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Source: Tropical Conservation Science, 4(2) : 187-202

Published By: SAGE Publishing

URL: https://doi.org/10.1177/194008291100400207

Research Article

Household bushmeat consumption in Brazzaville, the Republic of the Congo.

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Abstract
Wildlife meat is an important source of animal protein for rural and urban populations in Congo. Quantitative and qualitative surveys on the consumption of bushmeat were undertaken in Brazzaville in 2006, in about 1,050 urban households. The main objective was to establish the profiles of consumers and of species concerned. The results showed that 88.3% of the surveyed households consumed bushmeat. Their average size was 5.7 ± 3.2 persons. The average monthly income of an urban consumer with a permanent job was 98,334 (US$197) ± 84,306 (US$169) FCFA. It appeared that households preferred to consume bushmeat for two major reasons: the taste or flavor (67.8%) and food habits (14.7%). Meat from mammals was preferred, the top three orders of this class being artiodactyls (48.3%), rodents (28.3%), and primates (13.0%). Some of them are listed as threatened in Congo Brazzaville and are included in the IUCN Red List. The results showed that in Brazzaville, bushmeat consumption remains important and is determined by socio-economic parameters. The promotion of game farming, and breeding of domestic species such as poultry and fish, in the Brazzaville suburbs could help to meet Congolese demand for bushmeat

Keywords: *bushmeat, flavor, food habits, Brazzaville.*

Résumé
La viande de brousse constitue une source importante de protéines animales dans le régime alimentaire des populations rurales et urbaines au Congo. Une enquête quantitative et qualitative sur la consommation a été réalisée en 2006 à Brazzaville, auprès de 1050 ménages urbains. L'étude avait pour objectifs de dresser le profil des consommateurs et d'identifier les espèces animales les plus consommées. Les résultats ont montré que la consommation de viande de brousse concerne 88,3% des ménages enquêtés. La taille moyenne des ménages a été de 5,7 ± 3,2 personnes. Le consommateur urbain exerçant un emploi permanent disposait d'un revenu mensuel moyen de 98 334 (US$197) ± 84 306 (US$169) FCFA. Il apparait que les ménages consomment la viande de brousse pour deux raisons majeures : la saveur (67.8%) et les habitudes alimentaires (14.7%). Les gibiers les plus consommés appartenaient à trois ordres de mammifères: les artiodactyles (48,3%), les rongeurs (28,3%) et les primates (13,0%). Parmi les espèces les plus prisées, certaines sont menacées d'extinction au Congo et figurent sur la Liste Rouge de l'UICN. Les résultats montrent qu'à Brazzaville, la consommation de viande de brousse reste importante et est déterminée par plusieurs facteurs socio-économiques. L'élevage d'espèces domestiques à cycle court (aviculture, pisciculture) et du gibier, activités à promouvoir dans les banlieues de Brazzaville, pourraient être une des alternatives permettant de satisfaire la demande des congolais en viande de brousse.

Mots clés : *viande de brousse, saveur, habitudes alimentaires, Brazzaville*.

Received: 1 December 2010; Accepted: 17 April 2011; Published: 27 June 2011.

Cite this paper as: Mbete, R. A., Banga-Mboko, H., Racey, P., Mfoukou-Ntsakala, A., Nganga, I., Vermeulen, C., Doucet, JL., Hornick, JL. and Leroy, P. 2011. Household bushmeat consumption in Brazzaville, Republic of the Congo. *Tropical Conservation Science* Vol. 4 (2): 187-202. Available online: www.tropicalconservationscience.org

Introduction

Characterized by a 60% forest cover, Congo Brazzaville is among Africa's richest states for fauna and flora. Protected areas and forest zones constitute important habitats for wildlife [1, 2], but this is increasingly threatened by hunting. Indeed, bushmeat remains the main source of animal proteins for people living close to forests and also contributes significantly to the diet of people living in urban areas [3, 4].

Urbanization and economic crisis in Congo Basin countries contribute to the extension of forest exploitation and, on the basis of cultural values, to the hunting of wild animals and to the development of an informal bushmeat trade [5-7]. Roads established and maintained by logging concessions have intensified hunting by providing hunters greater access to relatively unexploited populations of forest wildlife and by lowering hunters' costs to transport bushmeat to market [8].This commercial hunting threatens many animal species such as monkeys and great apes [9-13], duikers, and the forest elephant, all of which are suffering from a decline in the Congo Basin [14-19].

Brazzaville is currently home to one-third of the human population of Congo with a strong demand for staple food products, in an environment which hardly meets those requirements [20, 21]. Protein consumption including beef, mutton, chicken, bushmeat, and eggs has been studied in Brazzaville by Ofouémé-Berton [22], who described the dietary habits of its inhabitants. However, data on bushmeat consumption, especially the socio-economic ones, are lacking.

Therefore, the present qualitative study was undertaken in order to outline the urban bushmeat consumers' profile and motivations, to identify the most popular species, and finally, to establish the consumers' perceptions in relation to the safety of bushmeat as food and their interest in breeding game animals for human consumption. This study is the first step of a broader quantitative approach that will be the subject of further papers**.**

Methods

Study area

The study was undertaken in Brazzaville (Fig. 1) [23, 24], located in the southern part of the Congo. The annual rainfall ranges between 1,400 – 1,600 mm [25]. Brazzaville – 1,029,980 inhabitants – covers about 17,000 ha with more than 30 km stretching along the Stanley Pool on the right bank of the Congo River [21]. As such, the administrative and political capital of Congo was divided into seven distinct geo-ethnic districts, i.e., Makélékélé, Bacongo, Poto-Poto, Moungali, Ouenzé, Talangaï, and Mfilou - Brazzaville, and offers nowadays a privileged field for sociologic research [26]. Nzoho [27] revealed that in Congo Brazzaville, the most important ethnic groups are the *Kongos* (40% to 45% of the total population), the *Tékés* (20% to 25%) and The *Mbochis* (10% to 15%). The *Kongo* group originates from the districts of Kouilou, Niari, Bouenza, Lékoumou, and Pool; the *Mbochi* one from the districts of Cuvette, Cuvette-Ouest, and Plateaux; and the *Téke* one from the districts of Niari, Bouenza, Lékoumou, Pool, Plateaux, and Cuvette Ouest. The other ones are the *Makaa*, *Sangha*,

Kota, *Nzabi-Mbédé* and *Echira* originating from the districts of Niari, Lékoumou, Cuvette-Ouest, Sangha, and Likouala.

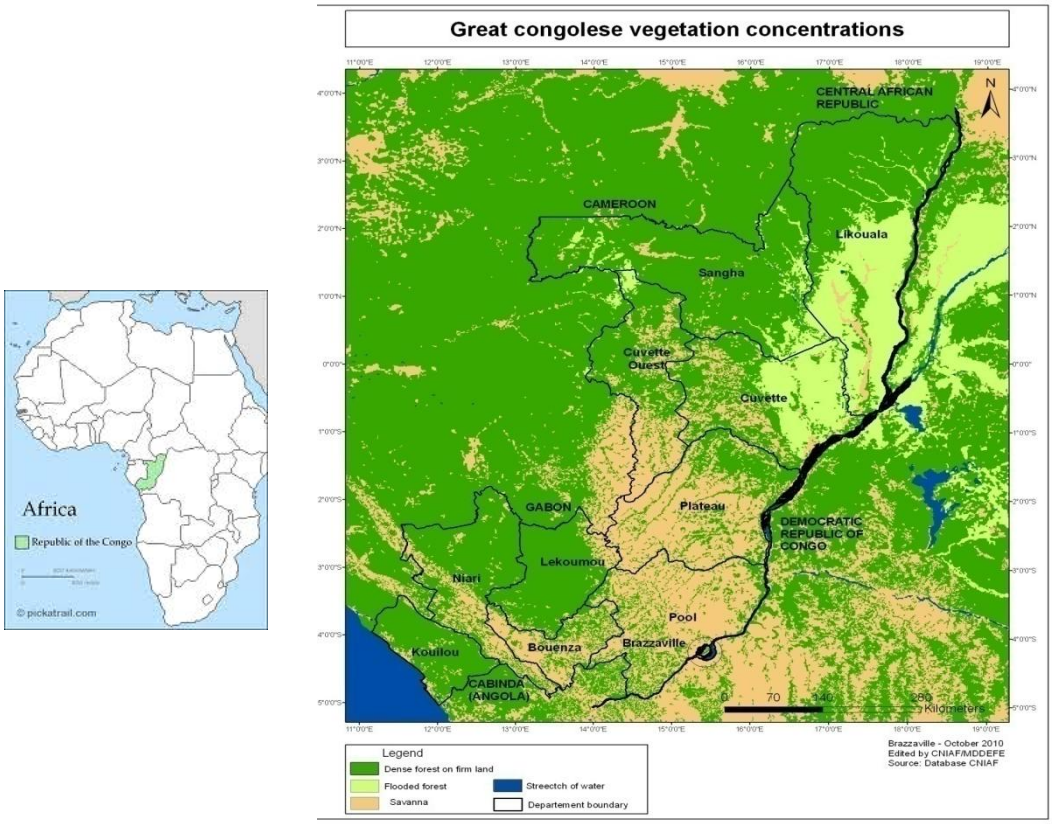

Fig. 1: Town of Brazzaville, southern part of the Congo. Annual rainfall is between 1,400 – 1,600 mm; 1,029,980 inhabitants live on 17,000 ha, with 30 km stretching along the Stanley Pool on the right bank of the Congo River.

Data collecting methodology

The survey was conducted during the open hunting period from May 1 to Oct. 31' 2006.
Selection of field areas was made on the basis of a cartographic report of the General Census of the Population and the Habitat of 2001. Twenty-one areas were chosen covering the entire city, three in each of the seven districts of Brazzaville.

These three areas per district were chosen in such a way that they were equidistant on a line perpendicular to parallel back streets of the district, dividing it in two equal parts. Fifty households per area were investigated by dividing the total number of households chosen to be investigated in the city (1,050), by the total number of areas (21). Each area was investigated according to a transect line. On each line, one household was surveyed in every five.

In compounds with several households, no more than three were surveyed. Each surveyed individual received a preliminary briefing on the study before the interview. Each head of household answered only once. Any unwilling persons were discounted from the survey. The available data were therefore obtained at the end of the interviews from households which gave their consent according to the declaration of Helsinki [28].

The study methodology combined two approaches: a quantitative approach using a questionnaire as the principal tool for collecting data and a qualitative approach calling for informal survey methods

via an individual or group interview. Besides these two approaches, direct observations, secondary data, interviews of key persons, focus groups, and a case study were used as previously recommended by Simard [29].

The questionnaire was structured into four parts: characterization of the socioeconomic profile of bushmeat consumers, supply of and demand for bushmeat, bushmeat consumption and perceptions on threats, and opportunities for its consumption.

Bushmeat consumption was evaluated through answers to the question: ''Do you currently eat bushmeat?'' The Yes/No answers were crossed with socio-demographic characteristics of the interviewed head of household (age, geographic and cultural origin, religion, professional situation, head of household's monthly income, and household size).

Statistical analysis

The software Epi Info version 6.0 was used for computerizing data collected during the survey. Data were then transferred into software SPSS [30] for statistical analysis. Data collected from qualitative surveys were subjected to a descriptive statistical analysis, including a bi-variate analysis using contingency tables

The chi-squared test indicated the strength of a relationship between two variables from the contingency tables. Differences were considered to be significant at $p \leq 0.05$.

Results

Bushmeat consumer's profile and motivations

The results revealed that the average age of bushmeat consumers was 44.4 ± 12.3 years (range 19 to 83 years). The highest number of heads of household (62.2%) admitting bushmeat consumption was in the 35-59 years age range. There was no significant relationship between the age of heads of household and bushmeat consumption (χ^2= 3.1; p = 0.534). The ethnic groups *Echira*, *Kota*, *Makaa*, *Nzabi-mbédé,* and *Sangha*, showed a great propensity for bushmeat consumption (93.7%) similar to that of the *Mbochi* groups (93.5%) and *Téké* (93.5%) (Table 1). There was however a dependence between the ethnic group of heads of households and bushmeat consumption (χ^2 = 16.0; p = 0.003).

Table 1. Bushmeat consumption according to the ethnic group of the household head in Brazzaville

	Do you currently eat bushmeat?					
	Yes		No		Total	
Ethnic group	Number	%	Number	%	Number	%
Téké group	142	93.5	10	6.6	152	14.5
Kongo group	491	85.1	86	14.9	577	55
Mbochi group	158	93.5	11	6.5	169	16
Echira. Kota. Makaa.Nzabi. Sangha	59	93.7	4	6.3	63	6
Outsiders (Centr. and West.Afr.)	78	87.6	11	12.4	89	8.5
Overall	928	88.4	122	11.6	1,050	100

In the districts of Lekoumou and Sangha, all the surveyed persons were consumers of bushmeat (Table 2).There was a relationship between the heads of households' native region and the probability of household bushmeat consumption (χ^2= 29.4; p = 0.002).

Table 2: Bushmeat consumption according to the native district of the head of household in Brazzaville

District	Do you currently eat bushmeat?					
	Yes		No		Total	
	Number	%	Number	%	Number	%
Bouenza	78	91.8	7	8.2	85	8.1
Brazzaville	38	95	2	5	40	3.8
Cuvette-Ouest	31	96.9	1	3.1	32	3
Cuvette	136	91.2	10	6.8	146	14
Kouilou	19	79.2	5	20.8	24	2.3
Lekoumou	27	100	-	-	27	2.5
Likouala	21	91.3	2	8.7	23	2.2
Niari	22	95.7	1	4.3	23	2.2
Plateaux	100	91.7	9	8.3	109	10.4
Pool	366	81.2	74	16.8	440	42
Sangha	12	100	-	-	12	1.1
Outsiders (Centr. and West. Afr.)	78	87.6	11	12.4	89	8.4
Overall	928	88.4	122	11.6	1,050	100

Concerning the religions, animist heads of household were the most enthusiastic bushmeat consumers (94.7%) (Table 3). Religion and probability of bushmeat consumption were related (χ^2 = 10.1; p = 0.017).

Table 3: Bushmeat consumption according to religion in Brazzaville

Type of religion	Do you currently eat bushmeat?					
	Yes		No		Total	
	Number	%	Number	%	Number	%
Animist	54	94.7	3	5.3	57	5.4
Catholic	486	89.5	57	10.5	543	51.7
Protestant	315	87.2	46	12.8	361	34.4
Others	70	78.6	19	21.4	89	8.5
Overall	925	88.1	125	11.9	1,050	100

The professional status influenced the behavioral bushmeat consumption (χ^2 = 9.7; p = 0.082). All employers were bushmeat consumers, followed by wage-earning workers in public and private sectors (91.6%) (Table 4).

Table 4. Bushmeat consumption according to employment of the household head in Brazzaville

Employment	Do you currently eat bushmeat?					
	Yes		No		Total	
	Number	%	Number	%	Number	%
Employer	5	100	-	-	5	0.5
Employee (public or private)	382	91.6	35	8.4	417	39.7
Retired	116	88.6	15	11.5	131	12.4
Unemployed	153	83.6	30	16.4	183	17.4
Self-employed workers	272	86.6	42	13.4	314	30
Overall	928	88.4	122	11.6	1,050	100

All employers were bushmeat consumers, followed by employees of public and private sectors (91.6%), retired workers (88.6%), and self-employed workers in agriculture and non-agriculture sectors (86.6%), and finally unemployed people (83.6%).

Most heads of household (89.7%) had a permanent and regular income (Fig. 2). The average monthly income of the ones consuming bushmeat was 98,334 (US$197) ± 84,306 (US$169) FCFA.The maximum income was 1,000,000 (US$2,000) FCFA and the minimum was 10,000 (US$20) FCFA. An equal rate of bushmeat consumption appeared for higher income ranges: 91.4% from 100,000 (US$200) to 199,999 (US$400) FCFA, 91.0% from 60,000 (US$120) to 99,999 (US$200) FCFA, 90.7% from 200,000 (US$400) FCFA or more. There was a relationship between the income of the head of household and bushmeat consumption (χ^2 = 13.3; p = 0.01).

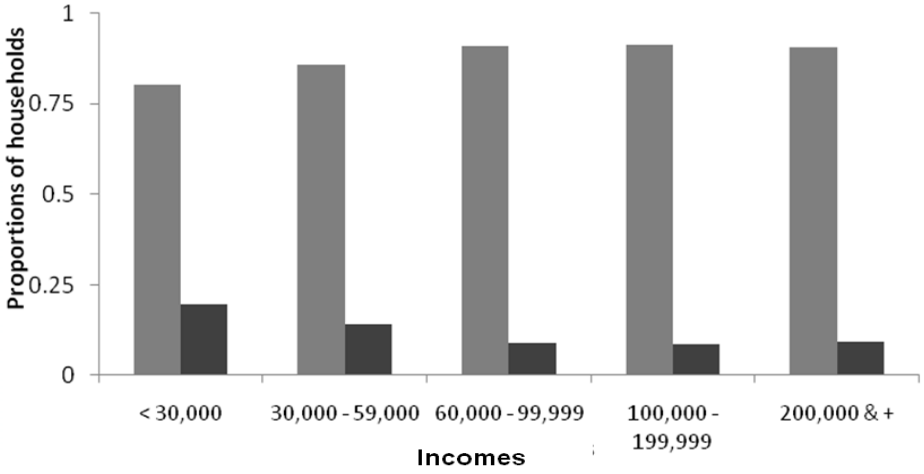

Fig. 2: Monthly income (FCFA) of the household chief for bushmeat consumption in Brazzaville. Gray bars: Yes, black bars: No.

The average number of persons per household was 5.7 ± 3.2 (Range 1-28) (Table 5). There was also a positive relationship between the size of the households and bushmeat consumption ($\chi^2 = 11.7$; $p = 0.008$).

Table 5: Bushmeat consumption according to the household size in Brazzaville

	Do you currently eat bushmeat?					
	Yes		No		Total	
Household size group	Number	%	Number	%	Number	%
1-3 pers	228	83.2	46	16.8	274	26.1
4-6 pers	398	88.8	50	11.2	448	42.6
7-9 pers	194	90.2	21	9.8	215	20.5
10 pers and +	107	94.7	6	5.3	113	10.8
Overall	921	87.7	122	11.6	1,050	100

The households with 10 persons or more showed a higher frequency in game consumption (94.7%) compared to households with 7 to 9 persons (90.2%), and to those with 4 to 6 persons (88.8%) and finally those with 1 to 3 persons (83.2%).

Finally, it appeared that households preferred to consume bushmeat for two major reasons: the taste or flavor (67.8%) and their food habits (14.7%).

Supply and demand for bushmeat

The main sources of bushmeat supply were markets (85.4% of households), gifts given by relations or parents who previously lived in places where the product was available and cheap (10.2%), intermediaries, mostly neighbors, wholesalers and other suppliers (3.7%), and hunters (0.7%).

Nearly 40% of purchases were made in the Bacongo municipal market called Total, 23.4% in Ouenzé market, 17.4% in Moungali market and 13.0% in Dragage market, in Talangaï. The other bushmeat purchases (6.4%) were made in Bouemba market, which was recently built in Ouenzé district.

When a shortage of bushmeat occurs in Brazzaville's traditional outlets, the majority (81%) of household heads declared changing their dietary habits by substituting other foodstuffs for bushmeat. A small group, 12.2% of the surveyed population, declared ordering bushmeat from village hunters, while the remainder (6.8%) replied changing the source of bushmeat supply, without giving any details.

Most of the surveyed households (79.7%) reported that the price of bushmeat was higher in recent years, *versus* 10.1% who found it stable and 3.3% who found it lower; 6.9% had no opinion.

In the light of this, 74.9% of households reported that their bushmeat consumption had decreased in recent years against 19.5% who said it was stable and 5.6% who estimated that their consumption had increased.

It appeared that 80.6% households would like to see a stabilization of the sale price of bushmeat in order to increase their consumption and thus guarantee their dietary security.

Diversity of game consumed or appreciated by households

Bushmeat species were distributed in three animal classes: mammals, birds, and reptiles. Taking into account the opinion expressed by 94.8% interviewed heads of household, 10 animal species were mostly consumed: *Cephalophus monticola* (blue duiker; Bl-dk), *Atherurus africanus* (African brush-tailed porcupine; Ab-tp), *Potamochoerus porcus* (red river hog; Rrh), *Cercopithecus* species (monkey; MK), *Tryonomys swinderianus* (cane rat; Cr), *Cephalophus dorsalis* (bay duiker; Bd), *Syncerus caffer nanus* (forest buffalo; Fb), *Tragelaphus scriptus* (bushbuck; Bb), *Civettictis civetta* (African civet; Ac) and *Loxodonta cyclotis* (forest elephant; Ft-elpt).

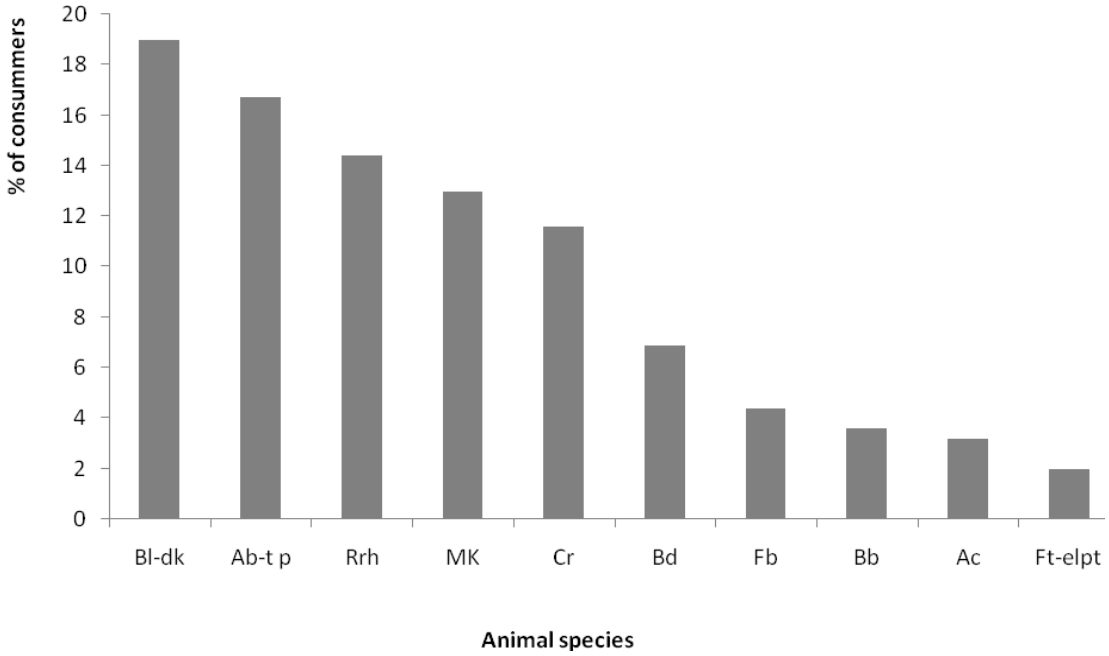

Fig. 3: The animal species that were most frequently cited as bushmeat by 1050 Brazzaville households (Bl-dk:blue duiker; Ab-t p :African brush-tailed porcupine; Rrh :red river hog; MK :monkey; Cr :cane rat; Bd :bay duiker; Fb :forest buffalo; Bb :bushbuck; Ac :African civet; Ft-elpt :forest elephant).

Overall, the most consumed groups were artiodactyls **(**48.3%), rodents (28.3%), primates (13.0%), reptiles (4.0%), carnivores (3.2%), proboscidians (2.0%), and birds (1.2%).

All those animal species whose flesh was found to be consumed by Brazzaville households are listed in Appendix 1.

Despite the high number of species concerned on the whole, those consumed within households are limited by numerous cultural and religious taboos. Over half (52.9%) of households surveyed would not consume *Gorilla g. gorilla* (western lowland gorilla) or *Pan t. troglodytes* (chimpanzee). Carnivore species such as *Canis adustus* (jackal), *Caracal aurata* (golden cat) and *Pantherus pardus* (leopard) were not consumed by 27.1% of households. Reptiles such as *Python sebae* (Seba python) and *Varanus niloticus* (Nile monitor lizard) were not consumed by 17.3 % of households, and rodents such as *Cricetomys emini* (forest giant pouched rat) were not consumed by 2.7%. There was a significant relationship between the household head's native region (χ^2= 53.6; p = 0.0001) and respect for certain food taboos.

Perceptions on threats and opportunities

In the surveyed population, 68.4% of heads of household expressed concerns about food safety and recognized the possibility of contracting diseases by consuming bushmeat. The diseases they feared were Ebola hemorrhagic fever (61.2%), diarrhoea (15.2%), gout (14.1%), filariasis (3.7%), cystocercosis (3.2%) and typhoid fever (2.6%), despite the fact that only the first two of these are associated with contaminated bushmeat.

This survey also revealed a relationship between the heads of households' native region ($\chi^2 = 83.1$; $p = 0.0001$), ethnic group ($\chi^2 = 60.7$; $p = 0.0001$), and concerns about food safety.

Referring to the organic quality of the meat, 72.5% of the respondents preferred to consume bushmeat and 14.8% farmed game, with 12.7% having no opinion. The reasons given concentrated essentially on the natural aspect of bushmeat, and 93.8% of households found bushmeat more natural than the other meat they consumed. A similar proportion (92.1%) of households indicated that they were not informed about the breeding of wild animals in the country.

Discussion

Limits of the Methods

The binomial Yes/No answers to questions are highly qualitative but they were considered as a first step to draw up the socio-economic profile of the consumers. When a person surveyed answered "Yes" to the question whether he eats bushmeat, it was expected that he was an active consumer.

Possible bias stems from the fact that to the question "Do you currently eat bushmeat?" no validation of the answers could be obtained. Mental conceptualization of bushmeat consumption in the imagination of the populations could be associated, to some extent, to a prestige factor and may have encouraged subjects to answer positively. That bias couldn't be isolated from the analysis of the data.

Household bushmeat consumption has been studied in most Central African countries, above all through surveys. As it was underlined by Chardonnet [31], the sampling methods used in most studies do not warrant the relevance of the sample and it is often difficult to infer the obtained results to the whole target population. In most cases, the studies do not usually last long enough and do not make a follow-up of the effective household's consumption, in order to integrate the consumption variation within the time period.

Profile of consumers

The surveyed Brazzaville population appears heterogeneous and characterized by great ethnic diversity, with varied dietary habits. From that perspective, the ethnic groups all showed a great propensity for bushmeat consumption, close to 94%. In Brazzaville, bushmeat thus constitutes a significant contribution in the diet [2, 3]. Bushmeat consumption was closely associated with rooted cultural values [4, 5]. It appears that the majority of household heads' attachment to this wildlife diet is due to the underlying links existing between the urban consumers of bushmeat and their geographic origin. Willcox and Nambu [32] and Schenck *et al.* [33] also found that other urban populations of the Congo Basin remain attached to their traditional diet. Bushmeat consumption involved a great proportion of all religious believers. However, animist heads of household, although a minority, were the greatest consumers of bushmeat. This corroborates a previous report of Noumonvi Cossi [34] in Libreville.

Factors which may influence bushmeat consumption in households

Standards of life such as the size and income of households have an important influence on the frequency of bushmeat consumption in urban households. Wilkie *et al*. [35] reported that people with substantial incomes regularly bought more bushmeat.

The results of the survey have shown that households having a monthly income less than 75,000 (US$150) FCFA (corresponding to the minimum survival borderline in Congo-Brazzaville, according to ECOM [21]) are confirmed consumers despite the inadequacy of their income. ECOM [21] also noted a poverty rate of 50.1%. Poor urban households, even if they consume bushmeat less frequently, are still an important sector of consumers.

According to the majority of urban consumers, prices of bushmeat are too high and are presently beyond their financial capacity [36, 37]. The present study found that only a few rich households declared they are presently able to regularly afford a meal based on bushmeat and the majority of households consumed bushmeat only on rare occasions in the quantities available and the prices asked. Abundance and scarcity are real phenomena on the bushmeat market and this situation often causes hardship among consumers since the law of supply and demand has resulted in large increases in bushmeat prices [36]. Low income households no longer have easy access to the product and the consumers have to turn to other protein sources. Yet, Wilkie *et al*. [35] indicated that the "sale price" in relation to purchasing power is a major determinant of bushmeat consumption.

In Brazzaville, the consumption of the three most prized orders namely, artiodactyls, rodents, and the primates, was motivated not only by the taste or flavor, but also by dietary habits. So, it appeared that the price determining the quantity to be acquired plays a significant role in the choice of preferred species. Thus, the desire to consume bushmeat is explained essentially by its organic qualities and the social habits of the consumers [2, 3]. The survey showed that artiodactyls were the most preferred, followed by rodents, then primates. The lowered frequency of consumption of primates, recently observed in Brazzaville households, is probably due to respect for many dietary taboos and the occurrence of emerging diseases such as viral hemorrhagic fever (Ebola) which may affect consumers of great apes [38]. This observation suggests that the appearance of zoonotic diseases constitutes a powerful psychological brake on primate consumption. Nowadays, because of the reduction of risk of catching the disease about which there is raised awareness, reticence about primate consumption is much reduced. Consumers' concerns, (except for the risk of gout, resulting from consumption of meat over a long period of time), and about other diseases (except Ebola), are linked above all to preservation and transport conditions of bushmeat not conforming to the required hygienic standards [39].

From that perspective, the majority of the surveyed households (68.4%) recognized the possibility of contracting diseases when consuming bushmeat. In 2003, a Congolese outbreak of Ebola-Zaire killed 114 out of the 128 humans who contracted it [40]. Around the same time, 600-800 western lowland gorillas (*Gorilla g. gorilla*), encompassing two-thirds of the local population, disappeared from the nearby Lossi Gorilla Sanctuary [41]. Contact with contaminated primates constitutes a major risk of viral infections in humans. A decrease of primate consumption has the potential to reduce the probability of such an occurrence [42].

Elsewhere, the survey showed that the survival or the persistence of dietary prohibitions or taboos might, to some extent, limit the consumption of species whose population numbers are naturally lower. It is particularly the case for the lowland gorillas and apes whose disappearance from the forests of Africa would be as much a loss for the culture as for the ecosystem [11-13]. From that perspective, in western Madagascar, taboos and strong dislikes limited the consumption of domestic pigs, bush pigs, goats, lemurs, and fruit bats [43].

However, Vermeulen [44] reported that dietary taboos have never prevented trapping of wild animals. The role of taboos is mainly to show the place of an individual within his social group, not to protect the species concerned, which continue to be sold in markets.

Implications for conservation

The study showed that bushmeat represents an important complementary source of animal protein in the diet of urban populations in Congo.

Among the bushmeat species consumed in Brazzaville, some are on the IUCN Red List of Threatened Species [45], due to the level of uncontrolled killing in the Congo Basin. At risk mammals include, *Pan paniscus, Pan t. troglodytes, Gorilla g. gorilla,* diverse small monkeys of the genus *Cercopithecus* species complexes, and *Loxodonta cyclotis.* The reptile most threatened by the bushmeat trade is the dwarf crocodile, *Osteolaemus tetraspis* [14-16, 46]. This also stems from other illegal practices such as traditional and commercial use of crocodile skin and elephant ivory [31]. However, the meat of these animals is also consumed when available. This situation is due to the emergence of commercial hunting which aims at satisfying the demand of urban markets but also to the lack of personnel and the inadequacy of financial and material means for those in charge of wildlife management [47, 48]. In order to reduce the pressure of hunting on the fauna, the control and management of hunting measures should be investigated, taking the season of reproduction into account [49]. It should effectively involve local and native populations in the sustainable management of protected areas.

a

b

c

d

Fig. 4. (a) Crowned monkey (*Cercopithecus pogonias) and* bay duiker (*Cephalophus dorsalis*); CITES Appendix II; (b) Red river hog (*Potamochoerus porcus);* CITES Appendix II; (c) Putty-nosed monkey (*Cercopithecus nictitans);* CITES Appendix II; (d) Blue duiker (*Cephalophus monticola);* CITES Appendix II.
Sources: Mbete *et al*. Survey, 2010.

Bushmeat derives mainly from wildlife species, essentially mammals (Fig. 4) including species less sensitive to pressure, which should, however, be rationally exploited. In Brazzaville, consumption of the three most prized orders, artiodactyls, rodents, and primates, was motivated essentially by its organic qualities and the social habits of the consumers [50]. If inhabitants of Brazzaville are allowed to consume bushmeat at the current levels, wildlife is likely to decrease and eventually to disappear. Conservation measures should take into account the interest of the population in bushmeat, and thus promote the breeding of domestic species and the breeding of animals whose meat products could be considered as "wild" by the population (blue duiker, forest buffalo, red river hog, African brush-tailed porcupine and cane rat). Such game farming already exists in the Congo Basin where cane rat, f.e., is sold at very competitive prices. The socio-economic profile of bushmeat consumers has been drawn up in this study. A further step will be to determine the quantities and frequencies of bushmeat intakes by households in Brazzaville. This will be the subject of a further paper.

Acknowledgments

The « Direction des Bourses et des Œuvres Universitaires » and « Centre de Recherches Vétérinaires et Zootechniques du Congo-Brazzaville » are fully aknowledged for financial help. The authors express sincere acknowledgements to Michel Bitemo of "Délégation Générale à la Recherche Scientifique et Technologique''for help with the statistical analysis. The authors also thank Professors Yolande Ofouémé Berton and Eugene Sama of "Université Marien Ngouabi'', Pierre Stassart and Antoine Clinquart of ''Université de liège'', Richard Jenkins of University of Sheffield, and Julia Jenkins of Wildlife Conservation Society-Congo, for their constructive comments.

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Appendix 1: Species reportedly consumed by households in Brazzaville.

Order	*Family*	*Species*	*English name*	*Vernacular name*	*CITES Appendix*	
					I	*II*
Primates	Hominidae	*Gorilla gorilla gorilla*	Western lowland gorilla	*Kibubu.Tchibubu. Ebobo*	*X*	
	Hominidae	*Pan t. troglodytes*	Chimpanzee	*Mokombosso. Sumbu. Ngondo*	*X*	
	Hominidae	*Pan paniscus*	Bonobo	*Bonobo. Sokomuntu*	*X*	
	Cercocebidae	*Mandrillus sphinx*	Mandrill	*Makakou*		*X*
	Cercocebidae	*Cercocebus albigena*	Gey-cheeked mangabey	**********		*X*
	Colobidae	*Cercocebus torquatus*	Red-capped mangabey	**********		*X*
	Colobidae	*Colobus guereza*	Colobe guereza	**********		*X*
	Colobidae	*Clobus baduis*	Bay colobus	**********	*X*	
	Cercopithecidae	*Colobus satanas*	Black colobus	**********		*X*
	Cercopithecidae	*Cercopithecus cephus*	Moustached monkey	**********		*X*
	Cercopithecidae	*Cercopithecus nictitans*	Putty-nosed monkey	*Nkoyi*		*X*
	Cercopithecidae	*Cercopithecus pogonias*	Crowned monkey	*Makakou. Kima. Tsima. Ntsima*		*X*
	Cercopithecidae	*Cercopithecus solatus*	Sun-tailed monkey	**********		*X*
	Cercopithecidae	*Cercopithecus neglectus*	De Brazza's monkey	**********		*X*
	Lorisidae	*Artocebus calabarensis*	Calabar Angwantibo	*Kinkanda*		*X*
	Lorisidae	*Perodicticus potto*	Potto	*Ndoundé*		*X*
Artiodactyla	Bovidae	*Cephalophus callipygus*	Peter's duiker	*Ngandzi. Tsoua. Ntsoua. Utsoua. Ossomo. Ossouri. Nkaâ. Ossiéri. Ossouémé*		*X*
	Bovidae	*Cephalophus rufilatus*	Red-flanked duiker	*Tsoua. Ntsoua*		*X*
	Bovidae	*Cephalophus dorsalis*	Bay duiker	*Ngbomo. Mvoudi. Mvouli. Mvouri. Ntsa*		*X*
	Bovidae	*Cephalophus leucogaster*	White-bellied duiker	*Ngandzi*		*X*
	Bovidae	*Cephalophus monticola*	Blue duiker	*Mboloko. Kissibou. Kissibi. Seri.Ntsiéné.*		*X*
	Bovidae	*Cephalophus nigrifrons*	Black-fronted duiker	*Ndzombe. Popolipo*		*X*
	Bovidae	*Cephalophus sylvicultor*	Yellow-backed duiker	*Bemba. Nzibika*		*X*
	Bovidae	*Sylvicapra grimmia*	Bush duiker	*Tsa. Ntcha. Ntsia*		*X*
	Bovidae	*Syncerus caffer nanus*	Forest buffalo	*Mpakassa. Ngombo. Ndzayi. Ndzali. Ndzadzi*		*X*
	Bovidae	*Tragelaphus scriptus*	Bushbuck	*Nkabi. Ikabi. Nka. In'ka. Okayi*		*X*
	Bovidae	*Tragelaphus spekei*	Sitatunga	*Mvouli. Mbui Infouli*		*X*
	Bovidae	*Tragelaphus euryceros*	Bongo	*Mbongo*		*X*
	Bovidae	*Hippopotamus amphibus*	Hippopotamus	*Ngubu. Ngouvou. Infoubou. Mvoubou*		*X*
	Tragulidae	*Hyemoschus aquaticus*	Water chevrotain	*Nili. Nyélé. Nzibika. Inili. Ignili*		*X*
	Neotraginae	*Neotragus batesi*	Dwarf antelope	*Ikobe*		*X*
	Suidae	*Potamochoerus porcus*	Red river hog	*Ngoya. Ngouya. Nsombo. Nsomo*		*X*
Proboscidea	Eléphantidae	*Loxodonta africana cyclotis*	Forest elephant	*Ndzaou. Ndjokou. Zokou. Nza. Ndja. Nzo*	*X*	
Hyraxes	Pocavidae	*Dendrohyrax arboreus*	Tree hyrax	*Mundzuendzue. Tchikongoni*	*X*	
Carnivora	Felidae	*Panthera pardus*	Leopard	*Ngoï. Ngouè. Ngoua. Nkoï*		*X*
	Felidae	*Nandinia binotata*	African palm civet	*Mbala*		*X*
	Viverridae	*Viverra vivetta*	Africa civet	*Ndzobo. Dzobo*		*X*
	Viverridae	*Genetta tigrina*	Blotched genet	*Intsisi. olouengue. Diya. Dia. renard*		*X*
	Viverridae	*Atilax paludinosus*	Marsh mongoose	*Moubakou. Mbakou. Mubaku*	*X*	
	Viverridae	*Bdeogale nigripes*	Black-legged mongoose	*Mouenguélé. Mouenzélé. Mfouengué*	*X*	
	Viverridae	*Herpestes naso*	Long-snouted mongoose	*Mabakou*		*X*
	Canidés	*Canis adustus*	Jackal	*Imboulou. Mboulou*		*X*
	Viverridae	*Genetta abyssinica*	Ethiopian genet	*Chiono. Schiono. Fione*		*X*
	Felidae	*Panthera leo*	Lion	*Ngouboulou. Ngoungou. Nkoué*		*X*
Pholidota	Manidae	*Manis gigantea*	Giant Pangolin	*Lekaka. Loukaka. Loukakaboni. kakaboni*	*X*	
	Manidae	*Manis tricuspides*	Tree pangolin	*Antsio. Tchikaka. Ntsuili. Tsiyesli*	*X*	
	Manidae	*Uromanis tetradactyl*	Long-tailed pangolin		*X*	
Tubulidentata	Orycteropodidae	*Orycteropus afer*	Ant eaters	*Embembé. mbenengue. Imbemné. Tsissi. Tsiéli*		*X*
Rodentia	Hystricidae	**Atherurus africanus**	African brush-tailed porcupine	*Ngomba. Porc epic. Ngoumba. Ngoumbi. Iko. Kitsaka. Kintska*		*X*
	Tryonomidae	**Thryonomys swinderianus**	Cane rat	*Sibisi. Simbiliki. Chimbric. Nsibiré. Mbéba*		*X*
	Sciuridae	*Protoxerus strangeri*	African giant squirrel	*Obo. Mpari. Oniongo*		*X*
	Sciuridae	*Funisciurus pyrrhopus*	Fire-footed rope squirrel	*Issimou. Tchissimou*		*X*
	Sciuridae	*Anomalurus derbianus*	Lord Derby's anomalure	*Ngyes. Ngounié*		*X*
	Cricetidae	*Cricetomys gambianus*	Giant rat	*Nkoumbi. Koumbi. Motomba. Nkolo/Nkondi*		*X*
	Cricetidae	*Cricetomys emin*	Giant pouched rat	*Nkoumbi*		*X*
Accipitriformes	Accipitridae	***Gypohierax angolensis***	Palm nut vulture	*Dimpapa*		*X*
	Accipitridae	*Stephanoaetus coronatus*	Crowned eagle	*Bokouango*		*X*
Musophagiformes	Musophagidae	*Corythaeola cristata*	Touraco	*Mokouloukoulou*		*X*
Galliformes	Phasianidae	*Francolinus squamatus*	Scary Francolin	*Dihoulo*		*X*
	Phasianidae	*Francolinus lathami*	Latham's forest francolin	*Ngouari*		*X*
	Numidae	*Agelaters niger*	Black guineafowl	*Kanga. Ewanko*		*X*
	Numidae	*Numida meleagris*	Helmeted guineafowl	*Kanga*		*X*
Coraciiformes	Bucerotidae	*Ceratogymna afrata*	Black-casqued hornbill	*Mpoho*		*X*
Columbiformes	Columbidae	*Columba iriditorques*	Western bronze-naped pigeon	*Bembe*		*X*
	Columbidae	*Treron calva*	African green pigeon	*Bembe*		*X*
***Squ*amata**	Pythonidae	*Python sebae*	Seba Python	*Mboma. Mbomo. Ngouma*		*X*
	Varanidae	*Varanus niloticus*	Monitor lizard	*Mbambi. Igouane*		*X*
Crocodilia	Crocodylidae	*Osteolaemus tetraspis*	Dwarf crocodile	*Ngoki. Ongomo*		*X*
	Crocodylidae	*Crocodylus cataphractus*	Long-snouted crocodile	*Ngando*		*X*
	Crocodylidae	*Crocodylus niloticus*	Nile Crocodile	*Ngando*		*X*
Testudines	Testudinidae	*Kinixys erosa*	Forest turtle	*Koussou. Koba. Mfudi. Mfouri. Mfoundi*		*X*
	Trionychidae	*Trionys triunguis*	Freshwater turtle	*Koussou. Mfouri. Mfoudi. Mfudi*		*X*