

WILD VERTEBRATE PESTS ACTIVITIES ON AGRICULTURAL CROPS AT GASHAKA GUMTI NATIONAL PARK NIGERIA

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(Received 14, April 2010; Revision Accepted 11, June 2010)

ABSTRACT

A survey was conducted among 57 farmers at three different ranges in Gashaka Gumti National Park to identify wild vertebrate pests that raided and destroyed agricultural crops. The results showed that 16 wild fauna species were identified as crop pests. Six of them, *Ceropithecus aethiops*, *Papio anubis*, *Heliosciurus gambianus*, *Thryonomys swinderianus*, *Tragelaphus scriptus*, and *Numida meleagris* raided crops ubiquitously in the park. The number of wild vertebrate pest species and crops cultivated were not significantly different at Mayo-Selbe versus Gashaka; and Gashaka versus Filinga ranges of the park ($P > 0.05$). Out of 14 agricultural crops, *Zea mays* > *Sorghum spp* > *Manihot esculenta* > *Oryza sativa* > *Dioscorea spp* were the most widely cultivated and also most raided crops in the park. A test of association between the number of wildlife species sighted destroying crops in the three surveyed range areas of the park, and the number of crops raided was not significant ($\chi^2 = 0.95$, $df = 2$, $P = 0.62$). In order to reduce losses associated with wild fauna raids on crops, and prevent the killing of wildlife to curb raids, local farmers should be educated on the need to use non lethal means of preventing crop raids such as effigies, guard animals, and reflective objects, and be encouraged to cultivate crops further away from wildlife refuge at the Gashaka Gumti National Park.

KEY WORDS: Wild Vertebrates, Pests, Crop Raids, Gashaka Gumti National Park Nigeria.

INTRODUCTION

The need to preserve and maintain managed ecosystems for the conservation of wildlife, particularly the endangered species, and the general forest resources has never been in dispute (Aglotsson 2006). However, even in designated national parks, unauthorised human activities such as farming, poaching of wildlife, and unsustainable harvesting of other useful forest resources frequently occur within and around these conserved areas (Ferraro 2002). These activities destroy the habitat, and reduce available food to wildlife and force the animals to forage on cultivated crops; pitting farmers against wildlife pest species (Hill, 2000). This conflict between wildlife species and local farmers as a result of destruction of agricultural crops are often manifested around many protected habitats (Gillingham and Lee, 2003; Chiyo *et al.*, 2005). The Gashaka Gumti National Park in Nigeria is not an exception. Although clearly defined boundaries exist for the containment of human activities within the park, many human activities such as cattle rearing and crops cultivation still persist in and around the park (Dunn, 1996) disturbing the natural habitats which in turn encourage free ranging animals to migrate out side the park in search of better food sources and cover. The quest for food often results it conflict which produces negative feedback to the wildlife species, wildlife managers, and the local farming communities (Sitati *et al.*, 2003), that grow subsistence crops within and around the park. Many farmers have suffered heavy

losses of crops produce as a result of crops raided by wild fauna pests in some protected areas (Hill, 2000; Gillingham and Lee, 2003) including Gashaka Gumti National Park (Warren *et al.*, 2007; Ikpa *et al* 2009a). Identifying wild vertebrate species that frequently raid cultivated crops would lead to the development of better solutions to forestall future losses of crops due to wildlife raids. The present study undertook a survey among local farmers in the area, aimed at identifying the major species of wild vertebrates that raided farms and crops as pests at Gashaka Gumti National, the types of crops often destroyed and to determine any link between the number of wild vertebrate species engaged in farm raids, and the number of crops they destroyed in the surveyed three range areas of the park.

MATERIALS AND METHODS

Site survey was conducted in the Gashaka Gumti National Park. The park lies in the sub-tropical climatic zone between latitude 6° 55q and 8° 05q North and longitude 11° 11q and 12° 13q East in the south eastern highlands of the savannah belt of Nigeria, south of the River Benue (Gashaka Gumti National Park Service). Data was collected from three farming communities, at three different ranges of the park, namely Mayo-Selbe, Gashaka, and Filinga.

Data Collection: data were obtained by means of a questionnaire survey (Gillingham and Lee, 2003; Warren *et al.*, 2007). Briefly, questionnaires were administered on 57 volunteered farmers on the farms and their

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responses recorded. Oral interviews using pictures of common animals found in the park, physical inspection of raided farms, barns, and animal signs such as droppings and foot prints were also conducted with the assistance of the farmers and experienced Park rangers. Animals were identified based on physical sighting or animal signs as well as published features (Wund and Myers 2005, Myers *et al.*, 2008). A total of $n = 57$ farmers, 19 each were interviewed at Mayo-Selbe, Gashaka, and Filinga ranges respectively. The study lasted during the harvesting/cropping season between February and August 2006.

DATA ANALYSIS

Data were analyzed by Wilcoxon Signed Rank Test (W). The analysis was performed with SPSS 17 software. Chi-square analysis was used to test for association between the number of wildlife species sighted destroying crops, and the number of crops cultivated in each range of the park. The level of significance was $\alpha = 0.05$.

RESULTS

A total of 16 wild vertebrate pest species were sighted and reported by local farmers to be involved in raiding agricultural crops in farms around the park. Out of the total, 13 (81.25%) crop raiding wild vertebrate pest species, 8 (50.00%), and 9 (56.25%) were sighted in Mayo-Selbe, Gashaka, and Filinga ranges respectively. Six wild fauna species namely, *Ceropithecus aethiops*, *Papio anubis*, *Heliosciurus gambianus*, *Thryonomys swinderianus*, *Tragelaphus*

scriptus, and *Numida meleagris* raided crops ubiquitously in the park. Two other species, *Phacochoerus africanus*, and *Cephalophus rufilatus* were found in at least two ranges of the park, while the remaining eight species were confined to only one range of the park. These species included *Hystrix cristata*, *Manis gigantea*, *Potamochoerus porcus*, *Kobus kob*, *Hippopotamus amphibius*, *Kobus deffasa*, *Lepus spp*, and *Hippotragus equines*. No significant difference was observed in the number of wildlife pest species sighted destroying crops between one range area and another, namely Mayo-Selbe and Gashaka ($P = 0.36$) Gashaka and Filinga ($P = 0.81$) and Mayo-Selbe and Filinga ($P = 0.72$) (Table 1).

Among the 57 farmers that were interviewed, most of them cultivated more than one agricultural crop. A total of 14 agricultural crops were being cultivated by the local farmers. The most widely cultivated and raided crops were in the order of *Zea mays* > *Sorghum spp* > *Manihot esculenta* > *Oryza sativa* > *Dioscorea spp*. These crops were found in all the three surveyed ranges of the park and were also the most targeted crops for wide scale raiding by wild vertebrate pest species in the park, resulting to heavy losses of farm produce by the farmers. The least cultivated crops were *Sesamum indicum* and *Triticum aestivum*. The number of crops cultivated in each range area compared to one another was not significantly different (Table 2). Many farms were located near wildlife refuge (data not included). The Mayo-Selbe range area was home to the highest number of wild vertebrate pest species often sighted by farmers raiding crops. This range area also had comparably higher number of cultivated

Table 1. Species of Wild vertebrate Sighted by Farmers Destroying Crops in Gashaka Gumti National Park

Scientific name	common name	Mayo-Selbe ^(x)	Gashaka ^(y)	Filinga ^(z)
<i>Ceropithecus aethiops</i>	Tantalus Monkey	10	19	15
<i>Papio anubis</i>	Baboon	17	19	12
<i>Heliosciurus gambianus</i>	Gambian sun squirrel	13	8	11
<i>Thryonomys swinderianus</i>	Cane rat/Grasscutter	9	11	4
<i>Phacochoerus africanus</i>	Warthog	6	1	-
<i>Tragelaphus scriptus</i>	Bushbuck	2	2	3
<i>Numida meleagris</i>	Guinea fowl	2	2	9
<i>Hystrix cristata</i>	Porcupine	6	-	-
<i>Manis gigantea</i>	Pangolin	2	-	-
<i>Potamochoerus porcus</i>	Red River Hog	2	-	-
<i>Kobus kob</i>	Kob	1	-	-
<i>Hippopotamus amphibius</i>	Hippopotamus	1	-	-
<i>Cephalophus rufilatus</i>	Red flanked duiker	1	-	7
<i>Kobus deffasa</i>	Waterbuck	-	1	-
<i>Lepus spp</i>	Rabbit	-	-	3
<i>Hippotragus equines</i>	Roan Antelope	-	-	5

Wilcoxon Signed Rank Test (W): (x) vs (y), $n = 16$, $W = 27.5$, $P = 0.36$, (x) vs (z), $n = 16$, $W_+ = 56$, $P = 0.81$, (y) vs (z), $n = 16$, $W_+ = 29$, $P = 0.72$.

*(-) values in Table 1 indicate vertebrate species not sighted in a range area.

Table 2. Relative Number of Farms/Crops Owned by Farmers and Raided by Wild Vertebrate Pests at Different Ranges in Gashaka Gumti National Park

Agricultural crops		Range			Total
Scientific name	common name	Mayo-Selbe ^(a)	Gashaka ^(b)	Filinga ^(c)	
<i>Zea mays</i>	Maize/corn	19	19	19	57
<i>Oryza sativa</i>	Rice	8	9	15	32
<i>Triticum aestivum</i>	Wheat	2	-	-	2
<i>Sorghum bicolor</i>	Guinea corn	17	12	15	44
<i>Musa spp</i>	Banana	-	9	-	9
<i>Abelmoschus esculentus</i>	Okra	-	2	-	2
<i>Sesamum indicum</i>	Beniseed	1	-	-	1
<i>Vigna unguiculata</i>	Beans	6	-	4	10
<i>Glycine max</i>	Soya beans	2	-	7	9
<i>Apios Americana</i>	Ground nuts	6	-	19	25
<i>Dioscorea spp</i>	Yam	6	5	15	26
<i>Manihot esculenta</i>	Cassava	19	11	8	38
<i>Ipomea batatas</i>	Sweet potato	6	2	3	11
<i>Saccarum officinarum</i>	Sugar cane	2	4	-	6

Wilcoxon Signed Rank Test (*W*): (*a*) vs (*b*), *n* = 14, *W*₋ = 26, *P* = 0.17, (*a*) vs (*c*), *n* = 14, *W*₊ = 24, *P* = 0.72, (*b*) vs (*c*), *n* = 14, *W*₊ = 13, *P* = 0.15

*(-) values in the Table 2 indicate crops not planted in a range area.

Agricultural crops compared to the other two range areas. However, no significant association was established between the number of wild vertebrate pest species sighted in a range area, and the number of cultivated agricultural crops that were destroyed in the same location ($\chi^2 = 0.95$, *df* = 2, *P* = 0.62 Table 3).

Table 3. The Number of Crops Cultivated and Wild Vertebrates Species Sighted Raiding Crops in Gashaka Gumti National Park

Range	Number of wildlife species	Number of crops cultivated
Mayo-Selbe	13 (81.25%)	12 (85.71%)
Gashaka	8 (50.00%)	9 (75.00%)
Filinga	9 (56.25%)	9 (75.00%)

$\chi^2 = 0.95$, *df* = 2, *P* = 0.62

DISCUSSION

The fact that free ranging animals do not respect borders makes it imperative that designated habitats that are conserved to serve as natural abode for wildlife species should be protected or managed in such a way as to generate optimum resources, needed by resident wild fauna or flora species in such habitats (Eken *et al.*, 2004). Any thing short of this expectation would lead to initial depletion in the flora species, needed by many wildlife species for food and cover, which will adversely affect the stability and niche of the wildlife in the habitat, causing the species to move out side in search of basic needed resources, especially food. Consequently cultivated agricultural fields situated near designated protected areas such as wildlife sanctuaries and national parks would become favourable alternative habitats for meeting such needs, and may be prone to invasion of wandering wild fauna species in quest for food and ultimate raids on agricultural crops. The Gashaka Gumti National Park is one example where cattle rearing is frequently done within the park (Dunn, 1996) and agricultural crops are often cultivated near wildlife refuge thereby exposing the

crops to raiding by both domestic cattle and wildlife (Warren *et al.*, 2007). Although crops destruction by domestic animals can be curtailed by strict enforcement of the park laws, the same can not be applied to destruction caused by wild animals.

Crops raiding by wild fauna species has been a major concern to farmers in Africa (Lahm, 1995; Hill, 1997; Saj *et al.*, 2001). The raids on agricultural crops, by wildlife pests and the resultant losses in farm produce reported by farmers in Gashaka Gumti National Park may be due to a number of factors such as depleting quality of foliage in the savannah ecosystem, during the dry season, which also coincides with the period of harvest. This condition often compels the wild animals to look for better quality food elsewhere. Thus farms located in the vicinity of the home range of these animals may suffer heavy losses (Warren *et al.*, 2007). In the Grizzly bear for instance, when faced with a similar condition, Gunther *et al.* (2004) observed a negative correlation between the bear feeding on anthropogenic food, and the abundance of naturally occurring bear food. This implies that the animals were driven to feed on the former as a result of depletion in

the source of their natural food; a condition which could apply in the present study as well.

Another reason for wild vertebrates raiding agricultural crops around the park could simply be as a result of their nearby availability, but it has been shown that this influence is only of great importance in the forest habitats, whereas in the savannah region as it is, in the present condition, seasonal fluctuations in the foliage quality consumed by wildlife has a greater influence in driving species to raid crops (Chiyo *et al.*, 2005). Thus apart from natural seasonal causes that lower the quality of foliage available for wildlife, any additional human factors such as illegal hunting, unauthorised bush burning and other resources exploitations within the park would tend to exert more pressure in depleting the local floral, and lower food quality available for the fauna species. Therefore it disturbs the local balance of comfort in the park, and forces the wildlife population to expand their niches outside the park into the surrounding farms with negative consequences.

Field evidence on the ground indicated that the most destructive wild vertebrate species that raided agricultural crops around the park, were *Papio anubis* (baboon) and *Ceropithecus aethiops* (tantalus monkey) these animals have similarly been implicated in previous studies in the area as actively involved in the wanton destruction of high energy rich food such as maize (Warren *et al.*, 2007; Ikpa *et al.*, 2009a), and tuber crops such as yam and cassava (Ikpa *et al.*, 2009a). Thus the species of the wild vertebrates available in an area is also a major factor that contributes to the degree of crops destruction by wild animals. Other vertebrates such as *Heliosciurus gambianus* (squirrel) were mostly responsible for heavy raids on ground nuts and cassava tubers, while *Thryonomys swinderianus* (cane rat) actively destroyed sugar cane. The only avian species in the park identified by the farmers as causing raids on cultivated crops were *Numida meleagris* (guinea fowls). Physical evidence indicated that the avian species was responsible for raids on guinea corn and rice grains produce. Other large mammals, such as warthog, bushbuck and the hippopotamus particularly, in the Mayo-Selbe range of the park (Table 1), were involved in trampling and destroying significant amount of crops on a large scale with their bodies, a common feature associated with the impact of large mammals raids on agricultural crops (Schley and Roper, 2003; Gillingham and Lee, 2003, Chiyo *et al.*, 2005).

Farmers in the area were mainly engaged in subsistence farming, thus heavy losses of their farm produce as a result of wildlife invasion would likely reduce the amount of food available for home consumption, as well as the portion earmarked for the market to earn some little income to augment household financial needs, thus exposing the household to a possibility of famine or poverty. Poverty has adverse repercussion on the conservation of natural habitat; it promotes unsustainable utilization of natural resources by local people in protected areas (Mbaiwa, 2005; Ikpa *et al.*, 2009b), similar to what was seen at Gashaka Gumti National Park. The single most important crop cultivated by 100 % of the farmers interviewed in area was maize (Table 2), this collaborates the report of a previous study (Warren *et al.*, 2007). Together with other grains such as guinea corn and rice; and tuber

crops including cassava, and yams, these five crops constituted over 70% of the total agricultural crops grown by the local farmers in Gashaka Gumti National Park, and constituted the staple diet of the local human population. Curiously, wildlife pests indicated greater propensity to raid these crops, probably as a result of their high energy yielding contents.

The spatial distribution of the number of wildlife species sighted being responsible for raids on agricultural crops and the number of crops species cultivated and raided by these animals across the range communities around the park were not significantly associated. Thus it appears that the location or sighting of crop raiding wildlife species within the park was not necessarily determined by the presence of edible agricultural crops grown in that range area. These animals were probably aggregated in specific range areas with more of their food and other natural habitat requirements within the park other than cultivated agricultural crops, despite the fact that the Mayo-Selbe range area which had the highest number of cultivated crops also had the highest number of wildlife species that raided them (Table 3). This observation also has implication for the development of ecotourism, particularly for the viewing benefit of visitors to the National Park, who might be interested in viewing a wide variety of wildlife species that are commonly sighted in the Gashaka Gumti national Park; the Mayo-Selbe range area might be an ideal section of the park to encounter a wider variety of these species.

The present study is important because it identified the major wildlife species that pose serious problem to specific cultivated agricultural crops around the Gashaka Gumti National Park. Although the present study did not address the specific question of what control measures might be needed to solve the problem of crops produce losses due to wildlife raids, it is recommended that non lethal control methods (Gilsdorf *et al.*, 2002; Baker *et al.*, 2008), particularly the use of effigies, guard animals, and reflective objects should be employed by the local farmers to mitigate the incidence of crop raids by wildlife. Trapping to kill the wildlife as previously reported (Ikpa *et al.*, 2009a) is not in the best interest of conservation and sustainable utilization of wildlife resources in the park. Thus a sustained and continuous education of the local farmers by wildlife managers at the park is needed to teach farmers on better approaches to curb crop raids and prevent the extirpation of wildlife species. Further studies may also be needed to provide local solutions to this conflict.

In conclusion, cultivating agricultural crops near wildlife refuge at the national park would readily provide alternative food to wildlife species whenever there is a decline in the food quality and quantity of wildlife in the park. It might be sufficient to inform farmers around the park that in order to minimise crops losses due to wildlife raids, it might be necessary to cultivate farms a reasonable distance away from the Gashaka Gumti national Park boundary.

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