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An Evaluation of Bush Meat Harvest in the Kimbi-Fungom National Park, North West Region, Cameroon

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Abstract: ***Bush meat flourish local and international markets in and around the Kimbi Fungom National Park with increasing national and international demands. Despite this, very little or nothing is done to eradicate this bush meat syndrome. This project is designed to evaluate bush meat harvest and method used in and around the park. To achieve this, the study employed the use of questionnaires, interviews, field observation and focus group discussion to collect the data from February, 2021 to June, 2021. Competent field assistants and community guides were purposefully selected and trained on the collection of socio-economic data pertaining to bushmeat harvest. This was done during the sensitization meetings in 10 communities held in February 2021. A questionnaire and interview guide was designed. The questionnaire was designed in two parts; part one captured bushmeat markets, routes and supply chain while part two captured the quantity of bushmeat harvested in the area per season. A total of 200 questionnaires were administered in the 10 communities. We selected one hunter from each village to lead the research team based on their popularity and position held in the hunting circle. Results revealed that a total of 1837 animals were harvested during the study period. From the total number, 52.15% were harvested in the rainy season while 47.85% were harvested in the dry season. The highest harvested species was the cane rate (417), porcupine (343) and pangolins (292). Gunshots and snare wires were identified as the main method employed by hunters in the harvest of the bush meat in the park. It was recommended among other things that in as much as bush meat harvest carried out in the park, government and conservation initiatives should increase the security of threatened, endangered and critically endangered species in the park.***

Keywords: Evaluation, bushmeat, harvest, flourish, National Park

1. Introduction

Bush meat exploitation is carried out throughout the tropical world, from the Amazon basin through the Congo basin to the Asian continent. This Wildlife or ‘‘bushmeat’’ is harvested for food or commercial purpose throughout the humid tropics (Milner-Gulland and Bennett, 2003). For many decades, humans have been hunting wildlife in tropical forests and consumption has greatly been increased in the last few decades. In the Asian continent, losses of tropical forest species due to unsustainable hunting have already been reported (Bennett and Rao, 2002) and African forest species are now experiencing similar threats over wide areas especially in Central and West Africa where it is currently a major source of livelihood to forest dwellers(Fa*et al.*, 2001). Bushmeat therefore constitutes an important resource of their stable diet and livelihood to many forest dwellers (Willcox and Nambu, 2007). Households can be seen to decide whether to sell or consume a particular species, where a balance is reached between the marginal utility from consumption and the foregone net payoffs that would have resulted from a sale (Damania*et al.*, 2005). Many of the poorest inhabitants routinely keep only the heads and intestines of meat for family consumption, but sell the more desirable meats to maximize profits. Therefore, bushmeat is often a critical component of livelihood, especially during the lean season (De Merode*et al.*, 2004). The bushmeat commodity chain may involve a stream of professional, semi professional hunters, bushmeat as an additional source of income and subsistence hunters who hunt for personal use (Cowlishaw*et al.*, 2005).

There has been a hand fold of research on bushmeat in the African continent with emphasis paid on the West and Central African sub regions. These studies have shown findings from other areas which are also applicable in this region giving the importance of bushmeat as an income source (De Merode*et al.*, 2004) and protein source (Vega *et al.*, 2013); lack of sustainability of harvest rates (Barnes, 2002); the impact of bushmeat on species declines (Brashares et al, 2004) and differences in consumption between urban and rural markets (Jenkins *et al.*, 2011). Despite the fact that there exists significance difference in ecosystem between the tropical forests of Western and Central Africa and savannah, studies have shown some similarities, such as urban centres driving commercialization of bushmeat (Lindsey *et al.*, 2013) and reliance of rural people on bushmeat for food and income (Knapp, 2012).

In the Congo Basin, bush meat has been estimated to contribute between 30 to 80% of the protein intake for forest-dwelling people. Recent studies in the Congo Basin showed that about 34 million people are still dependent on wildlife as a direct source of protein (Ziegler, 2009) In rural areas with poor access to markets, wild animals often constitute the cheapest and sometimes the only type of animal protein available (Redmond *et al.*, 2006). However, overharvesting can affect the survival of some species,

especially large-bodied, slow-reproducing taxa (Fa*et al.*, 2002).

Cameroon is one of the countries in the Congo Basin where bushmeat harvest is gaining strength despite it fight towards conservation effort. Bush meat harvest in the country is noted to be a threat to endangered wildlife (Bennett and Robinson, 2000; Koulagna, 2001). Muchaal and Ngandjui (1999) observed an annual extraction rate of 0.635 of blue duikers in the Dja Reserve, Cameroon, whereas the maximum sustainable harvest was calculated to be 0.492. According to their observation, the rate of exploitation of bush meat was unsustainable. Other studies in Cameroon carried out in Korup, Banyang-Mbo and Lobeke forests, Ebo Forest have influenced many wildlife decisions in the sub-region (Nguiffo and Talla, 2010; Fuashi et al.,, 2019). Despite research efforts in Cameroon in the area of Wildlife ecology and its dynamics, data are still scanty on bushmeat off take and trade in the sub-region.

The Kimbi-Fungom National Park is part of the Cameroonian Highlands ecoregion which encompasses the mountains and highland areas of the border region between Nigeria and Cameroon (Stuart, 1986; Ndenecho, 2009). The area falls within the Afromontane archipelago-like regional centre of endemism that spans the entire African continent (Ndenecho, 2009). The forests in the area are refugia in montane and sub-montane environments. The montane forests are of great ecological significance and contain several endangered species of plants and animals (Alpert, 1993; Ngwabuh, 2002). This region holds some of the globally threatened and endemic species such as the critically endangered Nigeria-Cameroon chimpanzee (*Pan troglodytesellioti*) and the pangolin (*Smutsiagigantea*). It also holds some tree species with high conservation values. This rich ecoregion located in the Western Highlands of Cameroon has been under serious human influence for over three decades. Recent studies in the park (Nkemtaji (2017; Zeh*et al.*, 2019) revealed that the population of wildlife has been on a steady decline due to heavy hunting. In addition to hunting, habitat problems from agricultural expansion also play a key part to the wildlife crisis in the park. According to the studies number of species had been declining status such as the ungulates, primates and rodents. These results were also got by Nkemtaji (2017) where he found a low encounter rate of buffaloes and bushbuck in the park. Thus conservation effort should help spare the lives of these species. The communities are strongly involved in hunting due to poverty, lack of information about the conservation status of pangolins and the outcry for the government calculated attempts to deprive them for God s given resources. Moreover, most ecoguards who work in the park live at Kimbi where their office is located thereby leaving 85% of the park without proper patrol. The discovering of fertile soils for cocoa and palm production has led to the influx of many people with high demand for bush meat, thus leading to increase hunting activities (Zeh *et al.*, 2019). Thus, conservation education is therefore inevitable to expose the need and benefit of wildlife conservation to the community and environment. This project therefore sets out to address these problems in the Kimbi-Fungom National Park. Conservation efforts have tended to emphasize the protection of biodiversity and to improve local livelihoods. Based on this, some questions were asked such as; what is the amount of bushmeat harvested in the park, where is the bush meat sold, who harvest the bush meat? The study recommended among other things that the government and conservation initiatives should improve the protection of threatened, endangered and critically endangered species in the park which are continuously being harvested for bush meat.

2. Materials and Method

Description of the Study Area

The Kimbi-Fungom National Park is located between latitude 6.5-6.9° N and longitude 9.8-10.5° E in the North West Region of Cameroon covering a total land surface of 95,380 ha. This national park is located in three divisions of the North West Region of Cameroon cutting across four sub divisions. These divisions are Menchum, Boyo and DongoMantung and found in the respective sub divisions of Fungom and Fru Awa, Misaje and Bum. The Kimbi-Fungom National Park (K-FNP) is a newly created national park and the only national park in the region (Figure 1). This region experiences two seasons; a long rainy season from mid-March to mid-November and a short dry season from mid-November to mid-March. The wettest months are July, August and September and the driest months being January and February. Hawkins and Brunt (1995) described the climate as a "sub-montane cool and misty climate" with an annual mean maximum temperature of 20 to 22°C and mean minimum of 13 to 14°C. Annual rainfall varies between 1780 and 2290 mm with most of the rainfall occurring between July and September. A dry season occurs from mid - October to mid-March (Tata, 2015). Geographically, the Kimbi-Fungom National Park has a heterogeneous landscape. The Fungom area lies east of Weh-Esu and South of Esu to Kung and Fang reaching a height of 1524 m. This area is made-up of woody savanna with hills running from Weh to Kuk. It is characterized by a rugged terrain from steep rolling hills into extensive flat valley at lower altitude. The Munkep-Gayama axis is an extensive valley about 6 km wide in the Munkep area to over 10 km in Gayama zone. It is in the midst of chains of some steep rocky hills which are almost impassable. The lowlands take another orientation from Munkep at a place called "Last Town" towards the eastern forest. The valley starts behind the eastern forests where it extends for more than 15 km wide to over 30 km long. This extensive eastward valley is fertilized by alluvial silts from the Southern near Escarpment chain of long hills that stretched from the West towards the East in the Fungom Reserve. This relief has greatly influenced the vegetation types and distribution within the park. The MunkepGayama axis lies on an extensive valley between chains of two hills. These valleys gradually protrude into near long rolling steep hills which are characterized by the woody vegetation. The hills are sandwich by galley forests which form the basis for the numerous tributaries in the park. It is drained by a wide range of rivers and streams, notably the Kimbi, the KatsinaAla, and the Kendassamen Rivers, along with significant streams that include: the Batum, Akum, Bissaula, Kenda, Yemene and Imia. These streams flow into the bigger ones that eventually flow through the KatsinaAla River and finally enter the River Benue. The soil types in

this area include; acrisols, andosols (Black soils of volcanic landscapes), ferrasols (red and yellow tropical soils with a high content of sequioxide), leptosol (shallow soil) and nitisols (deep, well-drained, red, tropical with a clayey subsurface) (Birdlife, 2010). The vegetation is principally lowland tropical rainforest at the Fungom low altitude area of the park and gradually progress into tropical deciduous forest to savanna and the grassland savanna. It has many tree species of economic values.

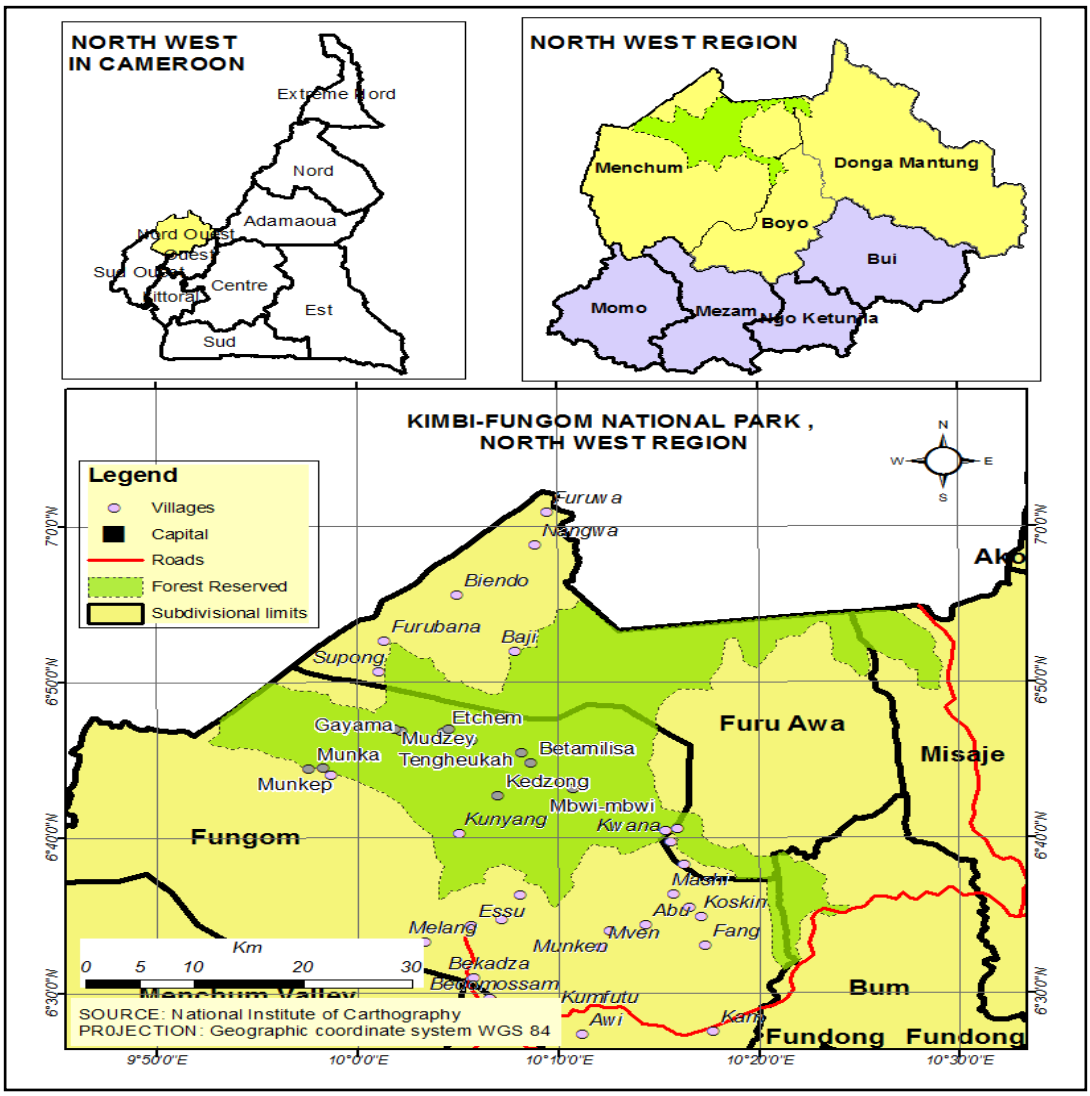


Figure 1: KimbiFungom National park

Research method

The study was carried out in 10 communities in and around the park. Socioeconomic data were collected using purposeful and random sampling methods as described by Fimbel et al. (2000) and Willcox and Nzoyango (2000). The bushmeat survey was done for a period of 6 months in the different communities from January to June 2021. This socio-economic survey was designed to assess the bushmeat markets, supply chain and quantity of pangolin and other wildlife harvested per season. Competent field assistants and community guides were purposefully selected and trained on the collection of socio-economic data pertaining to bushmeat harvest and trade. These assistants were selected during sensitization meetings in 10 communities for pangolin conservation in park. A questionnaire and interview guide was designed. The questionnaire was designed to capture bushmeat harvest and the quantity of bushmeat harvested in the area per season. A total of 200 questionnaires were administered in the 10 villages. We selected one hunter from each village to lead the research team based on their popularity and position held in the hunting circle. Datasheets were distributed to them and were collected every month. This was in a bit to obtain reliable data on harvest in the different villages.

Besides the use of data collection sheets, some selected Participatory Rural Appraisal (PRA) tools (Semi-structured interviews, focus group discussions, and ranking) were employed to triangulate questionnaires based data on hunting methods, weapons, local perceptions and alternatives to hunting. Data collection sheets were designed to collect information on Target Communities Subdivisional limits Divisional limit. Study Area and Target Communities the species poached, quantity (dry and wet), as well as poaching methods directly from poachers on their return from hunting at forest gates and sales points. The quantity of bushmeat harvested was established using a scale balance. The questionnaire was designed in the form of a data sheet for field assistants to collect information directly from hunters on their return from hunting expeditions, as well as

at sales points and forest gates. Information required for filling the data sheets were: the name of the wildlife species killed, its biomass using a spring balance.. This method assumed that the proportion of each species in the fresh state were the same as in the smoked state.

Data Analysis

Quantitative and qualitative data collected from the respondents was coded according to various variables and organized for computer analysis using SPSS Version 20.0. Analysis of this data included running of descriptive statistics such as frequency distribution and results presented in tables and pie charts, while the inferential statistical analysis done used student t-test.

3. Results

Bushmeat harvest

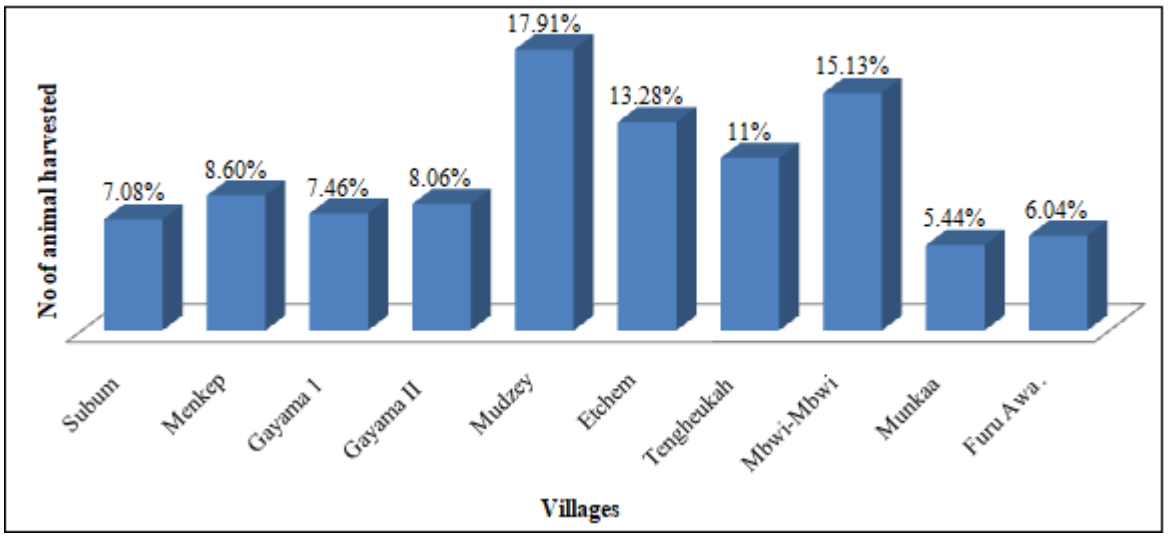
A total of 1837 animals were harvested in the kimbiFungom National for a period of six month between February 2021 and July 2021. The harvest was composed of 7 different species grouped under families of mammals and reptiles. The harvest according to species was made up of 43.66 rodents, 15.89% each for Scaly Ant eaters and primates, 13.17% primates, 4.84% each for Hyraxes and Carnivores and 1.69% for reptiles. In terms of the number harvested, a higher proportion (22.7%) was cane rat. It was followed by porcupine with 18.7% and the least was the buffalo and the Nigeria-Cameroon chimpanzee. This is represented in table 1.

Table 1: Bush meat have in the Kimbi-Fungom National Park

Species	Family	Scientific Name	Common Name	No of Animal	%
Ungulates	Bovidae	*Synceruscaffer*	Buffalo	1	0.05
		Tragelaphusscriptus	Bushbuck	9	0.49
	Antelopinae (duikers)	*Cephalophusdorsalis*	Bay duiker	82	4.46
		Philantombamonticola	Blue duiker	133	7.24
	Suidae	*Potamochoeruslarvatus*	Red River Hog (Bush Pig)	17	0.93
Primates	Homidae	*Pan troglodytes ellioti*	Chimpanzee	1	0.05
		Papioanubis	Olive baboon	93	5.06
		Cercopithecus sp.	Patas monkey	15	0.82
	Cercopithecinae	*Chlorocebuspygerythrus*	Velvet monkey	47	2.56
		Cercopithecusmona	Mona monkey	54	2.94
		Cercopithecusnictitans	White nosed monkey	82	4.46
Carnivores	Canidae	*Lycaonpictu*	Bush dog	4	0.22
	Viverredae	*Viverracivetta*	African civet	16	0.87
	Hyaenidae	*Hyaenahyaena*	Hyena	3	0.16
	Felidae	*Felislybica*	African wild cats	9	0.49
	Herpestidae	*Herpestessanguinea*	Slender Mongoose	57	3.1
Rodents	Hystricidae	*Hystrixcristata*	Porcupine	343	18.7
	Thryonomyidae	*Thryonomysswinderianus*	Cane rat	417	22.7
	Sciuridae	*Protoxerusstanger*	ground giant squirrels	15	0.82
			red-legged squirrels	27	1.47
Hyraxes	Procaviidae	*Procaviacapensis*	Rock Hyrax	89	4.84
Scaly Ant eaters	Manidae	*Smutsiagigantea*	Pangolin	292	15.9
Reptiles	Testudinidae	*Cheloniaspp*	tortoise	4	0.22
	Varanidae	*Varanus*	monitor lizards	6	0.33
	Pythonidae	*Python sebae*	Rock python	8	0.44
	Viperidae	*Bitisgabonica*	Viper	10	0.54
	Elapidae	*Najanaja*	Cobra	3	0.16
Total				1837	100

Bush meat Harvest in different communities

A total of 10 communities were surveyed. The 1837 animal harvested were done by 150 hunters in 10 communities who live in and around the park for a period of 24 week, that is 12 weeks in the dry season and 12 weeks in the rainy season. The quantity harvested per community is shown in table 1. Using the ANOVA–Single Factor test for significance, there was no significant difference in the number of species captured per community at p-value = 0.15 which gives a statistical summary picture of quantity harvested from each of these communities within the four zones.



Seasonal Extraction of Species

From the total harvest of 1837 animals during the study period, 879 (47.85%) were harvested in the dry season while 958 (52.15%) were harvested in the rainy season. The month with the highest harvest in the dry season was January with 317 (17.26) animal harvested while the highest rainy season month was June with a total of 392 (21.34). there was a significant difference in in the harvest as shown by our t-test of p=0.001. The results are summarized in figure 2. Most likely the seasonal disparity is a resultant of the fruiting season, crop availability, the nature of the forest floor and most importantly the method used in the extraction of the animal.

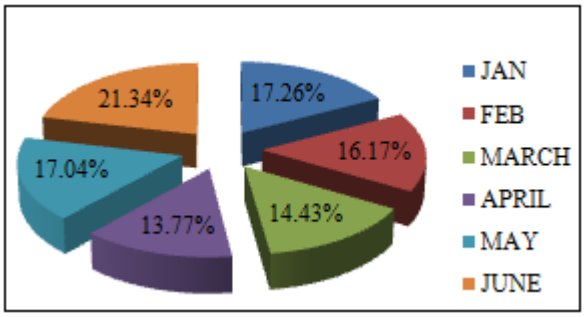


Figure: Seasonal Harvest of Bush meat in the Kimbi-Fungom National Park.

Method of harvest

The harvesting of bush meat in the park is through hunting which remains one of the most common economic activity in the park and opportunistic method. Hunting was either individually or collective. Collective hunting mostly took place in the dry season with the use of guns, dogs, fire and nets. This was mainly in the grassland and woody savanna ecosystems. A majority of rodents and ungulates were cut by traps and dogs while a majority of the primates were cut through gunshot. Traps are the most widely used methods of bush-meat harvest while gin trap was the least harvesting method used. Three types of wire snare traps were identified to be used by poachers in this area (free and barrier and hyrax traps). Free traps consisted of a wire noose connected to a bentover sapling under tension and placed on the animal's trail. The hyrax traps was a wire trap placed on the trail, or on a tree, or twine to capture the animal by neck. This is mostly for rodents and reptiles. From analysis, the method that captured a good number of animals was snare trap with 36.91% of the total catch. This was followed by gunshot with 27.54%. the least was barrier trap with just 0.78% of animal captured. Seasonally, animals killed by guns were more in the dry season whereas in the wet season, animal killing was more by the use of wire snares traps. This is presented in table 2. T-test analysis showed no significant difference in the number of animals killed per season at p= 0.58. Hunters were found to undertake hunting expeditions whenever they were available after farming. . Both night and day hunting were observed in the study area. Records have it that diurnal species were mostly hunted in the day while nocturnal species were mostly harvested in the night.

Table 2: Hunting methods employed and total of species caught per method

Method	Ungulate	Primates	Carnivores	Rodents	Hyraxes	Scaly Ant eaters	Reptiles	Total	%
Gun	30	240	15	185	15	21	0	506	27.54
Snare trap	146	25	40	301	30	136	0	678	36.91
Dogs	56	8	22	291	2	73	6	458	24.93
Gin trap	8	17	6	6	1	21	0	59	3.212
Barrier wire	0	0	2	6	0	0	5	13	0.708
Hyrax snare	2	2	3	9	41	1	18	76	4.137
Opportunistically (hand picking)	0	0	1	4	0	40	2	47	2.559
Total	242	292	89	802	89	292	31	1837	100

4. Discussion

The harvest of bush meat in the Kimbi-Fungom National Park is very much preoccupying. Considering the rugged nature of the park, it is difficult for a proper management and control to be done in the park. The rate at which wildlife off-take or harvest is done in the park is very high. This is due to the fact that the K-FNA with its high biodiversity value in the Western Highlands of Cameroon has a diverse ecosystem where both forest and savanna species strive. It proximity to Nigeria has further exacerbated the desire for hunting as the bush meat market especially pangolins flourished in the cross-border trade. The location of the park in close proximity with Nigeria, couple with it great accessibility from Nigeria, trade in wildlife becomes very vital.

With the advent of the Anglophone crisis, many school dropped out went into the park as hunters. They started the scorched earth hunting before they were called to order by some local conservation initiatives. Through the scorched earth hunting, there were killing all wildlife species no matter the age of the species. This frustrated conservation efforts in the park.

Cane rats were the highest rodents recoded in the park while blue duikers were the highest ungulates recorded. The bush meat harvest was dominated by key consumer driven species such as pangolins, porcupines, cane rats, blue duikers and bay duikers. This same observed was noted by Melle and Nkwatoh (2016) who in their study of bushmeat off takes in the Korup National Park of South West Cameroon, observed that brush-tailed porcupines and blue duikers were species of high consumer preference. The first groups of animal harvested were the rodents this was followed by Scaly Ant eaters and primates. Primates were noted to be the major key species in the park. As Okiwelu et al., (2009) put it, primates are not only for their food value but also for their medicinal and traditional value. On the other hand, primates were hunter with guns and have shown a declining trend. This is in line with the observation made by Zeh et al, (2019) on examining the impact of Land use Changes on wildlife in the Kimbi-Fungom National Park

Hunters in the park were found to have a weekly average harvest of 2.2 animals; this in comparative terms similar to what was obtained at Ebo Forest (Nkwatoh et al. 2019) and greater than that of Willcox and Nzouango (2000) who recorded 1.03 animals per poacher in the Bayang-Mbow Wildlife Sanctuary (BMWS). This study is however relatively lower than the 5.18 animals per week registered in Monte Mintra Forest, Equatorial Guinea (Fa and Yuste, 2001). The low exploitation of wildlife in the park compared to other parks in the Congo basin is due to the fact that over 85% of hunters in the park are also farmers who at times spent more time on their cocoa farms and hunt only in the night. Most hunters during the farming season go in for nocturnal animals since they spent all the days in their farms. Primates are mostly captured during the month of June around farmlands when they come to feed on crops. Most of the primates in the park survive throughout the year in natural fruits but also seasonally depend on agricultural products for survival. Hunters take advantage over time. The general trend of primate in the park is on a decline and thus conservation needs to be reinforced in the park (Zeh, 2020)

More animal were harvested in the rainy season than in the dry season. Thereason for this was in two fold; firstly it was the fruiting period and secondly it was the planting season. During the rainy season, most animals move in search of food. When hunters have already taken note of the areas of fruit abundance, they use this as an opportunity either to trap or to search with guns or dogs. The wetness of the forest floor during in the rainy season makes it easier to locate animal paths and footprints to set traps than in the dry season where the noisy leaves of the forest floor scared animals away. This makes animals more vulnerable to hunters especially to ground dwelling animals like rodents and ungulates. The gentle sound of the forest floor also makes it possible for hunter to move and **shoot tree dwelling** species like primates with little or no problems. During the rainy season which is the planting season, most animal come around farmlands to feed on crops. They are either trapped with snare wires or shot with guns. This makes them more venerable as well. The vulnerability of animals in the rainy season associated with more harvest by hunters in the Kimbi-Fungom National park is in line with the work of Nkwatoh et al, (2019), Muchaal and Ngandjui (1999); Fimbel et al. (2000), and Wilcox and Nzouango (2000), who in their separate studies have it that, the rainy season is the fruiting season for most forest plants which provide food to most animals. On the other hand, pangolins and reptiles were relatively captured more in the dry season due to the dryness and openness of the forest floor and the dryness of the savanna ecosystem. The month of February in the park is known as the pangolin month because most of the pangolins are captured opportunistically through hand pick. They are found everywhere in the park while some are being killed by bush fire set by headers to destroy the dry pasture so as to regenerate new ones for their livestock. The high harvest of pangolins and reptiles in the park is in line with Melle and Nkwatoh (2017) noted that the dry season is a season where poachers can easily penetrate the forest floor from any angle as forest undergrowth and water levels of most rivers are at their lowest at this period of the year in most forest areas in Cameroon.

Hunters in the park had different weapons used for hunting. These weapons used by hunters were found to have varying impacts on the quantity of bushmeat harvested. Two types (guns and wire snares) were observed to be the most commonly and widely used weapons in the park. The snare trap was recorded as the highest killer of wildlife in the study area while the gun came second. This is due to the fact that most of the hunters in the park are also farmers and trapping to protect their crops and in the forest become very important. They go in for trapping on the traditional Monday and comes back on traditional Friday, two days before the market day (Traditional Sunday). The use of traps as a dominant captured method of animals in the park is different from other studies like Nkwatoh et al., (2019), Willcox and Nambu (2007) who in their study observed that there is a gradual shift from traditional practices (non-selective techniques like trapping) the use of modern sophisticated weapons by poachers in and around protected areas in sub Saharan Africa. They further observed that the frequent use

of the gun in bushmeat harvesting was highly encouraged by the fact that harvests from the gun attracted a higher market price than that same harvest from a trap.

5. Conclusion

The Kimbi-Fungom National Park is an ecoregion where biodiversity strive in the North West Region of Cameroon. Before gaining it final status as a National Park in Cameroon, there had been several settlements in the park. The inhabitants of these settlements depended upon hunting and farming for survival. Thus, hunting has been the major problem in in K-FNP in particular and Cameroon protected areas in general due to the poverty level of villages around protected areas. Most household income and protein source are from bushmeat. A total of 1837 species were harvested from the park. Cane rats, porcupine, pangolins and Blue duikers were the most harvested species. Hunting intensity was observed to be relatively higher due to the location of the park at a very much accessible border to the Nigeria who are the major consumers of 75% of the bushmeat. Hunters were observed to use a diversity of weapons with wire snares and guns as being the principal weapons in use. More bush meats were harvested in the rainy season than in the dry season. Based on this, we highly recommend that the government and other NGOs in their conservation efforts should first build capacities of poachers on alternative income sources. Also, there is an outcry of the road so that there should be frequent patrol from the park authorities from the Kimbi control post. Since the hunters in the park are of the fact that the government wants to deprive them on the God given resources, it was recommended that alternative income sources should be introduced to hunters to reduce their dependence on hunter as a major source of income. It was however noted that sensitization campaigns should continuously be organized in the park so that they have an understanding of the important of conservation of species in the park.

Conflict of Interests

The author has not declared any conflict of interests.

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