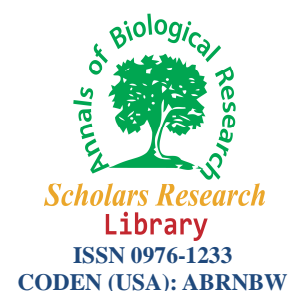




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Inventory of harvested wildlife sold at Theomagwabush meat market, Rivers State, Nigeria

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ABSTRACT

An inventory of harvested wildlife sold at the bush meat market, Omagwa in Ikwere Local Government Area of Rivers State, Nigeria was conducted for three months (April to June, 2014) without the consideration of seasonality. Samples were collected daily by documenting the number and taxa of animals brought to the market. A total of 9,500 animals comprising nine Mammals and one Ave were recorded within the period of the study. There was a progressive increase in the total number of harvested animals from the first month to the third month. The relative abundance of wildlife sold at the market showed great variability with a mean population of 105 ± 0.56 animals per day and $3,166 \pm 0.66$ per month. *Thyronomysswinderianus* had the highest abundance of 2065 (21.73%) with daily and monthly occurrences of 22 ± 0.94 and 688 ± 0.33 respectively. However, *Cercoptheusmona* had a total of 1846 (23.45) with daily and monthly occurrences of 20 ± 0.51 and 615 ± 0.33 respectively. This was followed by the *Tragelapussekei* which had an overall abundance of 1500 (19.05%). However, *T.sekei* also recorded daily and monthly occurrences of 16 ± 0.66 and 500 ± 0.00 respectively in the study. *Xeruserythropus* had an abundance of about 1423 (18.07%) with daily and monthly occurrences of 15 ± 0.81 and 474 ± 0.33 respectively. *Atheruruafricanus* was relatively high in abundance; 808 (8.50%) with daily and monthly occurrences of 9 ± 0.92 and 261 ± 0.33 respectively. These four most harvested animals represented 61.01% of the overall wildlife harvested in the study. The least harvested animal was the forest genet; *Genettacristata* with an overall abundance of 84 (0.88%) and daily and monthly occurrences of 0.9 ± 0.93 and 28 ± 0.00 respectively. The study is of the opinion that some of the animals harvested were not by hunters but farmers who targeted the wild animals as pests. The study opines that the acceptance of consumption of forest mammals as an ostentatious lifestyle in the Niger Delta increases hunting pressure on the threatened forest animals.

Key Words: Relative abundance of wildlife, *Thyronomysswinderianus*, daily and monthly occurrences, *Cercoptheusmona*, wildlife, hunting pressure.

INTRODUCTION

The Niger Delta is a region notorious for the exploitation of her renewable and non-renewable natural resources [1,2]. According to [2], the Niger Delta is a very important region because of its strategic position in the West African forest hotspot that is home to a minor Centre of endemism for faunal and floral groups. In view of the considerable threat that habitat devastation poses on the region and the variable ecological characteristics of the Niger Delta, the region's Hydrology stands out as the most important determinant of biological variation. According to [3] and [4], the hydrological uniqueness of the ecological region rotates strictly on a tripod pedestal such as; the precipitation of the area; the Atlantic Ocean tidal movement and the Niger River floods which further accentuates the assertion by [2].

The eco-zone enjoys an average annual precipitation range of 2500mm to 4000mm between the months of March to October, making it the wettest region in the West Africa region [5]. A total of 45 faunal species are extant in this region although, they exhibit great unevenness in their ecological distributions [6]. The faunal population exhibits profound habitat specificity with the flood forests, marsh forests and eastern flank forests housing more species than any other parts of the region. The frightening reality in the Niger Delta is that, an estimated 24.4% of the extant faunal species are globally threatened [7] with biogeographic pressures such as hunting, agriculture and habitat devastation exacerbating the decline in biodiversity and species abundance in the area [2,8].

In Nigeria, conservation of natural resources seems a waste of time to a greater percentage of the populace, not considering the educational background of the units of the population. This is not an exaggeration even though a study to ascertain the actual status has not yet been conducted. The nonchalant attitude to preservation of God's gift to the Nigerian nation stems from the aggressive exploitation of petroleum (the main source of foreign exchange), natural water bodies and forests that have brought great wealth to a few individuals in Nigeria.

The vocation of harvesting wildlife in the country will still strive in the midst of concerted measures to curb the deleterious practice on biodiversity. The rural communities in Nigeria regard harvesting of wildlife as a 'food safety net' that guarantees protein sustainability, provides revenue alternative and a means of technological advancement considering the various innovative techniques employed in trapping and killing of the animals in the wild [9,10,11]. Some scholars have identified the culture of refraining people access to some designated areas such as forests and water bodies, based on religious and cultural reasons as a form of conservation [12]. These designated sites usually called 'sacred sites' are in synch with several international conventions on conservation of biodiversity at sacred sites enacted in 1992 and 1998 by the Earth Summit in Rio de Janeiro and the United Nations Educational Scientific and Cultural Organization (UNESCO) Symposium on Sacred Sites Cultural and biological diversity in Paris, France respectively.

In Nigeria and the Niger Delta in particular the consumption of forest animals (wildlife) is seen as a social class statement considering the exorbitant costs of such animals [13]. In Omaogwa, Port Harcourt, Rivers State, a famous rendezvous for harvested wildlife exists and still strives on the efforts of dedicated hunters within the eco-region [14]. This culture has accelerated the rate of extinction and threatened the existence of the natural fauna of the ecological region. All over Nigeria the unsustainable harvesting of the faunal reserves of forests and the natural water bodies is a vocation that is ironically greatly rewarded by traditional chiefdoms with tradition titles. This uniformed lavish of accolades on wanton exploiters of wildlife in Nigeria and West Africa in general encourages the unsustainable killing/hunting of animals in this region [14-17].

Aside hunting, the degree of habitat loss and degradation are major factors that affect species diversity and richness in this ecological region. According to [18] an estimated 47% of forests in Nigeria have been lost between 1991 and 2002, in addition to the 12.8% loss of forest cover recorded between the years 2002 to 2013. The Niger Delta region is recorded to experience an annual deforestation rate of about 1.2%, equivalent to about 2,200 ha (22 km²) lost annually [19, 20]. Although some disjointed studies have concentrated on the inventory of mammalian population of the Niger Delta, however, there is little information on the ecology and Natural history of wildlife especially mammals in this region [21-30]. [31], stated that monitoring markets where harvested wildlife are landed and sold daily may serve as traditional sources of faunistic and ecological data for the estimation of mammalian community composition but expressed doubt that such datasets could reliably represent the mammalian faunas and community compositions at the local level.

The Niger Delta is a region with a unique climate that was previously assumed to possess no endemic mammals, however, the study by [3] ascribed new mammalian species to this eco-zone which actually indicates that the Niger Delta is a small center of endemism [3, 21,32,33]. The objective of this study is to develop an inventory of wildlife sold in three months at the Omagwa Bush Market, Ikwerre Local Government Area of Rivers State without considering seasonal variation.

MATERIALS AND METHODS

Study Area

The study site is located at Omagwa, an outskate of Port Harcourt metropolis, Ikwerre, Local Government Area of Rivers State, Nigeria. The area lies within latitude 4°58'59"N and 6°41'20"E and Ikwerre language is the indigenous language. The study Area lies in the lowland rainforest, dominated by secondary vegetation and fragmented by farms [14]. The strategic location of the town along the busy Owerri-Port Harcourt High way and its nearness to the Port Harcourt town accentuates its significance in commerce and real estate. Aside this, the position of the market encourages motorists and visitors to Port Harcourt to easily stop and purchase bush-meat as they travel. The indigenous population invests in the extractive industry such as; farming and hunting and palm wine tapping. Omagwa bush meat market is the main receptacle for any killed wildlife within the four Local Governments of Ikwerre Ethnic Nationality.



Figure 1., The study area in Rivers State, Nigeria

Sample Collection

The study was conducted between the months of April to June without the consideration of season but limited by resource availability, personnel and finance. The study was in two parts; to determine the parasites of the gut and document the daily number of kills landed and sold within the period of the study. Prior to the collection of samples, carcass vendors were visited and intimated on the objectives of the study. The research team set out before 7.00 a.m. Nigeria Time daily to take records of kills brought in. Notebooks were distributed to the vendors to keep records of very early sales or late-kills that the research team missed. Identification keys by [21] and [4] were used for the identification of carcass.

Data Analysis

Data comprised strictly first hand reports, no secondary data was considered. Measures of Central Tendency and standard diversity indices were used to analyze the data.

RESULTS

The Genera and Species of animals sold at the Omagwa Bush meat Market

The Omagwa bush market recorded 9,500 animals of various species within the three months survey. This number represented an average kill of about 105 ± 0.56 animals per day and $3,166 \pm 0.66$ per month (Table 1.). Out of the total kill; *Thyromys swinderianus* had the highest abundance of 2065 (21.73%) with a daily and monthly occurrences of 22 ± 0.94 and 688 ± 0.33 respectively. However, *Cercopithecus mona* had a total of 1846 (23.45%) with daily and monthly occurrences of 20 ± 0.51 and 615 ± 0.33 respectively. This was followed by the *Tragelapsus sekei* with an overall abundance of 1500 (19.05%) and daily and monthly occurrences of 16 ± 0.66 and 500 ± 0.00 respectively. *Xerus erythropus* had an abundance of about 1423 (18.07%) with daily and monthly occurrences of 15 ± 0.81 and 474 ± 0.33 respectively. *Atherurus africanus* also had a rich abundance of 808 (8.50%) with daily and monthly occurrences of 9 ± 0.92 and 261 ± 0.33 respectively. These four most harvested animals represented 61.01% of the overall wildlife harvested in the study. The least harvested animal was the forest genet; *Genetta cristata* with an overall abundance of 84 (0.88%) daily and monthly occurrences of 0.9 ± 0.93 and 28 ± 0.00 respectively.

Table 3.1., Genera and Species of animals landed and sold at Omagwa Bush meat Market

S/N	Common Name	Scientific Name	Relative Mean Abundance			
			Over all Total	(%)	Daily	Monthly (30 days)
1	Sitatunga	<i>T.sekei</i>	1500 (15.78)		16 ± 0.66	500 ± 0.00
2	African Civet Cat	<i>Nandiniabiotata</i>	637 (0.37)		7 ± 0.77	212 ± 0.33
3	Grater Cane Rat	<i>Thyromys swinderianus</i>	2065 (21.73)		22 ± 0.94	688 ± 0.33
4	Forest Genet	<i>Genetta cristata</i>	84 (0.88)		1 ± 0.93	28 ± 0.00
5	Maxwell's duiker	<i>Philantombamaxiwellii</i>	437 (4.60)		4 ± 0.85	145 ± 0.66
6	Red River Hog	<i>Potamochoerus porcus</i>	313 (0.32)		3 ± 0.47	104 ± 0.33
7	Geoffroy's Ground Squirrel	<i>X.erythropus</i>	1423 (14.97)		15 ± 0.81	474 ± 0.33
8	Guinea fowl	<i>Numidameleagrisgaleata</i>	387 (4.07)		4 ± 0.30	129 ± 0.00
9	Mona monkey	<i>C.mona</i>	1846 (19.43)		20 ± 0.51	615 ± 0.33
10	Brush Tailed Porcupine	<i>A. africanus</i>	808 (8.50)		9 ± 0.97	269 ± 0.33
Total			9500		105 ± 0.55	$3,166 \pm 0.66$

Statistics of Wild Animals Killed Over a Period of Three Months

There was great variability in the population of animals landed and sold at the Omagwa bush market during the period under review. There was a significant difference ($p < 0.05$) in the population of wildlife killed within the period of the study. Cumulatively, the third month recorded the highest abundance of kills which progressively decreased towards the first month, (Table 2.). *T. swinderianus* was the most abundant (900.00 ± 11.55) animal in the first month. This was closely followed by *T. binotata* 750 (750.00 ± 14.44) and *C.mona* 600 (600.00 ± 5.774). *G.cristata* was the least abundant with the mean value of 30 (30.00 ± 1.155) within the first month of the survey.

Table 3.1: Statistics of bush meats killed over a period of three months

Animal Species	Monthly Mean Population of Wildlife Harvested (%)			Total (%)
	1 st month	2 nd month	3 rd month	
<i>T. sekei</i>	750 (24.91)	450 (14.24)	300 (8.87)	1500 (15.78)
<i>N. binotata</i>	180 (5.98)	217 (6.86)	240 (7.09)	637 (6.78)
<i>P. maxiwellii</i>	250 (8.30)	70 (2.30)	117 (5.35)	437 (4.60)
<i>G. cristata</i>	30 (0.09)	40 (1.26)	14 (0.41)	84 (0.88)
<i>T. swinderianus</i>	90 (2.99)	775 (24.53)	1200 (35.49)	2065 (21.75)
<i>N. meleagrisgaleata</i>	217 (7.20)	120 (3.79)	50 (1.47)	387 (4.07)
<i>C. mona</i>	600 (19.93)	746 (23.61)	500 (14.78)	1846 (19.43)
<i>P. porcus</i>	153 (5.08)	90 (2.84)	120 (3.55)	313 (3.29)
<i>A. africanus</i>	200 (6.64)	248 (7.85)	360 (10.64)	808 (8.50)
<i>X. erythropus</i>	540 (17.94)	403 (12.75)	480 (14.19)	1423 (14.97)
Total (%)	3010 (31.68)	3159 (33.25)	3381 (35.58)	9500
Mean Total	100 ± 0.33	101 ± 0.90	112 ± 0.70	316 ± 0.35

*Values are mean values

The second month also showed that *T. swinderianus* was the most abundant kill; 775 (24.53%). This was followed

by the monkey; *C.mona* with a total of 746(23.61%) and was closely followed by the antelope: Sitatunga; *T.sekei* with an abundance of 450(14.24%).*X.erythropus* had a total of 403 (12.75%) of the second month harvest of wild in the study. However, the animal with the lowest occurrence was the Cat; *G.cristata* with an occurrence of 40(1.26%).

The pattern of kills recorded in the first and second months of the study altered in the third month. Although, *T.swindrianus* maintained the lead on the number of kills and *G. cristata*; the least number of kill in the month. The study also showed that more squirrels; *X. erythropus* were harvested than the bovines; *T.sekei* and *P. maxwellii*.

DISCUSSION

The study recorded variability in abundance of the various species endemic in the eco-region. The study documented a total of ten species of wildlife with consistent occurrence at the Omagwa Bush meat Market. Out of the 9500 animals recorded within the 90 days survey nine were Mammals while only one was an Ave. The reasons for the dominance of the mammals are based on their demand as alternative animal protein and the reputation of a lot of them as pests of field crops.[13]and [14] opined that the reproductive potential and the litter sizes of wildlife determine their survival during unsustainable harvesting as witnessed in the Niger Delta. In this study the most abundant carcass in the Bush meat market was *T. swinderianus*, reputed for its social habit, high fecundity; gestation period of between 152-156 and a litter size 2-6 which agrees with [21].In this study, the high relative density of the Greater cane rat; *T. swinderianus* carcass in the market was attributed to habitat devastation. The Niger Delta particularly the Ikwere Ethnic Group, are proud farmers and practice the fallow system of agriculture which is usually very devastating to secondary forests and the faunal community composition. Bush burning which is greatly employed in the Eco-region is a veritable strategy in the devastation of habitats especially vegetation that is recovering from devastation. This opinion agrees with [34] who stated that anthropogenic factors such as agriculture decline the regenerative potential of forests and indirectly altering the faunistic structure of such habitats.

The African Genet is listed as a threaten species worldwide and Endangered in Nigeria [35,36]. It is believed globally that even if there are isolated populations of this animal in West Africa the geographical range does not encompass the rainforests of the Niger Delta. However, the occurrence of the animal in the rainforest of Nigeria indicates that the conservation status currently imposed on the African forest Genet; *Genetta* spp. needs reconsideration. [14],stated that the recovery of *G. poensis* in their study however, this study has the opinion that the species endemic to the Niger Delta that has been probably erroneously identified is *G.cristata*, which is threatened by loss of habitat in the region. This assertion agrees with [31],who cautiously avoided specific identification due to the lack of recent reliable information on the taxonomy of the Genet. However, their study confirmed the occurrence of three species namely; *G. cristata*, *G. maculata*, and *G.thierryi* based on the taxonomic keys of [37].

[21],in his study pointed out the semi aquatic marsh loving habit of the Sitatunga (*T.spekiigratus* Sclater, 1880) both in forested and non-forested regions. Due to aggressive habitat devastation the Niger Delta region had witnessed since the stabilization of democracy in Nigeria in terms of infrastructural development, these ungulates are now endangered in this region. This position is in line with [21, 38 and 39];who pointed out that the bovine; Sitatunga is endangered in all Nigeria. Sitatunga; *T. spekei*is believed to increase hunting pressure because of its size and huge demand in the open market.

The Brush tailed Porcupine had a high relative abundance in the study 808 (8.50%) which cannot be attributed to their biological potential since most porcupines exhibit a gestation period of 100-110 days and produce a liter size not more than two per year. This study opines that their precocial life style and nocturnal habit of the porcupine ensures healthy younglings [40]. However, this rodent's reputation as field pest makes it vulnerable to exploitation by hunters and farmers. This study affirms that majority of *Africanus* that are traded at the various bush markets are killed by farmers and not professional hunters as was previously believed.

The primates of the Niger Delta and Nigeria in general are vulnerable due to habitat devastation occasioned by mechanized agriculture, urbanization and aggressive logging. Individuals in the Family; Cercopithidae in the Niger Delta live in fragmented habitats, with very rare species like Sclater's guenon (*Cercopithecussclateri* Pocock, 1904) listed as Endangered (EN) according to [7] for all its African range and are feared to become extinct in a few years if concerted effort is not made to conserve their natural habitats which decline on daily basis in Nigeria[21, 41,42].Ironically the majority of wildlife that are traded at the regional bush meat hubs are protected by Nigerian

Federal law; Act II schedule 1 and 2 these include; *A. africanus*, *T. spekei*, *Genetta* spp., *N. binotata*, *V. civetta*, and the *Cercopithecidae* [12, 31,43].



A



B



C



D



E



F

Plates A-F; *T. swinderianus*; *T. sekei*; *P. porcus* (being processed);
N. binotata; *A. africanus*; *Philantomba maxiwellii*

In Southern Nigeria where Christianity and African Traditional religion strive, sacred forests and totem animal and plant species are surprisingly spared from the wanton devastation that come from both developers and exploiters due to the deep rooted superstitious believe of doom on the part of the trespassers [12]. With the absence of any functional laws and regulatory bodies, protecting the biodiversity in the nation and Niger in particular, it may be wise to collaborate with the traditional institutions in the various regions where the need to protect threatened species is eminent to adopt such organisms as totem species. However this suggestion according to [44] may not be effective as wildlife carcass assemblages at bush meat markets come from hunters from different ethnic groups and believes.

The red River hog: *P. porcus* shares some behavioral characteristics with the Porcupine; *Africanus* in that they are strictly nocturnal and are extremely social with superb hierarchical organization. An outing predisposition of these animals to hunting is their destructive activities on field crops making them one of farmers' greatest pests. *P. porcus* is an omnivore that is capable of devastating large areas of plantation. Their high reproductive potential; low gestation period and high litter size exacerbates the hunting pressure for the bush pig. [14], also pointed that the bulk of the carcass represents a good supply of animal protein hence its relative high cost in the open market.

This study agrees with [31] that the bush meat market assemblages of wildlife is a reliable source of information on the relative abundance of common wildlife in the field at the regional scale but does not reflect the relative abundance of wildlife in protected forests and very rare species as well as small sized widely dispersed populations. It is very ambitious and unreliable to estimate the actual population of any given wildlife species based on their occurrence in established 'hubs' such as the Omagwa bush market. He further opined that data obtained from regional bush meat hubs are reliable in the characterization of the abundance and distribution of common species only at the regional scale.

This study states that it would be difficult to achieve meaningful restrictions on the unsustainable harvesting of wildlife in Nigeria due to the total dependence of the Nigeria rural population on extractive vocations [45]. Even when the political will is there to implement these policies on the part of the government, the acceptance of the policies by the populace is usually a problem because conservation means restriction to access forests and water bodies that sustain their livelihood.

CONCLUSION

The study concludes that the demand for bush meat by the populace either at the regional or national level is a social class statement and not a poverty alleviation alternative because both the exploiters and consumers exhaust high monetary and personnel costs to satisfy the interests. In the Niger Delta where the hydrology influences the biological characteristics of the environment, the seasonal flooding of the region is believed to flush out forest animals to upper reaches where they become vulnerable to hunting. Aside this, the study also concludes that the cultural farming techniques such as bush burning, shifting cultivation and plantation agriculture in the region exacerbates the rate of habitat devastation thereby threatening the endemic species. The study is of the opinion that a good number of the wildlife killed and sold at the Omagwa Bush Market are not killed by hunters but by farmers protecting their investments.

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