

Hunting for the Problem:
An investigation into bushmeat use around
North Luangwa National Park, Zambia



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DECLARATION OF OWN WORK

I declare that this thesis, "Hunting for the Problem: An investigation into bushmeat use around North Luangwa National Park, Zambia", is entirely my own work, and that where material could be construed as the work of others, it is fully cited and referenced, and/or with appropriate acknowledgement given.

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List of Acronyms & Abbreviations

ADMADE	Administrative Management Design for Game Management Areas
CBD	Convention on Biological Diversity
CBNRM	Community Based Natural Resource Management
COCOBA	Community Conservation Banks
COMACO	Community Markets for Conservation
CRB	Community Resource Board
CREATE	Conservation Research for East Africa's Threatened Ecosystems
FZS	Frankfurt Zoological Society
GMA	Game Management Area
GMP	General Management Plan
HWC	Human-wildlife conflict
NLCP	North Luangwa Conservation Programme
NLNP	North Luangwa National Park
PCA	Principal Component Analysis
PES	Payments for Ecosystem Services
RRT	Randomised Response Technique
UCT	Unmatched Count Technique
VAG	Village Action Group
ZAWA	Zambia Wildlife Authority

Abstract

Bushmeat is an important source of protein and income in rural populations in the tropics, where there are often few alternatives. With growing human populations, such exploitation is becoming unsustainable and is threatening both the existence of wildlife populations and the livelihoods of people depending on it. This research aimed to inform future conservation interventions, in the area around North Luangwa National Park in Zambia, by establishing the main drivers of bushmeat use; the prevalence of use; seasonal variation in use and the attitudes of local people.

Using a mixed-methods technique (structured interviews and focus groups) it was found that the main drivers were poor food/income security, human-wildlife conflict and enjoyment of the taste of bushmeat. Estimates of prevalence were low, with less than 1% of the population estimated to hunt/trade and 13.5% to consume, while results indicated less use in the cold season. Understanding of the law was low, especially for consumption.

By understanding some of the complexities of bushmeat use in the area, projects can be designed, potentially in partnership with development organisations, to address the specific combination of factors identified. Despite the low estimates of use, results show a twenty-fold increase in the last thirty years, and a tailored approach is necessary to prevent irreversible wildlife loss and damage to the well-being of local people.

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Cover photo: Entrance to North Luangwa National Park, Zambia.

Credit: Emily King

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1. Introduction

The current biodiversity crisis has been described as “the sixth mass extinction”, with predictions that within the next few centuries extinction rates will be comparable to the previous five mass extinctions (Barnosky et al, 2011). The causes include direct pressures on biodiversity and ecosystems in the form of habitat loss, overexploitation, invasive species, pollution and climate change (WWF, 2012: p.70; Figure 1.1).

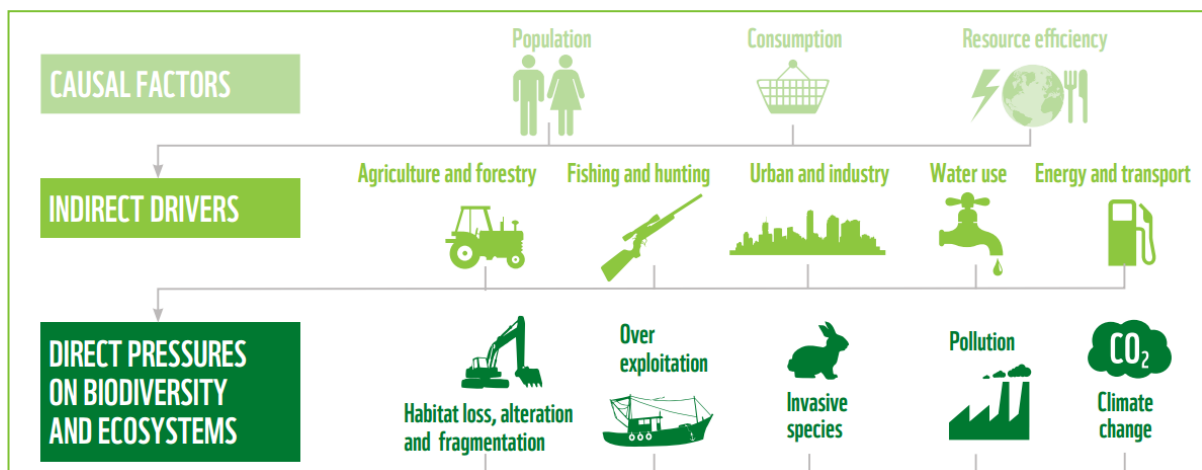


Figure 1.1: Causes of biodiversity loss, reproduced from WWFs Living Planet Report, 2012, p.70

While the causes of biodiversity loss may be understood, acting upon this understanding is often difficult, due to the complex range of interacting factors. Areas of highest biodiversity are concentrated in the tropics (Myers et al, 2000; Olson & Dinerstein, 2002; Brooks et al, 2006), home to some of the world’s poorest people (World Bank, 2014b). This juxtaposition means that many in the tropics are directly reliant on natural resources for their survival (USAID, 2006; Kalaba, Quinn & Dougill, 2013) and, with growing populations (World Bank, 2014a), resources are being exploited unsustainably. One example of overexploitation that is receiving a growing amount of attention is bushmeat, or wild meat (shown by the adoption of Resolution 2.64 by the IUCN, 2000). Bushmeat/wild meat can be defined as “wild animals [harvested] in tropical and sub-tropical countries for food and non-food purposes” (CBD, 2011).

Bushmeat is an important food source for people in developing countries (Fa, Peres & Meeuwig, 2002; Rentsch & Damon, 2013) and a valuable source of protein and fats in many rural diets (Bennett & Robinson, 2000); estimates of bushmeat consumption for the Amazon and Congo basins lie at over 5 million tons of meat annually, or 282.3g/person/day

(Fa, Peres & Meeuwig, 2002). The importance of bushmeat as a food source for rural people is matched by its importance as an income source (de Merode, Homewood & Cowlshaw, 2004; Brown & Marks, 2005), with hunting of bushmeat often a major proportion of income generation for the poorest households (Kümpel et al, 2010).

Concurrent with the recognition of the importance of bushmeat is increasing awareness of the role of bushmeat harvesting in the decline of some species (Fa, Ryan & Bell, 2005; Nasi, Taber & van Vilet, 2011; Albrechtsen et al, 2007), especially when coupled with the impact of habitat pressures, e.g. logging (Remis & Robinson, 2012). In the Congo basin, estimates based on current bushmeat consumption predict an 81% fall in supply of bushmeat protein over the next 50 years (Fa, Currie & Meeuwig, 2003). The implication is that bushmeat exploitation impacts not only wildlife and conservation but also development (Brown & Williams, 2003), with food and income security threatened by such unsustainable exploitation (Bennett & Robinson, 2000; Bennett, 2002; Rao & McGowan, 2002; Rentsch & Damon, 2013).

1.1 Bushmeat in Africa

Much of the current research on bushmeat in Africa focuses on West and Central Africa, and has shown that many of the findings from other areas also apply in this region, such as: the importance of bushmeat as an income source (de Merode, Homewood & Cowlshaw, 2004) and protein source (Vega et al, 2013); lack of sustainability of harvest rates (Barnes, 2002); the impact of bushmeat on species declines (Brashares et al, 2004; Jones-Bowen & Pendry, 2009); and differences in consumption between urban and rural markets (de Merode & Cowlshaw, 2006; Jenkins et al, 2011). However, despite this breadth, comparatively little research has been carried out on bushmeat use in Eastern Africa.

Research in East Africa has focused mainly on savannah landscapes in Tanzania. Despite the difference in ecosystem between the mainly tropical forests of Western and Central Africa and savannah, studies have shown some similarities, such as urban centres driving commercialisation of bushmeat (Lindsey et al, 2013) and reliance of rural people on bushmeat for food and income (Mfunda & Røskaft, 2010; Knapp, 2012). However, the migratory nature of many of the larger herbivores found in East Africa means that some

findings are unique to the area, such as peak hunting in the dry season coinciding with arrival of migratory species (Holmern, Muya & Røskaft, 2007). Such fundamental ecological differences mean that it is essential to explore the context of bushmeat in an area before designing interventions to address it, with only some extrapolation of findings possible from studies based in different ecological contexts.

1.2 **Zambian Context**

Zambia's Luangwa Valley ecosystem has been described as one of Africa's remaining "pristine wilderness areas" (FZS, 2014b). There has been little ecological or conservation research conducted in the area, with the main focus on vegetation composition and a small number of studies examining natural resource use (Barnett, 1997; Marks, 2001; Brown & Marks, 2005; Westhuizen, 2007; Lewis & Phiri, 1998; Kalaba, Quinn & Dougill, 2013). These studies have shown that: bushmeat use ranges between 4.6kg and 13.6kg/household/month in the Luangwa valley; bushmeat is seen as a substitute for domestic meat in rural areas and superior in taste in urban areas; and that rural hunters are motivated primarily by the need to feed their families and gain income (Barnett, 1997). In addition, bushmeat use was concluded to have a major impact on wildlife populations in the valley, especially with erosion of cultural "totem" status of animals such as hippo and zebra, and therefore the removal of the taboo on hunting these species (Barnett, 1997).

The more recent studies on bushmeat in the Luangwa Valley have shown that bushmeat hunting is already having an effect on species populations within the park, with hunters reporting having to travel further to find animals (Brown & Marks, 2005), reduced wildlife densities near the boundaries of North Luangwa National Park (NLNP) (Westhuizen, 2007) and high snare incidence in transects bordering the park (Lewis & Phiri, 1998). However, since the Barnett review (1997) there has not been a community-based study investigating local people's attitudes towards bushmeat or attempting to gauge the extent of bushmeat use in the Luangwa Valley.

The Conservation Research for East Africa's Threatened Ecosystems (CREATE) programme was established in 2011 and is funded jointly by the European Union and Frankfurt Zoological Society (FZS). The programme is managed by FZS to investigate

relationships between poverty and natural resource use in the North Luangwa (Zambia) and Serengeti (Tanzania) ecosystems. The study reported here aimed to support the 4th case study in the FZS CREATE programme (FZS, 2014a). Focusing on “the role and impacts of improving food security on human health and use of natural resources”, the study sought to specifically address section (a): to “better understand the primary local drivers of bushmeat hunting and distribution”.

1.3 Aims and Objectives

The overall aims of the study were to estimate the prevalence of bushmeat hunting, trading and consumption around NLNP, ascertain the main drivers of such use, and generate recommendations for future action based on those findings.

To meet these aims, this study had the following objectives:

- To investigate demographic and seasonal patterns in the hunting, trading and consumption of bushmeat in the study area;
- To ascertain the main drivers of hunting, trading and consumption of bushmeat;
- To assess the attitudes of local people to bushmeat hunting, trading and consumption, and ascertain whether attitudes vary across villages;
- To ascertain if there have been any changes over time in the availability of bushmeat in villages around NLNP;
- To explore local understanding of laws and regulations regarding bushmeat use, and establish whether this varies according to village or demographic factors;
- To assess views of local communities on alternatives to bushmeat.

2. Background

2.1 Drivers of Bushmeat Use

Hunting and consumption of bushmeat can be driven by a variety of factors, depending on the cultural-economic context of the region, and are broadly related to income, culture, and taste. For example, household wealth can influence bushmeat consumption: often poorer groups in communities hunt the highest percentage of bushmeat because they rely on it for income (de Merode, Homewood & Cowlshaw, 2004); some have grown richer selling bushmeat they hunt rather than keeping it for subsistence (Vega et al, 2013). Conversely, in some situations bushmeat consumption increases with household income, because it is preferred over domestic livestock protein (Wilkie et al, 2005; Schenck et al, 2006; Jenkins et al, 2011). This has been attributed to an “inverted U pattern” of demand in relation to income, with a peak in demand for bushmeat at middle income range, then a decrease when more expensive domestic meats become affordable with higher income (Wilkie & Godoy, 2001). Another explanation for this apparent contradiction is proximity to urban centres, with households closer to urban areas increasing bushmeat consumption with income, and vice versa (Brashares et al, 2011).

There are also rural vs. urban differences in taste preferences, e.g. rural participants in a taste test in Gabon showed consistent preference for bushmeat compared to urban participants (Schenck et al, 2006). Urban consumers in Equatorial Guinea (East et al, 2005), Zambia and Mozambique (Barnett, 1997) prefer the taste of bushmeat to domestic meat. Conversely, in rural areas the lower price of bushmeat drives demand, rather than taste (Barnett, 1997; Lindsey et al, 2010; Lindsey et al, 2011).

Bushmeat hunting and consumption can also have a cultural aspect, such differences in bushmeat consumption between different ethnic groups (East et al, 2005; Willcox & Nambu, 2007; Ceppi & Nielsen, 2014). However, it should be noted that some differences which are initially perceived as due to cultural factors may instead be explained by proximity to infrastructure such as roads, or the distance to areas of wildlife. Other cultural aspects can include use in traditional ceremonies, such as male circumcision ceremonies in Gabon (van Vliet & Nasi, 2008).

The diversity of potential drivers of bushmeat hunting and consumption indicates that it is essential to examine local context in each case, as without understanding the causes of bushmeat use in the area where an intervention is planned, it is not possible to design a project which reduces those drivers.

2.2 Alternatives to Bushmeat Use

Parties to the Convention on Biological Diversity (CBD) have recognised the need to address unsustainable harvesting of bushmeat as a priority (decision IX/5). As a result, a Liaison Group on Bushmeat has systematically reviewed alternative income and food options in tropical and sub-tropical countries (van Vliet, 2011), outlining ways to sustainably raise or harvest bushmeat, provision of alternative sources of protein, and creation of alternative sources of income. Domestic livestock are commonly promoted as alternative sources of protein. Alternative income schemes include promotion of traditional crafts to new markets (e.g. maasai beadwork in Kenya), increasing the market access of current agricultural products (e.g. fine aroma cocoa in Ecuador) or training in new activities (e.g. bee-keeping in Cameroon and much of Africa) and payments for ecosystem services (PES) schemes (e.g. the Community Markets for Conservation (COMACO) initiative in Zambia) (van Vliet, 2011). Projects aiming at providing sustainably harvested or raised bushmeat include CBNRM (such as that initiated by the Administrative Management Design for Game Management Areas (ADMAGE) project in Zambia or the Tamshiyacu Tahuayo Communal Reserve in the Peruvian Amazon (Newing & Bodmer, 2003) as well as breeding of indigenous species either on a small scale (e.g. greater cane rat farming in Central Africa) or a large scale (e.g. game ranching in Zimbabwe).

These alternatives aim to address bushmeat use when it is driven by either need for income or food; however, they do not directly address cultural drivers of bushmeat use, such as the need for bushmeat in traditional ceremonies. There can also potentially be issues with the sustainability of projects, such as the need for vaccinations or veterinary care in domestic livestock, or the necessity of continued demand for marketed products such as crafts, without which such projects may fail. There may also be large associated start-up costs, such as the need to buy equipment and establish infrastructure for game ranching

(Lindsey et al, 2013). It is vital, therefore, to not only consider the suitability of interventions for addressing the causes of bushmeat use in the target region, but also to consider the feasibility of introducing and sustaining such an intervention.

2.3 Investigating Bushmeat Use

Due to the often illegal nature of bushmeat use, it can be a highly sensitive issue and therefore difficult to investigate. However, sensitivity will vary according to how accepted bushmeat use is within the local context, and how well laws are enforced (Bitanyi et al, 2012). Gavin, Solomon & Blank (2010) summarise various approaches to investigating illegal behaviours (Table 2.1). Each of these approaches has advantages and disadvantages depending on the situation and context, and it is therefore important to carefully evaluate what is most appropriate for the circumstances.

Table 2.1: Comparison of methods used to investigate illegal resource use. Adapted from Gavin, Solomon & Blank (2010).

Method	Possible Data Outputs				Relative Labour Demand	Relative Tech. & Training Req.	Relative Bias
	What	Where	Who	Why			
Law enforcement records	y	y	y		Low	Low	Medium-High
Indirect observation: signs of illegal activity	y	y			Low (except for market survey)	Low (except for remote sensing)	Medium
Direct observation	y	y	y	y	High	Low	Medium
Self-reporting	y	y	y	y	Low	Low (except some computer data loggers)	Very High
Direct questioning	y	y	y	y	Medium	Medium	Medium-High
Indirect questioning	y	y	y		Medium	Medium	Low
Forensic studies		y			High	High	Low
Modelling	y	y		y	Low	High	Low

Direct questioning has been employed in areas where bushmeat has low sensitivity (Golden, 2009; Jenkins et al, 2011; Foerster et al, 2012; Mgawe et al, 2012). However, it can be difficult to accurately gauge the sensitivity of an issue before commencing an investigation, meaning direct questioning may be inappropriate, leading to inaccurate estimation of levels of bushmeat use. Indirect questioning techniques attempt to overcome this problem by eliciting overall patterns of behaviour without the need to directly ask people about their participation in the sensitive activity. Comparison between indirect and direct questioning techniques has shown that indirect techniques are more likely to provide higher and more accurate estimates of illegal behaviour (St. John et al, 2010). Examples of

such techniques that are being used more frequently in Conservation Science literature include the Randomised Response Technique (RRT) (Solomon et al, 2007; St. John et al, 2010; Cross et al, 2013) and the Unmatched-Count Technique (UCT) (Nuno et al, 2013).

Currently, RRT has been used more in conservation research than UCT, including the UK (St. John et al, 2010; Cross et al, 2013), USA (Blank & Gavin, 2009), Australia (Arias & Sutton, 2013), South Africa (St John et al, 2012), and on two occasions in low-income countries (Solomon et al, 2007; Razafimanahaka et al, 2012). However, despite UCT's relatively common use in studies of public attitudes (Dalton, Wimbush & Daily, 1994; Tourangeau & Yan 2007) and behaviours (Coutts & Jann, 2011; Sheppard & Earleywine, 2013), there are few examples of its application in conservation research. Where it has been used, respondents have reported high levels of understanding of the technique (Nuno et al, 2013) and greater feelings of trust and comfort compared to direct questioning (Fairbrass, 2012). In contrast, Razafimanahaka et al. (2012) used RRT in areas with low literacy and found that some respondents found the method confusing or were offended at the indirect method of obtaining information. These findings, coupled with findings that UCT results in more accurate estimates (Coutts & Jann, 2011) suggest that UCT has a great deal of potential for investigating sensitive, conservation related behaviours in low-literacy areas.

2.4 **Zambian Context**

2.4.1 **North Luangwa National Park**

NLNP is one of 20 national parks in Zambia (Figure 2.1). Gazetted in 1972, it covers an area of 4,636km² in the Luangwa Valley. The NLNP General Management Plan (GMP) refers to NLNP as “one of the most pristine wilderness areas in Zambia” (ZAWA, 2004). The area has also been identified as an Important Bird Area by BirdLife International (Fishpool & Evans, 2001), contains endangered species such as black rhino (*Diceros bicornis*) and is one of the best examples of undisturbed escarpment miombo woodland habitat (ZAWA, 2004).

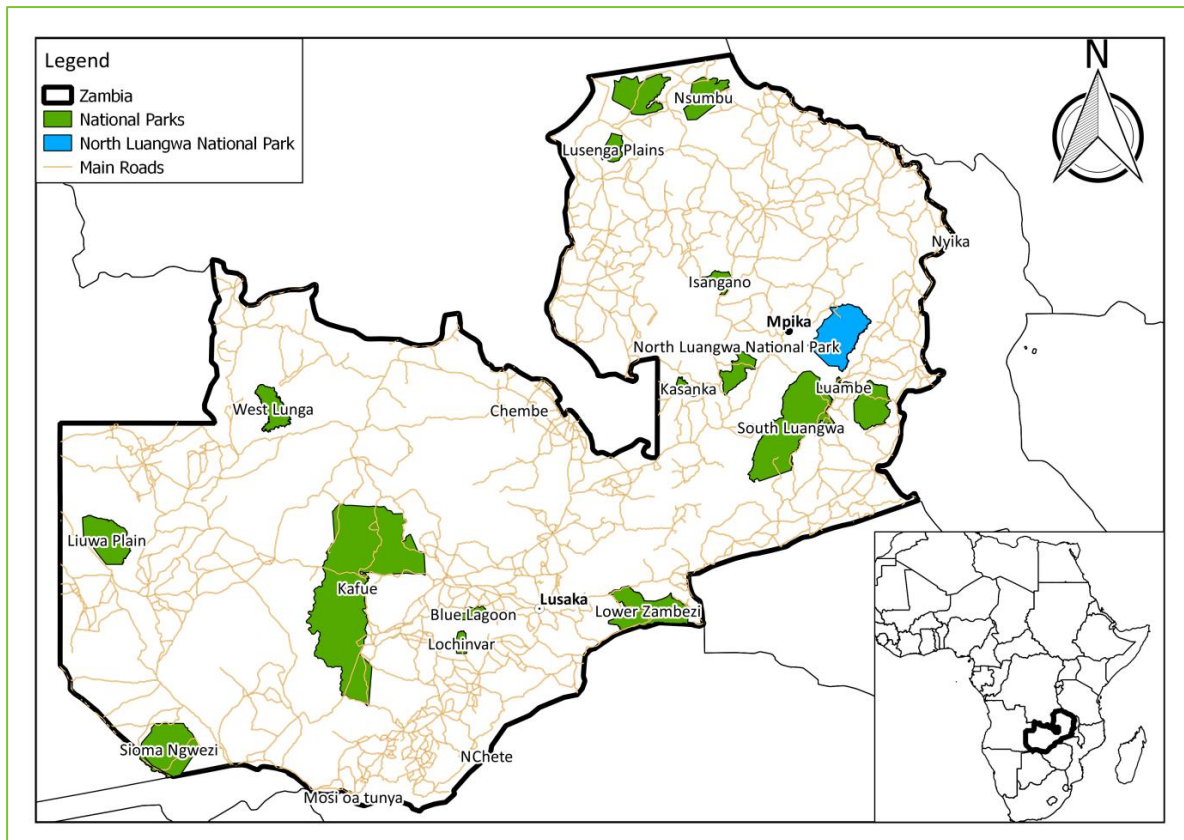


Figure 2.1: Location of North Luangwa National Park in Zambia.

In the 1970s and 1980s the park was subjected to extensive poaching, which notably led to local extinction of black rhino in the park from a population of 12,000 (Save The Rhino, 2014) and depletion of populations of elephant and other species. Today the Zambia Wildlife Authority (ZAWA) and North Luangwa Conservation Programme (NLCP) report that poaching in the park has seen a relatively large reduction (ZAWA, 2004; Save The Rhino, 2014). The park's GMP focuses on protecting natural resources within the park, expanding visitor use, and engaging and involving local communities in park tourism and management.

2.4.2 Game Management Areas around NLNP

Game Management Areas (GMAs) were established in Zambian law in 1972 (under the National Parks and Wildlife Act of 1968) and intended to provide a buffer zone around national parks, as areas where licensed hunting and trading of wildlife would be allowed and people would co-exist with wildlife (Chomba, Mwenya & Nyirenda 2011). There are four GMAs adjoining NLNP (Figure 2.2): Mukungule, Musalangu, Munyamadzi and Lumimba; the latter three were established in 1972 and Mukungule was established in 1998.

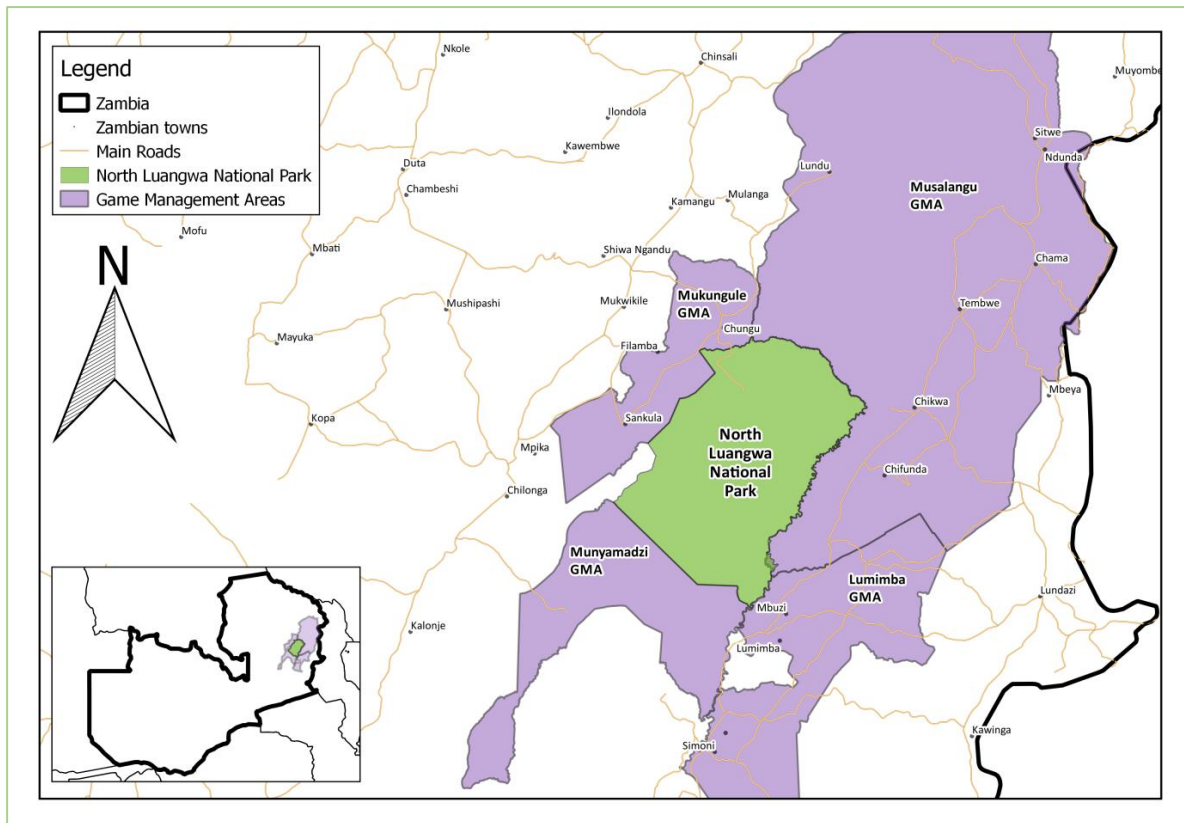


Figure 2.2: Game Management Areas surrounding North Luangwa National Park.

2.4.2.1 Mukungule and Musalangu GMAs

Mukungule GMA covers 90% of the Mukungule Chiefdom and consists of predominantly Bemba and Bisa people, with approximately 11,300 residents (Zambia Ministry of Health, 2013). In contrast, Musalangu GMA consists of predominantly Senga and Tumbuka people, with an estimated total population of 101,412 (based on the 2010 National Census; ZAWA, 2013). In both GMAs livelihoods are predominantly based on small-scale agriculture and natural resource utilisation. Predominant crops include maize, groundnuts, and finger millet; tobacco and cotton are also grown for commercial sale in Musalangu. Both GMAs are characterised by variable rainfall, poor market access, and Human-Wildlife Conflict (HWC) in the form of crop-raiding, livestock predation and occasional human attack (ZAWA, 2004a; ZAWA, 2013).

2.4.3 Community Based Natural Resource Management in Zambia

Community based natural resource management (CBNRM) emerged in the 1990s during a movement away from centralised, often government led, approaches to natural resource management, towards schemes in which communities local to resources played a more active management role (Shackleton et al, 2002). In Zambia, CBNRM was first trialled with the ADMADE programme, which ran from 1989 to 1999. ADMADE aimed to promote conservation of wildlife through financial benefits of conserving wildlife, i.e. payment for hunting licences distributed to local communities. Local communities were directly involved through employment of village scouts to patrol and detect wildlife crime, as well as through establishment of community resource institutions: the Community Resource Boards (CRBs) and Village Area Groups (VAGs). The aim of these institutions was to oversee distribution and spending of hunting revenues in the local community (structure shown in Figure 2.3). Near the end of the ADMADE project, the Zambia Wildlife Act of 1998 enshrined the structure and remit of the CRBs and VAGs in law (State of Zambia, 1998). However, there were problems reported as arising from the programme, such as an increase in the use of snares in areas receiving the programme (Lewis & Phiri, 1998), delay in funds from hunting licences reaching target communities (Clarke, 2000) and accusations of nepotism and misappropriation of funds (Marks, 2001). There was also discussion that illicit wildlife harvesting was driven underground rather than reduced, with a divisive role of village scouts in local communities (Marks, 2001).

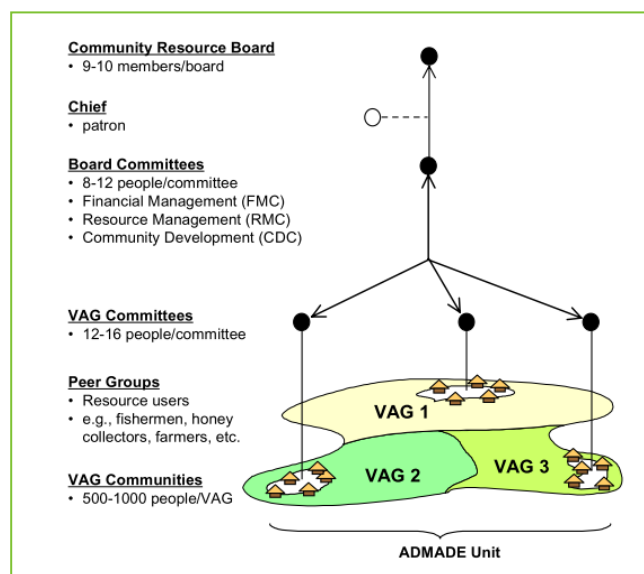


Figure 2.3: Structure of the community based institutions set up under ADMADE. Reproduced from Clarke et al (2000), p.24.

2.4.4 Law on Bushmeat in Zambia

The same law which enshrined CRBs and VAGs in statute also details the status of bushmeat hunting, selling and consumption under Zambian law (Zambia Wildlife Act 1998; see Table 2.2). Since this law was introduced in 1998, there has not been a systematic review of the effectiveness of CBNRM as regards reduction of bushmeat use in the GMAs surrounding NLNP. Few studies have examined bushmeat prevalence around NLNP; the most recent study was in 2005 (Brown & Marks, 2005), and evidence on bushmeat trends since then is largely anecdotal.

Table 2.2: The legal status of bushmeat related activities in Zambia. Source: Zambia Wildlife Act (1998).

Activity	Law	Relevant Section of the Act
Hunting of game or protected animals	'Any person who hunts any game animal or protected animal, except under or in accordance with the conditions of a valid licence issued under Part VII, shall be guilty of an offence'	31
Licences	Licences are only granted to hunt game and protected animals in GMAs and "open areas" (i.e. areas of land which are not classed as either a GMA, National Park, bird or wildlife sanctuary); no hunting is allowed inside National Parks	16
Self-defence	Killing of a wild animal if legal if done in defence of yourself, another person, livestock or crops	78 - 79
Possession of hunting equipment	Possession of hunting equipment such as poison, snares, traps and mist nets is prohibited	72 - 73
	Carrying any firearm, spear, bow...other weapon, explosive, snare, net, trap or poison into a National Park, for any purpose, is prohibited	17
Domestic animals	No domestic animals are permitted inside National Parks	19
Sale of meat	Possession, buying and selling of live game or protected animals or their meat is prohibited without a certificate of ownership	101
Punishment	For unlawful hunting in a National Park: 1-10 years for a first offence, 2-15 years for a subsequent offence For unlawful hunting outside a National Park: fine up to 20,000 penalty units or imprisonment up to 6 months, or both For possessing, buying or selling meat: a fine up to 70,000 penalty units or imprisonment up to 7 years, or both	134-136

3. Methods

3.1 Methodological Framework

As bushmeat use is illegal and a sensitive topic around NLNP (Siachoono, 2014), a mixed-methods approach was used to triangulate findings, as recommended by Gavin, Solomon & Blank (2010). This involved using a mix of structured interviews (containing UCT, closed and open-ended questions) and focus groups to gather data with which to verify the data of the structured interviews. Key informant interviews were also used to provide background on the context of bushmeat use around NLNP.

3.2 Survey Areas

Data were collected from five areas around NLNP, selected based on the findings of a preliminary survey on attitudes towards conservation and the NLCP (Siachoono, Mbokoma & Mweemba, 2014). Each area consisted of one to three villages, grouped together for analysis due to their close proximity, giving a sample of 10 villages in total (Removable Appendix I). Structured interviews were carried out in all villages, while focus groups were conducted in one village in each area, chosen from larger villages deemed to potentially have more variation in opinions, and more participants available.

3.3 Data Collection

Data were collected between the 12th May 2014 and 2nd July 2014, with piloting carried out on the 8th May 2014. Three local field assistants assisted with data collection. Prior to commencement, field assistants were briefed in social surveying techniques and how to facilitate focus groups. Interviews and focus groups were conducted in the local language: Bemba for clusters 1-3 and 5, Nyanja in cluster 4 (Removable Appendix I).

Two versions of the structured interview were piloted by two field assistants with five respondents on the 8th of May in a village near to Mpika; the two versions were used to gauge the reaction of respondents to a direct question about their bushmeat use, with one version containing this question and one without. During the pilot each field assistant

observed the other administering the interview, to ensure questions were asked in a standardised way. Subsequent to piloting it was concluded that the direct question made respondents uncomfortable and so was removed; minor changes were also made to the sequence of questions in the interview and to the wording of some questions (see Appendix I).

GPS coordinates were recorded for a centrally located area in each village surveyed, to allow calculation of approximate distance to the park boundary and distance to the nearest butchery, which had been cited in a previous study as a factor influencing bushmeat use (Siachoono, Mbokoma & Mweemba, 2014). A central village location was recorded instead of household location to preserve the anonymity of individual households.

3.4 Structured Interviews

Structured interviews were conducted with respondents in each of the 10 villages surveyed. To minimise sensitivity, interviews were conducted by field assistants in the local language. Due to the lack of accurate census data for any of the villages, an opportunistic sampling technique was employed in each case, with either the village headman or a local contact person for FZS informing the interviewers of household locations. With farming the predominant occupation, requiring people to be in the fields in the morning, interviews were later in the day. To reduce bias, interviewers avoided sampling all people congregated in one area, e.g. around shops, or people encountered close together. A minimum of 30 interviews were conducted in each village cluster.

Prior to commencing each interview participants were informed about the general nature of the research (natural resource use around NLNP) and who the interviewer was collecting data on behalf of. Participants were also informed that all information would remain anonymous and advised that they did not have to answer any question they did not wish to, and could withdraw at any time. They were then asked for permission to proceed. Participants were not paid for their time, but were asked to voluntarily contribute it.

The aim of these interviews was to collect quantitative estimates of bushmeat use (hunting, trading and consumption) in the area as well as qualitative information on

seasonality of bushmeat and drivers of bushmeat use. The interview was divided into five sections (Appendix I), covering: interviewee demographics; double list UCT addressing hunting, trading and consumption; seven day food recall diary; Likert-type statements addressing hunting, trading and consumption; attitudes; and knowledge of the law. At the end of the interview participants were invited to ask any questions or make any final statements.

3.4.1 Demographic Section

The demographic section of the interview collected information on household age structure, wealth indicators, main livelihood activities, education level, participation in village groups and number of dependants on the household. The household assets used as wealth indicators were based on those found to be applicable in the area in a previous study (Sennett, 2013). The number of days without protein out of the previous seven was also used to categorise the wealth level of each household (*sensu* Hargreaves et al, 2007), and each household was later assigned a wealth score (see section 3.7.1).

3.4.2. UCT Section

The UCT section of the interview was designed to elicit estimates of bushmeat hunting, trading and consumption in the areas around NLNP. UCT was used because bushmeat use is illegal without authorisation in Zambia, and it is perceived to be a sensitive issue (Siachoono, 2014). In addition, literacy is low in the GMAs surrounding NLNP, and UCT has been shown to be well understood by respondents in such situations (Nuno et al, 2013). This section consisted of four questions: one example question, which was designed to familiarise the participant with the format and on a non-focal topic (wildlife encountered in the village), and three questions focusing each on bushmeat hunting, trading, and consumption (Appendix I). For the hunting and trading questions the non-sensitive items were other livelihood options (e.g. builder, shop owner), with different items for hunting and trading. Previous studies have indicated that hunting and trading of bushmeat around NLNP is predominantly a livelihood activity (Brown & Marks, 2005). The consumption items were all other potential protein sources (e.g. beans, fish). The items on each of the lists (Appendix II) were chosen as locally appropriate in consultation with local field assistants, and were trialled during the pilot. Each list consisted of a picture of the item, a description in English,

and a description in the local language. Each list was designed to include one item that everyone would have done/eaten, and one item that no one would have done/eaten, to reduce potential floor and ceiling effects which could remove the anonymity of answers (Blair & Imai, 2012). The control cards showed four items, while the treatment cards had the same four items with the addition of the sensitive item (bushmeat hunting, trading, or consumption). The sensitive item was randomly positioned on each of the lists. The example lists did not have a sensitive item, but instead had one list with four items and one with five.

A double-list method was utilised to improve statistical efficiency (Glynn, 2013). The double-list method effectively allows each respondent to provide information on both the control and treatment lists. During the interviews, participants were asked to flip a coin before each question to decide whether they received the set with the sensitive item on the first list or on the second. Participants were then shown each of the two lists in turn and asked either “How many of the following have you done/eaten in the past year?” (for the hunting and trading and consumption questions respectively). It was emphasised to respondents each time that the interviewer only wanted the number of items, not which ones. If participants started to indicate which items, the interviewer politely stopped them and reminded them that only the number was required.

3.4.3 Drivers of Bushmeat Use Sections

The Likert-type statement sections were administered with the aid of a show card consisting of the four options available to the participant (Appendix III). The decision was made to use four options rather than an odd number to remove the option for a “neutral” or middle reply upon advice of local field staff that the local culture would predispose people to not reveal their opinions if presented with an option to remain neutral (Siachoono, 2014b). Participants were given a “don’t know” option; this was only presented to them verbally, rather than on the show card.

3.5 Focus Groups

Focus groups were used to provide additional context to the data collected with the structured interviews, as well as to discuss ways in which bushmeat use could be reduced

around NLNP. Two focus groups of 8-14 participants were held in each of the five clusters surveyed, one consisting of men and one of women. This gender division was culturally appropriate, to reduce the likelihood that men would dominate the discussion in mixed focus groups, and as men and women might have different experiences of bushmeat use due to different gender roles (Brown & Marks, 2005). The participants were selected in consultation with FZS staff and the local FZS contact person.

At the beginning of each focus group the translating field assistant gave a brief introduction to the research as well as the subject of the discussion. No demographic data were collected on focus group participants. The focus group was then either facilitated by a field assistant or by the researcher with the translation aid of a field assistant. At the end of the discussion the participants were offered a soft drink and biscuits as thanks for their time.

The focus groups were divided into five sections (Appendix IV): construction of a seasonal calendar for the village and discussion of seasonal aspects of bushmeat; construction of a timeline for the past 50 years with key event memory anchors and trends in bushmeat during that time, as well as causes of any discussed trends; a general discussion about bushmeat, including positives and negatives for the village; a discussion of the drivers of each of bushmeat hunting, trading, and consumption, as well as discussion of the main driver in each case; and discussion of alternatives to bushmeat use and ways to reduce it.

3.6 Ethics and Research Approvals

The research design and execution met with the ethical guidelines of both Imperial College London and FZS. FZS obtained permission from ZAWA to conduct research in Mukungule GMA and East Musalangu GMA. Prior to commencing work in each of the chiefdoms the Chief was also approached for permission for the research to be carried out; the Chief was given small gifts such as cooking oil, salt, and a blanket, as a sign of respect and as culturally appropriate. Prior to commencement of both focus groups and interviews participants were informed of the general aims of the research, and were assured of the anonymity and confidentiality of the data collected. Prior to the focus groups permission was also requested to take photographs, with the option to view them at the end of the focus group and request deletion. Participants were also reminded that they did not have to

answer any questions that they did not want to, and that they could withdraw from the interviews or focus groups at any time. Field assistants ensured that all participants were over 18 years of age. Data collected during the interviews were identified by a number code rather than any identifying feature of respondents such as name. Data were also stored in an encrypted database to which only the researcher had access.

3.7 Data Analysis

3.7.1 Quantitative Data

All analyses were conducted in R version 3.1.1 (R Core Team, 2014), with geospatial mapping carried out using QGIS version 2.4 (QGIS Development Team, 2014).

Wealth indicators collected in the structured interview were used to give participants a wealth score. Wealth categorisation was carried out via Principal Component Analysis (PCA) as recommended by Rustein and Johnson (2004), using R code “prcomp”. There is debate over which variables should be used to assess household wealth (see Falkingham & Namazie, 2002). Following Hargreaves et al (2007), wealth assets, number of days without protein, and number of household income activities were used to rank relative wealth of participants. The PCA output was used as a relative wealth score for further analysis.

Village central location coordinates were used to calculate the distance to both the edge of NLNP and the nearest butchery using the “Measure Line” tool in QGIS 2.4. In both cases, the shortest distance in a straight line was calculated, as the lack of mapping of minor roads and footways surrounding the park made a direct route the best available estimate.

Results of the UCT questions were analysed to give estimates of bushmeat hunting, trading and consumption around NLNP, using formulae recommended by Tourangeau and Yan (2007). Results were also used to create demographic profiles of those most likely to hunt, trade, and consume, using different demographic variables in a linear mixed-effects model to test for which variables were the best predictors of participation (justification for initial selection in Appendix V, Table V.1). “Respondent” was included as a random effect to account for each respondent giving two sets of data for each question. Models were chosen using step-wise selection via the “drop1” function.

Likert scales were analysed by calculating the frequency of each response for each of the statements presented to respondents. Kruskal-Wallis tests were then used to isolate significantly associated demographic factors.

Responses on the seasonality of bushmeat use were coded and checked against the seasonal calendars produced in the focus groups. Responses on the occurrence of bushmeat within the village were used to calculate the mean number of individuals reported in each time period, which were then compared between village clusters using one-way repeated measured ANOVA.

3.7.2 Qualitative Data

The results of the focus group activities were grouped into themes, and key quotes chosen to represent the themes. The frequency with which each topic occurred was also calculated. Responses to open ended questions in the structured interviews were coded and grouped into themes in a similar manner, with the frequency of occurrence of each topic calculated (as recommended by Newing (2011)).

The results of the focus group activities and discussions were compared to the results of equivalent questions in the structured-interviews for each village cluster, e.g. the predominant seasons for bushmeat hunting, trading and consumption.

During the focus groups, participants were asked to suggest what they perceived to be the drivers of bushmeat hunting, trading and consumption. Equation 3.1 was used to calculate the salience of effects listed in each focus group (*sensu* Harrison, 2013):

$$Salience (S) = \frac{1 + length - position}{length} \quad \text{Equation 3.1}$$

where *length* is the number of drivers given by the focus group and *position* is the rank (1-3) given to that driver. The cultural salience (i.e. the salience score for all focus groups) was then calculated using Equation 3.2:

$$Cultural\ salience = \frac{\sum Salience}{n} \quad \text{Equation 3.2}$$

where *Salience* is the salience score for that driver from each focus group, and *n* is the total number of focus groups.

4. Results

4.1 Demographics of Study Population

Interviews were conducted with 270 individuals in total, including equal numbers of men and women (Table 4.1).

Table 4.1: Distribution of the demographics of interview respondents.

Factor	Level	Frequency	%
Gender	Male	135	50.0
	Female	135	50.0
Head of household?	Yes	227	84.1
	No	41	15.2
	No response	2	0.7
Highest level of education	No formal education	19	7.0
	Primary	167	61.9
	Secondary	83	30.7
	Tertiary	1	0.4
Ethnic Group	Bemba	143	53.0
	Bisa	69	25.6
	Senga	47	17.4
	Other	11	4.1
Age bracket	18-25	58	21.5
	26-35	72	26.7
	36-45	67	24.8
	46-55	35	13.0
	55+	38	14.1
Number of income activities	1	152	56.3
	2	94	34.8
	3+	24	8.9
Years of residence	Less than 2	16	5.9
	2-5	54	20
	6-10	52	19.3
	11-15	44	16.3
	16-20	17	6.3
	20+	84	31.1
	No response	3	1.1

There was a significant difference between village cluster and mean number of days in a week with no protein (One-way ANOVA, $F_{1,268}=12.327$, $p=0.001$), mean wealth score (One-way ANOVA, $F_{1,268}=18.918$, $p<0.001$) and number of income activities (Pearson's χ^2 , $n=270$, $\chi^2=27.038$, $p<0.001$). Post-hoc comparisons using the Tukey's HSD test showed that cluster 4 had a significantly higher mean number of days without protein than each other cluster (at the 99% confidence interval, $p<0.01$ for clusters 1-3 and $p<0.001$ for cluster 5; Figure 4.1). Cluster 4 also had a significantly lower mean wealth score than every other cluster (at the 99% confidence interval, $p<0.01$; Figure 4.2), while the majority of respondents in clusters 3-5 had only one household income activity.

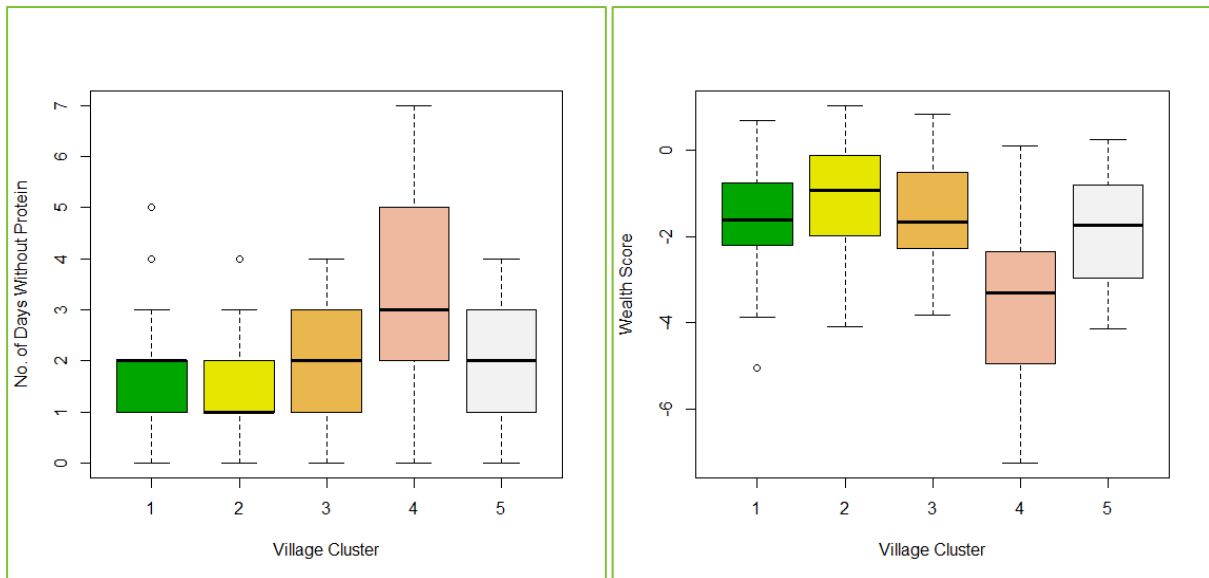


Figure 4.1: Mean no. of days without protein in each village cluster
 Figure 4.2: Mean wealth score in each village cluster

Wealth scores ranged from -7.27 to 1.04, with 50% of respondents having a score between -2.85 and -0.69 and a mean wealth score of -1.9. A higher wealth score corresponds to a higher socio-economic status, with possession of a house made of more durable building materials (i.e. brick and tin roof), carrying out more income activities, and possessing electronic equipment such as a mobile phone or solar panel corresponding to a higher socio-economic status (Appendix VI).

Mean wealth score was significantly different between education level (One-way ANOVA, $F_{2,266}=12.148$, $p<0.001$), ethnic group (One-way ANOVA, $F_{3,266}=28.372$, $p<0.001$), residence time (One-way ANOVA, $F_{5,261}=3.312$, $p=0.006$), and number of income activities (One-way ANOVA, $F_{1,268}=20.126$, $p<0.001$). Post-hoc comparisons with Tukey’s HSD test showed those with no formal education had a significantly lower mean wealth score than those with primary or secondary education (at the 99% confidence level, $p=0.001$ and <0.001 respectively; Figure 4.3). Respondents from the Senga ethnic group had a lower mean wealth score than each of the other ethnic groups (Tukey’s HSD test at the 99% confidence level, $p < 0.01$ for Bemba and Bisa, $p=0.001$ for “other”; Figure 4.4), while mean wealth score of residents present in the village for less than two years was significantly lower than residents present for 11-15 years (at the 95% confidence interval; $p=0.04$; Figure 4.5). Respondents with one household income activity had a lower mean wealth score than those which had two or three or more (at the 99% confidence level, $p=0.002$ for 2 activities, $p=0.001$ for three or more activities; Figure 4.6).

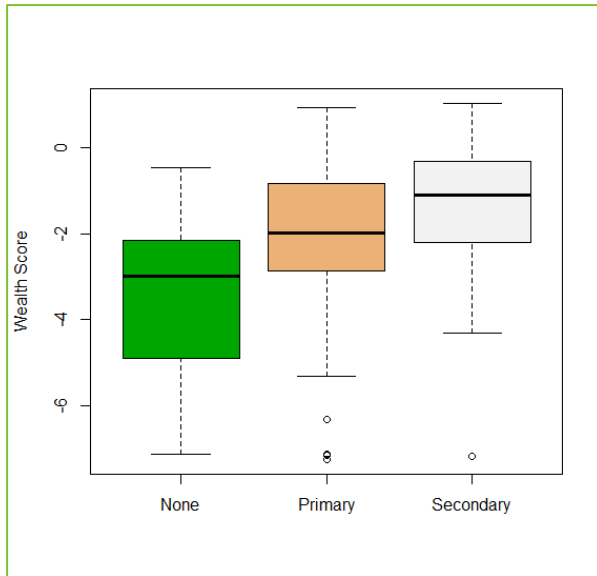


Figure 4.3: Mean wealth score for each education level

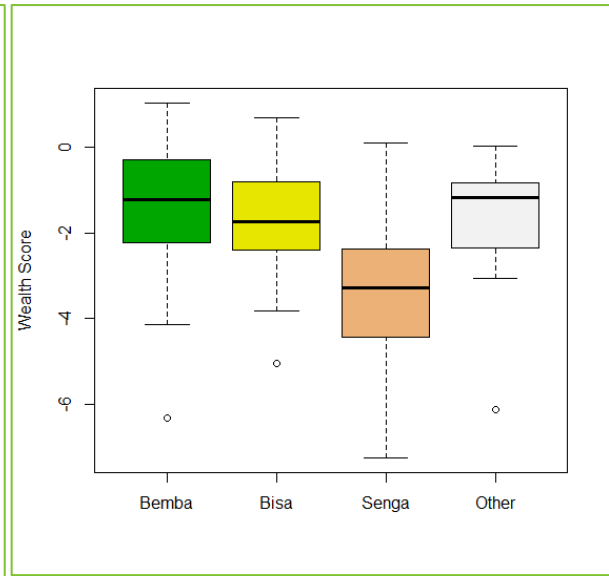


Figure 4.4: Mean wealth score for each ethnic group

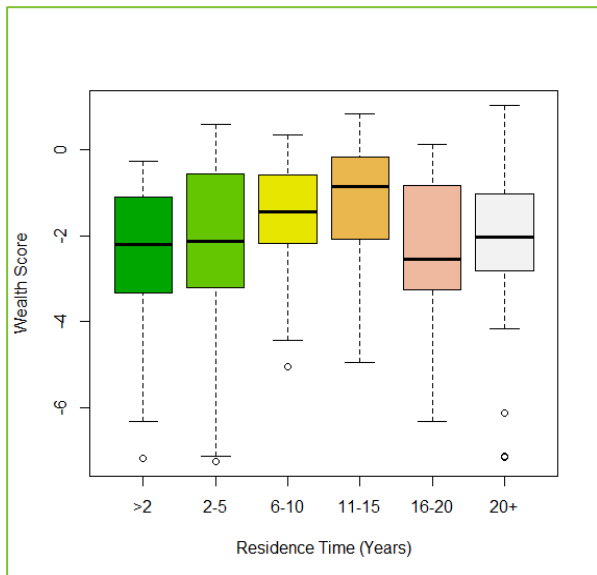


Figure 4.5: Mean wealth score for each residence time period

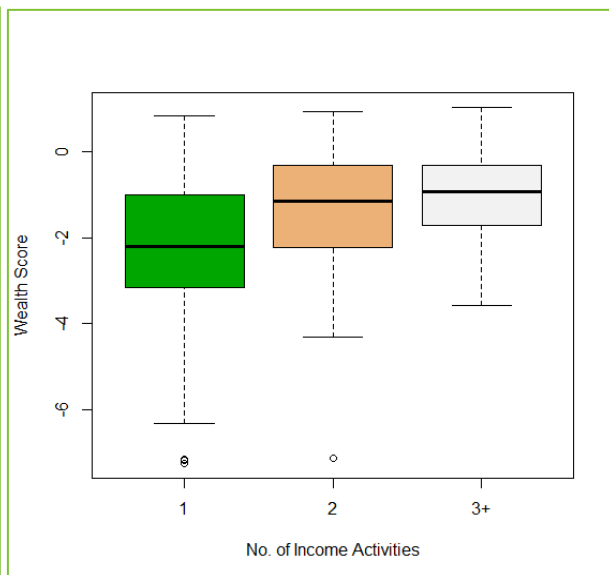


Figure 4.6: Mean wealth score for number of income activities

A higher wealth score correlated to more external people supported by the household (Pearson's correlation: $r_{268} = 0.131$, $p = 0.0313$), more days that food was bought (Pearson's correlation: $r_{268} = 0.276$, $p < 0.01$) and fewer number of days in a week that the household went without protein (Pearson's correlation: $r_{268} = -0.960$, $p < 0.001$). Households with a higher wealth score also lived closer to a butchery (Pearson's correlation: $r_{268} = -0.276$, $p < 0.001$).

4.2 Prevalence of Bushmeat Hunting, Trading and Consumption

4.2.1 Indirectly Derived Estimates of Use

The mean number of people reported as hunting, trading, or consuming bushmeat once a year were higher than those for every month or every week, although there was a much higher variance in responses for this time period (Table 4.2). The low means emphasise that the majority of responses (between 59%-73.7%) were zero; between 20.4%-26.8% of respondents either declined to respond or stated “don’t know” as an answer.

Table 4.2: Mean number of people reported as hunting, trading and consuming bushmeat in each time period.

Activity	Once This Year		Every Month		Every Week	
	Mean	Variance	Mean	Variance	Mean	Variance
Hunting	1.48	190.68	0.30	1.49	0.12	0.32
Trading	0.54	4.74	0.24	0.97	0.12	0.28
Consumption	1.75	22.7	0.82	7.84	0.24	0.82

There was no significant difference in the mean number of people reported as hunting or consuming bushmeat once a year, every month, or every week. There was a significant difference between the mean number of people estimated by respondents to be trading bushmeat at different time periods (One-way ANOVA, $F_{2,640}=4.996$, $p=0.007$), with post-hoc comparison using Tukey’s HSD test showing significantly more people trading once a year than every week (at the 99% confidence interval, $p=0.007$).

Cluster 2 had the highest mean number of people reported as hunting and consuming bushmeat once a year, although this also corresponded with a high variance in responses (Table 4.3). Cluster 4 had the lowest mean number of people reported as hunting and trading for every time period.

There was a significant difference in the mean number of people reported to be hunting every month in different village clusters (One-way ANOVA, $F_{4,205}=4.375$, $p=0.018$), with post-hoc comparisons using Tukey’s HSD test showing that there were significantly more people hunting monthly in cluster 2 than 4 (at the 95% confidence interval, $p=0.034$). There was no significant difference between clusters in the mean number of people estimated by respondents to be hunting bushmeat once a year or every week, or any of the three time periods for consumption. There was a significant difference in the mean number of people estimated to be trading once a year in different village clusters (One-way ANOVA,

$F_{4,210}=2.641$, $p=0.035$), every month (One-way ANOVA, $F_{4,209}=2.612$, $p=0.037$) and every week (One-way ANOVA, $F_{4,209}=2.709$, $p=0.031$), with post-hoc comparison with Tukey's HSD test showing significantly more people trading clusters 3 than 4 in every case (at the 95% confidence level, $p=0.027$, $p=0.297$ and $p=0.036$ respectively).

Table 4.3: Mean number in each village cluster of people reported as hunting, trading and consuming bushmeat in each time period.

Activity	Village Cluster	Once This Year		Every Month		Every Week	
		Mean	Variance	Mean	Variance	Mean	Variance
Hunting	1	0.18	2.51	0.17	1.12	0.08	0.43
	2	4.98	948.85	0.58	4.14	0.18	0.45
	3	0.62	6.47	0.35	2.25	0.18	0.87
	4	0.08	0.12	0.00	0.00	0.00	0.00
	5	0.28	3.08	0.08	0.34	0.02	0.02
Trading	1	0.25	3.98	0.15	1.70	0.08	0.44
	2	0.66	3.61	0.30	0.99	0.16	0.25
	3	0.90	14.14	0.38	2.13	0.20	0.78
	4	0.04	0.04	0.00	0.00	0.00	0.00
	5	0.24	3.06	0.08	0.34	0.02	0.02
Consumption	1	0.48	20.50	0.28	3.14	0.12	1.05
	2	2.74	48.98	0.78	6.55	0.32	1.31
	3	1.32	14.67	0.82	11.59	0.25	1.22
	4	1.40	17.27	0.96	15.15	0.10	0.18
	5	0.46	9.35	0.18	1.50	0.10	0.58

4.2.2 UCT Derived Estimates of Use

Estimates of prevalence of bushmeat hunting, trading and consumption from the UCT section of the structured-interview had a higher proportion of people estimated to have participated in consumption in the past year than hunting or trading (Table 4.4), although with a wide variance ($13.52\% \pm 0.02$).

Table 4.4: Estimates of bushmeat use derived from UCT.

Type of Use	N	Estimate of the % of the pop. participating	Standard Error	Variance
Hunting	268	0.82	0.006	1.26
Trading	268	0.79	0.005	1.78
Consumption	267	13.52	0.020	6.75

Consumption, as the key result from the UCT, was modelled with demographic variables. The mixed-effects model selected via stepwise model selection showed that there were seven explanatory variables that affect the number of items given as consumed (Table 4.5). As there are no interactions between "sensitive" and any of the other variables, this term gives a direct estimate of the prevalence of consumption: approx. 14% (CI 2-36%).

Table 4.5: Results of the mixed-effects linear model of demographic variables explaining the likelihood of having consumed bushmeat in the past year. Interactions between terms are indicated by “:”, while the “sensitive” and “card” variables account for the effect of being shown the sensitive item and the effect of being shown the alternative lists of non-sensitive items.

Explanatory Variables	Estimate	Std. Error	2.5% Confidence Interval	97.5% Confidence Interval
(Intercept)	3.21	0.14	2.60	3.83
Sensitive	0.14	0.06	0.02	0.26
Card	-0.52	0.13	-0.77	-0.27
Cluster 2	0.31	0.33	-0.33	0.95
Cluster 3	-0.07	0.31	-0.68	0.54
Cluster 4	-0.77	0.34	-1.40	-0.11
Cluster 5	-0.01	0.33	-0.64	0.63
Highest Education Level (Primary)	0.12	0.22	-0.30	0.54
Highest Education Level (Secondary)	0.42	0.23	-0.02	0.86
Wealth Ranking	0.25	0.04	0.17	0.32
Card:Cluster 2	0.11	0.19	-0.26	0.49
Card:Cluster 3	0.06	0.18	-0.29	0.42
Card:Cluster 4	0.86	0.19	0.49	1.23
Card:Cluster 5	-0.02	0.19	-0.39	0.35

The other parameters model the differences in the revealed consumption of the non-sensitive items. Respondents were more likely to have consumed more items on the non-sensitive lists if they: had secondary level education; had a higher wealth ranking; or resided in cluster 1. Non-significant variables included distance to NLNP and the nearest butchery, gender, age bracket, ethnic group, residence time in the village, number of people resident in a household and non-resident dependents and number of days without protein.

4.3 Drivers of Bushmeat Use

4.3.1 Bushmeat Hunting

Responses to hunting Likert-type statements are shown in Figure 4.7. Respondents thought that hunting bushmeat didn’t command respect, was a high risk activity, and was carried out as part of a wider range of activities. More than half of respondents strongly disagreed that people only hunt bushmeat when their families will go hungry, indicating that its main purpose is not just for household food consumption, yet 73.5% of respondents agreed that people would like to stop hunting bushmeat. There was no clear opinion among respondents whether people enjoyed hunting bushmeat, hunt because their forefathers did, or if it was a good way of making money.

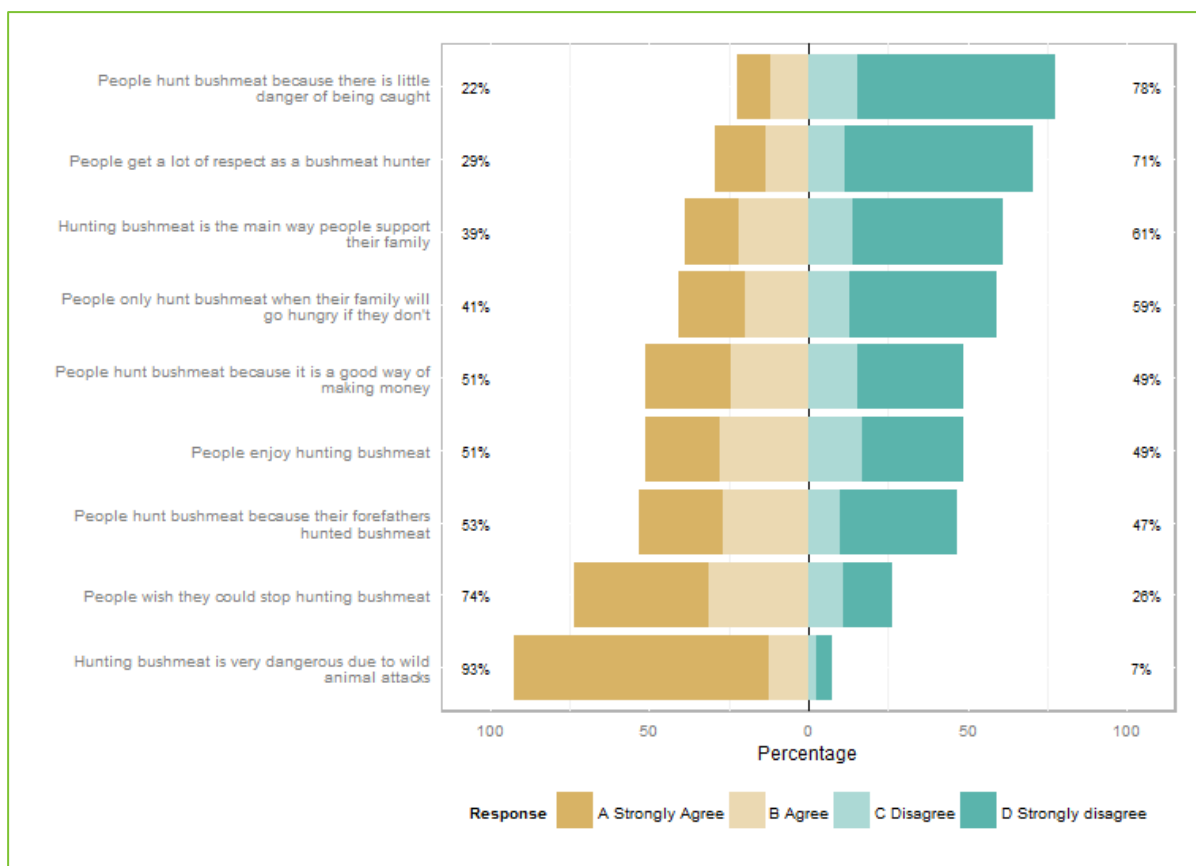


Figure 4.7: Responses to Likert-type statements on bushmeat hunting.

There was a significant difference between village clusters in responses to hunting statements representing food security, danger, income, lack of alternatives and poverty drivers (statements A-D, F and H; Table 4.7).

Table 4.7: Significant results at the 95% confidence interval of Kruskal-Wallis and post-hoc tests for differences in Likert-type statement answers between clusters for hunting.

Variable and Village comparisons	A. People only hunt bushmeat when their family will go hungry if they don't	B. Hunting bushmeat is very dangerous due to wild animal attacks	C. People hunt bushmeat as it is a good way of making money	D. People hunt bushmeat as there is little danger of being caught	F. People wish they could stop hunting bushmeat	H. Hunting bushmeat is the main way people support their family
Cluster	0.001	0.001	0.017	0.007	0.005	0.019
1-2	-	0.013	-	0.010	-	-
1-3	-	0.036	-	-	-	-
1-4	0.007	-	-	-	-	-
1-5	-	-	0.016	0.030	-	-
2-3	-	-	-	0.022	-	-
2-4	0.029	-	-	-	-	-
2-5	-	0.011	-	-	-	-
3-5	0.028	0.029	0.005	-	-	0.006
4-5	<0.001	-	-	-	<0.001	-

Post-hoc analysis (Table 4.7; Figure 4.8) showed significantly more respondents in cluster 4 strongly agreed with the statement representing food security as a driver (A) than in clusters 1, 2 and 5; significantly more respondents in cluster 4 also strongly agreed with the statement representing need for alternatives as a driver (F) compared to cluster 5. In clusters 2 and 3 significantly more respondents strongly agreed that there was danger of wild animal attacks (statement B) than respondents in clusters 1 and 5, while significantly more respondents in clusters 2 and 5 thought that there was a danger of being caught while

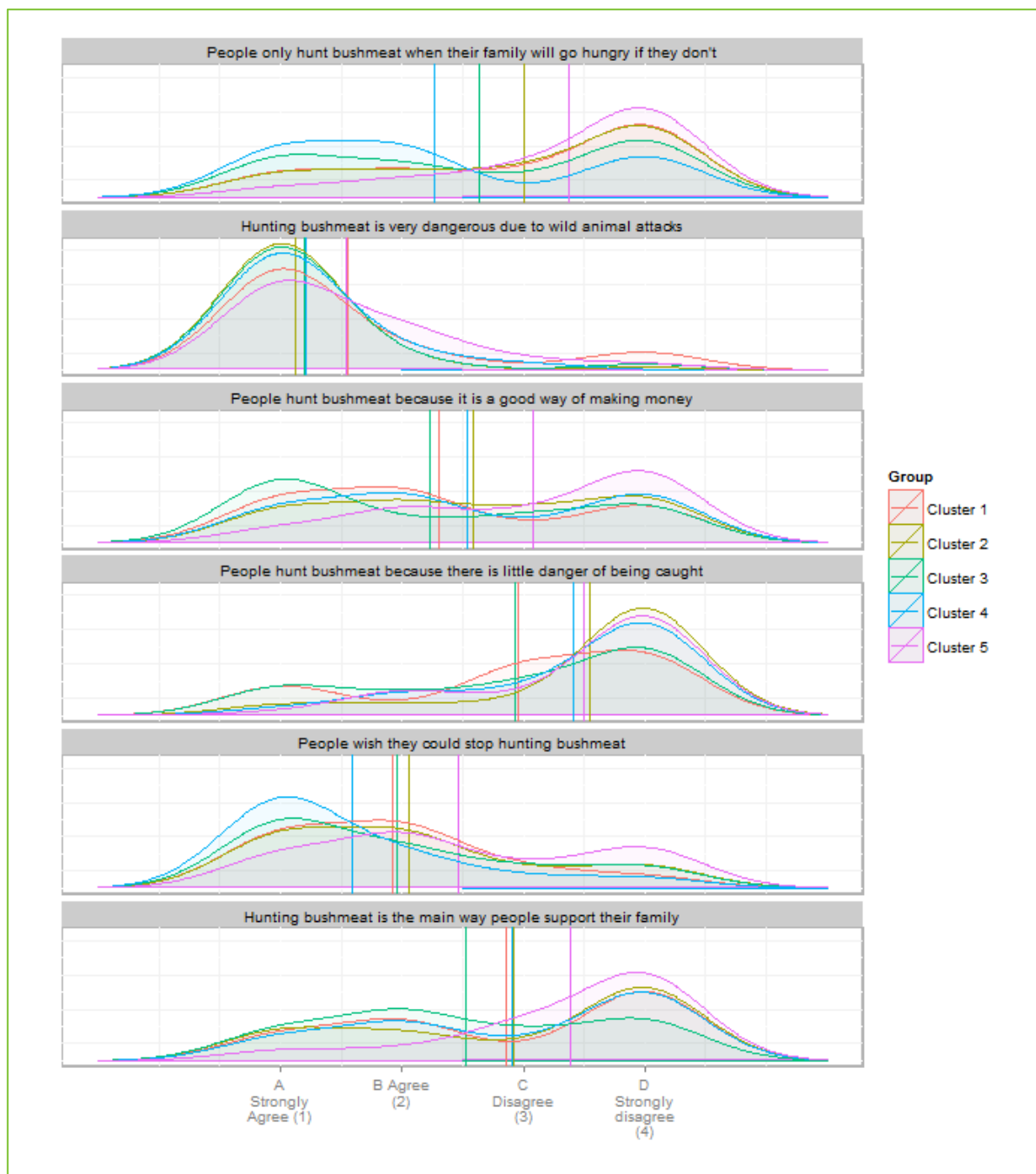


Figure 4.8: Differences in responses to Likert-type statements on bushmeat hunting by cluster.

hunting (statement D) than respondents in cluster 1. Significantly more respondents strongly agreed that hunting bushmeat was a good way to make money (statement C) in clusters 1 and 3 than cluster 5, while significantly more respondents strongly disagreed that hunting bushmeat was the main way people support their family (statement H) in cluster 5 than cluster 3.

4.3.2 Bushmeat Trading

Responses to trading Likert-type statements are shown in Figure 4.9. Bushmeat trading was seen as a dangerous, low respect activity and part of a set of ways traders support their family. Trading was not thought to be done because it was enjoyable, and was not thought to be due to tradition.

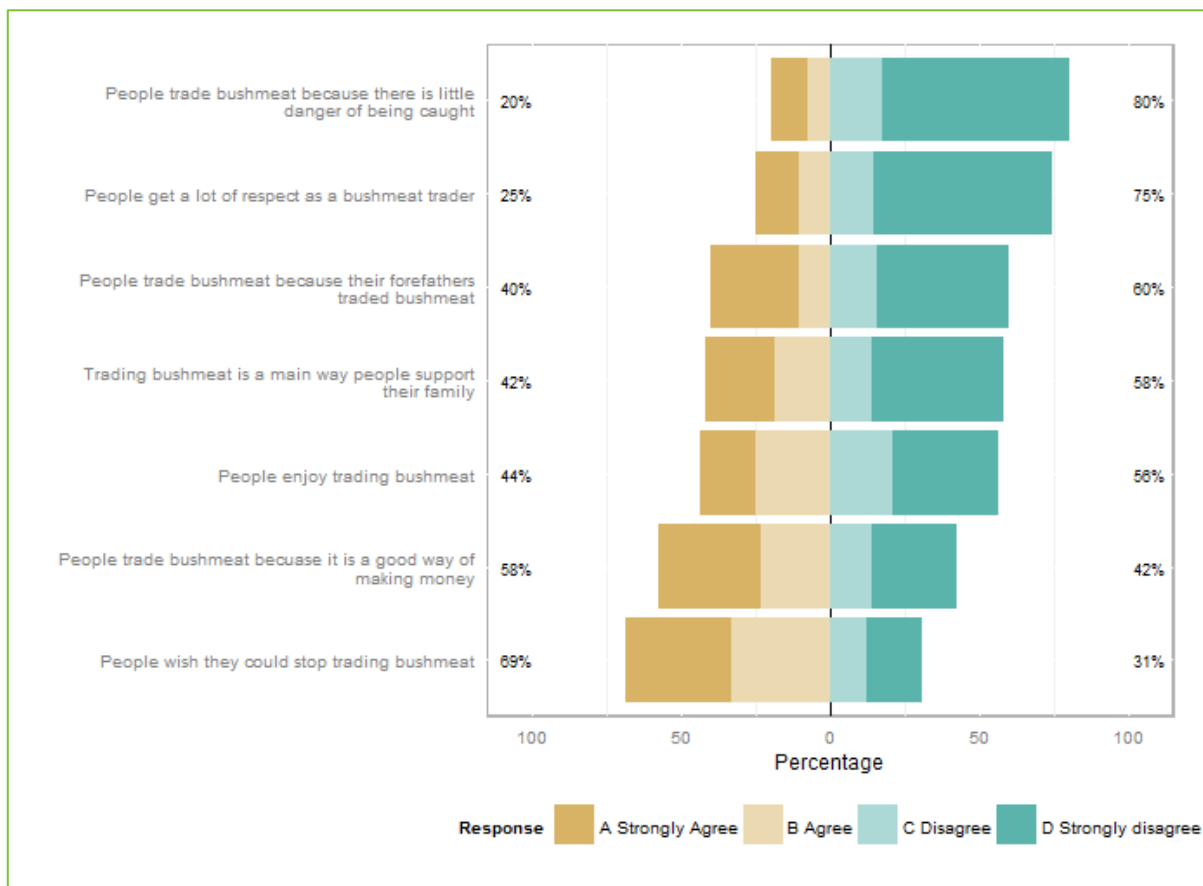


Figure 4.9: Responses to Likert-type statements on bushmeat trading.

There were significant differences between village clusters in responses to trading statements representing culture, income and poverty drivers (statements A, E and G; Table 4.8).

Table 4.8: Significant results at the 95% confidence interval of Kruskal-Wallis and post-hoc tests for differences in Likert-type statement answers between clusters for trading.

Variable and Village comparisons	A. People trade bushmeat because their forefathers traded bushmeat	E. People trade bushmeat because it is a good way of making money	G. Trading bushmeat is the main way people support their family
Cluster	0.027	0.012	<0.001
1-2	-	-	0.048
1-3	0.034	-	-
1-4	-	-	0.017
1-5	0.036	0.005	<0.001
3-4	-	-	0.043
3-5	-	0.005	<0.001

Post hoc analysis (Table 4.8; Figure 4.10) showed that significantly more respondents in clusters 3 and 5 strongly disagreed that tradition had a role in bushmeat trading (statement A) than in cluster 1, while significantly more respondents in clusters 1 and 3 strongly agreed that trading is a good way to make money (statement E) than in cluster 5.

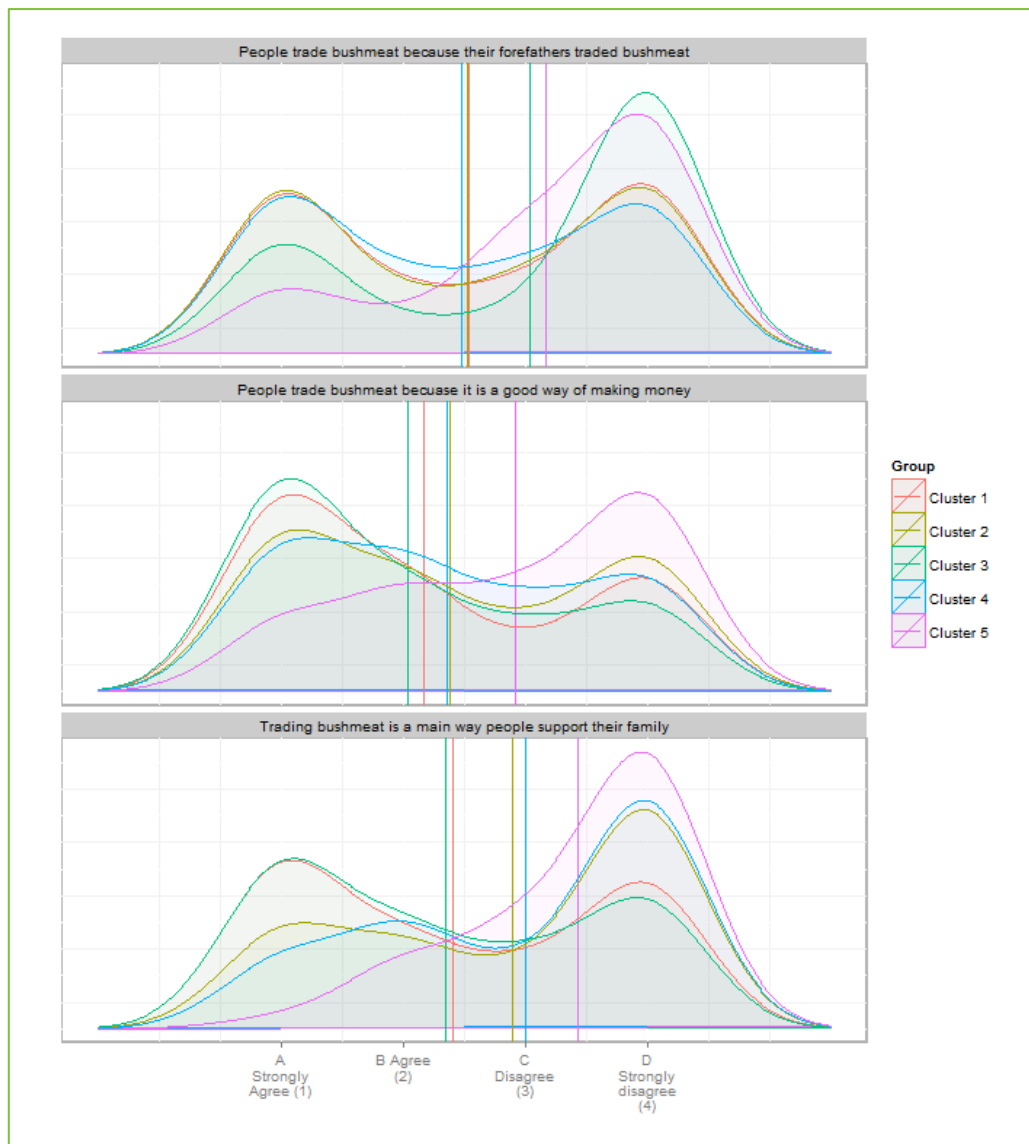


Figure 4.10: Differences in responses to Likert-type statements on bushmeat trading by cluster.

There were significantly more respondents strongly agreeing that bushmeat trading is the main way people support their families (statement G) in clusters 1 and 3 compared to clusters 4 and 5.

4.3.3 Bushmeat Consumption

Bushmeat consumption had the potential additional drivers of taste and availability of alternatives; responses to Likert-type statements are shown in Figure 4.11. Enjoyment was shown to be a driver of consumption, as was taste; most respondents disagreed that bushmeat was only eaten on special occasions, while they agreed that tradition had a role in consumption, with 56.6% agreeing that people eat bushmeat because their forefathers did. Consumption was also viewed as dangerous and 63.8% of respondents agreed that people wished they could stop. There was no clear consensus on whether bushmeat was eaten when there was no other protein available or other meat was unaffordable.

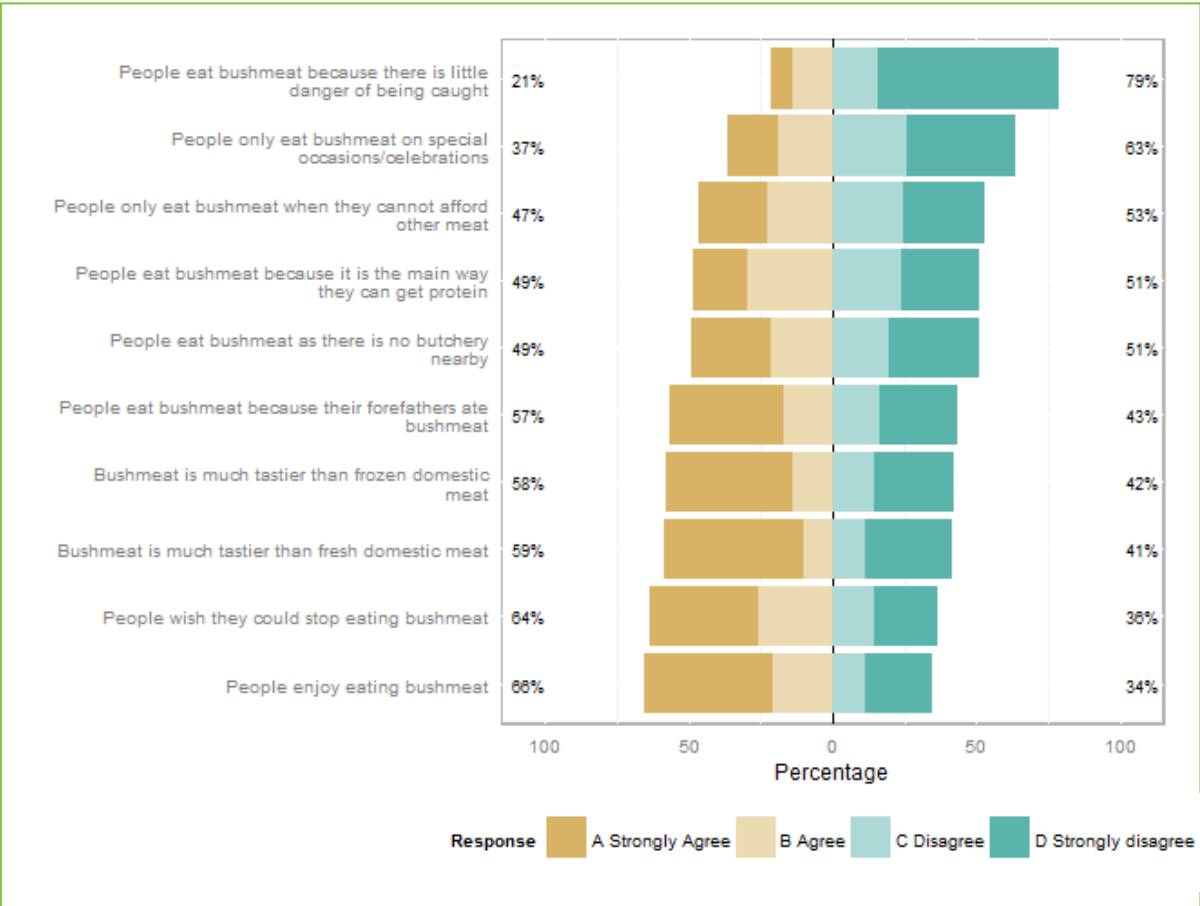


Figure 4.11: Responses to Likert-type statements on bushmeat consumption.

There were significant differences between village clusters in responses to the consumption statements representing drivers of taste, food security and enjoyment (statements A, B, C and I; Table 4.9).

Table 4.9: Significant results at the 95% confidence interval of Kruskal-Wallis and post-hoc tests for differences in Likert-type statement answers between clusters for consumption.

Variable and Village comparisons	A. Bushmeat is much tastier than fresh domestic meat	B. Bushmeat is much tastier than frozen domestic meat	C. People eat bushmeat because it is the main way they can get protein	I. People enjoy eating bushmeat
Cluster	<0.001	<0.001	0.005	0.016
1-2	-	0.028	-	-
1-3	-	0.032	0.015	-
1-4	<0.001	<0.001	0.001	-
1-5	-	-	-	0.009
2-4	-	0.015	-	-
3-4	0.038	0.009	-	-
3-5	-	-	-	0.016
4-5	<0.001	<0.001	0.014	-

Post-hoc analysis (Table 4.9, Figure 4.12) showed that significantly more respondents in cluster 4 strongly agreed that bushmeat is tastier than fresh or frozen domestic meat (statements A and B) than respondents in clusters 1, 3 and 5 (and cluster 2 for statement B). Conversely in cluster 1, significantly more respondents strongly disagreed that bushmeat was tastier than frozen domestic meat than in clusters 2 and 3. Significantly more respondents in cluster 4 strongly agreed that bushmeat was the main way people could get protein (statement C) than in cluster 1 or 5, while significantly more respondents in cluster 1 strongly disagreed with the statement than in cluster 3. Significantly fewer respondents in cluster 5 strongly agreed that people enjoyed eating bushmeat than in cluster 1 or 3.

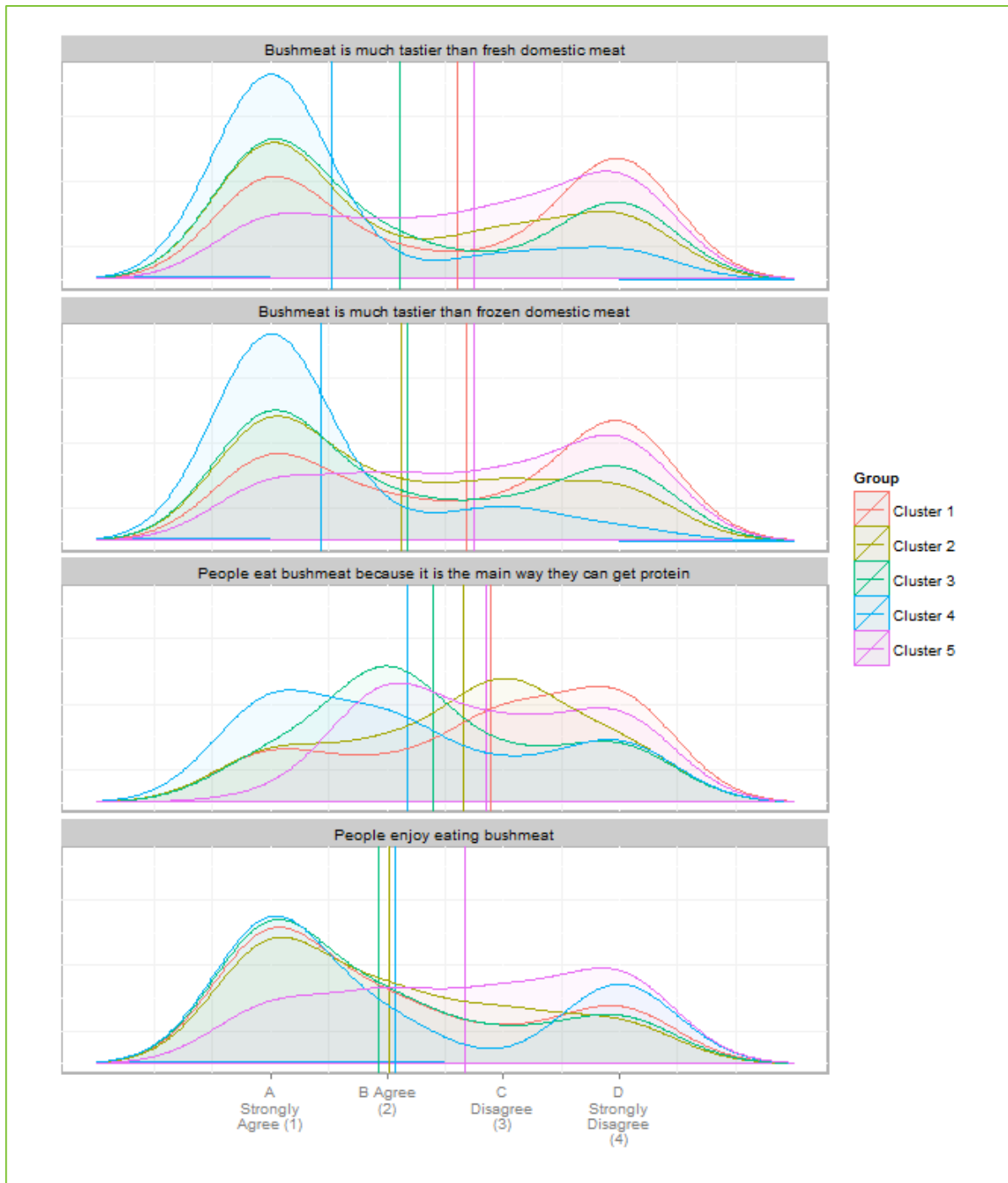


Figure 4.12: Differences in responses to Likert-type statements on bushmeat consumption by cluster.

4.3.4 Focus Group Discussion of Drivers

In contrast to the interview responses, focus groups rated need for income as the most important driver of bushmeat hunting and trading (Table 4.10). HWC was also commonly cited as a driver of hunting, trading and consumption, with crop raiding having the 4th highest cultural salience score for hunting and joint 3rd highest for trading, although it was only cited as a driver of consumption in one focus group. Animal attacks on people were

the 8th most cited driver of hunting, but were not mentioned as a driver for trading. Desire for meat/relish/protein was the main driver listed for consumption.

Table 4.10: Saliency scores and frequency of mention in focus groups of different drivers of bushmeat hunting, trading and consumption.

Driver	Hunting		Trading		Consumption	
	Saliency Score	Freq.	Saliency Score	Freq.	Saliency Score	Freq.
Income	0.38	6	0.4	8	-	-
Poverty	0.30	6	0.3	8	-	-
Meat	0.25	3	0.1	4	0.4	7
Crop Raiding	0.20	3	0.1	3	0	1
Lack of Employment	0.10	2	0	3	-	-
Relish	0.08	2	0.08	3	0.2	3
Forefathers did	0.07	1	0	2	0	2
Animal attacks on people	0.07	2	-	-	0	1
Outsider influence	0.06	1	0	2	-	-
To destroy	0	2	0	3	-	-
Hunger	0	2	0.1	4	0	3
Enjoyment	0	1	0	2	-	-
Food	0	2	0	2	-	-
No fear of law	0	2	0	3	-	-
Protein	-	-	-	-	0.27	6
Respect	-	-	-	-	0	2
No butchery	-	-	-	-	0	2

4.4 Attitudes Towards Bushmeat

4.4.1 Definitions of Bushmeat

When asked to define “bushmeat”, the largest group of respondents stated that they thought bushmeat was an animal (47.2% of responses), including wild animals, animals in the park/bush, and animals that bring income to ZAWA. 16.1% of responses mentioned specific species, including elephants (6.2%), buffalo (2.7%), rhino (0.3%), bush pig (1.6%), lion (1.1%), and impala (1.1%). 10.4% of responses described bushmeat as a natural resource or product, while 15.5% specifically described bushmeat as meat (whether from protected animals, wild animals, game animals, or from the bush). The remaining 5% of responses mentioned either positive or negative perceptions of bushmeat (1.3% and 1.1% respectively), while 2.1% described bushmeat as being “God given”, and 0.5% as it needing to be conserved.

4.4.2 Village Attitudes Towards Bushmeat Use

When asked about the attitudes of others in the village to hunting, 75.7% of responses involved reasons why hunting of bushmeat was not favoured in the village (Figure 4.13). Reasons cited included: benefits that wildlife bring including income, development and tourism; general desire for conservation including desire to conserve wildlife for future

generations; negative outcomes from hunting including fear of shared repercussions for the village, suffering of poachers’ families, and only one person benefitting from poaching; and ethical reasons such as protection of wildlife being desired by God. Of the remaining 24.3% of responses, 3.3% were focused on benefits to hunting (such as being able to buy bushmeat) and negatives to wildlife being present in the area (such as destroying crops), while 9.9% stated that people were unable to hunt (rather than not wanting to), for reasons including lack of weapons or animals nearby.

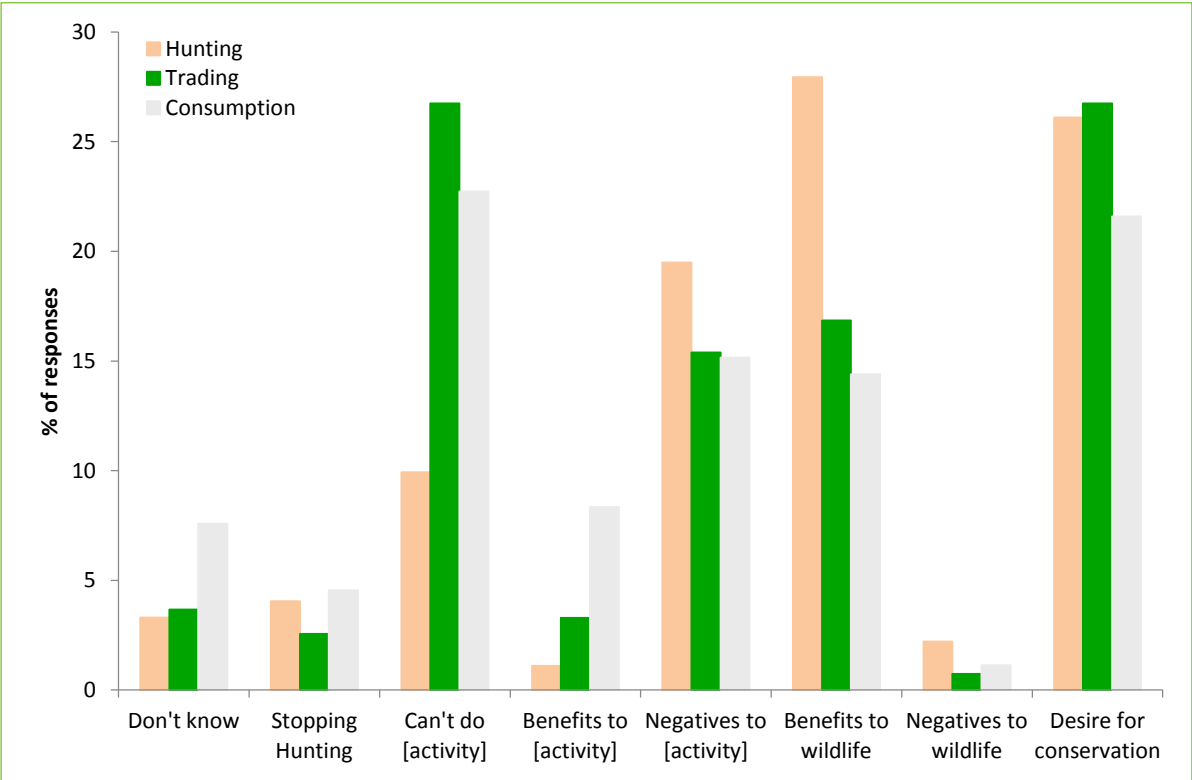


Figure 4.13: Responses to questions addressing village attitudes towards bushmeat use.

Responses on attitudes to trading had a similar range to those on hunting (Figure 4.13), but with a lower proportion of responses (59.7%). More people cited benefits to trading than for hunting, though fewer responses mentioned negatives to wildlife. A higher proportion of responses mentioned reasons why people couldn’t trade, mainly due to it being illegal or fear of arrest. Marginally fewer responses mentioned everyone in the village being opposed to trading.

Consumption had a similar pattern of responses to hunting and trading (Figure 4.13), although with a still lower proportion citing reasons why bushmeat consumption wasn’t

favoured (51.5%). 8.3% of people cited benefits to consumption compared to 3.3% for trading and 1.1% for hunting, with the main reason that people enjoy eating bushmeat.

4.4.3 Focus Group Discussions on Bushmeat Use

In each of the focus groups, HWC was mentioned in connection with bushmeat, either in combination with positive remarks (such as animals bring benefits but also destroy crops) or in entirely negative contexts, with anger also directed at the government and/or ZAWA:

“The government should realise value of a person over wild animals, because at the moment they seem to value animals more than people.” Male focus group participant, cluster 4.

Participants also mentioned benefits that wildlife brings to their community (seven out of 10 focus groups), which was also stated by some of the interviewees:

“Through wild animals is how we receive help in terms of donors and so we protect animals even though they destroy our fields.” Bisa male interviewee, aged 46-55, primary education level.

“We have received some roofing sheets because of the animals, though that is the only benefit we have seen.” Female focus group participant, cluster 5.

Six out of 10 focus groups also identified benefits to bushmeat consumption, hunting and trading, including protein in the diet, better taste than domestic meat, and the ability to sell meat for income. However, of those six, three also mentioned negatives of bushmeat, such as it leading to depletion of wildlife and the potential for arrest. Two other focus groups also discussed negatives to bushmeat use, including the potential for harm to come to hunters, and the potential negative social outcomes:

“Poaching is always shunned upon as it has bad consequences...your marriage can even end...you bring shame and embarrassment to your family.” Male focus group participant, cluster 1.

4.5 Seasonality of Bushmeat Use

The focus group discussions showed that there are three seasons of weather in the region (Figure 4.14).

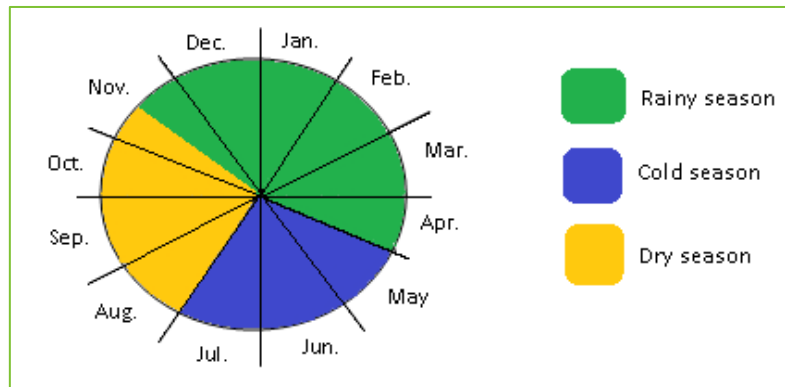


Figure 4.14: Calendar of seasons around North Luangwa National Park

The majority of respondents reported that there was no season in which more bushmeat was hunted, traded, or consumed (53.6%, 62.3% and 64.1% respectively). However, respondents varied between stating that this was due to their being no hunting, trading, or consumption in the village and because there was no specific season when use was higher. The predominant reasons for people not engaging in bushmeat use were that it was illegal or that people fear the law or ZAWA ; a much lower proportion of the responses cited lack of use being due to a desire to conserve (between 1.4% and 1.7% of responses) or because it had negative connotations (hunting only, one response). Reasons for bushmeat use being all year round included that it was whenever licences were given out, or when control was carried out on problem animals by ZAWA. However, some respondents also gave ZAWA animal control as the reason why more bushmeat was available in the wet season:

“We experience severe crop damages by elephants and this normally calls for game cropping. The most troublesome elephant is killed by the ZAWA game scouts and the meat shared among all the people in the village.” Bisa female interviewee, aged 18-25, primary education level.

Excluding null responses and “don’t knows”, the dry and wet seasons were those most commonly cited as the peak seasons for hunting and trading, with approximately equal numbers of respondents stating each season (15.8% for each for hunting; 12.7% for trading

in the dry season and 12.3% for trading in the wet season). There were more responses for the peak consumption in the wet season than the dry season, but were still very close (17% and 13.5% respectively).

The most cited reason for peak bushmeat use in the dry season was due to drought:

“The drinking points in the bush dry up and the game animals move closer to the villages in search of water in nearby streams and rivers.” Bisa male interviewee, aged 18-25, secondary education level.

Other reasons provided were associated with it being easier to hunt in the dry season, including:

“People are afraid to walk in the rain to hunt. Bushmeat is usually dried and so it is easier to dry meat then.” Bemba male interviewee, aged 26-35, secondary education level.

However, there were also converse reasons for why it was easier to hunt in the wet season, such as the greater difficulty of guarding and patrolling by ZAWA scouts making it easier for poachers to hunt unimpeded, and the greater vegetation growth allowing animals to feed closer to villages, making it easier for people to hunt them.

Less cited reasons for peak bushmeat use in the wet season included desire for bushmeat to celebrate occasions such as Christmas; there was also a more subtle variation on this answer, linked to income security:

“People want to celebrate the Christmas event by selling game meat to raise income for other essentials during this period.” Bemba male interviewee, aged 26-35, secondary education level.

Food security was also cited by between 3% and 5.6% of respondents as a cause of peak bushmeat use in the dry and rainy seasons respectively, with more respondents stating it as a reason for peak use in the rainy season:

“In this period people are cultivating and the crops are not ready for harvesting so people resort to bushmeat.” Senga female interviewee, aged 18-25, primary education level.

Lack of income was also listed as a reason for bushmeat trading and hunting during the dry season, as explained by this man:

“During this period people run out of money that they had kept from harvested crops, so they trade more to have some money.” Bemba male interviewee, aged 26-35, primary education level.

For those respondents that listed the cold season as peak for bushmeat use, the predominant reasons provided were related to crop raiding behaviour in animals due to food scarcity in the bush.

4.6 Changes in Availability of Bushmeat

Of the 10 focus groups, seven determined that the population of animals in the areas was currently increasing, while three thought that they were reducing. Reasons provided for increasing populations centred around a recovery from the poaching epidemic of the 1970s and 1980s, with specific reasons including the awareness work of Mark and Delia Owens (2 focus groups), education work on the part of ZAWA (1 focus group), patrol and protection of wildlife on the part of ZAWA (3 focus groups), and lack of hunting tools due to participation in a tools for farming equipment exchange (1 focus group). Two focus groups mentioned that even though animal populations were increasing, there were still less than there used to be:

“A long time ago I think there used to be more animals than now, as we used to hear stories from our parents about animals right inside the village, but now only those nearest the park have that.” Female focus group participant, cluster 2.

Of the three focus groups which stated that they thought animal populations were reducing, two did not give a specific reason, and the other cited HWC and crop raiding causing resentment and increased poaching in retaliation:

“People poach more due to animals coming from the park to people’s fields to eat, possibly because there less resources available for them in the park.” Male focus group participant, cluster 2.

Half of the focus groups concluded that there was no bushmeat traded or consumed in their village at the moment, and suggested this was the status quo. The other half stated that bushmeat in their village had reduced over the last 50 years, with very little or none currently being available. Reasons cited for this reduction included fear of arrest (2 focus groups), ZAWA protecting the animals (2 focus groups) and a reduction in the number of animals in the villages/surrounding area (2 focus groups). One participant attributed this to greater wariness on the part of the wildlife:

“There is less bushmeat because animals no longer come to our villages, probably because they stay in the park because they are scared of people.” Female focus group participant, cluster 5.

4.7 Bushmeat and the Law

Respondents’ understanding of Zambian law on bushmeat was generally limited and varied between different types of activities. For example, for hunting, 31% of responses correctly identified that hunting was illegal, but only 18% mentioned that it was allowed with a licence. A small number of responses mentioned specific rules that must be observed while hunting, such as not destroying the grass (2 responses), or not hunting “carelessly” (3 responses). There was a higher proportion of responses for trading identifying the need for a licence (26.6%), and fewer responses identifying that trading was illegal (23.3%). However, there was more variation in the conditions of when trading was illegal than for hunting, with two responses (0.7%) stating that buying is illegal, three that possession is illegal and one that a licence has to cover hunting and selling. Consumption had fewer respondents correctly identifying the law, with 21.4% stating that consumption is illegal, and wider variation in the conditions in which it is legal to consume meat, with 4.9% stating that it is not allowed without a permit, 5.3% stating that the trader has to be licensed, 2.5% stating that the original hunting has to have been licensed, and 6.7% stating that the meat has to be legally obtained/licensed (without specifying how this occurs).

Seven of the 10 focus groups discussed that the process of obtaining a licence was not clear to them; one focus group also commented on the number of licences available:

“There are a lot of people, but few hunting licences, so it is a major problem when licences run out; people still want to hunt so they may do it anyway.” Male focus group participant, cluster 3.

Focus groups also discussed whether the punishment for poachers was appropriate. Three focus groups stated that punishment for poachers should be harsh to discourage others from poaching, as described by this man:

“If poachers are harshly punished, they will be discouraged, as even children seeing the harsh punishment will be discouraged from poaching in the future.” Male focus group participant, cluster 2.

However, others focused on the different motivations of those who poach, with five of the 10 focus groups proposing lighter punishment for those who poached to support their families and a greater penalty for those who poach for commercial gain. One focus group also discussed the likely ineffectiveness of harsh punishment:

“Harsh punishment is not the solution, because poachers go into business as retaliation for crop damage.” Female focus group participant, cluster 4.

Conversely, some participants of the women’s focus group in cluster 2 thought that punishment should be lax, as arrest of poachers has negative impacts on the families they support.

4.8 Alternatives to Bushmeat Use

Many interview respondents (23.3%) suggested alternatives to bushmeat-related activities without specific prompting. The majority (44.2%) were focused on government interventions such as creation of employment, loans and fencing of fields. 11.5% of the suggestions were based around domestic meat/livestock, such as being given domestic animals. This was also mentioned in six of the focus groups as a solution:

“People should be empowered to rear more domestic animals e.g. pigs, goats, chickens. That will reduce poverty as people can export the meat or sell the animals.” Men’s focus group participant, cluster 1.

One focus group also mentioned the possibility of setting up loans to allow people to buy domestic animals or set up fish farms. More generally, six out of the 10 focus groups mentioned the need for an alternative income source from farming to allow year round income, and to remove some of the risk of drastic income loss due to crop-raiding by wildlife. The need for a different income source was summarised by this woman:

“The best way to reduce poachers...is to give them a different form of livelihood, so that they can send their children to school and get money to buy food for their families.” Women’s focus group participant, Cluster 4.

The need for a butchery for either domestic or bushmeat was mentioned by four respondents in the semi-structured interviews, and in two focus groups:

“I think a butchery for bushmeat should be opened in the village to discourage poaching activities. People will definitely buy.” Bemba male interviewee, aged 46-55, primary education level.

Education was also mentioned by five respondents in the structured interview, but was only mentioned in one focus group (cluster 1 men’s focus group). The most common suggestion in the interviews (11.5%) was for licences to be easier or cheaper to get; seven of the focus groups also discussed the difficulty of obtaining a licence.

Other suggestions for reducing peoples’ dependence on bushmeat included reintroduction of culling or resumption of safari hunting as a way of obtaining bushmeat, and suggestions from focus groups including vaccinations for livestock (cluster 4 men’s focus group) and provision of electric or chilli fences (cluster 4 women’s focus group). Two interview respondents also mentioned the need for better market access, with potential impacts on bushmeat use:

“The place where we sell our produce is far and transport is limited; if access was easier I am sure that people may stop trading and eating bushmeat.” Bisa male interviewee, aged 36-45, primary education level.

“People cry for customers for their produce. If they can have customers they can generate some income, and in this way there can be a reduction in poaching.” Bisa female interviewee, aged 36-45, secondary education level.

5. Discussion

5.1 Research Aims

5.1.1 Demographic and Seasonal Patterns in Bushmeat Use

5.1.1.1 Demographic Patterns in Use

In order to prioritise planned interventions, it is important to understand how common use of bushmeat is in the target area. Estimates of bushmeat use based on both respondents' estimates of village use and the UCT suggest that hunting and trading occur infrequently (if at all), while consumption is more common but still at a low prevalence. These figures are contradictory to the opinions of ZAWA staff (Mulena, 2014; Indala, 2014) and arrest records from NLNP (Appendix VII), suggesting either that the UCT questions have failed to accurately capture the true frequency of bushmeat use or that patrol reports and ZAWA opinion does not present a rounded, representative picture of the relative frequency of use (a potential problem with law enforcement records; Gavin, Solomon & Blank, 2010). However, relative to a previous estimate of 0.04% for households that hunt in the Luangwa Valley (Marks, 1979) this study has identified an approximately twenty-fold increase in the prevalence of bushmeat hunting over the last thirty years.

Interestingly, cluster 4 showed the lowest mean number of people engaging in hunting, trading and consumption, when it might be expected that the incidence of bushmeat use would be highest there, due to relative poverty and poor market access (Westhuizen, 2007; Brashares et al, 2011; Moro et al, 2013). Cluster 4 was one of those furthest away from a butchery (at 81.7km); this distance can also be used as a proxy for distance to markets and other facilities, as the nearest butchery for each cluster was in the nearest town (either Mpika or Lundazi). This remoteness helps to explain why those in cluster 4 were poorer than those in the other clusters, as it would be harder to sell produce at market or access alternative employment in towns (Brown & Marks, 2005; Brashares et al, 2011; Lindsey et al, 2013).

Respondents' estimates of the number of people that they knew who used bushmeat over different time periods suggested that frequent use (i.e. every month or every week) was less common than one off annual use (although only trading showed a significant

difference between the time periods). This could be supposed to be due to awareness of the illegality of use, and so people only hunt, trade or consume occasionally to reduce the chance of arrest, or that respondents, with that awareness, felt that to state lower frequency would be less “incriminating”.

The low estimates of use could be explained by a reluctance to discuss use of bushmeat, even indirectly, as indicated by the majority of responses being 0, no response, or “don’t know”. As ZAWA staff (Mulena, 2014; Indala, 2014) and incident records (Appendix VII) indicate that bushmeat hunting, trading and consumption are much more prevalent than estimates from this research suggest, the low estimates appear to confirm that bushmeat use is a highly sensitive topic in the area (Fairbrass, 2012; Nuno, 2013; Siachoono, 2014). In addition, the higher estimate for bushmeat consumption with a lower estimate for hunting and trading is apparently contradictory as there are few legal sources of bushmeat which could be fuelling such consumption; focus group discussions indicated that there was little control meat available in the past year, and that local people did not know how to obtain licences to hunt legally.

This sensitivity confirms UCT was appropriate to examine bushmeat prevalence in the area, as it minimises the discomfort of respondents (Dalton, Wimbush & Daily, 1994; Glynn, 2013; Tourangeau & Yan, 2007). The higher estimate of bushmeat consumption could be due to consumption being seen as a less sensitive topic; few respondents were able to correctly identify the law on consumption, indicating that they were less aware of the potential penalties and therefore more comfortable with discussing it. Consumption may also be perceived as a less complicit activity, as they may not have killed the animal.

Despite efforts during study design, the substantial numbers of very high or very low counts on the control cards suggest that there is potential for floor and ceiling effects to have occurred (Glynn, 2013). 18 respondents in effect directly stated that they had consumed bushmeat by responding that they had consumed all of the items on the “sensitive” list, while for hunting and trading only 3 and 2 respondents respectively revealed themselves in this way, reinforcing the view that consumption is a less sensitive topic. The very low counts were much more marked, with 83 and 77 respondents giving an answer of 0 for one or both lists for the hunting and trading questions respectively, although there were only 9 respondents responding with 0 for consumption.

The higher indication of potential floor effects in hunting and trading is indicative of the difficulty in designing UCT lists which address income activities when the area of interest is characterised by having few income activity options (Brown & Marks, 2005; Lindsey et al, 2014). Conversely, the opposite difficulty was encountered when designing the consumption lists, as the scarcity of protein sources in the area (Brown & Marks, 2005) meant that there were very few contextually appropriate protein sources that respondents wouldn't have eaten. This difficulty is therefore something that should be considered carefully when choosing non-sensitive items for UCT, and the greater effective sample size of a double-list technique should be weighed against the need for more non-sensitive items. In addition, specific methodology-orientated focus groups could be used to elicit an appropriate range of non-sensitive items to use.

That the UCT worked to some degree for consumption is shown by the results of the model (Table 4.4) which showed that the being shown the "sensitive" list caused a higher number of items to be listed as consumed. The lack of significant interaction between the "sensitive" term and any of the demographic variables is potentially due to a relatively small sample size.

The use of double-list UCT was novel for conservation research. While the application of the technique in this study had some difficulties, its use should nevertheless be recommended for the field, due to the potential for the technique to effectively double the number of responses obtained for both the sensitive and baseline lists (Glynn, 2013). This technique could usefully be implemented in situations where a relatively small sample size is anticipated, an indirect method of questioning is deemed appropriate (Table 2.1; Gavin, Solomon & Blank, 2010) and there are concerns that RRT may be difficult for respondents to understand (Razafimanahaka et al, 2012) or may provide less accurate estimates (Coutts & Jann, 2011).

5.1.1.2 Seasonality of Bushmeat Use

The high proportion (45.7-56.9%) of respondents who stated that there was no season for bushmeat use may also be indicative of the sensitivity of bushmeat as a topic. This is supported by the fact that the rest of the respondents gave definite seasons when bushmeat use was higher. This suggests that either there was reluctance to discuss the topic,

or ignorance of the extent of bushmeat use, and therefore in which season it was more prominent. The latter explanation is a reasonable possibility, as bushmeat trading was often described by respondents as secretive (cf. Barnett, 1997); it is therefore possible that those perceived not to be in favour of bushmeat would not be approached to purchase.

The approximately equal proportion of responses citing the wet and dry seasons as those of peak bushmeat, coupled with the logical arguments for each and the support of previous research (Barnett, 1997; de Merode, Homewood & Cowlshaw, 2004; Holmern, Muya & Røskaft, 2007; Lindsey et al, 2011, although see Pangau-Adam, Noske & Muehlenberg, 2012), suggest that instead of there being a peak season of bushmeat use, there is instead a “slack” season, the cold season, when bushmeat use lessens. This is contrary to previous research in the Luangwa Valley indicating that the majority of bushmeat was harvested in the dry season (Brown & Marks, 2005). A shift to all year exploitation of bushmeat could be due to increased consumer demand in urban areas (cf. Barnett, 1997) or an increase in law enforcement effort during the dry season (Lewis, 2014) necessitating a move away from dependence on one season. It is also important to consider the annual crop cycles in the context of seasonality of bushmeat use, e.g. that during the wet season households are often waiting for crops to ripen (“hungry months”, de Merode, Homewood & Cowlshaw, 2004), or that there may be seasonality of crop raiding (Sennett, 2013), and thus reliance on natural resources (such as bushmeat) increases (Kalaba, Quinn & Dougill, 2013).

5.1.2 Main Drivers of Bushmeat Use

Previous studies of bushmeat use in Luangwa Valley identified income generation, enjoyment and community respect as drivers of hunting, potential for income as a driver of trade and lack of availability/affordability of alternatives or preference over domestic meat as drivers of consumption (Barnett, 1997; Brown, 2003; Brown & Marks, 2005; Lindsey et al, 2013). Results in this study indicate that attitudes have changed over the past decade, to the extent that hunting and trading bushmeat no longer command respect and many people would like to stop. This apparent change in the drivers of hunting and trading may be explained by an increase in the perceived danger of arrest, as well as potential for physical harm from wild animals during hunting. This may also link to the apparent sensitivity of bushmeat use as a topic, as discussed above, as heightened risk (or perceived risk) of reprisal is likely to make respondents less willing to discuss the issue (Tourangeau & Yan, 2007).

Nevertheless, hunting and trading appear to remain a part of household income generation, with respondents' strong disagreement that hunting and trading are the main ways people support their family indicating that they are instead part of a diverse portfolio of income generating activities, and that they are carried out on more occasions than when the family is experiencing hunger. This stability in one of the main drivers of hunting and trading is likely to be due to the poverty that residents in the study area still experience, with few income generating options other than farming available (Brown & Marks, 2005; Lindsey et al, 2014).

A previously unreported driver of bushmeat use which emerged from this study was HWC. Sennett (2013) demonstrated that crop-raiding impacts food and income security adversely in Mukungule GMA and is a key source of conflict. Similarly, focus group discussions during the present study confirmed that crop-raiding was perceived as a serious issue, with three of ten groups stating it as a driver of bushmeat use. Given extensive reliance on crops for subsistence and income across the study area, it is understandable that farmers hunt and trade bushmeat to prevent or retaliate for damage and compensate for lost food or income. This conflict is likely compounded by perceptions that ZAWA does not act swiftly or appropriately to address problem wildlife when requested.

The significantly different responses for some of the Likert-type statements in cluster 4 (Figures 4.8, 4.10 & 4.12) can be linked to the socio-economic differences in this cluster relative to the others. The greater number of days without protein (Figure 4.1) indicates greater food insecurity in this cluster, and similar to other studies (Mfunda & Røskaft, 2010; Knapp, 2012; Kalaba et al, Quinn & Dougill, 2013) potentially explains why more respondents strongly agreed that bushmeat is the main way that people can get protein and that hunting is a result of food insecurity in a household. The significantly lower wealth score (Figure 4.2) indicates that there may be fewer income activities in the area, which would explain why more respondents strongly agree that trading is the main way people support their family as natural resources are relied upon for livelihoods (de Merode, Homewood & Cowlshaw, 2004; Brashares et al, 2011). The greater number of respondents in cluster 4 strongly agreeing that bushmeat was tastier than fresh and frozen domestic meat is potentially an indication that consumption is less sensitive in cluster 4 than other areas, potentially due to

a higher quantity of control meat relative to other clusters and thus a lower bias of negative social desirability (Tourangeau & Yan, 2007).

5.1.3 Attitudes Towards Bushmeat Use

The large number of responses stating that bushmeat hunting, trading and consumption were disliked in the villages (75.7%, 59.7% and 51.5% respectively) show that the majority of people do not look upon bushmeat use favourably, despite it still being potentially considered as necessary by those who have suffered crop-raiding, livestock depredation, or other damages to their food and income security. This is potentially indicative of an effect of long-term education and awareness campaigns (such as that of the NLCP; FZS, 2014), as well as an increase in the effectiveness of law enforcement, which has been shown to change attitudes and reduce bushmeat use (Gandiwa et al, 2013; Moro et al, 2013; Nielsen, Jacobsen & Thorsen 2014). This is supported by the citation of benefits of wildlife and the negatives of enforcement repercussions as reasons for dislike of bushmeat use, and such a shift in the “collective morality” of villages could have caused the low rates of use found in this study (Keane et al, 2008). However, the second potential explanation is that respondents are more aware of the increased risk of repercussions from bushmeat use, and thus do not wish to reveal their “true” attitudes, but instead give the answer that they think the questioner wishes to hear (Tourangeau & Yan, 2007). This latter explanation is supported by the lower proportion of respondents who reported that consumption of bushmeat was disliked compared to hunting and trading, when fewer respondents could correctly identify the law on consuming bushmeat, therefore rendering it a less sensitive topic as the punishment was less well understood (Tourangeau & Yan, 2007).

The mix of definitions of bushmeat given by respondents, including either being an animal or meat reflect the difficulty of translating the English word “bushmeat” into the two local languages, Bemba and Nyanja. Whilst in English “bushmeat” is usually thought of as a harvested wild animal for food/non-food purposes (CBD, 2011), in Bemba and Nyanja the same word is used to refer to both the game meat from a harvested wild animal, and the live wild animal (more analogous to the English word “wildlife”; Mwale, 2014). This was only a potential issue for the focus groups, as after asking respondents in the structured interviews for their definition of bushmeat they were given a standard definition to consider when answering the remaining questions. However, it serves to highlight the importance of

understanding the full cultural and linguistic context of an area before undertaking surveying (Newing, 2011).

5.1.4 Changes in the Availability of Bushmeat

Indications from half of the focus group discussions that availability of bushmeat for consumption has reduced over the last 50 years is positive, with increased law enforcement efforts perceived as being a main driver in the reduction. The majority of the focus group discussions also indicated that wildlife populations were currently increasing, with half of the discussions citing FZS programmes run by Mark and Delia Owens in the 1980s or the education programme run by NLNP today (FZS, 2014) as reasons why the amount of wildlife was currently increasing. Whilst it is difficult to prove links between education programmes and changes in behaviour, links have been shown between environmental/conservation knowledge and behaviour (Damerell, 2009; Cornelisse & Duane, 2013, although cf. Waylen et al, 2009) and research has shown that law enforcement efforts affect bushmeat use (Gandiwa et al, 2013; Moro et al, 2013; Nielsen, Jacobsen & Thorsen 2014). Therefore these results support the continuation of education projects and high enforcement presence and outreach in the region.

5.1.5 Understanding of Laws and Regulations Regarding Bushmeat Use

The relatively low proportion of respondents who correctly identified the need for a licence to hunt or trade bushmeat indicates that whilst there is understanding of the general regulations concerning bushmeat use there is poor understanding of the actual law. This may be partly due to confusion from local laws given by Chiefs enacting different or stricter regulations than those stipulated under national law, or it may be that insufficient effort has been put into educating people on the law.

The poor understanding of the licensing system reported in the focus groups is unsurprising given the low number of respondents in the interviews who correctly identified the need for a licence to hunt or trade bushmeat. The lack of understanding of how to obtain a licence, coupled with the apparent lack of understanding as to why there are set numbers of licences indicates that an education campaign explaining how the licensing and quota system works may help to dispel some of the current animosity apparently felt towards ZAWA and the government which has been displayed in a number of focus groups

and interviews. It is not enough to enact laws without ensuring that those who are affected by them are aware of their remit (Keane et al, 2011), as environmental attitudes have been shown to be linked to the knowledge subjects have (Arcury, 1990; Aipanjiguly, Jacobson & Flamm, 2003; Adefalu et al, 2012).

5.1.6 Views on Alternatives to Bushmeat Use

The suggestions for alternatives to bushmeat use focused on either different ways to improve food and income security, or ways to legally obtain bushmeat. These suggestions of alternatives reflect the drivers of bushmeat use that have emerged from this research (poor food and income security, HWC and enjoyment of consumption) and indicate that villages would be receptive to projects addressing these drivers.

5.2 Implications and Recommendations for Conservation Interventions and Policy

Building on the research findings, discussion of alternatives to bushmeat in the focus groups and discussions made by interview respondents, the following recommendations can be made:

1. *Projects addressing the drivers of bushmeat use:*

As two of the main drivers found were poor food and income security, and HWC, projects aiming to reduce bushmeat use should tackle these directly. The need for alternative sources of income and food could be addressed by projects such as establishing and sourcing more local butcheries and expansion of the Community Conservation Banks (COCOBA; Sulle, 2012) project to increase financial stability and loan access (cf. Moro et al, 2013) (or potentially combining the two in a locally run COCOBA butchery). Projects trialling methods to address HWC (see Sennett, 2013 for a discussion of elephant related HWC) also appear to be needed. Projects should also aim to address the causes of peaks in bushmeat use (e.g. increased use in the wet season due to food shortage and in the dry season due to crop raiding) with a strategy adaptive to the demands of different seasons.

2. *Partnership with development organisations:*

It should be noted that some of the main issues identified as associated with the use of bushmeat are fundamentally also development issues (i.e. poor food and income security; cf. Brown and Williams, 2003). It is therefore advisable to consider partnership with development organisations that have experience in the region to optimise project planning and implementation, as well as having the benefits of pooled resources.

3. *Targeted conservation interventions:*

Despite the estimates for hunting, trading and consumption being low, arrest data and estimates of the number of people known to respondents to have used bushmeat can be used to target conservation interventions to those areas which are the source of most bushmeat users. It is suggested that areas of focus for future conservation interventions are those with bushmeat use “trigger factors” such as HWC and resulting (or other) food and income insecurity, long distance to a butchery, and ongoing loss of livestock to wildlife predation and disease. Such conservation efforts would also contribute to improving the lives of people in such areas.

4. *Education on the law:*

The results show that respondents do not have a uniform understanding of the law on different types of bushmeat use, or of the purpose and use of licences. With the aim of increasing compliance with the law through enhanced knowledge of it and alleviating anger at a system which many appear to perceive is unfair, it is recommended that an awareness campaign be undertaken, potentially run through the CRBs and VAGs for maximum reach.

5. *Bushmeat supply:*

As people still perceive bushmeat to have a superior taste to domestic meat and eating it to be an enjoyable activity, it seems likely that even if household food and income security can be improved there will still be those who desire to eat bushmeat (especially when considering the potential for an increase in the demand if household income increases enough for bushmeat to be an “affordable luxury”;

Wilkie & Godoy, 2001). The potential for sustainably satisfying this demand should therefore be considered. Possibilities include a redesign of the current control/cropping system of wildlife, with the creation of “bushmeat butcheries” for the sale of the produce of problem animal control. To avoid ill-feeling, thought would need to be given to ensuring that those who directly suffered from HWC due to the problem animal were not marginalised. Alternatively, game ranching could be introduced to GMAs. Whilst there are currently commercial game ranches in non protected/GMA land in Zambia, there is much potential for expansion of the industry, as current supply does not meet demand (Lindsey et al, 2013). With suitable policy and legislation changes, community run game-ranches could be established within GMAs, which could provide both bushmeat and income to communities involved, thus addressing multiple drivers of bushmeat use. In addition, in some respects game ranching is potentially more suited to the Luangwa Valley than domestic livestock, due to the presence of tsetse fly and trypanosomiasis in the area. Game ranching would reduce the need for routine vaccinations and veterinary care (Munang’andu et al, 2012; Lindsey et al, 2013).

5.3 Future Research

Going forward, the following research avenues should be explored to further the understanding of bushmeat and potential alternatives around NLNP:

1. *The price of bushmeat:*

One important dynamic of the bushmeat trade which it was not possible to explore in this study was the price of bushmeat, and the effect of price changes on demand and supply. Research could be conducted using market surveys, records of historical prices of bushmeat (e.g. Brown & Marks, 2005) and a choice-experiment protocol (Moro et al, 2013; Nielsen, Jacobsen & Thorsen, 2014) to construct a model of price factors influencing bushmeat demand. The resulting model could then be used to further inform potential conservation projects.

2. *Feasibility of game ranching:*

To appropriately design a game ranching project, it is important to know the conditions under which communities would be prepared to invest in such a project (either in time or money). A choice experiment design could be used to determine supplies needed from the conservation organisation (e.g. fencing materials, stock), and those which communities would be prepared to provide. As game ranching requires potentially large start-up costs and areas of land (Lindsey et al, 2013), a feasibility study should also be conducted to inform plans.

3. *HWC Mitigation:*

HWC emerged as a significant contributing factor to bushmeat use, both in terms of lost food and income and in terms of retaliatory killings. Mitigation of HWC should therefore aid in reducing the use of bushmeat in the area. However, Sennett (2013) showed that previous approaches to mitigate one aspect of HWC (elephant crop-raiding) have had mixed success; it would therefore be informative to begin systematic trials of known HWC mitigation techniques to assess amenability to communities and success in reducing conflict. As there are likely to be variations in the forms of conflict and species involvement between different areas of the GMAs surrounding NLNP, a wide geographical spread of trials would be advisable, making this likely to be a long-term trial. To ensure that participating communities did not potentially lose crops due to the trial, a safety-net scheme would have to be in place to compensate farmers in kind for lost crops.

5.4 Conclusion

Bushmeat use is occurring in the area around NLNP and is intricately linked with development issues, such as poor food and income security, while HWC also has a significant role. Resentment against the part of the authorities and a lack of clear understanding of the law on bushmeat use and accessing legal hunting rights has the potential to promote defiance and lead to ineffectiveness of the law.

Future conservation projects can address these issues, providing viable and structured alternative sources of food and income together with significant education on the applicable law, its provisions and the reasons underlying its formulation.

Partnership with development organisations, both in addressing the socio-economic drivers of bushmeat use and in a pooling of resources and knowledge, would potentially assist in achieving the conservation target.

The results of this survey indicate a possible increase in bushmeat hunting in the area over the past thirty years and a continued increase, or possibly even maintenance of current levels, has the potential to seriously threaten wildlife populations in the region.

However with a clear understanding of the factors contributing to bushmeat use, approaches both conventional (such as improved education) and novel (such as game ranching) have the potential to alleviate the pressures on wildlife, and provide enduring benefits for both people and conservation.

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Appendix I – Structured Interview

North Luangwa Resource Use Questionnaire

Unique response ID: _____

Surveyor name: _____

Date of survey: __ __ / __ __ / 2014

Interview start time: _____

1. Record the gender of respondent here

Male:

Female:

2. Which age bracket do you fall into?:

18-25

26-35

36-45

46-55

55+

3. Are you the head of this household?:

Yes

No

4. What is the highest level of education you have attended:

No formal education

Primary

Secondary

Other: _____

5. What is your tribe?: _____

6. How many people live in this house? : _____

7. How many other people are supported by this household? : _____

8. How old are the men in your house? How old are the women in your house?: *Please write numbers in the boxes*

Age of people in household	Number of Men in household	Number of Women in household
0-10		
11-20		
21-30		
31-40		
41-50		
50+		

9. How long have you lived in this village?:

Less than 2 years

2-5 years

6-10 years

11-15 years

16-20

20+ years

10. Which of the following does this household own? *Also note down which you can see in the "observed" column:*

Item	Stated	Observed	Item	Stated	Observed	Item	Stated	Observed
Brick house			Cellular phone			Chickens		
Mud house			Radio			Goats		
Thatch roof			Television			Ducks		
Tin roof			Satellite dish			Sheep		
Bicycle			Generator			Cows		
Motorcycle			Solar panel(s)			Pigs		
Car/Truck			Mattress			Dogs		
Water system			Wheelbarrow					

11. What are the three main income making activities your household does? *Write in the spaces below.*
And which makes the most income? *Circle answer.*

- _____
- _____
- _____

12. Are you a member of any village groups, for example COCOBA, CRB (community resource board)?
Which?

Yes No

Group: _____

13. Are you involved with a conservation organisation, for example FZS or ZAWA? Which?

Yes No

Which: _____

14. *If answered "Yes" to 13:*

What is your role in that organisation?

D) Livelihoods Lists

I am now going to show you some lists. I'd like you to choose which list you look at by flipping a coin. It doesn't matter what you get, it's just a way of choosing which list you look at. If you get a heads I will show you cards named "Heads". If you get tails I will show you cards named "tails". There will be four different lists to look at, so you will need to flip the coin again after looking at each list. After you have chosen the list, I will ask you a question and then write down the answer.

Give the interviewee the coin, and put the first set of cards picture side down on the floor in front of the interviewee. Ask them to flip the coin, and then turn over the set of cards that match their flip. Record which set they have been shown. Then ask them the question for the hunting list, write down their answer, and repeat for the next list.

15. **Animals:** **You do not need to write anything down for this, as it is an example.** Could you please look at List 1 and tell me how many of them you have seen in your village in the last year. **You must not tell me which ones you have done, only how many.** *[Make sure that this is clear to the interviewee before continuing.]* Thank you. Could you now look at List 2, and tell me how many of them you have seen in your village in the last year.

16. **Hunting:** Could you please look at List 1 and tell me how many of the items you have done **in the last year. You must not tell me which ones you have done, only how many.** *[Make sure that this is clear to the interviewee before continuing.]* Thank you. Could you now look at List 2, and tell me how many of them you have done in the last year.

Heads Tails

Number from List 1: _____

Number from List 2: _____

17. **Trading:** Could you please look at List 1 and tell me how many of them you have done **in the last year. You must not tell me which ones you have done, only how many.** *[Make sure that this is clear to the interviewee before continuing.]* Thank you. Could you now look at List 2, and tell me how many of them you have done in the last year.

Heads Tails

Number from List 1: _____

Number from List 2: _____

18. *Eating*: Could you please look at List 1 and tell me could tell me how many of them you have eaten **in the last year. You must not tell me which ones you have eaten, only how many.** [Make sure that this is clear to the interviewee before continuing.] Thank you. Could you now look at List 2, and tell me how many of them you have eaten in the last year.

Heads Tails

Number from List 1: _____

Number from List 2: _____

E) Protein consumption

19. I would now like you to think back over which different foods you have eaten in the last 7 days. *Read the list in the table below to the interviewee, and make a tick in the box for the day they have eaten the food. If they say bushmeat, write down which species it was in the box.* Thank you. Now I would like to know where you got each of the foods you've just told me you've eaten, for example from a butchery, gift, etc. *Go back through each item you just recorded in the table, and write below it where they got it from. If they can't remember, write "CR".*

	Day 1 (Yesterday)	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Chicken							
Goat							
Sheep							
Beef							
Pork / Pig							
Fish							
Bushmeat							
Bushmeat							
Bushmeat							
Bushmeat							
Eggs							
Milk							
Beans							
Vegetables							

F) Bushmeat – Introduction

I would now like to ask you a few questions about bushmeat.

20. Could you tell me what you think bushmeat is?

From now on, when I use the word bushmeat, I mean any kind of hunted wild animal, for any reason.

G) Eating Bushmeat

21. Is there a season when you think people eat more bushmeat? Why?

22. I am going to read you some statements about eating bushmeat, and I would like you to say whether you strongly agree, agree, disagree, or strongly disagree with them: *Place the four choice option cards on the floor in front of the interviewee in order from strongly disagree on the left to strongly agree on the right.* Once I have read each statement I would like you to either say or point to how much you agree or disagree with it; **remember that this is your opinion, so it cannot be right or wrong.** *After each statement write down the letter code for which option they chose. If they say they don't know or have no opinion, write "DK",*

A = Strongly agree B = Agree C = Disagree D = Strongly disagree DK= Don't know

a. "Bushmeat is much tastier than fresh domestic meat"

b. "Bushmeat is much tastier than frozen domestic meat"

c. "People eat bushmeat because it is the main way they can get protein"

d. "People only eat bushmeat when they cannot afford other meat"

e. "People eat bushmeat because their forefathers ate bushmeat"

f. "People only eat bushmeat on special occasions/celebrations"

g. "People eat bushmeat as there is no butchery nearby"

h. "People eat bushmeat because there is little danger of being caught"

i. "People enjoy eating bushmeat"

j. "People wish they could stop eating bushmeat"

H) Bushmeat trading

23. Is there a season when you think people trade more bushmeat? Why?

24. I am going to read you some statements about trading bushmeat, and I would like you to say whether you strongly agree, agree, disagree, or strongly disagree with them: *Place the four choice option cards on the floor in front of the interviewee in order from strongly disagree on the left to strongly agree on the right.* Once I have read each statement I would like you to either say or point to how much you agree or disagree with it; **remember that this is your opinion, so it cannot be right or wrong.** After each statement write down the letter code for which option they chose. If they say they don't know or have no opinion, write "DK",

A = Strongly agree B = Agree C = Disagree D = Strongly disagree DK= Don't know

a. "People trade bushmeat because their forefathers traded bushmeat"

b. "People wish they could stop trading bushmeat"

c. "People trade bushmeat because there is little danger of being caught"

d. "People enjoy trading bushmeat"

e. "People trade bushmeat because it is a good way of making money"

f. "People get a lot of respect as a bushmeat trader"

g. "Trading bushmeat is a main way people support their family"

I) Bushmeat hunting

25. Is there a season when you think people hunt more bushmeat? Why? ***If they say it is the same as trading, record below, and can only ask statements a and b in question 26 (although try to elicit answers).***

26. I am going to read you some statements about hunting bushmeat, and I would like you to say whether you strongly agree, agree, disagree, or strongly disagree with them: *Place the four choice option cards on the floor in front of the interviewee in order from strongly disagree on the left to strongly agree on the right.* Once I have read each statement I would like you to either say or point to how much you agree or disagree with it; **remember that this is your opinion, so it cannot be right or wrong.** After

each statement write down the letter code for which option they chose. If they say they don't know or have no opinion, write "DK",

A = Strongly agree B = Agree C = Disagree D = Strongly disagree DK= Don't know

- a. "People only hunt bushmeat when their family will go hungry if they don't"

- b. "Hunting bushmeat is very dangerous due to wild animal attacks"

- c. "People hunt bushmeat because it is a good way of making money"

- d. "People hunt bushmeat because there is little danger of being caught"

- e. "People enjoy hunting bushmeat"

- f. "People wish they could stop hunting bushmeat"

- g. "People get a lot of respect as a bushmeat hunter"

- h. "Hunting bushmeat is a main way people support their family"

- i. "People hunt bushmeat because their forefathers hunted bushmeat"

J) Bushmeat –Village level

Ensure for the following questions that an answer is given to each of parts a, b, and c. If they say none, write 0 in the space. If they say "don't know", or "don't want to say", write why and any comments in the box.

27. In this village, how many people do you know that have hunted bushmeat:

A. Once this year:	_____	If they say "don't know" or "don't want to say, record here and any comments:
B. Every month:	_____	
C. Every week:	_____	

28. In this village, how many people do you know that have traded bushmeat:

A. Once this year:	_____	If they say "don't know" or "don't want to say, record here and any comments:
B. Every month:	_____	
C. Every week:	_____	

29. In this village, how many people do you know that have eaten bushmeat:

A. Once this year:	_____	If they say "don't know" or "don't want to say, record here and any comments:
B. Every month:	_____	
C. Every week:	_____	

For the questions 24-26, If they say "don't know", or "don't want to say", write why and any comments.

30. In this village, do you think anyone doesn't like people hunting bushmeat? Why?

31. In this village, do you think anyone doesn't like people trading bushmeat? Why? *If they say it is the same as hunting, record below.*

32. In this village, do you think anyone doesn't like people eating bushmeat? Why?

K) Bushmeat – Knowledge of Law

33. Could you explain to me the law on hunting bushmeat?

34. Could you explain to me the law on trading bushmeat?

35. Could you explain to me the law on eating bushmeat?

K) Final Points










36. Do you have anything further you would like to tell me about the things we have discussed? *Write down anything they say here, even if not about bushmeat.*

Thank you very much for taking the time to answer my questions. After a few months, once I have completed my research I will be providing Chief [insert name] with what we have found out from the research.




Time interview finished: _____

Appendix II – Unmatched Count Technique Cards

Hunting Cards- Set A (Heads)




List 1		List 2	
Teaching Ukufunda		Bushmeat hunting Ukulunga inama shampanga	
Carpentry Ukubasa		Government Work Umubofi wabuteko	
Tin Smithing Ukupanga imbabula ne mpoto		Craft making Ifyakupikulapikula	
Farming Ukulima		Shop owning Shimakwebo wetuka	
		Brewing Ukukukumba ubwalwa	

Hunting Cards – Set B (Tails)





List 1		List 2	
Government Work Umubofi wabuteko		Teaching Ukufunda	
Craft making Ifyakupangapanga		Carpentry Ukubasa	
Shop owning Shimakwebo wetuka		Bushmeat hunting Ukulunga inama shapanga	
Brewing Ukukukumba ubwalwa		Tin Smithing Ukupanga imbabula ne mpoto	
		Farming Ukulima	

Trading Cards – Set A (Heads)

List 1	
Firewood trading Ukushitisha ikuni	
Foodstuff trading Ukushitisha ifyakulya	
Charcoal trading Ukushitisha amalasha	
Building Ukukuula	

List 2	
Tailoring Ukubila	
Bushmeat trading Ukushita inama shapanga	
General labouring Bachibombobombe	
Honey collecting Ukupanda ubuchi	
Livestock keeping Ukusunga ifitekwa	





Trading Cards – Set B (Tails)

List 1	
Tailoring Ukubila	
General labouring Buchibombobombe	
Honey collecting Ukupanda ubuchi	
Livestock keeping Ukuteka inama	






List 2	
Firewood trading Ukushitisha ikuni	
Foodstuff trading Ukushitisha ifwakulya	
Charcoal trading Ukushitisha amalasha	
Bushmeat trading Ukushitisha inama shapanga	
Building Ukukuula	

Consumption Cards – Set A (Heads)

List 1





Milk Umukama	
Chicken inkoko	
Goat Imbushi	
Beans Chilemba	

List 2

Fish Isabi	
Duck Imbata	
Bushmeat Inama yapanga	
Beef In'gombe	
Eggs Amani	

Consumption Cards – Set B

List 1





Fish Isabi	
Duck Imbata	
Beef In'gombe	
Eggs Amani	

List 2

Milk Umukaka	
Chicken Inkoko	
Goat Imbushi	
Bushmeat Inamayapanga	
Beans Chilemba	

“Training” Cards




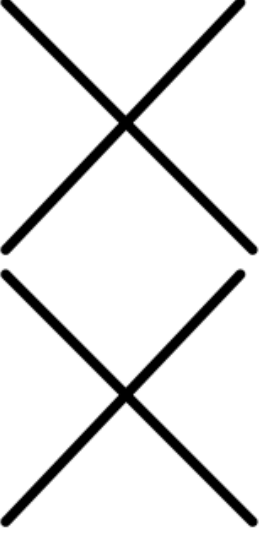
List 1

<p>Buffalo Imbowo</p>	
<p>Leopard Imbwili</p>	
<p>Warthog Umujili</p>	
<p>Elephant Isofu</p>	

List 2

<p>Crow Mwakole</p>	
<p>Impala Akabundi</p>	
<p>Zebra Choolwa</p>	
<p>Baboon Kolwe</p>	
<p>Rhino Chipembele</p>	

Appendix III – Likert-type Statement Show Card

<p>A. Strongly Agree</p>  <p>Ukusumina sana</p>	<p>B. Agree</p>  <p>Ukusumina</p>
<p>C. Disagree</p>  <p>Ukukana</p>	<p>D. Strongly Disagree</p>  <p>Ukukanina</p>

Appendix IV – Structure of Focus Group Discussion

North Luangwa Resource Use Focus Group

Good morning/afternoon, and thank you all for coming to join in our discussion. My name is _____ and I am from CREATE/Frankfurt Zoological Society. I am helping Emily to conduct this focus group which will inform her research for her Master's degree. Her research is looking at bushmeat in villages, and we are all really interested in your opinions on it.

The aim of the research is to better understand why people might hunt, trade, or eat bushmeat in different areas. It would be great to hear your opinions on bushmeat, and we are really interested in your suggestions for how people could be helped to move away from bushmeat use.

Everything you tell us today will be in strict confidence; we will not write down any names or anything else which could be used to identify you, and you do not have to introduce yourself at the beginning, although you can if you want to. Emily may want to take some pictures during the discussion, but she will make sure that your faces are not visible in the photos, and you can see them at the end of the session and ask for them to be deleted if you want to. **Please say now if you do not want any photographs to be taken.**

I have a range of questions to ask you and there are no right or wrong answers. Please feel free to share your opinions, even if they differ from other peoples; it is likely that different members of the group will have different opinions, which is great. This is meant to be an open discussion in which everyone participates. Only your comments will be included in the reports; we won't write down your names. Every now and then I will be looking at my watch to check how much time we have left; we have a lot of things we want to ask you, and want to check we have enough time to hear everyone's opinions.

I will be translating for Emily as we go through, so it is very important that everyone finishes their point before the next person starts talking, so I can be sure that I am making all of your points clear to her.

So thanks again for coming and let's begin. The discussion should take about 1 and a half hours.

Seasonal Calendar

Place the flip chart paper on the floor, and put markers by the paper.

Great, now we've all been introduced, we'd like to start by thinking about bushmeat generally, and what it means to each of you. If you could each tell me the first words that come to your mind when you hear the word bushmeat, and we will write them down on a piece of paper. For example, when I hear the word "cat", the first word I think of is "dog"; when you hear the word "charcoal" you might think of "fire". Remember that it is only supposed to be one word.

Give everyone a minute to think, then begin asking them for their one word. Write them all down on the paper as you go, even if there are some repeated words. (5 minutes)

Great. Just so we are all using the word "bushmeat" in the same way, I'd like you all to think of bushmeat as any kind of hunted wild animal, hunted for any reason.

I'd now like to think about whether bushmeat varies by season in your village, such as whether there is more hunting in certain seasons, etc. *Turn to next flip chart page with the circle calendar on it.* I'd like to start by thinking about when the different seasons are here in the village. Could you please tell me when you have your rainy season, when you have your dry season, etc., and I will write them down on the calendar.

Ask people to name which months the rainy, dry, etc. seasons occur in and write down on the calendar. (5 minutes)

Great, that gives us an idea of when you have different weather here in the village. Now I'd like to talk about when people use bushmeat in each of the seasons. Are there some months when people hunt more bushmeat? We would like you to think generally, even if there is no bushmeat in this village *Discuss and write these on the calendar.*

Great, and what about trading? Does this happen at the same time as hunting, or are there different times of the year when there is more trading? *Discuss and write these on the calendar.*

And finally, what about eating bushmeat? Are there some months where people eat more bushmeat? *Discuss and write these on the calendar. (5 minutes for all)*

[If not already discussed during the above sections, lead the discussion as to why there are seasonal differences as per the discussion below.

So now we know when bushmeat is used most throughout the year. Why do you think there are these differences? **(5 minutes)**

Bushmeat timeline

20 minutes

Move to a new piece of flip chart paper.

I'd now like to discuss whether you think the amount of bushmeat available in the village over time. Let's start by thinking of some key events that have happened in this village during the past 50 years. It might be something like a new headman, or presidential elections, or a large drought, but it's important that they are events which you can all remember. *Discuss and write down on timeline, with spaces between each anchor relative to the time gap. (5 minutes)*

Great, now we can think about how much b was available in the village when each of these events happened. *Lead discussion and plot bushmeat availability on the time line. We want to know when there was the most bushmeat available in the village, and when the least, as well as knowing how it changed in between. Can use the following questions to lead the discussion if necessary: (10 minutes)*

- *When did you have the most bushmeat in the village?*
- *When did you have the least bushmeat?*
- *Was there more bushmeat around the time of [key event] than [other key event]*

Thanks, that's really interesting. I'd really like to know why you think bushmeat availability has changed/remained the same (*ask as appropriate*) over time. *Lead discussion, using the questions below if necessary: (5 minutes)*

- *Why do you think there is less bushmeat at [key event]?*
- *Has ZAWA enforcement meant that there has been less bushmeat?*
- *Has there been less bushmeat because there have been less animals to hunt?*

Bushmeat Discussion

10 minutes

Thanks for all we've talked about so far, it's been really informative. I'd now like to discuss whether you think bushmeat use is good or bad for the village. Remember that we're only recording your opinions for this research, and won't share anything you've said with law enforcement, so please feel like you can speak freely. *Lead discussion, using questions below if necessary: (10 minutes)*

- *Is bushmeat good for anyone?*
- *Does it bring income or food?*
- *Are there any bad things about bushmeat for the village?*
- *What do most people in the village think of bushmeat?*
- *Do you think people should be able to hunt and eat it?*

Bushmeat Drivers List

30 minutes

I'd now like to discuss why you think people hunt, trade, and eat bushmeat. The reason I would like to know is because sometimes people may have to hunt bushmeat because otherwise they cannot feed their family, or they may need income to send their children to school; at other times it may be because they want to make money or they like the taste of bushmeat. It is important to know why people may hunt, trade, or eat bushmeat so we can begin to think about ways to help make people happier and better protect the park. We will talk about hunting, trading, and eating bushmeat separately; as we talk about the reasons why people do each one, I will write them down on a piece of paper, and at the end we will try to decide which are the three main reasons.

1. So firstly, let's think about bushmeat hunting. What do you think are the main reasons people hunt bushmeat? *Lead discussion, try to continue until no more new suggestions or until the allotted time has run out.*

(5 minutes)

Great, now I'd like to try and decide on which are the three main reasons people hunt bushmeat. *Lead discussion, ending up with a ranking from 1-3 (1 being the most important). Try to avoid voting, and instead encourage reaching agreement.*

(5 minutes)

2. Secondly, let's think about bushmeat trading. What do you think are the main reasons people trade bushmeat? *Lead discussion, try to continue until no more new suggestions or until the allotted time has run out. If people say they are exactly the same reasons as hunting, skip to the ranking exercise.*

(5 minutes)

Great, now I'd like to try and decide on which are the three main reasons people trade bushmeat. *Lead discussion, ending up with a ranking from 1-3 (1 being the most important). Try to avoid voting, and instead encourage reaching agreement.*

(5 minutes)

3. Finally, let's think about eating bushmeat. What do you think are the main reasons people eat bushmeat? *Lead discussion, try to continue until no more new suggestions or until the allotted time has run out. If people say they are exactly the same reasons as hunting, skip to the ranking exercise.*

(5 minutes)

Great, now I'd like to try and decide on which are the three main reasons people eat bushmeat. *Lead discussion, ending up with a ranking from 1-3 (1 being the most important). Try to avoid voting, and instead encourage reaching agreement.*

(5 minutes)

Bushmeat Alternatives

10 minutes

Thanks for all of your input and discussion so far. We are nearly finished, but for our last discussion I'd like to talk to you about what you think could be done to reduce the hunting, trading, and consumption of bushmeat in this village. I'd like to hear any ideas you have.

Lead discussion, covering general points on what people think could be done, including whether people want anything done. Suggested questions include:

- *Should poachers be punished more harshly?*
- ***Have you had any control bushmeat in the last year?***
- *Should it be clearer how to get a licence to hunt and trade?*
- *Is it clear why people are sometimes refused licences?*
- ***Would some way of raising game animals, such as bush pigs, be useful?***
-
-

Wrap-up

Thank you very much for all the information you have given me today, it has been very interesting and useful to the research. After Emily has finished her research here in Zambia, CREATE will give a report on the findings to Chief [insert name]. If you have anything else you'd like to add or discuss please feel free, and help yourself to a drink and a biscuit.

Appendix V – Variables Used in LMM

Variable	Justification
Village Cluster	Differences between village clusters may cause differences in bushmeat use.
Distance to butchery	Less access to domestic protein may cause people to rely on bushmeat.
Distance to park	Shorter distances to wildlife sources may increase the likelihood of using bushmeat.
Gender	Women and men have different gender roles in society; this may transfer to differences in which gender carries out different bushmeat related activities.
Age bracket	People of different ages may utilise bushmeat differently, due to different perceptions of the acceptability of bushmeat use or knowledge of the law.
Highest education level	Those with less education may be less able to generate income and be more reliant on natural resources such as bushmeat
Ethnic group	Different ethnic groups may have different cultural associations with bushmeat and different degrees of use.
Residence time in village	Those resident in a village for less time may have less stable household food and income security, and therefore be more reliant on bushmeat for food or income.
No. of people in household	More people resident in a household may mean more pressure on income and food sources, and a greater reliance on bushmeat.
No. of non-residents dependent on household	More external dependents may mean more pressure on income sources, and a greater reliance on bushmeat.
No. days without protein in last 7	Greater food insecurity may mean households rely on bushmeat more.
Wealth score	Poorer households may be more reliant on bushmeat as a protein source due to the cost of domestic meat. Alternatively, wealthier households may generate income from bushmeat hunting and trading.

Appendix VI – PCA Scores for Wealth-Ranking Items

Wealth Indicator	PCA Factor Score
No. of Days no protein	-9.412E-01
Thatch roof	-6.791E-01
Mud house	-1.112E-01
Ducks	-1.393E-02
Car/truck	-1.024E-03
Water system	5.294E-23
Generator	3.327E-03
Motorcycle	5.417E-03
Sheep	6.842E-03
Cows	8.014E-03
Wheelbarrow	8.626E-03
Satellite Dish	1.407E-02
Mattress	1.622E-02
Pigs	2.256E-02
TV	3.713E-02
Dogs	6.789E-02
Tin roof	6.791E-02
Bicycle	8.374E-02
Goats	8.478E-02
Radio	9.455E-02
Cellular phone	1.035E-01
Solar Panel(s)	1.100E-01
Brick house	1.112E-01
No. of income activities	1.129E-01
Chickens	1.185E-01

Appendix VII – NLNP Incident Data

Incident data is recorded by ZAWA patrols in and around NLNP whenever an illegal incident is detected. Incident types include: discovering meat drying racks or a camp, possession of weapons or traps, and carrying out illegal activities such as hunting.

Complete incident data is only available electronically for 2009 – 2014, although summary data is available for 2008 (Table AVII.1). The number of illegal incidents detected by the NLNP patrol team have increased year-on-year since 2009, although it is unknown if this corresponds to an increase in effort.

Table AVII.1: Summary of patrol data from 2008 to 2014. Figures for 2014 are to the end of June.

Year	# of foot patrols	Av. # foot patrols/month	# of poaching/illegal incidents	# of people arrested
2008	421	42	218	No Data
2009	443	37	187	94
2010	498	42	195	135
2011	453	38	208	108
2012	No Data	No Data	259	75
2013	No Data	No Data	363	96
2014	No Data	No Data	165	54

Patrol reports show that since January 2009, 29.3% of arrestees resided in the Mpika area, with the next most common area being Mukungule, with 22.3% of arrestees. There were 28 other areas which arrestees are recorded as residing in, but the majority only had between 1 and 7 arrestees residing there each year since 2009, with the exception of Chama (19% of arrestees), Lundazi (6.2%), Chikwanda (5.4%) and Mpumba (3.3%). When divided by Chiefdom, the majority of arrestees resided in Mukungule Chiefdom (38.1%), with the next most common being Chifunda (20.3%) and Chikwanda (12.4%).

Poaching incidents were generally dispersed throughout NLNP and surrounding GMAs and open areas between 2012 and 2014 (Figure AVII.1), although there appeared to be congregation of incidents around some of the main rivers shown on the map, such as at the Eastern border of the park and the river in the centre of the park.

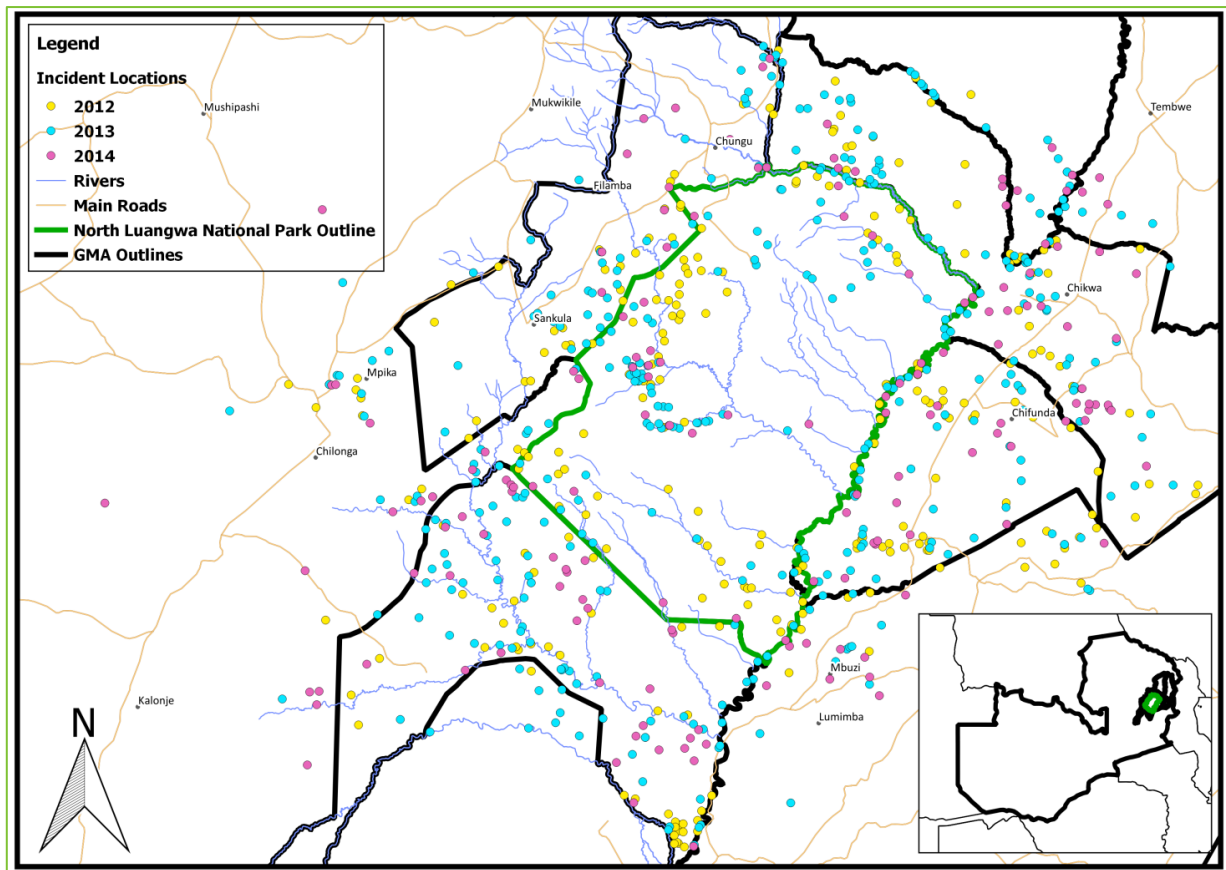


Figure AVII.1: Location of incidents recorded on patrols 2012-2014

The most common type of incident recorded was encountering a poached animal (13.6% of incidents). Locating a snare (either with or without an arrest) was also common (12.9% of incidents); the percentage of incidents involving guns was only marginally higher (16.7%). Indirect indicators of hunting were also commonly recorded, such as hearing gunshots (8.1%), finding someone possessing meat (9.2%), or encountering a drying rack (12.3%). Other incidents recorded included detection of a poachers camp, possession of traps or poison, and other illegal resource collection.

The occupation of most (91.9%) of arrestees was farmer/“peasant farmer”. The majority of arrestees were aged between 18 and 45 (75.4%), although they ranged from 14 to 81 years old. Gender of arrestees is not recorded on patrol incident forms, hence there is no definitive information on the proportion of men and women arrested. However, two people arrested since 2012 are recorded as having the occupation of “housewife” (0.28% of arrestees).

Thirty seven species, ranging from bush-babies to elephants, have been targeted by poachers since 2009. The species involved in most incidents was elephant (20%), followed by buffalo (16.4%), common duiker (11.9%) and impala (11.7%).