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Full Length Research Paper

Importance of bushmeat to the economies of hunting households in logging towns Cameroon

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The focus of this study is on the importance of bushmeat to the economies of 99 hunting households in two logging towns, northern boundary of the Lobeke National Park, East Province of Cameroon. In this area, bushmeat was the major source of daily animal protein and an estimated 37 960 wild animals were killed each year or 104 animals per day. In general, 62% of the hunted animals were sold for cash income while 38% were consumed by the hunters and their families. An annual gross income from the bushmeat to hunters was estimated at 234 058 548 CFA Francs (US$ 469 117) while gross revenue from 11 other income generating activities accessed by the hunters was only 4.5% of the income from hunting. Various costs represented 69.4% of the gross hunting revenues. Average hunting income was twice higher than the income of a junior technician and about the same as that of a senior technician working at SEFAC (logging company). The income of hunters at the higher end of the income range was comparable to those of mid-career SEFAC managers. Such a lucrative business provides economic incentives to hunting despite all the suppressive measures. Moreover, the importance of a large bushmeat market is rarely detected and seriously taken into account when designing conservation policies aimed at protecting wildlife and fighting against poaching. The study stresses the need for empathetic approaches that favour more deliberate development and conservation policies while dealing with bushmeat issues in logging towns of the region.

Key words: Game, food security, hunting, poaching, wildlife conservation.

INTRODUCTION

With due recognition to the fact that African tropical rainforests are of great global conservation priority because of their unique and high biological diversity, it has been well-documented that these forests are adversely affected by human activities resulting in fragmentation, degradation and loss of forest cover (FAO, 2007; Bennett et al., 2006). This is primarily due to activities such as timber logging, agriculture, mining and game hunting to meet diverse economic and social needs. Game hunting for meat, generally known as bushmeat, has long been a staple for rural livelihoods in many parts of the world, including villages in and around the Lobeke National Park (LNP) in the East Province of Cameroon. During the 14th Session of the Working Party on the Management of Wildlife and Protected Areas in March 2002, item 5 on the report reiterated the need to consider bushmeat as acrucial resource rather than a product, so that its economic and social values are fully reflected in national development plans (AFWC, 2002). However, in most African countries, research and conservation focused on the im-pact of bushmeat hunting on biodiversity and resource sustainability (Lwanga, 2006; Rowcliffe et al., 2003; Auzel and Wilkie, 2000; Bowen-Jones, 1999; Muchaal and Ngandjui, 1999; Wilkie and Carpenter, 1999; Ntiamou-Baidu, 1997; Freese, 1996; Usongo and Curran, 1996) but not on the socio-economic importance of such acti-vities to local household livelihoods (Damania et al., 2005; de Merode et al., 2004; Bennett and Rao, 2002; Bennett et al., 2002; Davies, 2002; UDRSS/VALEURS, 2002; Bahuguna, 2000). Some research dwelled on the volume and value of bushmeat marketed in both local and urban markets (Wilkie et al., 2005; Makazi, 2004; Mendelshon et al., 2003; Fa et al., 2000; Ngandjui and Blanc, 2000; Ambrose-Oji, 1997; Usongo and Curran, 1996) or concentrated on the estimation of wildlife popu-lation densities (Rovero and Marshall, 2004; Eggert et al., 2003; Waltert et al., 2001).

Little information exists on the number of carcasses, their mass and value of the animals captured by hunting households (Makazi, 2004; Ngueguim, 2001; Fa et al., 2002; Akwah, 1999; Noss, 1998). Furthermore, no clear understanding exists on the consumption and trade chains of the bushmeat to meet daily protein needs. The household economic value of bushmeat needs to be properly understood in order to target appropriate policies that can support the dual objectives of nature conservation and human development.

Several researchers argued that traditional forest hunting was probably sustainable in the past because of low human population densities, simple hunting technologies and subsistence-oriented consumption (Bennett et al., 2006). However, whatever the trend was in the past, the contemporary situation in the Congo Basin is a transition from subsistence to commercial hunting that in most cases has resulted in over -hunting with over 60% of hunted animals in the region being exploited unsustainably (Fa et al., 2002) due to human population growth, modernisation of hunting techniques, greater accessibility to remote forest areas. This is made possible by industrial logging, slash-and-burn farming and the overall expansion of road infrastructure (Laurance et al., 2006; Fa, et al., 2005; Barnes, 2002; Wilkie and Carpenter, 1999; Noss, 1998; Barnes and Lahm, 1997). This has provoked many confusing debates within conservation and development spheres on bushmeat production, consumption and trade in different parts of the world. In the last three decades, such debates have resulted in a number of confrontations between local hunters and conservation organisations. However, no clear policy statements or actions have been undertaken to meet the basic needs of the hunters and their families and the conservation objectives of sustaining the existence of targeted animal species. Instead, suppressive measures have been used involving hiring eco-guards, policing the forests and markets, seizing ammunition and hunting equipment as well as the imprisonment of illegal hunters. Despite mediocre results, more stringent anti-poaching steps are being established and additional financial resources are being allocated to regional processes, such as the Central African Forest Commission's Joint Plan of Action. Commercial hunting, tagged by conservation supporters as poaching (because it is against existing wildlife laws) as opposed to indigenous hunting for consumption, has been viewed as the major driver to bushmeat sustainability problems. In some cases the patronage of poaching by urban elites and government administrators has been blamed as a weakness in enforcing anti-poaching regulations. All these problems, often coined a "bushmeat crisis," are viewed with mixed feelings by both the local people and workers for conservation or development (Bennett et al., 2006; Laurance et al., 2006; Wilkie et al., 2005).

Some development workers blame the lack of viable alternatives to bushmeat on failing conservation strategies (Laurance et al., 2006). According to Fa, et al. (2003) and Bennett et al. (2006) the high dependence on bushmeat protein is associated with the fact that most countries do not produce sufficient amounts of non-bushmeat protein to feed their populations. This is truly observed in and around logging towns, where domestic animals, the alternative source of protein, are viewed by most people as delicacies and most often eaten only on festive days such as Christmas and New Year. Therefore, Fa et al. (2003) warn that the continuous reliance on bushmeat as a source of animal protein for teaming forest-dependent populations can drive the extinction of many species, thus adding to the misery of the forest-dependent poor. The role of alternative sources of income and animal protein would require deliberate policy overhauls within conservation and development agencies (Brown, 2003; Bennett, 2002; Davies, 2002) . This cannot happen without reliable data on household consumption and income from bushmeat that this study provides.

Study objectives

In the past, the surveys of bushmeat production and trade failed to include data on household consumption and income. Although hunting for bushmeat has been a major conservation issue, it is not only important in the conservation context but primarily in the context of peoples' livelihoods (de Merode et al., 2004). According to Fa and Garcia Yuste (2001) many hunters complement their income with the sale of bushmeat, suggesting the significance of using wildlife as a source of income for the local populations. Thus, local livelihoods are tied to bushmeat hunting (Bennett, 2002; Fa et al., 2003), which could contribute to economic vitality if managed for sustainability and transparently integrated into the general household economy (Albrechtsen et al., 2006; Brown, 2003). Such integration would complement other activities like farming, fishing, gathering of non-timber forest products and so on (Mendelson et al., 2003; Ntiamoa-Baidu, 1997).

This study examines the economics of poaching and its persistence despite all the suppressive measures around logging towns in the Congo Basin. The general objective was to examine the role of bushmeat hunting within the household economy with the following specific objectives:

- assess the value of bushmeat from hunting to local household economies, both for home consumption and for sale;
- extrapolate the role of bushmeat to household protein needs and income in two logging towns around the Lobeke National Park;
- proffer recommendations for bushmeat policy shifts in logging towns that can promote both development and conservation outcomes whilst tackling the bushmeat crisis.

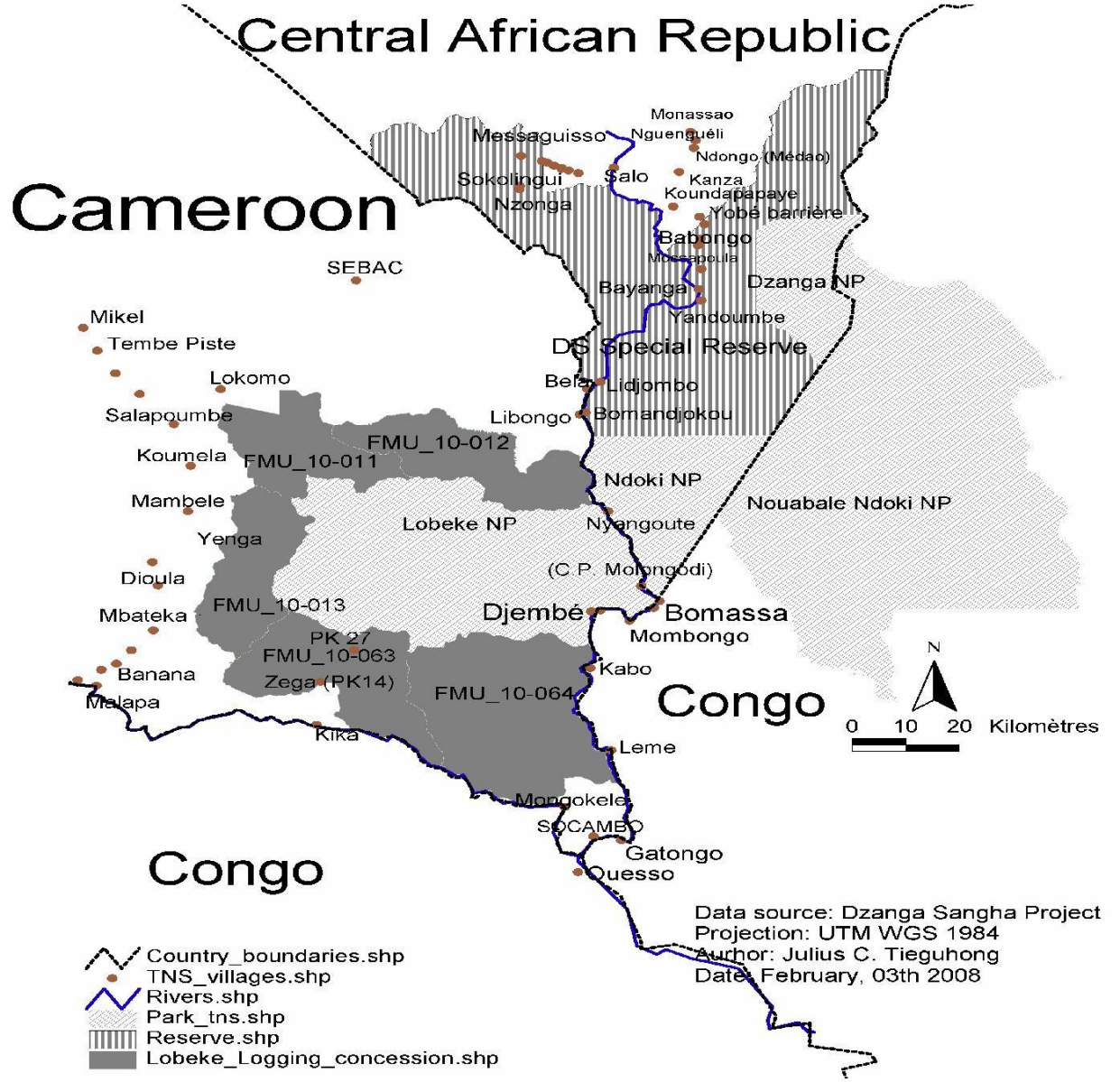

Figure 1. Map of the Sangha Tri-national Park -TNS showing the Lobeke National Park area and adjoining forest concessions and villages (Cameroon segment).

METHODS

Study area

Libongo and Bela are logging conglomerations with burgeoning populations of over 6000 inhabitants. They are located near the northern borders of the Lobeke National Park (LNP) in the East Province of Cameroon. These are typical logging towns and accumulations of people from different ethnic backgrounds, working or searching for jobs in an Italian logging company 'Société d'Exploitation Forestière and Agricole du Cameroun' (SEFAC). Typical of logging towns in the Congo Basin, Libongo and Bela are located in forested regions several kilometres away from administrative centers (divisional headquarters, Yokadouma and provincial capital, Bertoua) with formal economic activities central to logging. Aside from logging, other activities of these towns are either informal or are poorly supported and monitored by the existing infrastructures and administrative systems.

Cameroon declared the LNP as a "Gift to the Earth" and final park boundaries were established in 2001 under Decree No. 2001/107/CAB/PM. The LNP has a surface area of 217 854 ha and is surrounded by six community and trophy hunting zones that are superimposed on five logging concessions, covering a total area of 354 928 ha. The LNP is entirely located in the Moloundou sub-division, Boumba and Ngoko division of the East Province of Cameroon. This park and adjoining forest concessions are rich in forest resources and wildlife on which depend generations of indigenous communities. The local people include the Baka Pygmies, Bangandos and Bakweles as well as a diversity of immigrant people. Human activities in the region include timber

extraction, exploitation of non-timber resources, fishing, hunting and small businesses. The major stakeholders in this area are local communities, representatives of administrative and municipal authorities, delegates from the Ministry of Forests and Wildlife (MINFOF) as well as representatives from the Worldwide Fund for Nature (WWF) and the German Technical Cooperation (GTZ).

The biological richness of the region is characterised by a great variety of animals such as forest elephants, western lowland gorillas, chimpanzees, bongos, duikers, sitatungas, forest buffaloes, and many species of birds, including the African grey parrot. There are 764 plant and 45 mammal species, excluding rodents (MINEF, 2004). Another important feature of the LNP is that it is part of a trans-boundary park, known as the Sangha Tri-National Park (TNS). This Tri-National Park (28 000 km^2) comprises the LNP, the Dzanga-Ndoki National Park (DNNP) in the Central African Republic and Nouabale-Ndoki National Park (NNNP) in the Republic of Congo (Figure 1). Animals move among the parks, which instigated the need for a common management system.

Data collection and analysis

This research is based on household and user-group surveys conducted with the use of structured questionnaires (Appendix 1) and other qualitative methods such as rapid rural appraisal and participatory rural appraisal tools. The applied methods were focused on group interviews and key informants to illicit information from hunters on their activities in Libongo and Bela. Local research assistants were employed to collect information over a period of 10 days in the two logging towns. Confidence on the anonymous nature of this study was built for more than 18 months by regular visits to demonstrate no threat to illegal hunting. Such trust was required to capture sensitive information about hunting tools and methods, types and quantities of the hunted animals, and the bushmeat trade. Socio-economic variables sought included- village location, hunters' sex and age, ethnic background, marital status, education, household size, cash income from non-hunting activities, the five-ordered most hunted species, quantities of bushmeat hunted per week, quantities of bushmeat sold or consumed, average price and mass of each species, and average weekly income.

Research on bushmeat can be compromised due to hunters' fear of being criminalized. In the study area, such fears were obvious, which made them wary about giving details on the number of killed animals per species. Some willing hunters did not know or could not remember exactly the distribution of hunts by species. Others were merely afraid to furnish quantitative information. In order to elicit relevant information from the hunters, the best option was to make an estimation of the distribution of animals hunted per species based on hunters' statements. Then, weighted averages were calculated for each species reported by the hunters among the most hunted animals. Five most commonly hunted animals were ranked by each hunter, by allocating scores ranging from five to one, five being the most frequently and one the least frequently hunted species. These scores added to a maximum score of 15 attributed by each hunter to the five most frequently hunted animals. Therefore, coefficients defining the ranking of the hunted species were $_1$ = 5/15; $_2$ = 4/15; $_3$ = 3/15; $_4$ = 2/15 and $_5$ = 1/15 for the first, second, third, fourth and fifth most hunted species, respectively. In order to estimate the rate (R^j) at which each species (j) was hunted in the region, the relative frequencies of hunters that provided the same ranking were multiplied by the respective coefficients according to the following formula:

$$R^j = \sum_{i=1}^{5} \alpha_i \cdot \frac{n^j{}_i}{N}$$

Where:
j = Species.
N=99 the total number of hunters.
$n^j{}_i$ - Number of hunters that stated *j* as their *i* most hunted species
$_i$ - coefficient linked to *i* rank
R^j- Rate of j species.

With the known rate for hunting each species in the study area, it became possible to estimate the number of animals hunted per species by multiplying respective rates by the total number of animals hunted:

$$H^j = R^j \cdot H$$

Where
H^j = number of j species of animal hunted per year
R^j = rate of j species of animal hunted
H = total number of animals hunted in the region per year.

Two approaches were used to estimate an average income generated by hunters. In the first approach the estimated average income excluded all the costs incurred by the hunters because such costs were highly variable among the hunters and therefore difficult to measure. In some cases no obvious cost was discernible because family labour and the use of ropes from the forest were considered costless to the hunters. In the second approach the total number of animals hunted per species and the corresponding market prices of whole carcasses were used to estimate the total annual income. This second estimate included all the costs in the gross annual revenue. The revenue obtained from the first method was subtracted from that obtained in the second method to get the total annual cost of hunting operations. Cost/benefit estimates were made on a weekly basis and extrapolated per month or per annum as many hunters could not remember their activities for longer than two weeks.

Microsoft Excel and the Statistical Package for Social Sciences (SPSS) were used to compile and analyze data. T-tests were conducted to detect any differences between the income of full-time and part-time hunters. A correlation analysis was carried out to determine if the revenue earned by hunters was associated with the number of animals hunted or their mass, or both. The extrapolation of the number of animals, bushmeat mass and total revenue earned by the bushmeat hunters in the LNP area used the following formula:

$$NH_{14} = \frac{NH_2 \cdot P_{14}}{P_2}$$

where

NH_{14} – Annualtotalnumberof animalshuntedin 14 villagesaroundthe LNP

NH_2 – Annualtotalnumberof animalshuntedin thetwo villagessurveyed

P_{14} – Totalpopulationof the14 villagesaroundthe LNP

P_2 - Totalpopulationof the two villagessurveyed.

The assumption was that all villages in the region were homogenous in terms of bushmeat consumption, hunting habits and unit prices. The implication of such homogeneity was that the total bushmeat consumed was positively linked to the total population of the area. The local currency was valued at the following rates: one United States dollar was equivalent to 500 CFAF and one Euro cost 656 CFAF. Apart from household surveys some information was gathered from earlier studies on bushmeat trade and local consumption to buttress current findings (Bennett et al., 2006; Laurance et al., 2006; Wilkie et al., 2005; de Merode et al., 2004;

al., 2004; Makazi, 2004; Fa et al., 2003; Ngueguim 2001; Wilkie and Carpenter 1999; Noss 1998).

Logistic regression

We desired to understand the factors that drive hunters towards bushmeat hunting as a pertinent income generating activity and to distinguish between those that earn low or high incomes from bushmeat. Low and high bushmeat income earners present a dichotomous outcome such that target policy reforms could readdress the factors that enable such hunts and, thus, reduce hunting intensity. The cut off monthly hunting revenue between low and high income earners was 23 500 CFAF (US$ 47), the minimum salary rate authorised by national law 92/007 of Cameroon (Code du Travail au Cameroun, 1992). Hunters that earned less than the cut off amount were classified as low bushmeat income earners while those above the cut of point were considered at the high end.

Given this classification, 45.5 and 55.5% of the hunters were of the low and high bushmeat hunting revenue spectra respectively. The logit model was applied in SPSS Version 12 in the Microsoft Windows 2003 interface in order to establish the links between independent variables and the probability of the dependent variable taking the value 0 or 1 (Mukherjee et al., 1998). The dependent variable in this case was bushmeat income earners dichotomised into low (0) and high (1) outcomes (Masozera and Alavalapati, 2004; Gujarati, 1995).

The model used to determine the factors that explain hunters' revenues was:

$$\mathrm{Ln}\left[\mathrm{P_i}/(1\text{-}\mathrm{P_i})\right] = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + ... + \beta_n X_n + \varepsilon_i$$

Where:

P_i is the probability for a bushmeat hunter to earn a high revenue from hunting

$X_1, X_2, X_3 ... X_n$ are the independent variables

$\beta_1, \beta_2, \beta_3 ... \beta_n$ are coefficients associated with each independent variables

ε_i is the error term

Subscript n denotes the number of independent variables

Subscript i denotes the i^{th} bushmeat hunter in the sample

The explanatory variables used to explain the differences in hunters' revenues were: age of hunter, education, ethnic affinity, time input into hunting, number of years as hunter, household size, other income sources and marital status. Theoretical relationships between each explanatory variable and its impact on the income of bushmeat hunters are described as follows:

i) Ethnic group - ethnicity can determine the rate of hunting due to different hunting experiences. Hunters were of different ethnic backgrounds that could have attracted different hunting techniques with varying efficiencies. Therefore, the expected sign in the logit model can be positive or negative depending on the efficiency of hunting techniques employed;
ii) Years in hunting - number of years in hunting experience can influence hunting revenues positively, assuming that a more experienced hunter could have more tools and knowledge than beginners. Thus the expected sign in the logit model is positive.
iii) Age of hunters in years – Older hunters are expected to have more experience than younger ones, thus, the expected sign in the model is positive.
iv) Time in activity – full-time hunters are expected to have more revenue from hunting than part-timers, thus, time input into hunting activity is expected to have positive influence on hunters' revenues.
v) Other sources of revenue – other income-generating activities such as farming, fishing, formal employment, trading, and the collection of non-timber forest products are expected to influence hunting income negatively.
vi) Education level – education helps in knowing things beyond the confines of the immediate environment, meaning highly educated persons are expected to appreciate hunting techniques within and beyond their villages. Therefore, education is expected to influence hunting revenue positively.
vii) Marital status – married people have at least one additional mouth to feed and therefore would have to put greater energy into hunting, thus, generating higher revenue than singles. The expected sign is positive.
viii) Household size – hunters with bigger households could be influenced in the same way as described for 'married' marital status.

RESULTS AND DISCUSSIONS

Socio-economic profile of hunters

We found 99 active hunters in the two loging towns, 45 in Bela and 54 in Libongo. Most of the hunters (68.7%) were part-time hunt and 31.3% were fulltime. About 57% of the hunters had never attended any school while 33.3, 7.0 and 3.0% had some primary, secondary and nursery education respectively. The hunters were from twelve ethnic backgrounds including Baka Pygmies (46.5%), Kako (14.1%), Yanguere (13.1%), Bimou (12.1%), Bangando (4.2%), Vonvon (2.0%), Eton/Ewondo (2.0%), Gbaya (2.0%), Congolese (1.0%), Bakwele (1.0%), Badjoue (1.0%) and Maka (1.0%). The indigenous people (Baka, Bangando and Bakwele) represented 51.7% of the hunters while 47.3% came from other parts of the country and 1.0% from outside the country. However, Makazi (2004) observed that over 200 commercial hunters near the southern borders of the LNP area were immigrants from other parts of the country. In terms of age, 31.3, 41.4, 20.2 and 7.1% of the hunters were 15 - 30 years, 31 - 40 years, 41 - 50 years and over 50 years old respectively. The mean hunting age was 33 years, minimum (min) = 17, maximum (max) = 56 and standard deviation (sd) = 9.3. Overall 64.7% of the hunters were married, (5.4% had two wives). Household size varied from 1 to 18 persons (mean = 4.1, sd = 3.1). There were 409 people living in these hunting households, 241 of them being children. The mean number of children per household was 2.4 (min = 0, max = 15, sd = 2.8). 87.9% of hunters self-financed their operations, 10.1% had sponsors in the towns and 1.0% each either borrowed money or were sponsored to purchase hunting tools and ammunitions. Hunters that are sponsored usually share the proceeds from hunting with their sponsors and in some cases the latter take a larger share.

Hunting experience

The years of hunting experience for most hunters varied from 3 - 35 years, with a mean of 14.3 years (sd = 7.3). This result suggested that hunting was an old practice for

Table 1. Estimated annual value (CFAF) of bushmeat and number of animals hunted by the 99 hunters interviewed in Bela and Libongo (Cameroon) in 2007 (sd - standard deviation, min - minimum, max - maximum value).

Specification	Per hunter				Total for all 99
	Mean	sd	Min.	Max.	hunters
Number of animals hunted	383.4	215.4	104	1300	37 960
Number of animals sold	237.4	174.1	52	1040	23 504
Number of animals consumed	145.5	75.0	0	416	14 404
Cash income from sold meat (CFA F)	443576	337 363	52 000	1 820 000	43 914 000
Value of consumed meat (CFA F)	279 000	166 121	0	866 667	27 621 038
Total value of meat	723 206	437 127	78 000	2 340 000	71 597 438

most hunters in Bela and Libongo. One anonymous hunter vividly put it in these words:

‘‘Hunting has not started now, it is an ancient practice. In the past there was no gun to shoot, our fathers and forefathers used to dig holes like graves, construct fences around and rush animals into them. That was the way they used to get their animals. All types of animals used to fall inside the holes and were killed and taken to the village, presented to our leaders, who usually called all village members to divide the meat equally. There was no trade and no money exchange involved. Hunting for money started with the arrival of the Germans, who introduced the use of wires for snares and guns for shooting without missing. Nowadays we still use the guns and wires to kill animals. The tradition of presenting bushmeat to our leaders has virtually died away unless for selected species for indigenous people but with the outsiders this tradition has died off. The price of bushmeat has increased with the creation of roads and the installation of the timber company that has given rise to more clients and increased demand. Hunting activities are complementtary to other activities, especially farming and the collection of other forest products. Hunting is more intense during off-farm seasons and is more consistent because of the fluctuating prices of agricultural products as well as the high costs of establishing a plantation of agricultural crops for a reasonable income. Other sources of income aside from bushmeat are not available and I have been hunting for over 30 years to feed myself and my family. What else can be more lucrative and rewarding to me than hunting? Perhaps, I still need to find. However, hunting is becoming more limited now because most people are being harassed by conservation people and more time is being given to the establishment of farmlands. To some people hunting is more like a transition activity after farm products mature but some of us are still full-time hunters and the benefits keep life going albeit the high risks, warnings and empty promises. Most products are sold in rural markets both at night and in the early hours of the day but some buyers come from towns. To stop hunting completely and do nothing else productive or more rewarding is the same as telling you to abandon your job and go back to meet your father but do nothing else. Can you abandon your profession and go back home and do nothing else? How would you live, your children, your wife and other dependents?”

Numbers and values of hunted animals

According to the hunters interviewed in Bela and Libongo, the number of animals hunted per person per week varies from 2 - 25 animals (mean = 7.4, sd = 4.1). This gives a total of 730 animals hunted per week or 37 970 animals hunted annually by all the 99 hunters interviewed. This number varies from a minimum of 104 animals to a maximum of 1300 (mean = 383.3, sd = 215.4) per hunter. In Bifa, South Province of Cameroon, Ngueguim (2001) found that on average a hunter cap-tured at least three animals per week totaling 156 ani-mals per annum. In the Dzanga Sangha Forest Reserve region, Central African Republic, Noss (1995) estimated that cable snares trapped 10 552 animals per annum for the 2500 inhabitants of Bayanga. This excluded about 40% of animals hunted and sold locally.

The animals hunted by the Libongo and Bela hunters are either sold (62%) or consumed by the hunting households and given out as gifts (32%). In terms of cash value, the weekly incomes of hunters varied from 1000 CFAF to 35 000 CFAF (mean = 8530, sd = 6488). Annual cash incomes of hunters varied from 52 000 CFAF to 1 820 000 CFAF (mean = 444 000, sd = 337 000 CFAF (Table 1). The total annual cash income was estimated at 44 million CFAF for the 99 hunters interviewed. A total value of bushmeat was 71.6 million CFAF per annum when the value of the bushmeat utilized by the hunting households was included. This value excluded all hunting costs.

When the value of consumed bushmeat is taken into account, the hunters are making an average of 723 206 CFAF per annum (min = 78 000, max = 2 340 000, sd = 437 127). The total annual value of bushmeat consumed or given out as gifts by the 99 hunting households is about

Table 2. Mean revenues (CFAF) and numbers of animals captured by full and part-time hunters in Bela and Libongo, Cameroon, 2007 (sd = standard deviation).

Variable	Part time	Full time	Combined
Revenue	638 891.7 (sd = 394 704.4)	908 154.8 (sd = 474 130.4)	723 206.4
Animal numbers	323.5 (sd = 145.9)	515.0 (sd = 279.2)	383.4343

Table 3. Weighted rating of the 18 most hunted species of animals near Bela and Libongo, Cameroon, 2007.

Latin name	Local name	1st hunted	2nd hunted	3rd hunted	4th hunted	5th hunted	Rate
Cephalophus monticola	Blue duiker (lievre)	0.2626	0.3131	0.1919	0.0707	0.0909	0.225
Atherurus africanus	Porcupine	0.1111	0.2626	0.2727	0.1515	0.0606	0.186
Cephalophus callipygus	Peter's duiker (Birch)	0.3131	0.1010	0.1313	0.0606	0.0404	0.168
Tragelaphus euryceros	Antelope (bongo)	0.1010	0.0606	0.0202	0.1212	0.1414	0.079
Manis spp	Pangolin	0.0404	0.0606	0.1010	0.1212	0.1515	0.076
Tragelaphus spekei	Sitatunga	0.0707	0.0202	0.0909	0.0707	0.1010	0.063
Hylochoerus meinertzhageni	Giant forest hog	0.0606	0.0707	0.0505	0.0707	0.0505	0.062
Thryonomys swinderianus	Grasscutter	0.0101	0.0606	0.0202	0.0707	0.0808	0.038
Cercocebus spp.	Monkeys	0.0101	0.0000	0.0303	0.1212	0.1111	0.033
Cricetomys gambianus	Giant rat	0.0000	0.0101	0.0606	0.0808	0.0202	0.027
Crocodylus niloticus	Crocodile	0.0202	0.0202	0.0101	0.0303	0.0000	0.018
Hyemoschus aquaticus	Water chevrotain	0.0000	0.0000	0.0101	0.0202	0.0404	0.007
Felis aurata	Golden cat	0.0000	0.0101	0.0101	0.0000	0.0202	0.006
Guttera plumifera	Guinea fowl	0.0000	0.0000	0.0000	0.0101	0.0606	0.005
Syncerus caffer nanus	Forest buffalo	0.0000	0.0101	0.0000	0.0000	0.0000	0.003
Gorilla gorilla	Gorillas	0.0000	0.0000	0.0000	0.0000	0.0101	0.001
Atilax paludinosus	Marsh mongoose	0.0000	0.0000	0.0000	0.0000	0.0101	0.001
Python sebae	Python (boa)	0.0000	0.0000	0.0000	0.0000	0.0101	0.001
Total		1.0000	1.0000	1.0000	1.0000	1.0000	1.000

about 28 million CFAF or an average of 279 000 CFAF per hunter.

The cash income per hunter from bushmeat in Bifa in southern Cameroon averaged 5343 CFAF per week or 277 836 CFAF per annum (Ngueguim, 2001). In the southern section of LNP, the annual income of a hunter averaged 608 000 CFAF (Makazi, 2004) . On a national level, Infield (1988) estimated an annual income of 350 000 CFAF and 360 000 CFAF per hunter for Cameroon and the Central African Republic, respectively. Noss (1998) reported that snare hunters in the Dzanga-Sangha Forest Reserve earn 200 000 - 350 000 CFAF per year. Such annual hunting revenue per hunter generally exceeds the national per capita income for most countries in the Congo Basin, except Gabon and Equatorial Guinea.

According to Fa et al. (2003), the current bushmeat protein supply may range from 30 g person^{-1} day^{-1} in the Democratic Republic of Congo to 180 g person^{-1} day^{-1} in Gabon. In Latin America the average daily consumption of bushmeat was 59.6 g per person (Townsend, 2000). In the Malaysian state of Sarawak, 67% of Kelabits' (indiginous people) meals contain bushmeat, forming the main source of protein (Bennett et al., 2000).

Full-time and part-time hunters in our study area earned significantly different annual incomes of 908 155 CFAF and 638 892 CFAF ($df = 97$, $|t| = 2.95$, $p = 0.004$), respectively, from significantly different average number of killed animals, 515 and 324 respectively ($df = 97$; $|t| = 4.49$; $p < 0.001$) (Table 2). There were no significant differences in the proportions of animals consumed and sold by the two types of hunters ($df = 97$, $|t| = 1.18$, $p = 0.239$). Part-time hunters evidently have similar motives as full- time hunters that are to make additional income by selling bushmeat, an unexpected finding because part-time hunters were thought to hunt mainly for personal consumption.

Species, mass and value of hunted animals

Eighteen (18) animal species were regularly hunted in Libongo and Bela with a total annual take of 37, 960

Table 4. Ranking of hunted species by numbers, bushmeat mass and value (CFAF) in Bela and Libongo, Cameroon, 2007 (figures in parenthesis represent the ranks).

Species	Annual animal numbers	Average mass (kg) per animal	Annual bushmeat mass (kg)	Average price/ animal	Average price per kg of bushmeat	Total annual bushmeat value
Blue duiker (lievre)	8538 (1)	4	34151 (4)	2000	500	17075609 (5)
Porcupine	7055 (2)	2.5	17638 (7)	2000	800	14110384 (6)
Peter's duiker (birch)	6391 (3)	8	51125 (2)	6000	750	38343434 (2)
Antelope (bongo)	3016 (4)	80	241308 (1)	25000	313	75408754 (1)
Pangolin	2889 (5)	2.5	7221 (10)	2000	800	5777077 (8)
Sitatunga	2403 (6)	18	43251 (3)	10000	556	24028552 (4)
Giant forest hog	2352 (7)	15	35276 (5)	12000	800	28220768 (3)
Grasscutter	1457 (8)	2.5	3643 (11)	2500	1000	3642626 (11)
Monkeys	1253 (9)	6	7515 (9)	4000	667	5010209 (10)
Giant rat	1022 (10)	0.5	511 (18)	500	1000	511246 (14)
Crocodile	690 (11)	40	27607 (6)	20000	500	13803636 (7)
Water chevrotain	281 (12)	5	1406 (13)	5000	1000	1405926 (12)
Golden cat	230 (13)	5	1150 (14)	3000	600	690182 (13)
Guinea fowl	204 (14)	0.5	102 (16)	800	1600	163599 (17)
Forest buffalo	102 (15)	100	10225 (8)	50000	500	5112458 (9)
Gorillas	26 (16)	75	1917 (12)	18000	240	460121 (15)
Marsh mongoose (renard)	26 (17)	1.5	38 (17)	1500	1000	38343 (18)
Python (boa)	26 (18)	8	204 (15)	10000	1250	255623 (16)
Total	37 960	-	484 290	-	-	234 058 548

animals or 104 animals killed per day by 99 hunters. Therefore an estimated total of 576 264 animals were killed by the 99 hunters during their mean hunting experience of 14 years. Individual hunters killed between 416 - 35 100 animals (mean = 5821, sd = 5435) over the same period. Great variations were observed on the number of animals per species. Based on the reports by the hunters on their most hunted animals, a weighted average coefficient was calculated for each of the species (Table 3).

The weighted ratings indicate that out of 1000 animals hunted, 225 would be blue duikers, 186 porcupines, 168 Peter's duiker, 79 bongo antelopes, 76 pangolins, 63 sitatunga, 62 giant forest hogs, 38 grasscutters, 33 monkeys, 27 giant rats, 18 crocodiles, 7 water chevrontains, 6 golden cats, 5 guinea fowls, 3 forest buffalos, and one each of gorillas, marsh mongoose and python.

The observed high frequency of duikers is similar to hunting results from neighbouring Bayanga, Central African Republic where 74.6% of the animals captured with net snares were blue duikers and 22.8% of other species, including porcupines and other duiker species (Noss, 1998). Fa and Garcia Yuste (2001) found similar results in Monte Mitra, Equatorial Guinea where the most hunted species was the blue duiker (21.6% or 658 carcasses), followed by the porcupine (20.3%) . The ranking of the species hunted in Bela and Libongo areas was different when bushmeat mass or values were taken into account (Table 4) . This approach is new in the relevant studies except for the study by Fa and Garcia Yuste (2001) that made some estimates of the body mass for various hunted species.

The ranking of species clearly varies depending on a characteristic used (Table 4). The blue duiker is first in numbers followed by porcupine, Peter's duiker, bongo and pangolin. The largest total bushmeat mass is obtained by hunting bongo and then Peter's duiker, sitatunga, blue duiker and the giant forest hog. The same species deliver the highest total annual value but in the following order: bongo, Peter's duiker, the giant forest hog, sitatunga and blue duiker. The most valuable animals on a bushmeat unit mass basis are guinea fowl, python, grasscutter, giant rat, water chevrotain and marsh mongoose. These observations suggest that the importance of wildlife in providing bushmeat or income to the households' economies is a function of animal numbers, mass and price. One or all of these factors, in addition to species vulnerability to hunting methods, can explain hunting pressures. Generally, some of the most hunted animals such as the bongo are hunted not just for the meat but also for trophies, for which trophy hunters in Cameroon pay 1, 000, 000 CFAF, the same rate as for hunting elephants and lions. For other species, the ease to hunt duikers or to capture smaller mammals such as the porcupines and pangolins with wire/rope snares are technical incentives to consider in hunting preferences.

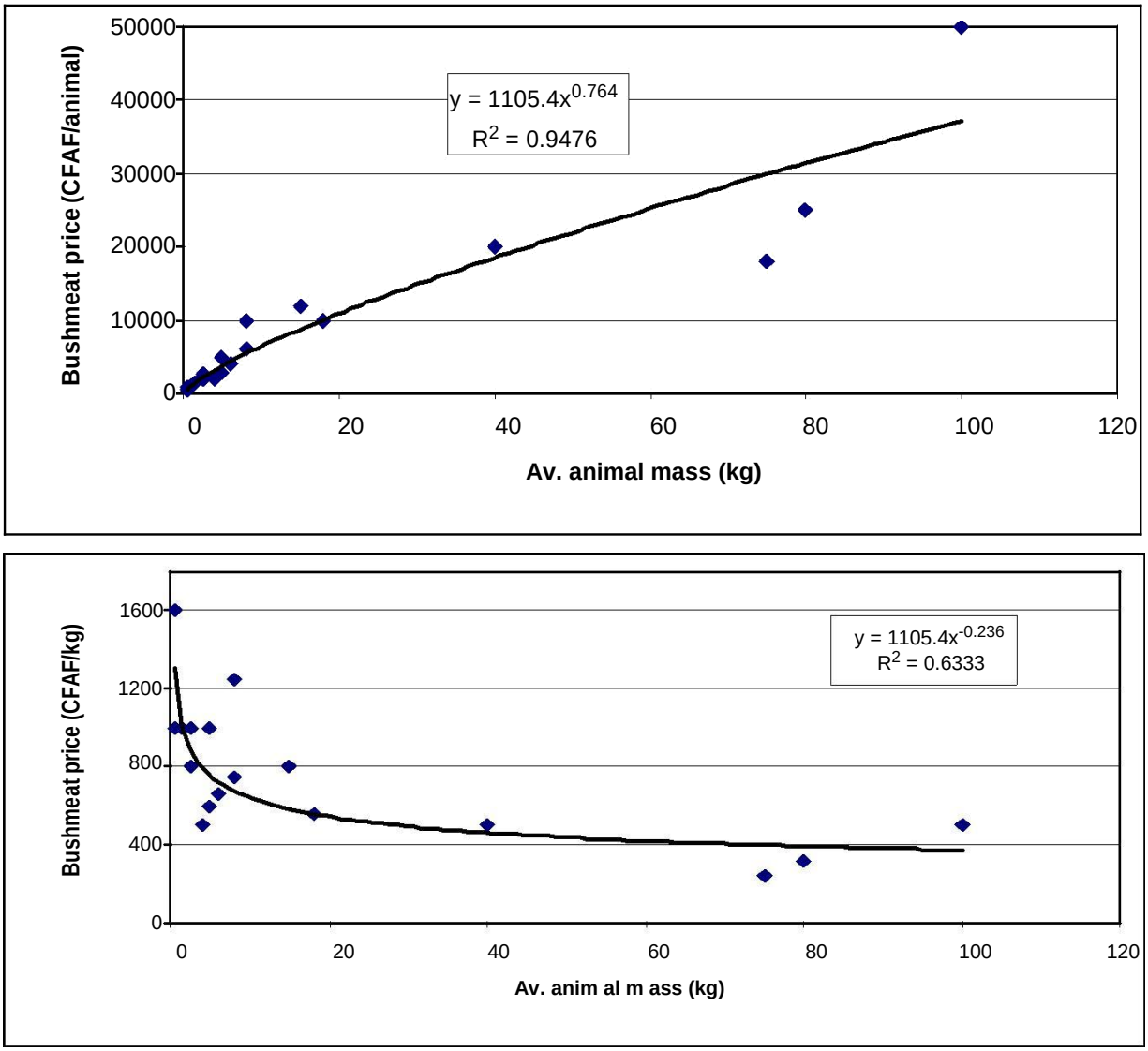

Figure 2. Trends in the relationships between (i) the average animal mass and the bulk bushmeat price (top) and (ii) the average animal mass and its unit (kg) bushmeat price (bottom) in Bela and Libongo, Cameroon, 2007.

A correlation analysis to determine whether number or mass contributed most to the annual revenues of hunters indicated only a weak correlation between the total revenue and the number of animals hunted per species (r = 0.452) . However, the revenues earned by hunters were highly correlated to the mass of the hunted animals (r = 0.943) because the total bushmeat mass is a combination of animal size and number. Hunters are likely motivated to hunt more animals of high body mass than numerous but smaller animals. This may explain the high hunting pressures on bongo. The high frequency of capturing blue duikers is likely associated with the relative ease of capturing them with cable snares rather than because of their value (Noss, 1998).

The relationship between the average animal mass and the bulk bushmeat price (Figure 2) showed that the value of animals generally increases with their mass because large animals provide large quantities of food (R^2 = *0.9476*). Almost 95% of the variation in animal prizes can be explained with the average animal mass by fitting a power function. On the other hand, the larger animals are worth less per kilogram (Figure 2). That is, the unit price of a kilogram of bushmeat decreases with the total mass of the animal hunted (R^2 = 0.6333). In this case a power function can explain only 63% of the variation because the lack of refrigeration compels the rapid sale of a large bulk of bushmeat. It is also possible that some smaller animals are delicacies and preferred by the buyers who pay a high price per kilogram.

Despite the positive relationship between the number of hunted animals and their total value (Figure 3), there is much (33%) unexplained variation due to differences in

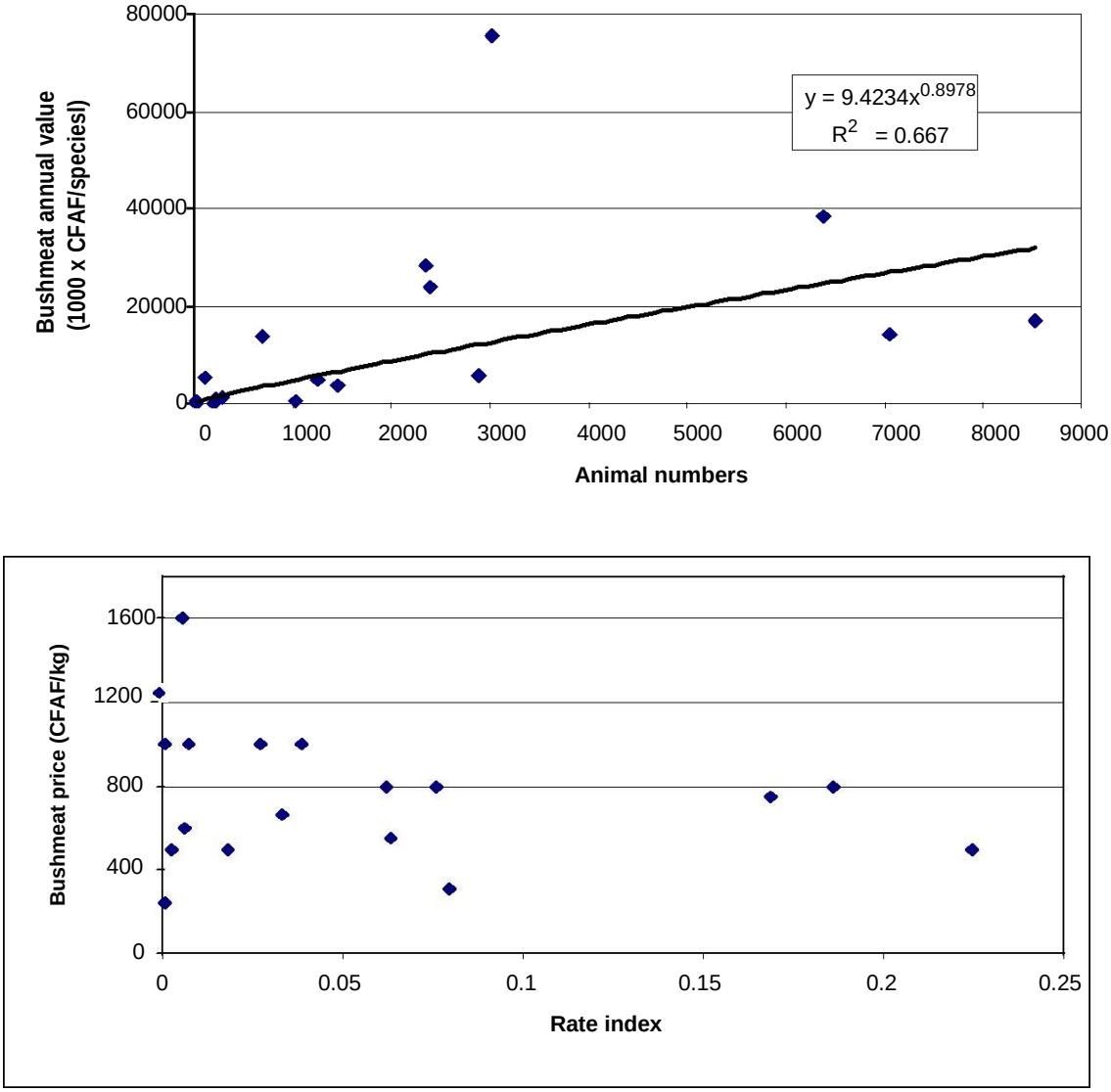

Figure 3. Relationships between (i) the number of all animals hunted and their (total) bushmeat value (top), and between (ii) hunters' rate index and the price of bushmeat per killogram (bottom) in Bela and Libongo, Cameroon, 2007.

the animal mass and price per kilogram of the hunted species.

The hunters' rating of the hunted species was not associated with the bushmeat price on a per kilogram basis (Figure 3) because there was no relationship between their ratings and the bushmeat unit price. The most hunted animals were priced at an average level while there is a large price range for the less frequently hunted species. This may indicate an opportunistic nature of the hunts which may be more dependent on animal population densities rather than their value per kilogram. The "random" nature of hunting may be a preferred phenomenon from a sustainability view point because unlikely hunters will persist in finding less common species by declining to hunt the easiest species to find. On the other hand, any attempt to regulate species populations by selective culling may be resisted by the opportunistic bushmeat hunters. Proper game management may enhance ecosystem capacity but a better understanding of the biology and ecology of the game and the needs of the hunting communities is essential.

Over 484 tons of bushmeat, valued at over 234 million CFAF are hunted each year in Bela and Libongo (Table 4). This amount includes all the costs incurred by the hunters because it is the gross value of all animals captured. Although in terms of numbers, the bongo does not feature as the most hunted animal, it becomes the most hunted species in terms of the total mass and value estimated at 241.3 tons and 75.4 million CFAF (Figures 4 and 5).

Table 5. Extrapolation of the number and mass of hunted animals and the bushmeat revenue from Bela and Libongo to the 14 villages around the Lobeke National Park, Cameroon.

Region	Population	Number of animals	Mass (kg)	Revenue (CFAF)
Bela/Libongo	6000	37960	484 290	234 058 548
Lobeke National Park area	26000	164493	2 098 590	1 014 253 708

Table 6. Hunting methods, number of hunters and weekly number of animals hunted in Bela and Libongo, Cameroon, 2007.

Hunting method	Hunters		Animals	
	Number	Percentage	Number/week	Percentage
Guns	1	1.0	8	1.1
Guns and wire traps	27	27.3	264	36.2
Wire traps	41	41.4	275	37.7
Wire and rope traps	30	30.3	183	25.1
Total	99	100.0	730	100.0

If in just two logging towns, over 484 tons of bushmeat are harvested per year for consumption and trade, the total annual harvest of bushmeat, defined to be between one and five million tons in the Afrotropical region, may be a substantial under -estimate (Wilkie and Carpenter, 1999; Fa et al., 2002). The estimates of bushmeat consumption in the Congo Basin by Nasi (2007) seems to be more realistic:

Cameroon, 78 077 tons
Democratic Republic of Congo, 1 067 873
tons Republic of Congo, 16 325 tons
Central African Republic, 12 976 tons
Equatorial Guinea, 9 762 tons
Gabon, 11 381 tons

Libongo and Bela harbour a total population of about 6000 inhabitants and the total population of the 14 villages around LNP was estimated at 26 000 people (MINEF, 2004). The extrapolation of the bushmeat supplies from Bela and Libongo to the entire LNP region further reveals the likely extent of hunting (Table 5).

Moreover, the estimate made for Bela and Libongo did not include other less frequently captured animal species, which, according to Fa et al. (2003), could furnish appreciable quantities of bushmeat. Reptiles and birds as well as meat from elephants and other protected animals were not mentioned by hunters, suggesting that the esti-mates made in our study could also have suffered from an underestimation.

Hunting methods

Four combinations of three hunting methods were used by the Libongo and Bela hunters (Table 6). Some used only guns (1.0%) or wire traps (41.4%) as single hunting methods. Other hunters used a combination of guns and wire traps (27.3%) or wire and rope traps (30.3%). No hunter used only rope traps as required by the wildlife law in Cameroon. Ropes are natural materials gathered from the forest, usually lianas or climbers with relatively high strength and used locally for setting traps in the place of metallic wires.

The most popular hunting tool was the wire trap. However the most effective hunting technique involved a combination of guns and wire traps. This method yielded on average 9.8 animals hunted per week compared to 6.1 animals per week for the least effective method (wire and rope traps). Rope traps are less effective because they usually loose their strength after a few weeks. Guns are expensive and few hunters can afford to stay in the forest at night to use guns when many animals are active.

The legal implications of hunting were studied by Eves (2002) who defined various types of venison:

- bushmeat is considered to be illegally derived from wildlife, by hunting either, (i) through the use of illegal hunting methods (wire traps, unregistered guns, etc.), (ii) killing endangered, threatened or protected species, (iii) in protected or excluded areas, or (iv) for trade or commercial gains;
- game meat is defined as legally obtained in commercial (private or communal) operations that are regulated and controlled, where monitoring of the wildlife populations and habitat is carried out, and where trade is legally conducted by authorized agents;
- wild meat is that meat which is derived mainly for subsistence and local trade only by using legal means and conducted by individuals with legal rights to hunt animals officially specified for culling.

According to the above definitions, all the meat investigated

Table 7. Other sources of revenue (CFAF) for hunters in Bela and Kibongo, Cameroon, 2007.

Categories	Monthly mean	Standard deviation	Number of hunters	Monthly aggregate	Annual aggregate
Work at SEFAC	50 000	24 833	7	350 000	4 200 000
NTFP gathering	5 375	2 744	28	150 500	1 806 000
Livestock	12 625	6 802	8	101 000	1 212 000
Agriculture	5 143	2 797	14	72 000	864 000
Small business/trade	20 000	8 660	3	60 000	720 000
Fishing	9 750	7 320	4	39 000	468 000
Carpentry	30 000	.	1	30 000	360 000
Sawmill waste collection/sale	11 000	1 414	2	22 000	264 000
Barbing	20 000	0	1	20 000	240 000
Shoe mending	15 000	0	1	15 000	180 000
Fuelwood collection/sale	6 500	2 121	2	13 000	156 000
No alternative	-	-	28	-	-
Total	-	-	99	872 500	10 470 000

during this study must be classified as bushmeat. Specifically related to Cameroon, the conditions for hunting are clearly spelt out for trophy hunters but for bushmeat hunters the procedure seems problematic and need further analysis and overhauls. The 1994 Forestry and Wildlife Laws spells out hunting rights for subsistence and not for commercial purposes. A permit is required for all forms of commercial hunting (MINEF, 1994). Unfortunately, local hunters located in forested regions do not have access to these permits because of ignorance of legal requirements, long and complicated procedures, long distances to administrative centres and high transaction costs. Therefore, all the hunters from Bela and Libongo are unlawful because their guns are unregistered, they use illegal hunting techniques and all the hunters sell some of the bushmeat for income to feed their families. Given no current substitute to bushmeat in the area, perhaps the legal status of bushmeat can be redefined. There is after all a governmental to ensure that the protein needs of the people in the region can be met in other ways.

Hunting costs

The total annual costs of hunting operations in Bela and Libongo were calculated by subtracting the money retained from hunting, that is 71.6 million CFAF from the gross revenue of 234 million CFAF. Therefore the cost of all hunting operations was estimated at 162.4 million CFAF, 69.4% of the total annual gross revenue. This high operational cost for hunters is not surprising because hunters make at least 15 trips to the forest per month. They incur substantial costs of labour for seasoning meat in the forest, long distance transportation from and to hunting sites, purchase of wires, guns, food and other supplies supplies. The latter include pots for cooking, machetes, polythene bags, tents, rubber shoes and so on. There are other sporadic costs that might actually reduce their income. Such costs include: the seizing of bushmeat by conservation and law enforcement officers, waste of meat (decay) associated with poor drying or the ill-health of hunters; theft of bushmeat from hiding places associated with the clandestine nature of the business; bribing eco-guards to be set free; and payments of informal taxes to some forest officers to get protection and information on anti-poaching strategies. Poor salary structures of conservation agents and government officials render most of them vulnerable to bribes of bushmeat or cash. Some resilient hunters hunt with appreciable sums of money. If they are apprehended by one or two eco-guards, they bribe them immediately and they are set free. Bribery is difficult to when the eco-guards are many or are escorted by their supervisors for joint anti-poaching patrols and in the presence of some drivers that are loyal to the senior management of conservation organisations. The varying and informal ways these costs are incurred make them difficult to measure when using conventional research methods. Despite the overall high proportion of the costs, the revenue earned by a hunter remains appreciable under the contemporary socio-economic circumstances in Cameroon.

From the above analysis, the average income earned by a hunter is twice as high as the average income of a labourer (35 000 CFAF) or almost equal to the salary of a senior technician (80 000 CFAF) working at the SEFAC sawmill or an eco-guard working for conservation and development organizations. For the local people without professional education and employment, hunting provides for their needs at an economic level roughly equal to those of their employed neighbours. This simple comparison suggests a high financial incentive for hunting to meet

Table 8. Results of the logit analysis on the determinants of hunting revenues for hunters in Bela and Libongo, Southeast of Cameroon (– coefficient; SE – standard error; df – degrees of freedom; p – probabilities; OR – odds ratios).

Independent variables		SE	df	p	Odds Ratio
Education level			2	0.54	
No formal education	0.824	1.271	1	0.52	2.28
Primary education	0.076	1.140	1	0.95	1.08
Marital status	0.963	0.722	1	0.18	2.62
Other sources of revenue	0.000	0.000	1	0.21	1.00
Time in activity	1.202	0.558	1	0.03	3.01
Age	0.155	0.079	1	0.05	1.17
Ethnic group			2	0.05	
Other Cameroonians	1.322	0.578	1	0.02	3.75
Bangando /Bakwele	1.818	1.296	1	0.16	6.16
Year hunting	-0.165	0.093	1	0.08	0.85
Household size	-0.070	0.124	1	0.58	0.93
Constant	-3.455	2.235	1	0.12	0.03
Correct prediction		64.3			
R^2		0.3			
Log likelihood		111.045			

meet daily needs despite the official suppressive measures taken against poaching.

Revenue alternatives

Eleven additional income generating activities were reported by most (71.7%) hunters (Table 7). More stringent hunters (28.3%) believed that there was no visible source of income besides hunting.

Some hunters believed that alternative activities such as agriculture were capital intensive and the amount of capi-tal required for starting alternative commercial activities remained beyond the financial means of a typical village hunter. According to Messer (2000), measures on provi-ding alternatives to poaching need to be addressed at the level of policy-making on wildlife management and con-servation. Some hunters, when asked about their job preferences, often opted for a job in a logging company or any other formal job because hunting activities need their constant presence in the forest, which in most cases they found difficult and risky.

Regression results

The model on the revenue of hunters was significant with a log likelihood ratio (LR) of 111.0 which was higher than the Chi-square of 24.2 (df = 10; = 0.05). The explana-tory power of the model was high as indicated by the goodness of fit statistic (R^2 = 0.3). Three variables (education level, marital status and other sources of revenue) had slight positive influence on hunting revenues, while years of hunting and household size had slight negative influences. Three variables significantly explained the determinants of hunters' revenues: age, time in activity, and ethnic group; all in conformity with the expected signs (Table 8).

Time in activity (= 1.202; p 0.05; OR = 3.0) was positively linked to the revenue from hunting, with full-time hunters having as much as a three times higher probability to earn higher income than part-timers. Age (= 0.155; p 0.05; OR = 1.2), was related to hunting revenue, meaning that age increased the probability of yielding a higher revenue from hunting. Ethnic group also determined the probability of increased revenue from hunting. Other Cameroonians (= 1.322; p 0.05; OR = 3.75) were characterised by a 3.7 higher probability to earn higher income from hunting than indigenous people (Baka and Bangando/Bakwele). The model, therefore, demonstrated that older full-time hunters from other parts of Cameroon were most likely to earn higher revenue from bush meat hunting activities than others.

Conclusion and Recommendations

Bushmeat has always been an important component of the diet of millions of people in the tropics, especially forest-dependent people in the Congo Basin. Not only are there high economic incentives for poaching but also bushmeat supplied by poachers is the only source of protein in rural areas. Hunters find new ways to contravene or circumvent conservation policies and strategies to sustain their activities. The bushmeat discourse for the Congo Basin and any other region in the world has often failed to address the protein needs of the

truly bushmeat-dependent populations with the consequent depletion of the most sought- after wild animals, despite all suppressive measures by conservation and government agencies.

These errors have to be corrected in the Congo Basin as regional governments are making strong commitments to ensure sustainable forest and wildlife management. They are assisted by regional processes, such as the Central African Forests Commission (COMIFAC), a joint action plan on anti-poaching strategies, established to reduce poaching and to ensure the conservation of wild animals. The use of empathy by policy makers and conservation agencies towards the animal protein shortages in rural areas is strongly recommended. This study showed that any suppressive measures which are impregnated with shortfalls might never yield desired results unless alternative protein sources and adequate income generating activities are provided to the rural poor. Alternative protein sources could include chicken, fish, mutton, beef as well as goat meat and efforts should be made for their local production. This strategy could reduce poaching and enhance the conservation of animal populations in the forest.

Given the economic and dietary incentives of hunting in logging towns in the Congo Basin, there is a need for more research to guide further social and environmental developments on the following topics:

1.) Design cost-effective commercial activities that hunters could get involved in, to reduce their dependency on poaching.
2.) Develop local technologies and schemes for comercial meat production and supplies at prices compatible to bushmeat prices.
3.) Determine an understanding of financial compensations that can enable hunters to abandon hunting at the financial cost compatible to the cost of suppressive, anti-poaching measures.
4.) Establish hunter associations responsible for a sustainable and environmentally sound game management, for regulated and legal hunting and sell off the culled animals to be commercially processed and distributed.
5.) Develop forestry-based game farms for the local supply of meat and trophy hunting.

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Appendix 1: Poaching economics Questionnaire in the Congo Basin

In the last three decades, there have been a number of confrontations between local hunters and conservation organisations regarding the killing of wild animals for local livelihood portfolios such as food and income. No clear policy statements have been made to have a win-win outcome, where the basic needs of the hunters are met alongside the conservation objective of sustaining the existence of targeted animals. Instead suppressive measures have been attempted involving hiring ecoguards, policing the forests and markets, seizing ammunition and hunting equipment as well as imprisoning local hunters. This has been viewed with mixed feelings by both the local people and other development workers. However, there is recent re-awakening to examine why poaching persists despite all suppressive measures. What incentives sustain poaching activities? Are there alternative activities that poachers could get involved to reduce the time allocated to poaching? This study aims at estimating the economic incentive to poaching as well as poachers' minimum willingness to accept (WTA) compensation for abandoning poaching for other local economic activities. Please, give your most sincere opinion as this would not be used to criminalize you, rather it could help provide lasting solutions that benefit the people as well as the sustainable use of wild animals.

1. Name
2. Number of children
3. Age
4. Ethnic group
5. Education
6. Marital status
7. Number of years as hunter
8. Occupation as hunter a) Full-time b) Part-time
9. Number of animals captured per week:
a). Number sold per week:
b). Number eaten per week:
10. Main five species in order of frequency of capture:
11. According to you what is the best alternative activity to poaching:
13. How much income excluding all expenses from animal sale per week?
14. Hunting tools:
a). wire traps
b). Gun c). Ropes d). a&b e). a&c f). b&c
15. Source of capital:
a). Self finances b). Village sponsor c). External sponsor d). Borrowed money
16. Other sources of revenue
a). Agriculture

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b). Fishing
c). Livestock
d). Trade
e). NTFP collection
f). Employment at logging company (SEFAC)
17. Best other source of revenue:
18. Approximate weekly income from other sources of income:

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