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Getting to grips with the magnitude of exploitation: Bushmeat in the Cross–Sanaga rivers region, Nigeria and Cameroon

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ABSTRACT

Wild meat harvests in African moist forests are presumed to exceed production, even in the case of traditional societies still using rudimentary hunting methods. Though some approximations do exist of the volume of bushmeat harvested in some Central African moist forest areas, estimates based on extensive and simultaneous sampling, within a large geographical region, are not available. Here, we present the results of the first reported study of this kind. During a period of 5 month, we counted bushmeat carcasses deposited in 89 urban and rural markets in a 35,000 km^2 area between the Cross River in Nigeria and the Sanaga River in Cameroon. We used these data to calculate annual bushmeat volume traded by site, species and overall in the study area.

Mammals represented >90% of the bushmeat carcasses sold in all sites. Reptiles were also abundant, but birds and amphibians were relatively scarce. Estimates of carcasses extracted and crude biomass per site varied significantly between countries. In Nigeria, biomass (kg) extracted for sale per km^2 per year, was three times greater (600 kg/km^2) than in Cameroon. Conservative estimates for the entire study area indicate that >900,000 reptiles, birds and mammals are sold each year by the rural and urban population, corresponding to around 12,000 tonnes of terrestrial vertebrates. We also assessed the relationship between bushmeat harvested for sale and distance of the study settlements from the main protected areas (Cross River and Korup National Parks). The number of carcasses and biomass sold was negatively related to the proximity to the national parks in >50% of species in Nigeria, and in 40% of species in Cameroon.

Our cross-site comparison documents the staggering volume of wild species affected by hunting in the region. We also conclude that species within the main protected areas in both countries are likely to be negatively affected by the current and future demand for bushmeat in the surrounding areas.

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1. Introduction

Wildlife is harvested for food or "bushmeat" throughout the humid tropics (Milner-Gulland and Bennett, 2003). Although for millennia humans have been hunting wildlife in tropical forests, consumption has greatly increased in the last few decades. Losses of tropical forest species due to unsustainable hunting have already occurred in Asian forests (Bennett and Rao, 2002) and African forest species are now experiencing similar threats over wide areas (Fa et al., 2001). Depletion of forest wildlife will not only impact biodiversity, but can also have a negative effect on the food security of the region (Fa et al., 2004).

In small discrete areas, such as around a hunting village, the status of hunted species can be determined directly and most cost-effectively by traditional survey techniques (e.g. Robinson and Bennett, 2000a; Bodmer and Puertas, 2000). Multiple-site surveys are necessary to obtain accurate assessments of the magnitude of bushmeat extraction in large tracts of forests. However, such methods are very expensive and labour-intensive at such large scales. An alternative method of estimating the state of hunted faunal assemblages is to conduct carcass counts of species at bushmeat markets, since these are found in almost every town and village and are important concentration points of wildlife harvests in surrounding catchment areas (Juste et al., 1995; Fa et al., 2001). Although accuracy may be compromised by variation in hunting effort, initial faunal assemblages and their densities, market data can be useful as a measure of hunting pressure within supply areas.

We gathered information about volume and identity of bushmeat taxa available in market sites in moist tropical forests between the Cross River in Nigeria and the Sanaga River in Cameroon. These forests are rich in animal species, many of which are endemic. Some parts of the forest are protected although the area is heavily affected by human use, including logging and plantation agriculture.

Here we present the results of bushmeat carcass counts from a large sample of study sites. We use these data to estimate bushmeat traded per year from the study area. We examine differences between sites and countries, and we investigate whether proximity to the main protected areas can explain recorded bushmeat levels in both countries. Finally, we discuss the implications of these results for bushmeat extraction in the entire Central African moist forests, defined here as the extent of dense humid forests in the Congo River Basin, and extending west to the right bank of Cross River in Nigeria.

2. Methods

2.1. Study area

Our study area covers a total area of 35,324 km^2, and extends from the right bank of the Cross River in South-Eastern Nigeria, along the coast towards the Sanaga River in Cameroon, and inland up to 150 km from Douala. The majority of the area belongs to Cameroon (24,529 km^2) and the rest to Nigeria (10,795 km^2). At the eastern and western margins of the study area the topography is low, while the border region between Nigeria and Cameroon is mountainous and includes the Rumpi Hills, Bakossi Mountains, Mount Nlonako, Mount Kupe and Mount Manengouba. Mount Cameroon, the highest mountain in West Africa (4095 m) and also the most active volcano, lies along the South-Eastern corner of the study area.

Rainfall averages 3000 mm/yr, but can exceed 10,000 mm/yr with little seasonal variation in montane areas. There can be a short but sometimes severe dry season of 2–3 months. Humidity is high (rarely <90%) and daily temperatures range from 15 to 33 °C, with very minor seasonal differences. The principal vegetation is hygrophilous coastal evergreen rain forest, with mixed moist semi-evergreen rain forest, turning into savanna further inland in the drier regions (White, 1983). In the highland regions above 800 m, vegetation is submontane or montane forest. A mosaic of farm and fallow covers most of the area, especially the extreme eastern and western parts.

Despite much deforestation, there are still extensive areas of rain forest (World Resources Institute, 2005). The forests in the border region between Nigeria and Cameroon are a particularly important conservation areas, with populations of an endemic chimpanzee subspecies (*Pan troglodytes vellerosus*), and forest elephants (*Loxodonta cyclotis*) (Oates, 1999). In some parts, forest areas are sufficiently large and interconnected that migration of forest elephants still occurs. The largest protected area in the Cameroon region is the Korup National Park (1256 km^2), while in Nigeria it is the Cross River National Park, which is made up of the Oban and Okwango divisions and covers 3586 km^2.

We estimated human population numbers in the Nigeria study area from the Government of Nigeria census data for the relevant political regions within the Cross River state (National Population Commission, 1991). For Cameroon, we used human population figures for the South-West and Littoral Provinces given in PNUD (2000a,b). Because available figures were from 1991 for Nigeria and from 2000 for Cameroon, we estimated the population during our study in 2002 by extrapolating at an annual rate of increase of 2.7% (United Nations Development Programme, 2004). We estimated a total of 1,342,871 inhabitants for the Nigeria section, and 3,873,740 for Cameroon. Most inhabitants were concentrated in the large cities and surroundings (e.g., Calabar and Douala). The Calabar municipality (442,053 inhabitants) accounted for 33% of the population in the Nigeria study area and the Douala municipality (1,452,646 inhabitants) made up 37% of the Cameroon population.

2.2. Sampling sites

Reconnaissance trips to bushmeat markets and source villages throughout the study area were undertaken during December 2001–January 2002. We then conducted a pilot study in Cameroon in February 2002 to standardize sample collection. This showed that it was possible to survey a maximum of 90 localities over 5 month, because of the cost constraints of deploying field personnel. Data collection was conducted between August 2002 and January 2003 in order to cover both wet and dry seasons. This time period is statistically adequate based on Fa et al.'s (2004) assessment of the

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