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Anthropogenic Influences on the Wildlife Conservation Efforts in Maze National Park, Southern Ethiopia

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Abstract
Studies on anthropogenic impacts on wildlife resources were carried out in the newly established Maze National Park, southern Ethiopia, during April 2011 to February 2012. An investigation on anthropogenic impacts in the Park area was made through household questionnaire survey, direct observation, group discussion and key informant interviews. Vehicle-wildlife collision and human intrusion are major problems in the Park. Livestock predation, crop raiding and encroachment of the local community in to the Park for exploitation of resources are important causes of conflict. Unless proper and urgent measures are taken to limit illegal activities, the benefits from the existing wildlife such as Swayne's hartebeests which is the endangered and endemic sub-species of the country, and their habitat will continue to decline and the future of the existing species of the Park might be in danger.
Keywords: Impacts, Human-wildlife conflict, Maze National Park, Wildlife Resources

INTRODUCTION

The human population increases exerts more severe and intensifying pressure on natural resources including wildlife (WILDCRU, 2010). The establishment of conservation areas is a widely used technique for reducing such human induced threats (Margules and Pressey, 2000). However, human population density tends to be high in areas surrounding protected areas (Chown *et al*., 2003). Protected areas have hardly been managed in Ethiopia due to population pressures (Feyera Senbeta and Demel Teketay, 2003). Ethiopia covers a total surface area of 1,104,000 km^2 with a population of over 80 million and living in rural areas with about 83.3% that are mainly agrarian and forest dwelling (CIA, 2011).

A human–wildlife conflict which is a function of human population increase and encroachment to protected areas arises from conflicts between human and wildlife needs (Kiringe and Okello, 2007). Human-wildlife conflict is fast becoming a critical threat to the survival of many globally endangered species, in particular to large and rare mammals (Morrison *et al*., 2007). They are highly vulnerable to extirpation by humans and consequently, severe contractions in the range of species result in large mammal faunas becoming increasingly rare. At present, the ranges of individual species of large mammals have been reduced greatly because of human activities, primarily through habitat alteration and direct exploitation or persecution (Morrison *et al*., 2007). Lack of involvement of local communities in wildlife conservation as well as providing them economic interest in resource conservation will be the reason for their continued indifference to poaching and bush meat trade (Kiringe and Okello, 2007). Steidl and Powell (2006) described that, activities that alter the physical environment change the amount or the suitability of habitat for a species.

Although protected areas are one of the conservation's oldest devices and remain a cornerstone of conservation policy, they are continually threatened by growing human populations (Wynne, 1998). Human population growth has led to encroachment into wildlife habitats, constriction of species into marginal habitat patches and direct competition with local communities (Siex and Struhsaker, 1999). It is important for conservationists to have detailed information on the type of impacts that result from expanding human populations in areas of high biodiversity (Stephens *et al*., 2001). The objective of this research is to investigate the human impacts on the wildlife resources, and to determine the cause of human-wildlife conflict in the recently established Maze National Park, Southern Nations Nationalities and People's Regional State, Ethiopia. The study is highly crucial to alleviate the problems encountered for sound Park management and making the area as a potential tourist attraction centre in the future.

MATERIALS AND METHODS

The study area

The study was carried out in Maze National Park (MNP), which is located in Southern Nations Nationalities and Peoples Regional State, Ethiopia. The name of the Park is derived after the largest river called Maze River, which rises from the southern parts of the surrounding highlands and passes through the Park in the north direction, and finally drains to Omo River. The Park was established by the regional state in 2005. It is about 485 km southwest of the capital Addis Ababa via Wolaita Sodo-Sawla road. It is situated between x=286484.25 and y=671467.31 latitude and x=300963.36 and 696852.69 longitude. The Park is surrounded by chains of mountains and bounded

to the north by Quecha Wereda, to the northwest by Omo River and Gofa Wereda, to the west by Zalla Wereda, to the east by Deramalo Wereda and to the south by Kemba Wereda. The altitude ranges from 998 to 1200 m above sea level and covers an area of 220 km^2.

Rainfall at Maze (Morka area), although continuous has a moderately bimodal pattern, typical of semi-arid agro-ecological zone of Ethiopia. The annual rainfall varies between 843.8 mm and 1375.3 mm. Maze area experiences a long rainy season that extends from April to October with the highest peak towards the end. The dry season is from November to February (ENMA 1995-2009 Meteorological data). The lowest temperature recorded during the wet season was 17.6°C in June and the highest during the dry season 33.9°C in February.

Methods

This research is mainly based on primary data which is obtained through household survey, direct observation, group discussion and key informant interviews. Secondary data were collected from the recorded data by the Park and neighboring Wereda offices. A standard questionnaire and focus group discussion or semi-structured questionnaire were designed and carried out with the sample households of the local people. The questionnaires included both open-ended and fixed response questions. The questionnaire was also pre-checked among some groups of the communities, which was not included in the main sampled groups. Twenty households were selected randomly for the pilot survey; after which the necessary improvements were made in the questionnaire. These pilot questions were not considered in the result analysis. The questionnaire survey was conducted within 0 to 5 km range from the Park boundary. 30% of the households were randomly selected from four closest Kebele or villages, such as Masha Morka 28.70% (n=66), Masha Chaba 36.96% (n=85), Domaa Omala 14.34% (n=33) and Wagesho Kebele 20.00% (n=46) of the surrounding Wereda based on the distance from the Park boundary and their impact on the conservation area following the work of Newmark *et al*. (1994). Local Kebele people were involved in the research to facilitate the data collection. Questions were addressed to household heads to gather demographic data, way of utilization of the Park resources, crops grown, damage caused to crops and livestock, and the species of wildlife responsible for the damages, protection measures adopted, livestock type, number killed by wildlife and knowledge and attitudes of local communities towards wildlife and the Park management.

Most of the questionnaires were individually administered, primarily with the head of the household, of which mostly were male. The exception was where they were absent during the household visit. In many cases, other family members also participated to form a collective response. Interviewees were met at their home and roughly 35 to 50 minutes of time was required for an interview, depending to the respondents. If a household member 18 years of age or older was absent during the survey request, that house was skipped and the next house was approached. The interview was conducted during April 2011 to February 2012. Several secondary data were also obtained from the National Park Archives and were verified through key person interviews like Park scouts and community representatives. Each of the questionnaire data was analyzed using descriptive statistics and responses compared using Chi-square test. Before entering the data into Microsoft Office Excel, each questionnaire was given an identity number. Every question and the responses were coded. After completion of data entry into the Excel sheet, the data were imported into SPSS. Before analyzing inconsistencies, typing errors and missing information were corrected by comparing the original data sheet (protocol) with the frequency output table of SPSS.

RESULTS AND DISCUSSION

A total of 230 questionnaires were administered in the four closest settlements and/or villages/ Kebeles' of three neighboring Weredas households, whose inhabitants were using the resources in the Park area more often. The age of respondents ranged from 18 to 82 years old. Among the respondents, males constituted 76.52% (n=176) and females 23.48% (n=54). The higher number of respondents age class was between 28 and 37 years old (33.92%, n=78) (Fig 1). The educational background of respondents was illiterate about 20% (n=46), non-formal education 6.52% (n=15), primary level education 48.70% (n=112) and, secondary level education and above 24.78% (n=57). Most of the respondent's occupational characteristics were combination of pastoralist with settled agriculturalists (86.09%, n=198).

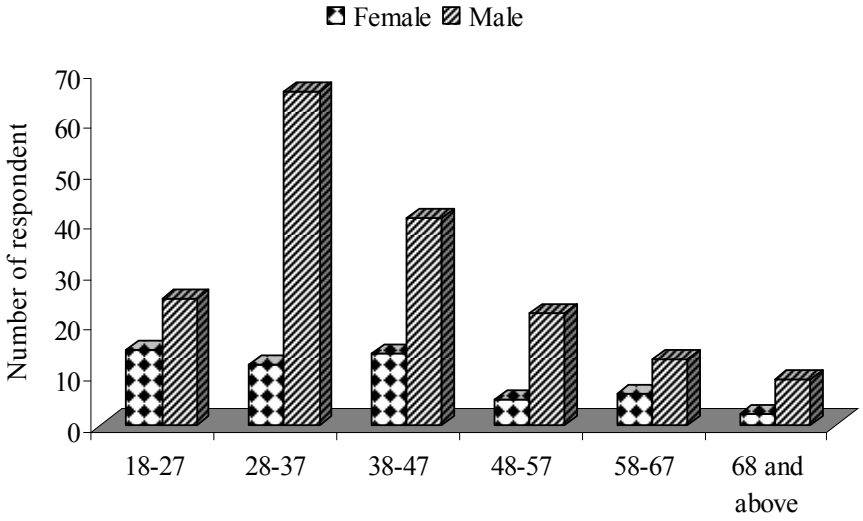

Fig 1 Age class distribution of respondents

The majority (60.36%, n=134) of the respondents livestock have grazed both inside and around the Park at the buffer zone. Most (90.09%, n=200) of the respondents did not have their own private grazing land. Most of the time, they used the Park area for grazing livestock during the dry seasons, from November to April. Many of the wildlife were observed grazing grasses very close to large number of livestock inside the Park. The density of livestock was more during the dry season. The adjoining Kebeles 2009/2010 annual report livestock data revealed that high number of livestock (n=52,221) was involved in grazing grasses in and/or around the Park area. 96.96% (n=223) of the respondents used a herder to look after their livestock (Fig 2). The majority (76.09%, n=175) of the respondents did not use guarding dog to safeguard their livestock. Most (85.22%, n=196) of the respondents replied as they did not practice bush burning in the Park area. There was a significant difference between the respondents bush burning practice inside the park area ($\chi 2=114.104$, df=1, $p<0.05$). The locals close to the Park set fire intentionally at regular base during the dry season, mainly between December and February just before the onset of rain, in order to stimulate fresh leaves and grasses for their livestock, and also to control ticks and snakes. Illegal hunters also burn the vegetation in order to attract wild games for better hunting, to make open foot tracks for better visibility and protect themselves from dangerous wild animals. Wildlife inside the Park also benefited from the fire as verified from their dramatic shift from the unburned area to the recently burnt area to get new shoots (Fig 2). 46.09% (n=106) responded that they are collecting fire wood from both inside and outside of the Park area. There was a significant difference in the fire wood access inside the Park and other sources outside the Park area ($\chi 2=79.913$, df=3, $p<0.05$). During the study period, so many people leaving around the Maze National Park were observed several times cutting and carrying timber products on shoulder for house construction and firewood purposes. Most of the time, they transport the forest products to their villages during the night time with their herd.

Fig 2 Livestock grazing and fire set by the people inside MNP (Photo: By Wondimagegnehu T.)

There is high pressure on Park resources from the local communities living in the periphery and people coming from far distant areas. Illegal activities such as, poaching, wildfire, livestock grazing, fuel wood extraction, gathering fodders, timber cutting for construction, non-timber forest products, farming practices in the Park and, wild honey and green pepper gathering had been carried out by the adjoining villagers. The human pressure in and around MNP has resulted in severe degradation of the environment and loss of wildlife and their habitat. The 2009/2010 human population data of the ten adjacent Kebeles' of the three Wereda Agricultural and Rural Development Coordination Offices annual report shows that there are about 36, 938 individuals surrounding the

Park. Majority of respondents (92.61%, n=213), acknowledged getting benefits from the Park area. Among the benefits were: getting livestock grazing access (19.25%, n=41), fire wood gathering (14.08%, n=30), both livestock grazing access and fire wood collection (21.13%, n=45), employment as a short-term daily labourer, such as inside Park road construction or permanent job, such as guards, Park scout or other office works (6.57%, n=14), from tourist visit (0.94%, n=2), bush meat access (3.29%, n=7), construction wood and grass harvesting (15.96%, n=34), livestock grazing access, fire wood gathering, and construction wood and grass harvesting (6.10%, n=13), wild honey collection (5.63%, n=12), farming land at the border of the Park (3.76%, n=8) and other benefits, such as wild green pepper collection (3.29%, n=7). There was a significant difference among the respondents in the getting of benefits from the Park ($\chi 2=119.427$, df=10, $p<0.05$). They also suggested that most of the benefits getting from the Park after its establishment were illegal. In the future they expect that if the Park management will allow legal activities to harvest and utilize some beneficial resources from the park, such as firewood collection, free grazing land, harvesting grass and wood for their own use and sale, without disturbing the wildlife and their habitats, the illegal activities might be minimized or mitigated. They also expected from the Park management to facilitate additional job opportunities, water hole access for both their livestock and the local community as a whole. They also suggested that if the Park should build and provide them social services, and facilitate training on how to advance their livestock farming and manageable utilization of limited resources.

80.43% (n=185) mentioned that getting bush meat in the locality had been effortless. They described that African buffalo, Swayne's hartebeest, bushbuck, waterbuck, oribi, warthog, greater kudu and bohor were frequently hunted by diverse people. 68.70% (n=158) did not agree in poaching of wildlife by the local community. But, most people during the interview and group discussion asserted that, poaching of wildlife in the area was intense before the establishment of the Park. Whereas, 31.30% (n=72) of the respondents did not hide as poaching had been practiced by the local community. Poaching is practiced by the people coming from distant Weredas to exploit the African buffalo's horn for cultural marriage practices, i.e. to provide the horn as a reward and expression of hero to their marriage partners (Table 1).

Table 1 Poached wild animals during the study period

Wild animals	Number poached	Percentage (%)
Oribi	3	20.00
Lion	1	6.67
Bushbuck	2	13.33
Waterbuck	2	13.33
Bohor reedbuck	1	6.67
Swayne's hartebeest	3	20.00
Greater kudu	2	13.33
Warthog	1	6.67
Total	n=15	100.00

There were 15 poaching activities during the study period on oribi (20.00%, n=3), lion (6.67%, n=1), bushbuck (13.33%, n=2), waterbuck (13.33%, n=2), bohor reedbuck (6.67%, n=1), Swayne's hartebeest (20.00%, n=3), greater kudu (13.33%, n=2) and warthog (6.67%, n=1) (Table 1). Local communities also participate in illegal hunting activities together with the intruders and hidden by their own.

Large number of vehicles had observed crossing day and night through the Park. The highway passing to Gofa-Sawla town and adjacent Weredas crosses through the Park. Motor vehicles with fast speed, especially during the nighttime, had crushed and killed many wild animals on the road (Fig 3 and Table 2). During the study period 28.28% (n=28) oribi, 15.15% (n=15) bird species, 13.13% (n=13) snakes, 5.05% (n=5) lions, 2.02% (n=2) leopards, 2.02% (n=2) Anubis baboons, 8.08% (n=8) bush pigs, 5.05% (n=5) common bushbucks, 7.07% (n=7) common waterbucks, 2.02% (n=2) bohor reedbucks, 5.05% (n=5) Swayne's hartebeests, 3.03% (n=3) greater kudus, 3.03% (n=3) warthogs and 1.01% (n=1) vervet monkey were found dead due to car accident (n=35, 35.35%), electric power (n=9, 9.09%), poaching (illegal hunting) (n=15, 15.15%), revenge measures (n=13, 13.13%), wildfire (bush burning) (n=6, 6.06%), predator attack (n=2, 2.02%) and unknown reasons (n=19, 19.19%) (Fig 4 and 5).

a) Male bushbuck b) Female oribi

Fig 3 Road crossing accident of wildlife in MNP (Photo: By Wondimagegnehu T.)

There was a significant difference in the number of oribi lost due to various reasons compared to other wildlife in the Park ($\chi2=99.939$, df=14, $p<0.05$) and among the reasons for the loss of wildlife with more of car accidents due to road cross compared to other reasons ($\chi2=49.556$, df=6, $p<0.05$). During the study period 4 oribi, 3 birds, 2 snakes, 2 pythons, 1 leopard, 2 baboon, 1 bushbuck, 2 waterbuck, 1 Swayne's hartebeest, 1 greater kudu and one African civet were found dead with unknown reasons. Electric line crossing the Park from Kucha-Selamber to Gofa-Sawla town had also contributed for the loss of birds. Death of nine birds was recorded by the Park scouts underneath the electric wire.

Table 2 Wild animals killed by road cross accidents during the study period

Wild animals	Number crushed	Percentage (%)
Oribi	16	45.71
Birds	2	5.71
Leopards	1	2.86
Bush pigs	2	5.71
Bushbucks	2	5.71
Waterbucks	3	8.58
Bohor reedbuck	1	2.86
Swayne's hartebeest	1	2.86
Total	n=35	100.00

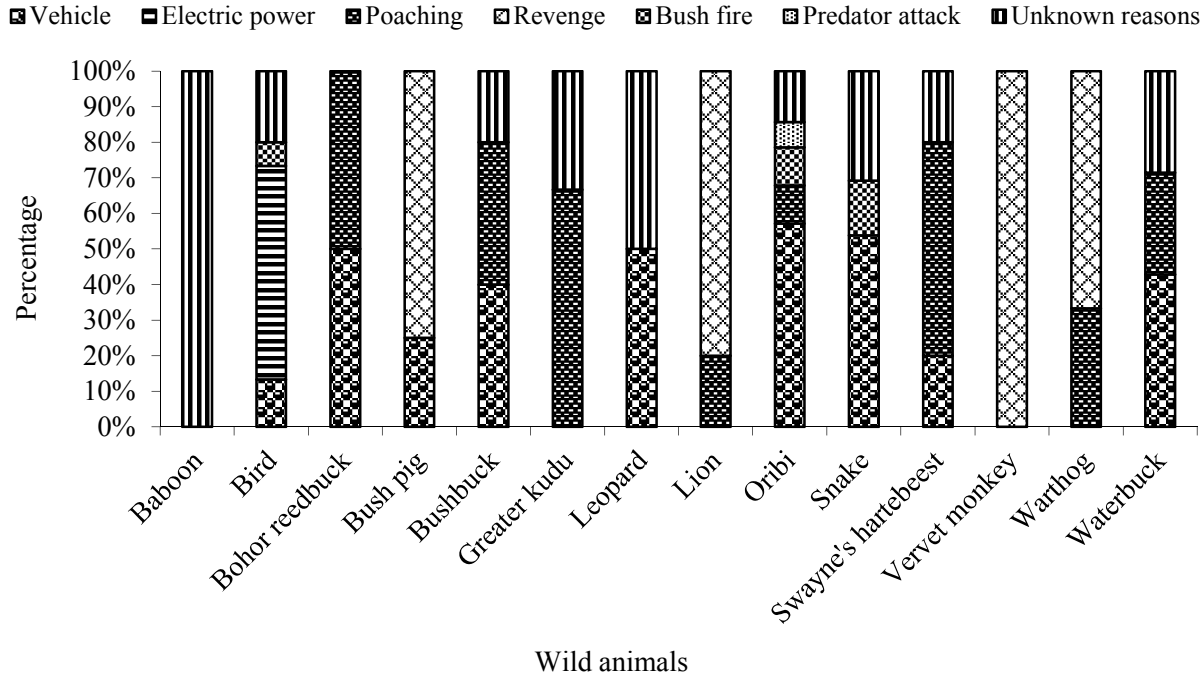

Fig 5 Percentage of wildlife attacked or killed by various factors in MNP

Fig 4 African civet found dead for unknown reason on the wild (Photo: By MNP Office)

Most of the Ethiopian National Parks including MNP are in the lowlands, where grazing land is becoming scarce due to overgrazing and clearance for agriculture. Wildlife in such areas is considered to be in direct competition with humans and their livestock. Most Ethiopians have subsistence livelihoods relying on small-scale farming, livestock, and natural resources which have resulted in alarming reductions of both wildlife and habitat (Stephens *et al*., 2001). Pastoralists in Ethiopia try to eliminate the wildlife conserved in protected areas, whenever the opportunity arises, such as during the change in government (fall of 'Derg' regime) in 1991 (Fishpool and Evans, 2001). East (1999) stated that some parts of Africa are now almost completely devoid of large wild animals because of uncontrolled slaughter during recent civil wars. Most of the factors that define the vulnerability of a species to rapid decline or extinction are controlled by human influence (Brooks *et al*., 2002). Mallon and Kingswood (2001) explained that many species are threatened with extinction in their original habitat, which influences the stability of forest ecosystems. As human population expands, wildlife resources are increasingly subjected to severe pressure in many of the protected areas including MNP, which threatens their existence and sustainability.

The questionnaire survey of the present study and personal investigation of the area identified that local communities are affecting the wildlife and resources of the Park area. The animals are threatened by further loss of habitat and illegal exploitation of resources by the local community. To minimize the impacts of local people on the Park area and conflicts between wildlife conservation and socioeconomic development, we must understand how humans affect the wildlife habitat (Liu *et al*., 1999). Chapin *et al*. (2000) stated that understanding the effects of humans on wildlife populations, as well as devising strategies to restructure these effects, is an increasing challenge for resource managers. Understanding the underlying mechanisms and interrelationships of various human activities is critical in designing and implementing feasible policies for balancing human needs and wildlife conservation (Liu *et al*., 1999). Based on the interview response of the present study, the local people are more likely to confine in encroaching the wildlife habitat by ignoring the rules and regulations of the Park, due to the lack of alternative resources in their surrounding for the survival of their own and their livestock. The continuous interference of the local people into the boundary of the Park has led to the deterioration of the wildlife territory making an insecure place for the normal activity of wild animals. The present questionnaire survey focused on the four nearby settlements and/or Kebele's from the three adjoining Weredas. Most of the views of different Kebele's respondent were similar and not significantly different. Nearly all of the respondent occupational characteristics depended entirely on settled agriculture and livestock production. These activities may aggravate the impact on the Park area.

Uncontrolled wildfire is one of the major problems of the Park. Ohlenbusch and Hartnett (2000) described that prescribed or control burning is an excellent management practice for grassland and if properly used, it can be a cost effective method for increasing the productivity of rangeland in the Park area. Mortality among most species has been found to be minor (Koprowski *et al*., 2006) and fire generally poses no significant threat to large wildlife populations. The problem in the study area was that, fire was set without any firebreak and at night when most animals were inactive. This may affect calves. Main and Tanner (2003) described that fire can have negative consequences when it occurs in the wrong place at the wrong time. The information available from research indicates that periodic fires benefit and are indeed vital to wildlife populations in fire-adapted habitats. Mishra *et al*. (2003) described that growing densities in livestock populations can create an overlap of diets and forage competition with wild herbivores. This results in overgrazing and decline or local extinction in wild herbivore populations. With increasing human population and encroachment into areas, there is an increasing risk of disease spreading from domestic animals to the wildlife. Strategies to protect valuable wildlife species from introduced disease need to be developed by the MNP management and concerned sectors. Direct competition for forage resources between wild herbivores and livestock can lead to changes in foraging behaviours and diet selection, which alter the performance and population dynamics (Hepworth *et al*., 1991; Odadi *et al*., 2007). Illegal farming

practices by the community around the Maze River and other small tributaries along the riverine vegetation are the main problems of the Park. Although farming is still an important activity within the MNP, it has undergone a significant decline over the last few years as a result of control.

Wildlife has been colliding with vehicles that cross through the Park with high speed, especially during the night period. In addition, the high intensity of wildfire also pushed the animals to the highways exposing them to collision accidents. Branch (2008) explained that vehicle traffic is noisy and at night also involves considerable light pollution from car headlights and, these factors can depress local populations of sensitive birds and large mammals. Vehicle-wildlife collision throughout the Maze National Park is very serious. Besides the above mentioned impacts, power transmission lines along the road have also their own contribution on the mortality of birds. Branch (2008) described that, raptor and vulture mortalities are often associated with power transmission lines, and the impact of power lines and cables across the major roads on bird mortality needs to be regularly monitored. Unless proper and urgent measures are taken to curtail unsustainable and/or illegal resource use by improved law enforcement, public awareness and education, and generating benefits for local communities future wildlife of MNP will be in danger of extinction.

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