

A zoo-led study of the great ape bushmeat commodity chain in Cameroon

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ABSTRACT

Current levels of bushmeat hunting in west and central Africa are largely unsustainable, and will lead to the loss of an important natural resource and cause the extinction of threatened species. Worryingly, great apes are hunted for their meat despite being protected across their range. In this paper, we highlight the main actors involved in the trafficking of great ape meat around the Dja Biosphere Reserve (DBR) in Cameroon, and describe the commodity chain associated with the trade. In total, 78 hunters, porters, traders and consumers were interviewed. Hunters, all men, were primarily driven by profit, encouraged by middlemen, though some hunt for their own consumption. However, we identify that great ape hunting is undertaken by specialised hunters along a relatively short supply chain. Gorilla and chimpanzee meat is sold to restaurants and wealthy buyers via few intermediaries. The price of great ape meat varied at different stages of the chain. Middlemen obtained the greatest financial gain, whereas wholesale traders profited least. Movement of ape meat to markets was predominantly by public transport and facilitated by drivers who can pass through checkpoints unnoticed. Based on our study we recommend potential interventions, including support of law enforcement, investments in conservation and development initiatives, and monitoring and research.

Key-words: bushmeat; chimpanzees; commercial trade; conservation; gorillas; hunting; illegal meat; primates; supply chain; zoos.

INTRODUCTION

Bushmeat is the term given to the meat of wild animals that are hunted, captured and killed for their meat. Countless rural communities (including many indigenous people) inhabiting rainforests worldwide, depend on hunting wildlife for food and income (Elliott *et al.*, 2002). In some cases, bushmeat can account for almost all the animal protein in the diets of some peoples and rural subjects show a consistent partiality for wild meat in taste-preference tests (Fa *et al.*, 2003; Schenck *et al.*, 2006). However, the rapid urbanization of tropical forest regions has increased the demand for bushmeat from towns and cities (De Merode & Cowlshaw, 2006; Wright & Priston, 2010; Martin *et al.*, 2012; Obioha *et al.*, 2012). Moreover, improvements in hunting technology as well as the greater availability of guns have boosted bushmeat extraction levels and the bushmeat trade (e.g. Dounias, 2016). The overall result is that bushmeat hunting has rapidly become unsustainable in many parts of the world and some wildlife species, especially large-bodied mammals, are seriously threatened with extinction (Robinson & Bodmer, 1999; Barnes, 2002; Gandiwa *et al.*, 2013; Fa *et al.*, 2016; Ripple *et al.*, 2016). There is also growing evidence that as species that play an important

function in ecosystems (e.g. seed dispersers) are eliminated through overhunting, this leads to cascading alterations of ecosystems and the loss of ecological interactions and, in turn, impact other ecosystem and social services (Dirzo *et al.*, 2014; Petrozzi *et al.*, 2016).

In total, 504 primate species in 79 genera are found worldwide. Of these, c. 60% are threatened with extinction from hunting and trapping (Estrada *et al.*, 2017); monkeys and apes constitute one of the three most-hunted animal prey groups (along with ungulates and rodents) (Fa & Tagg, 2016). As a result, many primate populations across the world are declining in numbers, especially when hunting occurs alongside other threats, such as habitat loss and disease (Kormos & Boesch, 2003; Walsh *et al.*, 2003; Linder & Oates, 2011; Cronin *et al.*, 2017). In the case of great apes, even comparatively low hunting levels can severely impact their populations because these species have relatively slow life-history strategies and they have a greater vulnerability to hunters, especially as most great apes live in large, noisy groups (e.g. Marshall *et al.*, 2009; Linder & Oates, 2011).

African great apes, chimpanzees (*Pan* spp) and gorillas (*Gorilla* spp), are hunted primarily for their meat, but sometimes for trophies, medicines or even pets. Great ape body parts are also used in traditional beliefs: for example, gorilla hair is employed to boost the production of fruit and pistachio trees, and chimpanzee skulls are placed in a river to provoke rainfall if the dry season is too long.

Ape meat is considered highly desirable by the wealthy in most countries where great apes are found, and because of its higher price (and greater 'return per cartridge') these species become a target for specialist hunters (Starkey, 2004). However, pursuing, capturing, keeping and killing of chimpanzees and gorillas is prohibited across their range countries.

Although there is considerable information available on the biological impacts of the bushmeat trade, information is generally lacking on how bushmeat reaches its point of consumption from its place of extraction (Robinson *et al.*, 1999; Cowlshaw *et al.*, 2005). This, components of what is known as the commodity chain, is defined as 'the ensemble of activities and relations in and around the production, exchange, transport and distribution' of a specified commodity (Ribot, 1998).

Bushmeat commodity-chain analyses have been undertaken for multiple species traded in markets, or more specifically for animal groups such as pangolins and fruit bats (Mendelson *et al.*, 2003; Cowlshaw *et al.*, 2005; Boakye *et al.*, 2016; Kamins *et al.*, 2011). In contrast, for species such as great apes, whose hunting and killing is an 'illegal wildlife crime', no trade is

permitted. Despite this, buying and selling of great ape meat is actively carried out on the black market and through closely guarded networks. Thus, understanding the stages and actors involved in the great ape meat commodity chain becomes even more important for pinpointing ways of enforcing cost-effective, realistic measures to break, weaken or even replace parts of the chain (Cowlshaw *et al.*, 2005). To our knowledge, there have been no commodity-chain analyses for the African great ape meat.

We undertook a study of the great ape meat commodity chain at a number of sites in the northern and western periphery of the Dja Biosphere Reserve (DBR) in south-eastern Cameroon. The DBR (5260 km²), mostly lowland rainforest, is noted for its rich biodiversity, in particular important populations of the Western lowland gorilla *Gorilla gorilla gorilla* and Central chimpanzee *Pan troglodytes troglodytes*, among other species (IUCN, 2014; Betti, unpubl.). Despite this, managing the conservation of the area continues to be hugely challenging because the wildlife that inhabit the DBR is heavily hunted. Here we report on a study, led by a consortium of zoos (Royal Zoological Society of Antwerp, Belgium; Bristol Zoological Society, UK; Zoological Society of London, UK) together with the Living Earth Foundation (UK), that aimed to determine the main actors involved in the ape meat trade as well as identifying the existing links along the chain. We also investigated, as far as possible, the income captured by the different actors involved in the trade. The ultimate aim was to stimulate debate and discussion among decision makers and find ways of tackling the illegal trade of great apes in the region. Finally, we provide recommendations on how zoos can better support the mitigation of the illegal bushmeat trade.

DATA COLLECTION AND ANALYSIS

In order to obtain information on the bushmeat commodity chain 78 face-to-face interviews directed at suppliers [hunters ($n = 51$), including 31 opportunistic hunters, 7 specialist hunters, and 13 hunters who declined to answer the question, traders ($n = 22$): wholesalers and retailers in villages, markets and restaurants) and consumers ($n = 5$) were conducted in six villages and three bushmeat markets along the east, and seven villages in the west of the periphery of the DBR (Fig. 1).

Within the communities, information on hunting and the movement of meat was obtained via interviews with people in their homes. Access to the villages was obtained via the village chief. An initial mission involved presenting the study objectives to the chiefs and notables of each village using different reasons for our visit to avoid biased responses and hostility towards. A second mission involved spending several days in the village observing and listening, and identifying key actors, followed by discreet interviews and observations of the

respondent. As the interviews evolved, questions were added to our questionnaire. When a respondent developed a certain mistrust of a question, a banal question was immediately raised to restore confidence. Another route of access to the community, as developed through previous initiatives in the region, was via 'community guides' who not only introduced the researchers to other participants but also provided direct information on hunting and trade of great apes within the community. We also interviewed representatives of the government's forestry and conservation services, including forest guards, the Conservator of the DBR, the district wildlife-management supervisor, as well as district forestry-management supervisors.

These data were supplemented with direct observations and interviews carried out in local markets (such as Lomié, Abong-Mbang and Mindourou). To establish a relationship of trust in markets, access was sought via the president of the shopkeepers, with whom discussions were held to discuss our objectives and seek access to the bushmeat traders. Subsequently, several days were spent interacting and listening to the traders, and counting the different species on sale, daily, where possible. In cases where suspicious traders refused to interact, a different approach was used, whereby researchers posed as consumers and obtained information through this role play with the traders.

Given that great ape hunting and consumption is illegal, it must be borne in mind that some interviewees may have provided inaccurate information. Information received, however, was triangulated as much as possible, via discussions with other groups. For example, informal discussions were held whenever an opportunity arose with individuals and groups in transport agencies in bushmeat-collection areas, as well as with motorbike taxi-drivers, heads of transport agencies, coach drivers, members of local monitoring committees, village leaders, passengers in public buses, and consumers in villages and restaurants. Information was readily gained through such discussions, and aided in confirming facts and figures obtained directly from interviews. In addition, information was, to some extent, 'ground-truthed' given the long-established activity of the researchers in the region.

We focused only on actors and ape-meat transactions within rural areas and did not extend our analyses to the movement of meat to urban centres, such as the capital city Yaoundé or beyond, or to the elite or members of the higher echelons of society, partly for reasons of personal safety. All interviews were conducted between May and December 2014, with a follow-up research period during 2015.

Information on financial costs of participation and profits was derived from interviews with the traders and hunters targeted by this survey; no specific transactions were observed. We calculated the following: net profit (NP) = gross profit (GP) – total costs (TC); gross profit = sales price (SP) – purchase price (PP).

ACTORS AND TRADE ALONG THE COMMODITY CHAIN

Participants involved in the ape-meat trade have a variety of roles: some participants (hunters, carriers, traders) supply great-ape meat to the final consumer, while others influence the trade in other ways (middlemen, forestry administration, consumers) (Fig. 2).

Hunters

Hunters were all men, who were either casual/opportunistic hunters (61% of our sample) that pursued all types of prey for their own consumption and sold a surplus, or specialised hunters (14%) who only targeted apes for profit (25% of hunters refrained from categorising themselves). Great apes were primarily hunted for their meat, and consumers can pay a premium price per kilo of this meat because it is considered very tasty (Box 1). Great ape hunters declared themselves as being part of a well-structured trade network that included the highest local-government spheres.

Hunting was practised all year but hunters also engaged in agriculture (66·7%), fishing (7·8%), harvesting forest products, domestic farming or traditional healing (2% each), or were employed in nearby forestry companies (13·7%). Hunting of great apes was carried out with home-made shotguns or commercially produced 12-bore guns, which are either owned by the hunter (purchased in the hunter's village, purchased further afield, inherited from grandparents or received as gifts from family members who are retired uniformed personnel; e.g. military, gendarmes, police officers) or were leased from others. The research team also noted the presence of 'Simplex' weapons (a local term), which are specifically intended for big-game hunting, especially elephants. Whatever the type of weapon used (home-made shotgun or 12 bore), the ammunition used in the study target area was buckshot, locally called 'two zero', and other cartridges known locally as 'one zero'.

Almost half of all hunters (25 of 51: 49%) claimed they would cease if they had a viable alternative such as paid employment or were funded to carry out agriculture or livestock activities. The remaining 51% stated they did not intend to stop hunting even if there was an alternative, because of the considerable income accrued from this activity and the importance of tradition. Among the seven specialist great ape hunters, most (71·4%: $n = 5$) of those interviewed argued they would not stop hunting.

Carriers

When an opportunistic hunter shoots a gorilla or a chimpanzee, it is butchered in the forest and discreetly carried back to the village, possibly with the help of porters. However, specialist great ape hunters may enter the forest with porters. Meat will be fully smoke-dried for preservation and then the porters will carry the game on their heads or by motorbike in hard-to-access areas to deliver it directly to the customer or to deposit it at a pre-determined location for the middleman or trader to collect. Other carriers involved include drivers of bush taxis, buses, logging trucks and some private cars. Porters can also be hired by middlemen and are paid in cash or in kind (meat). As the trade of great apes is illegal, the actors develop strategies to transport their produce without being caught; for example, by concealing it (e.g. hiding the meat inside car body panels or hidden in the cargo areas of trucks using separating panels), unofficial collaboration with Ministry of Forests and Wildlife (MINFOP) guards, or using cars that cannot be stopped and searched (i.e. '*immatriculation temporaire*', IT, and '*corps administratif*', CA, registered plates, which are used by international organisations and senior executives of the Cameroonian administration, respectively).

Traders

Traders sold meat in markets, restaurants and at home, and were either retail sellers (selling pieces rather than whole animals), wholesale traders, wholesale/retail sellers (those who sell both), or those who only sold meat to restaurants. Most traders practiced other income-generating activities, such as agriculture (82%), although some carried out small trade (9.1%), beekeeping (4.5%) and poultry farming (4.5%). Traders would buy meat from hunters or from middlemen, but usually meat from species other than great apes. Great ape meat was sold clandestinely to well-known buyers and restaurants, or transported directly to urban areas.

Middlemen

Middlemen (also referred to as 'intermediaries' or 'contractors'), included forestry administration personnel, and were known to subsidise hunting expeditions by the specialised hunters. They would supply these hunters with equipment (ammunition, flashlights, batteries and, sometimes, weapons) and money as well as assist them to extract bushmeat out of rural areas. Middlemen were typically motivated by the desire of market demand and, in some cases, provide supplies for urban restaurants. Middlemen were said to be motivated to serve individuals from the upper echelons of Cameroonian society, including members in political office. The middlemen, who form part of the supply chain (although invisible), have a pervasive sense of impunity (Mbété et al. 2011). Furthermore, specialist

hunters noted that they are not particularly afraid of denunciations made in the villages (unlike opportunistic hunters) because they may be covered by the middlemen, who had passed the order for the meat. These middlemen may be representatives of the elite and influential members of the local administration, who can prevent the arrest of hunters.

Government officials, especially the forest administration, play a role in the commodity chain. As law enforcers, they administer control barriers, undertake lightning-strike operations and generate intelligence from within communities. When great ape meat is seized, it is officially disposed of and the offender referred to the prosecutor's office. However, seizures were said to have decreased dramatically in the area according to informants because great apes have become scarcer. Weapons can also be seized during crackdown operations and are transferred to the territorial administration.

Consumers

The final link in the chain comprises the consumers. This part of the chain can vary in length, either being very short in cases when the hunter brings the meat directly to the home (if for family consumption or local sale) or longer in cases where meat is transported into a large nearby village or a nearby town, and traded by various actors before consumption. Our results indicate that ape meat is mainly consumed near at hand, close to where the animals are killed, and within the local communities and neighbouring small towns. While there is evidence of specific ape-meat orders by higher elite, because of the likely personal security risk in directly addressing this group, it was safer for us to focus on the commodity chain at the forest and village level.

Consumers source bushmeat either from the hunter who decides to sell surplus, from retailers who sell discreetly, from restaurant retailers or from middlemen on command. A common message received from consumers interviewed informally in villages and markets was that great ape meat is mainly consumed for its flavour. Some parts of the gorilla are popular because of their perceived effect on the skills and strength of people. Interviews in the Lomié area revealed that the chest, hands and ribs of the gorilla are considered symbols of respect, courage, strength and skill, and afford superiority to the person who consumes them.

FINANCIAL GAINS AND PROFIT

A captured great ape is butchered into pieces which are subsequently smoked; a chimpanzee produces in the region of 10–12 'cuts' of meat and a gorilla 18–20. Depending on the type of cut, the smoked chimpanzee or gorilla meat fetches, respectively, 1500–2000

XAF (c. 2–3 Euros) or 2000–3000 XAF (c. 3–5 Euros) per piece, when being sold locally by an opportunistic hunter. A specialist hunter, who has acquired or purchased his own firearm and ammunition, can receive in the region of 5000–6000 XAF (c. 8–9 Euros) per smoked piece of ape meat. Net profits varied significantly between actors. Our analyses of monetary gains and profits by the different actors clearly showed that the greatest returns from the trade of great ape meat are attained by the middlemen (Fig. 3). This finding is similar to the results of a study by Binot & Cornelis (2004) in Libreville, Gabon. The high profit margins for middlemen [128 400 XAF (c. 196 Euros)] result from the fact that their financial costs of participation in the trade chain were relatively low. Middlemen not only make significant profits but also use the meat to feed their families. Similarly, specialist hunters earn a considerable profit [78 750 XAF (c. 120 Euros)]. In contrast, opportunistic (subsistence) hunters will sell great ape meat acquired opportunistically relatively quickly but for very low prices [20 250 XAF (c. 31 Euros)] (see Box 1), to avoid being caught in possession of illegal meat, thus these hunters do not benefit prominently from the great ape commodity chain.

The profits of wholesale traders are lower than for middlemen and specialist hunters [66 000 XAF (c. 101 Euros)] as they have the greatest financial outlay and risk losing money. These traders subsequently earn a smaller profit on the sale of great ape meat and profits are directly linked to the expenses incurred. Therefore, they typically buy several different species, including small game which has much higher profit margins, to spread the costs associated with transport and ‘informal taxes’ (Bahuchet & Loveva, 2000). These expenses are linked to transport costs, harassment by law-enforcement agents, and to compensate for the number of days spent in the forest by the hunter and/or trader. Thus, wholesale traders prefer to spend several days in villages on one trip to collect a larger quantity of produce, to reduce costs.

The financial gain of the local retailers and restaurateurs calculated in this study were the lowest of all groups [15 000 XAF (c. 23 Euros)]. However, their net profit margins depend upon the number of pieces of meat and dishes of meat sold, which in turn affect the value of the produce being sold. Net-profit margins fall to the lower end of the range when there is more meat on the market; for example, when a whole animal is sold within one month.

RECOMMENDATIONS ARISING FROM THE STUDY

The findings of the study led to the formulation of a number of recommendations.

Law enforcement

Improved law enforcement is required to deter and prevent specialist hunters who are unlikely to be susceptible to change via social programmes (see section below) (Milner-Gulland & Bennett, 2003). This is ideally carried out via close collaboration with wildlife authorities, with a view to capacity-building and training of existing or new ministry-appointed game guards to ensure a regular and effective anti-poaching effort on the ground.

Stop transport routes

Stopping the transport routes that facilitate the trade in great ape meat would involve addressing both the capacity of game guards and the effectiveness of law enforcement. This could be approached by setting up effective and thorough road-checks both on main road networks which serve neighbouring towns and cities, and on smaller, less well-known trails between villages. Furthermore, the lack of 'will' to make changes to traditional behaviour and related corruption issues inherent in the system of game guards and their enforcement of the law, hamper progress in this area.

Develop social programmes

Programmes should be developed to investigate the provision of alternative sources of income for hunters/traders, in order to link them to conservation objectives (i.e. reduced trade of great apes), including the development of conservation agreements. These sources of income should comprise 'carrot' solutions; for example, targeting those hunters and traders who have stated that they are prepared to stop hunting great apes if they had an alternative way to make a living. It is important to note here that harsher 'stick' solutions explained in the law enforcement section above are necessary for specialist hunters who are less likely to be susceptible to change via social programmes. Zoo consortiums can seek to support agencies on the ground in order to work with communities to obtain community participation in local wildlife management. For example, local authorities and experts can assist community-appointed groups to assign hunting and no-take areas, and set restrictions on when and how much hunting is permitted, and of which species; thus, leading to a regulation of sustainable hunting of only the permitted species, which can increase understanding and motivation to adhere to restrictions (Milner-Gulland & Bennett, 2003). Such initiatives can include reward systems for informants. It should be noted, however, that zoning and quota hard to enforce.

Improve monitoring and research

Additional monitoring and research, specifically on urban consumers and intermediaries, the volume of the trade and the rates of harvest, is necessary to identify and understand the drivers of great ape meat consumption. It is also necessary to ascertain chimpanzee and

gorilla population densities across their range, in order to monitor trends and evaluate the effectiveness of any interventions in the great ape meat trade, particularly in areas where data are lacking (Brashares *et al.*, 2011).

CONCLUSION

Many primate species, including great apes, are increasingly threatened across their range as a result of hunting and trading. Understanding more about the actors and stages involved in the chain of this trade can inform and guide conservation interventions. To respond to this need, this study offers important information on the actors involved, their respective financial gains, and the main trade routes involved in the commodity chain of integrally protected and Critically Endangered species, chimpanzees and gorillas. Zoos worldwide increasingly invest more and more in the *in situ* conservation of the species and taxa that they manage at their institutions. If the long-term preservation of wild great apes is to be achieved, addressing and mitigating the massive, widespread and accelerating threat from hunting and trading is essential. Efforts must be stepped up, by raising or pledging financial contributions to *in situ* conservation efforts, and by communicating appropriately with the public who are informed and educated during their visits to zoos. Similarly, zoos should strive to raise awareness within the public in the hope that additional funds can be channelled into research, solutions for alternative employment and law enforcement. Various means can be used to instigate such changes, including campaigns in zoos, information boards, activities, themed days, web blogs, posts and news bulletins, to name a few. Zoos have a responsibility to consider a holistic approach to the well-being and preservation of the animals they care for, and are well placed to take a leading role in conservation initiatives such as these.

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CAPTIONS

Fig. 1. Map of the study area in the northern and western periphery of the Dja Biosphere Reserve (DBR) in south-eastern Cameroon, showing where interviews were carried out with 78 hunters, porters, traders and consumers in 13 villages and three bushmeat markets, Lomié, Abong-Mbang and Mindourou (red stars). © *OpenStreetMap contributors* (<http://www.openstreetmap.org/copyright>).

Fig. 2. A simplified diagram of the great ape meat commodity chain in the rural target area, as identified from interviews with participants in the northern and western periphery of the Dja Biosphere Reserve (DBR) in south-eastern Cameroon.

Fig. 3. The relative monetary gain (in XAF, Central African Franc, per 'cut' of great ape meat) of the main actors (hunters, middlemen and traders) involved in the great ape meat commodity chain in the rural target area in the northern and western periphery of the Dja Biosphere Reserve (DBR) in south-eastern Cameroon. Information was obtained via interview with various actors: Hunters=51 [31 opportunistic; 7 specialist] and traders=22 [6 wholesalers, 16 retailers].