loss of resource collection from the park	120 (62.8%)	71 (37.2)
Competition of wild animals overgrazing lands	113 (59.2%)	78 (40.8)
Livestock predation by wild animals	135 (70.7%)	56 (29.3)
Crop damage by wild animals	166 (86.9%)	25 (13.1)
Hive hanging restrictions inside the park	95 (49.7%)	96 (50.3)

Impact of BSNP on local farmers' livelihood: Regarding the overall attitude of local farmers' livelihood of the BSNP, many (57.9%) respondents claimed that they had concerns about their livelihood due to the restriction of resources from it. While, others (42.1%) reported that they had no impact on their livelihood due to the restriction of resources from the BSNP. One respondent said, ''we are just humble farmers, why do our livestock prevent grazing inside the park but allow for wild animals like geladas?". A Chi-square goodness of fit test indicates that there was a significant difference in the proportion of respondents' answers regarding the impacts of BSNP on the livelihoods of local farmers as compared with an even distribution of the expected value ($p = 0.036$). While many (50.3%) respondents stated that hanging hive restrictions inside the park were not a great concern for local farmers.

Most (86.9%) respondents claimed that crop damage impacted by wild animals like primates (e.g., geladas (*Theropithecus gelada*), hamadryas baboons (*Papio hamadryas*) and grivet monkeys (*Chlorocebus aethiops*) was the main concern on their livelihood (Table 2). Similarly, livestock predation by wild animals (e.g., leopards and hamadryas baboons) was the other main problem in the area. Respondents reported that leopards not only predated livestock but also their dogs have victimized by this carnivore. Many (57.6%) respondents claimed that crop damage and livestock predation by wildlife affect their livelihoods while others (42.4%) respondents mentioned that the crop damage and livestock predation by wildlife had an insignificant impact on their lives.

Most (73.8%) respondents stated that they didn't report any crop damage and livestock predation to the park managers. These respondents explained that they didn't know to whom they wanted to report. While other (26.2%) respondents stated that they tried to report to the scouts but they didn't get visible responses. A Chi-square goodness of fit test indicates that there was a significant difference in the proportion of respondents' answers regarding crop damage and livestock predation reports to park staff as compared with an even distribution of the expected value ($p = 0.051$).

Trend of crop damage and livestock predation by wildlife: Most (59.7%) respondents claimed that crop damage and livestock predation by wildlife increased after the development of BSNP while others (28.3%) reported that crop damage by wildlife was similar to before the area developed into the park status. Few (12.0%) respondents reported that crop damage decreased after the development of BSNP. Based on respondents' responses, the claim of crop damage and livestock predation varied significantly from an even distribution of the expected value ($\chi^2 = 67.25$, $df = 2$, $p<0.001$).

Factors that threat the BSNP: When asked about the threat to the BSNP, most (86.9%) respondents disagreed on those factors that threaten it (Table 3). While others (11.5%) responded that different factors threatened the park. When asked to elaborate, these respondents stated that illegal firewood collection and livestock grazing inside the park were the two most common threats to the park. Few (1.6%) respondents didn't know whether there were threats or not to the park.

Several threats were observed to the park. These include illegal timber production, expansion of agriculture and human settlements are the main threats in the region (Fig. 1). In addition, livestock grazing inside the BSNP was observed during my survey period.

Fig. 1: Some type of threats to the BSNP
Source by Kifle Z.

Table 3: Factors threats to the BSNP

Threats to BSNP	Agree	Disagree	Neutral
Illegal firewood collection	25 (13.2%)	162 (84.8%)	4 (2.1%)
Illegally grass mowing	20 (10.6%)	167 (87.4%)	4 (2.1%)
Agricultural expansion toward the park	10 (5.2%)	180 (94.2%)	1(0.5%)
Illegal timber production	15 (7.9%)	173 (90.6%)	3 (1.6%)
Livestock grazing inside the park	21(11.0%)	168 (88.0%)	2 (1.0%)
Conflict between local people and scouts	13 (6.8%)	176 (92.1%)	2 (1.0%)
Charcoal production	1 (0.5%)	190 (99.5%)	-
Wildlife hunting/killing	1(0.5%)	190 (99.5%)	-

Knowledge of the local community on the benefits and purposes of BSNP: When asked about the benefits of BSNP, most (67.5%) respondents knew about the ecosystem services and wildlife conservation values of the park. But still, others (32.5%) didn't appreciate the benefits of these services from the park. When asked to elaborate, these respondents stated that their interests were to use unrestricted resources from the park for their daily livelihood rather than appreciating the ecosystem services, wildlife conservations and climate change mitigation of its values. Based on respondents' responses, the knowledge of local people on the ecosystem services of BSNP varied significantly from an even distribution of the expected value (χ^2 = 23.50, df = 1, $p<0.001$).

Regarding the overall direct economic benefits of local people from the BSNP, most (79.6%) respondents claimed that local communities didn't feel as benefited as they were expecting from it. While the other (20.4%) respondents stated that they benefited from the park in terms of regulating thatch and hay grass collections from the park. Based on respondents' responses, the economic benefits of local people from the BSNP varied significantly from an even distribution of the expected value (χ^2 = 66.85, df = 1, $p<0.001$). Thatch and hay collections and honey production were the most important benefits of the local community from the BSNP (Table 4). However, almost all (98.4%) respondents didn't benefit from the tourism sector.

Local community relationship with park scouts and managers: Most (88.5%) respondents stated that local people had a good relationship with park scouts while few (8.6%) respondents had a bad relationship with them. The other (3.1%) respondents were indifferent to answering the question. A Chi-square goodness of fit test indicates that there was a significant difference in the proportion of respondents' answers regarding the relationship with park scouts and managers as compared with an even distribution of the expected value ($p<0.001$).

Table 4: Economic benefits of local community from the BSNP

Benefits	Yes	No
Thatching collection	68 (35.6%)	123 (64.4%)
Revenue from tourism	3 (1.6%)	188 (98.4%)
Hay grass collection	77 (40.3%)	114 (59.7%)
Recruit as scout	4 (4.1%)	187 (97.9%)
Honey production	43 (22.5%)	180 (94.2%)

Table 5: Perceptions of local community over ownership of the BSNP

Ownership of BSNP	Frequency	Percentage (%)
Local community	34	17.8
Government	37	19.2
Both local community and government	118	61.8
I don't know	2	1.0

Local community perceptions on the ownership of BSNP: Most (61.8%) respondents reported they considered BSNP as the property of both the local community and government (Table 5). Only a few respondents were confused to categorize the ownership of the park.

Concerning the overall view of the BSNP, many (51.4%) respondents replied that they were dissatisfied with the park's development. While others (48.6%) reported that they were satisfied due to the development of BSNP.

DISCUSSION

In Ethiopia, most national parks and their wildlife have been negatively affected by habitat fragmentation and losses for agricultural expansions, livestock grazing, human encroachments and human settlements near their vicinities. As a result, most wild animals live in closer proximity with human settlements. Such intense habitat overlaps can be problematic and result in human-wildlife conflict. Thus, the attitude of local farmers towards BSNP is largely unstudied in the region. Therefore, this study was conducted to explore the attitudes and perceptions of local people towards the BSNP, Wollo, Ethiopia.

In the present study area, many (57.9%) respondents claimed that they had concerns about their livelihood due to the restriction of resources from the park. Similarly, a study in Nanda Devi Biosphere Reserve, India showed that most respondents expressed a negative attitude towards the reserves due to restrictions imposed by the reserve authorities in collecting forest products[20]. The benefits of which the local people acquire from the protected areas influenced their attitude toward them. If resources are restricted from protected areas, local people may develop a negative feeling towards parks and their wildlife. As human population growth increases in the area, the imposition of local people to the park increases in terms of an attempt to use the park to graze grass, collect firewood, produce timber and thatch grass collections.

Almost all of the local people's livelihoods depend on people subsistence farming activities. Thus, crop damage and livestock predation by wildlife is the source of economic loss and local frustration for subsistence farmers. This might cause local farmers to develop negative attitudes toward the conservation of wildlife in the park. Geladas (*Theropithecus gelada*), hamadryas baboons (*Papio hamadryas*) and grivet monkeys (*Chlorocebus aethiops*) are the most common wild animals that damage cereal crops in the region. Similarly, leopards (*Panthera pardus*), hamadryas baboons and African wolves (*Canis aureus lupaster*) are the most common predators of livestock around BSNP. For substance farmers predating single livestock (i.e., sheep or goat) has a great impact on their livelihoods. These impacts may be associated with a strong negative attitude toward the conservation of the park and its wildlife. Similarly, a study in Nanda Devi Biosphere Reserve, India showed that most respondents expressed a negative attitude towards the reserves that attributed to crop and livestock damage by wildlife[20]. A study in the Wonchit Valley, Wollo, Ethiopia also indicated that local farmers considered hamadryas baboons to be the

major pest for both crops and livestock[21]. People who incurred losses from depredation and crop damage by wild animals expressed a more negative attitude toward wildlife conservation in their area[22]. These opportunity costs are often substantial and are incurred by poor subsistence farmers.

Livelihood benefits through formal or informal processes for the local community from the park resources can be highly valuable for the sustainable conservation of wildlife. If resource collections are abandoned from the park, the local people may develop hostility toward the park and its wildlife. A study showed that the inclusion of local communities in protected area management is likely to be a key determinant of the level of compliance with protected area conservation strategies[23]. Therefore to alleviate the problem and create a positive relationship between the park and the local community, resource exploration should be allowed sustainably for the local community. The exploitation of certain natural resources inside parks can diminish conflicts between locals and park authorities[24]. Therefore, frequent negotiations and discussions with the local people should be implemented to avoid hostility between the local community and the park administrators.

Most (79.6%) respondents claimed that local communities didn't feel as benefited as they were expected from the BSNP. If the local people do not directly benefit in terms of economic opportunities from the park, they may develop negative attitudes and perceptions towards it. One of the major expectations of local people from the park was ecotourism. However, if the local people don't get this expectation, they undermine the conservation value of the park and its wildlife. A study in Nanda Devi Biosphere Reserve, India showed that the attitudes of local people had negative attitudes towards Nanda Devi Biosphere Reserve in India[20]. This was attributed to restrictions imposed by the Reserve authorities on collecting forest products. Similarly, a study in Kosi Tappu Wildlife Reserve in Nepal revealed that the park-people relations were negative due to restrictions on resources[25]. Benefits in terms of access to firewood and construction poles to local communities surrounding protected areas create positive attitudes toward wildlife conservation[26].

The implication of this research is crucial to ensure positive attitudes toward wildlife conservation in BSNP. Lack of direct economic benefit through the tourism sector, resource use prohibition and livestock grazing restriction and crop damage and predation by wild mammals negatively affect the attitude of local people toward BSNP. These factors challenge the conservation of the park and its wildlife. Therefore, sustainable use and benefit of the park's resources by local people have paramount significance for the overall support and effective conservation management of biodiversity of the region.

CONCLUSION

For protected area establishment and management, the attitudes of local people should be considered and the park management should advocate a win-win approach for the sustainable conservation of the park. Therefore, to create a more hospitable environment both for local people and BSNP multi-action approaches that include proper land use planning, allowing local people to extract selective resources sustainably, job opportunity and creating broad biodiversity conservation education and awareness campaigns for effective conservation of BSNP.

SIGNIFICANCE STATEMENT

High human population pressure and lack of off-farm employment opportunities trigger the conversion of wildlife habitats into farmlands, which affects the conservation of protected areas. Only a few studies have been conducted on the attitudes of local farmers regarding protected area conservations in Ethiopia. The purpose of this study is to investigate the attitudes of local people toward BSNP. Most respondents claimed that local communities didn't benefit economically as they expected from the BSNP. Understanding the attitude and perception of local people towards BSNP is crucial to developing effective

conservation management plans and mitigation strategies. This study addresses problems of negative attitudes to improve local people's relationships with the park and reduce their hostility toward wildlife conservation.

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