

Importance of rodents as a human food source in Benin

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ABSTRACT. Rodents are an important food source for villagers near the Lama forest reserve, located in the south of Benin between 6°55' - 7°00'N and 2°04' - 2°12' E. This study was designed to look at the consumption of rodents as a food source combined with a survey of rodents sold in markets. Data was collected on : rodents species consumed, frequencies of consumption and food preferences. Some animals were captured in order to confirm the species. Rodents were a major part of diet included 10 species : grasscutter (*Thryonomys swinderianus*), giant rats (*Cricetomys gambianus*), Gambian Sun-squirrel (*Heliosciurus gambianus*), crested porcupine (*Hystrix cristata*), ground squirrel (*Xerus erythropus*), grass rat (*Arvicanthis niloticus*), slender gerbil (*Taterillus gracilis*), Kemp's gerbil (*Tatera kempii*), multimammate rats (*Mastomys spp.*) and grass mouse (*Lemniscomys striatus venustus*). On average, young people and children consumed rodents 6 times per person per month. The preferences of local populations were grasscutter and giant rats which were sold in local markets at relatively high prices US\$8-10 and US\$2-4 respectively. It is important to conduct further studies to look at the impact of this hunting on the rodent populations and to ensure sustainable harvesting.

KEY WORDS : Rodents, Human consumption, Lama forest, Benin.

INTRODUCTION

Little attention has been given to the beneficial effects of rodents to human food security (MENSAH, 1991; JORI et al., 1994; HANOTTE & MENSAH, 2002). In Africa, rodents are a significant source of animal protein for humans, especially in tropical Africa (AJAYI & OLAWOYE, 1974; MALEKANI & PAULUS, 1989; FALCONER, 1996; MALAISSE, 1997; NTIAMOA-BAIDU, 1998). In Benin, there have been few studies conducted to show how important rodents are in helping to ensure the food security of the populations (BAPTIST & MENSAH, 1986; CODJIA & HEYMANS, 1988; HEYMANS & CODJIA, 1988; MENSAH, 1991; ASSOGBADJO, 2000). Therefore, a better understanding of the way rodents contribute directly to the diet of local populations is required. This study, carried out in Lama forest reserve (Bénin), describes a case study on the consumption of rodents by forest-bordering human populations.

Study site

Lama forest reserve is located in south Benin from 6°55' to 7°00' N and between 2°04' and 2°12' E (Fig. 1). It covers 16,250 ha, including 2,290 ha of dense forest as censused in 1999. The bordering populations of this forest comprise 20 rural villages with an estimated number of 41,500 individuals (1998) belonging mainly to the Holli and Fon ethnic groups. The altitude of the forest averages 60 m. Soils are vertisols of a clay-sandy type. The water network is exclusively composed of ponds and seasonal streams. The climate is a transitional guinean type, falling between the bimodal and unimodal rainfall distribution. The annual average rainfall is 1,112 mm. The annual average temperature varies between 25°C and 29°C. Relative humidity remains very high throughout the year, even in the dry season. The vegetation of the forest is

composed of about 173 plant species and belongs mainly to the soudano-guinean and guineo-congolian flora. Accordingly, the natural vegetation of the forest is characterized as dense humid semi-deciduous forest. In spite of intensive poaching, it contains a rich and fairly abundant fauna that is maintained by protection activities.

MATERIAL AND METHODS

This study comprised two phases : (1) food consumption and socio-economic investigation in the bordering villages and (2) the captures of rodents in various vegetation groups and villagers' farms. A total of 126 villagers were classified into three age classes (young, adult and old) and two genders (male or female) (Table 1). Villagers between 5 to 25 years old were considered as young, an informant aged 26 to 50 years old were considered as adults, and an informant aged above 50 years old were considered as old. A structured questionnaire was used to interview individuals or a group of informants by combining retrospective method with direct observations. For examining the relative importance of rodents in the diet, data were collected from information on the consumption of other mammals to pair them with these obtained on rodents. Data were collected on the frequency of consumption and the food preferences of each species of mammals (including rodents). Practical handbooks were used to help the informant in identifying the animal species and also to obtain some useful information on it (DE VISSER et al., 2001; KINGDON, 1997; SINSIN et al., 1997; HEYMANS, 1986). The frequencies of consumption were obtained by averaging the number of times a given species was consumed per week and per informant. Three level of consumption frequency were defined as :

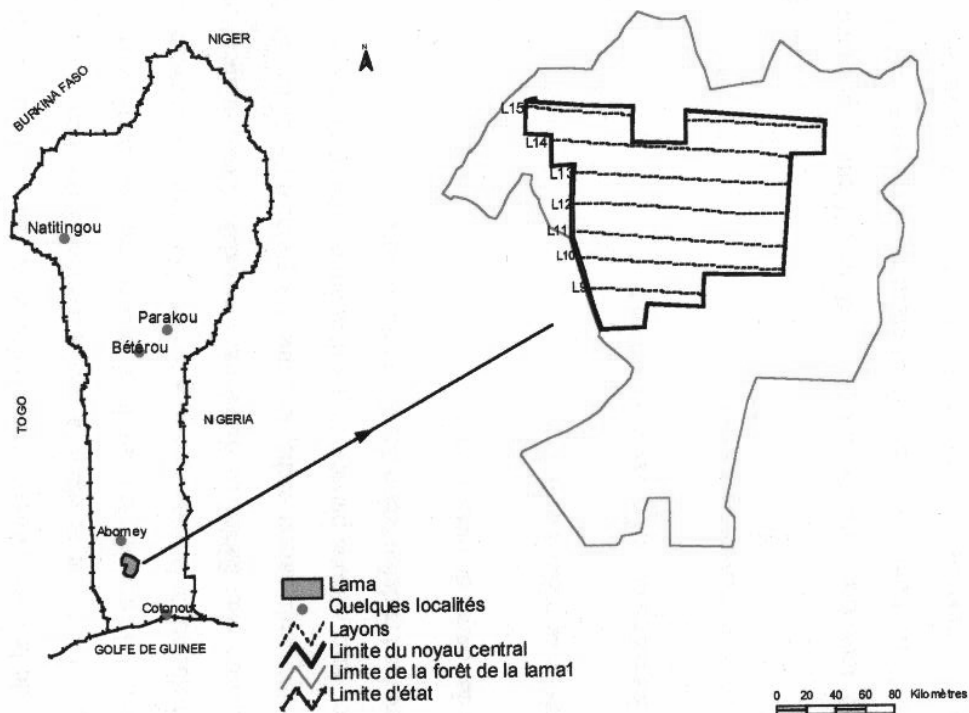


Fig. 1. – Location of Lama reserve forest in Benin

- Less consumed species : rodent species consumed by 1 to 25% of the informants
- Fairly consumed species : rodent species consumed by 26 to 50% of the informants
- Highly consumed species : rodent species consumed by more than 50% of the informants.

To capture rodents, we used a combination of several methods. We lay during 2 weeks traditional traps currently used by local population in four types of vegetation : fallow, dense and degraded forests, plantations and farms. In addition, we employed indigenous hunters to use their traditional rodent hunting techniques. Hunting takes place between 6h and 12h in the morning and between 15h and 18h in the afternoon. Regarding giant rats, villagers dug them from their burrows with a hoe before killing them and used chasing and bush fires methods for other rodents. This enabled us to survey the different traditional hunting techniques and to understand how rodents were collected from the wild.

TABLE 1
Number of local villagers (informants) who were interviewed for the study

Gender	Young	Adult	Old	Total
Male	6	25	22	53
Female	3	41	29	73
Total	9	66	51	126

NB : The age classes were defined as : young, 5-25 years old; adults, 26-50 years old; and old, >50 years old.

RESULTS

Diversity and habitats of rodents consumed by bordering populations of Lama forest reserve

Ten rodent species were consumed by local populations (Table 2) : *Thryonomys swinderianus*, *Cricetomys gambianus*, *Heliosciurus gambianus*, *Hystris cristata*, *Xerus erythropus*, *Arvicanthis niloticus*, *Taterillus gracilis*, *Tatera kempii*, *Mastomys natalensis* and *Lemniscomys striatus venustus*. These species belong to 4 rodent families namely Murideae (6 species), Sciurideae (2 species), Thryonomideae and Hystricidae (1 species for each). Although rodents were trapped in different vegetation types, villagers' farms and forests were the preferred habitats for most of rodent species consumed (Table 2)

Hunting techniques for rodents and other collecting strategies in the study area

The hunting techniques varied according to the type of animal, vegetation and season. The most common hunting techniques were chasing, trapping and using bush fires, especially at the end of the dry season before the land preparation for agriculture. Bush fires were the most frequently used technique for hunting rats.

The grasscutter (*Thryonomys swinderianus*) is the rodent species most collected by local villagers, due to the quality of its meat and the income that can be gained. Villagers hunt grasscutters in small groups of young people, by lighting bush fires to disturb the animals and flush it from the bush to be chased by dogs. Hunting takes place between 6h and 12h in the morning and between 15h and 18h in the afternoon. Giant rats (*Cricetomys gambianus*), were dug from their burrows with a hoe.

TABLE 2
Mammal species consumed by local villagers.

Scientific name	Common name	Family	Habitat type				Proportion Consumed
			For	Pla	Far	Fal	
<i>Thryonomys swinderianus</i>	Grasscutter	Tryonomidae	+	+	+	+	> 75%
<i>Hystrix cristata</i>	Crested porcupine	Hystricidae	+	+		+	> 75%
<i>Heliosciurus gambianus</i>	Gambian sun-squirell	Sciuridae	+	+			51-75%
<i>Xerus erythropus</i>	Ground squirell	Sciuridae	+	+			51-75%
<i>Cricetomys gambianus</i>	Giant rat	Muridae	+	+	+		> 75%
<i>Arvicanthis niloticus</i>	Grass rat	Muridae	+	+	+		> 75%
<i>Taterillus gracilis</i>	Slender gerbil	Muridae	+	+		+	51-75%
<i>Tatera kemp</i>	Kempi's gerbil	Muridae	+		+		51-75%
<i>Mastomys natalensis</i>	Multimammate rat	Muridae			+		51-75%
<i>Lemniscomys striatus venustus</i>	Grass mouse	Muridae	+		+	+	51-75%

Habitat types : For = Forest; Pla = Plantation; Far = Farm; Fal = Fallows.

Grasscutters and giant rats account for most of the cases sold after they had been captured (Table 3). Apart from these two highly preferred species, other rodent species are hunted by using bush fires, dogs and hunting. People can buy rodents in local markets for their consumption. However, this was uncommon in the study area. Hunting is still the main way for villagers to obtain rodents for animal protein. Table 3 outlines the average numbers of rodents killed per week and per hunter. This gives also the sale prices for rodent meats.

TABLE 3

Average number of rodents killed per week per hunter, and average sale prices per individual animal.

Species	Number of rodents killed	Part sold	Sale price in 1999 (US \$)
Grasscutter	4	The whole	8 to 10
Giant rat	10	The whole	2 to 4
Other rodent species	15	Not sold	-

Consumption frequency for mammal and rodent species

In villages around Lama forest reserve, any kind of bush meat is considered as edible by local villagers, despite the governmental restrictions on hunting. More than 75% of the village population ate grasscutter, giant rat, grass rat and crested porcupine, while the other rodent species were consumed by 51-75% of the village population (Table 2).

Rodent meats were consumed at least 6 (Fig. 3) times per month per person. This rate was at least twice the meat consumption of other mammal species (Figs 2 & 3). The frequency of meat consumption in men is much higher than for women ($\chi^2 = 1.16, p < 0.05$) (Fig. 3), and the frequency of meat consumption for young people was much higher than old people ($\chi^2 = 0.56, p < 0.05$) (Fig. 2).

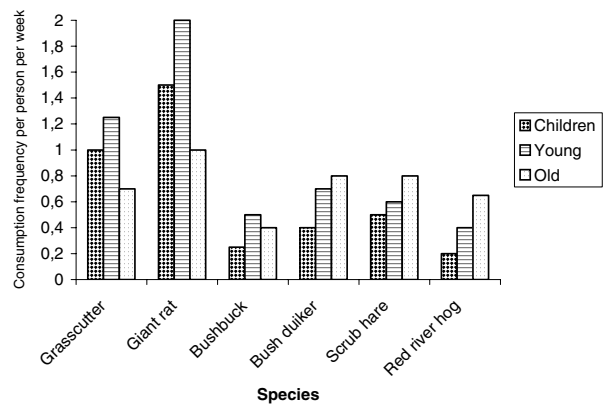


Fig. 2 – Consumption frequencies for children, young and old villagers per individual per week for the most hunted mammals in Lama reserve forest according to different age classes.

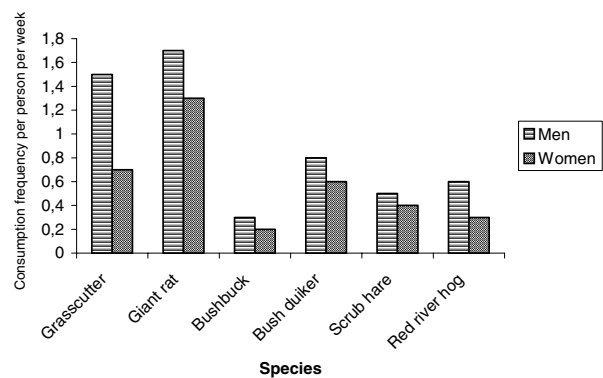


Fig. 3 – Consumption frequencies for male and female villagers per individual per week for the most hunted mammals in Lama reserve forest according to informant gender.

Local populations' consumption preference for various mammal and rodent species

More than 53% (made up of giant rat 5%, grasscutter 40%, common rat 8%) of the villagers preferred rodent meat than the meat of other mammal (Fig. 4). The red

river hog (*Potamochoerus porcus*) also was a significant source of meat (45%), with bushbuck (*Tragelaphus scriptus*) accounting for 2% of consumption.

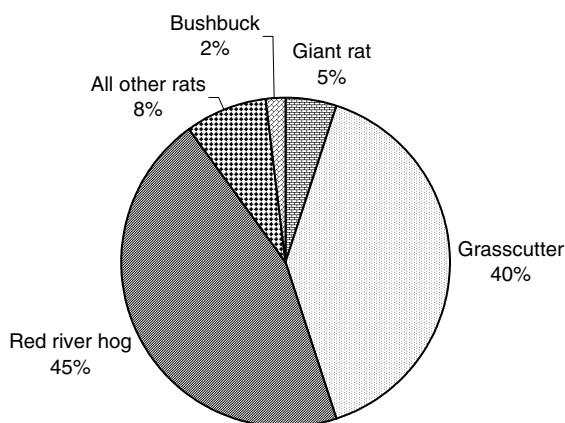


Fig. 4. – Mammals species

DISCUSSION

Wildlife constitutes an important food resource, which cannot easily be replaced or removed without causing negative socio-economic disturbances. To understand the contribution of wildlife in the food of local populations we should not consider only the big game. Most of the meat consumed by forest bordering populations in this study came from small mammals, which could be captured in any time of the year. If rodents were not available, bush meat would not be consumed by more than 60% of local populations (ASSOGBADJO, 2000). Rodents were and still are the main source of animal food for rural populations and provide an important dietary quantity of animal proteins (COLYN & DUDU, 1987; MALEKANI & PAULUS, 1989; WETCHI et al., 1988). The grasscutter and giant rat were most consumed by villagers in our study. MALAISSE (1997) showed that 100 g of grasscutter or giant rat's fresh or smoked muscle provided 28 g and 42.6 g of protein, 10 mg and 20 mg of iron, and 936 Kj and 1132 Kj energy respectively. MALAISSE (1997) also indicated that the nutritional value of rodents is similar to that of beef and chicken. In addition, these two rodent species are sold in local market at high prices, providing them with a source of income. In Lama forest reserve, the selling price for a grasscutter was US\$10-12 (Table 3). In this area, a hunter killed an average of 4 individual grasscutter rats per week. This is equivalent to an income of US\$40-48 per week (US\$160-192 per month). This pattern is characteristic in West Africa as NTIAMOA-BAIDU (1998) reported that the incomes resulting from the sales of bush meat enable households not only to buy less expensive other source of protein such as fish, but also it helps satisfy other needs for the families. For example, in Ibadan (Nigeria), in 1975, when the meat of sheep and beef were sold respectively at US\$2.80-4.20 /kg, grasscutter meat cost UD\$9.60 (ASIBEY & CHILD, 1990). The hunting pressure on wildlife led to a progressive reduced availability of animal products in nearby cities where poaching was common. However, due to their high rate of reproduction,

many rodent species populations were able to cope with recurrent hunting without extinction (MALAISSE, 1997). The limiting factor is much more the lack of thorough knowledge on their ecology and the density of their populations. Therefore, it would be desirable to undertake a population study in these regions to look at the impact of this hunting on the rodent populations. The hunting of wildlife, in particular rodent species as found here, provide important sources of animal proteins and incomes for local populations, and therefore should be integrated in the concept of sustainable development. The consumption of large rodents for their meat (grasscutter and giant rat) is not only a consequence of lack of meat, but also a response to a set of complex factors including cultural constraints, preferences and values. Such factors may explain why older people consumed more rodent meat than younger people in our study area and highlight the importance of these resources for rural populations of Africans.

CONCLUSION

Rodents will continue to be a considerable source of animal protein and income for villagers of Lama reserve forest. Rodents are the animal species most frequently consumed and preferred by the local populations. However, wild animals, including rodents, are not always taken into account in the national programmes for food security. Management of these resources should be included in sustainable resource initiatives that are already part of the cultural values of poor rural populations. Production in the wild and production in the extensive and intensive domestication of wild fauna can be integrated into national programmes for protected areas management. This is necessary to take into account the concerns of local populations and concurrently to satisfy requirements for keeping the balance within ecological communities.

LITERATURE CITED

- AJAYI & OLAWOYE, (1974). Some indications of the social acceptance of the African rat (*Cricetomys gambianus* Waterhouse) in southern Nigeria. *Nigerian J. Forestry*, 4(1) : 36-41.
- ASIBEY, E.O.A. & G.S. CHILD (1990). Aménagement de la faune pour le développement rural en Afrique subsaharienne. *Unasylva*, 161 : Vol 41.
- ASSOGBADJO, A.E. (2000). Etude de la biodiversité des ressources forestières alimentaires et évaluation de leur contribution à l'alimentation des populations locales de la forêt classée de la Lama. Thèse d'ingénieur Agronome. FSA/UNB, Bénin. P. 131 + Annexes.
- BAPTIST, R. & G.A. MENSAH (1986). Benin and West Africa : the cane rat-farm animal of the future? *World Animal Review*, 60 : 2-6.
- COLYN, M. & A. DUDU (1987). Exploitation du petit et moyen gibier des forêts ombrophiles du Zaïre. *Nat. Fau.*, 3(4) : 22-39.
- CODJIA, J.T.C. & J.C. HEYMANS (1988). Problématique liée à l'utilisation du gibier et écoéthologie de quelques rongeurs consommés au Bénin. *Nat. Fau.*, 4(4) : 4-21.
- DE VISSER, J., G.A. MENSAH, J.T.C. CODJIA & A.H. BOKONONGANTA (eds), (2001). *Guide préliminaire de reconnaissance*

- des rongeurs du Bénin*. C.B.D.D./Ecooperation/ReRE/VZZ - République du Bénin/Royaume des Pays-Bas. ISBN : 99919-902-1-6, 253 p.
- FALCONER, J. (1996). *Sécurité alimentaire des ménages et foresterie. Analyse des aspects socio-économiques*. FAO, Rome, 1996.
- HANOTTE, O. & G.A. MENSAH (2002). Biodiversity and domestication of 'non-conventional' species : a worldwide perspective. *7th World Congress on Genetics Applied to Livestock Production*, 19-23 August, 2002, Montpellier, France, 30 : 543-546.
- HEYMANS, J.C. & J.T.C. CODJIA (1988). L'élevage des rongeurs : une possibilité pour résoudre le problème alimentaire en Afrique. *Rised-Bulletin*, 7 : 9-12.
- HEYMANS, J.C. (1986). *Petit guide des mammifères du Nord-Bénin*. Bibliothèque FSA/UAC, Campus d'Abomey-Calavi, Bénin.
- JORI, F., G.A. MENSAH & E. ADJANOHOON (1994). Grasscutter production : an example of rational exploitation of wildlife. *Biodiversity and conservation*, 4 : 257-265.
- KINGDON, J. (1997). *The kingdom field guide to African mammals*. (ed) Academic press. ISBN 0-12-408355-2. P. 465.
- MALAISSÉ, F. (1997). *Se nourrir en forêt claire africaine : Approche écologique et nutritionnelle*. P.384. CTA.
- MALEKANI, M. & J. PAULUS (1989). Quelques aspects de la consommation du cricétome, *Cricetomys* (Rongeur), par les populations zaïroises. *Tropicultura*, 4 : 60-67.
- MENSAH, G.A. (1991). Élevage des espèces de gibier : cas de l'aulacodiculture. (Élevage de l'aulacode : *Thryonomys swinderianus*). Mémoire spécial. Chapitre D : Gestion du patrimoine forestier. Gestion de la faune sylvestre. *10^{ème} Congrès Forestier Mondial "La forêt, Patrimoine de l'Avenir"*, Paris 17 au 26 septembre 1991. *Revue Forestière Française, Hors série*, 5 : 301-309.
- NTIAMOA-BAIDU, Y. (1998). *La faune sauvage et la sécurité alimentaire en Afrique*. P. 109. Rome.
- SINSIN, B., I. DAUDA, E. AHOKPE, A. TEHOU, P. COUBELOU, I. TOKO & S. FANDOHAN (1997). *Faune sauvage des forêts classées de Goungoun, de la Sota et des environs*. Laboratoire d'Ecologie Appliquée FSA/UNB.
- WETCHI, L., M. BIYA & J. RUELLE (1988). Observations sur l'importance relative des voies d'approvisionnement du gibier mammalien vendu au marché central de Kisangani (Zaïre). *Ann. Fac. Sci. Kis.*, 5 : 105-114.