



Bushmeat in Gabon

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EXECUTIVE SUMMARY

1.1 The National Strategy for Bushmeat Management in Gabon

From 2000 to the present, the Gabonese government, through the Wildlife Department of the Ministry of Wildlife and Forests (*Ministère des Eaux et Forêts*) has been developing a National Strategy for Bushmeat Management. This process, originally supported as part of a regional initiative by the FAO, has involved both extensive discussions on policy and revision of the legislation in force and also support and coordination of a broad suite of research projects, some carried out by independent researchers and most involving DFC staff.

The twin aims of the National Strategy for Bushmeat Management are:

to safeguard food and economic security for those people reliant on bushmeat for their livelihoods, until alternatives are available,

to ensure protection of viable wildlife populations for the future

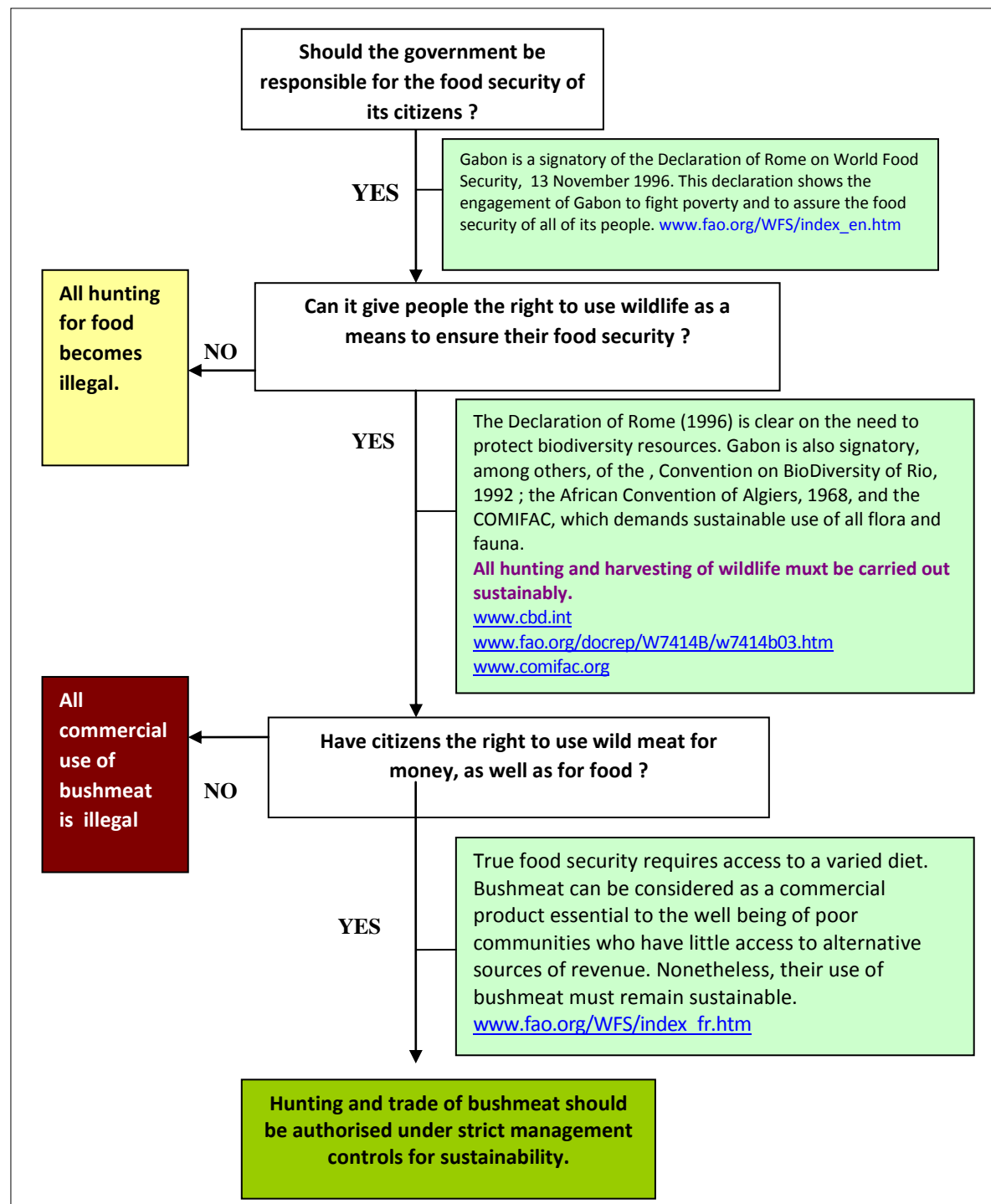
The two are inextricably linked, as without the long-term local survival of wildlife, there is no possibility of reliance on the resource, for either food or economic security. It is possible for some wildlife species to persist within an impoverished faunal community, and still provide enough meat for rural populations. Whilst this may be acceptable in some areas, it is not a desirable national outcome. The hope is that the national management strategy can enable both the survival of representative intact wildlife communities in some areas free of hunting, along with sustainable local use of the bushmeat resource elsewhere, whilst still safeguarding these wildlife communities as well as possible through catch limits and protection for vulnerable species.

The following two pages give a schematic overview of the decisions taken to arrive at the need for development of a National Strategy (First decision tree) and the definition of the objectives of this Strategy (Second decision tree).

Once the general framework of the Strategy was outlined, field research was carried out to clarify the current situation on the ground and develop a Strategy that can take into account the status quo and develop reasonable short term (dealing with the current situation), medium term (working towards alternative rural opportunities, urban education and species protection) and long term (sustainable harvests with labelled, legal product) goals.

This remainder of the document synthesizes the research results of studies of bushmeat use in Gabon over the last decade. The majority of these studies were carried out in association with the Wildlife Department (*Direction de la Faune*) of the Ministry of Water and Forests. The bulk of the work is already published as doctoral or Masters degrees and some is published in the scientific literature, but the majority is available only in English. The original works, methods and analyses are made available through links and annexes whilst the report text concentrates on clear presentation of the main results.

The first decision tree for the National Strategy



The second decision tree is concerned with the terms for managing sustainably,

1. In respect of the state's international engagements for sustainability, especially the **United Nations Millenium Development Goals (MDG) 1 & 7** : Poverty reduction and promotion of environmental protection through sustainable use.

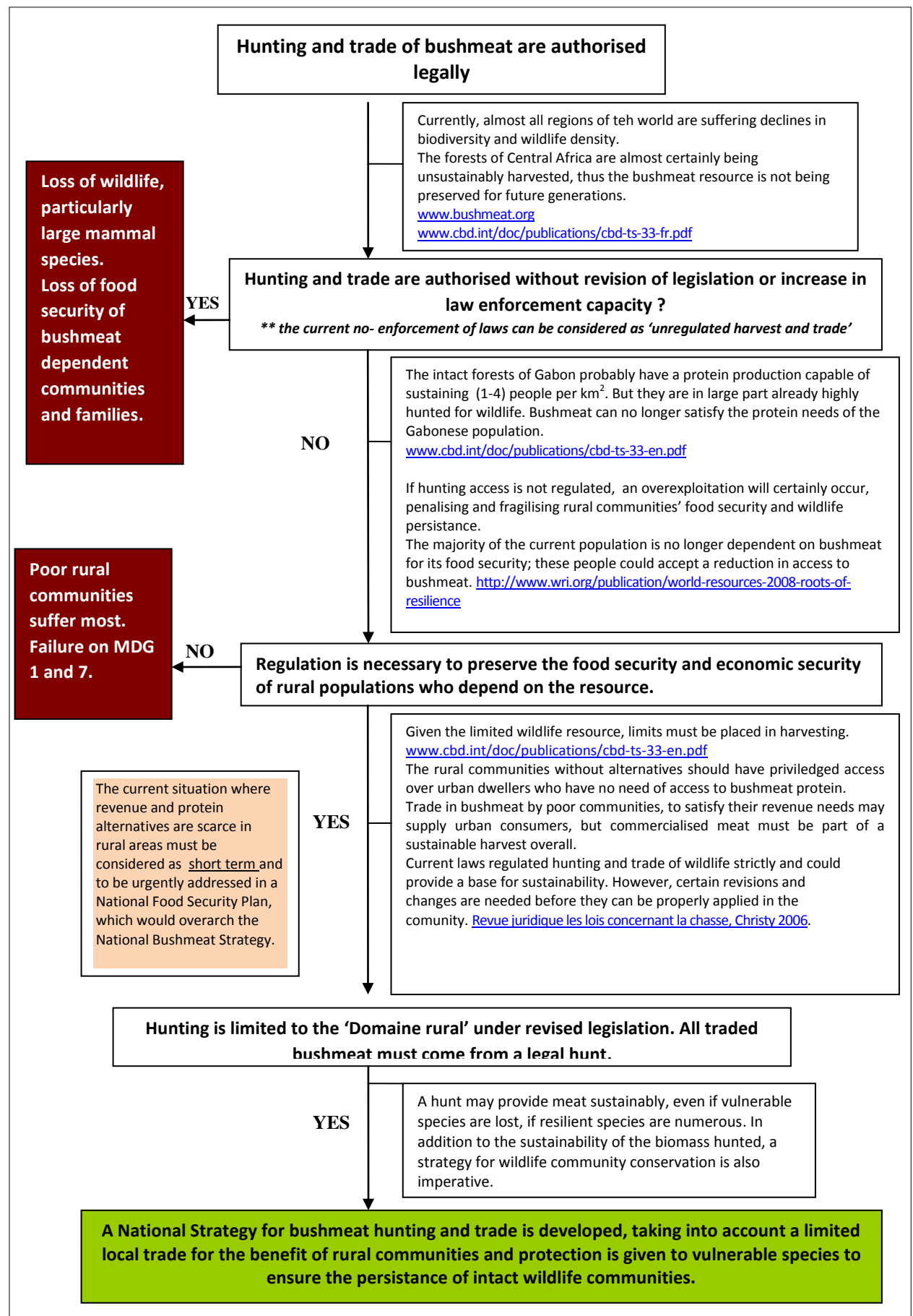
<http://www.un.org/english/millenniumgoals>

and the **Convention on Biodiversity – Objective 2010**; a significant reduction in the current rate of impoverishment of biodiversity at global, regional and national levels, to contribute to poverty eradication and for the benefit of all forms of Life ion Earth.

<http://www.cbd.int/2010-target/>

2. In the search for a balance between local and national concerns for biodiversity use, national heritage and the safeguard of hunting traditions and access to bushmeat.

The second decision tree of the National Strategy



The main goals of the National Strategy are found in this second tree.

1.2 Summary of Hunter Practices

Who is hunting?

Over 70% of all rural families engage in some degree of subsistence hunting.

The very poorest rural families in villages hunt least, as they lack manpower and equipment. They do receive bushmeat in gifts.

Commercial hunters working only for income hunt in production forests and the domain rural. They poach in protected areas and for protected species.

Hunting with shotguns and wire snares is only legal in the open season for village hunters with licenses, under 'villager hunting' laws.

Where are they hunting?

Village subsistence hunters trap the area very close to a village very intensively, but rarely hunt beyond 15km from their village. Commercial hunters can move illegally into more remote areas. Logging company employees can hunt legally in designated areas of the production forests far from permanent villages.

Hunting areas around villages are allocated to individual hunters and are rotated, with 'fallow' periods. In the past, villages moved within clan lands, however, recent permanent settlement of villages means that land is returned to more frequently in the past, allowing less time for wildlife regeneration. Hunting within 5km from villages is very intense everywhere.

65% of Gabon's territory is probably hunted for village/logging camp needs, 96% is within reach of commercial hunters and poachers.

How are they hunting?

Although year-round subsistence hunting with traditional methods is legal for all villagers, the majority of hunting in practice is illegal, as closed seasons and limits on use of guns and wire snares, numbers of animals caught, protected species and protection for female and juvenile animals are not respected.

Village hunters mostly use snares and shotguns. Neck snares are used close to villages and catch smaller prey, leg hold snares are used further away for larger animals. Shotguns can be used anywhere, but are more effective for larger prey and so are used most between 3 and 15 km from villages where larger animals can still be found. Heavy firearms and automatic weapons are very rare and cannot be used legally.

Most village hunting is still on foot from the village, but commercial hunters increasingly use vehicles to get to remote areas and transport large quantities of meat out in freezers and iceboxes.

What are they hunting?

114 species have been recorded as bushmeat in Gabon since 2000. Most of these are mammals, but birds and reptiles are also common.

The top 5 species provide >70% of the biomass hunted, and **Blue duikers**, **Brush-tailed porcupines** and **Red duikers** are always in these top 5 species, wherever hunting takes place in Gabon.

Rare and vulnerable wildlife species form a minority of the village hunters' catch. Limiting the offtake of these species would have a relatively low impact on village hunter livelihoods and a relatively high impact on wildlife survival and biodiversity conservation.

Is current bushmeat hunting sustainable?

Several small species (<5kg) which are fast breeding and live at high densities seem to be quite resilient to current village subsistence hunting intensity. However, hunter returns in areas that have been hunted for

a long time are now low even for these species, suggesting that the offtake has been unsustainable over the last few decades. Viable populations of duikers can still be found at 5-10km from many villages, but the overall faunal community within which they are found has been changed by hunting pressure.

Large bodied animals (>10kg) are now rarely found in resident populations close to hunting villages (<3km) which must have been over-hunted in the recent past, and for very large animals, such as elephant, buffalo or apes, abundances <10km from a village are low.

Why are rural communities hunting bushmeat?

Bushmeat is a very significant part of the rural economy, with nearly 80% of rural families gaining some benefit from the resource.

Bushmeat is providing up to 90% of the protein in the diet of some remote rural families, and >70% of family income in remote, forest areas (which could be as much as 25% of the rural population, >50,000 people). Hunting returns within a community are highly skewed, with few families hunting most of the meat. Total value of bushmeat is greatest for wealthier families, who hunt most successfully, but proportionally poor families benefit more.

Traditional use of bushmeat for family ceremonies is still important and can increase hunting by up to 30% in the dry season and at the New Year.

Alternative proteins and sources of income are rare in rural villages. In coastal regions, seafish provides alternative protein for a similar price, but in forested areas, alternatives on sale are scant and over twice the price of bushmeat.

1.3 The Commodity Chain

How much of their catch do village hunters sell?

Hunters across rural forested Gabon are generally selling about 40% of the animals they catch. This equals about 50% of the biomass they catch, because they preferentially sell larger animals.

Which species are most commercially important for villagers?

The most frequent sales across all Gabon are duikers, porcupines, and red river hog. Smaller species are generally eaten in the village and larger animals are less often caught, but when they are, they will be sold. In most villages, 3-5 species account for over 70% of commercial sales. The exact species vary with locality, but commonly include duikers, porcupines and red river hog.

Which families and communities are the most dependent on selling some of their bushmeat?

Most village families make the majority of their income from agriculture and only remote villages make >50% of their income from bushmeat, but this may be the situation for around 25% of villager households. The families that make most commercial benefit from bushmeat are not the poorest in the village, but the middle sector, who can afford to use guns and catch larger animals.

How much cash income do hunters make from selling bushmeat?

All families who hunt (77% of the rural sector) will sell bushmeat when they can. Successful hunters can make up to 10,000fcfa/day, but only around 5% of families that hunt get these sorts of returns. 90% of hunters make less than 1,000fcfa per day, often only a return of 100fcfa/day, for all sales averaged over the year. The average rural family income is around 6,000fcfa/day from all activities, so for most, bushmeat is not a major resource.

Cash from bushmeat is not generally considered a reliable income and is not usually used for daily needs (other food, fuel etc) but for luxury goods, or more occasional needs, like clothes, medicines or ceremonies.

Where is bushmeat sold?

Bushmeat is sold from villages into a commercial chain of usually 3 to 4 steps (hunter to transporter, to small town market, to larger town), eventually supplying the capital. The proportion of meat from each provincial town that arrives in the capital is small (around 10%, depending on transport possibilities). However, the aggregation of supply from many towns results in large markets in urban centres, largest in Libreville.

Although around half of the catch is commercialised, only a small part gets into a recognised market chain, being sold at fixed bushmeat markets. Much of it is sold through direct orders to a hunter, roadside or street vending in larger towns or restaurants. In Libreville, only 18% of meat that is consumed was purchased from a recognised marketplace.

Who is involved in the commercial trade?

There are many actors in the commercial chain: village hunters are mostly partially commercial; selling surplus meat after satisfying dietary needs of their families, but others are purely commercial, selling all of their catch, or hunting for a salary.

Once sold by a hunter, traders (market sellers, resellers, procurers for private orders, street vendors and shop owners, transporters and restaurateurs) may all make financial gain from bushmeat. Around 11% of all Gabonese families make some money from the bushmeat trade in some way. The numbers of marketplace traders and shop and restaurateurs are known for each town, but the number of private order traders and resellers in each locality is hard to survey and is largely unknown.

Who buys commercial bushmeat?

Even in small settlements, bushmeat is generally bought, rather than family hunted. In Libreville, although only 18% of bushmeat comes from recognised market places, over 80% of consumed bushmeat came from a commercial supplier of some sort. In contrast around 90% of village consumption was supplied by family hunters. In all settlements of over 2,000 people, most consumers are buying the majority of their bushmeat commercially.

How much meat is sold commercially each year?

Rough calculations suggest a minimum of around 10,000 - 11,500 tonnes of meat may be sold commercially each year in Gabon; the equivalent of about 30,000 cattle carcasses.

What income and profits do resellers make?

Vendors in provincial markets have been recorded making up to 425,000fcfa per month profit from their bushmeat trading and most resellers trade in other commodities also, thus this is only partial income.

Carcasses of bushmeat may double their value between sale from the hunter and the price paid in the capital city.

1.4 Bushmeat Purchase and Consumption

Where is bushmeat acquired for the household?

Bushmeat comes into homes from family hunting, gifts or the commercial chain. Commercial outlets include shops, markets, street vendors, roadside or doorstep sales, orders from on-demand hunters and restaurants.

Consumption of commercial and family hunted meat

At least 50% of all the bushmeat consumed in Gabon is bought commercially.

In all urban settlements greater than about 2,000 people, the majority of the bushmeat eaten is from a commercial source not a family hunter. This is a combined effect of depleted wildlife around larger villages and alternative opportunities for men's employment.

The effect of wealth on the consumption of protein

People in richer households and houses with higher incomes eat more protein than poor households. However, they tend to choose a lesser proportion of bushmeat within that. In Gabon, all rich people (>US\$10 per person per day) live in urban centres, especially Libreville.

People in urban centres have more choices of alternative proteins than in rural areas. Bushmeat is the cheapest meat in villages. In larger urban centres, this is reversed. Bushmeat can be very expensive and there are always cheaper alternatives available (i.e. frozen chicken).

People eat least protein in provincial towns, with small towns of 2,000 – 10,000 people faring worst, as all proteins, including bushmeat, are imported and are expensive.

The effect of urban living on bushmeat consumption

People of the same income eat less bushmeat in urban centres than in rural areas. This is mostly explained by the relatively high price of bushmeat in urban centres, rather than a free choice by urban people.

The longer people have lived in urban areas, especially for people under 25, the less bushmeat they choose to eat.

The availability and price of alternative foods

In urban areas, alternative proteins are available, and become more widely available and cheaper the larger the urban centre, and the better the transport links to Libreville, the main importation port.

In villages, bushmeat is the cheapest and most available meat, between 40 and 60% the price of the cheapest other protein. In Libreville, bushmeat can be up to 6 times the price of alternatives such as tinned meat or frozen chicken.

Prices of rurally available alternatives are high because transport costs are high and there is no tradition of rural domestic meat production. Almost all imported meat goods originate in Libreville and have to be transported to the interior. Currently, poor transport infrastructure limits both quantity and quality (freshness) available, and adds a high overhead to the goods, which become very expensive.

Rural food security

Although many villagers, especially in forest areas in dry season, have been shown to be overall food insecure, the protein part of their diet was generally good. The fact that other parts of their dietary requirements are not being met makes their reliance on meat for energy very high and their access to bushmeat currently critical.

Consumer perceptions of bushmeat

Around 60% of urban dwellers and 90% of rural dwellers said they preferred bushmeat to domestic meats. They cited taste, health, habit, ease, price and culture as reasons for this choice. But only 13% of families said they had no cultural prohibitions against certain family members eating any species of bushmeat.

In taste surveys, Brush-tailed porcupines, duikers and red river hog always came out in the top 5 bushmeat species preferences.

1.5 Wildlife

How much wildlife is there to hunt?

For most wildlife species, there are no good estimates of the wildlife numbers currently in Gabon. There are no estimates at all for the numbers of the most hunted prey species; brush-tailed porcupines, blue duikers, red duikers or red river hog living in the domain rural or production forests and estimates from protected areas are likely to be much higher than those in hunted areas.

Is wildlife declining due to village hunting?

Wildlife surveys of hunted areas and interviews with village hunters suggest that wildlife communities have been seriously depleted by the unregulated village hunting regime in the last 30-50 years, since villages became permanently-sited and vehicle access became widespread. Large mammals, such as gorillas, elephants, manatee, hippo and Bongo rapidly declined soon after hunters using modern methods (guns and snares) accessed their habitat and are now absent or in very low numbers close to human settlements and roads.

Abundant populations of apes and elephants are now limited to remote areas, generally more than 15km from vehicle access. Leopards are absent from areas close to villages and have become rare in areas where humans hunt duikers, their preferred prey.

How much wildlife habitat is used for hunting?

Half of Gabon's land lies within 15km of a village and is assumed to be accessed by hunters. Three-quarters of Gabon's land is within 15km of vehicle access for commercial hunters and nearly the whole country (96%) is within 40km of vehicle access, known to be used to some extent by commercial hunters.

How much wildlife is vulnerable to hunting?

Wildlife is not evenly distributed across the land, and the most abundant wildlife populations are now in the remotest and most protected areas, which have minimal overlap with the village hunting areas. This is positive for long term wildlife conservation, but does not contribute to the sustainability of village hunting.

What proportion of the wildlife community is affected by bushmeat hunting?

Many of Gabon's mammal species (46%) and all of the mammals over 3kg are used for bushmeat. Fewer of the reptile and bird species are used. Species are targeted differently and over-hunting changes the balance of wildlife communities. Long term overhunting alters the entire ecology of the forest.

Is current hunting of wildlife sustainable ?

No. Wildlife populations of almost all hunted species are known to be declining in areas where there is bushmeat hunting. Brush-tailed porcupines and blue duikers seem more resilient than expected, but even their populations have declined in areas where hunting pressure has been sustained over a long period.

Local protein needs are more than fulfilled by the current bushmeat harvest and a sustainable subsistence hunt for a limited number of species to feed rural communities is probably feasible. However, current village harvests are higher than local needs, in order to supply cash from sale of bushmeat to an urban

demand and are causing local wildlife to decline, which jeopardises local food security and livelihood security.

The productivity of Gabon's remaining wildlife is not sufficient to supply the current consumption levels recorded in urban areas.

1.6 Legality, management, control and sustainability

Are current hunting laws appropriate for the National Strategy?

The current hunting laws are very strict and designed for a rural subsistence hunt for meat using traditional methods, and long term wildlife conservation. However, they do not afford for use of modern village hunting methods for subsistence (year round use of shotguns and unselective wire snares) and so are unpopular and hard to enforce in subsistence communities.

The laws on hunting access, methods, seasons, bag quotas and age-sex limits of the catch need to be revised in the light of current rural needs and the limits to sustainable harvesting that must be respected.

Modern day mobility means that the definition of 'villager' or 'home use' is difficult for law enforcers to apply and needs clarification for people to know their rights.

Are the wildlife species protection statutes appropriate for the current threats?

The protected species lists require revision. They currently include species not found in Gabon, like the Drill, and have not yet been revised in the light of recent data on globally endangered species, of which Gabon holds extremely important populations (leatherback turtles, forest elephants).

As so many species are used for bushmeat and are declining in the face of hunting, yet so few are important to rural subsistence, a revision to select legally-hunted game species with default protection for all other species may be a more successful management strategy and easier to enforce. For a given sustainable offtake, reduction of the number of harvested species better protects the wildlife community structure by retaining the proportions of different species in natural balance.

Modern methods have led to increased hunter offtakes and less species selectivity, which is now in combination with the loss of hunting area rotation, bringing long-term problems for sustainability of rural hunting livelihoods.

Are trade laws appropriate?

The laws on hunting, trading and transportation licences and permits for legal trade in bushmeat are well designed and could underpin a legal local trade sufficient for hunter income needs. However, they are very costly in the staff and time resources they require for proper enforcement and have thus not been enforced. An in-depth review of the strategy for enforcement is needed in order to gain rural community respect for regulation of trade.

Trade into urban areas can only legally happen through licensed hunters and traders, purveying certified carcasses. This is an appropriate framework for a legal urban supply, but requires careful and vigilant enforcement to protect legal rural hunter supply from infiltration by illegal commercial poachers.

Health issues

The licensing and permitting of bushmeat provides a framework for ensuring hygiene and healthy meat. If enforced, the current permit system could be adapted to ensure health standards in supply.

Technical legal issues

Many of the relevant laws do not have appropriate accompanying application texts. This makes their enforcement almost impossible. Updating and completing the '*textes d'application*' is urgently required to allow the legal framework to operate efficiently.

Robust definitions of ‘villager’ and on-the-ground definition of village lands, currently defined by ‘5km beyond the plantations’ are required to allow both villagers and enforcers to know what the law requires.

Legislation for local circumstances

Villages are faced with different opportunities for sustainable hunting, depending on their history and local circumstances and current population. Legislation for sustainability of rural hunting must be flexible enough to allow wildlife recovery to be planned for, in generating long term sustainable harvest programmes.

2 HUNTER PRACTICES

2.1 Who is hunting?

2.1.1 Who can legally hunt in Gabon?

The national laws governing hunting do not refer to particular groups of people who can hunt, however, customary and village hunting rights refer only to members of the village or forestry camp communities as having the right to hunt in their village territories (5km beyond the village plantation area), community forests or areas defined by the concession management plan. **Thus the current hunting rights of people now resident in urban areas are unclear** although the places that hunting can take place are well defined. Hunters exercising customary rights can hunt year round without a permit, as long as they catch only males of non-protected species, respect bag limits¹, and use traditional methods (not firearms or steel wire snares) and remain within a 5km radius area around their home. To hunt using shotguns or steel snares, the hunter must be at least 18 years old, resident in the village or employed in the forestry camp, and must apply for an annual permit which is valid only for the open season from March to September. This permit also allows him to hunt partially protected species in limited numbers (Christy, 2006)².

The current problems with the practical application of these laws lie mainly in the ineptitude of the closed seasons for hunters with subsistence needs. Although they can hunt under customary law year round, prohibition of their main gun and wire snare hunting techniques during the closed season makes application of the law locally very difficult.

Although the principles of licensing hunters, quotas and commerce from the hunter would ensure good wildlife management, currently local Ministry authorities are not sufficiently numerous on the ground to cope with giving or overseeing permits for firearms, hunting, commerce and registration of legally-caught animals for commerce. Village hunters obtain most of their catch with wire snares or shotguns, therefore under 'village rights'. They sometimes have firearms licenses, but generally hunt without license, do not have commercial licenses and do not register their catch to sell.

2.1.2 Rural village hunting

Socio-economic surveys show that around 12% of all families in Gabon may be directly involved in hunting and 11% in trading bushmeat. The figure for hunting is highly biased toward rural communities with very few urban families actively involved in regular hunting for meat.

¹ Current per hunter quotas for all non-protected species are: per day 3 of the same species or 4 of different species, and per week 9 animals of any species. Females cannot ever be legally hunted. Article 7 of Decree n° 692 /PR/MEFEPEPN of the 24 August 2004 fixing the conditions for exercise of customary usage rights for forestry, wildlife, hunting and fishing. Article 5 of Decree n° 189/PR/MEFCR of the 4 March 1987 relative to wildlife protection.

² Current per licence (1 hunter, 1 year) quotas for partially protected species are :2 sitatungas, 2 bushbuck, 1 giant forest hog, 10 red river hog, 10 mandrills, 2 Yellow backed duikers and 2 servals.

Table 2.1.a: Estimation of the proportion of the nation currently involved in hunting and trading bushmeat³.

A small additional proportion of urban families probably hunt occasionally, as evidenced by the seasonal influx of hunters in rural localities (i.e. Okouyi, 2006; Carpaneto et al., 2007).

	Percentage of Gabonese population	Percentage of surveyed families containing a regular bushmeat hunter	Percentage of all Gabonese families estimated to be hunting bushmeat	Percentage of surveyed families with income from trading bushmeat	Percentage of all Gabonese families estimated to be trading bushmeat
Capital city	40	0	0	0.2	0.08
Provincial urban	44	0.2	0.09	2	0.88
Rural village*	16	77	12.3	65	10.4
Total	100		12.4		11.4

Around 80% of all rural village families hunt and that those that do not hunt are mainly families with no able-bodied man available to hunt (Starkey, 2004; Okouyi, 2006). Rural families without an able-bodied man are often the very poorest of the rural village population, and cannot afford the equipment or labour needed to hunt. The few rural families that didn't hunt where a man was present were those that gained alternative income elsewhere, which prevented the man from hunting (salaried employment, commerce etc; Coad, 2007).

These numbers do not include information from the semi-nomadic BaBongo, Baka and Babendjele people (often grouped as 'pygmy people'), whose hunting practices may be different from the sedentary village populations surveyed here. In these entirely forest-dependent communities, hunting is practiced by all families, even old, children and the infirm (O Hymas, pers. comm.). These forest communities are probably the absolutely poorest sector of Gabon's population.

The vast majority of hunting is done by men and hunters include men from 12 to 75, though the most successful hunters are those in the 30-50 age group, probably due to a combination of strength and experience (Okouyi, 2006; Coad, 2007). Only one study, in Pongara, found women hunting with guns (Peindi, 2007), but several studies have reported women and children laying snares near to villages (Lahm, 1993; Starkey, 2004; Coad, 2007).

2.1.3 Commercial hunting

In addition to village-based hunters, there are hunters acting for purely commercial ends, with no subsistence needs. These men are often acting as salaried or commissioned hunters for an urban vendor and do not have daily subsistence needs for the meat. They are often hunting in an area away from their native village.

Expatriate hunters are often in this fraction. Though expatriates who have settled in villages do participate in hunting for family subsistence (i.e. Coad, 2007, p.262), their numbers are quite low.

³ The involvement of urban people in hunting and selling was estimated from 4506 household surveys of sources of both income and household food in Libreville and provincial urban areas, carried out in 2003 and 2005. *Average village family involvement was estimated from 3 studies of village hunting in forest areas between 2000-2004. The national estimates are approximate, as they assume equal family sizes in all settings. Population data is from RGPH, 2003. Sources: Okouyi, 2006; Coad, 2007; Starkey, 2004; Abernethy et al., unpublished; RGPH 2003.

2.2 How are villagers hunting?

2.2.1 What are the legally recognised hunting methods?

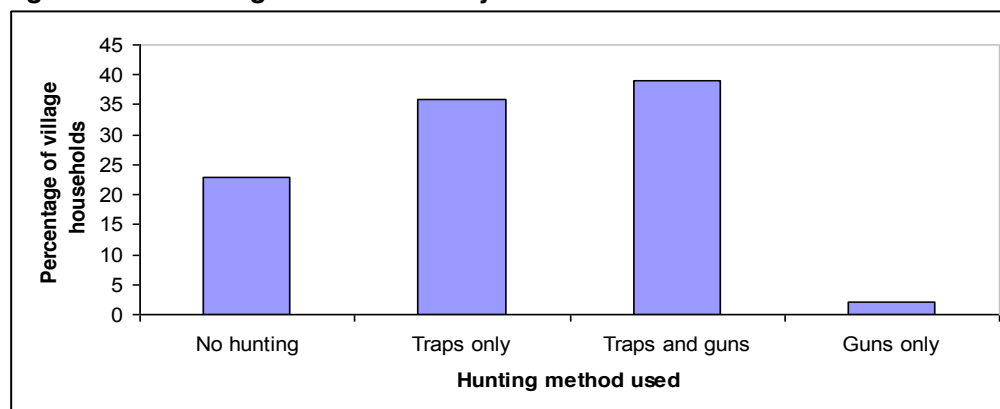
Year round, only customary hunting is allowed and this authorises only traditional methods and local (in the village they are used in) fabrication. In addition, the forestry code now prohibits nets and pit hunting. This effectively reduces legal hunting to liane snares, bows and arrows, spears, knives, glue traps and dogs.

The most common hunting methods: steel wire snares and small firearms are illegal for hunting carried out under 'customary rights' law and only allowed under annual license for 'village hunting' rights. Village hunting rights are limited to the open season of March 15th to September 15th each year and can be carried out in the rural domain within 5km of the village agricultural lands and in areas of a forestry concession designated for hunting under a management plan. In practice the enforcement of the laws on hunting methods are only enforced for national parks or some privately managed forestry concessions.

Families that hunt use traps (mostly forms of metal cable snares), or a combination of trapping and gun hunting. Some forest dwelling people in very remote areas still use bows and arrows, spears, pits, dogs and net hunts, but on a national scale, these are now very rare in Gabon. Liane snares are still common, but steel wire is preferred as it is stronger and lasts longer, despite its illegality in most cases.

Very few rural subsistence hunters use only gun hunting and very few families obtain meat only through protective snares on their plantations, without setting traps in the bush. These latter families are exceptionally poor, disadvantaged families who have no able bodied man (Starkey, 2004).

Figure 2.2.1. Hunting methods used by rural households in forest areas⁴



Differing hunting methods target different species, with guns being used for larger animals and arboreal species, and snares for relatively smaller and terrestrial prey, though these targets are not exclusive. Snares can be set for a leg or neck hold, and the use of these targets different species; smaller prey are caught most often in neck hold snares, blue duikers are caught almost equally in both snare types, and red duikers and larger ungulates (sitatunga, red river hog etc) are caught almost exclusively in leg hold snares (Coad, 2007). Hunters tend to set leg hold snares further from villages where hunting intensity is lower and available prey are larger (Coad, 2007; Henschel, 2008). In 2009, following wildlife exploitation over many years, larger prey are found, and therefore captured further from the villages (Henschel, 2008; Van Vliet, 2008, Coad, 2007 and see section [2.3.2](#)

Though exclusive gun hunting is rare, the local proportion of gun hunting varies across the country and depends to some extent on local economic circumstances. The recent increase in commercial activities in the rural sector, and better road access to wildlife-rich forests can lead to better returns from bushmeat

⁴ Data combined from Lahm, 1993; Starkey, 2004; Okouyi, 2006; Coad, 2007;

and increases in gun hunting. The species targeted also depend on the methods used, with the increased gun hunting resulting in an increased proportion of larger ungulates (especially Red River Hog) and corresponding decrease in rodents compared to areas where snaring predominates. When wildlife becomes severely depleted, gun hunting close to a village becomes unfeasible and snaring will predominate. As hunting families become poorer through low bushmeat returns, gun hunting will also become increasingly difficult as the costs are relatively high.

Figure 2.2.a: Hunting success of village subsistence hunters in an intensively hunted forest⁵.

Hunting Method	% animals caught	% biomass
Snaring	67.9	62.2
Gun hunting	30.6	35.2
Netting	0.5	0.3
Dogs	1.0	2.3
Other (glue, live traps)	Children hunters only, low returns	Unknown but very small

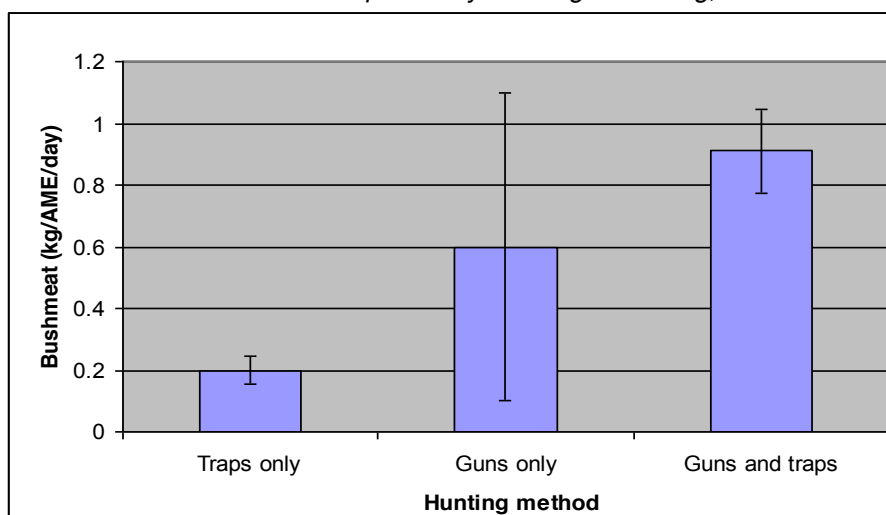
Hunting practice is closely related to wealth, with families with higher income practicing gun hunting more than poorer families (Starkey, 2004). As gun hunting can only be practiced by households with the means to purchase or hire the firearm and supply ammunition, there is a threshold below which very poor families cannot gun hunt.

Starkey (2004) shows that for inexperienced hunters initial investment in equipment is high and returns will probably be low. The relatively risky business of learning high-cost gun hunting is a significant deterrent to families, who can seriously indebt themselves if initial returns are low. Very poor rural families in this predicament opt for cheap and reliable snare hunting, though unquantified labour costs are relatively high and efficiency is low.

For villagers, snaring is the most common method of hunting, and has the lowest overhead costs in materials. However, snaring is also the most wasteful method of hunting wildlife, with losses to rotting or scavenging reaching significant amounts. Wastage increases greatly with distance of the trap from the village, corresponding to a longer delay before the trap was revisited. Traps more than 15km away waste nearly 30% of their catch (Muchaal and Ngandjui, 2005). An average loss due to rotting of 8% of the individual animals (4% of the biomass) caught in snares was recorded for villagers in Gabon trapping on average 4km (0-10km) from the village centre (Coad, 2007).

Figure 2.2.2: Meat obtained by rural families from different hunting methods⁶.

Wealthier families have more possibility to use gun hunting, and more labour available for all hunting,



⁶ which allows better comparison between a proportion on an adult man's average

thus tend to have the highest meat returns.

2.3 Where are villagers hunting?

For village subsistence hunters, who hunt almost exclusively on foot, traps are usually set within 10 km of the village, with trapping intensity highest within 1 km of the village. In intensively hunted areas where villages have been sedentary for more than 25 years, densities of up to 180 traps per km² have been recorded within 1 km of the village, reducing to around 10 per km² at 10 km.

Hunters setting out on foot from villages to gun-hunt, go to a maximum distance of about 15 km when targeting species for meat (Starkey, 2004; Coad, 2007; Van Vliet & Nasi, 2008). Hunting camps can be temporarily used to extend this distance to up to 40 km.

The way in which a landscape is used is important to the hunters' efficiency, and also to the resilience of wildlife. Recent studies in Gabon (Coad, 2007; Van Vliet, 2008) and Equatorial Guinea (Kumpel, 2006) have looked at the way in which a village hunting area is used and discussed implications in terms of wildlife survival and thus harvest sustainability. Local intensity of hunting, as well as the overall offtake, is important to long term sustainability of wildlife populations. This is further discussed in [section 5](#).

2.3.1 How is access to land for hunting governed?

Land in Gabon is owned by the state. Access for hunting is legally controlled under the legislation relative to the land use (in general, 4 major uses are defined: protected area, production forest, rural domain, urban). All hunting is banned in protected areas but can be carried out in the production forests and rural domain under the 'customary rights' laws, or 'village rights' laws, in areas close to villages, community forests or defined in forestry management plans. A full review of the current legislation and its interpretation is found in Christy, 2006.

The State definition of a village territory in Gabon is a minimum of 78.5 km² area, measured as a standard 5 km radius around the village plantations⁷. Plantations are found a maximum of 5 km from the village (usually less), making an absolute maximum radius of 10 km (314 km²) for a state recognised village territory

In practice, most subsistence hunting occurs close to village and towns in the rural domain. Here, local hunting areas are still defined by tradition in many communities, but different local histories and circumstances mean that respect for traditional access to the forest is very varied across Gabon today and no generalities can be easily made here about what will govern current access in any given locality. Increasingly, men from outside the village community are coming in to hunt in village lands and this is causing increasing concern in some village communities.

Entirely commercial hunting (rather than subsistence) is more frequent in the production forests, where distance from villages means that access is less well defined by traditions, and regulation depends largely on the concession manager and its vision and capacity to control access and hunting. All Gabonese, including the nomadic BaBongo, Baka and Babendjele people, have customary access rights in the production forests, but all hunters must use traditional, locally made equipment to hunt⁸. Use of firearms and steel snares is prohibited for areas hunted under the laws of 'customary rights' and only permitted in the rural domain and areas where 'village hunting' is permitted. In some areas (like protected area buffer

⁷ Article 6 of Decree 1205/PR/MEFPE of the 30 August 1993.

⁸ Article 2 of Decree 692/PR/MEFEPEPN of the 24th August 2004 gives the terms of customary rights to use of the forest. Arrêté n° 687/CH of the 17 February 1956 and the arrêtes of 16 September 1953 and 3 September 1955 give the list of methods and weapons that can be used for customary hunting. Article 215 of Law 16/2001 of the 31 December 2001 (the Forestry Code) bans the use of steel wire for snares, pit traps and nets, even for customary hunting in forestry concessions.

zones, and hunting areas defined within logging concessions), whether hunting is restricted to customary hunting, or whether 'village' techniques can be used is unclear (Christy, 2006).

Village hunters' knowledge of the state laws governing hunting areas in the production forests or rural domain is often scant, but they are still highly aware and respectful of traditional community laws determining their local hunting area rights (Starkey, 2004; Okouyi, 2006; Coad, 2007; Van Vliet, 2008).

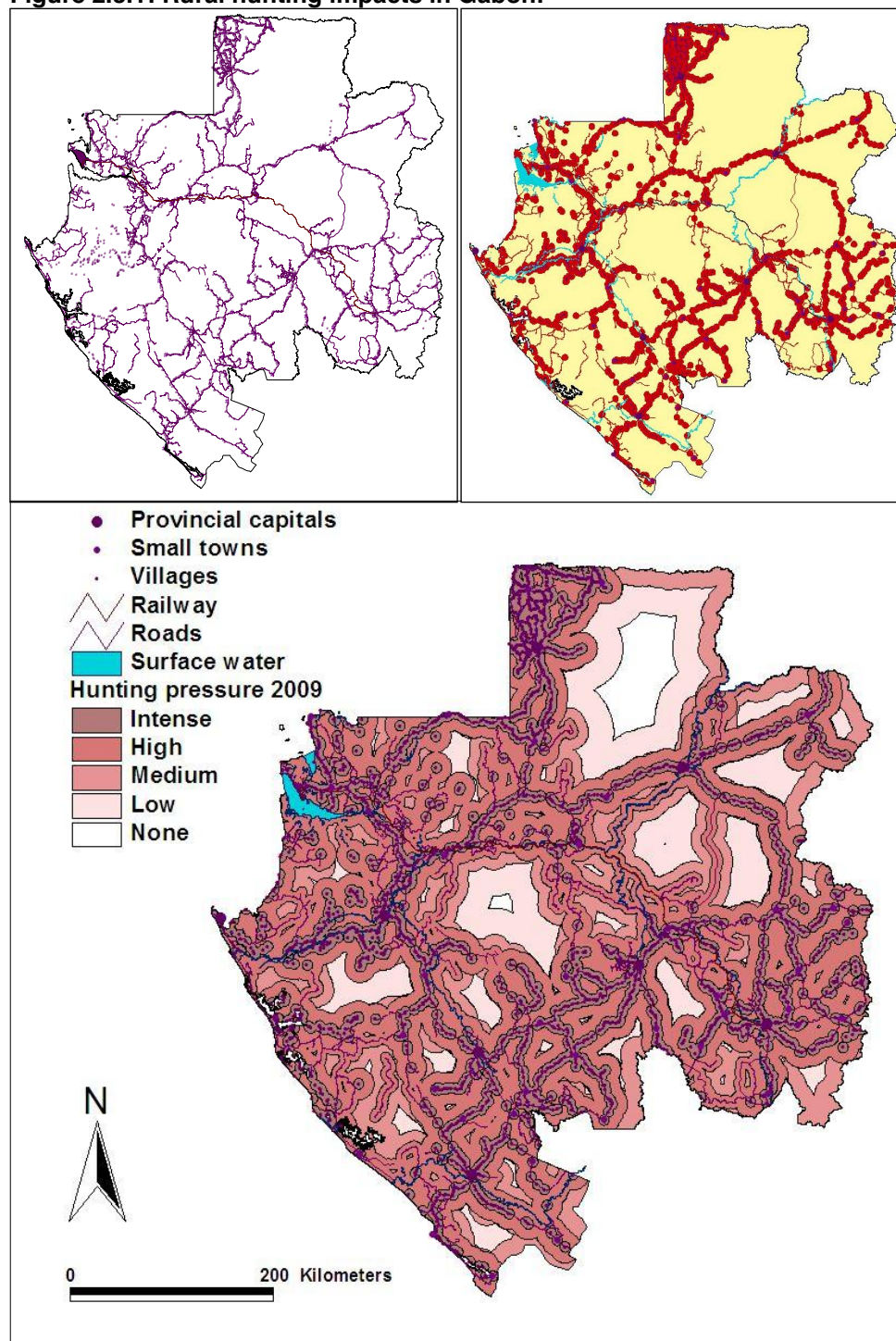
2.3.2 How is the local landscape used?

Land around villages is used in a similar way in most areas of Gabon. Local hunting areas are usually determined by the hunters' family associations and are used exclusively by them. Trap lines are set in areas along a set of pathways which are allocated to a particular hunter or family and which are used and abandoned in a traditional system of set-aside⁹ type management. Traditional village management systems allow time for regeneration between hunting periods. These fallow periods used to be exercised both on a short-term basis, when hunting areas around the village were managed by individual families at their own judgment; and on a longer term basis by the village chief, through a long-term rotation of the village site, where the settlement, and hence the hunting centre, moved around 10km approximately every 20 years, within a greater clan territory. This long-term rotation of hunting areas is now almost abandoned as investments in modern houses, state infrastructures and roads mean that villages have ceased to move within the larger clan lands.

2.3.3 Hunter pressure estimates

The lands within 5km of permanently settled villages are now very intensively hunted (permanent snaring pressure) and farmed over many years, though in any one year only part of the area will be used. Wildlife surveys have shown that wildlife densities for animals >10kg are now extremely low <5km from roads and village centres (Laurance *et al.*, 2006; Maisels, 2007; Laurance *et al.*, 2008; Henschel, 2008; Henschel *et al.*, 2009;).

⁹ the term 'set aside' refers to land management solutions based on periods of activity and periods when the land is not used or 'set aside'. In comparison, other methods use definitive definitions of land use, where some lands are always hunted, and adjacent areas always protected as sources of animals for the hunted areas, or use quotas of offtake to limit the hunt intensity instead of limiting the hunted area.

Figure 2.3.1: Rural hunting impacts in Gabon.

a) Towns and villages documented in Gabon (2003) **b)** settlements buffered at 5km (dark circles), corresponding to intense hunting pressure. **c)** all current hunting pressure: Intense = <5km from settlements; High = 5-15km from a settlement or <5km from other access; Medium = >5 <15km from other access; Low = >15 <40km from access; none = >40km from access¹⁰.

Areas beyond 15 km from any villages are not heavily used for the subsistence requirements of rural communities based on snaring and one-day gun hunting trips. This is supported by measures of wildlife on the ground, using camera traps in hunted and unhunted areas (Henschel 2008; Henschel *et al.*, 2009 in press; see section 5). More remote areas are accessed along roads by commercial gun hunters in vehicles

¹⁰ Data sources: Forestry concessions, villages, NPs, roads, WRI Global Forest Watch 2009; Hunting pressure, Okouyi, 2006; Coad, 2007, Maisels, 2007 & van Vliet, 2008; settlements, RGPH 2005

particularly within logging concessions, but land beyond 15 km from vehicle access is largely free from bushmeat hunting in Gabon. Trophy, ivory, or specialist meat hunters, targeting elephants, apes, Bongo or Grimm's duikers, can travel up to 40km from vehicular access using temporary camps (Maisels, 2007; WWF, 2008). These impacts are hard to monitor as they usually sporadic events and often facilitated by temporary roads, or wet season water access.

Ninety-eight percent (98%) of Gabon's area is land. Of this around 24% is in the intensively-trapped zone within 5km of villages (intense pressure) and a further 46% is within 5km of a vehicle access route or 5 - 15km of a village (high pressure). The remaining land is probably experiencing medium pressure (5-15km from any access; 14%), or low pressure (15-40km from any access; 14%). Only 2% of the country is probably free of bushmeat hunting pressure, based on the knowledge we have of the way hunters are using land, and even this area may be being used by ivory poachers (WWF 2008).

While the state designated village area (78 – 314 km²) corresponds well to the area actually freely chosen for use by hunter villages (Coad, 2007) most traditional village hunting lands are not a closed circle, but follow ridge paths or rivers out of the village and thus include areas farther from the village (5-10km), and ignore some of the land closer to the village (Coad, 2007; Van Vliet, 2008).

In this way, in addition to the seasonal or annual set-aside of different hunting lands, the area around a village contains land that is rarely or never visited for hunting; sacred areas, deep marshes, steep slopes, dense regrowth of recently abandoned plantations, and the areas between principal paths are all underused for hunting (Coad, 2007; van Vliet, 2008). This unofficial long-term set-aside land, mostly in the 5-15km band around villages, can harbour viable populations of small-sized wildlife whose land requirements are low, such as blue duiker or rodents (Newing, 2001). Animals from these populations will disperse periodically into the hunting areas.

Nearly fifty percent (50%) of Gabon's land area is within the 15km 'daily walk' distance, in easy reach of hunters on foot setting out from village homes and some of this land is in reach of more than one village, whose territories interlock. The use of all of this foot accessible land would give an average territory size to each village of 65km² or to each rural inhabitant of 0.46km². These estimates are likely to be lower than the true land use, as villages change territories to avoid overlapping other village lands. If each censused village exclusively used the State allocated minimum of 78.5 km², the total hunted area would be around 58% of the country's land, or 154,645 km²

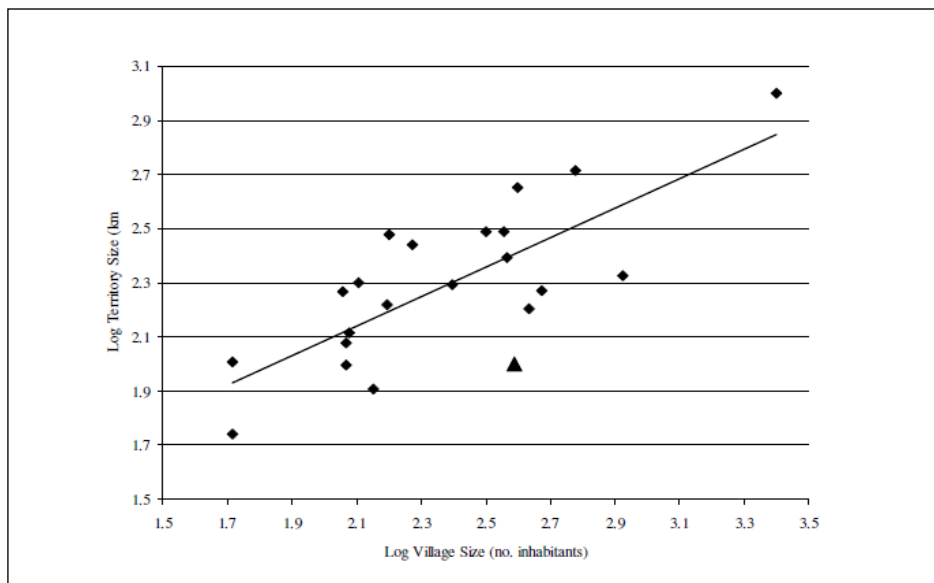
2.3.4 What is the regional use of forests for hunting?

The total area regularly hunted by the inhabitants of a village is fairly predictable across Central African forests, with villages using between 0.25 and 1.96 km²/inhabitant. Figure 2.3.1 (Coad, 2007) shows how the area hunted around a village increases with the size of the village. The average area hunted by villages in central African forests is 0.96km² per person, but villages using more intensive hunting strategies (snaring) have smaller territories than those using gun hunting. The site with the highest area used per person is in Ituri forest, where net hunting predominates in the south and bow and arrows in the north.

Figure 2.3.1: The relationship between hunted area and village population for studies across central Africa (log transformed data).¹¹

¹¹ Source data: Coad, 2007 p. 195, compiled from 22 published studies in Central African forests. Studies in Gabon have generally shown villages with relatively small territories (<70km²). Data on the forest used per capita are not widely available for Gabon, where village level census data has not been released since 1993.

The Ogooue Lolo site (shown with a triangle) and has smaller size than expected; an average of 0.26km² per inhabitant, but is hunted intensively, mainly using snares.



2.4 What is being hunted?

2.4.1 What are the current legal limits to catches?

Both customary and village hunting rights are limited to quotas for the hunters and allow only adult male animals to be caught. Each hunter can take 3 of the same species or four of different species per day, up to a total of 9 animals of all species counted together per week. In addition, licensed hunters under village rights law can take some partially protected species using a shotgun¹². Totally protected species can never be legally hunted anywhere.

2.4.2 What are actual catches from village hunters?

Village hunting offtakes vary with distance from the village, the habitat type hunted and the methods used. On a national scale, the local catch will vary also with the distribution of available wildlife and large scale habitat changes. Several local studies have produced species lists for hunter offtakes, and some general statistics can be useful to look at overall patterns in the diversity and proportions of different types of animals.

The legal bag limit of 9 animals per week is generally not exceeded by village hunters. Though these limits may be exceeded in occasional weeks, over the course of a year most village hunters do not catch these numbers consistently. However, the zero limit on female and juvenile animals, and the legal protection of some species are not generally respected at all, as snaring is not selective enough for the hunter to prevent their capture.

When all the available data were compiled, between 2000 and 2006, 114 recognized species were recorded in Gabon's hunter catches, household consumption and markets. This figure is very high compared to West African markets, where wildlife is already dramatically impacted (Ghana Wildlife Society, 2005). The harvest of bushmeat is dramatically biased towards mammals, with 78 (46%) of Gabon's 171 mammal species represented. In comparison, only 22 (3%) of the 753 bird species and 10

¹² 2 sitatungas, 2 bushbuck, 1 giant forest hog, 10 red river hog, 10 mandrills, 2 Yellow backed duikers and 2 servals. No elephants or buffalo are currently allowed as the 'Grande Chasse' is closed

(6%) of the 160 reptile species are harvested¹³. All crocodilians are used. The bias in use of animal orders is probably largely to do with body size, with many more mammals than bird or reptile species, and all the crocodilians, falling into the preferred prey sizes of 2-20kgs. A full list of the species recorded can be found in [Annex 8.1](#).

Twenty-three of the partially protected species and 24 of the totally protected species were found to be used as bushmeat, indicating the scant respect for these laws.

Individual localities recorded different levels of diversity in the original catch, reflecting the fundamental relationship between habitat area and heterogeneity and animal species diversity, and the relatively low animal diversity used by any one village.

Table 2.4.a: Animal diversity captured by local hunting communities and total bushmeat species diversity recorded nationally in Gabon over 6 years¹⁴.

Location, year	Approximate area (km ²)	Number of hunted species recorded (total)
Makokou region, 1993		33
Ntsieté, 2006	45	23
Dibouka and Kouagna, 2003	111	50
7 Ogooue Lolo villages, 2002	281	45
National	267,667	114

National surveys of consumption of bushmeat in a variety of households from Libreville to remote villages can give us an insight into what must be harvested, on a national scale, but meat is consumed in biased proportions in different contexts, so data on the species present at points further on the commodity chain must be handled with care and do not directly reflect all of the original offtake of wildlife.

Animals are not hunted equally frequently. The most frequently hunted animals are those between 2 and 22kg, with **brush-tailed porcupines**, **blue duikers** and **red duikers** forming the majority of the catch in most forest areas in Gabon. Village hunter surveys carried out in a variety of locations in the last 20 years have all discovered the top 5 species¹⁵ accounting for over 70% of the individuals hunted by a village community. The top five species vary by locality, but always contain brush tailed porcupines, blue duikers, and the red duiker group. The presence of other species depends on local circumstances but most commonly includes guenons, pangolins, red river hog and water chevrotain (Starkey, 2004; Coad, 2007; Lahm, 1993; Okouyi, 2006; Van Vliet, 2008). When assessing catch by biomass rather than numbers, red river hog are more often included in the top 5 species, and guenons less often included.

Village hunters target a small number of preferred species, whose management will be crucial for the sustainability of hunting communities' livelihoods. Hunters only gain small amounts of meat or revenue from most other species, although the biological impacts on these species, especially larger and rarer animals, may be intense, from even small amounts of hunting, as their densities and reproductive rates are low.

Restriction of hunting of the rarer species will have a low impact on the meat and revenues available to villagers, but a high impact on the survival of these species. The way different species are harvested and traded is of key importance to planning for sustainable harvests to protect cultural traditions, the

¹³ Figures for the numbers of mammal, bird and reptile species found in Gabon, from the Smithsonian Institute, Gabon, 2008.

¹⁴ Lahm, 1993; van Vliet, 2008, Coad, 2007, Starkey, 2004. National data compiled from all sources (village hunter studies, market surveys, consumption surveys) between 2000-2006.

¹⁵ 'Species' cannot be or are not always correctly identified for each animal caught by a hunter, and so some groups of species are necessarily considered for their aggregated contribution. 'Red duikers', 'small monkeys' and 'small carnivores' or 'reptiles' are typical groupings in many studies. Whilst this is of little relevance for many points, it prevents analysis of biological impacts on individual species within these groups, which may be differently affected by hunting.

livelihoods of rural people and for wildlife conservation. The way different species are used and traded is discussed further in [sections 3.2.2, 4.1.6 and 4.5](#)

The method of hunting, as well as the wildlife available, influences the catch. In two sites in Gabon, one had relative low hunting intensity and one had relatively high hunting intensity as defined by the number of hunter trips per year (see Table 2.4b below). The low intensity site was hunted mainly by snaring in the 1980's, but by 2006 it was hunted mainly with guns. The proportions of mid sized prey (that can be hunted by either method) has remained stable, but the proportion of porcupines fell significantly as guns were used, and the proportion of primates and pigs increased significantly (Van Vliet & Nasi, 2008).

The site that is intensively hunted has mainly snares also (Coad, 2007). The proportion of smaller rodents is very high and that of larger ungulates and primates very low.

The state of wildlife being hunted can to some extent be assessed by the success of the hunters (Robinson and Bennett, 2000 for review). Although hunters are setting traps in a high density throughout the <5km zone around villages, the returns from these traps show that closer than 3km to the village most wildlife caught is <4kg weight (Coad, 2007; Van Vliet, 2008).

The most commonly caught species, the blue duikers and brush-tailed porcupines, are all species with smaller territory sizes than the land areas left set aside at any given time in a village. This means they can survive even close to villages, using the unhunted pockets of land. However, the loss of long-term rotation of hunting areas means that hunting pressure on the land immediately surrounding a village has effectively increased over the last 50 years and even these resilient species may be slowly declining now.

The loss of large species of wildlife from the area <5km from a village clearly shows that hunting close to modern villages has not been sustainable to date for larger species, but understanding the potential for sustainable harvest of smaller species is crucial to long term planning.

Animals	Percentage of all animals taken		
	Low intensity hunting, snares> guns	Low intensity hunting, guns>snares	High intensity hunting, snares> guns
Blue duikers	38.9	37.5	15.6
Primates	18.4	23.5	8.3
Red duikers	12.7	13	10.9
Porcupines	11.5	6	38.4
Carnivores	4.9	1	5.1
Water chevrotain	4.9	0.5	0
Pangolins	3.8	0	6
Small rodents	2.9	0	10.3
Reptiles	2.0	1	2.8
Red River hog	0.0	12.3	0.5
Other spp	0.0	5.2	2.1
Total catch	100	100	100

Table 2.4.b: Proportional contribution of different species of animals captured by hunting communities in different studies¹⁶.

The proportions of species vary significantly between sites. Differences are probably dependent on the wildlife available and techniques used. As hunting pressure is sustained and wildlife communities change, hunters take smaller and more diverse prey, and snaring becomes more efficient than gun hunting. Significant differences are seen in the proportions of typically snare-hunted porcupines and typically gun-hunted red river hog, whilst other taxa remain in similar proportions, despite methods.

¹⁶ Source data: Lahm, 1993; Coad, 2007; Van Vliet and Nasi, 2008

Figure 2.4.1: Relative proportions of different animals caught by hunters in a forest area¹⁷.

This distribution of species contributing to the catch is typical of most studies with few (<5) species accounting for over 75% of the harvest, and most species contributing very little.

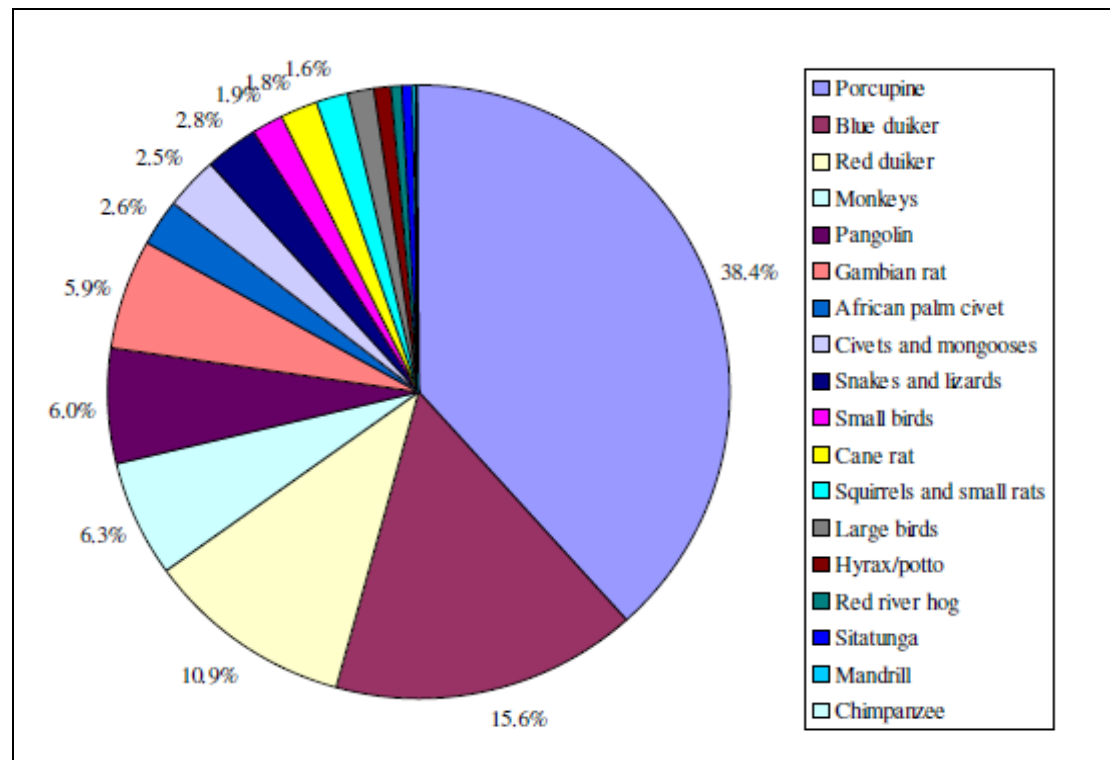
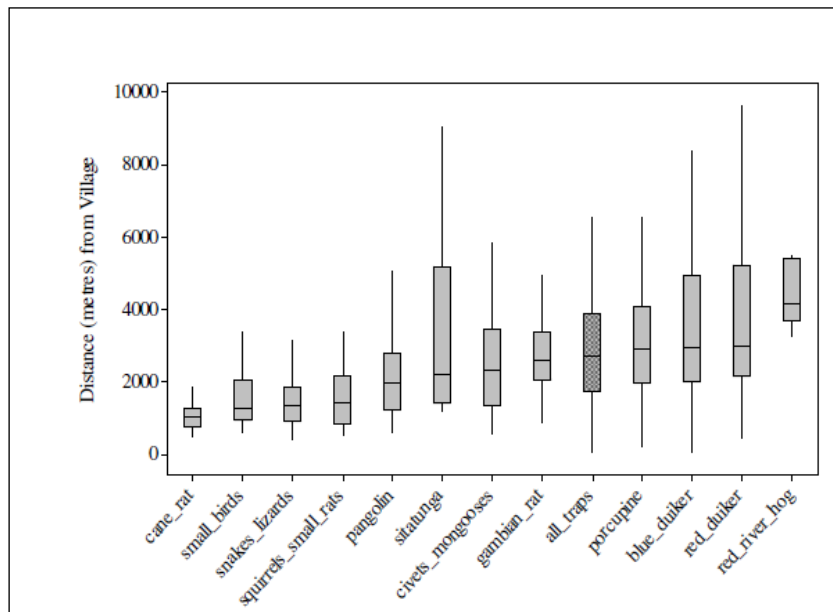


Figure 2.4.2: Changing species captures as hunters move out of a village¹⁸.

Small, generalist species persist close to the village, despite intensive trapping. Larger species, and those specialist to intact forests, are found beyond the secondary vegetation 3-5km from the village. Sitatunga, a marsh specialist and frequent crop raider, come closer to villages than their size would suggest, as they are not confined to forest cover. Rarer species like apes or elephants tend to be found even further away, in the 5+km zone. The overall number and local densities of apes and elephants in Gabon are declining, even in protected remote forests and areas (Walsh et al, 2003; Blake, 2007; Maisels, 2007; WWF, 2008). Their disappearance from village areas cannot be due to migration to other places.

¹⁷ Data from Coad, 2007. 2647 animals caught by village subsistence hunters using a combination of snares and guns in Ogooue Lolo, 2003-2004.

¹⁸ Data presented are from 64 hunters snare trapping over 1 year in Ogooue Lolo, (Coad, 2007). The same patterns are found by Van Vliet, 2008 for 16-30 hunters, gun hunting over 1 year in Ogooue Ivindo forests. In the gun-hunting data set, the catch is less diverse and does not include very small prey (smaller than 3kg).



2.5 How much bushmeat is hunted?

Although the vast majority of rural families are involved in hunting and benefit from it, the catch (and benefits) are skewed, with a small number of families taking most of the meat. Over half the meat is captured by just 10% of the most successful hunting families in a community, and the least successful half of the hunting families share less than 10% of the meat (Lahm, 1993; Starkey, 2004; Coad, 2007).

It is therefore difficult to use the success of any one family as typical, but the hunting of a whole community or village seems to follow a similar pattern in many areas.

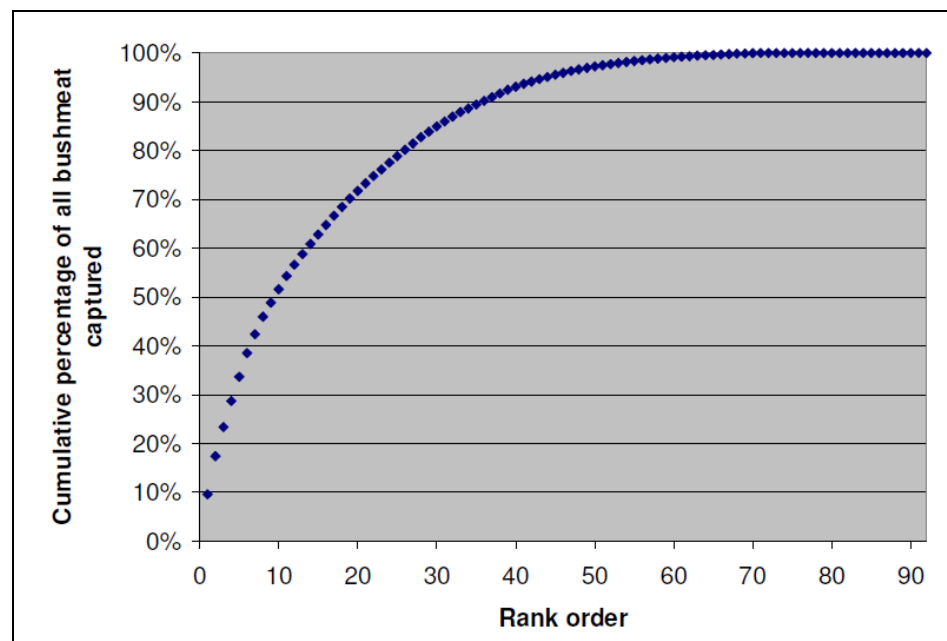
Quantifying how much wildlife is being hunted each year in Gabon is very difficult. There is no direct measure of what is hunted, but estimates can be made in some simplistic ways, to give a rough quantification of the scale of the harvest. This is probably a useful idea to have in order to discuss the magnitude of economic mitigation that may be required if hunting or trade laws are changed. It is not useful for wildlife conservation planning, as each species requirements will be different.

One way is to look at the mean number of animals killed per hunter, per inhabitant, or per km² hunted in village studies, and use this to estimate the number killed in the whole village area.

A second method would be to use the biomass killed each year in studies, and use these figures to estimate the total catch.

Figure 2.5.1: The different success of hunting families in the Ogooue Lolo villages¹⁹.
The most successful family caught more meat than the 50 least successful families put together.

¹⁹ All bushmeat captured (kgs) by 92 families in 7 villages, followed for 9 months (2974 household days), Starkey, 2004, p.111.



2.5.1 How many individual animals?

In a typically heavily-hunted area of the rural domain (Dibouka and Kouagna, Ogooue Lolo) a village of 431 people caught 2,647 animals in one year. If this rate of harvest per capita is typical, this would equate to a national harvest of around 1,725,480 animals for the 278,761 rural people in Gabon. However, this estimate is likely to be high, as the animals hunted in this area are many and small (3.9kg average; Coad, 2007).

In a better wildlife area (Ntsieté in Ogooue Ivindo), hunters mean catch was 13.9kg and a similar village (415 people) took only 706 animals in a year, which equates to an annual national subsistence harvest of 474,230 animals (Van Vliet, 2008).

Because the mean size of the animals caught is so different in the depleted area and the good area, these very different numbers of animals actually produced a very similar weight of meat per inhabitant for these two villages.

The true national annual offtake of animals is probably somewhere between 500,000 and 2,000,000 individuals per year, which is a very large range.

2.5.2 How many tonnes?

Calculations of the approximate mass of generic 'bushmeat' that is being hunted by the whole subsistence village community can be made as above, from the offtake per capita in hunting communities (i.e. Starkey, 2004, Coad 2007, Van Vliet, 2008), and the rural population estimate (RGPH, 2003). How many animals this represents is impossible to say, as species and sizes will vary in each area.

Table 2.5.a: Estimates of the annual total national hunting offtake, from the amount hunted per capita in two one-year village studies²⁰

	Estimate using per capita figures	Notes
Annual biomass	23.85 kgs	23. 69 kg/capita/yr Van Vliet, 2008

²⁰ Estimates of biomass per capita from one year studies of offtake in villages of known size, Van Vliet, 2008 and Coad, 2007

returned per unit		23.95 kg/capita/yr Coad, 2007
Rural hunting population	278,761 people	Rural population estimate, 2003
National offtake from all villagers hunting (kgs)	6,649,555	
Losses to snaring at 8%	578,222 kgs	Coad, 2007
Total hunted mass annually	7,228 tonnes	Estimate of Wildlife biomass hunted annually by all villagers in Gabon.

Table 2.5.b Village offtake estimates weighted by the wildlife estimates for the hunting zone <15km from village centres.

Wildlife Integrity	Area within 15km of a village	Measured annual offtake kgs/km ²¹	Total national offtake
Depleted	128,049	93	11,909
Reasonable	41,347	221	9,138
Intact	0		
TOTAL	169,400		21,047

Using the data that we have from two village studies, the annual national village harvest of bushmeat is probably between 7 and 21 thousand tonnes. These estimates are clearly very approximate but give an idea of the possible offtake from the country's hunted area of about 130 kgs/ km² annually.

Total biomass estimates can also be made from the amounts of bushmeat that people in different socio-economic communities in Gabon are eating per capita and the census data for the people found in each locality. These estimates are made in [section 4](#).

However, estimations of the numbers or biomass of all bushmeat hunted are only of limited use in determining threats to local wildlife, which will be different for each species within the faunal community.

2.5.3 Current sustainability of village bushmeat hunting

Because many villagers still rely on bushmeat for the majority of their protein and income, if modern hunting is unsustainable, then these villagers' livelihoods and well-being are at risk, as well as the wildlife.

²¹ Data from Coad, 2007 working in a depleted area and Van Vliet, 2008 working in a reasonable wildlife area. Methods and data used to derive maps of wildlife integrity estimates for 2009 are given in section 6.

Despite their high biodiversity, tropical forests have low annual biological productivity and do not sustain high yields of meat (Robinson & Redford, 1991). They can only support the total protein needs of a human population up to about 1 human/km². However, shifting agriculture within a rainforest and supplementing the diet with other proteins (fish, insects, domestic meats and vegetables) can be used to support locally higher human populations in a sustainable system (see Nasi *et al.*, 2008 for review). The problem is to determine the limits to this system. A hunting catch is only truly sustainable if the same quantities of meat can be hunted year after year, with no change in the species or sizes of animals hunted.

There is no information recorded about the numbers and densities of wildlife in the past (prior to about 1960's 'modern' hunting with vehicles, firearms and from permanent villages) and so changes in wildlife are hard to quantify. However, some evidence indicates that current village-based hunting has probably not been generally sustainable for all species over the last few decades.

2.5.3.1 Hunter reports

Hunters interviewed about the wildlife in their area all perceive a decline in the wildlife that can be caught close to the village (Starkey, 2004; Coad, 2007). In different areas, this can be a decline in the size of animals caught, or a decline in their numbers, or both. No reports of wildlife increases have been recorded close to hunting villages. Hunters' perception of how much wildlife is left depends mainly on the hunter's own experience and leads to a 'shifting baseline' which masks the problem from younger people (Pauly, 1995)²². Older men, who can remember the quantities of wildlife available 50 years ago, report a >75% decline in the numbers of large species (apes, buffalo) near the village, whereas 20 year old men only report much smaller declines, based on their own experience of what was there a decade ago (Starkey, 2004).

2.5.3.2 Declining hunter catches

Hunter catches are accepted as a reasonable measure of the availability of wildlife. If wildlife is no longer caught in a hunted area, it may be because it has been killed, it has migrated or it is hiding. Migrations imply rising numbers in other areas, but these have not been recorded in Gabon (e.g. Maisels, 2007). Cryptic behaviour of hunted species certainly does occur (i.e. Newing, 2001; Croes *et al.*, 2006), but snaring is indiscriminate of species activity patterns and will catch animals at any time of day or night. Declining hunter returns from snaring are probably closely related to real wildlife declines.

Hunters using snares in some areas now report very low returns for very high trapping effort. For bushmeat to fully support the current average rural family size of 6 AME at the minimum protein requirement of 70g/AME/day, then the hunter must bring back at least 420g / day. In a wildlife depleted area, only 25% of the hunters managed this level of return from their snaring efforts and the most successful hunter bringing back only 600g per day (Coad, 2007).

Even in relatively good wildlife areas, less than 20% of hunters have never had to resort to other employment (Van Vliet, 2008) and in depleted areas, returns are so low that hunters will abandon hunting for employment if offered a chance (Coad, 2007).

In response to low returns (few and small animals) close to the villages, hunters increase the catchment area, moving further away from the village. However, snare losses are high when the snares are far away, access to guns is limited to richer households and available forest is limited, meaning that for many poorer village hunters, the low snaring returns could endanger their livelihoods.

²² 'Shifting baselines' refer to the ability of people only to judge against their own experience. So if a 75 year old man found gorillas once a week as a 15 year old when hunting from his village and now meets them only once a month, he sees a 75% decline and is worried. The 25 year old, starting out 60 years later, saw gorillas only once in 3 weeks when he was 15 years old. Now he meets them once every month, He sees only an 8% decline and does not perceive it as threatening, even though he is observing the same true decline.

2.5.3.3 Declining wildlife

Several studies have now shown that a lot of wildlife species are declining near to human settlements and that the declines are severest in large-bodied animals. Censuses carried out by transects, 'recce-transect' walks and camera trapping across Gabon have all shown an absence of large wildlife near humans. Apes, elephants, large ungulates are now found almost exclusively in areas > 5km from villages and elephants >10km from roads (Laurance *et al.*, 2006; Buij *et al.*, 2007; Blake 2007; Maisels, 2007; Henschel, 2008; Henschel *et al.*, 2009; Kuehl *et al.*, 2009)

2.5.3.4 Resilient wildlife

In contrast to the evidence against sustainable hunts of larger animals, there is some evidence that current hunting of smaller animals, particularly of some species, may be more sustainable (Van Vliet, 2008; Van Vliet & Nasi, 2008). Blue duikers, rats, brush-tailed porcupine and even some red duiker species are still found in high numbers close to villages. Despite essentially unrestricted hunting for subsistence for many decades from a fixed village, these species still persist in low numbers.

However, commercial hunting supplies a potentially enormous demand and could quickly push species that are hunted sustainably for local consumption into decline. Recent technical advances (LED torches for night hunts, widespread electricity for freezing meat and improved transport routes) improve the hunters' ability to supply fresh meat to more distant commercial markets and thus increase the hunt beyond locally sustainable proportions even for these species, as has been the case in most West African countries (i.e. Ghana Wildlife Society, 2005). A plan for reliable long-term sustainable management must include careful monitoring of these resilient species in the future.

2.6 Why are people hunting?

Most hunters are residents of rural villages where bushmeat is an important source of both **meat and income**. These men are hunting to supply food to their families, and to gain cash revenues for essential services and products (schools, medicines, other foods, fuel), as well as for some luxury goods. In communities where alternative sources of revenue are rare, cash income from bushmeat can be deemed a subsistence activity also and this money can be as critical to the survival of these families as the protein itself. Bushmeat is still culturally significant as part of family **ceremonies** like initiations, circumcisions or marriages and at certain times of the year, the majority of the catch can be for cultural ceremonies, though it also provides food on these occasions. The dry season is the time when most ceremonies are held in Gabon, and hunting is increased in some regions (particularly the north and north east) at this time. Near Makokou, half of all the animals caught for the year were caught in the dry season months of July and August and the number of active hunters increased by 30% (Okouyi, 2006; van Vliet and Nasi, 2008).

Generally, village hunters eat a portion of their catch, and sell a portion, once their household food needs are met. The fate of the portion they sell is further discussed in [section 3.2.1](#). The relative amount that bushmeat contributes to a household depends on the household economics. Starkey (2004) and Carpaneto (2007) found that the access a village had to a market was a strong influence on how much bushmeat was hunted and consumed. People in remote villages with poor market access hunted more bushmeat, consumed more bushmeat and bushmeat was more important in their household economics, than for villagers who could easily access markets. The analyses from Starkey (2004) are summarised in Table 1.5.a below.

Although the patterns of bushmeat use are highly influenced by market access, household wealth is also significant in determining the benefits derived from bushmeat. Starkey (2004, p 127), Wilkie *et al.* (2005) and Coad (2007) all show that within the rural sector (the poorest part of the national population), the wealthiest families are most successful at hunting and derive the most absolute benefit from bushmeat.

Hunters hunting for entirely commercial sale (often salaried by a reseller in the commodity chain) are likely to be fewer than those involved in subsistence activities, and are often hunting in areas outside of traditional village controls (remote areas, logging concessions). Their only gain is cash and their involvement in the industry entirely reliant on the commercial trade of bushmeat, but simpler to understand than subsistence hunters who make a daily choice between the different gains from hunting, agriculture or other activities.

Table 2.6.a: The relative benefits and use of bushmeat in remote and accessible villages²³.

The shading gives an overview of the consistency of the trends with geographic location. Remote villages are the poorest communities, and hunt and use most bushmeat. Bushmeat forms a greater proportion of their diet, production and income than for families with access to markets.

Measure	Access to markets		
	Remote	Medium	Close
Absolute biomass hunted (kg/household/day)	1.93 - 3.94	1.54 - 2.29	0.64 - 1.42
Absolute bushmeat consumption (kg/AME/day)	0.23 - 0.82	0.16 - 0.50	0.08 - 0.12
Proportion of protein from bushmeat (% kg consumed/AME/day)	18.7 - 24.5	13.1 - 20.3	12.7 - 12.8
Proportion of production from bushmeat (% total pppUS\$/AME/day, 2002)	29.1 - 33.2	17.4 - 26.0	14.6 - 20.3
Absolute income (pppUS\$/day, 2002)	0.56 - 1.39	0.14 - 2.13	2.68 - 3.16
Proportion of income from bushmeat (%)	61 - 72	32 - 42	15 - 30

Status relative to other villages	Highest
	Medium
	Lowest

²³ Source data: Starkey, 2004, Chap 5.

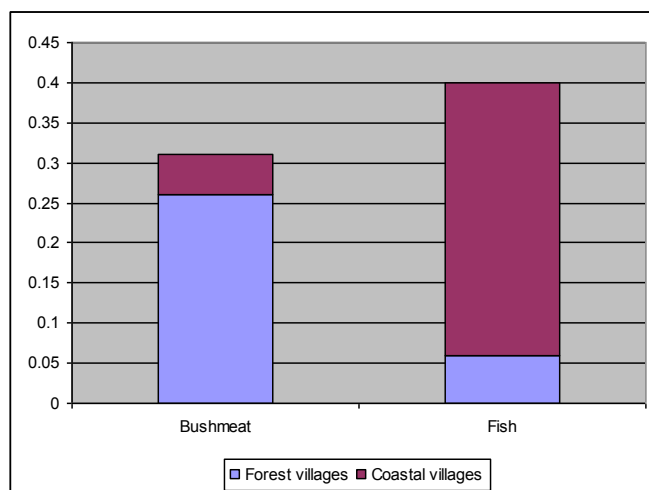
2.6.1 How much bushmeat do hunters and their families eat?

The proportion of the biomass caught that is consumed by the family is remarkably consistent, ranging from 40–44% studies in villages (Lahm, 1993; Carpaneto 2007 (1992 data), Coad, 2007; Starkey, 2004; Van Vliet, 2008).

Forest villagers consume around 270g per AME²⁴ per day on average, ranging from 80g – 800g/AME/day (Wilkie et al, 2005; Starkey, 2004; Gally & Jeanmart, 1996) Villagers in remote forest sites are the highest consumers in the country and absolute per capita consumption declines rapidly with access to alternatives and higher income (see Table 2.6.a for comparison to less remote rural forest villages).

Studies of bushmeat consumption across the country in 2003 showed that villagers used bushmeat and freshwater fish similarly, so that one could be substituted for the other.

Figure 2.6.1: The amounts of bushmeat and fish consumed by villagers in different habitats²⁵. *Fish and bushmeat seem to act as dietary substitutes, i.e. if one is not available, or more expensive, families will replace it with the other.*



Protein requirements depend on gender, body mass, age and lifestyle, but around 70g - 100/AME/day is accepted as ensuring food security in protein, for an active adult lifestyle (FAO-WHO, 2009; British Nutrition Foundation, 2009). On average, Gabon's villagers currently make sufficient returns on their hunting and fishing activities to ensure food security using these resources.

Bushmeat in rural Gabon is probably as important in food security through its role as a source of income as it is as a source of protein. Blaney (2008) found that rural villagers were not protein deficient, using bushmeat to fulfill their whole protein requirement, but were classed as food insecure due to the amount of their income used to buy other foods. This is discussed in more depth in [section 3.2.7](#).

2.6.2 Village dietary alternatives to bushmeat

Families that do not hunt, or do not catch enough, in villages must gain protein by some other means.

Farming of domestic livestock is very rare in Gabon and its contribution to village consumption is negligible. Starkey (2004) shows domestic meat contributing only 0.4% of household production in villages.

²⁴ AME refers to the standard measure 'adult male equivalent' which allows better comparison between places with different demographic profiles than 'per capita'. The consumption of women and children is standardized as a proportion on an adult man's average consumption (Deaton, 1997).

²⁵ Data from consumption surveys in 1215 villages households in Gabon, 2003 and 3001 village households in 2005: Wilkie et al, 2005 and Abernethy et al., unpublished data.

Surveys of household acquisition of food show that villagers eat 70 times as much bushmeat as domestic meat²⁶. All domestic meat is bought and bushmeat is typically the least expensive and most available protein at around less than 50% the price of the best alternative, whilst domestic meat or poultry are the most expensive and the least available (Wilkie et al., 2005; Okouyi, 2006; Coad, 2007; this report).

Table 2.6.b: Price comparison for meats available in various villages.

**In the Ogooue Lolo study, only two meat alternatives (canned sardines and cassoulet) were available in the one shop.*

Villages	Price range for meats on sale (fcfa/kg) (N meat or fish alternatives)	Average price for alternative meats (fcfa)	Average price for fresh bushmeat (fcfa/kg)	Bushmeat price as a percentage of cheapest alternative (%)
Haut Ogooue 2003	1500 – 2600 (N=17)	1935	835	56
Ogooue Lolo, 2003	2400 – 2500 (N=2)	2400	1037	43
Ogooue Ivindo 2004	1300 – 2000 (N=17)	1579	806	62

Coastal and large river villages have better access to fish than the forest villages of the Ogooue Lolo and in these areas fish is used as a substitute to bushmeat. When fish consumption goes up, bushmeat consumption goes down (Wilkie et al. 2005).

2.6.3 Village alternatives to hunting employment or bushmeat revenues

Salaried employment in villages is rare. In surveys of village income in Ogooue Lolo, Haut Ogooue and Ogooue Maritime²⁷, only 8% of families had a member in employment. Coad (2007) found only 10 men (8.2%) employed out of a population of about 121 full-time resident men, and Starkey (2004) found that <2.5% of average household production came from paid employment.

During 2 recent studies²⁸ of forest village economy in a wildlife-depleted area of Ogooue Lolo, average daily income from hunting was 100fcfa/day, though a maximum daily return of over 50,000fcfa was recorded. Hired labour during this time was paid at a standard wage of 3,000fcfa/day and many, particularly less-successful, hunters, were prepared to abandon hunting if employment was offered. Six out of the 10 employed men in Dibouka had left or reduced their hunting in favour of employment when it was offered during the year studied, and all hunters over 20 had had some form of paid employment at some point in their lives (Coad, 2007, p. 102)

In Ogooue Ivindo, in a more wildlife rich area where the prey size was four times as great as in Ogooue Lolo²⁹, hunters typically made a gross income of between 50,000 and 200,000fcfa a month, equivalent to a wage of 2,300 – 9,100fcfa/day, from which costs of arms, lights and ammunition must be deducted.

²⁶ Data from 1206 household surveys in 2003 and 3001 household surveys in 2005, across Gabon. Wilkie et al, 2005; Abernethy et al., unpublished.

²⁷ Data from surveys of the socio-economic status of 874 village households in 2003 and 2005. Wilkie et al and Abernethy et al., unpublished

²⁸ Starkey, 2004; Coad, 2007;

²⁹ Van Vliet, 2008; Okouyi, 2006;

(Okouyi, 2006). In these communities, 16% of hunters over 20 had never had paid employment in their lives, gaining income solely from subsistence activities of hunting-gathering, fishing and agriculture.

In areas where wildlife is depleted, hunting can no longer provide sufficient returns for survival and even in areas where wildlife is relatively rich, less than a fifth of men can manage without alternative incomes.

Increased agricultural production could offset reductions in hunting, but market access is a significant factor in gaining wealth from agricultural effort (Starkey, 2004, Chap 5) and remote villages are unlikely to be able to replace hunting gains with increased agricultural production. Without domestic livestock-raising traditions, current agricultural practices cannot replace the meat or income supplied by hunting in remote rural Gabon.

3 THE COMMODITY CHAIN

Once hunters have captured bushmeat in the forest, they make a decision either to feed their families or to sell the meat. Once the meat is sold, a commodity chain begins. In Gabon this often leads through several hands to a final market in the large cities, and even on to international export.

3.1 Current legal status of trade in bushmeat in Gabon

3.1.1 Closed seasons

Legally, only customary hunting rights are valid during the closed season between 15th September and the 15th March³⁰ and these do not allow any sale of meat beyond the village community where it was hunted, including to members of this community elsewhere³¹. During the rest of the year village and forestry concession hunting are also legal, but meat hunted on forestry concessions cannot be transported or traded outside the concession (Christy, 2006).

3.1.2 Trading licences

Bushmeat from legal village or customary hunting can be traded freely to members of the hunter's village (or for village hunts, to family elsewhere in quantities for personal consumption only). For trade outside the village, the hunter must hold a commerce permit as well as his hunting permit, and each carcass must be permitted³². This permit then passes with it at each point of sale to the consumer or restaurant. Bushmeat cannot be transported or traded at all outside the village between 15th September and March 15th, when village hunting is banned.

The existence of some form of year-round commodity chain is currently equally as essential to village food and livelihood security as the meat consumed, as villagers currently have few alternatives for generating cash. The existing laws are in general well-designed to support rural needs for protein, which can be hunted under the customary rights laws all year round, but do not allow for year-round cash needs of hunting families. The need for income could be replaced by other income-generating activities or by limited trade opportunities in the closed season. The underlying reasons for rural poverty and lack of alternative economic opportunity, which seem to lie in reduced market access, will need to be addressed alongside any strategy to regulate bushmeat trading for subsistence needs.

3.1.3 Enforcement

Current enforcement of the laws on transport and commerce of bushmeat is very low. The reliance of village communities on illegal hunting in the closed season and illegal commerce of their meat makes enforcement impossible locally, where it would cause hardship to many families. In addition, with so many hunters wishing to trade some meat, the permitting authority (the Ministry of Water and Forests) does not currently have sufficient presence on the ground in villages to make permitting of hunter-traders, or legally hunted carcasses feasible (Wilkie et al., 2006).

30 Article 184 of the Forestry Code and article 2 of the Decree n° 679/PR/MEFE of the 28 July 1994, fixing the open and closed seasons for hunting.

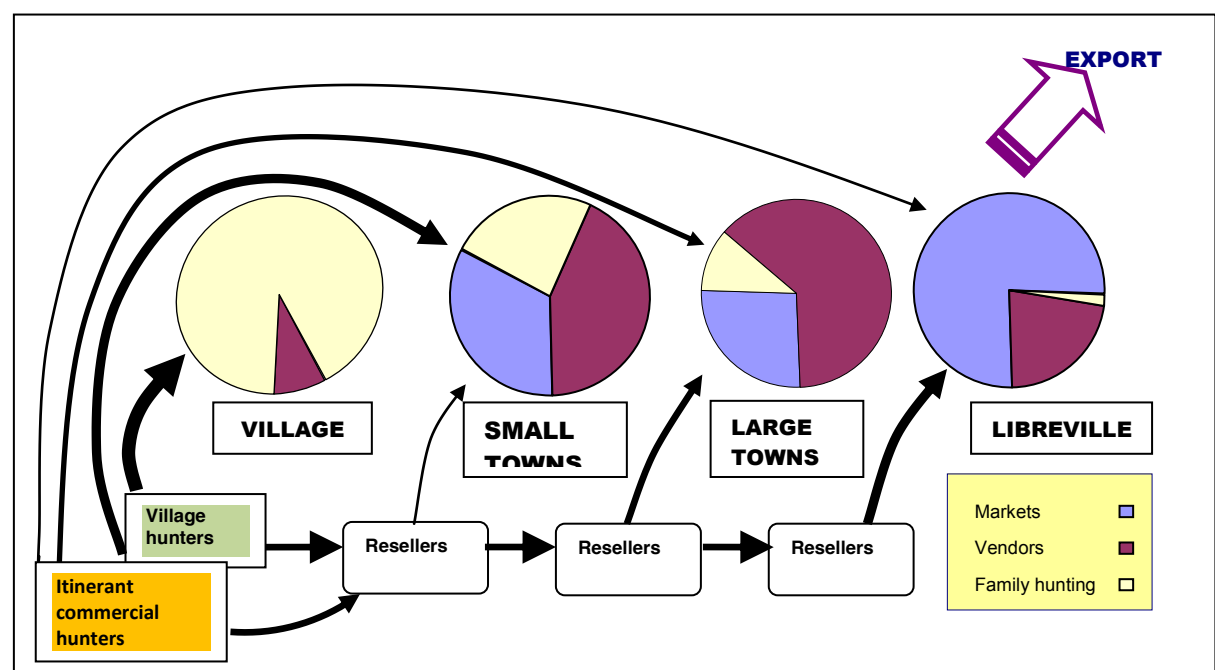
31 Articles 4 & 7 of Decree n° 692/PR/MEFEPEPN of the 24 August 2004 fixing the conditions for exercise of customary usage hunting rights.

32 Article 197 of the Forestry Code, Articles 2, 3, 4 and 7 of the Decree n° 677/PR/MEFE of the 28 July 1994 relative to special agreements for trade in products from hunting.

It is likely that unregulated commercial trade will be unsustainable and will reduce the wildlife resource to a level where rural subsistence communities cannot survive (BCTF, Nasi *et al*, 2008). The current laws require revision of their content and particularly their application on the ground, in order to ensure good regulation and therefore sustainability of the bushmeat harvest without destruction of the faunal communities and natural heritage of the land.

Figure 3.1.1: The commodity chain in Gabon.

A simplified representation of the commodity chain operating, grouping varied hunter, consumer and reseller profiles into single units. The pie charts show the sources of household meat consumed in 3001 surveyed homes in 2005³³. The category 'Markets' refers to fixed place selling, where the client goes specifically to acquire meat. 'Vendor' includes ordered meat, restaurants, door-to-door salesmen, roadside offer. 'Family hunted' includes gifted meat as well as that hunted directly by family members. The increasing importance of commercialised meat and markets is clear as meat moves down the chain to Libreville. 'Resellers' include those selling to an open market, on-command traders, transporters and restaurateurs.



3.2 Production of commodity bushmeat: sale from the hunter

3.2.1 How much meat will a hunter sell?

As detailed in section 2 most hunters are village-based and hunt primarily for subsistence needs. On average, these hunters' families consume around 60% of the animals in their catch, and the rest are sold to provide essential income, beginning a commercial trade in the resource.

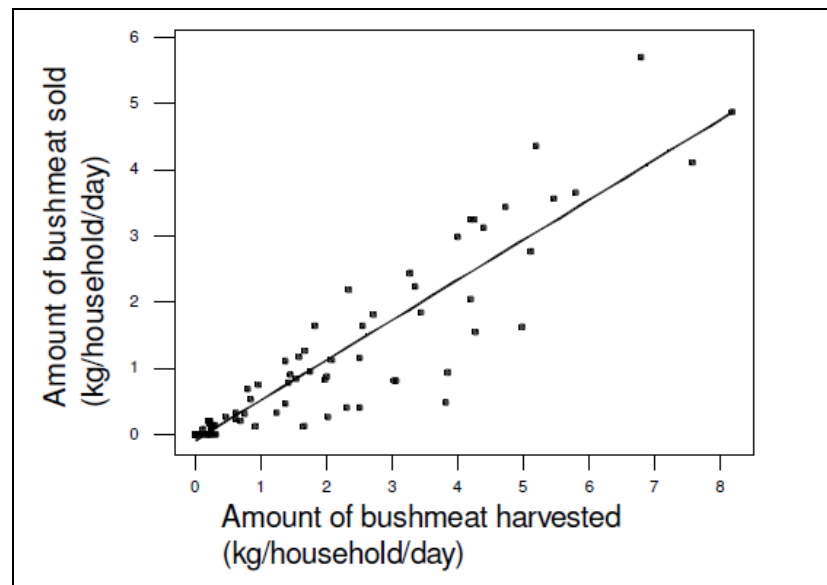
Near Makokou, 70% of hunters hunt for subsistence and around 30% of all hunters recorded in the area were hunting only for commercial ends (Van Vliet & Nasi, 2008; Okouyi, 2006). This is probably typical of towns with transport access to ship meat out. In villages with limited market access, all hunters used a portion of their catch for family subsistence needs and only 68% of hunters sold any meat at all (Coad, 2007).

³³ Data from 3001 household consumption surveys carried out 8 locations in Gabon in 2005, Abernethy *et al.*, 2006.

Hunters sell more bushmeat when they have more in their total catch (Starkey, 2004), which is a reflection of the basic need to satisfy protein requirements before cash requirements. Their decision of which part of their catch to sell is consistently biased to larger animals (Lahm, 1993; Starkey, 2004; Okouyi, 2006; Coad, 2007; Van Vliet, 2008).

Figure 3.2.1³⁴: More meat can be sold when more is caught.

Rural families are consuming on average about 270g (80-800g) of bushmeat per adult male equivalent (AME)³⁵ per day (Blaney, 2008; Starkey, 2004), however, minimum nutritional needs are only about 70g / AME/day even if bushmeat is the only source of protein. In theory, once minimum food requirements are satisfied, the hunter can then sell the remainder of his catch.



3.2.2 Which animals are sold?

The decision to sell larger animals is based on hunter perception that they are worth more. Larger animals of a given species command a higher price and larger species commanded higher prices per animal than smaller species (Lahm, 1993; Starkey, 2004; Okouyi, 2006; Carpaneto et al, 2007; Coad 2007, van Vliet, 2008).

No particular species is always sold or always eaten, and an animal's fate is not always a simple function of its size, but also of the total amount of that catch and which other species were in the catch, the hunter's relative needs for meat or cash, the current sale demand and some effect of consumer preferences. For instance, brush-tailed porcupines are sold more often than expected (Coad, 2007), and are a particularly preferred meat some species have locally restricted sales, because of taboos about their consumption and some have additional value as medicine or ceremonial trophies (i.e. carnivore pelts). (Okouyi, 2006; Schenck et al, 2006).

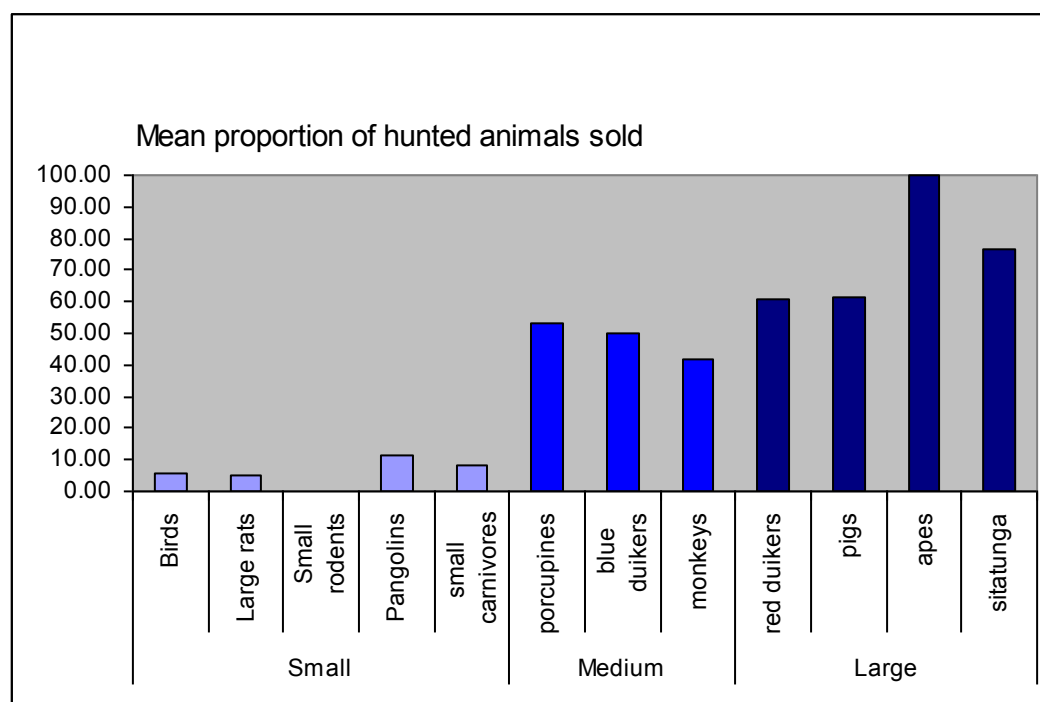
Figure 3.2.2: The mean proportion of animals sold, showing consistent choice for sale of larger animals and consumption of smaller ones in hunting families across 4 studies³⁶.

Sizes are approximately Small >2kg, Medium 2-15kg, Large >15kg. Porcupines are sold disproportionately often for their size, as they are a widely preferred meat (see section 4.5)

³⁴ N=92 households followed through 9 months. S = 0.504259 R-Sq = 85.0 % R-Sq(adj) = 84.8 %. Starkey, 2004, p.118.

³⁵ This standardisation is useful in order to aggregate and compare total consumption between areas where average family size and population demography are different (see James & Schofield, 1990).

³⁶ N=fate of 3607 animals hunted by hunters in Lahm, 1993, Coad, 2007, Carpaneto et al., 2007 and Van Vliet, 2008.



As an approximate rule, hunters judge the average size of an animal caught in their area and will be more likely to sell animals of this size or larger and less likely to sell animals that are smaller. In heavily hunted areas, where the average weight of an animal in the catch is low, even relatively small animals are preferentially sold.

In most areas in Gabon, this approximately means that animals smaller than 4kg (i.e. squirrels, genets, birds) are eaten, animals of 4-10 kg are equally eaten or sold (brush-tailed porcupines, blue duikers), and animals larger than 10kg (red duikers and above) are more often sold.

The majority of the large bodied mammals in Gabon have some level of legal protection. The high rates of trade in these species are indicative of a general lack of respect for these laws.

3.2.3 What is the amount of village commercial production?

Subsistence hunters generally sell their catch as whole animals and proportions of the catch sold are most usually estimated as numbers of animals.

Only two studies have recorded hunter offtakes in a way that might be used to estimate national hunting levels, or national commercial production. Both report 40% of hunted animals are sold annually, representing 50% of the biomass in each study.

Table 3.2.a³⁷: Proportions of hunters' catch sold in different studies.

Study	Data collected	% production sold (biomass)	% production sold (beasts)
Lahm 1993	254 animals caught		53
Starkey 2004	92 households, 9 months	58	

³⁷ All studies were for 9-12 months in one location, with 16-71 hunters per site.

Coad 2007	64 hunters, 1 year	50	39
Carpaneto, 2007 (1992)	432 animals, 8 weeks	54	44
Van Vliet 2008	16 hunters, 1 year	50	40

Table 3.2.b: The potential national commercial production of bushmeat from village hunters.
The figures are approximate and do not include the contribution to the commodity chain of non-village based (entirely commercial) hunters

Study	Estimate of wildlife abundance ³⁸	Animals sold per year	Commercial production kg/km ² /year	National annual production estimate ³⁹ (kg/yr)	Notes
Van Vliet 2008 Ntsieté	Medium	282 17.6/hunter/yr	110.5	16,265	Average animal 13.9kg, mainly duikers and red river hogs.
Coad 2007 Dibouka & Kouagna	Low	1032 16.1/hunter/yr	46.5	6,845	Average animal 3.9kg, mainly porcupines and blue duikers
National village zone Average ⁴⁰	*		78.5	11,555	Equivalent to a total offtake of 23,000 tonnes
Weighted village hunting average ⁴¹					This applies only to village hunting areas. Off take/km ² will be potentially higher in many logging concessions, but pressure is more varied than in villages.

The large difference in the size of animals caught is probably a reflection mainly of the wildlife available in the two places. At best, we can take these two figures as roughly indicative of medium yield and low yield wildlife areas, depending on the estimated wildlife populations (see Section 5). Hunting returns from intact wildlife communities are potentially higher.

3.2.4 Hunters outside village communities

Hunting is also done by people outside village or forestry camp communities. These hunters do not have a subsistence requirement for their meat other than their own food during the hunting trip. Often they are salaried by a vendor who takes orders in urban areas for the meat. Sometimes they work for themselves

³⁸ Wildlife estimations (low, medium and high abundance) from independent camera trap studies carried out in the two study areas, 2003-5, Henschel, 2008.

³⁹ The national village production is taken from the total land area, assuming 55% of Gabon's is hunted by villagers.

⁴⁰ Mean position of the two studies offtake kg/km², applied to whole village hunting area (55% Gabon)

⁴¹ Weighted average of the offtake kg/km calculated for high and low wildlife estimations of the village hunting areas, applied to the national territory (see Chapter 4). All land within 5km of a village is deemed low wildlife. Medium wildlife densities in the 5 -15km band are accorded if the adjacent land is high wildlife (protected area, sustainably managed forestry, empty) and the settlement is small. For small towns, the 'low' wildlife band is increased to 20km and 30km for larger towns and Libreville.

seasonally, selling all of their catch when hunting and working at other employment the rest of the year (Okouyi, 2006).

No studies have yet followed this group of hunters, who are often highly mobile and almost always acting illegally (through hunting protected species, in protected or privately managed areas, in closed seasons, using illegal methods or taking illegal bag sizes in addition to illegally selling the catch; see Christy, 2006 for full review of legal restrictions). Their input to the commodity chain can be deduced in two ways: by the relatively high frequency of biologically rare species in markets, compared to their frequency in the village hunter catches that have been studied, and by the overall volume of measured market trade, which outstrips the supply from village hunters alone.

It is likely that commercial hunters have a relatively higher impact on the large rare species than subsistence hunters as these species are now confined to forest further than 15km from villages (Henschel, 2008), and village hunters rarely catch them (Starkey, 2004; Coad, 2007, van Vliet, 2008). In addition, recent research has shown that ape numbers have recently been more affected by towns (commercial demand) than village hunting (Kuehl *et al.*, 2008). However, the number of purely commercial hunters operating in Gabon and the volume of their offtake are unknown.

3.2.5 Economics of hunter sales

Purely commercial hunters may be salaried, or paid on a commission on the basis of the animals, rather than the worth or their catch. However, most hunters also need to be business men and sell their catch themselves. The worth of their catch therefore depends not only on the animals they catch, but their business acumen in selling them.

3.2.5.1 How much money do hunters make?

Hunters have very varied commercial success. Many families use hunting only occasionally to supplement short term cash needs and their income from this activity is very small (<100fcfa/day). Although most families in a village hunt, only a few families make significant cash income from it.

The relative ease of finding alternative sources of income is crucial to how much hunting is done. Hunters in remote areas hunt more and use bushmeat for income more than those where there are other markets or employment opportunities. Hunter families far from markets in Ogooue Lolo made around 400fcfa a day from hunting, but this was up to 72% of their income⁴².

In 2004, two studies followed hunters' success. In a wildlife depleted area of the Ogooue Lolo, hunters made an average daily net return of about 100 fcfa/day, mainly from snaring activities, with a maximum gross return of 50,000 fcfa/day ever recorded. In a richer wildlife area of Ogooue Ivindo, Hunters made averages of between 2,300 and 9,200 fcfa per day gross returns using gun hunting, with a top return of about 200.000 fcfa in a day⁴³.

The average daily returns for a hunter are much less than spending the equivalent time in employment, or even agriculture.

3.2.5.2 Are hunters getting good value?

An important point in the economics of bushmeat commercialisation is that price per kilogramme for bushmeat actually *declines* with increasing species size. This relationship between body size and price has been found both at the local hunter sales level (Lahm, 1993; Okouyi, 2006; Coad, 2007; Van Vliet, 2008), and nationally at markets across the country (Abernethy *et al.*, unpublished).

⁴² Data from Starkey, 2004.

⁴³ Data from Coad, 2007 & Okouyi, 2006;

Price per kilo is inversely related to body size, but the relationship is complex. Few village marketers actually weigh sales, instead relying on by-eye estimations of weight which tend to relatively underestimate larger animals. Demand is also low for very small animals, or large animals sold whole, as storage options are limited. For large animals the hunter may have to lower the price to ensure a sale if meat is fresh.

Table 3.2.c⁴⁴: The relationship between price per kilo and bodyweight

For common species sold in a village, showing the decreasing price per kilogramme for larger animals. The animal is not generally bled, gutted, skinned or prepared in any and so no weight is lost to 'dressing' the carcass.

	<i>Mean body weight (kg)</i>	<i>Mean price/animal (fcfa)</i>	<i>Mean price/kg (fcfa)</i>
Small pangolins	1.8	2107	1129
African Palm civet	3	3346	1114
Brush-tailed porcupine	3.3	3908	1207
Moustached guenon	4.1	3407	852
Blue duiker	4.1	3250	825
Bay (red) duiker	15.7	10241	663

Coad and Van Vliet quantified the relative sizes of animals hunter chose to eat, against those they chose to sell in one year studies in two places. Even though individual hunters will sell more on a given day if they catch more (see section 3.2.1), as a group over the year, hunters and their families ate and sold approximately equal biomass of meat in both locations, and made very similar economic choices.

The table below shows that, due to the price/kg being lower for larger animals, hunters may be losing a significant portion of the economic worth of their annual catch by choosing to eat smaller animals, however demand for smaller animals may be so low that their worth cannot always be realized in village sales.

Table 3.2.d: The choice of consumption or commercialisation of the catch⁴⁵.

Hunters tend to eat smaller animals, though these might be worth more per kilo, dependent on the circumstances.

<i>Study</i>	<i>Total annual biomass eaten/sold (1:1, kg)</i>	<i>Mean weight eaten animals (kg)</i>	<i>Mean weight sold animals (kg)</i>	<i>Approx price/kg 46 Eaten weights (fcfa)</i>	<i>Approx price/kg for Sold animals (fcfa)</i>
Coad 2007	5,162	2.6	5.0	1100	700
Van Vliet 2008	4,917	11.6	17.4	800	500

Regardless of the economic evidence that subsistence benefits might be maximized by eating the larger species and selling the smaller ones, a detailed investigation of hunters disposal of their catch show that the beginnings of the national commodity chain show a significant bias to the sale of larger-bodied

⁴⁴ N = 480 weighed fresh animals sold in Ogooue Lolo villages over one year. Source data: Coad, 2007.

⁴⁵ Based on 2 one-year surveys of all village hunting. 16 hunters using 44.5km² around Ntsiete, Ogooue Ivindo and 64 hunters using 111km² in Ogooue Lolo.

⁴⁶ Prices/kg expected for the mean sold and eaten weights are approximated from the data collected by Coad, (2007) and Okouyi (2006), on hunter sale prices for different species and animals weighed in villages.

animals at all locations, and that the preferential sale of larger animals continues in resales beyond the village of origin. This is further discussed in Section 3.3.

3.2.6 Butchering and preserving bushmeat for sale

The commodity chain starts at the hunter with a whole, fresh animal. However as meat is commercialized, hunters and resellers have options for treatment of their produce to keep or increase its value, so bushmeat is sold in increasingly diverse ways as it moves along the commodity chain. Butchering carcasses into cuts and smoking meat to preserve it and change flavour are the most common practices. Resellers will trade meat in cuts ranging from gigots to 'tas' (small piles of diced meat) and also use freezing, smoking and drying to preserve meat during transport and storage.

Urban market traders have been documented selling defrosted frozen meat as fresh and even preserving meat with injected formalin in order to pass it off as fresh. These practices are relatively rare, but were cited by some consumers in the preference and ethnographic surveys carried out in 2003-2004 as a reason not to buy bushmeat in urban markets (see 4.5) Okouyi, 2006; Schenck, 2006).

3.2.6.1 The economic consequences of butchering meat

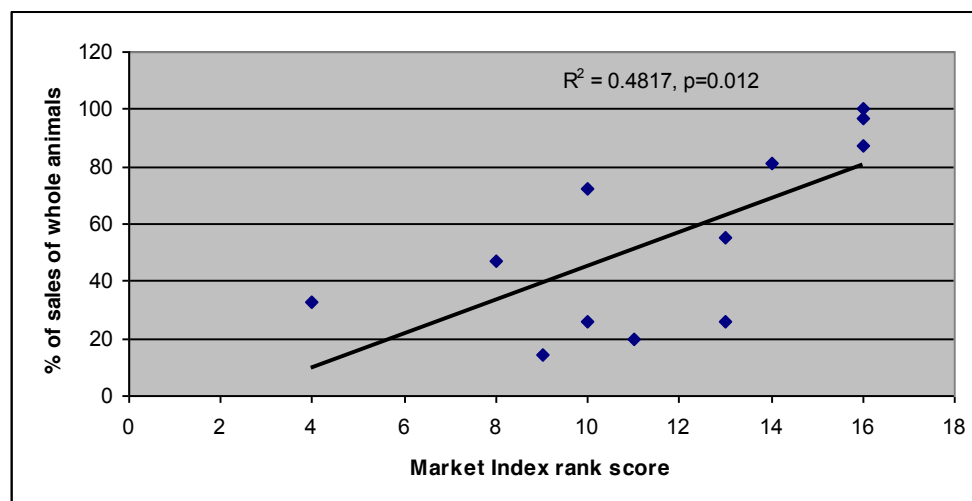
As meat passes from the subsistence harvest in villages to the commodity chain, it is increasingly sold in butchered parts, rather than whole animals. The national surveys of market sales show 97% of sales are of whole animals in village markets but only 32% of sales in Libreville are whole animals. Large animals are more likely to be sold to larger markets, and large animals are more likely to be cut into parts. In addition, Coad (2007) notes that for red duikers butchered into parts, the parts were sold for only 75% of the average value of a whole red duiker in the village (7,990/10,300 fcfa). In urban markets, however, this ratio completely changed and the parts are sold for a sum that can be *more* than the whole animal was worth⁴⁷. Thus carcass value can be further increased as it moves towards the urban markets by the cuts in which it is sold.

Figure 3.2.3: The decreasing proportion of sales along the commodity chain concerning whole animals⁴⁸.

Ranks are highest for most remote, rural markets. 20 = most rural markets in villages reducing to 4 = capital city.

⁴⁷ In 2001 a trader working at Akebe Plaine market in Libreville was cutting whole Brush-tailed porcupines into 14 'tas' (portions) each worth at least 1,000fcfa, thus making 14,000fcfa per animal. Concurrently, the average price in that market for a whole porcupine was 3,190fcfa/kg (about 10,000/animal), already the most expensive price in the country for a whole animal (Abernethy & Ntsame Effa, 2002; Milner Gulland et al, 2003), but only 70% of the potential price for the same carcass when butchered well.

⁴⁸ Data from 1032 sales made by village hunters (Coad, 2007) & 102,241 urban market sales recorded, 2000-2006, Abernethy et al unpublished in 11 other market sites. Abernethy et al unpublished. Sites are ranked on the commodity chain using the interaction of 5 independent terms that describe 1) the abundance of local wildlife 2) their supply from hunters and resellers, 2) their purchase and sales links to other supplying markets, 3) their transport possibilities towards larger markets, and 4) the transport time to the final market. Maximum score is 20, minimum score is 4 Abernethy et al., in prep.



3.2.6.2 The economic consequences of smoking meat

Hunters prefer to sell fresh meat, perceiving a lower price for smoked meat. Smoking caused a 40% drop in mean carcass price for meat sold by village hunters (Coad, 2007) but smoked meat has a lower weight for the same carcass, and price/kg can actually be higher. For hunters selling their meat in carcass units, smoking truly does reduce returns and this perception is carried along the commodity chain, even though for trade in smaller units in urban markets, smoked meat is more valuable than fresh meat. Table 3.2.e below shows comparative prices in markets in Okondja and Franceville, for sales where the true weight of the meat traded was measured. These data reveal a significantly higher price per kilo for smoked meat.

Hunters tended to eat meat that was starting to decompose, rather than attempt to sell it; therefore sales of rotting meat in village markets were few. However national market prices do show significant value loss for rotting meat, the burden of which is falling on resellers, rather than hunters.

Table 3.2.e: Mean prices per measured kilogramme for bushmeat⁴⁹

Smoked meat actually commands a significantly higher price per kg than fresh meat, despite the perception by hunters and resellers that fresh meat is most valuable because the price per carcass is higher. There is a shift along the commodity chain in the unit of sale, from a carcass (worth less smoked or butchered), to a kilogramme (worth more when not part of a whole animal and more when smoked), which affects sellers choices.

Meat State	Mean Price/kg (fcfa)	N Sales
Fresh	1370	548
Smoked	1668	91

A compilation of all market data from Gabon (2000-2006), spread across urban and rural markets shows that the average prices were best for fresh (or live) meat and that the majority of meat is sold fresh.

Table 3.2.f⁵⁰: Mean prices for all market sales surveyed in Gabon (2000-2006) of different states of bushmeat.

The discrepancy between the prices for measured kg sales (Table 2.5) and estimated kg sales (Table 2.6) probably stems from underestimation of the true mass of smoked meat, and thus underselling. i.e. a customer asking for a kilogramme of fresh meat will be served more true weight than a customer asking for, and being charged for, a kilogramme of smoked meat.

⁴⁹ Data from 639 sales of the 27 most common species, weighed at point of sale in Okondja and Franceville markets, 2004. Abernethy et al., unpublished.

⁵⁰ Data from market monitoring in 16 markets across Gabon, 2000-2006, Abernethy et al., unpublished.

Meat State	N Sales	Total biomass (kg)	Average Price per kg (fcfa) ⁵¹
Fresh	95,495	448,344.2	1,080
Smoked	6,746	27,158.1	1,000
Boiled	1,051	5,365.8	1,000
Alive	142	869.6	
Frozen	22	177.6	1,000
Body fat	40	158.7	1,158
Decomposed	11	28.5	
Overall	103,507	482,102.5	1,048

3.2.7 Hunter use of bushmeat revenues

The daily success of hunting bushmeat is unpredictable. This makes the income difficult to manage, and unlikely to be relied upon for necessary daily needs, even though over time it forms a large part of household income.

Families in remote villages are gaining around 70% of their income from bushmeat (Starkey, 2004; Okouyi, 2006) and even families in villages with alternative sources of income (market access, some employment) currently gain 15-30% of their income from bushmeat (see also Section 2.6).

Saving money in rural communities is very difficult, as banking services are rare. Revenue from hunting is often treated as a 'windfall' resource, which can be used to cover occasional needs, like medicines, schooling, ceremonies or clothes. Hunters in rural Gabon tend not to save income from bushmeat beyond the immediate needs of the moment, preferring to increase the effort they put into hunting in response to short term need, rather than saving for eventualities. When hunting returns are unexpectedly high, hunters spend a large proportion of this income on luxury items, including cigarettes and alcohol (Okouyi, 2006; Coad 2007). This money is spent largely within the local community, and so does benefit the local economy, though not the hunter families directly.

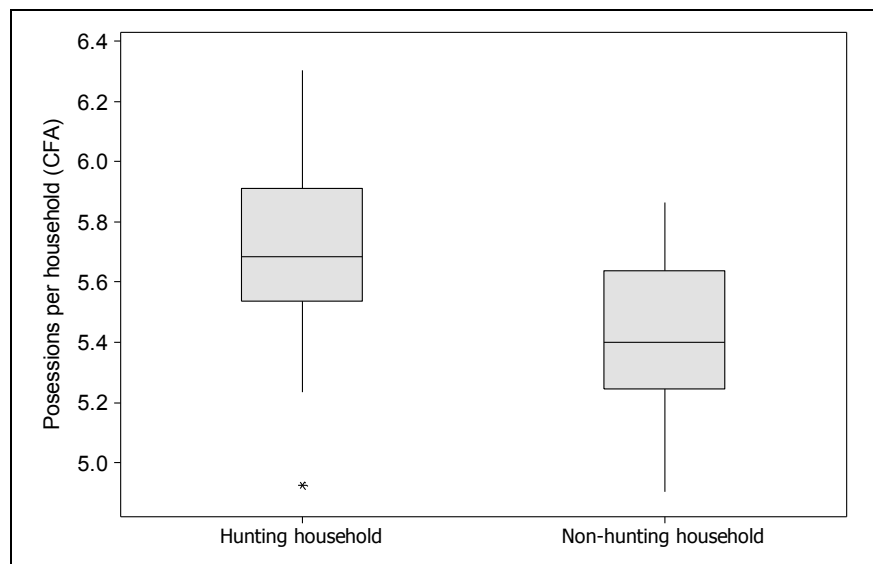
Even though investments in household assets are proportionally a small fraction of bushmeat returns, hunting revenues do allow accumulation of wealth over time. Households that hunt have a generally greater wealth of assets (excluding those used directly for hunting) than those which do not hunt (Starkey, 2004; Coad, 2007).

Figure 3.2.4: Wealth of households that hunt bushmeat, and those that do not.

Hunting households are significantly wealthier⁵² (as defined by a basket of goods survey of assets) than non-hunting households.

⁵¹ for sales where weight of the transaction was not measured, but estimated by the seller and accepted by the client

⁵² Source data, Coad et al, 2009 in prep. ANOVA: F43, 19 = 15.99, r2 = 0.19, p <0.001, df = 61,1.



As well as being directly available to the families and friends of hunters, bushmeat is also widely available commercially, from markets, travelling vendors or hunters. Some trade in bushmeat is crucial to hunter producers, who rely on income from bushmeat for other subsistence needs. However, an increasingly lucrative commodity chain, moving meat into urban centres fuels a high national demand for bushmeat, far beyond subsistence needs. This demand is supplied in part by meat from hunters with no subsistence requirements who hunt for cash only, often outside village areas.

3.3 Trade in bushmeat: buying and reselling

Trade in bushmeat is legal only for carcasses obtained by legal hunting under village rights. The law provides for any Gabonese person to be able to apply for a licence to trade in hunting products, but they may only trade in legally hunted products. The hunter may obtain a certificate for any legally-hunted carcass from the local Ministry of Water and Forests office, and this certificate remains with the carcass until consumed.

In practice, certification of legally hunted meat is almost never carried out and trade legality rarely checked. The exception is the enforcement of closed season bans on trade in some of the larger town markets (i.e. Franceville, 2002) or the occasional arrest of market traders in the large markets of Libreville.

3.3.1 Where do people obtain bushmeat?

Bushmeat is traded in six different scenarios (Abernethy and Effa, 2001).

- At fixed markets or boutiques, where sellers have a stand and trade during recognised hours and days of the week. These markets are only found in stable population centres, and their operation depends on local authority tolerance.
- At regular trading locations, but without a physical stand or recognised hours. These markets are less regular than the fixed markets, but their location and approximate hours are fairly predictable to the local population. They are often found on port quays, near bus and train stations or at road junctions in smaller towns and villages
- At mobile delivery points. Here the location is locally known, but the hours and days of trade are very irregular, dependent on hunter success. These markets are often roadside locations, where car loads of meat will be brought when hunters exit from a hunting trip. They are often supplied by commercial hunters who have regular clients

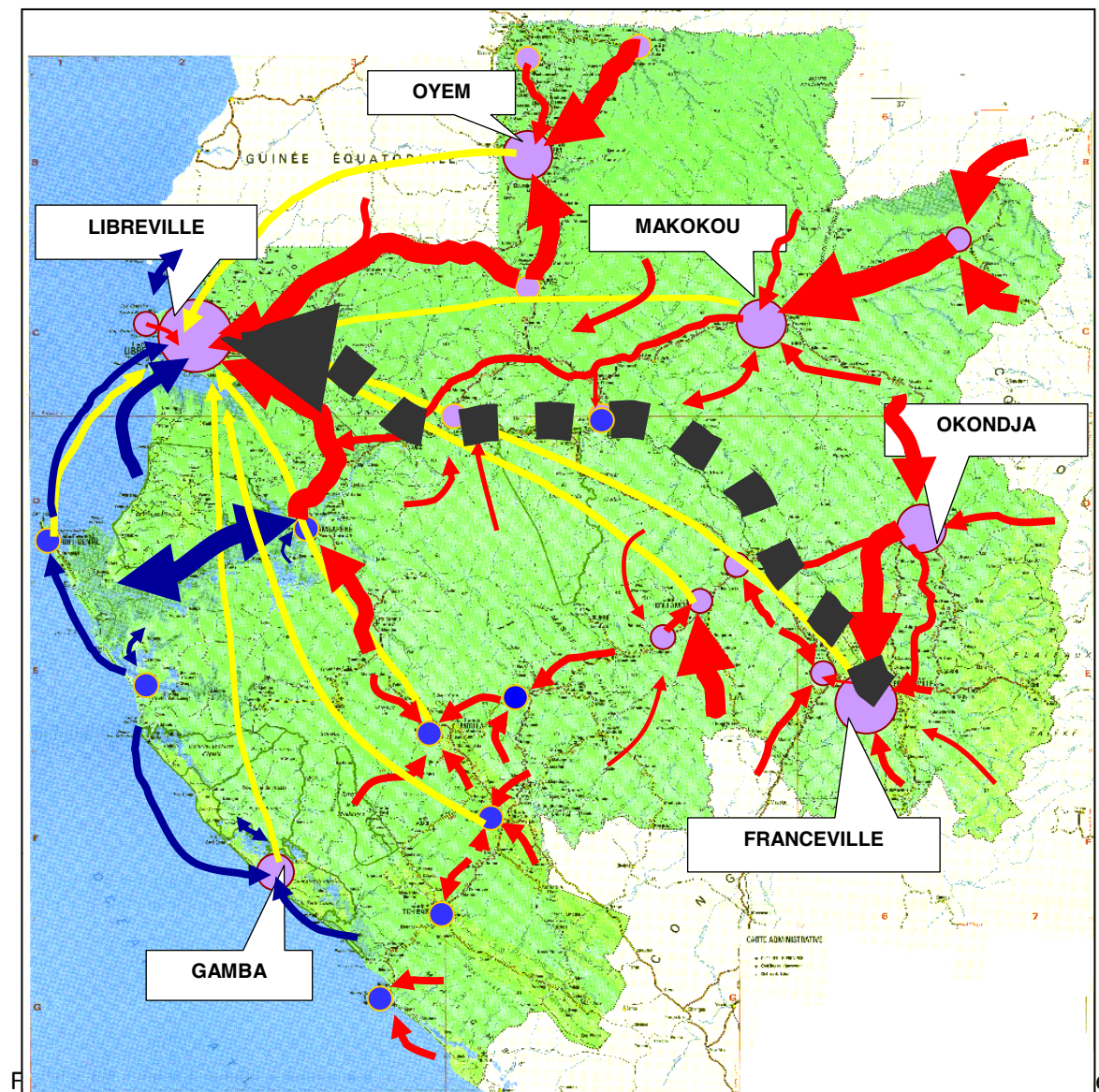
(called subscribers) and delivery points are often in the quarters of larger towns and Libreville.

- Direct delivery to a client on command. Some hunters hunt on demand, for a commercial client or restaurateur. Their meat is not offered for open sale, but delivered directly to the door, for a negotiated price.
- In village markets. These are held informally in villages where village resident hunters are hunting daily and other villagers know that any catch will be for sale around a certain hour of the day.
- Family roadside sales and village sales. These are points of sale trading small and irregular items for small amounts of family income. They are seen across Gabon on all roadsides where traffic is frequent, but typically trade less than 3 items per day and often far less than this, maybe only one item per month.

Village / family points of sale can be considered to be in every village in the country, and have not been independently mapped. Command clients cannot be mapped and are largely unidentified. The other 3 market types identified are shown in the map in Figure 3.3.1 below along with approximate trade routes and proportions into and out of the market.

Figure 3.3.1: Bushmeat trading locations and approximate transport routes identified in 2000-2001.

Relative trade volumes are approximately indicated by corresponding size of circles and weight of lines. Roads in **red**, Railway in **black**, waterways in **blue**, air transport lines in **yellow**.



markets and through roadside surveys of points of sale. Mobile delivery points, selling commercially in urban areas were not followed as they were too unpredictable, but from socio-economic surveys of the origin of household meat in urban areas, the amount of bushmeat sold by this route is considerable in provincial towns (see Sections 3.3.1 and [Error! Reference source not found.](#)).

Detailed knowledge of local supply routes and quantities in several provinces (Haut Ogooue, Ogooue Ivindo, Ogooue Lolo, Nyanga in particular) have shown a fairly consistent format for the commercial chain. Meat hunted in village communities is sold within the village (around 30% biomass) or on to the nearest small town (around 20% biomass). From here between 10 and 20% of what arrives in the small town is sold on to a larger centre (Okouyi, 2006; S.Touladjan, pers.comm), often directly to Libreville..

3.3.2 What do people buy?

Demand is outstripping supply in all markets surveyed. Sellers were rarely faced with meat that they could not sell, except when rotting was already advanced when the meat arrived at the marketplace.

3.3.2.1 Choice of carcass size to buy

Most hunted animals are in the 2-20 kg range.

In villages, in addition to perceiving a better price for bigger game, hunters report that very small (<1kg) species cannot be sold easily, and are consumed in the house. However, when offered for sale in the large markets, such as Mont Bouet, these species sold for relatively high prices per kilo⁵³. Often, their value is increased by traditional medicinal or cultural value for ceremonies, but this value cannot be guaranteed in small population centres, where need for medicines and ceremonies are sporadic. In larger urban centres, this sort of demand is reliable and where transport costs are low, small species are profitable to sell in the capital.

Very large species cannot be sold whole in villages, where people do not have the means to conserve them, nor the capacity to consume them fresh. Even transportation of these species whole can be problematic, and thus they will be butchered and sold or gifted in parts. Coad (2007) notes that for village sales of butchered animals the parts are worth *less* than the whole within the village. However, hunters still usually butchered fresh carcasses of above 12kg, as demand is too uncertain for sale of whole animals.

3.3.2.2 Choice of species to buy

There is demand for all species of wildlife as meat.

Locally, some traditions make some meats less favoured. However, even in studies that have recorded local traditions against certain species, the prices of these meats were not significantly lower than generic bushmeat in the local markets (i.e. Okouyi, 2006). Several studies have looked directly at consumer preferences for meat. All found that brush-tailed porcupine, python, and red river hog are particularly preferred, and often (but not always) these meats commanded slightly higher prices than other meats.

Table 3.3.a: The major stated preferences for species amongst bushmeat consumers in three studies⁵⁴.

* The 'other' category contained monkey, Gambian rat, small pangolins (10% in the national survey), elephant, dwarf crocodile and python.

Species stated as preferred	% of respondents making first choice		
	Makokou (2004)	Libreville (2002)	National (2003)
<i>Atherurus africanus</i>	13.4	42	56
<i>Potamochoerus porcus</i>	21.8	22	8
Duikers	58.8	18	19
Other*	6	18	17

⁵³ In Mont Bouet market, Libreville, the average price/kg for species of < 1.5kg was 3847±2743 fca (N=1092 sales of animals <1.5kg in 2004). In comparison, species of around 16kg (preferred size, red duikers) sold for an equivalent of 732±235 kg (N=894 sales of animals 16-18kg) and very large species, such as hippo, manatee, elephant or buffalo, sold at 695±238 fca/kg (N=56 sales of parts of these species).

⁵⁴ Data from Schenck, 2006 (N=104 bushmeat consumers in Libreville, Franceville and inland villages; Okouyi, 2006 N= 196 consumers in Makokou; DABAC, 2002).

3.3.3 What are bushmeat prices?

Prices on a national scale are most affected by the location and type of market. When the local wildlife abundance, the hunters selling to the market (supply), the local population size (local demand), the distance and the transport options to a city market (for resale demand) were taken into account, markets were ranked on an index of 4-20. Markets scoring lowest were furthest from supply and closest to the largest demand, markets scoring highest were closest to supply and furthest from demand.

Price of bushmeat is very predictable from the market characteristics and varies very little between species, with even preferred species such as porcupine commanding only around a 10% higher price than other species.

Generic bushmeat price in markets (2000-2006) varied between 840fcfa/kilo in Ogooue Ivindo in 2000 to over 2000fcfa/kg in Oyem or Libreville in the same year. In a given locality, no species commands a predictably high price per kilo, with all prices varying between 500 fcfa and 1500 fcfa for fresh meat.

Figure 3.3.2: Prices of bushmeat in different market locations⁵⁵.

Prices are from markets ranked on an index from 4 to 20, with highest scores for markets nearest supply and furthest from demand; lowest scores were for markets nearest urban demand and furthest from rich wildlife hunting areas⁵⁶.

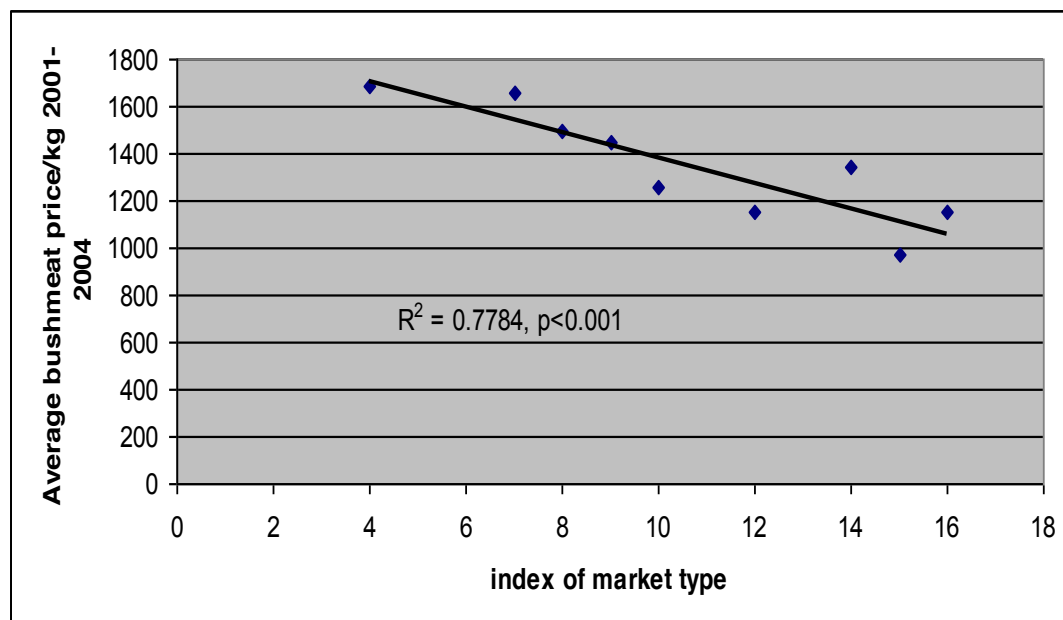


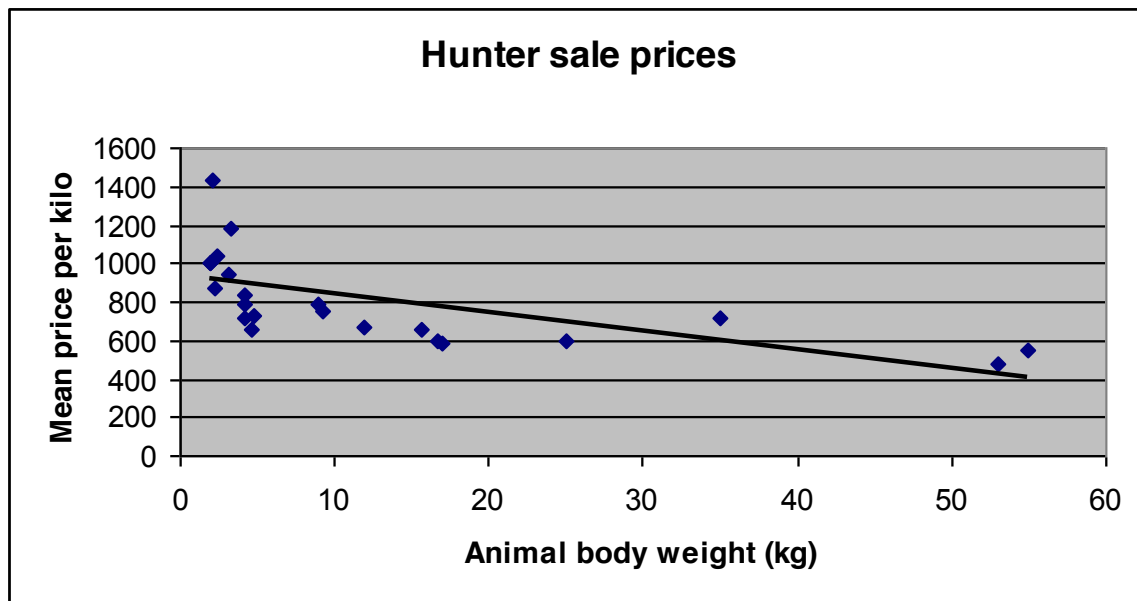
Figure 3.3.3: Mean reseller selling prices / kg for different animals within one market⁵⁷

⁵⁵ Mean annual price per kg from surveys of 17 markets in 11 locations 2000-2006. Surveys varied between 1-12 months per year. N (total) < 173,000 sales. Abernethy et al., unpublished.

⁵⁶ Sites are ranked on the commodity chain using the interaction of 5 independent terms that describe 1) the abundance of local wildlife 2) their supply from hunters and resellers, 2) their purchase and sales links to other supplying markets, 3) their transport possibilities towards larger markets, and 4) the transport time to the final market. Maximum score is 20, minimum score is 4 Abernethy et al., in prep.

⁵⁷ Source data: Okouyi, 2006. Sales of 834 animals. R adj = 0.386, p=0.001. This general trend is repeated in all similar datasets on animal species, size and prices/kg

Prices per kilo decline as the overall size of the animal increases. Nonetheless, larger animals are consistently chosen for sale at all points along the commercial chain.



3.3.4 What do people resell?

3.3.4.1 Selling into market chains

Generally, as shown for hunter sales, animals resold along the chain continue to fetch a lower price per kilo the bigger they are. This relationship is weakened when animals are sold in parts, as the customer (and seller) becomes better able to estimate the true weight of each portion sold.

Table 3.3.b⁵⁸: The commercial bias to larger and fewer species is increased when selling to a larger market.

This means that the larger species are extremely over-represented in the markets, compared to the original offtake, whereas diversity is under-represented.

Measure	Fate of animal hunted			
	Original catch	Eaten in village	Sold to villagers	Sold to town
Mean body mass (kg)	3.9	2.6	3.9	5.8
Mean price / carcass (fcfa)		*	3,462	4,740
Number of species	50	47	19	17
Ratio small: large species	1:1	11:1	1:3	1:21

At the scale of the national markets, very small species command very high prices relative to their size for two reasons; a) the Gabonese market is truncated at 500fcfa, which is the minimum price ever paid for bushmeat, no matter what the size, species or weight, and b) very small species, such as squirrels often have a medicinal use, which elevates the price even beyond that of their meat. Very large species cannot command the full price for their size, as this would run into hundreds of dollars for large apes or ungulates

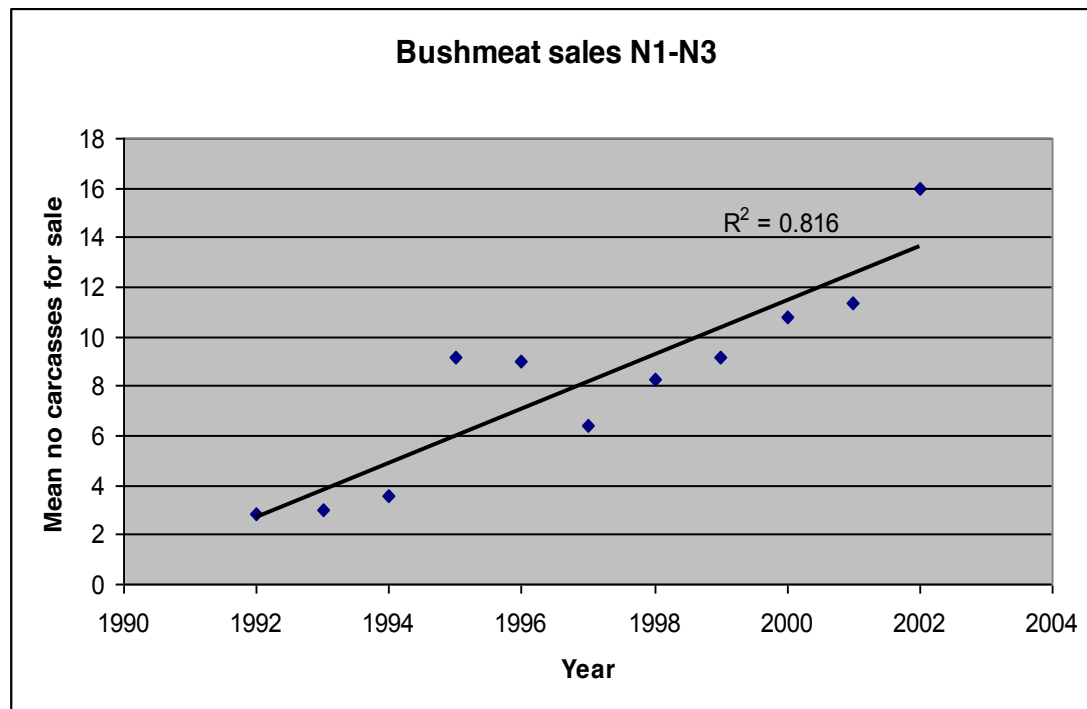
⁵⁸ Data from fate of 1032 animals originally sold by hunters in Ogooue Lolo. Coad, 2007.

and no consumer is willing to pay this. Prices are truncated at around 130.000fcfa, which seems to be the top acceptable per carcass price, regardless of actual size, species or weight.

3.3.4.2 Selling at the roadside

During the last decade, roadside selling by rural families along the N1-N3 has significantly increased. This is probably the case on other roads also. The number of carcasses offered for sale along 360km of the N1 Libreville to Franceville significantly increased over 10 years from an average of only 3 offers per day in 1992 to around 16 per day on this section of road in 2002.

Figure 3.3.4: Increasing numbers of roadside sales of bushmeat, 1992 - 2002⁵⁹



This trend is probably caused by increasing traffic on the road and hence increasing demand for bushmeat and probability of making a sale. Sellers will only offer meat for sale if the likelihood of making a sale is sufficient.

Concurrently with the increase in the number of animals offered for sale, the size of the species offered has significantly declined since 1992.

The interpretation of this information is complex. Increased hunting pressure in the area may have resulted in depleted wildlife and smaller catches (see also sections 2.4 and 0). However, increasing traffic and transport opportunities will also allow animals to be sold in the city markets, for a better price. As for other hunters, people will choose the larger animals to sell in the bigger markets, keeping the smaller ones for doorstep sale and household consumption if they are not sold.

The trend towards increasingly tiny species offered for sale closer to Libreville is more pronounced the closer to the capital. The comparison between the stretch between Ntoum and Kango (34-70kms from LBV) and the stretch Kango – Bifoun (70-108kms from LBV) is shown in Figure 3.3.6.

⁵⁹ Data from all bushmeat seen offered for sale on 106, 365km daytime trips made along the N1-N3 between Lope and Libreville, 1992-2002. Abernethy and White, unpublished. Spearman rank correlation, $R^2 = 0.816$, $p < 0.001$.

Figure 3.3.5: Decreasing size of species offered for roadside sale on the N1-N3 in Gabon 1992 - 1998⁶⁰.

Roadside sales almost certainly represent a part of the hunting offtake from the immediate local area. No one is buying bushmeat from elsewhere to resell at a roadside outlet. The drop in animal size may be caused by a true drop in the available wildlife, but may also be underlain by the increase in traffic, which increases transport opportunities for markets in Libreville and thus the removal of larger beasts to the more certain markets in the city.

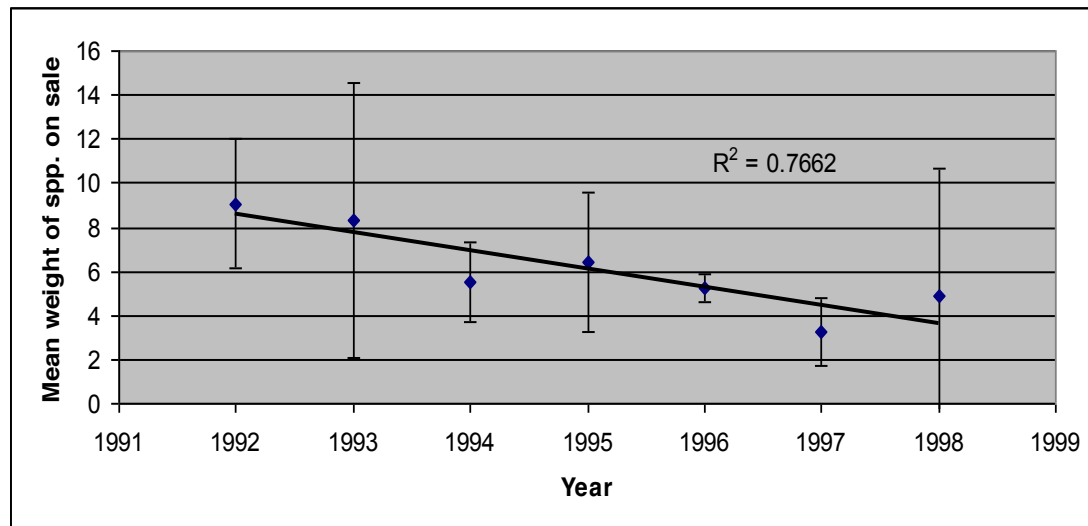
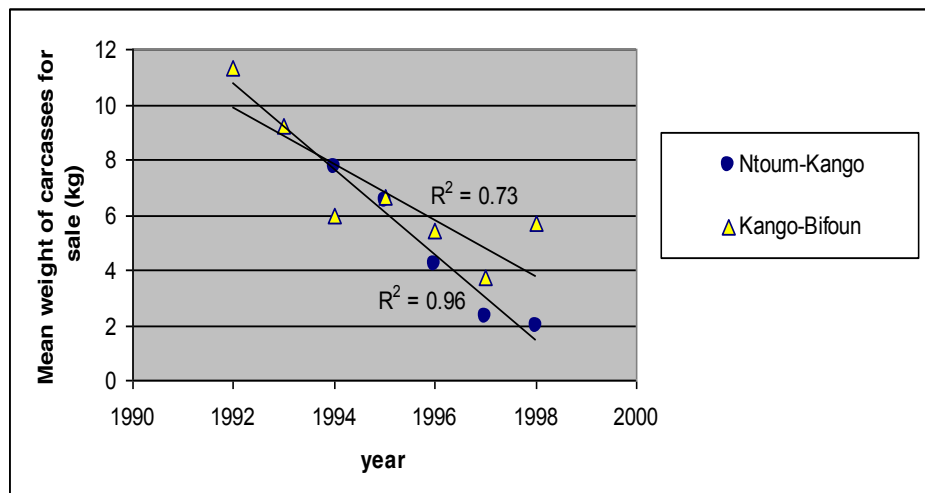


Figure 3.3.6: The effect of declining sold animal size is more pronounced for the section of the road closer to Libreville.

The trend towards smaller animals in roadside sales maybe the result of steeper declines in wildlife closer to Libreville, or may be that improved transport opportunities to Libreville mean that larger animals are preferentially transported to markets there.



Although the reasons for the change in roadside trade are not clear, what is certain is that roadside selling of bushmeat is changing, and this will be having an effect in the household economies of the rural family sellers.

⁶⁰ Data from all bushmeat seen offered for sale on 106, 365km daytime trips made along the N1-N3 between Lope and Libreville, 1992-1998. Spearman rank, $r_2 = 0.77$, $p < 0.001$. Abernethy and White, unpublished

For families in urban settlements, an average of 22% of the biomass of bushmeat they consume is bought from doorstep sales, for families in Libreville (whom this road supplies), 10% of consumed bushmeat was from roadside sales in 2005 (see also Section 4.1.2).

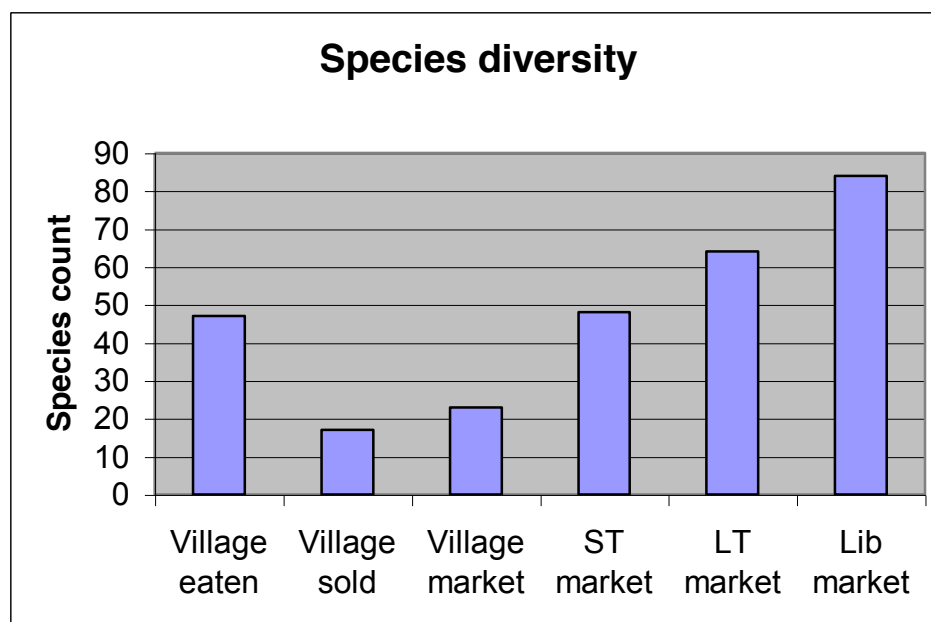
3.3.4.3 How do seller choices affect species diversity in the markets?

Trends in species diversity were followed through the commodity chain to the markets of major cities, but meat being sold for export could not be monitored.

Species diversity changes predictably with market size and catchment in this way: the initial loss of diversity in the portion of the catch village hunters sell reflects the hunter bias to selling only larger species. As several small villages supply meat to larger urban markets, diversity increases again, due to the larger number of habitats and species distributions sampled, and the accumulation rare species, which are sold only occasionally in villages.

Figure 3.3.7: The changes in species diversity in markets along the commodity change in Gabon⁶¹.

Markets are arranged in rank order of the supply chain and population size. The first step of the chain, hunters to village sales, entails a large drop in diversity as a biased selection is made for sales. Thereafter, diversity is accumulated in larger markets, which sample larger and more diverse habitat catchments. Although the qualitative diversity of species is regained across the chain, the total biomass and number of individuals of these species in markets remains biased from the original catch at all stages of the chain.



The immediate bias toward larger animals in the commercial trade in bushmeat means that **markets do not ever show a balanced reflection of what is being hunted in the immediate locality**, and the potential discrepancy between the local offtake and the market selection grows with the number of supply chains into that market. The implications of this for managing markets and using markets to monitor wildlife impacts are discussed further in Section 5.

⁶¹ Data from annual recorded diversity of animals hunted and traded by village hunters in Ogooue Lolo, (Coad 2007), and surveys of 11 markets in small towns, large towns and Libreville 2004. Abernethy et al., in prep.

3.3.4.4 Which species are most commercially important?

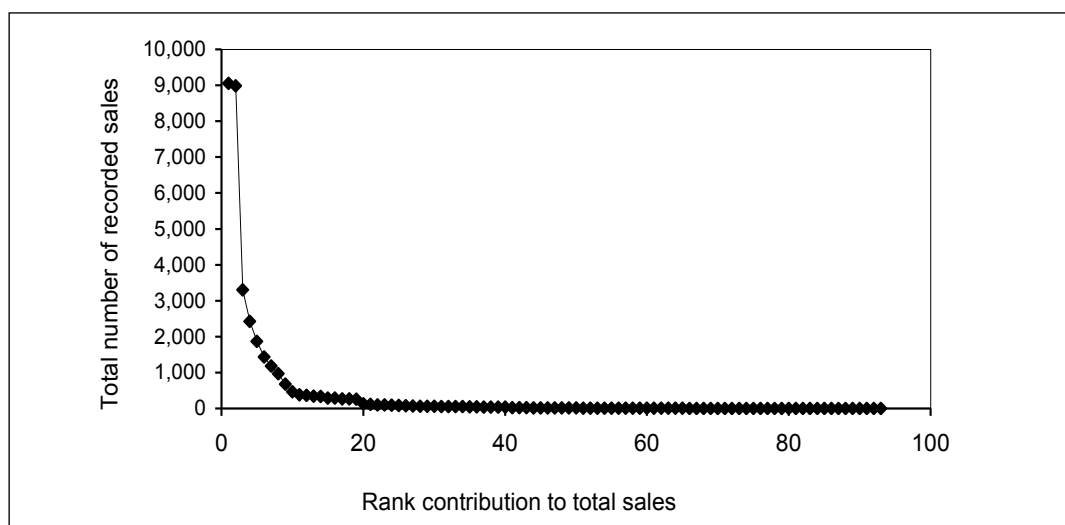
Of the [114 species recorded](#) as bushmeat in Gabon, a very small proportion underpins the vast majority of the hunt, consumption and trade.

Village hunter catches are enormously biased to a few species, with 5 or less species always responsible for over 70% of the biomass hunted and these always include Brush-tailed porcupine, Blue duiker and members of the Red duiker group.

On a national scale, these 3 species⁶² maintain their importance along the length of the commodity chain. A further 15 species are seen at all stages of the trade chain, though are not always important in all localities, as for the first three. Figure 2.2e shows the general pattern of species biomass contributions to the overall commercial range, demonstrating clearly the large skew to few species. Table 2.2a shows the relative frequency of sales of the 18 species common in the trade chain, together with their protection status nationally and internationally. Most of the trade in Gabon currently involves unprotected species, or those deemed of low concern (though these classifications may not reflect the true predicament of the species in the wild), however, several species of national or international concern are still traded.

The protection of individual species has not to date prevented them being widely hunted and traded. Thirty percent of the top 18 species in markets (by sale frequency) had some sort of national legal protection and protected species of a given weight are not traded any less than unprotected species of a similar type.

Figure 3.3.8: The proportional contribution of different species to the commercial market⁶³.
The top five species ranked by their proportion of the biomass of all recorded national sales were Brush-tailed porcupine, Blue duiker, Bay duiker, Peter's duiker and Red river hog.



⁶² The red duiker group is referred to as a 'species' here for ease.

⁶³ Data from 88,000 sales recorded in 16 markets nationally during 2000-2002. Abernethy et al., 2007. This curve is also demonstrated by Starkey (2004) for the hunter sales in Ogooue Lolo.

Table 3.3.c⁶⁴: The 18 species found commonly in all types of markets surveyed: Villages, small towns, large towns and capital city.

Commonly means that the species was recorded in all six markets in >75% of months sampled in each year sampled. Other species (96 other spp. recorded) were not seen along the whole chain. Rank frequency is the overall frequency of records for the species (1= Brush-Tailed Porcupine, the most frequently traded animal overall). Shading shows categories of relative abundance in the markets, with darker shading being most abundant (found in all six markets, in all months of all years in large numbers), mid-grey species seen as frequently (all markets, months, years), but in lower numbers and white being least frequent: species which were not found 'commonly' in the villages markets, but were there in many months.

Rank frequency of appearance 1=most	Species	IUCN status	Gabon protected status
1	<i>Atherurus africanus</i> Brush-tailed porcupine	Least concern	Not protected
2	<i>Cephalophus callipygus</i> Peter's duiker	Lower risk/least concern	Not protected
3	<i>Cephalophus dorsalis</i> Bay duiker	Lower risk/near threatened	Not protected
4	<i>Cephalophus monticola</i> Blue duiker	Lower risk/least concern	Not protected
5	<i>Cercopithecus nictitans</i> Putty-nosed guenon	Lower risk/least concern	Not protected
6	<i>Cephalophus nigrifrons</i> Black-fronted duiker	Lower risk/near threatened	Not protected
7	<i>Cephalophus sylvicultor</i> Yellow-backed duiker	Lower risk/near threatened	Partially protected
8	<i>Genetta servalina</i> Servaline genet	Lower risk/least concern	Not protected
9	<i>Hyemoschus aquaticus</i> Water chevrotain	Data deficient	Totally protected
10	<i>Manis tricuspis</i> Tree pangolin	Lower risk/least concern	Not protected
11	<i>Potamochoerus porcus</i> Red river hog	Lower risk/least concern	Partially protected
12	<i>Uromanis tetradactyle</i> Long-tailed pangolin	Lower risk/least concern	Not protected
13	<i>Nandinia binotata</i> African Palm Civet	Lower risk/least concern	Not protected
14	<i>Osteolaemus tetraspis</i> Dwarf crocodile	Vulnerable	Partially protected
15	<i>Tragelaphus scriptus</i> Bushbuck	Lower risk/least concern	Partially protected
16	<i>Civettictus civetta</i> African civet	Lower risk/least concern	Not protected
17	<i>Tragelaphus spekii</i> Sitatunga	Lower risk/near threatened	Partially protected
18	<i>Thryonomys swinderianus</i> Cane rat	Least concern	Not protected

Although the bulk of the trade chain involves relatively few species, many other species are traded occasionally. Some of the species recorded least frequently in the markets (e.g. tree hyrax) were relatively common in the village hunting returns (Coad, 2007), but were too small to be traded by the hunters. Other small species may not be biologically rare, but are not targeted and if caught in snares are not usually traded by village hunters (i.e. monitor lizards or squirrels). Larger species may be biologically rare, either by ubiquitous but low density (apes, leopards) or by restricted biological range (Bongo, Leatherback

⁶⁴ Data from 6 years of surveys in 16 markets in Gabon. Abernethy et al., unpublished.

turtles) and their rare appearance in trade is a reflection of genuine rarity, as their size makes hunters more likely to sell them if caught.

Only one totally protected species which should never be hunted was found in the top 18, showing that enforcement of its protection must be low. Four partially protected species are also found in all months in all markets, when they can only be legally hunted in the open season, also indicating scant application of the protection laws for these species.

The list of thirty rarest records in the commercial chain (Annex 8.4) does not include some of the species generally thought to be rare and under great threat from the market trade, such as the apes, elephants, buffalo or Mandrill. These species are found more frequently and in more markets than the rarest 30, though were not recorded along all markets in the chain (Table 3.3.c). Generally, their large size and relatively biological rarity means that these species are not found in the village areas (Henschel, 2008, Chap 2), are not specifically targeted by village hunters (though are inevitably sometimes caught in non-specific snares; i.e. Starkey, 2004; Coad, 2007), instead, they usually enter the commodity chain from commercial hunters who are using more remote (and biologically intact) forests.

3.3.4.5 Is there specialist trading in different species?

Anecdotal evidence from simultaneous wildlife, hunter and market follows in Haut Ogooue show that the Grimm's duiker (*Cephalophus grimmia*) is hunted often, but was almost never recorded in the open markets, anywhere in the country. Hunters of this species work mostly on command, supplying the duikers to private clients.

Mismatches between hunter records and market records have been noted for gorillas in the Ogooue Ivindo and Grimm's duikers in Haut Ogooue, and in general for elephants, where the primary motivation to hunt is for ivory and in many cases the majority of the meat is left in the forest.

Okouyi (2006) notes an influx of non-resident hunters into the Makokou region in the dry season, of which several stated a specialist target (elephants, apes, red river hog).

In addition to 'on command' hunters, specialist traders (though not exclusive) do exist for red river hog, apes and Grimm's duikers. Although pythons command high prices for their body fat, no specialist hunters or traders of pythons were found.

3.3.5 What profits do resellers make?

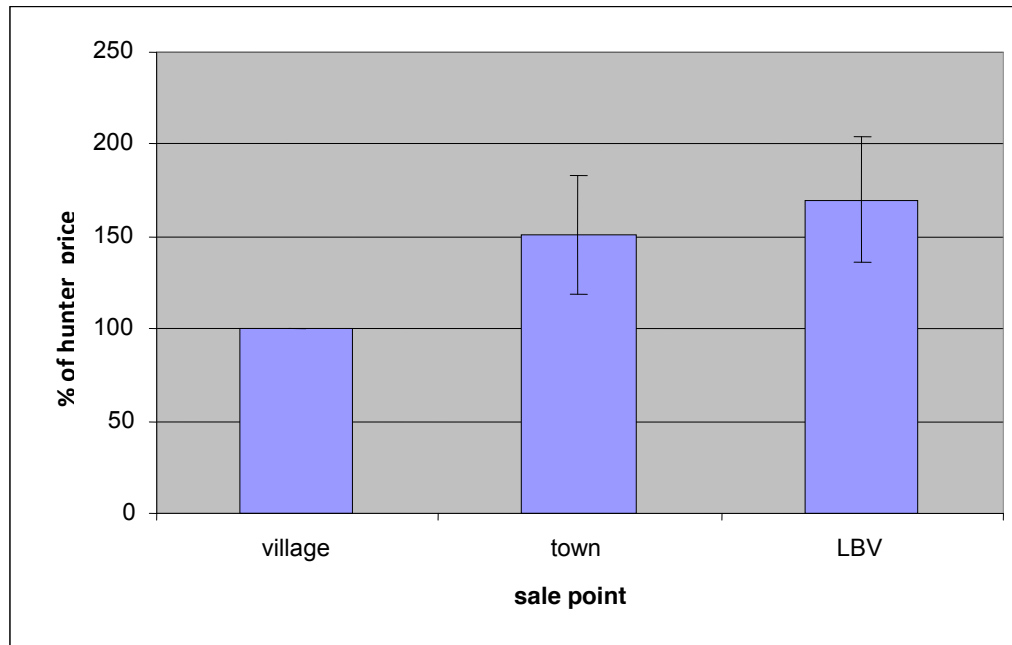
Okouyi following resales of bushmeat in Afane market, Makokou, in 2004 showed that carcasses from 5-15kg did best when butchered into small parts (average resale of 122% purchase price) and small animals did best whole. A whole carcass (5-15kg) made an average profit of 60% on its resale, 68% difference if it was cut into haunches and a 100% profit on its purchase price from the hunter, if butchered into small parts (500g-1kg).

Larger animals did relatively better if cut into haunches, rather than small parts (average resale of 155% purchase price). Red river hog carcasses could almost double their value if butchered into haunches, rather than offered whole.

Figure 3.3.9: The proportional profits made in meat sold in different locations⁶⁵.

Trade followed through four chains showed that between 10 and 40% of meat sold on the provincial town markets was bought by resellers who then traded it in the capital.

⁶⁵ Data on prices from market surveys 2000-2006, Abernethy et al., unpublished; Okouyi, 2006; Coad, 2007; Data on supply links between markets Lahm, 1993; Nyingone, 2004; Walters 2009, pers comm., Touladjan, 2009, pers.comm.



Lahm (1993), Steel (1993) and Carpaneto (1992, published in 2007), also followed the resale of meat from hunters in the Ogooue Ivindo, Moyen Ogooue and Haut Ogooue, through the same chain of hunters to market to traders who resold in Libreville as were followed in 2002-2004 by Coad, (2007) van Vliet (2008), Okouyi (2006) and Abernethy et al. (unpublished).

The proportional profits along the chain show the relative economic stability of involvement in bushmeat trading over the last decade.

Even though absolute prices have risen in 10 years, the relative profits are similar to those found along the same trade chains ten years later (Table 3.3.d), indicating the comparative stability of bushmeat trading through the last decade.

Table 3.3.d: The gross value of bushmeat through 4 chains where meat was followed through markets to Libreville 1992-1993 and 2002-2004⁶⁶.

Price rises are mean per kilogramme prices for all fresh bushmeat sold in the market during the surveyed part of the year. Chain a) Dibouka - Koulamoutou – Libreville. Chain b) Ivindo villages – Makokou – Libreville. Chain c) Obiri – Franceville – Libreville. Chain d) Port Lambarene – Lambarene centre – Libreville.

mean price/kg (fcfa)	Ogooue Lolo ^a 2002	Ogooue Ivindo ^b 2004	Haut Ogooue ^c 2002	Moyen Ogooue ^d 2004
village	1,037	805	903	1,012
town	1,370	1,554	1,530	1,129
LBV	1,562	1,802	1,562	1,802
% increase				
village	100	100	100	100
town	132	193	169	109
LBV	151	224	173	132
mean price/kg (fcfa)		Ogooue Ivindo 1992	Haut Ogooue 1992	Moyen Ogooue 1993
village		447	935	
town		668	1,285	
LBV		1,340	1,340	
% gross profit				
village		100	100	
town		143	137	
LBV		244	143	

3.3.6 What is the importance of commercial bushmeat in trader households?

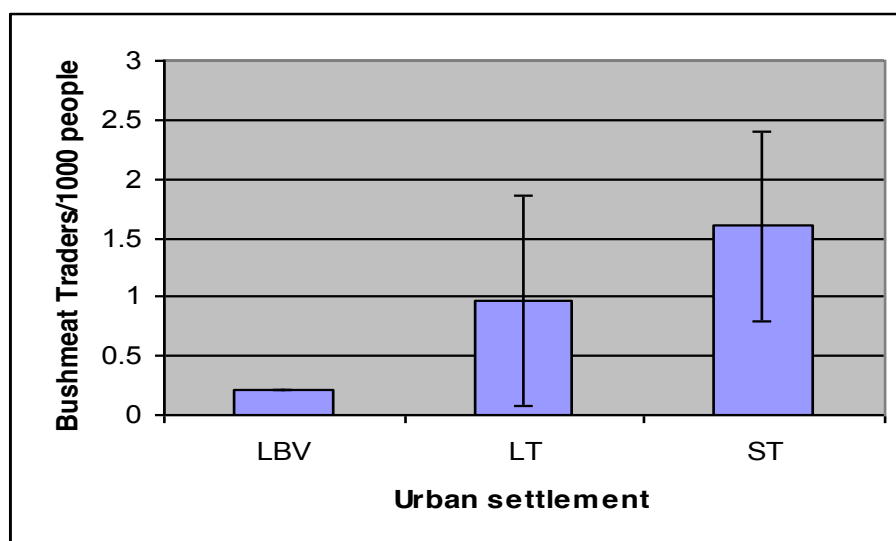
Many people are currently gaining a livelihood from trading in bushmeat. Buying from hunters, or from another trader and thus moving meat along a commodity chain, usually towards a larger urban centre. Resellers can make considerable profits. Okouyi (2006) details the economy of trading bushmeat for women resellers trading around the Makokou market as a gross profit of between 172.000 and 425.000 fcfa per month, depending on how much of their meat can be sold butchered, which raises better profit margins. These sellers all traded in other commodities also, and estimated the revenue from the bushmeat part of their business between 60% and 90% of their total income⁶⁷. These returns make bushmeat trading very competitive with trade in other natural resource commodities.

⁶⁶ Data on trade links and prices from Okouyi, 2006; Coad 2007 and Abernethy, unpublished, 2001-2006. N ranges from 501 - 36,338 sales surveyed per location per year. Surveys covered 1-12 months of the year.

⁶⁷ Data from purchase and resales of 5205 carcasses by 13 resellers over 12 months in Afane market, Makokou, 2004, Okouyi, 2006.

Figure 3.3.10: The number of bushmeat traders in different towns⁶⁸.

Traders of bushmeat in fixed markets were surveyed across Gabon, 2000-2006. The number of fixed market traders was proportionally higher per 1000 inhabitants in smaller towns, closer to bushmeat production hunters than in more urban settings. In large urban settlements, bushmeat traders form a tiny proportion of the population.



No survey carried out to date has been able to accurately measure how many people are currently involved in the bushmeat industry in Gabon, or what their economic benefit from these activities is. However, several local or national studies have identified the different actors qualitatively. Hunters (village and commercial); transporters, traders (resellers, procurers for orders, street vendors, market sellers, shop owners), restaurateurs. Of these groups, some information is available to estimate the economic involvement of hunters and market traders, but the membership and economic gain of the other sectors are unknown.

Table 3.3.e: The potential economic involvement in the bushmeat trade.

Studies of hunter communities and markets show that at least 36,000 families, almost all in the rural sector, are certain to be affected by any change in commercialisation of bushmeat. In addition to these people, must be added the purely commercial hunters, procurers, transporters, restaurateurs and street vendors. Of these groups, restaurateurs may be numerous.

Village Hunters		Market Resellers		Transporters , commercial hunters, restaurateurs, street vendors, procurers	
Income from village commercial bushmeat	15-72%	Income from commercial bushmeat (fixed markets)	60-90%	Income from commercial bushmeat	?
Proportion of population involved	17.8 %	Proportion of population concerned	0.05%	Proportion of population concerned	?
Approximate number of families concerned	35,000	Approximate number of families	840	Approximate number of families	?

⁶⁸ Data from 6236 trading days surveyed in 21 different markets across Gabon between 2000-2006. N days varies from 23 to 1685 days surveyed per market. The urban settlements follow the same designations as throughout the report (Large Town >10,000; Small Town 2,000-10,000). Abernethy, unpublished.

4 CONSUMPTION OF BUSHMEAT

The consumption of bushmeat is entirely legal. Legal *acquisition* of bushmeat depends on the carcass coming from a legal hunt and through a chain of licensed vendors, but the law only provides for penalties against the hunters and sellers not the consumers.

The choice to eat bushmeat is a complex mix of taste preferences, cultural expectations, habit, wealth, environment and the comparative availability and price of other proteins. It may also be a decision imposed on younger members of the family by the family head or the person who provides and cooks.

In Gabon, people in different wealth classes, differing economic and cultural settings, of different ages, and in different geographic areas eat predictably different amounts of bushmeat. Understanding all the factors that influence their use of bushmeat is crucial to designing fair and effective management of the resource for the whole nation.

Consumption of bushmeat in Gabon follows similar patterns to the consumption of other food commodities, which are eaten in greater quantities when they are cheaper than alternatives. Bushmeat is most abundant in remote forested areas, where alternative, imported meats are most expensive and least abundant. Bushmeat consumption is highest *per capita* in these areas of the country. In the cities, bushmeat is expensive and rare, and consumption *per capita* is least.

However, even in Libreville, where many cheaper alternatives exist, consumption of bushmeat has not dropped to zero, showing clearly the cultural importance to many families of a few meals of bushmeat a year even if it is highly expensive.

4.1 Role of wealth in use of Bushmeat in Gabon

Many consumers of bushmeat purchase it rather than hunting themselves. Village hunters sell about 50% of the biomass they catch and additional, specialist hunters probably sell close to 100% of their take (see Section 3.2). This means that a minimum of half, and probably significantly more, of the bushmeat hunted in Gabon becomes a commercial commodity

The fact that the majority of bushmeat consumed is purchased means that socio-economic circumstances of the consumers are important to the way the trade in bushmeat might change if supply is changed through hunting regulation or declining wildlife.

Bushmeat is eaten in two main scenarios:

- family meals within a household;
- restaurants. Bushmeat is available in all forms of selling of prepared food in Gabon, from roadside snacks in villages to high-class restaurants in international hotels. Restaurant meals may be shared with the family, but often constitute an extra or replacement meal, or snack, taken outside the home by only one or a few family members.

In Gabon, surveys of consumption of food inside the home have been carried out by several groups, but the quantities of bushmeat passing through restaurants have not been systematically studied yet. The amounts of bushmeat consumed in restaurants are likely to be as varied as household consumption across the country, and may add a significant amount to estimates of total consumption of bushmeat.

Restaurants with a high trade volume are often ordering their meat directly from commercial hunters and procurers, and thus meat that is used in this way is not quantified by the village hunter surveys, market surveys or household consumption surveys that have been made in Gabon.

The volume of meat passing through restaurants, in particular in provincial towns, is likely to be quite large and merits quantification.

4.1.1 How much bushmeat is bought and how much comes into households from family hunting?

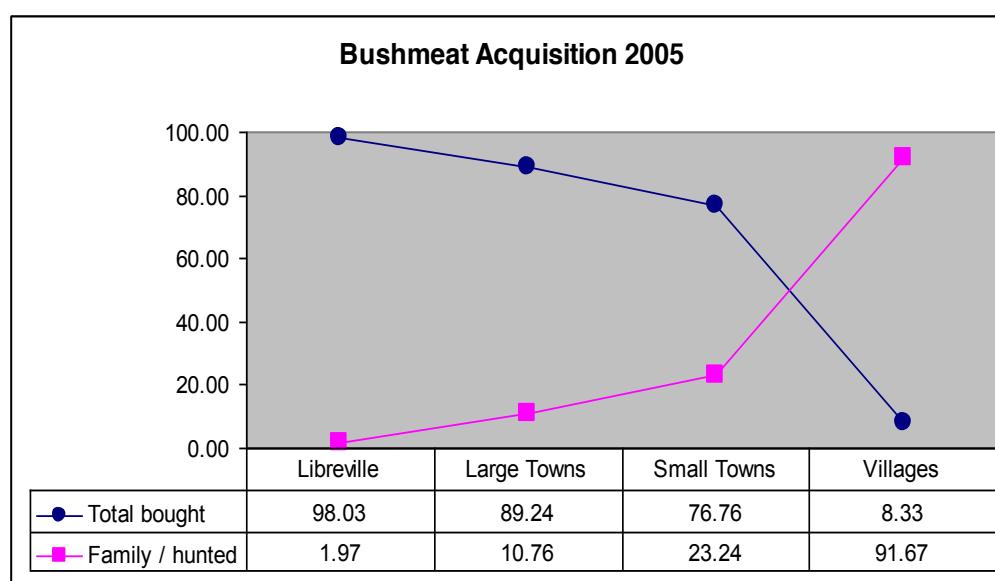
Bushmeat is brought into the household by family members hunting, through gifts from other families or friends, and by purchases from vendors or markets and shops.

In urban areas, where few families have hunters and access to cash for purchases is relatively good, most bushmeat is bought rather than hunted or gifted. Even small urban centres (3000+ people), the majority of bushmeat is acquired commercially. This shows the importance of the commercial trade to the consumer, as well as the subsistence hunters.

Markets and shops are the most used source for urban bushmeat and most urban consumers choose their bushmeat purchase against the local market prices.

Figure 4.1.1: The acquisition of bushmeat from hunting or the commercial chain in 2005⁶⁹.

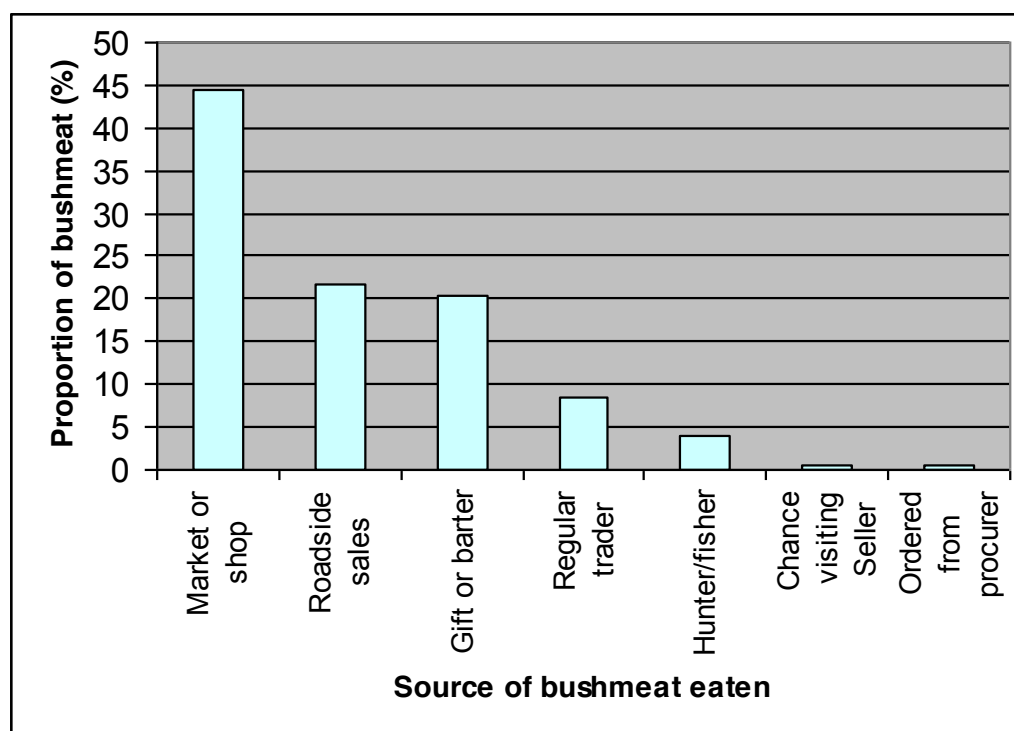
The importance of the commercial chain in bushmeat is already evident in small urban centres (>3000 inhabitants). In Libreville, only a very small proportion of the bushmeat consumed was acquired from the families' own hunters or familial gifts.



4.1.2 Where is bushmeat bought?

Bushmeat sourcing is very diverse in urban settlements, with city households obtaining bushmeat through 7 different channels. Very little is directly hunted, the majority (over 90% in Libreville) is purchased at fixed markets, shops or from vendors or roadside sales. In comparison, less than 10% of bushmeat consumed in villages (<2,000 people) is obtained through a commercial chain.

⁶⁹ Data are mean proportions of the total household consumption acquired from different sources, from 6-day recall surveys of the bushmeat eaten by 3001 household in Gabon in 2005. Abernethy et al., unpublished.

Figure 4.1.2: The sources of bushmeat eaten by urban families⁷⁰.

Surveys of bushmeat purchases both in Gabon and other countries in the region have concentrated on the fixed markets, as these are easiest to survey, and purvey most bushmeat in one location. However, the quantities passing through other routes are significant and merit attention for management planning.

4.1.3 What is the effect of price on purchasing?

People's choice to eat bushmeat, is made in the light of the availability and price of alternatives (see Section 4.3), as well as their cultural circumstances.

As bushmeat is a purchased commodity, people consume less when the price is higher (Figure 4.1.3). However, people's choices are complex, and depend not only on the price of bushmeat itself, but on the price of alternatives (Wilkie et al., 2005). Richer people will always have a larger choice of alternatives.

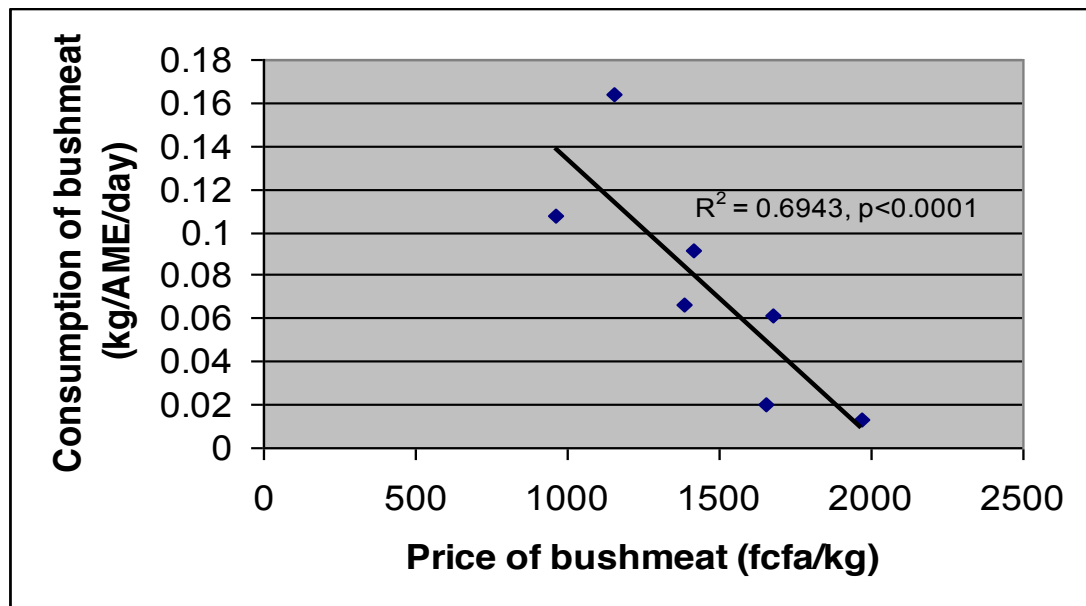
Protein is a necessary commodity that families must obtain, however their needs can be met by alternatives other than bushmeat (fish meats, nuts, vegetables or pulses). For this sort of commodity, a general rule is that as people's income goes up, they will buy more of the good if they consider it superior to alternatives, and less of it if they consider it inferior to a (more expensive) alternative which they will switch to. This being the case, the way people compare bushmeat to other goods is critical to how people will choose to spend money on it, and on how their choices will change if its price, or their economic circumstances, change (Wilkie et al., 2005).

Figure 4.1.3. The effect of bushmeat price on consumption in Gabon⁷¹.

Where bushmeat is expensive, significantly less of it is consumed.

⁷⁰ Data from the stated sources of 368 bushmeat meals consumed by urban families (in 7 settlements 5000 – 636,000 people) across Gabon. Abernethy et al., 2005 unpublished.

⁷¹ Data on prices and consumption were all taken in 2003 in the same locations. Mean prices are from market surveys of 1-12 months in each town, Abernethy et al., unpublished. Data on consumption from household surveys of between 80 – 512 households in each locality, Wilkie et al., 2005.

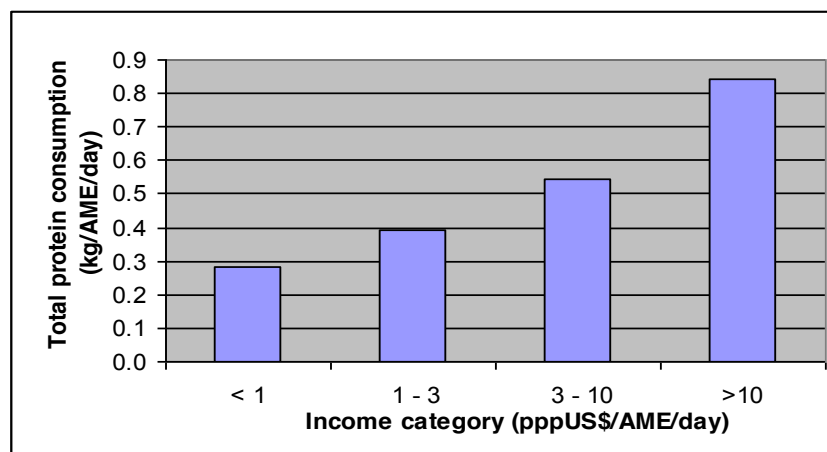


4.1.4 Do richer people eat more protein?

Generally, families have better nutrition if they are wealthier and wealthy households generally eat more protein than poorer households in Gabon. Household protein consumption by wealthy households is nearly four times that of the poorest households. This is a common relationship in most societies in the world, where protein intake is increased with increasing wealth.

Figure 4.1.4: Increasing protein consumption with increasing income in households surveyed across Gabon⁷².

The WHO guide for protein requirements is 70-100g/AME/day. All households in Gabon probably fulfil this requirement.



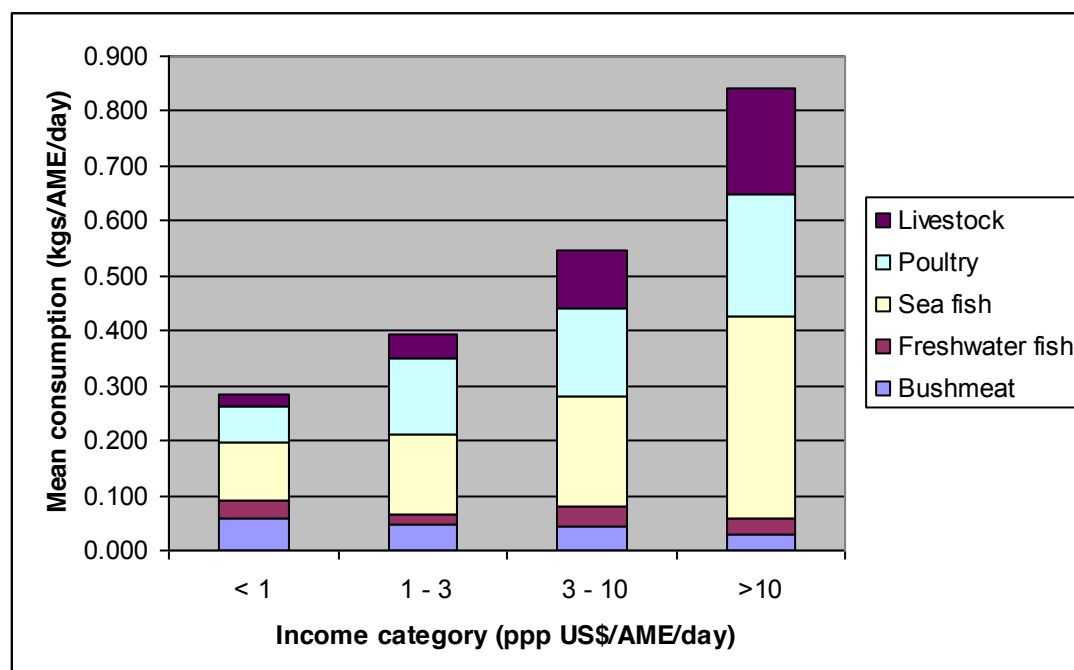
4.1.5 Do richer people eat more bushmeat?

Although people in wealthy households eat more total protein, the types of protein consumed change in relation to wealth class. Richer families eat relatively less bushmeat and freshwater fish in their diet, and relatively more livestock, poultry and sea fish.

⁷² Data from 368 households in 9 locations (5 inland, 4 coastal) in Gabon, Wilkie et al., 2003; Abernethy et al., unpublished.

Table 4.1.a: The protein consumption of families in Gabon⁷³.

Bushmeat is relatively more important in poorer households and its proportional importance declines in richer households. Freshwater fish use is unexpectedly not determined by household wealth, but use of all purchased proteins increases predictably with household wealth.



The wealthiest households were found to consume least bushmeat per person per day. The highest consumers are the 'wealthier poor' who can afford guns and labour to hunt more and also buy some bushmeat, if it is available.

Wealthy households were responsible for only 12% of the national annual consumption of bushmeat, whereas the poorest sector of the nation consumed 45% of the total annual biomass.

Table 4.1.b: The contribution of each wealth class to the total consumption of bushmeat by the nation.

Income category (pppUSD\$/AME/day)	Bushmeat consumption per AME per day (kg)	Annual biomass of bushmeat consumed by wealth class ⁷⁴	% of total population in wealth class	% of total bushmeat consumption by wealth class
<1	0.063	7,904,439	33	45
1-3	0.094	3,758,477	21	21
3-10	0.052	4,011,247	29	23
>10	0.043	2,091,968	17	12
Total	0.052	17,766,132	100	100

⁷³ Survey of 4650 households in 9 locations (5 inland, 4 coastal) in Gabon, Wilkie et al., 2003; Abernethy et al., unpublished

⁷⁴ Wealth class populations are calculated from the RGPH 2003 data on settlement sizes, and the proportions of the population in each location in each wealth class are derived from household surveys of 1208 households in 6 locations in Gabon in 2003 (Starkey, 2004; Wilkie et al., 2005)

4.1.6 Is there a bias to which species are chosen by richer people?

Wealthier households (as measured by their assets) bought more expensive bushmeat⁷⁵ It is likely that people with higher incomes can choose their preferred species or cuts more often. They often choose also to pay a higher price per kilo for having bushmeat delivered on demand, rather than visiting a market.

Brush-tailed porcupine and red river hog are often said to be preferred (Okouyi, 2006 and section 4.5) and are relatively expensive meats in a given market. Some species, often those widely recognized as endangered and illegal to trade, such as ape or Grimm's duiker, are offered at higher prices by private vendors on demand. As rich people are relatively few, eat bushmeat relatively rarely, and individual preferences are many, it is hard to detect one particular species that is consistently the 'choice of the rich'.

4.1.7 Do poor people who use bushmeat live in cities or rural areas?

There is a clear effect of wealth on the consumption of bushmeat, but wealth in Gabon is not distributed evenly across the country. In Gabon, the effects of wealth and location are very difficult to look at independently, as proportionally more poor people live in rural areas and more wealthy people in towns, especially Libreville. This can often confuse the effects of urban location and wealth.

Although the poorest sector of the whole population is responsible for 44.5% of the nation's total consumption of bushmeat, the poor in Libreville are only responsible for 0.4% of the total, whilst poor provincial town dwellers eat 10.5% and the rural poor eat 33.5% of the nation's total consumption (see below, Figure 4.1.5).

For poor families, whose nutritional needs per person are after all the same as those of rich people, a larger part of their income must be spent on necessary food than for richer families. The prices of alternative foods are thus relatively more influential on poor people's choices. The graphic in Figure 4.1.5 shows that urban poor must spend much more on protein than rural poor, and within this money, they spend only a very small proportion on bushmeat, which is very expensive. Rural people gain over 90% of their protein by hunting or barter, only buying a small proportion (see section 4.1.1). They spend a greater proportion of their money on bushmeat, which is cheap.

Figure 4.1.5. The amount spent (fcfa) on different proteins bought by people in the lowest wealth class (<pppUSD\$1/AME/day) in different locations.

People in villages spend the least on protein, as >80% of their protein is hunted, not bought. Poor people buy the largest proportion of bushmeat where it is cheapest in villages, and the least in Libreville, where prices are highest.

⁷⁵ Data from the consumption of bushmeat by 279 households in 9 locations across Gabon, Wilkie et al., 2003, Abernethy et al., unpublished, comparing the amount paid per kilogramme for bushmeat. The species purchased was not always divulged.

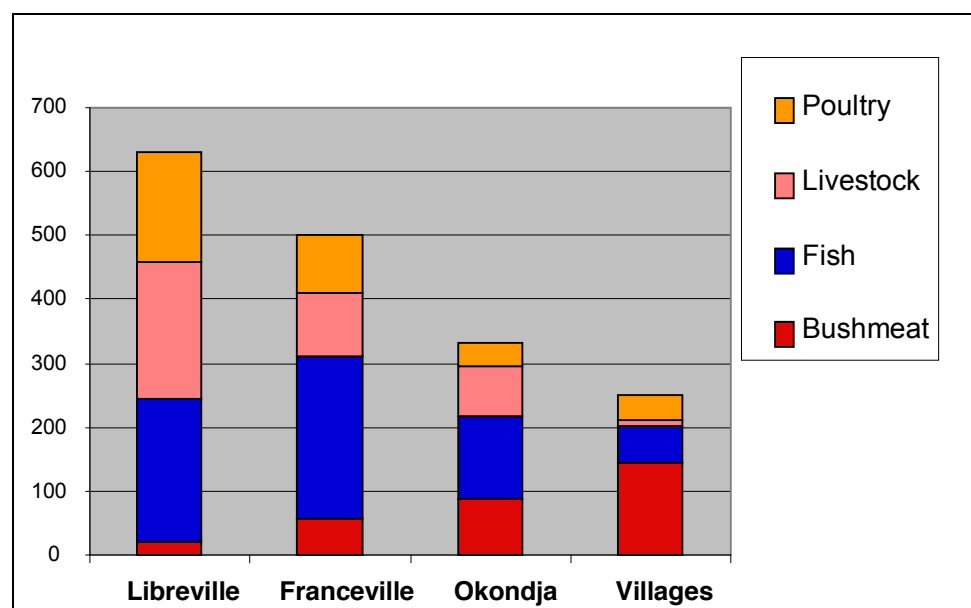


Table 4.1.c: The relative purchasing power in different locations.

In Libreville only 3.5% of the money destined for protein is spent on bushmeat and this buys only 10g per AME per day. Due to the price difference, the money spent on bushmeat in villages is six times more per person than in Libreville, but it buys 11 times more meat.

	Spend on protein (fcfa)	Spend on Bushmeat (fcfa)	Price/kg bushmeat (fcfa)	Estimate bushmeat bought (kgs/AME/day)	Ratio of spending	Ratio of purchase
Libreville	632	22	1969	0.01	1.0	1.0
Franceville	500	58	1675	0.03	2.6	3.0
Okondja	332	87	1415	0.06	3.9	5.4
Villages	250	145	1156	0.13	6.5	11.1

4.2 Urban and Rural consumption of bushmeat

There is a strong effect of geographic circumstance in the consumption of bushmeat, in that location affects the price and abundance of bushmeat in the opposite sense to the price and abundance of the alternative foods available in Gabon. This is because Gabon has very limited supply of protein alternatives, the vast majority of which are imported and can be thought of as originating in Libreville (domestic meats, poultry and even seafish are shipped to Libreville frozen). Bushmeat, in contrast, originates in the forest, and the most abundant wildlife and most accomplished hunters (so cheapest bushmeat) are in the areas furthest from urbanisation.

4.2.1 Is more bushmeat consumed by the urban or rural populations?

Table 4.2.a uses 2003 census figures for Gabon's population and the 2003 socio-economic data collected across the nation to calculate the aggregate consumption of bushmeat likely to be occurring across Gabon by wealth class and location.

Table 4.2.a. The aggregate consumption of bushmeat by different wealth classes in different urban locations across Gabon.

Although consumption per capita by rural people is very much higher than for urbanites of the same wealth class, the urban populations are so large, that aggregate consumption is still higher than the total consumption in rural areas.

Town and income category	Human Population estimate			Bushmeat kg per AME per day	Annual Total Biomass Consumption (kg)	% of total national consumption
	2003 census ⁷⁶	AME equivalent	Proportion			
Libreville	636,161	482,019	100	0.02	2,961,020	16.6
1	89,063	67,483	14	0.003	73,894	0.4
2	139,955	106,044	22	0.006	232,237	1.3
3	248,103	187,987	39	0.031	2,127,078	11.9
4	159,040	120,505	25	0.012	527,811	3.0
Large towns	525,781	398,384	100	0.04	6,165,395	34.6
1	136,703	103,580	26	0.024	907,360	5.1
2	126,187	95,612	24	0.079	2,756,978	15.5
3	157,734	119,515	30	0.026	1,134,200	6.4
4	105,156	79,677	20	0.047	1,366,856	7.7
Small towns	121,328	91,930	100	0.06	1,890,462	10.6
1	65,517	49,642	54	0.052	942,211	5.3
2	24,266	18,386	20	0.091	610,692	3.4
3	26,692	20,225	22	0.019	140,258	0.8
4	4,853	3,677	4	0.147	197,301	1.1
Villages	278,761	203,961	100	0.09	6,749,255	37.8
1	217,434	159,090	78	0.103	5,980,975	33.5
2	41,814	30,594	15	0.014	158,570	0.9
3	19,513	14,277	7	0.117	609,711	3.4
4	0	0	0	0.081	0	0.0
Gabon	1,562,031	1,183,551			17,766,132	100.0

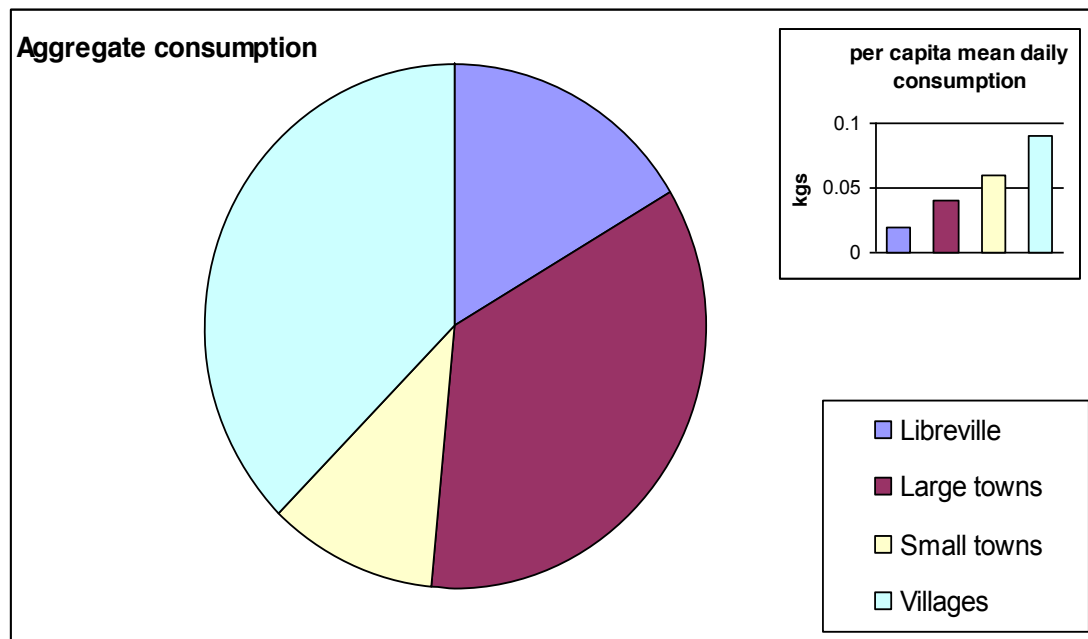
The total annual national consumption is estimated at 17.8 thousand tonnes of which 38% is consumed in villages. The geographic differences in mean per capita consumption combine with the numbers of people in each area to mean that even the huge population of Libreville is consuming far less bushmeat than that of the rural sector or large provincial towns. As bushmeat becomes relatively more expensive than alternatives in larger towns, the more wealthy sectors of the population become the major consumers.

Figure 5.2c. Aggregate and per capita (inset) consumption in different places⁷⁷.

The effect of average wealth and bushmeat price combine to make per capita consumption highest in rural areas. The population distribution results in the highest aggregate consumption being in rural areas, closely followed by the consumption in large provincial towns. Even on aggregate, consumption in Libreville is a smallish part of the whole.

⁷⁶ Data from the RGPH, 2003 (RGPH, 2005).

⁷⁷ Data from RGPH, 2003 (published 2005) and socio-economic surveys of households in 2003 (Wilkie et al, unpublished).

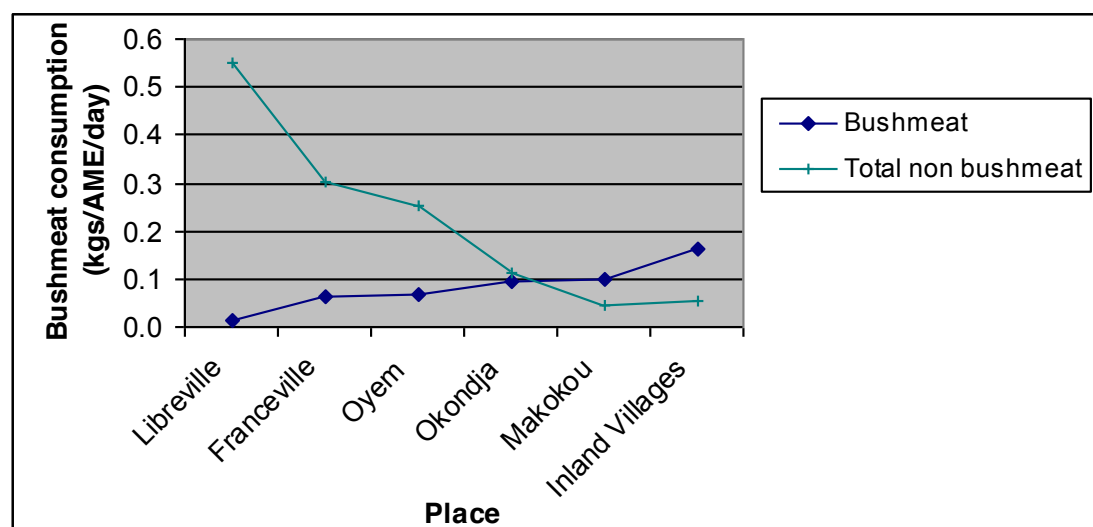


4.2.2 Is more protein consumed by urban or rural people?

More protein is eaten overall by urban people than rural people. As wealth affects how much protein people eat (see section 4.1.4), and wealth is found more in the urban areas than in the rural areas, then this trend is expected. It is heightened by the difference in prices for bushmeat and alternatives, which make bushmeat an increasingly expensive protein in increasingly urban areas.

Figure 4.2.1: The relative proportions of the total consumption of protein in different inland locations.

There is a trend from the capital towards rural areas to eat less protein, but a greater proportion of bushmeat.



4.3 Alternative foods

Data on the use of all available proteins across Gabon, show that the use of bushmeat as the major protein component of the diet is restricted to the rural, forest small towns and villages. Coastal settlements all rely heavily on fish, and even in larger towns, where transport links are good, people use large quantities of frozen seafish and poultry.

As the total consumption of protein is strongly affected by the household income (Section 4.1.4), these trends have economic factors, as well as geographical ones underlying them.

Table 4.3.a. The daily consumption (kgs) of bushmeat and alternatives per AME in different places in Gabon⁷⁸.

For each place, the most important food is highlighted. The universal importance of sea fish in coastal areas is clear. In large urban centres inland, frozen seafish is available and widely used, but in inland settlements, bushmeat becomes the most important food. Lambarene and Ombooue, situated on large lagoons, have important river fish consumption.

Place	Type	Area	N house holds	Livestock	Bushmeat	Freshwater fish	Sea fish	Poultry
Libreville	CAP	coast	515	0.101	0.013	0.009	0.253	0.189
Port gentil	LT	coast	142	0.053	0.008	0.020	0.134	0.117
Ombooue	ST	coast	76	0.020	0.056	0.129	0.129	0.107
Villages	VIL	coast	78	0.017	0.027	0.140	0.233	0.039
Franceville	LT	inland	214	0.047	0.061	0.027	0.129	0.097
Oyem	LT	inland	151	0.017	0.066	0.012	0.105	0.116
Lambarene	LT	inland	111	0.016	0.020	0.076	0.011	0.064
Makokou	LT	inland	101	0.002	0.108	0.007	0.013	0.024
Okondja	ST	inland	103	0.008	0.092	0.006	0.077	0.024
Villages	VIL	inland	158	0.000	0.164	0.017	0.030	0.008

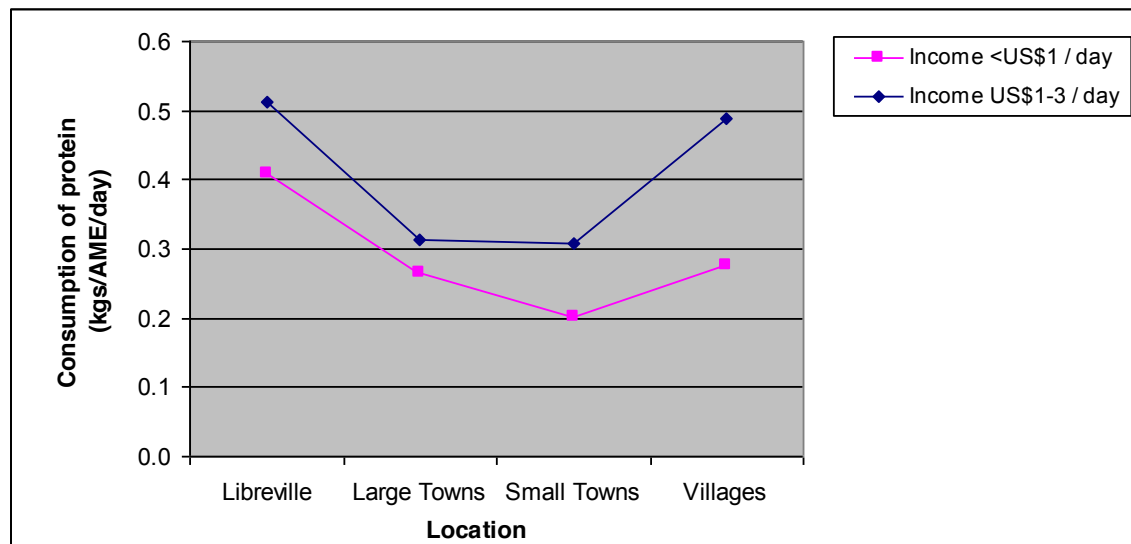
4.4 Nutritional and health importance of bushmeat in rural diets

4.4.1 Nutrition

In villages where most bushmeat or fish is obtained by hunting/ fishing family activities (Section 3.3.1) even the poorest people eat almost as much protein in villages as in cities. The part of the nation that has least protein in their diet are the poor of the provincial towns, where family access to hunting is low, bushmeat is purchased and alternatives are limited and expensive (see also section 4.3).

Figure 4.4.1: The consumption of protein by the poor classes in different locations in Gabon. *Poorer people (pink line) always eat less protein than their richer neighbours (blue line), wherever they are. The people eating least protein are those in provincial towns, where everything, including the majority of bushmeat, is imported and expensive.*

⁷⁸ Data from 3-day recall surveys of 1649 households across Gabon: Wilkie et al, 2003 , described in Knights, 2008.



Although most of the poorest people are found in rural areas, the protein intake of the poor of small urban areas suggests that these people are the most vulnerable families. However, though protein needs depend on an individual's size, age, gender and activity, for an average man the daily needs are about 70-100g of protein (James and Schofield, 1990; FAO_WHO, 2009). Even for the families with the lowest protein consumption in the country, these needs are largely satisfied.

The nutritional status of a person is not solely determined by their calorific intake, but also by the proportions of different nutrients eaten. Blaney (2008) looked at the nutritional quality of the diet of the people in the rural areas (both coastal and forested) of the Nyanga and their food security and use of natural resources, such as bushmeat.

In general, most rural people were found to eat enough protein, but not to take in enough energy overall, and were often they were short of other nutrients, such as vitamin A or iron⁷⁹. This reflects the relative ease of access by rural people to protein resources, but the generally low intake and poor balance of nutrients in poor people's diets, possibly due to their lack of income to provide other foods.

Children under five were most affected by poor diets and young people and women most affected by the family's access to natural resources (including bushmeat, but also fish and wild plants). Young people (5-19 years) had better nutritional status if the family had access to natural resources, but women, particularly young women, had worse health and nutritional status if the family used natural resources. The extra energetic costs incurred by women gathering and processing natural resources were not recovered by the better diet afforded by including natural resources, making women gatherers victims of increasing their families overall health and nutritional status.

4.4.2 Food security

Food security is the certainty that the nutritional needs of the family can be met from day to day. When people have to spend a large proportion of their income on essential food, then they are not food secure, as any problem with their source of income will result in them not eating. They are also insecure if they do not have access to the full range of dietary requirements for all members of the family (enough calorific intake of all the essential food groups, vitamins, minerals and total energy). This could be because the elements are not available, or because even though they are available, the family cannot afford them or are culturally excluded from them.

⁷⁹ Data from a 14 day weighed assessment of all food intake for 500 individuals (95% of the community, including all age groups) in 4 locations (2 coastal and 2 inland; one location each for the two ethnic groups Bapounou and Balumba. Blaney, 2008.

Table 5.9 shows the range of circumstances of village families and their resulting food insecurity.

Figure 4.4.2: The food security status of rural families⁸⁰

Food security is a combination of the nutritional adequacy of the diet, and the family's ability to support this diet from their income. If a high proportion (>50%) of the income is spent on food, then their situation is insecure. Low nutritional adequacy and high financial insecurity are classed as severely food insecure circumstances for the family.

Nutritional adequacy*	Share of income on food/alcohol	Seasonal pattern	Degree of food insecurity	% of the households in the rural community
low	high	Both seasons	Severe	16
low	high low	One season Other season	Moderate	23
low	low	Both seasons	Light	41
low satisfactory	low high	One season Other season		
satisfactory	high	Both seasons		
low satisfactory	low low	One season Other season	Vulnerable / Food secure	20
satisfactory	high low	One season Other season		
satisfactory	low	Both seasons		

Even though the majority of rural families in Gabon were found to be eating enough protein, they were nonetheless generally food insecure, because of the proportion of their income they spent on food and/or because of the nutritional inadequacy of their diet in other areas

4.4.3 Health risks

In July 2002 Gabon banned the capture, captivity, consumption and trade of all primates, due to the risks associated with the Ebola virus. This is the only legislation that has been passed in relation to health concerns about bushmeat. Although the ban is still in force, and several species have total or partial protection in Gabon⁸¹, primates still form a large part of the bushmeat hunted and traded in Gabon.

Market sales of primates in Gabon declined in the months after the July 2002 ban, though this may have been more to do with the publicity surrounding the Ebola outbreak, rather than concerns about illegality. Sales returned to pre-ban levels within 8 months, indicating the lack of regard for the law, and general lack of concern about the health risks.

4.4.3.1 Parasites

Humans can be infected by parasites from other mammals, especially primates and pigs. Most parasites are killed in the cooking process and if meat is well-cooked, risks are low. No data exists on the rates of parasite infection in bushmeat species killed for meat in Gabon, nor on the rates of transmission to consumers.

⁸⁰ Data redrawn from Blaney, 2008 (p.122), surveys of 95 families in rural coastal and inland villages in the Gamba complex, 2002. * Adequacy of the household intake for at least two of four nutrients: energy, protein, vitamin A, iron

⁸¹ Gorilla, Chimp, mandrill, Angwantibo, Gabon bushbaby, Southern needle-clawed bushbaby, Prince Demidoff's bushbaby, Drill (not present) and Potto

However, surveys in other countries have shown that several parasites harmful to humans can be caught from bushmeat.

4.4.3.2 Diseases

Humans can be infected by diseases carried in the bodies of animals killed for bushmeat. Transmission is most likely when the animal is freshly killed and butchered, but some viruses or bacteria can remain alive in meat for several days. Like parasites, most bacteria or viruses are killed in the cooking process, if meat is thoroughly well-cooked.

The most dramatic cases of disease transmission from bushmeat are the Ebola virus epidemics seen several times in north eastern Gabon in the last 20 years. The Ebola virus, a filovirus causing a haemorrhagic fever and death in 80-90% of human cases, is carried by wild bats which do not get sick from it (Leroy *et al.*, 2005). It can be transmitted from bats to humans if the bats are hunted and eaten as bushmeat (Leroy *et al.*, 2009) and can also emerge in other wildlife populations where it will be harmful and through them to humans (Rouquet *et al.*, 2006; Bermejo *et al.*, 2006). When humans kill and butcher animals infected by the virus, they have a high risk of contracting it themselves and passing it on to other family members through close contact. Contacts with infected apes, bats and duikers have been at the source of Ebola epidemics in humans (Leroy *et al.*, 2004; Leroy *et al.*, 2005; Rouquet *et al.*, 2006; Leroy *et al.*, 2009).

Primates carry the SIV (simian immunodeficiency viruses) and STLV (Simian T lymphotropic viruses). The human forms of these viruses, HIV and HTLV cause the development of the AIDS syndrome, which is terminal and incurable. All species of primate have specific viruses of these families, which can be transmitted to humans through body fluids (Voevodin, 1997; Koralnik *et al.*, 1994). The rates of infection of wildlife by these viruses have not been well documented for many species. Mandrills. In wild mandrills high rates of infection with both SIV and STLV have been recorded in Gabon (Souquière *et al.*, 2001; Makuwa *et al.*, 2004) and transmission of the both viruses from mandrills to humans has happened.

Wildlife species are likely to harbour other pathogens that can also transmit to humans. For example, Simian Foamy Virus, a virus close to SIV, has been found to be widespread in central African primates, in particular Apes and mandrills, and has been transmitted to humans from bushmeat (Wolfe *et al.*, 2004). Marburg virus, a haemorrhagic fever similar to Ebola, has also been found in wild bats (Towner *et al.*, 2007). Anthrax has often been transmitted to humans from wild ungulates.

4.4.3.3 General hygiene

As with any meat product, care must be taken with hygiene, or the meat can harbour harmful fungal or bacterial infections which will cause illness. Bushmeat is not often gutted or prepared in any way at the site of hunting and often passes along several stages of the trade chain as a whole carcass without skinning, or blood or intestines being removed. Transport and storage of fresh meat in these conditions is not hygienic and likely to lead to high levels of bacterial infection of meat.

Butchering, smoking and freezing or refrigerating fresh meat can all help to reduce rotting, but these practices are not widely used. Freezing is often not available in the early stages of the trade chain, and refrigeration extremely rare. Bushmeat that is traded in markets or by roadside vendors is usually displayed for several hours at ambient temperature (around 25-35 °C).

Thorough cooking will kill most bacterial or fungal infections and reduce the risk of any poisoning from them. Although hygiene in the bushmeat industry is generally low, few cases of serious food poisoning are reported, thus bushmeat cooks must be generally mindful of the risks.

No published studies exist that quantify the bacterial infections found in bushmeat hunted and consumed in villages or that for sale in urban markets in Gabon.

4.5 Preferences of consumers

Although people's use of bushmeat seems to change mainly in response to its price, in Libreville, where many alternatives to bushmeat exist, and most are cheaper than bushmeat, people continue to consume a small amount of bushmeat. On average, people in Libreville still consume bushmeat in about 3-6% of meals in the year (an equivalent of about 18g per AME per day across the year), despite its high cost. Even for the poorest families in Libreville, bushmeat consumption has not dropped to zero, although it is very low. The persistence of use of bushmeat by some families, despite its price, shows the strong preference for it in some families. The generally low use, however indicates that most people only use bushmeat occasionally. Some of these occasional decisions will be driven by looking for variety in the diet (Schenck, 2006), but surveys of bushmeat consumers showed that much of this use is also for the few ceremonial occasions in the year.

4.5.1 Age and urban experience effects on bushmeat use

The age of consumers is important in their choice to eat bushmeat. Across Gabon, people over 50 always ate bushmeat more often than those in the 15-25 year-old group, regardless of the income of the family or the location. These older people, even in urban environments, often stated distrust of domestic or imported products and familiarity with bushmeat as the reason for their preference for it⁸². In contrast, younger people ate bushmeat less often than their older relatives. Urban youngsters, but less-so rural youth, expressed a distrust of the hygiene in the bushmeat trade, the diseases bushmeat could carry and a dislike of preparing it.

In urban places, the proportion of the life lived in the town is important in dietary choices. The longer people have lived in cities, especially if this is in their childhood years, the less they choose to eat bushmeat as adults.

Choosing alternatives to bushmeat may begin as a purely economic consideration for Gabonese families who move to urban places. As young people grow up unfamiliar with purchasing, preparing or tasting bushmeat, they tend not to choose it as adults, even if their economic situation would allow them to.

The human population of Gabon has significantly urbanised in the last few decades and continues to do so (World Bank, 2009). The use of bushmeat by the urban sector of the population is now very low per capita, and in addition, young people, who will become the purchasers and family decision makers in 10-15 years time, are choosing to eat less and less bushmeat, regardless of its price.

If Gabon continues to urbanise, and young urban people continue to choose alternatives, urban demand for bushmeat will drop in the future.

4.5.2 Taste preferences

Several studies have looked at consumers stated taste preferences and all find very similar results. Brush-tailed porcupine is almost universally preferred, along with red river hog, and Blue and red duikers. The stated preferences are often for meats that are widely available, non-protected and for some species (porcupines and blue duikers) showing resilience to heavy village type hunting. These factors are very positive for the development of an acceptable, sustainable bushmeat harvest.

Despite quite strongly expressed preferences, taste tests carried out across Gabon found that only people who regularly ate bushmeat (mostly rural people) could reliably discriminate between domestic alternatives and bushmeat (Schenck et al, 2006). These results indicate that true taste preference has a

⁸² Data from Ethnographic surveys of 197 people in various locations across Gabon, 2003. Wilkie et al., 2003.

large amount of experience and habit associated with it, and that as urban dwellers eat less bushmeat, their true preferences may change.

Table 4.5.a: The expressed preferences for bushmeat from consumers surveyed.

Place	Year	Type of settlement	Preferred species	% respondents	Second species	% respondents	N	Study
Libreville	2004	Capital	Brush-tailed porcupine	52%	Blue duiker	14%	500	Dabac
Libreville	2003	Capital						Starkey
Libreville	2003	Capital						Schenck
Libreville	2005	Capital						Hymas
Franceville	2003	Large town						Schenck
Franceville	2005	Large Town						Hymas
Oyem	2005	Large town						
Port Gentil	2005	Large town						
Makokou	2004	Small town						Okouyi
Makokou	2005	Small town						
Mayumba	2005	Small town						
Okondja	2005	Small town						
Omboue	2005	Small town						
Dibouka	2002	Village						
Haut Ogooue villages	2003	Village						Schenck
Iboundji	2005	Village						
Ndindi	2005	Village						
Ogooue Maritime villages	2005	Village						

4.5.3 Cultural taboos

Most people have cultural beliefs about eating bushmeat. In household surveys of nearly 4000 families across Gabon in 2005, only 13% of families said they had no cultural prohibitions against any member eating any species. 46 species, or animal groups, were cited as prohibited by at least one family, and many species were prohibited by many families. Leopards, gorillas and white-bellied duikers were the most frequently prohibited mammals. Snakes, tortoises and monitor lizards or reptiles in general were also prohibited by many people (26%).

Cultural taboos vary greatly across the country, both in their existence, and in the respect people still have for them.

5 IMPACTS ON WILDLIFE

The direct impacts of bushmeat hunting on wildlife have rarely been measured in central Africa. In tropical forests, directly counting animals is very difficult (Walsh & White, 1999; White & Edwards, 2000). Even for large species, such as elephants and apes, measures of true densities are hard to collect, and are usually only accurate to $\pm 20\%$ (Walsh & White, 1999; Walsh et al., 2000) and for many of the key prey species, like duikers, to date no field techniques exist that allow accurate assessment of their populations in a time frame appropriate to monitor hunting. Animal populations change their behaviour in the face of hunting, both in the way they use habitat, their daily behaviour (becoming nocturnal, more silent and cryptic); and in their reproductive rates (Caughley, 1977; Robinson and Redford, 1991). These behavioral changes make censusing hunted populations even more difficult.

Lightly-hunted (or extensively-farmed) populations breed faster when there are fewer adults competing for food, and most young are born when the adult population is at about 60% of the unhunted number. However, if the female adults are overhunted, or further reduced by other pressures, such as habitat loss, disease or predation by other wildlife, then the population cannot breed fast enough to replace the losses and numbers begin to decline.

This overhunting is clearly unsustainable and will result eventually in completed extinction of the wildlife locally.

5.1 Prey species

5.1.1 Quantifying the impact of hunting on hunted species

Unfortunately, very few areas in Central Africa were ever surveyed before hunting and so baselines of what has been lost are unavailable. Censuses undertaken in the last decade will provide information on future hunting, but the impacts to date are largely unknown. This lack of good information has led many people to using indirect methods to infer the impact that hunting has had, but these methods must be used with caution to control for other factors underlying any differences seen in wildlife populations.

Wildlife census in forests is technically very difficult and costly and few people are sufficiently qualified to undertake and analyses wildlife surveys. Hunter surveys, though also costly, are easier to undertake than wildlife surveys, requiring smaller teams of people and less logistical support.

A hunter's returns for the effort he makes - the number and body size of prey he catches, and how many hunters are successful in an area, can be used to infer whether wildlife is available to him.

Two studies in Gabon in the last 10 years (White and Walsh, 2001; Maisels, 2007) have directly measured wildlife numbers on the ground across large areas of Gabon, but these studies were both carried out in the National Parks and surrounding areas, which are remote and wildlife abundant and cannot be used to infer much about densities across the rest of the country. Even comparisons within the landscapes surrounding the NPs show that road access and villages generally correspond to diminished numbers of large mammals, thus it is likely that the abundance of wildlife outside these landscapes is lower than that measured inside the protected areas.

Unfortunately, the rarer wildlife is, the more difficult it is to count accurately (Walsh and White, 1999), and so direct measures of wildlife have not been possible in the rural hunting territories. In these depleted areas, only a relative abundance of wildlife (low, medium, high) compared to another area can be assessed (White & Edwards, 2000).

Sustainably managed, FSC-certified CFAD⁸³ logging concessions (or concessions in the latter stages of certification) now cover 21,685km² of the production forests (23% of all the CFAD land) and on these lands wildlife should already be sustainably managed with strict controls on legal hunting and respect for protected species. National Parks and other protected areas cover a further 30,000 km² and other CFAD lands, which should be managing wildlife sustainably within 5 years, a further 65,000km², affording Gabon a real possibility of wildlife protection and sustainable harvest management structures on 125,000 km² (47%) of its forests by about 2015.

However, currently the National Parks have very few ground staff and anti-poaching activities are minimal. Hunting pressure within NP's in 2009 is probably similar to that in other forests at similar distances from settlements and roads.

Table 6.1 shows the land that designated as eco-certified CFAD, or National Park, that is nonetheless likely to be under some intensity of hunting pressure, based on the surrounding human populations and access routes.

⁸³ Forest Stewardship Council. International body (UK based) setting standards for sustainable management of logging operations and eco-certifying companies and products, based on performance towards environmentally responsible and sustainable goals. CFAD = Concession Forestière sous Aménagement Durable, or sustainably managed forestry concession.

Table 5.1.a & b Current hunting pressure and the potential for land management to change the situation.

a) *The majority of the land in sustainably managed CFAD concessions is currently under high to intense hunting pressure, based on its proximity to roads and settlements. Good management by the logging industry could have significant impact on the wildlife resources on this land. In contrast, the majority of the national parks land is remote and enduring low to medium pressure even in the absence of active management. These lands can also provide significant sanctuary to wildlife, without impacting the village harvest in the rural domain.*

Hunting pressure belt	Percentage of the land type in each pressure band		
	Gabon	FSC CFAD	National Parks
Intense	24	18	4
High	46	55	25
Medium	14	17	19
Low	14	10	29
None	2	0	23
Total	100	100	100

b) *Only a small part of the intensively village-hunted land lies within a certified CFAD or National Park, showing the essentially low conflict of management interests. Over 50% of the land currently remote and unhunted, or suffering only low pressure, is already within protected or sustainably managed areas.*

Hunting pressure belt	% of the pressure belt under some management protection			Total % of this hunting impact on land with management planning
	CFAD (non FSC)	CFAD FSC	National Park	
Intense	20	6	2	28
High	39	10	6	55
Medium	18	10	16	44
Low	18	6	23	37
None	5	0	9	14

5.1.2 History of access for hunting

In addition to current hunting pressure which is mainly determined by the local human needs, sustained hunting pressure over a long period has been shown to have depleted wildlife in areas where surveys have been made.

The access to forests in Gabon has changed dramatically over the last 50 years for two reasons:

An increasing transport network has allowed motor vehicles and hunters into areas relatively far (>15km from villages) which had probably not been significantly hunted for meat since the *regroupement* of the turn of the century

Villages now accessible by roads have ceased to move around clan lands as they did in the past and local hunting pressure on foot is sustained for a longer time in the same area than in the past.

The major N1-N3 road from Libreville to Franceville was built between 1965 and 1970, and the railway was completed to Franceville in 1987. The N2 to Lambarene was tarred in 1995.

More recently, the roads from the Cameroon border at Bitam and the Congolese border at Leconi and Djenga have been upgraded and tarred, making transport between Libreville and Oyem or Lambarene possible without off-road vehicles. Franceville can also be accessed on tarred roads from the eastern Haut Ogooue province and on to Libreville on the railway.

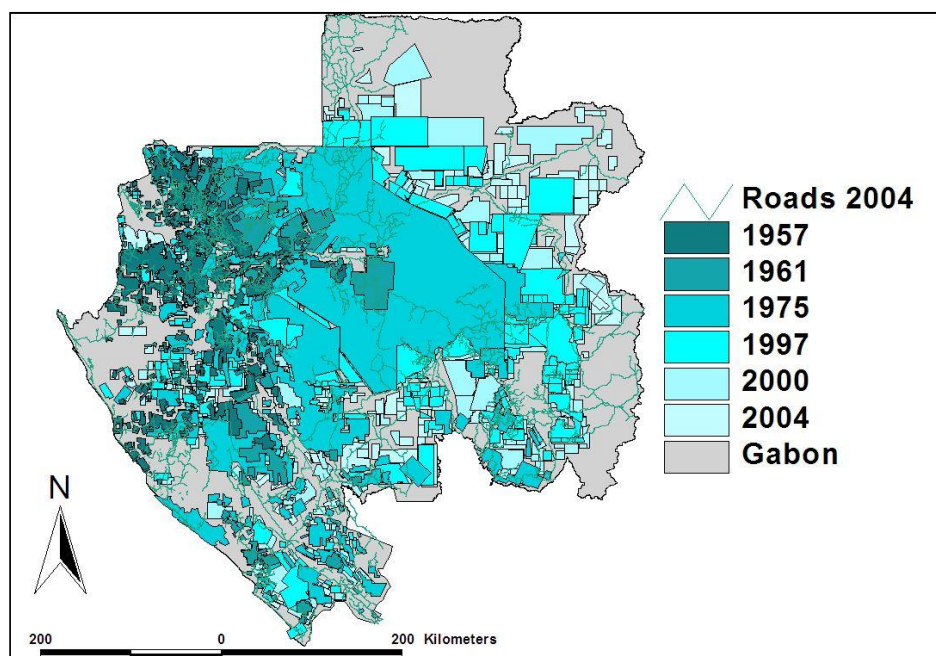
A map of Gabon taking these factors into account shows the duration of sustained access and therefore likely hunting pressure in different areas over the last 50 years, which has probably reduced and changed wildlife populations.

Figure 5.1.1: The history of concessions granted in the production forests.

For concessions granted before the establishment of the Forestry Code of 2001, it is very hard to find information on the dates that roads were opened or closed and the numbers of people hunting on the concession. For any individual concession, the date it was awarded may not be an accurate reflection of whether there was vehicle access to the land for hunting, or whether the concession management controlled hunting. However, a general expansion of access to the land since the 1950's can be clearly seen.

Combining the two maps: duration of hunting and current pressure shows that only a very small part of the country, in Minkébé and Lopé NPs, may have truly intact wildlife populations at present. A road currently being constructed along the western border of Lopé NP will bring even this area within 15km of a open road by the end of 2009.

As shown in section 2.4.2, hunters living in areas of recent access, and therefore currently more abundant



wildlife populations, have higher returns (larger species caught on average) and catch their preferred species (red duikers and Red River Hog) more frequently than hunters in areas which have been accessible for longer.

Wildlife surveys also show that areas where there has been vehicle access for over 30 years, and where current hunting pressure is medium or more, wildlife is severely depleted and large mammals are absent (Henschel, 2008).

Figure 5.1.2: Estimation of the current state of wildlife populations in Gabon.

Combining information from the duration of hunter access to the land with the measured hunting pressure of the last five years, gives an estimation of the likely state of prey populations. The proportions of the country in each band are given in Table 6.1. The two sites of hunter studies used to define offtakes in depleted and reasonably intact areas are shown by yellow triangles.

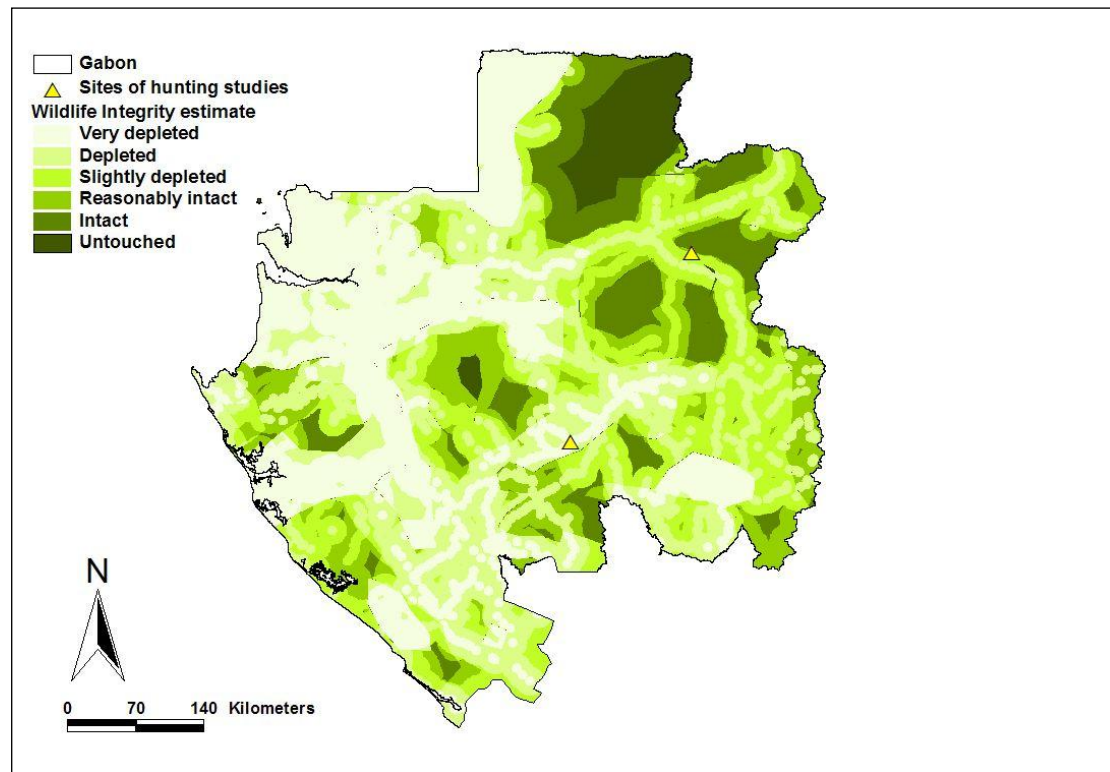


Table 6.1. The proportions of Gabon in each estimated wildlife integrity band.

Although the frontiers of Gabon along the North eastern boundary of Minkébé National Park are within reach of poachers, much of the poaching activity is for trophies (WWF 2008) and impacts on prey species are determined as low. Compare to the analysis of hunter access in Figure 6.1.2. Only 2% of Gabon is truly beyond the reach of poachers today.

Wildlife Integrity Estimate	Percent of Gabon Land Area
Very depleted	30
Depleted	25
Slightly depleted	18
Reasonably Intact	11
Intact	11
Untouched	5

5.1.3 Ecology of prey species

The vulnerability of wildlife to human hunting depends on the methods hunters use and the ecology of the animal. This is why different hunting strategies and intensities change the wildlife communities, because some species are more heavily impacted than others.

Two species in particular appear more resilient to hunting in Gabon than expected: the Blue duiker and the Brush-tailed porcupine, and other species have survived in low numbers despite high pressure (see also section [2.5.3.4](#)).

The way hunters use the landscape and the techniques they use, can mean that pockets of land within a hunting zone are not used, or hunted only lightly and provide sanctuary for some species. As these pockets are always small, species that can use these sanctuaries are usually small species, such as rodents or the smaller antelopes. These species seem able to persist despite sustained hunting, if overall the hunted area contains 'sanctuary' areas, which are stable, and if snaring is not so intensive that young animals are killed as they disperse out of the sanctuaries (Newing, 2001; Coad, 2007; Van Vliet, 2008).

5.1.4 Sustainability of recent hunting

Wildlife surveys in the last decade have shown that wildlife communities have declined across Gabon and that hunting is likely to be a major cause (Walsh et al., 2003; Maisels, 2007; Laurance et al., 2006; Laurance et al., 2008; Kuehl et al., 2009; Henschel et al., 2009;). If hunting is causing wildlife to decline, then the rate of hunting is clearly unsustainable.

Over half of Gabon's land is already probably significantly depleted of its original wildlife, due persistent hunting close to village and access roads in the last 30+ years. Village communities in these areas are highly aware of wildlife declines and hunter returns for their efforts are much lower (smaller animals and fewer animals/ trap or gun outing) than hunters living in areas that are estimated to be less significantly depleted.

Even the areas with significantly depleted wildlife communities are still supporting a regular offtake of some small, generalist species. These species are resilient and sustainable offtakes may be possible under the current land management systems with only slight regulation of current offtakes and application of revised hunting laws.

In areas where less resilient species can still be hunted, the experience to date indicates that the current unregulated offtake of many species is unsustainable and will result in the loss of all the larger mammals, followed by the loss of many medium-sized animals over the next 5-10 years.

5.1.5 Impacts of hunting regulation

Seventy percent (70%) of Gabon's land is under intense or high hunting pressure and provides most of the bushmeat used by villagers for their subsistence. Currently, although a set of strict laws exist to regulate bushmeat hunting and trade, few of the laws are implemented and hunting on and trade from this land are essentially unregulated, even for protected species. Regulation of hunting on this land is the most critical to sustaining village livelihoods and as this area represents such a large tract of the country, its management is also important for wildlife survival.

However, 75% of this hunted land is already significantly depleted of wildlife and only 25% still has reasonable or mildly-depleted wildlife communities providing good returns for hunter effort. Any revision or application of the laws will have to take into account the already poor returns for hunter effort. Sustainable harvests in these areas may be very low, or may not be possible at all, until after a period of wildlife recovery.

Most of the heavily hunted land currently lies in the rural domain. Currently nearly 60% of the heavily used village lands overlap CFAD concessions (which also overlap village lands in part) and 16% is within certified sustainably-managed forestry concessions. Reduction of hunting to sustainable levels in these CFAD areas may substantially affect village livelihoods in the short term but will significantly benefit them in the longer term. Installing sustainable wildlife management on CFAD concessions in areas that are already significantly depleted may require some offer of alternative incomes, meat resources or compensation of rural livelihood losses in the short term, in order to recover the wildlife resources necessary for sustainable harvests. This may be more easily implemented in the private sector managed CFAD than in the remainder of the rural domain.

5.2 Impacts on predator species

The depletion of the prey that humans use also has an impact on other predatory species that eat the same animals, and are therefore in competition with humans. In Gabon, there are only three large predators that would compete with humans for similar-sized animal prey: leopards (*Panthera pardus*), African rock pythons (*Python sebae*) and Nile crocodiles (*Crocodylus niloticus*). In the past, lions (*Panthera leo*) and African wild dogs (*Lycaon pictus*) were also found in Gabon, but these are now extinct (Henschel

& White, 2005). Golden cat, the second largest mammalian predator, has been found to take prey predominantly in the <1.5kg range (Gilbert, 2006), smaller than the majority of human prey. However, in intensively hunted areas where small prey is snared, golden cats will begin to suffer competition from human hunters.

5.2.1 Effect of human hunting pressure on leopards

Leopards choose red duikers and red river hog for most of their food, if they can find them.

In remote forests in Gabon, leopard prey ranges in weight from 19.8 to 31.6 kg, which is almost identical to the weight of the species humans prefer to hunt if they are available. The further leopards live from human hunting pressure, where the species they prefer are plentiful, the fewer and larger the prey they choose. In sites furthest from human hunting, nearly 40% of their diet was red river hog and the total biomass contribution of ungulate prey was 90.6%. At human hunted sites, leopards showed higher use of rodents and smaller primates, as the proportion of ungulates in their diet decreased.

When humans have taken the prey that leopards prefer, leopards will switch to a wider selection of other animals. Studies that looked at the prey leopards took when they hunted alongside humans (close to settlements) showed that the wildlife was depleted in these areas and leopards took very different prey to what they chose in rich sites.

Table 5.2.a Dietary overlap measured between humans and leopards in Gabon.

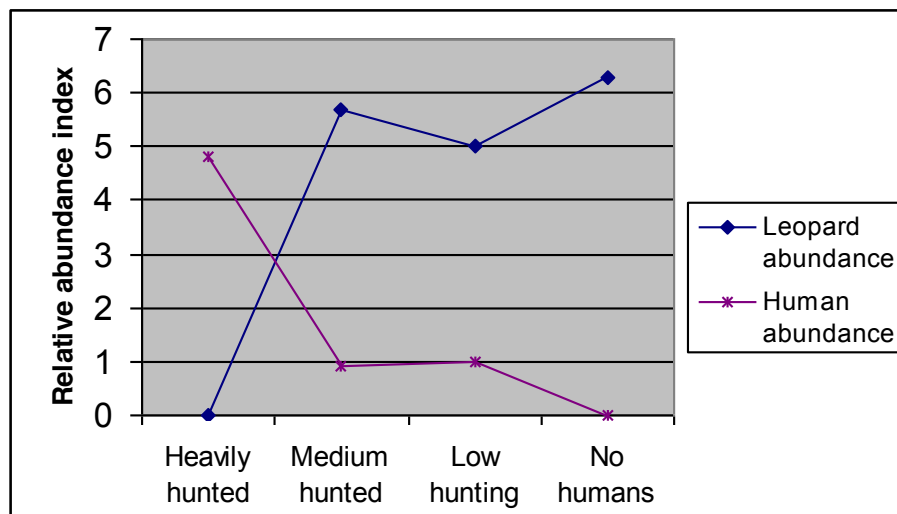
As leopards live more remotely from people, they suffer less competition for their preferred food. At sites where the wildlife community is depleted, choice is restricted and leopards and humans are forced to choose similar prey. When the diets overlap completely, leopards cannot compete with humans and do not survive in the area. An overlap of 1 shows identical choices.

Leopard status in site	Overlap between leopard prey and human prey
Heavily hunted, close to settlements	no overlap - leopards absent
Medium hunting	0.64
Low hunting	0.42
No hunting	0.25

As leopard survival and breeding is clearly affected by whether food is available, leopard densities are also affected by human hunting pressure. The relative abundance of human hunters and leopards are inversely related, showing that leopards do not survive well in areas where human hunting is intense. As very few leopards are directly recorded in hunter catches, this is probably due to loss of food prey for leopards, than direct killing of leopards.

Leopard densities only drop in the face of heavy human hunting. Even medium levels of hunting they can tolerate by switching to less-preferred, but more abundant, prey. Total loss of leopards from an area is a sign that human hunting has reached unsustainable levels and is depleting the prey species quite fast.

Figure 5.2.1 The relationship between the presence of human hunters and that of leopards in four, different sites in forest Gabon⁸⁴.



Predictions for current leopard survival in Gabon are that high density populations of leopards will only be found at distances of >15km from villages. In suitable habitat (all forests) their density will increase with decreasing human presence and in areas of heavy hunting <15km from a village or road, their numbers are likely to be very low. In areas <5km from a village leopards can now be considered absent (see maps section [2.3.3](#)).

5.3 Wildlife community changes

Meat can be provided from any species of animal (bird or reptile) and although some preferences exist in Gabon, a wide range of species are acceptable as bushmeat. This means that sustainable yield of bushmeat can be taken, even if certain species within the wildlife community are being heavily impacted and the balance of the wildlife community is changing.

The data from current harvests show that large carnivores and large mammals are lost from areas where smaller more resilient species can persist, so the proportions of different species will already have changed in many locations, as well as their absolute numbers.

Reducing the number of species hunted will focus impacts on few species which can be sustainably-managed (rodents, duikers, reptiles) and be more truly sustainable and less detrimental to wildlife community balance than the same biomass harvest spread over a changing range of species, some of whom may decline even whilst the overall biomass appears sustainably harvested.

⁸⁴ Data from Henschel, 2008. Relative abundance index is the number of photos taken per 100 days of trapping in a camera trap surveys at each of 4 sites pre-stratified for different human hunting pressure. Trapping periods were 60 days with 48 traps in each case.

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TERMINOLOGY

The term '**hunting**' is used to mean any method of capturing animals to eat. Specifically it includes shooting with guns, bows and arrows, or slingshots, snaring using wire or liane cords, capturing in nets or pits, by dogs or on glue traps, or killing directly with spears, knives, machetes or clubs. **Commerce** and **trade** are used to include any exchange of goods or services for other benefit, including cash sales, barter and swap.

Animal species are referred to using their common names and Latin names. Common names follow those given in Haltenorth and Diller (1980).

8.3 Annex A: Species used as bushmeat in Gabon 2000-2006.

Class	Order	Latin Name	English name	Nom français	IUCN Status	Gabonese Protection Status
Aves	Accipitriformes	<i>Trigonoceps occipitalis</i>	White Headed Vulture	Vautour huppe	VU	Not protected
Aves	Anseriformes	<i>Pteronetta hartlaubii</i>	Hartlaub's Duck	Canard de Hartlaub	LC	Not protected
Aves	Ciconiiformes	<i>Bostrychia hagedash</i>	Hadada Ibis	Ibis hagedash	LC	Partial
Aves	Ciconiiformes	<i>Bostrychia olivacea</i>	Olive Ibis	Ibis olivâtre	LC	Not protected
Aves	Ciconiiformes	<i>Ephippiorhynchus senegalensis</i>	Saddle-billed Stork	Cigogne Jabiru	LC	Partial
Aves	Ciconiiformes	<i>Platalea alba</i>	African Spoonbill	Spatule d'Afrique	LC	Partial
Aves	Ciconiiformes	<i>Threskiornis aethiopica</i>	Sacred Ibis	Ibis sacré	LC	Partial
Aves	Columbiformes	<i>Columba delegorguei iriditorques</i>	Bronze napped pigeon	Pigeon à nuque bronzé	LC	Not protected
Aves	Columbiformes	<i>Columba unicincta</i>	Afep pigeon	Pigeon gris	LC	Not protected
Aves	Coraciformes	<i>Bycanistes fistulator</i>	Piping hornbill	Calao siffleur	LC	Not protected
Aves	Coraciformes	<i>Ceratogymna atrata</i>	Black casqued hornbill	Calao noir	LC	Not protected
Aves	Coraciformes	<i>Tockus fasciatus</i>	African Pied hornbilled	Calao	LC	Not protected
Aves	Cuculiformes	<i>Corythaeola cristata</i>	Great Blue Turaco	Touraco bleu ou Touraco Géant	LC	Not protected
Aves	Cuculiformes	<i>Turaco persa persa</i>	Green turaco	Touraco verte	LC	Not protected
Aves	Falconiformes	<i>Gypohierax angolensis</i>	Palm-nut Vulture	Vautour palmiste	LC	Partial
Aves	Falconiformes	<i>Haliaeetus vocifer</i>	African Fish Eagle	Aigle pêcheur	LC	Total
Aves	Falconiformes	<i>Stephanoaetus coronatus</i>	Crowned Hawk Eagle	Aigle couronne	LC	Total
Aves	Galliformes	<i>Agelastes niger</i>	Black Guinea fowl	Pintade noire	LC	Not protected
Aves	Galliformes	<i>Francolinus lathamii</i>	Forest Francolin	Francolin de Latham	LC	Not protected
Aves	Galliformes	<i>Francolinus squamatus</i>	Scaly Francolin	Francolin Ecaille	LC	Not protected
Aves	Galliformes	<i>Numida meleagris</i>	Helmeted Guinea fowl	Pintade des taches blanches	LC	Not protected
Aves	Pelecaniformes	<i>Pelecanus rufescens</i>	Pink-backed Pelican	Pélican gris	LC	Total
Aves	Psittaciformes	<i>Psittacus erithacus</i>	African Grey Parrot	Perroquet gris	NT	Partial
Gastropoda	Pulmonata	<i>Achatina spp</i>	Forest Snail	Escargot de foret		Not protected
Mammalia	Artiodactyla	<i>Cephalophus callipygus</i>	Peter's duiker	Céphalophe de Peters	LR/NT	Not protected
Mammalia	Artiodactyla	<i>Cephalophus dorsalis</i>	Bay duiker	Céphalophe Bai	LR/NT	Not protected
Mammalia	Artiodactyla	<i>Cephalophus grimmia</i>	Bush duiker or Grimm's duiker	Céphalophe de Grimm		Total
Mammalia	Artiodactyla	<i>Cephalophus leucogaster</i>	White-bellied duiker	Céphalophe à ventre blanc	LR/NT	Not protected
Mammalia	Artiodactyla	<i>Cephalophus monticola</i>	Blue duiker	Céphalophe bleu	LR/LC	Not protected
Mammalia	Artiodactyla	<i>Cephalophus ogilbyi</i>	Ogilby's duiker	Céphalophe Ogilby ou Céphalophe aux pattes blanches	LR/NT	Total
Mammalia	Artiodactyla	<i>Cephalophus spp.</i>	Red Duiker	Céphalophe		Not

				rouge		protected
Mammalia	Artiodactyla	<i>Cephalophus sylvicultor</i>	Yellow-backed duiker	Céphalophe à dos jaune	LR/NT	Partial
Mammalia	Artiodactyla	<i>Cephalophus nigrifrons</i>	Black-fronted duiker	Céphalophe au front noir	LR/NT	Not protected
Mammalia	Artiodactyla	<i>Hippopotamus amphibius</i>	Hippopotamus	Hippopotame	VU	Total
Mammalia	Artiodactyla	<i>Hyemoschus aquaticus</i>	Water Chevrotain	Chevrotain aquatique	DD	Total
Mammalia	Artiodactyla	<i>Hylochoerus meinertzhageni</i>	Giant Hog	Hylochère	LR/LC	Partial
Mammalia	Artiodactyla	<i>Kobus defassa</i>	Kob	Cobe défassa	LR/CD	Total
Mammalia	Artiodactyla	<i>Kobus ellipsiprymnus</i>	Waterbuck	Cobe onctueux	LR/CD	Total
Mammalia	Artiodactyla	<i>Loxodonta cyclotis</i>	Forest Elephant	Eléphant de forêt	VU	Partial
Mammalia	Artiodactyla	<i>Neotragus batesi</i>	Royal Antelope	Antilope royale	LR/NT	Not protected
Mammalia	Artiodactyla	<i>Potamochoerus porcus</i>	Red river hog	Potamochère	LR/LC	Partial
Mammalia	Artiodactyla	<i>Redunca arundinum</i>	Southern Reedbuck	Cobe des roseaux	LR/CD	Total
Mammalia	Artiodactyla	<i>Syncerus caffer nanus</i>	Forest Buffalo	Buffle de forêt	LR/CD	Partial
Mammalia	Artiodactyla	<i>Tragelaphus euryceros</i>	Bongo	Bongo	LR/NT	Partial
Mammalia	Artiodactyla	<i>Tragelaphus scriptus</i>	Bushbuck	Guib harnache	LR/LC	Partial
Mammalia	Artiodactyla	<i>Tragelaphus speikii</i>	Sitatunga	Sitatunga	LR/NT	Partial
Mammalia	Carnivora	<i>Aonyx congica</i>	Congo Clawless Otter	Loutre des marais ou chien d'eau		Not protected
Mammalia	Carnivora	<i>Atilax paludinosus</i>	Marsh mongoose	Mangouste des marais	LR/LC	Not protected
Mammalia	Carnivora	<i>Bdeogale nigripes</i>	Black-footed mongoose	Mongoose à pattes noires	LR/LC	Not protected
Mammalia	Carnivora	<i>Civettictus civetta</i>	African Civet	Civette africaine	LR/LC	Not protected
Mammalia	Carnivora	<i>Genetta servalina</i>	Servaline Genet	Genette servaline	LR/LC	Not protected
Mammalia	Carnivora	<i>Genetta tigrina</i>	Blotched Genet	Genette aux grandes taches	LR/LC	Not protected
Mammalia	Carnivora	<i>Herpestes naso</i>	Long-snouted mongoose	Mangouste à longue museau	LR/LC	Not protected
Mammalia	Carnivora	<i>Herpestes sanguinea</i>	Slender Mongoose	Mangouste rouge	LR/LC	Not protected
Mammalia	Carnivora	<i>Lutra maculicollis</i>	Spotted-necked Otter	Loutre au cou tacheté	LC	Not protected
Mammalia	Carnivora	<i>Melivora capensis</i>	Honey Badger	ratel	LR/LC	Not protected
Mammalia	Carnivora	<i>Nandinia binotata</i>	African Palm Civet	Nandini ou chat huant	LR/LC	Not protected
Mammalia	Carnivora	<i>Panthera pardus</i>	Leopard	Panthère, léopard	LC	Total
Mammalia	Carnivora	<i>Poiana richardsoni</i>	Central African Linsang	Poiane	LR/LC	Not protected
Mammalia	Carnivora	<i>Profelis aurata</i>	Golden Cat	chat d'ore	VU	Partial
Mammalia	Hyracoidea	<i>Dendrohyrax arboreus</i>	Tree Hyrax	Daman des arbres	LC	Total
Mammalia	Insectivora	<i>Potamogale velox</i>	Giant Otter Shrew	Potamogale	LC	Not protected
Mammalia	Pholidota	<i>Manis gigantea</i>	Giant Pangolin	Pangolin géant	LR/LC	Total
Mammalia	Pholidota	<i>Manis tricuspis</i>	Tree Pangolin	Pangolin géant pangolin des arbres	LR/LC	Not protected
Mammalia	Pholidota	<i>Uromanis tetradactyle</i>	Long-tailed Pangolin	Pangolin à long queue	LR/LC	Not protected
Mammalia	Primates	<i>Arctocebus calabarensis</i>	Calabar angwantibo		LR/NT	Total
Mammalia	Primates	<i>Cercocebus agilis</i>	Agile Mangabey	Cercocebe agile		Not protected
Mammalia	Primates	<i>Cercocebus torquatus</i>	Red-capped Mangabey	cacou ou cercocebe à collier blanc	LR/NT	Not protected
Mammalia	Primates	<i>Cercopithecus cephus</i>	Moustached Guenon	cercopitheque moustac	LR/LC	Not protected

Mammalia	Primates	<i>Cercopithecus neglectus</i>	De Brazza's Monkey	Singe de Brazza Hocheur, pain a cacheter, singe a nez blanc	LR/LC	Not protected
Mammalia	Primates	<i>Cercopithecus nictitans</i>	Putty-nosed Guenon		LR/LC	Not protected
Mammalia	Primates	<i>Cercopithecus pogonias</i>	Crowned Guenon	Singe diadème	LR/LC	Not protected
Mammalia	Primates	<i>Cercopithecus solatus</i>	Sun-tailed Guenon	Singe au queue de soleil	VU	Total
Mammalia	Primates	<i>Colobus guereza</i>	Guereza Colobus	Colobe noir et blanc	LR/LC	Not protected
Mammalia	Primates	<i>Colobus satanas</i>	Black Colobus	Colobe noir	VU	Not protected
Mammalia	Primates	<i>Euticus elegantulus</i>	Elegant needle- clawedbushbaby	Galago mignon	LR/NT	Total
Mammalia	Primates	<i>Galago alleni</i>	Allen's Squirrel	Galago d'Allen	LR/NT	Total
Mammalia	Primates	<i>Galago demidoff</i>	Demidoff's Bushbaby	Galago de Demidof	LR/LC	Total
Mammalia	Primates	<i>Galago thomasi</i>	Thomases bushbaby	Galago de Thomas	LR/LC	Total
Mammalia	Primates	<i>Gorilla g. Gorilla</i>	Western lowland gorilla	Gorille de plaine	CR	Total
Mammalia	Primates	<i>Lophocebus albigena</i>	Grey-cheeked Mangabey	Cercocèbe à joue grise	LR/LC	Not protected
Mammalia	Primates	<i>Mandillus sphinx</i>	Mandrill	Mandrill	VU	Partial
Mammalia	Primates	<i>Miopithecus talapoin</i>	Southern Talapoin	Talapoin	LR/LC	Not protected
Mammalia	Primates	<i>Pan t. troglodytes</i>	Chimpanzee	Chimpanzé	EN	Total
Mammalia	Primates	<i>Perodicticus potto</i>	Potto	Potto	LR/LC	Total
Mammalia	Rodentia	<i>Anomalurus beecrofti</i>	Beecroft's anomalure	Anomalure de Beecroft	LC	Not protected
Mammalia	Rodentia	<i>Anomalurus derbianus</i>	Lord Derby'sAnomalure	Anomalure de Derby	LC	Not protected
Mammalia	Rodentia	<i>Anomalurus spp,</i>	unknown	Anomalure sp		
Mammalia	Rodentia	<i>Atherurus africanus</i>	Brush-tailed Porcupine	Porc-épic	LC	Not protected
Mammalia	Rodentia	<i>Cricetomys emini</i>	Emin's Giant pouched Rat	Rat d'Emin	LC	Not protected
Mammalia	Rodentia	<i>Cricetomys gambianus</i>	Giant Gambian Pouched Rat	Rat de Gambie	LC	Not protected
Mammalia	Rodentia	<i>Epixerus ebii</i>	Western Palm Squirrel	Ecureuil d'Ebi	DD	Not protected
Mammalia	Rodentia	<i>Funisciurus isabella</i>	Lady Burton's Rope Squirrel	Ecureuil d'Isabella	LC	Not protected
Mammalia	Rodentia	<i>Funisciurus lemniscatus</i>	Ribboned Rope Squirrel	Funiscure rayé	DD	Not protected
Mammalia	Rodentia	<i>Funisciurus leucogenys</i>	Red Cheeked Rope Squirrel	L'écureuil à tête orange	DD	Not protected
Mammalia	Rodentia	<i>Heliosciurus rufobrachium</i>	Red-legged Sun Squirrel	Ecureuil à pattes rouges	LC	Not protected
Mammalia	Rodentia	<i>Myosciurus pumilio</i>	African Pygmy Squirrel	Ecureuil nain	DD	Not protected
Mammalia	Rodentia	<i>Paraxerus poensis</i>	Green Squirrel	Ecureuil olivâtre	LC	Not protected
Mammalia	Rodentia	<i>Protoxerus stangeri</i>	African Giant Squirrel	Ecureuil géante de Stanger	LC	Not protected
Mammalia	Rodentia	<i>Thryonomys swinderianus</i>	Cane Rat	Aulacode ou Hérisson	LC	Not protected
Mammalia	Sirenia	<i>Trichechus senegalensis</i>	Manatee	Lamantin	VU	Total
Mammalia	Tubulidentata	<i>Orycteropus afer</i>	Aardvark	Oryctérope	LC	Total
Reptilia	Squamata	<i>Bitis gabonica</i>	Gaboon Viper	Vipère du Gabon		Not protected
Reptilia	Squamata	<i>Bitis nasicornis</i>	Rhinoceros viper	Vipère bicorne		Not protected
Reptilia	Squamata	<i>Chameleo sp.</i>	Chameleon	caméléon	LR/LC	Not protected

Reptilia	Squamata	<i>Python sebae</i>	African Python	Python d'Afrique		Partial
Reptilia	Squamata	<i>Varanus niloticus</i>	Nile Monitor lizard	Varan du Nil	LC	Partial
Reptilia	Testudines	<i>Chelonia mydas</i>	Green Turtle	Tortue verte	EN	Partial
Reptilia	Testudines	<i>Dermochelys coriacea</i>	Leatherback Turtle	Tortue Luth	CR	Partial
Reptilia	Testudines	<i>Kinixys erosa</i>	Forest Hinged tortoise	Tortue de foret	DD	Not protected
Reptilia	Testudines	<i>Pelomedusa sp</i>	Helmeted turtle	Tortue d'eau douce carapace dur		Not protected
Reptilia	Testudines	<i>Trionyx triunguis</i>	Soft shelled Nile terrapin	Tortue d'eau douce carapace moelle		Not protected
Sauropsida	Crocodylia	<i>Crocodylus cataphractus</i>	Slender snouted crocodile	Faux Gavial	DD	Partial
Sauropsida	Crocodylia	<i>Crocodylus niloticus</i>	Nile Crocodile	Crocodile du Nil	LR	Partial
Sauropsida	Crocodylia	<i>Osteolaemus tetraspis</i>	Dwarf Crocodile	Crocodile nain	VU	Partial

114 recognized species were recorded in Gabon's markets between 2000 and 2006. The true number of species involved is likely to be higher, due to difficulties in correct identification of smaller mammals and reptiles, and rotted meat.

The harvest of bushmeat is dramatically biased towards mammals, with 78 (46%) of Gabon's 171 mammal species represented. In comparison, only 22 (3%) of the roughly 753 bird species and 10 (6%) of the 160 reptile species are harvested. However, all crocodilians are used. The biases in use of animal orders are probably largely to do with body size, with many more mammals than bird or reptile species, and all the crocodilians, falling into the preferred prey sizes of 2-20kgs, .

Twenty-three of the partially protected species and 24 of the totally protected species were found to be used as bushmeat.

Descriptions of most of these species, together with their conservation status, can be found on

www.en.wikipedia.org/wiki/Genus_species

www.fr.wikipedia.org/wiki/Genus_species

http://www.iucn.org/about/work/programmes/species/red_list/index.cfm

Kingdon, J. 2003. The Kingdon Field Guide to African Mammals. Princeton University Press

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8.4 30 Species rarest in the commercial trade

Species	Market	IUCN status	Gabon protected status
<i>Pelomedusa sp</i> African helmeted turtle	Pottos (Franceville)	Not listed	Not protected
<i>Paraxerus poensis</i> Green squirrel	Carrefour Monaco (Oyem)	Least concern	Not protected
<i>Psittacus erithacus</i> African grey parrot	Carrefour Monaco	Near threatened	Partially protected
<i>Panthera pardus</i> Leopard	Mont-Bouet (Libreville)	Least concern	Totally protected
<i>Melivora capensis</i> Honey badger	Mont-Bouet	Lower risk/least concern	Not protected
<i>Kobus defassa</i> Kob	Mont-Bouet	Not listed	Totally protected
<i>Dermochelys coriacea</i> Leatherback turtle	Mont-Bouet	Critically endangered	Partially protected
<i>Dendrohyrax arboreus</i> Tree hyrax	Pottos	Least concern	Totally protected
<i>Pteronetta hartlaubii</i> Hartlaub's duck	Carrefour Monaco	Least concern	Not protected
<i>Cercocebus agilis</i> Agile mangabey	Mont-Bouet	Not listed	Not protected
<i>Cricetomys emini</i> Emin's rat	Mont-Bouet	Least concern	Not protected
<i>Cercocebus torquatus</i> Red-capped mangabey	Carrefour Monaco and Mont-Bouet	Lower risk/least concern	Not protected
<i>Euoticus elegantulus</i> Elegant needle-clawed galago	Mont-Bouet	Lower risk/least concern	Not protected
<i>Columba unicincta</i> Afep pigeon	Mont-Bouet and Gare Routiere (Okondja)	Least concern	Not protected
<i>Francolinus squamatus</i> Scaly Francolin	Carrefour Monaco	Least concern	Not protected
<i>Hippopotamus amphibious</i> Hippopotamus	Lambarene, and Mont-Bouet	Vulnerable	Totally protected
<i>Herpestes sanguinea</i> Slender mongoose	Carrefour Monaco and Mont-Bouet	Lower risk/least concern	Not protected
<i>Kobus ellipsiprymnus</i> Waterbuck	Mont-Bouet and Gare Routiere	Lower risk/conservation dependent	Totally protected
<i>Lutra maculicollis</i> Spot-necked otter	Carrefour Monaco and Mont-Bouet	Least concern	Not protected
<i>Myosciurus pumilio</i> African pygmy squirrel	Carrefour Monaco and Mont-Bouet	Data deficient	Not protected
<i>Numida meleagris</i> Helmeted Guinea fowl	Carrefour Monaco and Mont-Bouet	Least concern	Not protected
<i>Orycteropus afer</i> Aardvark	Carrefour Monaco and Mont-Bouet	Least concern	Totally protected
<i>Potamogale velox</i> Giant otter shrew	Carrefour Monaco and Pottos	Least concern	Not protected
<i>Redunca arundinum</i> Southern reedbuck	Gare Routiere	Lower risk/conservation dependent	Totally protected
<i>Stephanoaetus coronatus</i> Crowned eagle	Carrefour Monaco	Least concern	Totally protected
<i>Tragelaphus euryceros</i> Bongo	Carrefour Monaco	Lower risk/near threatened	Partially protected

8.5 Consumption of protein by household surveyed

Town and Income Category	Consumption kg per AME per day					
	Livestock	Bushmeat	Freshwater fish	Sea fish	Poultry	Total protein
Franceville	0.047	0.061	0.028	0.130	0.098	0.363
1	0.028	0.029	0.023	0.125	0.066	0.272
2	0.045	0.117	0.015	0.122	0.116	0.415
3	0.070	0.059	0.051	0.145	0.138	0.463
4	0.157	0.080	0.062	0.165	0.164	0.629
Lambarene	0.016	0.020	0.076	0.011	0.064	0.187
1	0.013	0.020	0.089	0.010	0.070	0.202
2	0.021	0.012	0.046	0.013	0.043	0.135
3	0.025	0.031	0.111	0.009	0.097	0.273
4	0.000	0.208	0.000	0.000	0.105	0.313
Makokou	0.002	0.100	0.007	0.013	0.025	0.147
1	0.001	0.075	0.006	0.007	0.015	0.104
2	0.004	0.143	0.009	0.034	0.050	0.240
3	0.000	0.234	0.010	0.010	0.033	0.286
4	0.094	0.000	0.000	0.000	0.188	0.282
Okondja	0.008	0.092	0.006	0.077	0.024	0.206
1	0.003	0.071	0.003	0.076	0.010	0.164
2	0.033	0.149	0.023	0.080	0.071	0.356
3	0.000	0.204	0.000	0.074	0.066	0.344
Ombooue	0.020	0.056	0.129	0.129	0.107	0.442
1	0.012	0.038	0.136	0.115	0.134	0.435
2	0.032	0.051	0.045	0.154	0.055	0.338
3	0.035	0.136	0.219	0.067	0.062	0.518
4	0.000	0.000	0.262	0.578	0.291	1.130
Oyem	0.017	0.066	0.012	0.105	0.116	0.318
1	0.010	0.063	0.012	0.099	0.114	0.298
2	0.017	0.057	0.012	0.106	0.130	0.321
3	0.039	0.081	0.017	0.117	0.089	0.343
4	0.000	0.145	0.000	0.122	0.171	0.438
Port Gentil	0.053	0.008	0.020	0.134	0.117	0.331
1	0.054	0.001	0.020	0.084	0.124	0.284
2	0.043	0.008	0.005	0.143	0.111	0.309
3	0.057	0.017	0.045	0.136	0.118	0.373
4	0.090	0.000	0.000	0.471	0.099	0.660
Inland Villages	0.000	0.164	0.017	0.030	0.008	0.218
1	0.000	0.161	0.017	0.028	0.007	0.214
2	0.000	0.181	0.012	0.057	0.003	0.254
3	0.000	0.409	0.000	0.080	0.053	0.542
Coastal Villages	0.017	0.027	0.140	0.233	0.039	0.455
1	0.000	0.021	0.155	0.238	0.019	0.433
2	0.216	0.000	0.124	0.147	0.275	0.761
3	0.000	0.087	0.087	0.216	0.010	0.400
4	0.000	0.000	0.000	0.413	0.073	0.485

8.6 Human footprint in Central Africa: relative position of Gabon

Gabon has currently the highest ratio of forest to people, the largest proportion of its land forested, one of the lowest deforestation rates and medium population growth. With this profile, Gabon still has the potential to install long term, sustainable management of forest products, including bushmeat, for its population.

Country	Average annual human population growth rate (%) 1990-2005	Current number of people per km ² of land (and per km ² of remaining forest)	% of land under forest	Average annual deforestation rate (%) 1990-2005
Burundi	1.9	292 (4,947)	5.9	3.2
Cameroon*	2.2	35 (77)	45.6	0.9
Chad*	3.2	8 (81)	9.5	0.6
Central African Republic	2.0	6 (18)	36.5	0.1
Congo, Republic	3.2	12 (18)	65.8	0.1
Congo, Democratic Republic	2.8	25 (43)	58.9	0.3
Gabon	2.5	5 (6)	84.5	0.1
Rwanda	1.6	364 (1,869)	19.5	3.4

Table Source: World Bank, 2007. website