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Wildlife-Human Interface: A Case Study of Obudu Cattle Ranch, Cross River State, Nigeria

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ABSTRACT: The objective of establishing protected areas should be made to tally with needs and aspirations of the local community. Interaction between the local populace and the ecosystem plays a significant role in the determination of effective management. Overgrazing by cattle and deforestation by human activities over time has denuded the Obudu Cattle Ranch, Cross River State, Nigeria, of its lush natural flora. Consequently, its productivity as grassland has drastically been reduced. Denudation has exposed the surface soils in a number of places to crustation, creating conditions unfavourable for plant growth and has also led to the domination of the ranch by undesirable plant communities that now pose a big threat to the palatable species. These conditions also affect the wild animal species, such as roan antelopes, to encroach on farmlands and destroy agricultural produce. The free area is under socio-cultural activities. There is much sense in the concept that local people should be allowed to utilize resources from protected areas. Nevertheless, this is hard when the future of so many people is at stake from destructive land and resource uses. The most effective means of reducing the conflict between local people and wildlife is through land-use planning, where activities that are non-attractive to wild animals should be encouraged in areas adjacent to the ranch.

KEY WORDS: Africa, agriculture, human-wildlife conflicts, land use practices, Nigeria, Obudu Ranch, pest animals

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INTRODUCTION

Human-wildlife conflict is a growing global problem, which is not restricted to particular geographical regions or climatic conditions, but is common to all areas where wildlife and human population coexist and share limited resources. According to the World Conservation Union (WCU 2003), human-wildlife conflict occurs when wildlife's requirements overlap with those of human populations, creating costs both to residents and to wild animals. Direct contact with wildlife occurs in both urban and rural areas, but it is generally more common inside and around protected areas, where wildlife population density is higher and animals often stray into adjacent cultivated fields or grazing areas.

Crop-raiding is a form of human-wildlife conflict that directly affects local people's perception of and support for conservation initiatives (Hill 1998, 2004; Conover and Decker 1991). Insects, rodents, birds, and antelope are frequently cited as culprits, due to their impact on cash crops (Singleton et al. 2003). However, in areas of high conservation concern, primates are commonly significant pests (Priston 2005) and perceived as the most serious risk to subsistence farmers (Tweheyo et al. 2005). Crop damage causes economic loss, results in opportunity costs, and promotes negative perceptions towards species of conservation concern (Tweheyo et al. 2005, Hill 2000). Primates dominate amongst pests that damage crops, particularly around African and Asian reserves (Naughton-Treves 1998). The absence of effective and locally acceptable methods of combating human-wildlife conflict has led to negative perceptions towards conservation initiatives and protected areas (Hill 2004). Given the trend for community-based conservation, interdisciplinary approaches that focus on the social aspects of human-wildlife conflict are needed.

Over about the past 20 years, several factors have

contributed to the degradation of the forests of the Obudu Plateau. The presently degraded state of the gallery forests is a result of the cumulative impact of various activities by an assortment of interest groups on the Obudu Plateau, Cross River State, Nigeria. Forested areas have been cleared for the farming of coco-yam, bananas, and other products by local settlers. Forest degradation has been further amplified by the grazing Fulani cattle. During the dry season, Fulani herdsman indiscriminately burn the grasslands. Fire in the forests also occurs as a result of uncontrolled clearing and burning for farming purposes.

Obudu Cattle Ranch, like other protected areas in Nigeria, is surrounded by a dotting of villages and towns. These settlements and the ranch are one entity, as an attempt to separate them would be a wholly difficult thing. The activities of the residents of these settlements affect the ranch. This study assesses how the activities of the surrounding communities affect the wildlife resources of the ranch; determines the biological diversity of the fauna and flora; and identifies the various factors influencing human-wildlife conflict.

METHODOLOGY

Study Area

The Obudu Plateau is located in the northeast portion of Cross River State, Nigeria, close to the Nigeria-Cameroon border. It is located at Latitude 9°10'N and Longitude 6°40'E. The plateau is an extension of the Bamenda Highlands in Cameroon, with an average elevation above sea level of 1,500 - 1,700 m. Temperature of the area ranges between 7 - 15°C year-round. The area contains a montane forest and grassland ecosystem supporting many endemic species of plants and animals. The total size of the ranch is 72,000 ha. It is surrounded by 8 villages, namely Anape, Keji-ukwu,

Okpazagwe, Kegol, Okwamu, Apah-Ajile, Ikwette and Abayiule.

Method of Data Collection

Structured questionnaires were used to collect data from the communities around the ranch, while secondary data from the ranch records were also obtained. A reconnaissance survey of the ranch and the free area ("free area" is forestland 'earmarked' by the government to be controlled by the indigenous communities) was carried out to identify some wildlife-human conflicts that occur in and around the ranch. During the field survey, the following were done:

- An ecological survey of vegetation, using belt transect and random quadrant methods
- An animals census using line and point transect methods
- Soil samples were collected at a depth of 0 - 15cm and mechanical sand, silt analysis, clay, soil moisture at field capacity, holding capacity, and texture clay were determined. Chemical components of the soil (such as pH, organic carbon, organic matter, nitrogen, phosphorus, calcium, magnesium, potassium, and manganese) were also determined from the soil samples from various sites.

Statistical Analysis

All data collected were subjected to appropriate statistical analysis, depending on the nature of the study. Data were analysed using chi square and correlation.

RESULTS

Soil Characteristics and Composition of the Study Sites

The physical characteristics of soils in the study sites are shown on Table 1. Soil characteristics did not vary significantly ($P > 0.05$) throughout the ranch or by season. The soil from all sites was essentially loamy sand. The soil fractions and soil moisture were similar both at depths 0 - 15 and 15 - 30 cm. Irrespective of site, season, and depth, the soil fractions were essentially loamy, followed by clay and silt. The sand composition varied from 56.2% (Kejiukwu) to 40.0% (Ikwette), while silt ranged from 7.2% (Kejiukwu and Ikwette) to 18.4% (Anape), and clay ranged from 6.2% to 15.2% at Ikwette and Kejiukwu, respectively. Soil moisture at field capacity varied slightly, from 33.2% (Abayiule) to 65.2% (Ikwette). The soil water holding capacity was highest in Okwamu (32.1%) and lowest in Anape (22.4%). The soil profile reveals that denudation has exposed the surface soils in a number of places to crustation, creating conditions unfavourable for plant growth due soil compaction.

The chemical composition of soils in the study sites is shown in Table 2 and varied significantly ($P < 0.01$) by site. Soil pH at all sites was below 7.0, with values ranging between 4.2 (Abayiule) and 6.4 (Keji-Ukwu). Available phosphorus was the most concentrated element in soils, varying from 0.95ppm (Anape) to 1.92ppm (Balegete). Soil organic matter in the upper horizon ranged between 0.343% in Keji-Ukwu to 1.521% in Okwamu. Other elements found in the soil were calcium, magnesium, potassium, aluminium, and manganese.

Table 1. Physical characteristics of soils at study sites.

Study Sites	Horizon (cm)	Mechanical sand	Analysis silt	Clay (%)	Soil moisture at field capacity	Holding capacity (%)	Texture clay
Kegol	0-15	51.2	8.2	10.0	42.2	27.2	Loamy Sand
Apah-Ajile	0-15	48.3	12.2	8.0	40.2	25.2	Loamy Sand
Okwamu	0-15	40.2	10.4	8.2	40.6	32.1	Loamy Clay
Balegete	0-15	54.2	11.2	9.0	35.8	27.3	Loamy Clay
Anape	0-15	50.0	18.4	9.2	39.2	22.4	Loamy Clay
Abayiule	0-15	42.2	7.5	11.2	33.2	26.2	Loamy Clay
Kejiukwu	0-15	56.2	7.2	15.2	40.6	25.2	Loamy Clay
Ikwette	0-15	40.0	7.2	6.2	65.2	27.2	Loamy Clay

Table 2. Chemical composition of soils at the study sites.

Study Sites	Horizon (CM)	pH (H ₂ O)	Organic Carbon %	Organic Matter	Total N %	C/N Ration	Bray p (ppm)	Na	K	Mn	Ma	Ca
Kegol	0.15	6.0	0.426	1.241	0.64	12.14	1.74	0.062	0.021	0.461	0.0006	0.142
Apah-Ajile	0.15	6.1	0.416	1.248	0.701	11.24	1.82	0.079	0.011	0.333	0.017	0.140
Okwamu	0.15	6.1	0.368	1.521	0.721	8.62	1.71	0.001	0.014	0.233	0.004	0.411
Balegete	0.15	6.1	0.366	1.346	0.075	9.24	1.92	0.114	0.016	0.072	0.002	0.085
Anape	0.15	5.9	0.396	0.349	0.041	10.12	0.95	0.001	0.00	0.123	0.001	0.012
Abayiule	0.15	4.2	0.476	0.524	0.114	12.17	1.42	0.005	0.030	0.178	0.001	0.412
Keji-Ukwu	0.15	6.4	0.338	0.343	0.119	12.00	1.44	0.211	0.042	0.241	0.002	0.426
Ikwette	0.15	6.0	0.362	0.421	0.031	14.00	1.45	0.212	0.024	0.596	0.002	0.600

Plant Species Distributions in Obudu Cattle Ranch

The highest number of plant families (58) was found in Kegol, while the least number (25) was found in Ikwette.

The number of plant species varied significantly ($P < 0.01$) among study sites. Distribution of the plant species into the various families, as shown in Table 3, indicates that family Graminae appeared to be most abundant, with mean values of 32, 19, 1,5 and 14 in Kegol, Abayiule, Ikwette and Anape, respectively. Food crops mostly cultivated were *Manihot* sp., *Zea mays*, *Sorghum* sp., *Oryza* sp., and *Solanum melongena*. Fresh grasses that flush out after the early burning include *Andropogon gayanus*, *Panicum maximum*, *Andropogon tectorum*, and *Pennisetum pedicellatum*.

Wild Animals Encountered During the Study

Table 4 shows the animal data sheet at the Obudu Cattle Ranch. The Preuss monkey (*Cercopithecus preuss*), one of the most endangered primates in Nigeria, is found here. Red river hog (*Potamochoerus parvus*), hippopotamus (*Hippopotamus amphibius*), and tree squirrel (*Funisciurus angythrus*) are locally extinct; cane rat (*Thryonomis swinderianus*) and black house rat (*Rattus rattus*) are at lower risk and mostly are common; roan antelope (*Hippotragus equinus*) is at lower risk and it is found very close to the farmlands.

The numbers of birds found in Kegol (42) and Anape (40) were similar and were significantly higher than at the other sites (Table 5). Apart from Oban with only 2 primates, Apah-Ajile, Balegete, Abayiule, Keji-Ukwu, and Ikwette had 3 primates each while 4 primates each were recorded for both Kegol and Okwamu.

Land Use Patterns in the Study Sites

The land use pattern in the villages (Table 6) shows that farming (59.8%) is a natural way of life, and the people regard other activities such as hunting (17.7%),

rearing livestock (18.3%), gathering produce (3.6%), and timber exploitation (0.6%) as part-time endeavours.

The farm preparation method used by the people (Table 7) shows that 71.9% of respondents clear their farmlands with cutlass and holes, 25.6% claim to use uncontrolled fire, while 1.25% each use tractor and bull (animal tractor). Fire and other agricultural intensification activities affect the ecosystem and decreases wildlife habitats. The reduction of wildlife habitats often results in conflict between the farmers and wildlife, as well as between wildlife and crops / domestic livestock.

Agricultural Pests at the Study Sites

From Table 8, it can be seen that monkeys act as agricultural pest in all the study sites except Balegete. All of the study sites were reported to be affected by more than one kind of agricultural pest.

Benefit Derived from the Ranch by the Rural People

Table 9 shows some benefits enjoyed by the rural people at the study sites, as a result of the facilities provided by the ranch authority. The result shows that people from all the study sites have a fair representation in the work force or labour force of the ranch (e.g., as ranch guards, casual labourers, or in tourist assistance). The people also enjoy the collection of non-timber forest produce such as fruits, seeds, leaves of herbs, etc., and they also claimed that they never enjoyed the sale of game meat during cropping, postal services, or electricity.

Conflicts and Measures Taken by Management Staff

The result shows that there is a widespread destruction of farmland by cattle and wild animals pests (90%) in the study sites (Table 10). The issue of boundary demarcation also rated high (80%), since there is no buffer zone separating the ranch from the farmland where the crops are planted. Measures to resolve these conflicts rated low because there is no special unit within the ranch

Table 3. Distribution of plant families at the 8 study sites.

Family	Kegol	Apah-Ajile	Okwamu	Balegete	Anape	Abayiule	Kejiukwu	Ikwette
Annonaceae	1	1	2	1	1	1	2	0
Apocynaceae	1	1	2	1	3	1	1	1
Caesalpiniodeae	12	12	3	12	3	3	18	2
Compositae	1	0	1	1	1	1	0	1
Guttiferae	0	1	1	0	0	0	0	1
Labiatae	0	0	1	1	1	0	0	0
Graminae	32	7	9	6	14	19	8	15
Rosaceae	1	0	1	1	1	2	1	1
Sapotaceae	2	1	1	1	1	0	0	1
Sterculaceae	0	0	1	0	1	1	0	0
Mimosoidea	1	1	0	0	0	0	0	0
Palmeae	1	1	1	1	0	1	0	0
Papilionolodeae	2	2	1	2	1	1	1	0
Rubiaceae	1	2	1	1	1	2	1	0
Moraceae	0	0	0	1	0	0	1	0
Solanaceae	3	2	1	2	3	2	1	2
Malvaceae	0	1	0	1	1	0	1	1
Total	58	32	26	32	32	34	35	25

Table 4. Animal data summary (from field, literature, and interview).

Taxon					Transect					
Order	Family	Common Name	Scientific Name	Number available	1	2	3	4	5	IUCN status
Primates	Cercopithecidae	Anubis baboon	<i>Papio anubis</i>	1	-	+	-	-	-	V
		Preuss monkey	<i>Cercopithecus preuss</i>	3	-	-	-	-	-	e
		Putty nosed	<i>Cercopithecus Nictitacus</i>	3	-	-	-	-	-	e
		Tantalus monkey	<i>Cercopithecus aethiops</i>	3	-	-	-	-	-	e
Artiodactyla	Bovidae	Bush buck	<i>Tragelaphus scriptus</i>	1	-	-	+	-	-	V
		Roan antelope	<i>Hippotragus equines</i>	4	-	-	-	+	-	Lr
	Hippopotamidae	Hippopotamus	<i>Hippopotamus amphibious</i>	-	-	-	-	-	-	Le
	Suidae	Red river hog	<i>Potamocheirus porius</i>	-	-	-	-	-	-	Le
Carnivore	Viverridae	African civet	<i>Viverian civet</i>	2	-	+	+	-	-	E
	Suidae	Warthog	<i>Phacechoerus aethiopicus</i>	2	-	-	-	-	-	Lr
Rodentia	Thrynomidae	Canerat	<i>Thrynomys swinderianus</i>	>8	+	+	-	-	-	Lr
	Herpestidae	Black house rat	<i>Rattus rattus</i>	>5	-	-	+	-	-	Lr
	Aciuridae	Tree squirrel	<i>Funisciurus angythrus</i>	-	-	-	-	-	-	Le
	Cricetidae	Giant rat	<i>Cricetomys gambianus</i>	3	-	-	-	+	-	Lr
Insectivora	Soricidae	Black giant shrew	<i>Crociodura odorate</i>	3	-	-	-	-	-	Lr

+ = present in transect survey Le = locally extinct - = absent in transect survey v = vulnerable
 Lr = lower risk e = endangered t = threatened

Table 5: Taxonomic distribution (number of animal species during transect survey) in the surrounding villages.

Taxa	Study Sites							
	Kegol	Apah-Ajile	Balegete	Okwamu	Anape	Abayiule	Kejiukwu	Ikwette
Primates	4	3	3	4	2	3	3	3
Proboscidae	1	1	0	1	1	0	1	2
Artiodactyla	1	2	2	2	1	2	1	2
Birds	42	22	14	14	40	15	18	25
Rodentia	4	6	3	2	4	2	4	2
Total	52	44	22	23	48	22	27	34

Table 6. Land use patterns in the surrounding villages.

Methods	Kegol	Apah-Ajile	Balegete	Okwamu	Anape	Abayiule	Kejiukwu	Ikwette	Total	%
Farming	12	14	10	12	14	12	14	10	98	59.8
Timber Exploitation	0	0	0	1	0	0	0	0	1	0.6
Gathering Produce	1	1	0	0	2	1	1	0	6	3.6
Hunting	7	4	3	5	4	2	1	3	29	17.7
Rearing Livestock	2	1	7	2	0	7	4	7	30	18.3
Total	22	20	20	20	20	22	20	20	164	100

Table 7. Farmland preparation methods by farmers at the study sites (n = 20).

Methods	Kegol	Apah-Ajile	Balegete	Okwamu	Anape	Abayiule	Kejiukwu	Ikwette	Total	%
Use of fire	10	6	6	4	4	3	4	4	41	25.6
Use of cutlass and hoe	10	14	13	16	15	15	16	16	115	71.9
Use of tractor	0	0	1	0	0	1	0	0	2	1.25
Use of bull (animal tractor)	0	0	0	0	1	1	0	0	2	1.25
Total	20	20	20	20	20	20	20	20	160	100

Table 8. Major wild animal agricultural pest in the surrounding villages.

Animal Species	Kegol	Apha- Ajile	Balegete	Anape	Abayiule	Kejiukwu	Okwamu	Ikwette
Monkeys	+	+	-	+	+	+	+	+
Antelopes	+	+	+	-	+	+	+	+
Guinea fowl	+	+	+	+	+	+	+	+
<i>Quelea quelea</i>	+	+	+	+	+	+	+	+
Grasshoppers	+	-	-	+	+		+	-
Black rat	+	+	+	+	+	+	+	-

+ Present
- Absent

Table 9. Benefits derived by the rural people from the study sites: “Yes” responses (n = 20 respondents per site).

Benefits	Kegol	Apah-Ajile	Okwamu	Balegete	Anape	Abayiule	Kejiukwu	Ikwette
Employment as Ranch Guard	3	2	1	1	3	1	2	2
Tourist Assistance	1	1	2	2	2	1	0	0
Hospital / Mobile clinic	10	10	0	0	0	10	0	0
Access roads	0	0	0	0	0	0	0	0
Water supply	0	0	0	5	0	0	0	0
Electricity supply	0	0	0	0	0	0	0	0
Post office / Postal agency	0	0	0	0	0	0	0	0
School / College	10	10	10	10	10	10	10	10
Game meat cropping	0	0	0	0	0	0	0	0
Non-timber forest produce	13	15	15	15	15	15	12	15

Table 10. Conflicts and measures based on workers responses (n = 20).

Conflicts and Measure	“Yes” Responses	
	Frequency	%
Animal destruction of Plants	18	90
Boundary conflicts	16	80
Controlled shooting*	3	15
Train farmers on how to use controlled trapping methods	0	0
Provision of hunting permit	1	5
Keeping of surrounding of farms clear	6	30
Education of the people	5	25

* n = 10

that deals with conservation education. For instance, measures such as controlled shooting (15%) and provision of hunting permits (5%) are infrequent, and workers also claim that there is no training of farmers on use of trapping methods.

DISCUSSION

The soil physiochemical analysis revealed that in all the sites, the soil is loamy with little clay and silt quantities with pH values between 5.6 and 6.4. The sand composition varied from 56.2% (Keji-Ukwu) to 40.0% (Ikwette) while silt ranged from 7.2% (Kejiukwu and Ikwette) to 18.4% (Anape). It explains the flora and fauna distribution, especially that of the ruminants.

The distribution of wild animal species reveal that primate species occur on the plateau but are not easily found as a result of human and farming pressure on their habitat. These include three monkey species, the very rare Preuss monkey (*Cercopithecus preuss*), the putty nosed monkey (*Cercopithecus nictitacus*), and Tantatus monkey (*Cercopithecus aethiops*). Their presence on the ranch is threatened.

Farming (59.8%), hunting (17.7%), livestock rearing (18.3%), gathering of forest produce (3.6%) and timber exploitation (0.6%) are the various land use patterns of the people living around the ranch. Farming is a major land use pattern that causes human wildlife conflict

around protected areas in Nigeria because it reduces the animals' habitats. Some of the crops planted attract wild animals, causing the destruction of those farm products and leading to conflict between the rural dwellers and the animals.

The use of uncontrolled fire in clearing sites for farming and those set by nomadic herdsmen is popular in all the study sites. This practice is also common in other parts of the country. Inah (1991) also affirms that the use of uncontrolled fire in clearing sites for farming is a popular practice in Bauchi state, which also affects the game reserve there. This method of farmland preparation is against wildlife conservation since non-targeted ecosystems are often destroyed by the wild fire and large vegetation resources in the protected areas are greatly destroyed.

There is a wild spread of destruction of farmlands by wild animal pests (90%) in the study sites. Ayodele and Adegeye (1993) said that some species damage managed forests and crops adjacent to them in some states in Nigeria. Various items valued by man are often damaged by wild animal pests. Crops majorly destroyed by wild animal pest in the study sites include maize, mango, millet, melon, plantain/banana, beans etc. The wild animal pests that destroy the farm produce in the study sites include monkeys, antelopes, Guinea fowl, *Quelea quelea*, grasshoppers, and black rats. This is in

accordance with the findings of Singleton et al. (2003) that insects, rodents, birds, and antelope are frequently cited wild animal pests. Hill (1997) and Priston (2005) observed that in areas of high conservation primates are commonly significant pests and are perceived as the most serious risk to subsistence farmers (Tweheyo et al. 2005).

From the result, monkeys are one of the major wild animal pests in the study sites. They are found in all sites except Balegete, where the people are engaged in homestead farming with fencing and other forms of preventive methods. According to Naughton-Treves (1998), primates dominate amongst pests that damage crops, particularly around African and Asian reserves. Primates are responsible for crop-losses of up to 70% of an individual farm (Priston 2005) and 60% of annual harvests (Hill 2000). Boundary demarcation also constitutes a major conflict (80%), since there is no buffer zone separating the ranch from farmlands. Therefore, the need to set up a special unit within the ranch management to resolve conflicts is desirable.

Members of the communities surveyed complained about the lack of opportunity for meaningful participation, and inadequate conservation education; these are fundamental problems that need to be addressed.

CONCLUSION

Growing pressures to find alternative income or subsistence where resources are depleted has made free area to be under severe pressure of use for agriculture, rearing livestock, hunting, and gathering forest produce. These preferred human-modified habitats have led to high intrinsic rates of growth of problematic species such as rodents, monkeys, and birds. These agricultural pests destroy the crops and other properties of the rural people, and they also threaten their livelihood. To break this cycle, there is a need to protect rural livelihoods and reduce their vulnerability. There is a need to embark upon community-based conservation, so as to counterbalance losses with benefits for the local human population.

The most effective means of reducing the conflict between local people and wildlife is through land-use planning, where activities that are non-attractive to wild animals would be encouraged in areas adjacent to the ranch. A sustainable solution for reducing human-wildlife conflict is a land-use and development planning system that takes human-wildlife conflict into account. It should be based on public consultation, good technical feasibility studies, and environmental assessments that link all the different levels. This kind of system would not only be beneficial for the reduction of conflicts (and result in reduction of costs to local communities, industry, and governments), but would also provide a more cohesive and positive general structure for national development, which would be far less likely to cause unforeseen problems and conflicts.

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