Global Science Research Journals

ISSN: 2449-1780 Vol. 5 (4), pp. 205-210, April, 2017

http://www.globalscienceresearchjournals.org/

Global Journal of Wood Science, Forestry and Wildlife

Full Length Research Paper

An assessment on species richness and distribution of large mammals within the Bakossi landscape

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Accepted 25 March, 2017

A survey was conducted in the Bakossi landscape area during the wet season to determine the species richness and distribution of large mammals within the three conservation sites. Results show that 10 species of large mammals (Red duikers, Blue duikers, Red river hog, Chimpanzees, Drill, Putty-nosed monkey, Mona monkey, Black-fronted duikers, Bushbuck and Sitatunga) were present in the Bakossi landscape. Of these, two species are considered to be threatened on the IUCN Red list (1990): chimpanzee (*Pan troglodytes)* and drill (*Mandrillus leucophaeus)* (http://www.iucnredlist.org/). The results also suggested that the indigenous people depend on the forest for their survival since the forest is highly valued as a source of food (51.66%), medicine and building materials (39.40%), fuel wood and household items (9%).

Key words: Large mammals, Bakossi landscape area, national park, conservation, human activity.

INTRODUCTION

Large mammals are found in most forest and savannah regions in Africa and it is of the utmost important to protect them for the role they play in the ecosystem. Large mammals are animal species least of the size of a blue duiker (Ekobo, pers. Com) . Cameroon large mammals are in a critical state as a result of severe hunting pressure, accelerated timber extraction and escalating population pressure, leading to forest encroachment, reducing them to small refuges in which the biota struggles to survive (Grubb et al., 1998). As a result, conservation initiatives of large mammals over the last decade have resulted in the creation of protected areas.

Cameroon encompasses an intricate mosaic of diverse habitat and wildlife; with moist tropical forest predominating in the South and South east and 54% of the country is comprised of closed canopy forest (WCMC, 1994). Wildlife is also highly diverse. There estimated to be 297 species of mammals, 849 species of birds and 190 species of reptiles (Audubon Society, 1996). There are several national parks, several faunal reserves and a large network of forest reserves designed to protect these habitats and the associated biodiversity representing 13% of the national territory (Besong, 1996). Documentation of large mammals' abundance has been provided for many sites but Bakossi landscape has been receiving very little attention. Hence there is scanty published work on wildlife abundance and distribution in this area hampering management actions to be orche-strated to achieve conservation goals. Therefore the main objective of this research is to establish the abundance of large mammals and their distribution within the Bakossi landscape. More specifically;

1. Conduct a survey of large mammal species found in the Bakossi landscape area'.
2. Determine the relative abundance of each species'.
3. Determine the geo-spatial distribution of large mammals in the Bakossi landscape area.
4. Evaluate the impact of anthropogenic activities in relation to the distribution of large mammals in the Bakossi landscape area.

MATERIALS AND METHODS

Study area

Bakossi landscape area is situated between latitude 04º 38' - 05º 10'N and longitudes 09º 22'- 09º 58'E and has a total surface area of 189,000 ha harboring among others three conservation sites namely Bakossi National Park, Kupe and Muanenguba proposed

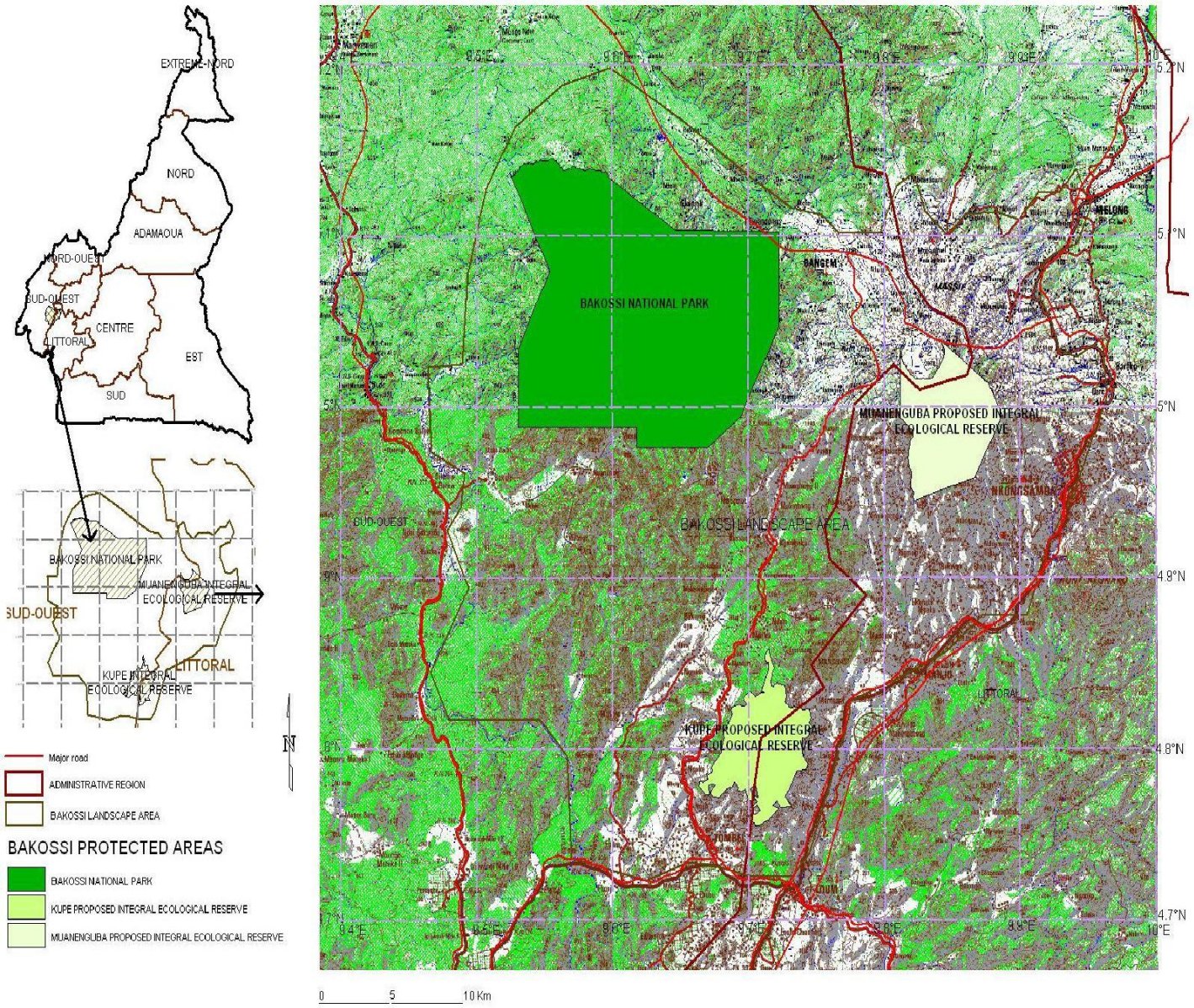

Figure 1. Map of Bakossi Landscape showing the three study sites. Source: Okon and Dunn (2003).

Ecological Reserves (Figure 1). This area has an altitude of 2,396 m with two outstanding mountains namely Mount Kupe and Mount Muanenguba. The slopes of these mountains are made up mainly of fertile volcanic soil which is good for cultivation. The climate has a dry season from November to March. January is the hottest month. The rainy season commences from April to October with August as the wettest month. Temperature ranges between 22 and 32ºC, while humidity between 70 and 85%

The Bakossi landscape area is characterized by high and low lands that give raise to a wide range of habitats which support different types of plants and animals (Inyang, 2009) and therefore is generally known for high biodiversity and endemism (Inyang, 2009). This area supports three conservation sites which habour some important large mammals such as the drill (*Mandrillus leucophaeus*), the African forest elephant *(Loxodonta africana),* the chimpanzee *(Pan troglodytes*), and the Preuss' Red colobus *(Piliocolobus pennanti preussi)*. Over the years, owing to population explosion (70,000) and the people's quest for survival, activities such as illegal hunting, farming gathering of forest products and small scale logging has evolve to achieve unsustainable magnitudes that have put large mammals at stake (WWF-CFP, 2003).

Method

Survey of large mammals was done in the wet season in the month of June to October, 2009. The line transect method was used whereby indirect (footprint, tracks and dung) and direct observations of large mammals species and human signs were recorded while walking on foot along a straight line. Sixty four line transect were marked out using global information system (GIS)

Table 1. Large mammals recorded in the three protected areas of BLSA.

Species	BNP/ Intensity		Kupe/Intensity		Muanenguba/Intensity	
Red duikers	T, S, D	38, 3, 12	T, S, D	2	T	16
Blue duikers	T, D	22, 2	T, S	1	T	13
Black-fronted duikers	D	2	S, D	2, 1	X	X
Sitatunga	T	3	X	X	X	X
Chimpanzee	V, N	3, 22	V, N	2, 2	X	X
Putty-nosed monkey	X	4	V	2	V, S	2, 3
Mona monkey	X	X	X	X	V, S	1, 3
Drill	V	1	T	2	T	7
Bush buck	X	X	X	X	T	11
Red river hog	T	1	T	6	T	2

S= Seen, H= Heard; T= Tracks seen; D= Dung piles seen; N= Nests X= Absence of identification. Red duikers refer to Bay and Ogilbyi duikers as their dung or foot print could not be reliably separated.

map at intervals of 2 km. The starting point of each transect was randomly generated using a random number table. The exact position in the field was determined by using the "GO TO function" of GPS GARMIN 12XL. 63.5 km transects (28.4 km in Kupe, 28.8 km in Bakossi National Park and 6.3 km in Muanenguba) were cut passing through major habitats and spending 8 h each day for a period of 5 months (May to September). Data on all large mammal sightings, vocalization and animal signs and on human signs were recorded on a data sheet and later enter into the Excel program. Encounter rate of large mammals and human activities were pooled to determine the fitted regression line.

RESULTS

All large mammals seen or heard or recorded through their signs with intensities of their occurrence are listed in Table 1. These signs are accompanied with their intensity which is the number of times one could see a sign or observe.

A perusal of table shows that track is the sign that shows the highest number of intensity in the BNP, followed by nest that occur 14 times and the least is vocalization. In Kupe, tracks show the highest number of intensity, followed by vocalization and dung. Tracks in Muanenguba, is also the highest followed by sighting and the least is vocalization. Tracks which are the highest in all the three sites might be due to the fact that these mammals migrate often in the study sites in search for food as such imprinting their foot print of the ground. They also follow a pathway created for easy movement. Vocalisation is the lowest in BNP and Muanenguba probably due to few populations of these species. While the least is the chimpanzee nest might be as a result of the fact that is only chimpanzee that built nest in that area.

These signs are very important because they confirm species occurrence in an area. The mammals identified have been classified under two cohorts: The Ferungulata and the Unguiculata with two orders are namely Artiodactyls and primates. The former include representatives of the families Bovidae and Suidae whereas, the latter includes Cercopithecidae and Pongidae.

ABUNDANCE OF LARGE MAMMAL SPECIES IN THE BAKOSSI LANDSCAPE AREA

The abundance of large mammals in the Bakossi Landscape Area is presented in Table 2.

The family of Bovidae is the most abundant as far as species richness is concerned, with five (5) species recorded. Records from Table 2 show that Red duiker *(Cephalophus dorsalis)* is the most abundant species with mean encounter rate of 2.2 (high) signs per km. This may be due to its large size that provides sufficient habitat for the species and also because of their large size and strength that permits them to escape snares when trapped.

Black-fronted duiker (*Cephalophus nigrifrons*) is the least abundant of the duiker species, with a relative density of 0.16 (weak) signs per km. Badjue people from the northern section and the Boulou people of the Dja Reserve, respect taboo against eating Black-fronted duikers which might partially explain its presence close to the village (Muchaal and Ngandjui, 1999) which is not the case with the Bakossi people of the studied area. However, hunting and farming are intense around the edges of walked transect and therefore it is likely that it had taken refuge relatively in inaccessible area off the park.

Sitatunga *(Tragelaphus spekei)* is the least abundant species in the Bovidae's family with encounter rate of 0.1 (weak) signs per km walk. It was detected only in the BNP, mostly in the centre and in the Northern parts of the park, probably due to abundance of marshy areas where they survive best

The family Suidae is represented by single species namely Red river hog *(Potamochoerus porcus)* with an encounter rate of 0.78 (high) signs per km transect walk, present in the three study sites due to a suitable swampy

Table 2. Encounter rate (Number of animals seen per km transect walk) of large mammals in Bakossi Landscape Area.

Species	Abundance rate (IKA) (km^2)
Blue duiker *(Cephalophus moticola)*	1.15
Red duiker *(C. dorsalis)*	2.20
Sitatunga *(T. spekei)*	0.1
Bushbuck *(Tragelaphus scriptus)*	0.15
Black-fronted duiker*(C. nigrifrons)*	0.16
Red river hog *(P. porcus)*	0.78
Drill *(M. leucophaeus)*	0.20
Putty-nosed monkey *(Cercopithecus nictitan)*	0.22
Mona monkey *(C. mona)*	0.12
Chimpanzee *(P.,troglodytes)*	0.37
Total	5.45

IKA 0 = No observation, 0.1- 0.5 = Weak, > 0.5 = High.

habitat.

Pongidae is represented by chimpanzee with an encounter rate of 0.37 (weak) signs per km transect walk.

SPATIAL DISTRIBUTION OF LARGE MAMMALS IN BLSA

The spatial distribution maps are scaled depending on the number of each species present. The scales are directly proportional to the number of species present.

Result reveals a mammalian concentration in the northern and southern parts of the Bakossi National Park and low concentration in the remaining area of the park (Figure 2).

The field observations suggest that high concentrations of mammals in the northern and southern area of the park could be related to availability of food, shelter, less hunting and farmland encroachment and also large size of the study area, although establishing this relationship was beyond the scope of this study.

HUMAN ACTIVITY IN THE BAKOSSI LANDSCAPE AREA

Figure 4 shows the different human activities that take place in the BLSA. These activities are hunting with the highest percentage of destruction follow by agriculture, logging and the least is grazing (Figure 3). Human activity in the BLSA indicates that the indigenous people rely mostly on the forest for food, medicine, building materials, fuel wood and household items.

Biodiversity hotspot and human activity hot spot in the Bakossi landscape area

Figure 4 shows a weak relationship between the animals and human signs in the three study sites. The data did not suggest a statistically significant correlation (r^2 = 2.33%) between large mammals and human activity [F (d.f. = 1, 61) =1.46, P = 0.2322].

The impact of human activity on large mammals in the Bakossi landscape area is mild (weak). Even though the result shows that there is no statistical significant correlation between the two variables however, there is low human intervention as a result of farming of cash crops (e.g. Cocoa, Coffee, etc.) as a source of income generation.

DISCUSSION

Of the 10 species of large mammals recorded from BLSA, 6 species belongs to Ferugulata and rest to the Unguiculata. Chimpanzee and drill are class “A” species under the aegis of Wildlife Law 1994 and accordingly are rare or threatened with extinction and forbidden to be killed (CED, 2008).

Sitatunga, bush buck, red river hog and blue duiker have been classified as class “B” species that benefit from partial protection, that is, could be hunted, captured or killed after obtaining a wildlife exploitation title or license. On the other hand, red-fronted duiker, blue duiker, mona monkey and putty-nosed monkey have been classified as class “C” species and accordingly are partially protected, that is, their numbers are regulated in order to maintain the dynamics of their population. Previously, Ekobo (2003) surveyed the Mt Nlonako, Makombe and Ebo areas and reported five species in Ferugulata including elephants and eight species of the Unguiculata including Preuss’ guenon species not found in the present survey

The results buttressed by field observations show that chimpanzees were the most frequently encountered primate species amongst primates in the BLSA, followed by drill, putty-nosed monkey and mona monkey.

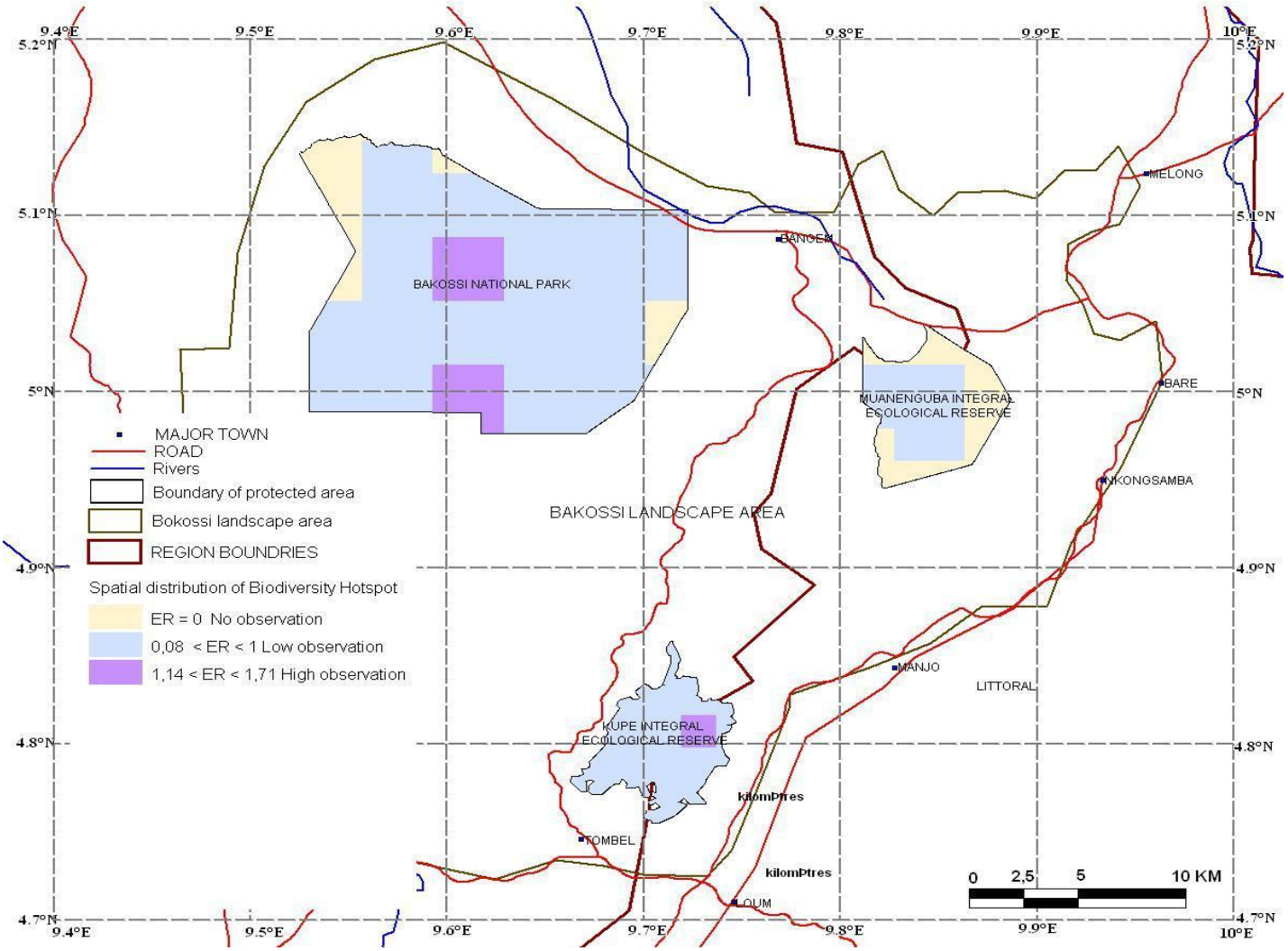

Figure 2. Spatial distribution of mammal species in the Bakossi landscape area

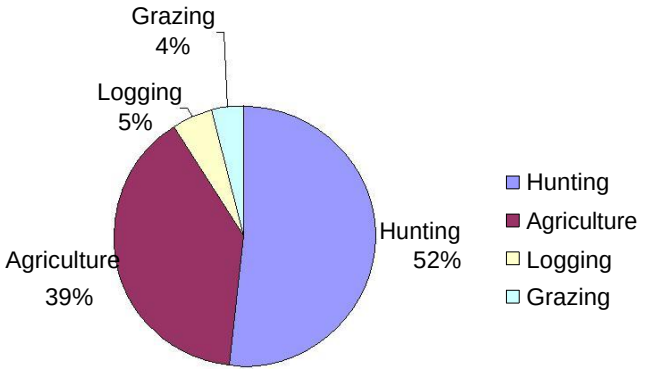

Figure 3. Frequency of human activity in the Bakossi landscape area

Chimpanzees appear to favour more rugged and inaccessible areas (Okon and Dunn, 2003) of the Bakossi National Park and Mount Kupe where hunting pressure may be less due to the rugged topography. The same authors reported in the Korup National Park that the Mona monkey *(Cercopithecus mona)* prefer areas of secondary forest Hunting typically contributes between 30 and 80% of protein consumed by forest-dwelling families in the Congo Basin (Koppert et al., 1993), this applies also to the people in the BLSA. The high demand for bushmeat and the lucrative trade (Mesape, 2009) associated with it must be the underlying factor that promotes poaching in the BLSA and the generally indiscriminate exploitation of wildlife as a source of food. In addition, most of the indigenous people in the BLSA are engaged in farming as their main occupation. They cultivate both cash crops (Cocoa and coffee) and food crops (Plantains, cocoyam, cassava, beans, pepper,) for sale and for local consumption. Plantains and cocoyams are available all year round, which maintains a constant supply of starchy food. It is rare for the indigenous people

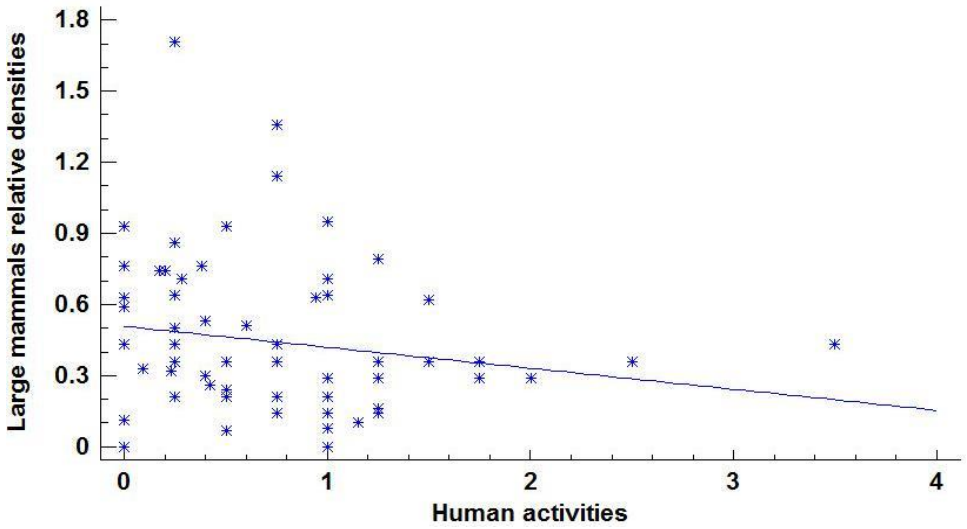

Figure 4. Fitted regression line of pooled encounter rates of large mammals and human activity in the Bakossi landscape.

in this area to live only on hunting and gathering. Moreover, the BLSA does not have any logging company for now. Logging is done only by the local communities for construction and for making local furniture. This type of logging has very little or no impact on the forest due toits Savannah characteristic of Muanenguba that attracts large cattle population for grazing.

Conclusion

The BLSA has 10 species of large mammals which is lower than Takamada with 18 species (Groves and Maisel, 1999). Human activities in the BLSA are hunting, logging, agriculture and grazing. Hunting is the most destructive human activity because of its high encounter rate of 1.56 signs per km transect walk and grazing is the least destructive because of its low encounter rate of 0.13 signs per km transect walk.

ACKNOWLEDGEMENT

Special thanks to WWF-CFP for their financial and moral support. Gratitude to Njila and Okon for taking their time to design the maps found in this work.

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