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IMPACT OF HUMAN ACTIVITIES ON WILDLIFE: THE CASE OF NILE LECHWE IN GAMBELLA NATIONAL PARK SOUTHWEST ETHIOPIA

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Abstract

Assessing human threatening factors of wildlife is the base in determining and proposing appropriate conservation measures of biological diversity. The present study was conducted to assess the impact of human activities on the wildlife of the Gambella National Park, Southwestern Ethiopia from October 2015 to March 2016, specifically the case of the Nile Lechwe (Kobus megaceros). The data in this study was gathered using Structured Questioners among the sample of 384 respondents. In addition to the questioner survey, 6 focus group discussions one per each study villages were held in order to investigate the major human factors that affect the Nile Lechwe population. Data on the threatening factors was compared by chi-square test and descriptive statistics using SPSS version 20 software. Out of the 384 respondents, agricultural investment, illegal hunting, overgrazing, rice cultivation in the area and habitat loss were the most predominant human factors that affect the Nile Lechwe. Agricultural expansion and, respectively, illegal hunting were the highest human impact on the Nile Lechwe. Most of the respondents replied that they used hunting as a primary and secondary professional activity across the study villages. Before designing and implementing any development investment, particularly large-scale agricultural expansions, the government and other stakeholders should give consideration and attention to the rapidly declining natural resource beside to the development. Therefore, designing appropriate eco-friendly managements with options must be adopted to mediate the effects and minimize future impacts.

Keywords*: Agriculture; Anthropogenic disturbance; Habitats; Nile lechwe; Gambella National park; Wildlife*

Introduction

The impact of human inducing factors on wildlife needs to be understood, after having becoming a globally recognized controversial issue. Similarly, the imbalance between the needs of humans and the needs of wildlife populations in basic life supporting systems of the biological environment have always been resulted in conflict between human and wildlife that affect the lives of both counterparts [1]. Despite the efforts made to conserve biological diversities, our natural ecosystems have been exposed to change significantly by humans at some point in human history [2, 3]. As a result, Biodiversity conservation is achieved through eco-friendly traditional human cultural practices and beliefs [2, 4].

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Nowadays, the increase in human population besides to the question of the better life through improvements in science and technology, the global biodiversity has become easy targets for human over-exploitation. This situation is an indication of the global biodiversity, is being exploited at an alarming rates than ever before with negative implications for sustainable human livelihood [2, 3] and it has been suggested that biodiversity is facing a decline of crisis proportions which could ultimately lead to mass extinctions in the very near future. In Ethiopia, increasing evidence indicates that the rate of environmental degradation has increased in recent times, with the countries faunal and floral diversities are under a great threat. Likewise, the Gambella region of Ethiopia is also facing challenges in conserving the precious animals including the Nile Lechwe, white eared kob, etc., as well as plant species due to the habitat loss and fragmentation and other human activities [5, 6]. It has been estimated that Ethiopian forest coverage in the past was 40%, and has shrunken to only 3% today [6, 7].

In Africa, where majority of the community rely on natural resource for satisfying their day today needs that includes agricultural practice, hunting, fishing fuel wood consumption and other life supporting activities escalating, people in food-importing countries are facing added pressure to the their surrounding land and cause loss of wildlife and wildlife habitats [8].

The Ethiopian Government has designed major develop-mental activities during the last decade in different regions of the country including Gambella. Such activities especially large scale agricultural practices have caused drastic changes in the natural environment in the country. As a result, the natural resources of the country have been depleted alarmingly for over two decades. Investing the land to investors for development activities is important for the development and wellbeing of the nation. However, if the correct environmental impact assessment is not well conducted, it will have tremendous impact on the wildlife and their habitat [9, 10]. Hence, taking proper care and controlling and managing the activities are mandatory for protection of wild-lives and their habitats.

Moreover, recent observations indicate that extensive poaching, human and livestock population pressure and inappropriate land use accompanied by extensive investments have resulted in massive destruction of wildlife habitat and severe wildlife population decline [11]. Therefore, the present study was designed to assess the effect of Human activities on wildlife in the study areas with special emphasis to Nile Lechwe (*Kobus megaceros)*.

The question of the research is: What are the major human factors that affect the population of Nile Lechwe (*Kobus megaceros)*?

Materials and methods

Description of the study area

Gambella National park is located 850km west of Addis Ababa. It was established as a protected area in 1973 to conserve a diverse assemblage of wildlife and unique habitats. Its location is between 33045'- 34015' E and 07030'-08015'N at the west part of Gambella town, in the Gambella National Regional State. The park is located in the centre of Gambella Regional state between the rivers of Baro and Gilo [12]. The Park is characterized by heavy rainfall during the wet season (May to October) and very little precipitation during the dry season (November to April). The mean annual rainfall of the park is 1400mm. The mean annual temperature is 27ºC but the mean monthly temperature varies significantly. The absolute maximum temperature of 45ºC has been recorded in mid March while the absolute minimum temperature of 10.3ºC has been recorded in December [13] (Fig. 1).

Sample size determination

Since the estimated population around the national park would be beyond 10,000, hence, by the assumption of normal distribution the minimum sample size was 384.

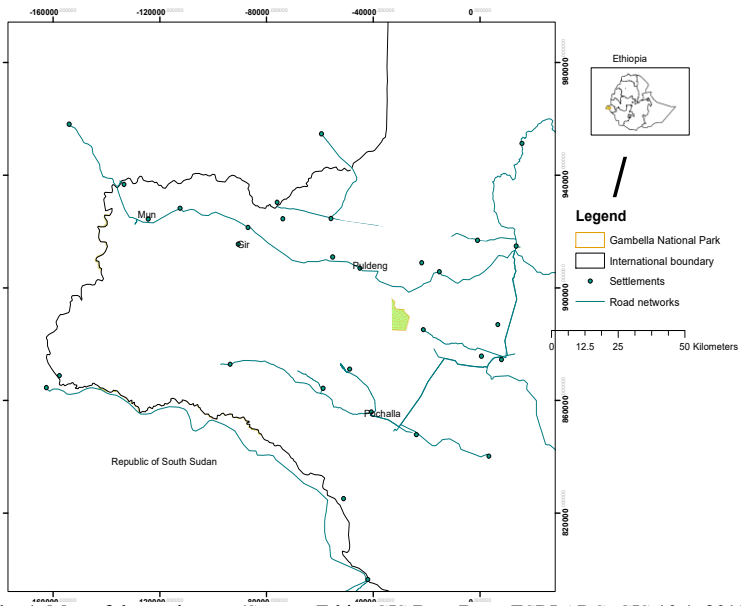

Fig. 1. Map of the study area (Source: Ethio_GIS Data Base, ESRI ARC_GIS 10.1, 2010)

Data collection

Data for this study was collected from October to March 2015/2016 and involved a sample of 384 local people that include dwellers of the study areas villages (Pochalla, Pokedi and Ollaw from Agnua village and Puldiang, Mun and Gir from Nuer village) and the Gambella national park staffs. The study was carried out by means of a questionnaire, and focus group discussion (FGD) that was designed and conducted in each focused population. The questionnaire survey, which formed part of a broad study on the village near by GNP, the structured questionnaire was administered to members of the household on a random manner [15]. In the household survey, people were interviewed by native speakers and training was provided for the interviewer prior to data collection. Focus group discussion was held to appropriately clarify, validate, and frame the issues to be covered later in the survey instrument. Pre-designed open-ended questions were used for gathering information. FGD was conducted; one per each sampled villages. The group size in each discussion varied from 10 to 15 people.

Data Analysis

Statistical package (software) SPSS version 20 was used to analyze the data. Each question was coded to run SPSS (chi-square, descriptive statistics was used based on the nature of the data) and data obtained from focus group discussion was analyze through content analysis method [16].

Results

The demographic data got from the respondents which included; - the gender, age and educational level and income source were summarized (Table 1).

From the views of the respondent among the study villages towards the population status of the Nile Lechwe is presented within the year 2005-2015. From the findings, 311(81%) of the respondents responded that the population of Nile Lechwe was decreased (Table 2).

From the assessment of the impact of Agricultural investment on Nile lechwe (*K. megaceros*) is presented in the study area. Of the 384 respondents in the study area 357(92.97%) pointed out that Agricultural investment affect the Nile Lechwe (*K. megaceros*) population in the study area (Table 3).

Table 1. Socio-demographic information of Respondent adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Gender	Frequency	Percent (%)
Male	252	65.6
Female	132	34.4
Total	384	100
Ages in years		
18-27	162	42.2
28-37	83	21.6
38-47	75	19.5
48-57	40	10.4
Above 57	24	6.3
Total	384	100
Education level		
Illiteracy	325	84.6
Primary school	37	9.6
Secondary school	16	4.2
Above secondary school	6	1.6
Total	384	100
Income source		
Agriculture	217	56.5
Fishing	61	15.9
Employment	27	7
Hunting	35	9.1
Charcoal Making	24	6.3
Livestock keeping	20	5.2
Total	384	100

Table 2. Population status of Nile Lechwe in the year 2005-2015 in the study area adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Population status of Nile Lechwe (*K. megaceros*)	Frequency	Percent
Decreasing	311	81.0
Increasing	15	3.9
Can't estimate	57	14.8
Stable	1	.3
Total	384	100.0

Table 3. The presence and impact of Agricultural investment on Nile lechwe (*K. megaceros*) the study area adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Agricultural investment affect Nile lechwe (*C. megaceros*)	Villages						Total
	Pokeddi	Puchalla	Olaw	Gir	Puldiang	Mun	
Yes	62	60	61	59	59	59	360
No	2	4	3	5	5	5	24
Total	64	64	64	64	64	64	384

$X^2 = 0.837$, df = 5, P-value = 0.008

Table 4. Factors to decrease both Population and habitats of Nile lechwe (*K. megaceros*) in the study area adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Factors	Frequency	Percent
Large scale Agriculture	139	36.2
Illegal hunting	51	13.2
Overgrazing	49	12.8
Habitat loss	41	10.7
Bush fire	23	6.0
Reduced of Alwero river for irrigation	38	9.9
Rice cultivation in the area	43	11.2
Total	384	100.0

From the assessment of predominant human factors which affect the wildlife population is presented in the study area (Table 4). The finding revealed that Large scale Agriculture 139(36.2%) and 51(13%) were the predominant human factors to Nile Lechwe (*K. megaceros*).

Table 5. Habitats of Nile lechwe (*K. megaceros*) in the study area adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Habitats of Nile lechwe (*K. megaceros*)	Frequency	Percent
Gambella National Park	206	53.6
Baro river basin	12	3.1
Alwero wetland	161	41.9
Others	5	1.3
Total	384	100.0

The habitats of Nile Lechwe (K. megaceros)

From the present finding Nile lechwe (*K. megaceros*) was observed mostly in Gambella national park followed by alwero wetland respectively

Table 6. Sources of fuel wood in the study area adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Source of feul wood	Villages						Total
	Pokeddi	Puchalla	Olaw	Gir	Pudiang	Mun	
Harvesting from wild	50	48	47	45	35	43	268
Buying from market	5	9	9	8	3	2	36
Collecting from farm after Burning	9	7	8	11	26	17	78
Others	0	0	0	0	0	2	2
Total	64	64	64	64	64	64	384

$X^2 = 41.626$, df = 15, p-value 0.004

In table 6, the bassessment of major source of fuel wood consumption in the study area. Source of fuel wood consumption in the study was vary significantly (p = 0.004) and most of the respondents replied that they obtained fuel wood by harvesting from wild 268(69.8%) followed by collecting from farm after burning 78(20.3%).

Table 7. Hunted animals in the study area adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

	Frequency	Percent
Nile Lechwe	191	49.7
African elephant	57	14.8
white ear kob	47	12.2
Bush Buck	39	10.2
Primates	16	4.2
Others	34	8.9
Total	384	100.0

The present study was also tried to investigate commonly hunted animals in the study area. From the finding the most frequently hunted animal species was Nile lechwe (*K. megaceros*) 191(49.7%) followed by African elephant 57(14.8%).

Table 8. Hunting activities across the study villages adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Hunting as an activity	Villages						Total
	Pokeddi	Puchalla	Olaw	Gir	Puldiang	Mun	
Primary activity	10	5	7	14	6	7	49
Secondary activity	54	59	57	50	58	57	335
Total	64	64	64	64	64	64	384

$X^2 = 38.242$, df = 5, P = 0.000

The hunting activities in the study area

The findings varied among the study villages (p=0.000) in which most of the respondents in the present study were replied hunting as a primary activities.

Table 9. Hunting tools adjacent to Gambella National Park, Southwest of Ethiopia from October 2015 to March 2016

Hunting tools	Villages						Total
	Pokedi	Puchalla	Olaw	Gir	Puldiang	Mun	
Shotgun	30	34	30	46	40	35	215
Locally manufactured trap	12	10	18	7	17	18	82
Spear	22	20	16	11	7	11	87
Total	64	64	64	64	64	64	384

$X^2 = 25.071$, df = 10, p-value 0.005

The types of hunting tools in the study area

Majority of the respondents responded that they used shotgun for hunting purposes 215(55.99%)

Focus group discussion results

About three fourth of the discussant replied that the most devastating human factors to wildlife in the study area were hunting, overgrazing, wildfire fish hunting, agricultural expansion and habitat loss in order of importance. On the other hand the most predominant human factors to the population of Nile Lechwe were large scale agricultural expansion in and around the Gambella national park, irrigation rice cultivation, Illegal hunting, overgrazing, charcoal making wildfire in order of importance in the study area. More than 95% of the discussant assured that agricultural investment is present in their area. More-over, the presence of agricultural investment in their locality did not benefit the local people except some employment opportunities rather this investment activity exploit the natural resource of the area in turn affect the population of wildlife and their habitats.

The village of Pokedi serves as an example of the consequences of Saudi Star's operations. Domestic investors are encroaching on land to its north side while Saudi Star has cleared the land to its south. The damming of the Alwero river will affect the village's local industry just as it receives a population influx from relocated communities. Combined with ongoing raids by neighboring tribes, Podeki's economic and social future looks bleak.

Almost all the discussant responded that Illegal hunting is common in the study area even there were professional hunter in which their livelihood is mainly rely on and there was both individual and group hunters and the majority of the hunters used the shotgun for hunting. This is an indication of illegal hunting is one of the most anthropogenic factor which affect the wildlife in the study area. One third of the discussant revealed that some time may design certain investment activities without considering the side effect of the investment on the environment and the surrounding local communities and even without creating awareness among the local communities. Besides they also indicated that the government and other stalk holders should create awareness and if possible provide alternative means of income generation to tackle the situation present in the study area.

Discussion

The present study identified that the major predominant human activities which affect wildlife and their habitat in the study area were large scale Agricultural expansion, illegal hunting, overgrazing, habitat loss, rice cultivation in the area and bush fire. Similar finding was reported [17] in Kenya in which the major threats to protected area biodiversity were illegal killing of wildlife for bush meat and recent agricultural expansion and other incompatible land use changes. Large scale Agricultural expansion is the most anthropogenic factor recorded in

the present study particularly for Nile Lechwe because large scale rice cultivation resulted in the reduction of the wetland. The Ethiopian Wildlife Conservation Authority (EWCA) estimates that some 438,000 ha of land have been awarded to investors, in early 2008 in the vicinity of the Gambella National Park, all without Environmental Impact Assessments. Wetlands, with abundant fish populations and birdlife, are presently being altered for rice production while extensive forest cover in nearby areas has been completely cleared. The present findings revealed that more than 93% of the respondents replied that the presence of agricultural investment in the study area affected both the habitat and the population of Nile Lechwe.

In the present study the activity levels of hunting and hunting tools of the respondent were assessed. From the findings of the present study more than 12% of the respondents replied that their daily lives are mostly interconnected with hunting. This is an indication that hunting is one of the most anthropogenic activities which affect the wildlife population in the study area. Likewise, the hunting strategies and hunting tools of the respondents were also assessed and the majority of the respondents in the study area were group hunters and most of them were using shotgun for hunting. As expected, shotgun hunting was the most popular method of hunting, because it enabled the killing of larger game within a shorter period, and was, therefore, economically more profitable (more meat with less hunting effort). Another reason for the popularity of shot gun hunting was that trapping was considered inefficient and dangerous, since the traps sometimes caught non-target dangerous animals (e.g. snakes), and the trapped target animals could be stolen, often together with the trap.

Another anthropogenic disturbance of wildlife was wildfire in the study area which is mostly associated with land-use practices and changes. The property, health and welfare of people in these areas are negatively affected by direct and indirect consequences of fire and air pollution. Active involvement of the local people has therefore been recognized as a condition for the successful implementation of fire management programmes, especially at the interfaces between wild lands, managed systems and residential areas [18].

Fuel wood plays an important role in human activities like fish smoking and charcoal production in every community. Although, most of the communities obtained energy sources from fuel wood, the situation has many side effects in the destruction natural resource. Inline to this view the present study revealed that majority of the respondent replied that they obtained fuel wood by collecting from the wild.

Framework to Analyze Human, Wildlife and Wildlife Habitat Interaction

To undergo effective conservation measure of wildlife it is very important to understand the interaction among human, wildlife, wildlife and their habitats. Human factors such as illegal hunting, Large scale agricultural investment, Encroachments of human and livestock particularly the buffer zone of the protected area, result negative interaction between the wildlife and peoples that reside near by the protected area. This situation is happened in the present study area where there are different large scale agricultural investments even they are crossing the protected area (Fig. 2). As a human population increases the needs and wants are simultaneous increases which inturn add pressure on the natural resource in general and wildlife and their habitat in particular (Fig. 3).

Nile Lechwe (Kobusmegaceros), dwell almost exclusively in flood plains particularly alwero wetlands where they are uniquely adapted to the area's wetlands, swamps and marshes. The source of these swamps is the Alwero River which is highly utilized by the large scale production of rice in the area and supposed to be decline the volume of the wetland which ultimately affects the habitat of Nile Lechwe (Kobusmegaceros). The following framework shows integrated effect and impact of human activities on wildlife.

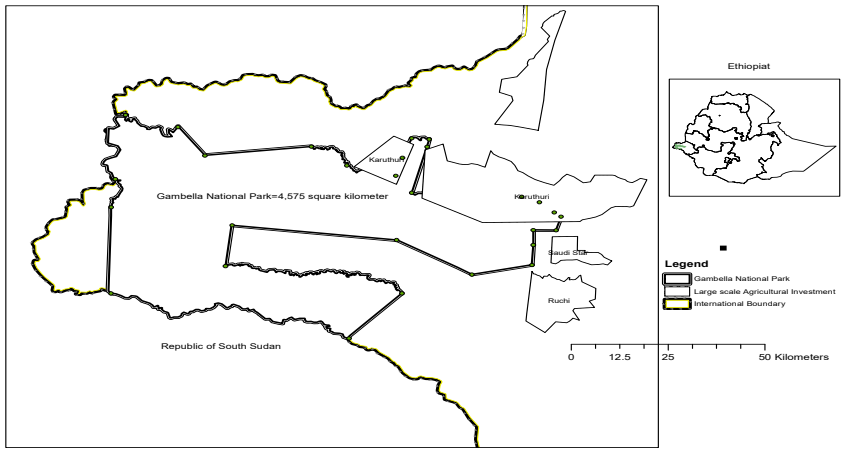

Fig. 2. Large scale agricultural investment in the buffer zone of Gambella national park. The figure revealed that the large scale agricultural investment in the buffer zone of Gambella national park tried to engulf the park itself.

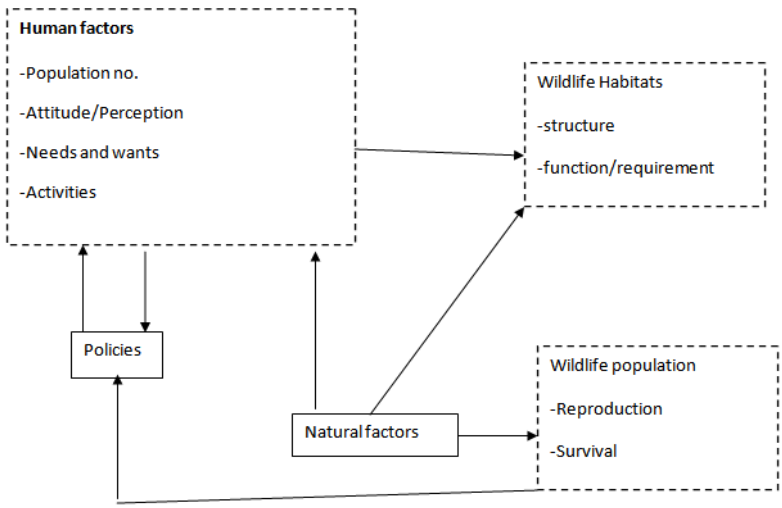

Fig. 3. A Framework to analyze human, wildlife and wildlife habitat interaction

Understanding the Policies existed in a country besides to the anthropogenic factors are crucial to establish wildlife conservation strategies. Weak enforcement of polices and strategies has a negative impacts on natural resource. In Ethiopia, although, there had been conservation attempts since long before, the implementation of wildlife policy is typically underestimated. Wildlife conservation program in 1965, with the establishment of a chartered wildlife conservation authority with the aim of conserving the precious heritage, wildlife resources, preserving the endangered species from depletion and protecting and developing the wildlife resources of Ethiopia as a potential tourist attraction. The authority latter called the Ethiopian Wildlife Organization (EWCO). The first legislation protective of wildlife was started during 1908; the Proclamation was to regulate hunting, especially elephant hunting. In 1944, further legislation was passed to regulate hunting of wildlife to ensure that certain species were not over hunted [14]. Currently the federal government of Ethiopia established different protected areas particularly national parks in different regions of the country to conserve wildlife species.

One of these parks is Gambella national park where primarily established conserve diverse wildlife and their habitats.

Conclusion and recommendation

From the findings of the study, the major human activities that have an impact on the Nile Lechwe (*Kobus megaceros*) of the study area were agricultural investment and illegal hunting. The large-scale agriculture activities nearby the protected area have effects on the wildlife resource in the area. Therefore, any development practice should give consideration and attention to the rapidly declining natural resource, besides the development facet. Hence, there should be choral relationship between agricultural investments and conservationist, as well as find out possible ways in which both activities go harmonically side by side. Again it is the duty of the government and developmental entities of the country to give more attention to further investigate the problems and mitigate the effects of the human factors.

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