

May 2021

# Why Eat Wild Meat?

---

Local food choices, food security and desired design features of wild meat alternative projects in Cameroon

## Author information

Stephanie Brittain is a postdoctoral researcher in the Interdisciplinary Centre for Conservation Science (ICCS) at the University of Oxford.

[stephanie.brittain@zoo.ox.ac.uk](mailto:stephanie.brittain@zoo.ox.ac.uk)

## About the project

For more information about the Why Eat Wild Meat? project, visit [www.iied.org/why-eat-wild-meat](http://www.iied.org/why-eat-wild-meat)

## Acknowledgements

With thanks to colleagues from the Why Eat Wild Meat? project for their inputs, including Mama Mouamfon (FCTV), Cédric Thibaut Kamogne Tagne (FCTV), E J Milner-Gulland (ICCS), Francesca Booker (IIED), Dilys Roe (IIED), and Neil Maddison (The Conservation Foundation).

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them — from village councils to international conventions.

Published by IIED, May 2021

<http://pubs.iied.org/20176IIED>

Citation: Brittain S (2021) Why Eat Wild Meat? Local food choices, food security and desired design features of wild meat alternative projects in Cameroon. Project Report. IIED, London

All graphics were created for this report.

International Institute for Environment and Development

235 High Holborn, London WC1V 7LE

Tel: +44 (0)20 3463 7399

Fax: +44 (0)20 3514 9055

[www.iied.org](http://www.iied.org)

 @iied

 [www.facebook.com/theIIED](https://www.facebook.com/theIIED)

Download more publications at <http://pubs.iied.org>



IIED publications may be shared and republished in accordance with the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International

Public License (CC BY-NC-ND 4.0). Under the terms of this licence, anyone can copy, distribute and display the material, providing that they credit the original source and don't use it for commercial purposes or make derivatives. Different licences may apply to some illustrative elements, in which instance the licence will be displayed alongside. IIED is happy to discuss any aspect of further usage. Get more information via [www.iied.org/Creative-Commons](http://www.iied.org/Creative-Commons)

IIED is a charity registered in England, Charity No.800066 and in Scotland, OSCR Reg No.SC039864 and a company limited by guarantee registered in England No.2188452.

## Summary

This project report summarises research conducted in four villages around the Dja Faunal Reserve in south-eastern Cameroon. The research aimed to understand local food preferences and the importance of wild meat for food security and explore which kind of wild meat-alternative projects could result in the greatest reduction in household hunting and consumption of wild meat.

Differences in the drivers and prevalence of wild meat consumption between individuals, households, and between villages, were investigated using semi-structured interviews. Several hypothetical approaches to designing future wild meat alternative projects were explored using scenario-based interviews.

The report outlines our methods and results in detail. We found that younger people consumed wild meat more often than older people. Taste, ease of access and health were the key drivers of species preference, while taste, health, tradition and in some cases, appearance, were the key reasons for species avoidance. The species that people prefer to eat are generally, but not always, abundant and non-protected.

In this particular area, household-level alternative projects were preferred, but initiatives may also want to target hunters and younger people, who eat and hunt wild meat more regularly in this area. Overall, alternatives should be viewed by their recipients as providing equal or greater benefits for less effort than hunting, if uptake of these alternatives is to be sustainable.

## Contents

<b>1. Introduction</b>	<b>2</b>
<b>2. Study site</b>	<b>3</b>
<b>3. Overview of research methods and analysis</b>	<b>5</b>
3.1 Data collection	5
3.2 Data analysis	9
3.3 Ethics	11
<b>4. Results</b>	<b>12</b>
4.1 Exploring the importance of wild meat for local food security	12
4.2 Food preferences and drivers of preference	16
4.3 Understanding locally-desired design features of wild meat-alternative projects	28
<b>5. Discussion and wider context</b>	<b>32</b>
5.1 Key drivers of wild meat consumption and avoidance	32
5.2 Individual-level differences in drivers of consumption	34
5.3 Village-level differences in avoidance and consumption	35
5.4 Implications for wild meat alternatives in the Dja Faunal Reserve	35
<b>Bibliography</b>	<b>37</b>
<b>Appendices</b>	<b>40</b>
Appendix 1: The IUCN Red List Categories and Criteria	40
Appendix 2: Full list of preferred and avoided species	41
Appendix 3: The saliency of species cited as 'avoided'	45

## 1. Introduction

The 'Why Eat Wild Meat' project was established to explore the complex drivers of wild meat preference and consumption, and the barriers to effective and sustained engagement of wild-meat consumers in alternative projects (Box 1). Funded by the Darwin Initiative, the project is a collaboration between the International Institute for Environment and Development (IIED), the Interdisciplinary Centre for Conservation Science (ICCS) at the University of Oxford, The Conservation Foundation (formerly the Living Earth Foundation) and the Fondation Camerounaise de la Terre Vivante (FCTV). In making recommendations to project implementers and policy makers, the project aims to improve the design - and hence effectiveness - of wild meat-alternative interventions, thus reducing current levels of exploitation that are threatening both species populations and long-term local food security and nutrition.

The primary objectives of the initial project research were to: 1) Identify local people's food choices and drivers to consume wild meat, (2) Explore the importance of wild meat for local food security, and (3) Understand locally-desired design features of wild meat-alternative projects

### **Box 1: Definition of protein alternatives used in this study**

We focus on alternatives for wild meat consumption in rural settings, such as wild meat from sustainable sources (sustainable hunting or domestication of wild animals) or the provision of other sources of protein that are considered substitutes by wild meat consumers (CIFOR/CBD 2011). While we do not focus on livelihood alternatives, which seek to provide other sources of income that reduce wildlife trade and reduce pressure on natural resources, we do explore if producing enough alternatives wild meat, so as to be able to sell for additional income, affects household hunting and consumption rates.

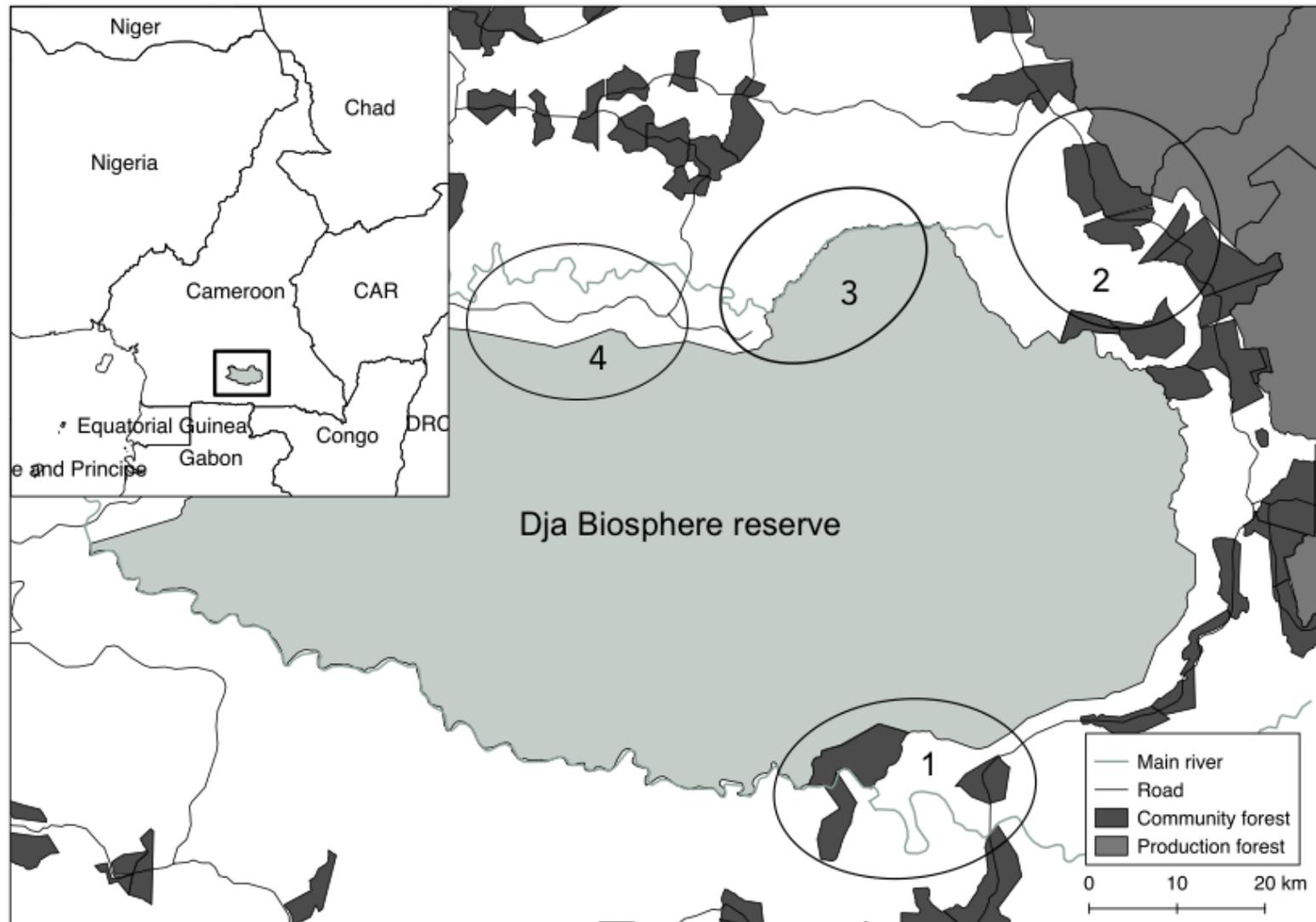
## 2. Study site

The Dja Faunal Reserve (DFR) is a World Heritage Site lowland rainforest in south-eastern Cameroon. Encompassing 5260km<sup>2</sup> and surrounded on three sides by the Dja River, the DFR is noted for its rich biodiversity (Betti, 2004). The DFR is home to 107 mammal species, five of which are threatened (UNESCO, 2015), including the endangered forest elephant (*Loxodonta cyclotis*), the critically endangered western lowland gorilla (*Gorilla gorilla gorilla*) and endangered central African chimpanzee (*Pan troglodytes troglodytes*). See Appendix 1 for an overview of the IUCN Red List Categories and Criteria.

Research was conducted in four small to medium sized villages situated around the periphery of the DFR (Figure 1). Village names and locations are not recorded to ensure anonymity at the community level (St John et al., 2016):

- Village 1 is the most remote village, located 5km from the periphery of the DFR and only accessible by logging road since 2015. No past or present wild meat alternative projects have taken place within this village, although previous research in the village by the field team showed that residents wish to harness the potential of the new logging road for sustainable development.
- Village 2 is the largest of the villages and the most accessible, situated along the length of a road which provides access to market towns of Abong-Mbang, Mindourou and Lomie. It is comprised of three smaller settlements which here we treat as one. In 2019, a community hunting zone was established. However, administrative delays with the development of a management plan mean that people in the neighbouring communities cannot yet benefit from this CHZ.
- Villages 3 and 4 are situated on the northern periphery of DFR, approximately 70-80km and 50-60km from Somalomo, where the Ministry of Forests and Fauna (MINFOF) who are responsible for the management for the DFR, are based. Their presence is well-known by people living along the northern periphery. Residents of both villages are currently actively involved in wild meat and livelihood alternative projects.

Figure 1: Map showing the location of the DFR in Cameroon, and the approximate location of the 4 villages in relation to the reserve. Village 1= no past or present interventions, village 2= Developing community hunting zone (CHZ), villages 3 and 4= currently involved in wild meat alternative projects.



### 3. Overview of research methods and analysis

In a recent review of the current literature on the drivers and barriers to wild meat consumption, Booker (2019) identified a limited number of studies that take an in-depth look at a wide variety of factors determining wild meat preferences, and inter-village and inter-personal differences. As such, we explored wild meat preferences, drivers of current preference, and responses to hypothetical wild meat alternative project scenarios, employing a comparative case study survey design to explore inter-village and inter-personal differences.

Differences in the drivers and prevalence of wild meat consumption between individuals (e.g. gender, age, livelihood or ethnicity), households (e.g. household wealth), and between villages were explored using semi-structured interviews, comprising of socio-demographic closed questions, freelists, and open-ended questions. We then investigated a number of hypothetical approaches to designing future wild meat alternative projects using scenario-based interviews. Scenario-based interviews allow participants to explain how their hunting and consumption patterns may or may not change under each scenario, pick the scenario that would most likely enable them to switch away from a dependence on wild meat hunting and consumption, and providing insights into how such projects should be designed and implemented to enable ongoing participation

#### 3.1 Data collection

##### Phase 1: Current wild meat preferences and drivers of preference

The research team conducted semi-structured interviews from April-June 2019, also employing a local guide in each village (who was therefore familiar with the community, the area and the dialect) to build trust and maximise the reliability of the data collected. Some of the research team were already known to residents of villages 1 and 2, having successfully worked there since 2015. Good relations with FCTV field staff were also already established in villages 3 and 4.

We collected socioeconomic data including participant age, gender, ethnicity and primary livelihood using semi-structured interviews, administered on a one-to-one basis at participant's households. To explore household wealth, we first asked the village chiefs to identify key indicators of wealthy and poor households within their village, which were then checked in discussions with both men and women in all villages (Table 1). The key indicators of wealth identified were similar to those used by Lau et al. (2018) to measure relative wealth, based on the presence of household items (such as a mobile phone, mode of transport); the types of household structures (e.g. materials used for flooring and roofs) in addition to the means to generate ongoing food security and income (e.g. ownership of a field). We also collected information on people's stability and adequacy of income throughout the year. Scores for both household items and income were combined and each participant was given a score from 1-6, with one indicating that their household was one of the poorest and 6 indicating that it was one of the wealthiest.

Table 1: Household wealth indicators used in this study.

Household items		
Indicator	Variables	Justification
House building materials	Roof: rattan (0) or metal (1) Floor/walls: earth (0) or concrete (1)	Poorer households are roofed in rattan with earth floors, while wealthy households have concrete floors and metal roofs
Transport	Means of transport (e.g. motorbike): no (0), yes (1)	Poorer households have no means of transport, while wealthier ones have a motorbike
Communication	Mobile phone: no (0), yes (1)	Poorer households have no means of communication, some households have a simple phone while wealthy households have a smart phone

Field	Has field that currently produces income: no (0), yes (1)	Households that do not produce crops that generate income are viewed as more economically insecure than other households
<b>Wealth</b>		
Stability of income throughout the year	No income (-1 point) Some income throughout the year (0) Sufficient income all year (+1 point)	Households that have sufficient income to support them throughout the year are considered to be wealthy, while the norm is for core livelihood activities such as agriculture to provide income for parts or most of the year.

Finally, we asked participants whether they perceived their household to be one of the poorer, wealthier, or an average wealth compared to other households in their village. Significant correlation between participants self-assessment, and the initial research team's assessment, indicate that the assessments were accurate and that the indicators used were sufficient.

The benefits of this simple household wealth index approach are that it is relatively straight forward to administer, assesses the wealth status of each household according to factors relevant to their village, and relative to the spectrum of wealth displayed across the households within their village. As such, those that are the poorest and wealthiest in each village will be identified. One limitation is that differences in the average wealth of all four villages are not accounted for in this method, although the indicators can act as a between-village check. There was no evidence for inter-village differences in household wealth indicators, therefore the indicators used can act to identify differences in wealth within and between villages.

Having collected the sociodemographic data and household wealth indicators, we asked participants how frequently they consumed wild meat to explore the importance of wild meat for food security. Recognising the variation of wild meat hunting and availability throughout the year (van Vliet and Nasi, 2008; Alexander et al., 2015), participants were asked whether the rate of wild meat consumption changed or remained consistent throughout the year, whether they perceived other sources of protein to be available, and when such alternatives were available.

Next, participants were asked to "free list" the species they preferred to eat and those they tended to avoid. A freelist interview simply entails listing things in a domain (e.g. "species you prefer to eat" or "species you avoid eating") in whatever order they come to mind. The resulting lists reflect local preferences and its variation within and between the study villages (Quinlan, 2005). Freelisting rests on three assumptions: 1) people list in order of preference; 2) participants who prefer more items will list more items on the list; and 3) items mentioned by more respondents represent generally preferred items in the village. Freelisted data allows for the analysis of salience using the Smith S, a statistic that combines both the number of people who mentioned the item and the order in which they mentioned it (Quinlan, 2005). Salience analysis can also reveal information about the people who list each item. For example, frequently mentioned species indicate consensus, within the culture or community, while differences in list length and content are measures of variation (Furlow, 2003).

Finally, we asked follow-up, open-ended questions to explore why participants did or did not prefer each species listed by them, so that we could better understand variation in the reasons for and against eating wild meat and other protein sources.

To ensure the internal validity of the findings and explore the individual, household and village-level differences in wild meat preference, all willing and available adults over the age of 18 were interviewed, from all available households. In total, 542 participants were interviewed, representing 177 households (c. 3 participants per household). These 177 households represent between 85-95% of all households per village. The number of households for villages 1 and 2 was known by the research team, however the number of village inhabitants changes regularly with seasonal work away from the villages. Further, lists of households with household members were not available prior to starting fieldwork in villages 3 and 4. As such the households in all villages were identified once in the village. When going from household to household to interview participants, notes were made when people were absent, and the team arranged to return at a time that suited them to explain the work and ask permission to conduct the interview.

## Phase 2: Preferences for future wild meat alternative scenarios

Having gained an in-depth understanding of current local food preferences and the importance of wild meat for food security for participants, we explored which kind of wild meat-alternative projects could result in the greatest reduction in household hunting and consumption at the study site. In our case, we were interested in how people's hunting and consumption might change if they were offered projects involving two domestic wild meat alternatives that had scored well in our preference rankings; fish (from a fish pond) and chicken (kept in a coop). We were also interested in whether people would reduce their hunting or consumption of wild meat more if the alternative enabled them to generate an income, compared to if it was just for household consumption. Finally, we were interested in whether people thought their behaviour would change more if the project was implemented at the level of individual households, or for the community as a whole. We chose these different dimensions to investigate based on previous literature and theory about how people might respond to interventions (Table 2).

Table 2: The dimensions of alternative project design that were investigated through the scenarios presented, and the rationale for including these dimensions.

Dimension	Rationale
Fishponds vs chicken coops	Stage 1 of the research showed that both chicken and in particular fish were cited as being a preferred meat in terms of taste. Fish was currently available and regularly consumed in all villages while chickens were kept by some, although not reared in any formal way (e.g. no coops, feed or veterinary care). We wanted to see whether participants have a) a preference in terms of meat between the two and b) a preference in terms of the activity offered (e.g. pond vs coop). We wanted to see if there were village or individual level differences in these preferences.
Subsistence vs subsistence and income	Wild meat is commonly hunted for subsistence and additionally as a source of income, which is particularly helpful to people during certain times of year (such as low agricultural seasons, or in the lead up to annual celebrations). The line between hunting for subsistence and for income is often blurred, with households often taking what they need for subsistence and selling the rest. In recognition of the importance that wild meat plays for local livelihoods, it was important to understand if projects that offer wild meat alternatives, without replacing the additional driver of hunting for income, would result in a decline in hunting.
Household vs community	Past wild meat alternative projects have often implemented community wide projects as a means of reaching more people, reducing individual work burden, and encouraging community cohesion and capacity. However, not all people may wish to work collaboratively, and failing to understand possible underlying local power dynamics may result in some households or powerful individuals benefiting more than others. As such, we wanted to explore what people in rural Cameroon preferred, and whether the benefits of community level projects outweighed any perceived costs.

To do this, we used scenario-based interviews, a predictive tool that can help guide decision-making around project and programme design to minimise the risk of unnecessary failures (Travers et al., 2016). We used a script to present a series of hypothetical alternative project scenarios and ensure that all participants received exactly the same information (Box 2). The scenarios presented included one current situation baseline scenario, plus six further alternative project scenarios, whose design was informed by our phase 1 findings on food preferences. We sought to understand people's likely responses to each scenario (i.e. could it increase, decrease or would there be no change), followed by an open, unstructured discussion of why participants think these changes would or would not occur. Responses to these scenarios and subsequent discussion provide valuable insight into both how people are likely to respond to the scenarios, and the reasons why they might respond that way.

## Box 2: Summary of the script used to explain the different scenarios to participants, and the scenarios presented (English version).

For each scenario, please think about how this project would affect rates of wild meat hunting and consumption within your household over the next 5 years, if at all. In each case, you would be supplied with training and support on condition that no one in your household hunted in the reserve, or hunted any protected species anywhere in the forest. All financial and technical support would stop after 5 years, so please consider how sustainable the project is for you and whether you would be able to continue. Please also consider the time you would have to spend taking part in these projects:

**Scenario 1, business as usual:** Imagine that the current situation stays the same for the next 5 years. The prices for cocoa remain stable, park ranger patrols don't change, and the effort and time needed to hunt doesn't change. No new projects bringing alternatives or livelihoods would come to the village. With this in mind, how do you think this project would affect rates of wild meat hunting and consumption within your household over the next 5 years, if at all?

**Scenario 2, household fishpond:** Project to build a fishpond for each participating household, which requires little household participation once established. Once established, and if properly maintained, household ponds would produce enough fish for consumption, 2-3 times a week, but there would not be enough to sell.

**Scenario 3, household chicken coop:** As scenario 2, but for a household chicken coop

**Scenario 4, household fishpond and income:** Project to build a larger fishpond for each participating household which, once established and if properly maintained, provides fish for consumption 2-3 times a week and income at the household level. In order to achieve this, all members of the household must take an active part in the maintenance and upkeep of the pond.

**Scenario 5, household chicken coop and income:** As scenario 4, but for a household chicken coop

**Scenario 6, community fishpond:** Project to build large fishponds that are maintained and shared by the community. Once established and properly maintained, these ponds will provide enough fish for household consumption 2-3 times a week, and income generation. A reduced rate of household level input is required due to the sharing of labour across the community. However, community cooperation is required, both in terms of pond maintenance and decision making regarding how to spend any money made from the sale of fish (e.g. split between households, or spend on community projects).

**Scenario 7, community chicken coop:** As scenario 6, but for community managed and shared chicken coops.

Because participation in wild meat alternative projects generally involves households rather than individuals, we carried out the surveys for this phase at the household level. To explore household-level responses to each scenario, we attempted to interview all 177 households reached in phase 1, interviewing one person per household. Representatives from each household were selected to ensure balanced gender representation. Of the original 177 reached in phase 1, six could not be reached during this phase because the family were away from the village at that time. As such, 171 participants were interviewed, representing one participant per household.

## 3.2 Data analysis

### Current wild meat preferences and drivers of choice

The food preferences freelisting data were analysed using the “AnthroTools” package in R Studio. First, the two dimensions of salience (the frequency with which the same species appeared on each person’s list and how early or late on the list the species appeared) were plotted against each other to identify any outliers. Species salience was then plotted to identify any differences or groupings according to species order (e.g. carnivore, rodent, ungulate). Only species mentioned by 10% or more of all respondents were taken forward for further analysis. Sociodemographic, household and village-level explanatory variables that may affect wild meat preferences were selected *a priori*, based on the literature and the experiences of the research team (Table 3). Generalised linear models (GLMs) were used to explore which sociodemographic variables best explain participants’ wild meat consumption, and to draw inferences about individual-level differences in species preferences, using the “mlogit” package in R (Croissant, 2019).

### Future preferences for wild meat-alternative projects

All interviews were transcribed using nVivo qualitative data analysis software (QSR International Pty Ltd, 2020). Coded responses to each scenario could take one of six states: Reduce hunting or consumption, increase hunting or consumption or no change to hunting or consumption. Explanatory variables that were hypothesised to affect the responses to each wild meat alternative scenario, and their expected effect on hunting/consumption, were selected *a priori* based on the literature and the experiences of the research team (Table 3). Multinomial general linear models were constructed using the “mlogit” package in R (Croissant, 2019) to analyse the effect of the different scenarios on household wild meat hunting and consumption. Participants’ qualitative explanations for why hunting and consumption rates may change under each scenario were also coded in nVivo, and the themes which emerged were extracted for discussion in the results.

Table 3: Variables included in both phases of data analysis, and why they were included.

Variable	Variable type	Scale	Rationale
Frequency of wild meat consumption	Dependent	Individual	To explore individual and village level differences in the frequency and dependence upon wild meat for food, so that we can better understand if certain groups or villages consume more than others, and why that may be.
Reasons given for wild meat preference and avoidance	Dependent	Individual	To explore individual and village level differences in the reasons provided for wild meat preference and avoidance, so that we can better understand if certain groups of people or villages shared different motivations which would need to be accounted for in subsequent alternative projects.
Predicted rate of wild meat hunting and consumption	Dependent	Household	To explore differences in predicted rates of household hunting and consumption under each project scenario presented, to understand the predicted effectiveness of certain scenarios over others.
Village	Predictor	Village	To explore village-level differences in preferences and predicted behaviour due to village-specific characteristics, such as village location in relation to the reserve, roads and markets (e.g. villages closer to the reserve or in more isolated areas may have a higher abundance of wild meat available to them, while villages located closer to roads and markets may have alternatives available to them and are therefore less dependent on wild meat).
Wealth	Predictor	Household	To explore whether household-level differences in wealth affect preferences for wild meats and responses to potential wild meat alternative projects (e.g. richer families may prefer different meats because they are able to access them, and may also prefer different types of project, e.g. at the household rather than community level).
Age	Predictor	Individual	To explore the impact of age on wild meat consumption and preferences (e.g. age may affect the types of wild meat consumed, and preferences for project types).
Gender	Predictor	Individual	To explore the role that gender plays on wild meat consumption and the drivers of consumption (e.g. men may consume more wild meat than women. Women may cite traditions or taboos as a reason for avoiding certain meats more than men).
Ethnicity	Predictor	Individual	To explore the role that ethnicity plays on wild meat consumption and the drivers of consumption (e.g. do certain ethnicities consume more wild meat than others due to their traditional customs, and are drivers such as tradition affected by ethnicity).
Livelihood	Predictor	Individual	To explore if those naturally more able to access alternative sources of protein (e.g. fishermen) are less dependent on wild meat than hunters, for example.
Project scenario		Household	To assess the how different wild meat alternative scenarios may affect household-level predicted change in hunting and consumption (e.g. increase, decrease, remain the same).

### 3.3 Ethics

Before any interactions with respondents, the research team explained the objectives and how the data would be used. Free informed consent was verbally obtained prior to starting interviews, and participants knew they could stop participating at any time. Participants were able to reach out to FCTV field staff if they had any questions or concerns regarding the interviews. To ensure personal anonymity, identification numbers were allocated to each interviewee. Village locations were not recorded to ensure anonymity at the community level (St. John et al., 2016).

For the semi-structured seasonal interviews, participants were given a gift package, which included soap, Maggi cubes and matches in return for their time. The same gifts had been used by the research team in previous work in villages 1 and 2 and were always gratefully received. The gifts were selected to thank participants for the time they gave us, without causing rifts in the village or incentivising people to take part if they did not really want to. For the scenarios study, a larger gift package still comprising of the same items (soap, Maggi cubes and matches) was given to each participant. The larger package reflected the longer interview time spent with each participant, and also provided a gift that was sufficient to share among all those in the household, in recognition that not all would be interviewed. This was to avoid any potential conflicts regarding who would, or would not, be invited for interview. The research was approved by Oxford University's Central University Research Ethics Committee (CUREC) (R6337).

## 4. Results

A total of 542 interviews were carried out across 4 villages: 71 (village 1), 90 (village 2), 135 (village 3) and 46 (village 4). These interviews captured 80-95% of the total population of each village. Fifty-one percent (51%) of participants were male, 49% female and ages ranged from 18-35 (53%), 36-55 (29%) and 56 years old or over (18%). Twenty Five (25) ethnicities were identified, of which 71% of participants were Badjoue, reflecting their majority in villages 2, 3 and 4. Fang and Bulu, the most common ethnicities in village 1 to the south of the reserve, made up 5% and 6% of the total breakdown respectively. Five percent (5%) of those interviewed were Baka, constituting 18%, 13%, 6.5% and 2.6% of participants in villages 1-4 respectfully.

74% identified agriculture as their primary livelihood activity, although activities such as hunting and fishing were regularly cited as additional important livelihood activities. Seventy-four percent (74%) also stated that while they had income for part of the year, they were financially insecure during certain seasons, because their cash crops (e.g. cocoa) do not produce all year round.

### 4.1 Exploring the importance of wild meat for local food security

We first wanted to understand how frequently people eat wild meat and whether alternatives to wild meat are thought to be present in each village. This was to help us ascertain whether people are reliant on wild meat as a source of protein, and how important it is for their food security (Table 4).

Table 4: Summary of village level wild meat consumption, food security and availability of wild meat-alternatives to wild meat.

Village	Existing projects	Description	Reliance on wild meat	Wild meat consumption (Figure 2a)	Food security (Figure 2b)	Availability of alternatives (Figure 2c)	Seasonality of alternatives (Figure 2d)
1	No project alternatives	5km from the reserve and relatively closed off compared to other study villages. A logging road constructed in 2015 facilitated access to markets.	Most reliant on wild meat Most abundant forest No huge commercial drivers (yet)	Weekly=94.37% Monthly=5.63%	Always=15.49% Usually=29.58% Rarely= 54.93%	Yes=84.5% No=15.5%	All year=21.12% Seasonal=78.87%
2	Community hunting zone in process of completion	On a main road linking market towns and adjacent to timber concessions and other villages. FCTV established CHZ	Reliant on wild meat However hunting is becoming hard Commercial drivers evident	Weekly=75.26% Monthly=24.74%	Always=36.84% Usually=24.74% Rarely=37.89% Never=0.53%	Yes=96.84% No=3.15%	All year= 46.32% Seasonal= 53.68%
3	Involved in alternative project (wild fishing and cocoa)	70-80 km from Somalomo, park enforcement and markets.	Least reliant on wild meat due to alternatives	Weekly=74.26% Monthly=25.74%	Always=9.56% Usually=23.53% Rarely=66.91%	Yes=100%	All year=14.7% Seasonal=85.3%
4	Involved in alternative project (wild fishing and cocoa)	50-60 km from Somalomo, park enforcement and markets	Least reliant on wild meat due to alternatives	Weekly=72.41% Monthly=27.59%	Always=20.14% Usually=20.84% Rarely=56.94% Never=2.08%	Yes=98.62% No=1.38%	All year=9.65% Seasonal=90.35%

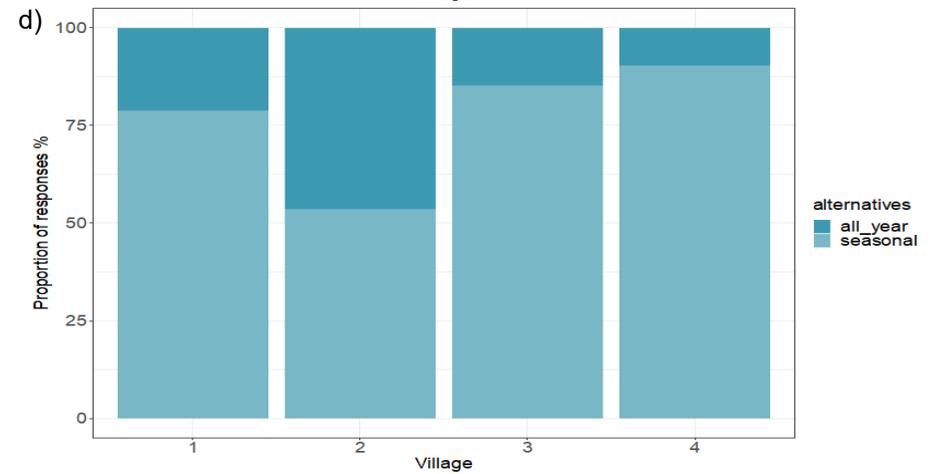
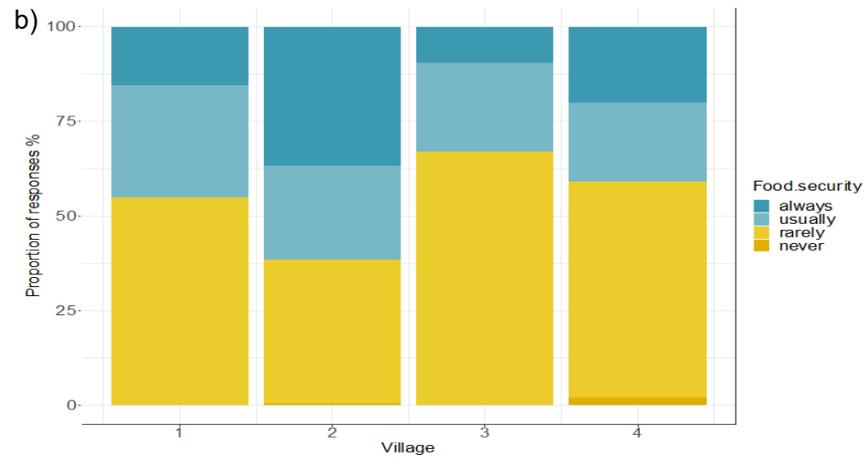
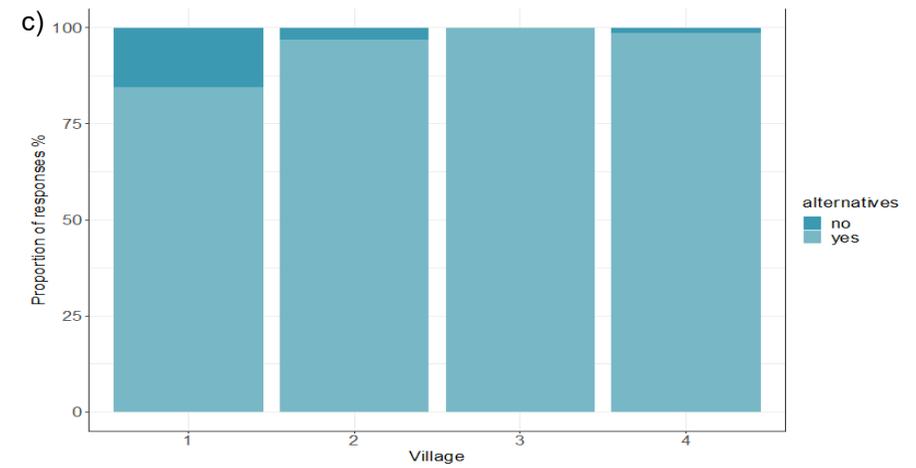
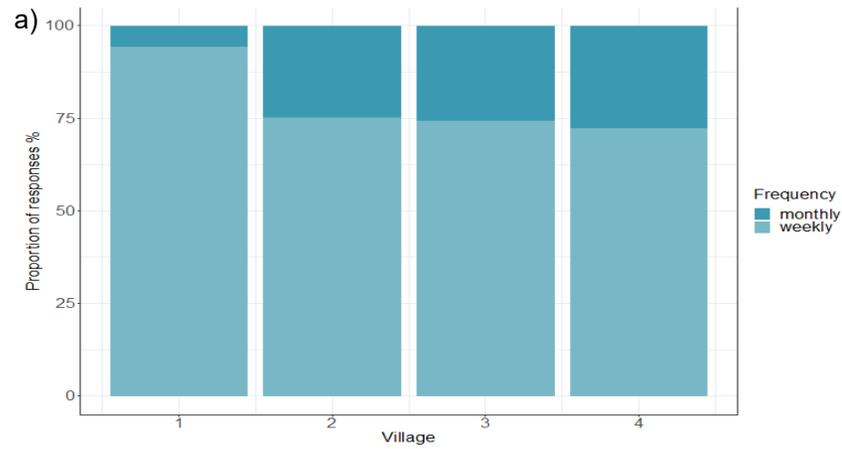
### **Current rates of wild meat consumption and food security**

The vast majority of participants in village 1 consumed wild meat on a weekly basis (Figure 2a). This suggests that alternatives to wild meat may be more prevalent in villages 2-4 than village 1, and that more people in village 1 depend on wild meat for their food security. It may also be that wild meat is more readily available in village 1 compared to the other villages, given its more remote location and proximity to the reserve. Only 9% of participants in village 3 stated that they were always food secure. Village 2 is the only village to have greater than 50% of participants to state they are either always or usually food secure (Figure 2b). It's interesting to note that villages 1 and 2, while lacking in wild meat alternatives, report the greatest level of food security overall. This may reflect a relative ease with which people from village 1 can produce and hunt food, and village 2's ability to sell and buy produce from passers-by, and their connectedness to nearby market towns.

### **Availability of wild meat alternatives**

Participants stated during interviews that the alternatives to wild meat available include eggs, chicken and fish, although overwhelmingly fish was the most prominent option and the only alternative cited in all four villages. Village 1 is home to the greatest proportion of people who felt that alternatives are not available to them (15%). It may be that people here eat more wild meat because there are no alternatives, or it may be that there are no alternatives here because people here have enough wild meat, and less of a motive to be actively involved in project alternatives (Figure 2c). Interestingly, given the current lack of active wild meat alternative projects in village 2 (the most accessible village), 45% of participants deemed alternatives to be present all year round. This further supports the hypothesis that village location in relation to roads, market access and the reserve may well influence the availability of alternatives and peoples' ability to ensure their food security throughout the year (Figure 2d).

Figure 2: Proportion of participants in each village (1-4) who a) eat wild meat on a weekly or monthly basis, b) who are food secure throughout the year, c) perceive alternatives to wild meat are available in their village, and d) who feel that alternatives are present all year round.



## Sociodemographic, household and village level differences in consumption

Age, gender and village had a significant effect on how frequently people eat wild meat. Ethnicity, livelihood and household wealth had no effect. Older participants (aged 36+) were more likely than younger participants (aged 16-35) to rarely eat meat or to eat meat on a monthly, rather than a weekly basis. Men were also more likely than women to eat meat more regularly. People in village 2-4 were significantly more likely to eat meat on a less regular basis than people in village 1.

### 4.1.3 Summary

Younger people eat wild meat more regularly than older people. People in village 1 eat wild meat more regularly than any other village, possibly because of their proximity to the reserve resulting in abundant forests, lack of alternative foods, and distance from law enforcement compared to the other villages. Fish is available as an alternative to wild meat in all villages, although not throughout the whole year. While providing people with resources to get a better yields of fish from the rivers, current wild meat alternative projects in village 3 and 4 have not relieved the issue of seasonal dependence on wild meat, as the alternative promoted, river fishing, is a seasonal activity. Fish ponds could provide fish all year round and act to fill the seasonal gap in the availability of wild meat alternatives during the wet season, when it is too dangerous to fish on the rivers, and during the lean agricultural season, when hunting can provide an important financial backstop. However, without further testing it is not possible to know whether farmed fish from ponds will be seen as positively as wild fish from the river.

## 4.2 Food preferences and drivers of preference

Having explored differences in wild meat consumption and dependence between villages, households and different sociodemographics, we next explore people's food choices and the drivers of wild meat consumption.

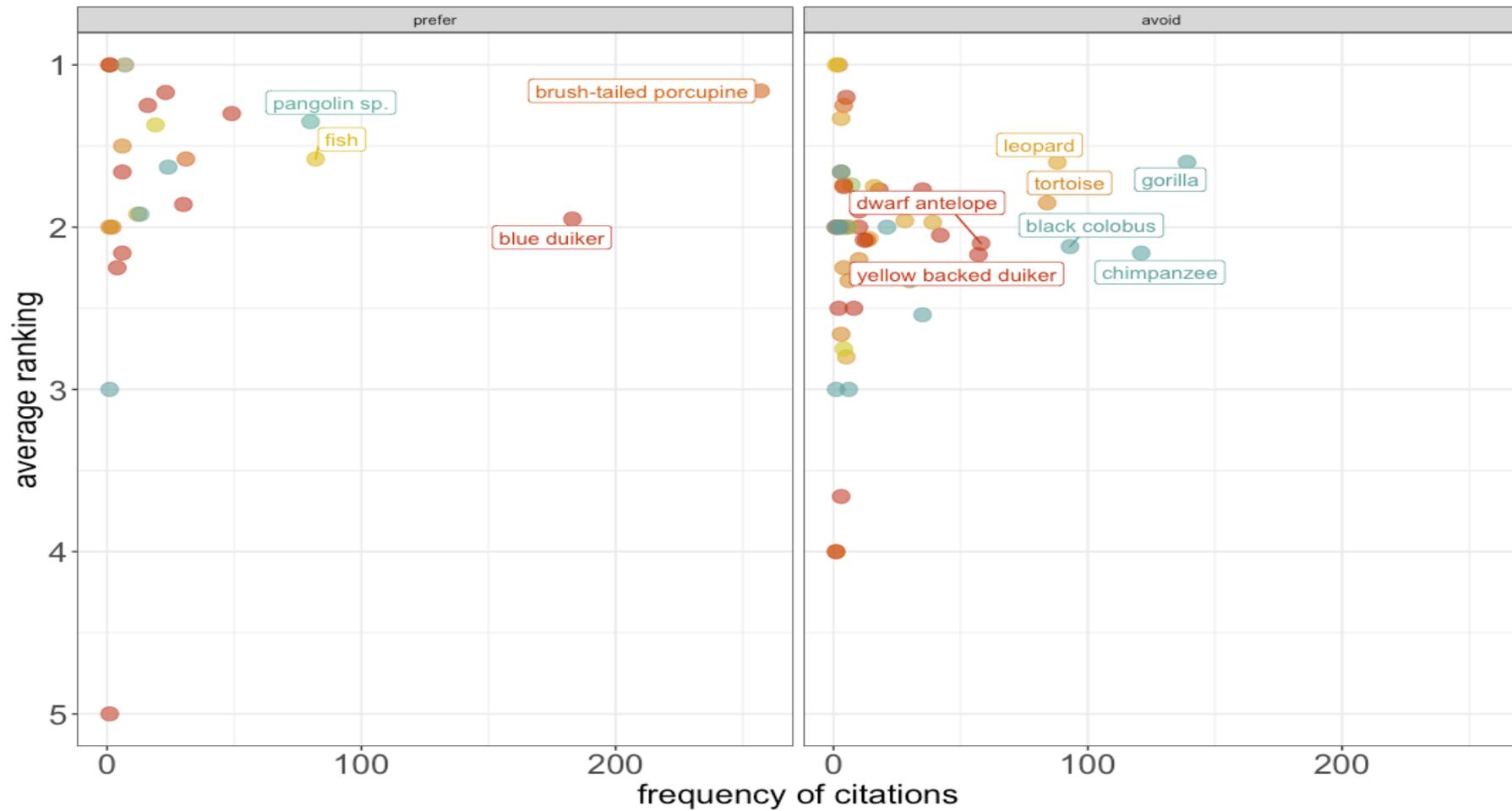
### 4.2.1 Saliency analysis

Twenty-three preferred species or species groups were listed across all villages, of which four species/groups (brush-tailed porcupine, blue duiker, fish sp. and pangolin sp.) were cited by >10% of interviewees. Brush-tailed porcupine and pangolin both ranked highly, while brush-tailed porcupine and blue duiker were most frequently cited. 'Fish sp.' was the only non-wild protein source cited by more than 10% of respondents (Figure 3a).

There were 55 species cited as 'avoided', of which seven were cited by >10% of those interviewed. All species were known to be hunted and/or consumed as wild meat in the region. The ranking and frequency of citations for the avoided species were more clustered compared to the preferred species; three primate species: gorilla, chimpanzee and black colobus were most frequently cited, while leopard, gorilla and tortoise had the highest average ranking in one or more villages (Figure 3b).

None of the species cited by >10% of participants featured in both the preferred and avoided lists, showing that preferences and avoidances of particular species were distinct. However, some overlap in the full list of species cited exists. For example, brush-tailed porcupine had a 'preferred' summed-saliency of 243 and an 'avoid' summed-saliency of just 3, indicating a strong consensus for species preference overall. Further, chicken, had a 'preferred' summed-saliency of 16.87 and an 'avoid' summed-saliency of just 1.75, again indicating an overall preference. Yet for some other species, the direction of preference was more ambiguous. For example, the summed-saliency for bay duiker 'preference' was 3.17, and 2.83 for 'avoidance'. The summed-saliency for preference for goat meat was 5.2, while the summed-saliency for 'avoid' was 5.92. This indicates that, for the top 10% salient species, participants agreed on whether each species was a preferred or avoided species, but the direction of preference becomes more ambiguous for less salient species. For a full list of all species cited as preferred and avoided, see Appendix 2.

Figure 3: Figure comparing how preferred (a) and avoided (b) species performed on the two measures of saliency: i) how frequently each species was cited by participants and ii) how highly the species ranked in each list. Only species cited by >10% of participants are labelled.



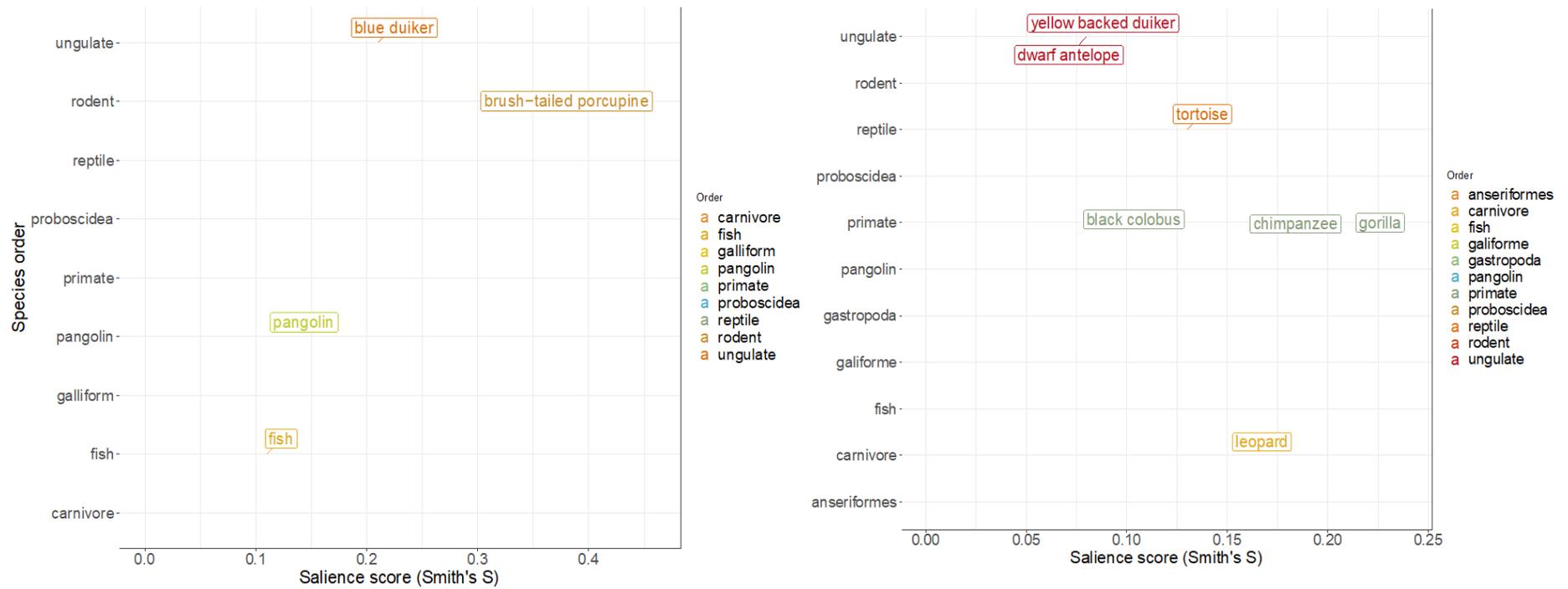
Having compared the two components of salience in Figure 3 (rank and frequency of citation), we combined the two components to explore individual species differences in salience. Across all villages, wild species of mammal and reptiles hunted for meat were more salient than domestic mammals or wild-caught fish (Figure 4).

The most popular species, brush-tailed porcupine and blue duiker, are both relatively abundant and resilient to overhunting (Rowcliffe et al., 2005; Bruce et al., 2017). However, the two endangered species of pangolin present in the study area, white bellied and black bellied pangolin (grouped here as 'pangolin sp.' because participants often refer to both species as 'petit pangolin'), were regularly cited as a preferred meat. Yet, they are both "Class A" species, a term defined in Cameroonian law which protects a species from hunting for any purpose. Fish was again the most popular non-wildmeat option in all villages, above any domestic animal, ranking just behind pangolin (Figure 4a).

Across all villages, primate and carnivore species were most cited as avoided, followed by reptiles. Gorilla and leopard were most salient, followed by chimpanzee, tortoise and black colobus. Carnivore and ungulate species clustered around similar saliences, while primate species saliences were more spread out. Leopard was a clear outlier among carnivores, being particularly avoided (Figure 4b).

Village-level differences in the species avoided were also identified; while highly salient in Figure 4b, leopard were almost solely cited by participants from village 1, while black colobus monkeys were frequently cited in villages 3 and 4. Gorilla, chimpanzee and yellow-backed duiker were commonly cited in all villages, whereas dwarf antelope were only mentioned in villages 3 and 4 (Appendix 3).

Figure 4: The saliency of preferred (a) and avoided (b) species, grouped by species order. Species with a higher Smith S score are most salient (e.g. cited frequently and prioritized regularly). Species cited by > 10% of the those interviewed are labelled.



#### 4.2.2 Overall drivers of species preference and avoidance

Taste, ease of access and health were the key drivers of species preference, while taste, health, tradition and in some cases, appearance, were the key reasons for species avoidance. While the reasons cited for species preference were relatively consistent across all species, species-level differences in the importance of each reason were clear (Figure 5a). Taste was markedly the top reason for liking brush-tailed porcupine and pangolin sp:

*“I love the taste of pangolin, all the others I eat because they are there.”*

*“Porcupine and giant pangolin taste really good.”*

*“Porcupine tastes good and is easy to catch. Pangolin is tasty, but is less easy to hunt. Hog is easy during certain seasons; I love its taste and the fat”*

*“I like the taste and the fat of hog and giant pangolin. Duiker are easy to eat and there are loads of them.”*

Health was most commonly cited as a reason for preferring fish, but was also mentioned as a reason for preferring porcupine, blue duiker and pangolin. These ‘white meat’ species were perceived as lighter on the stomach and as such considered to be ‘better for the gut’ than other darker meats. Older participants also cited preferring fish, pangolin and porcupine because they are soft meats and therefore easier to eat when they have dental problems. This may in part explain the results in Table 3 which revealed that overall, younger people ate wild meat more regularly than older people:

*“I like pangolin and porcupine because of their taste, and fish is very good because it doesn't give worms”.*

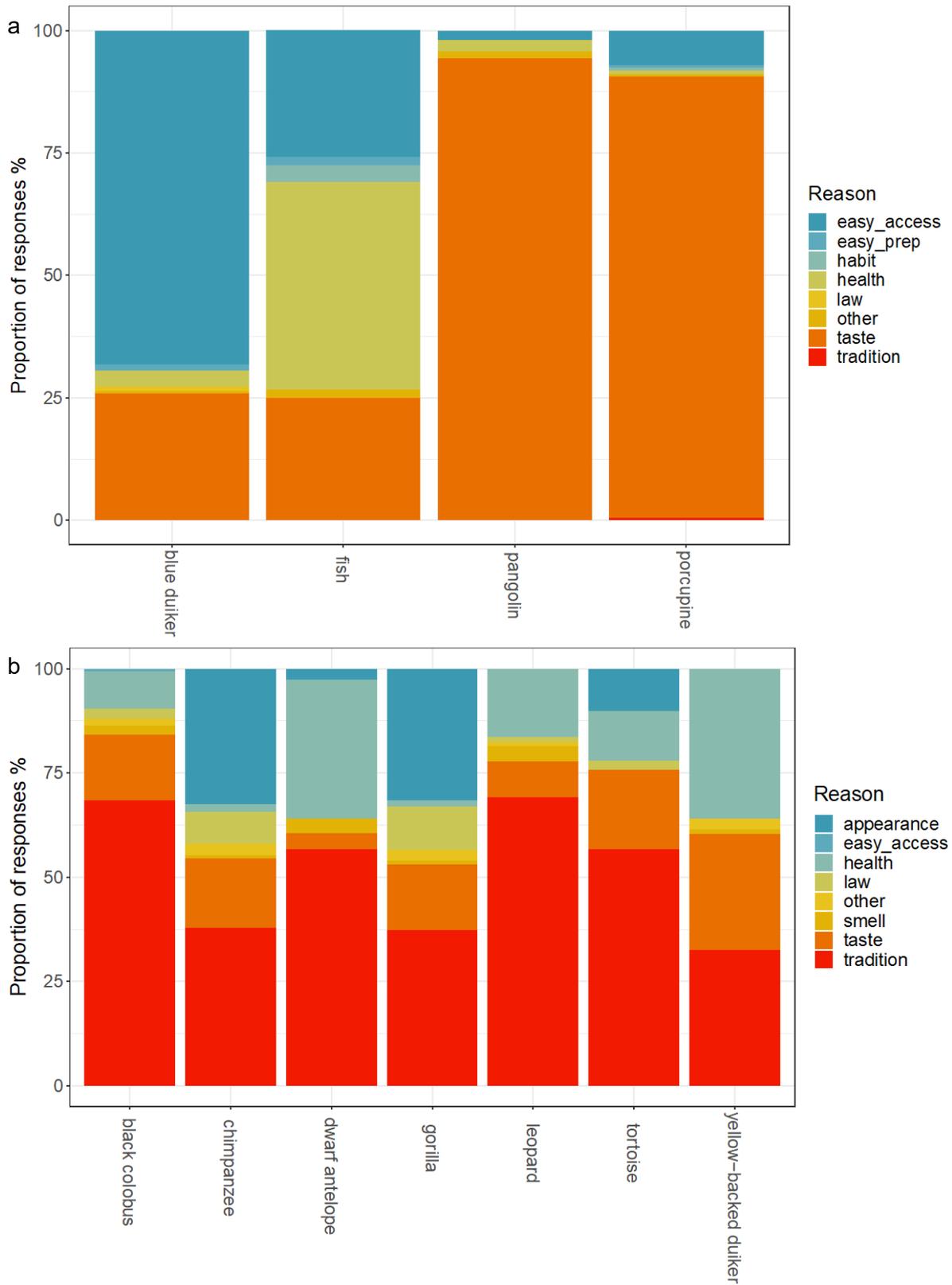
*“I like pangolin and porcupine because they are soft, good for my teeth”.*

*“When I eat fish, I feel well. The other meat give worms”.*

*“Fish is lighter. When you eat fish, you can still run. Fish is more nourishing than meat”.*

*“White flesh of fish causes less issues in the body than bushmeat. If I could, I would not eat bushmeat again because of health problems that it causes”.*

Figure 5: The reasons cited for a) preferring or b) avoiding each species, cited by >10% of participants.



Ease of access was the most commonly cited reason for preferring blue duiker, suggesting that food sources that reduce the amount of effort required to hunt are desirable. Fish were also considered to be easy to access by 25% of respondents, however, with seasonal variation as discussed with Figure 2d:

*“Blue duiker and Peters's duiker are easy to hunt”.*

*“I eat blue duiker a lot though because that's what gets hunted a lot around here”.*

*“When I see it (duiker), I eat it”.*

Although not a prevalent driver of wild meat consumption, tradition was cited as a reason for avoiding all of the species by at least 25% of participants, and was the main reason for black colobus, leopard, tortoise and dwarf antelope avoidance (Figure 5b). Black colobus and leopard were viewed as totem species and as such should not be eaten:

*“I don't eat leopard and colobus because our parents told us that they give us spots”.*

*“My parents told me that if I eat leopard, I will get spots all over my skin”.*

*“Tradition says that the colobus is our totem, it's an important animal for us, like the leopard too”.*

*“I'm not meant to eat it, I'm a twin so my father told me never to eat leopard”.*

*“leopard gives women spots if we eat it. Also my parents always told me not to eat it. Same with the hyrax, it's just not in our tradition to eat it”.*

*“Leopard and colobus are totems of the forest and traditionally we don't eat them as our parents told us not to”.*

*“We don't eat le magistrat (black colobus), and sometimes gorilla and elephant are a totem”.*

*“Fang men and women can't eat leopard, plus it's our totem”.*

*“I don't eat leopard because its forbidden for women from Nzime culture to eat carnivores”.*

*“Black colobus has been forbidden to us by parents. Otter is forbidden to parents waiting for a child. Bongo is forbidden even to see”.*

Another aspect to tradition was that respondents' parents had not taught them to eat certain species because they were reserved for older generations, or because ancestors are believed to transform into these species:

*“Tradition does not allow us to eat genet, leopard, gorilla or chimpanzee”.*

*“Gorilla is reserved for old people”.*

*“In our Baka family, grand-parents transform into gorilla, chimpanzee, or leopard after they are dead”.*

Taste was also consistently cited as a reason for avoiding species (Figure 5b), in particular for large duiker and antelope species:

*“It is a forbidden tradition to eat yellow back duiker and black colobus. and in addition theses meat have a bad taste”.*

*“Sitatunga don't have the good taste; yellow back duiker give epilepsy and taste bad”.*

*“yellow back duiker has a bad, strong taste”.*

Health concerns led participants to avoid ungulate species such as dwarf antelope and yellow-backed duiker. It was sometimes hard to discern between concerns about physical reactions, such as rashes, epilepsy, worms in the meat or allergic reactions, and health-related reasons that may have been more associated with tradition. In particular, women often stated that large duiker and ungulate species such as yellow-backed duiker and sitatunga were forbidden for medical reasons, citing concerns over the health of unborn children, or their menstruation patterns. Several duiker species were also commonly cited in all villages as causing rashes and spots:

*“Duikers give me a rash”.*

*“Sitatunga gives me a rash and civet and bay duiker are not food for women, only men can eat those. Especially if you are pregnant- if you eat civet your child will have spots”.*

*“Genet gives me spots and duiker causes epilepsy. I also don't like the taste of yellow duiker”.*

*“Yellow duiker makes women bleed a lot”.*

Almost all those who cited dwarf antelope agreed the species can give you epilepsy and has lethal effects on small and unborn children, if eaten while pregnant:

*“Dwarf antelope give epilepsy”.*

*“Tradition forbids white bellied duiker, black colobus. When you eat it your child dies. When you eat dwarf antelope your child get epilepsy”.*

*“White bellied duiker is forbidden to those who give birth. Dwarf antelope gives epilepsy to children”.*

*“Tradition forbid those giving birth to eat dwarf antelope, black colobus, de Brazza monkey, white bellied duiker, it gives epilepsy”.*

*“dwarf antelope, black colobus, de Brazza monkey, yellow backed duiker are unadvised to eat for the people that still bear children”.*

An off-putting appearance was cited by > 25% of participants as a reason for avoiding gorilla and chimpanzee and 10% for tortoise (Figure 5b). In all villages, participants frequently shared that gorilla and chimpanzees looked too much like humans, and that the appearance of tortoise was off-putting:

*“Panther gives me itches, yellow backed duiker gives me pain at the lower abdomen, and turtle disgusts me”.*

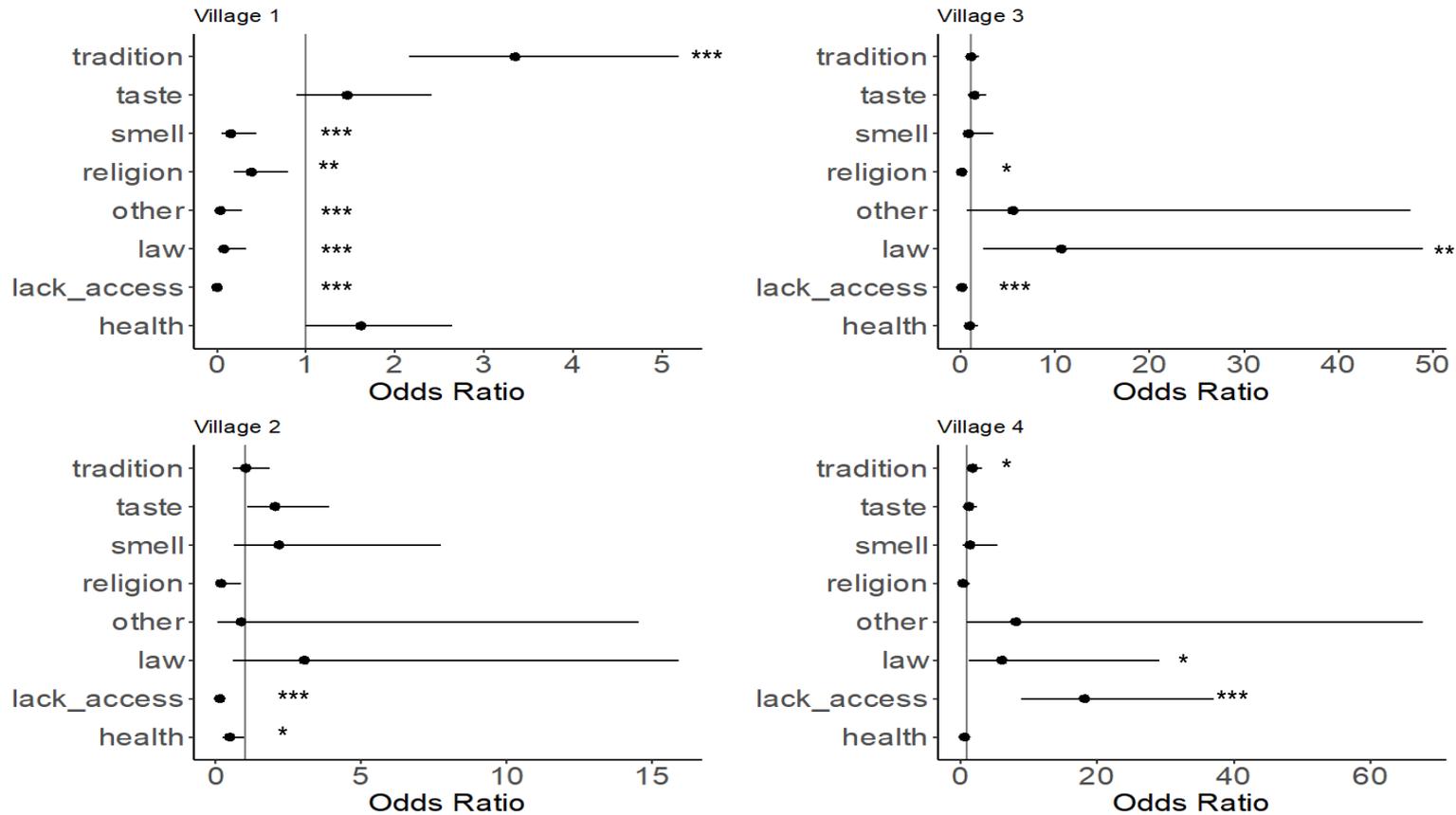
*“Gorilla and chimp look like your grandma in a pot- how can I eat something that looks like a human? I don't also like the taste of any of them”.*

*“The tortoise disgusts me, and it's for older people anyway”.*

#### **4.2.3 Village level differences in the drivers of species preference and avoidance**

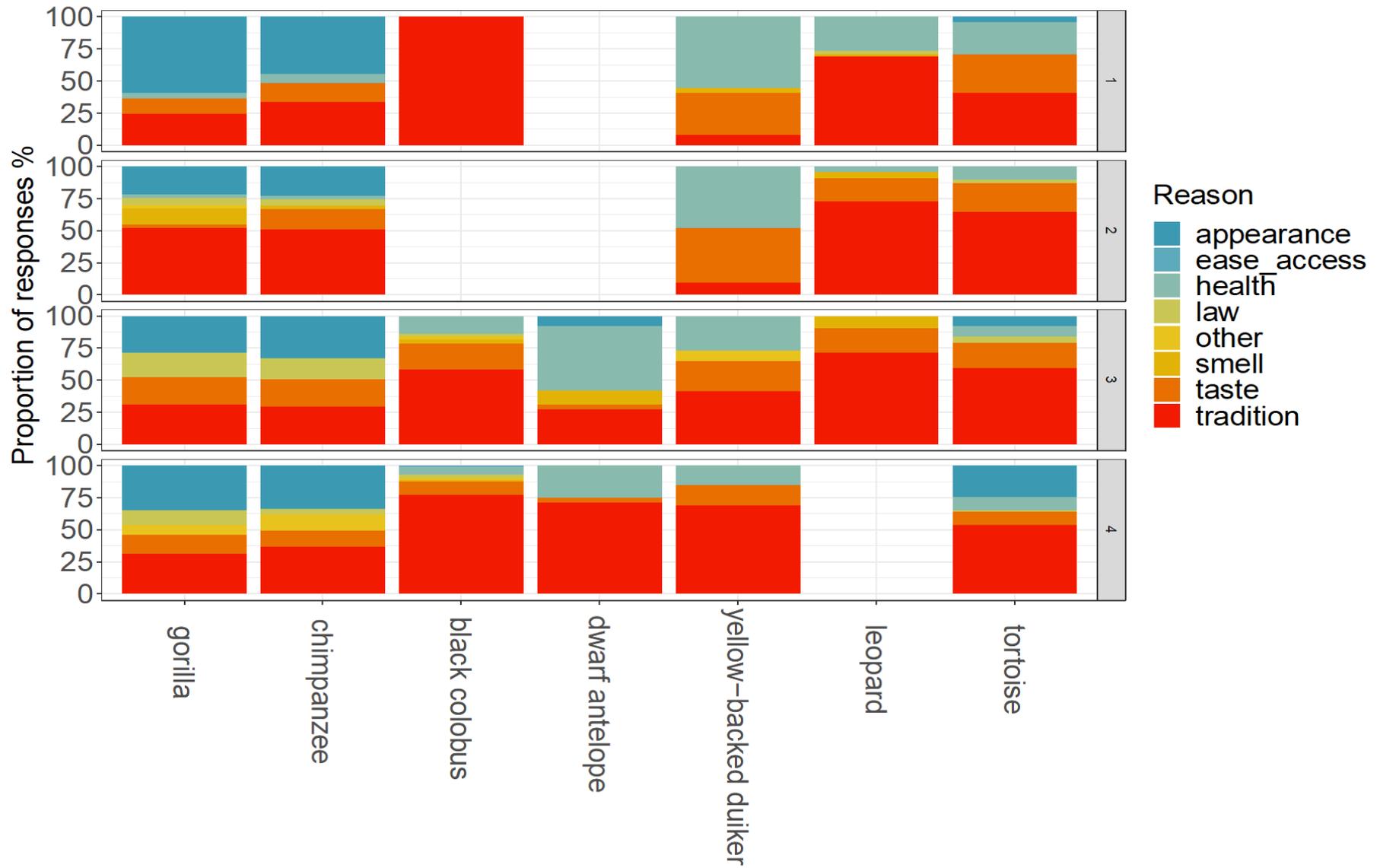
We found no significant village-level differences in wild meat preference, or the reasons for such preference. However, we found significant village-level differences in species avoidance and the reasons provided for species avoidance. Participants in village 3 were 10 times more likely than those in other villages to cite the existence of the law or fear of penalties as a reason to avoid species, possibly reflecting their relative proximity to a base for park rangers and MINFOP staff, and possibly their involvement in education and awareness activities linked to wild meat alternative projects in their village. Participants in village 1 were more likely to cite tradition, taste and health as key barriers than those in other villages (Figure 6).

Figure 6: The odds estimates from the best model, assessing the village-level differences in the reasons for avoiding species. Vertical line indicates the baseline, dots to the right indicate greater odds that a reason is given, and dots to the left indicate reduced odds compared to the baseline. Asterisks (\*) next to the value labels indicate statistically significant factors in the model (\*=p-value <0.05, \*\* = p-value <0.005, \*\*\*=p-value <0.001) calculated with Wald tests.



The law was cited by 23% and 22% of participants as a reason for avoiding gorilla and chimpanzee respectively in village 3, but not mentioned once as a barrier to consumption in village 1 (Figure 7). One Hundred percent (100%) of participants cited tradition as the reason for avoiding black colobus in village 1, while health and taste concerns were also mentioned in villages 3 and 4. Tradition was the key barrier to dwarf antelope consumption in village 4, although health was a greater concern in village 3. Health and taste were the primary concerns regarding yellow-backed duiker consumption in villages 1 and 2, while tradition was the dominant barrier in village 4 (Figure 7), reflecting the themes identified in the qualitative interview data.

Figure 7: The reasons provided by participants for avoiding each species, divided by village. Only species included in the top 10 for each village are included (n=7).



#### 4.2.4 Sociodemographic predictors of species preference and avoidance

The reasons cited for species preference did not vary significantly between sociodemographic groups (e.g. age, gender, ethnicity or livelihood) or by household wealth. However, the reasons cited for species avoidance did vary by age and gender: men were significantly less likely than women to cite lack of access as a reason for avoiding a particular species, but were more likely to cite health concerns and the legal protection status of the species. This makes sense because as men hunt, they are the ones most likely to be penalised if caught with a protected species. Conversely, women were more likely to cite tradition as a reason for avoiding meats, which makes sense given the volume of taboos and traditions that involve women and their wild meat consumption (see quotes on page 22). Participants aged 36-55 were more likely to cite religious reasons for avoidance than both younger (16-25) and older (56+) participants.

#### 4.2.5 Summary

The species that people prefer to eat are generally abundant and non-protected (e.g. blue duiker and porcupine). The exceptions are 'petit pangolin' species, which are both protected and have highly prized meat in all villages. Primates and carnivores are most avoided, although that doesn't mean that they are not consumed at all. Health, taste, and ease of access are the key drivers of wild meat consumption, while health, taste and tradition are the greatest drivers of avoidance of particular meats.

There are no significant village-level differences in species preference or in the reasons cited for those preferences, but there are significant village-level differences in species avoided and the reasons why they are avoided. Village-level differences in these reasons, such as law, taste, tradition and access, may reflect several factors, including variation in participation in wild meat alternative projects (villages 3 and 4 host such projects), the ease with which hunters can find wild meat (e.g. village 1 which is near good forest), village-level access to other alternatives due to its location (e.g. village 2 which is near the river), as well as differing traditions. While we found no ethnicity or wealth-based differences in the drivers of preference, age and gender influence the reasons provided for avoiding species. Women cite tradition more than men, while men cite the law and health more frequently.

## 4.3 Understanding locally-desired design features of wild meat-alternative projects

Having explored the current role of wild meat for protein consumption, and the drivers of this consumption, we next explored how future wild meat alternative projects may be received by participants, and how and why these projects may affect rates of both wild meat hunting and consumption. A total of 171 scenario interviews were carried out across 4 villages: 31 (village 1), 65 (village 2), 35 (village 3) and 30 (village 4).

### 4.3.1 Baseline scenario

Under the baseline 'business as usual' scenario, in which respondents were asked to imagine that current trends continue as now, 27% and 32% of respondents reported that their household rate of hunting and wild meat consumption respectively would increase over the next five years, while 32% and 27% stated that their current rate of hunting and consumption of wild meat would not change. Of those who reported their consumption would either increase or remain the same, a lack of income sources to buy alternative meats was a primary reason in village 1. By contrast, participants in village 2 said that they were in the habit of eating wild meat, and couldn't imagine being able to stop. The importance of wild meat for their food security was the primary reason cited in villages 3 and 4, which is surprising given the presence of wild meat alternative projects in both villages. Of those who said that hunting would either increase or stay the same under the current scenario, the need to hunt as a source of income was the primary reason cited in all four villages.

Forty-one percent (41%) of respondents stated that their household rates of wild meat hunting and consumption would drop under the business as usual scenario. On the surface, this sounds positive. However, participants in villages 1 and 4 reported that this would be because of declines in wild meat species, causing reduced availability. People in village 1 additionally said that the village's population has grown since the arrival of the new logging road. The role that law enforcement plays in limiting wild meat consumption and hunting was a key reason cited in villages 3 and 4. These results highlight a potential challenge for food security and livelihoods, in the context of the current high level of wild meat hunting and consumption around the Dja reserve. They also indicate how village location in relation to law enforcement has a role in the perceived ability of participants to continue hunting and consuming wild meat.

### 4.3.2 Subsistence vs income

Scenarios offering both food and income from a wild meat alternative project performed significantly better than those offering either of these alone. 92% of households reported that their hunting and consumption would decrease under scenario 4. Households were 21 and 22.5 times more likely to reduce their consumption and hunting under scenario 4 (fish for food and income), and 10.5 and 13.5 times more likely to reduce their consumption and hunting under scenario 5 (chicken for food and income) than under the baseline business-as-usual scenario (Figure 8). Offering chicken farming was less likely to reduce both hunting and consumption because participants would find it hard to imagine eating chicken on a regular basis; chicken is usually reserved for special occasions, or is seen as a resource to be sold in times of financial need. Others also shared that they didn't like chicken as much as fish, because chickens are 'dirty', running around the village eating what they find. When we explained again that these chickens would be kept in a coop and fed, they were still uncertain.

Improved food security was the most frequently cited reason for predicted declines in household wild meat consumption in all four villages under these scenarios. Meanwhile, the reasons for declines in hunting were more diverse. The fact that these projects would encourage a change in hunter behaviour away from hunting and towards other alternative activities was commonly cited in villages 1 and 3, while the provision of an income alternative was most important in villages 1 and 4. Increasing food security

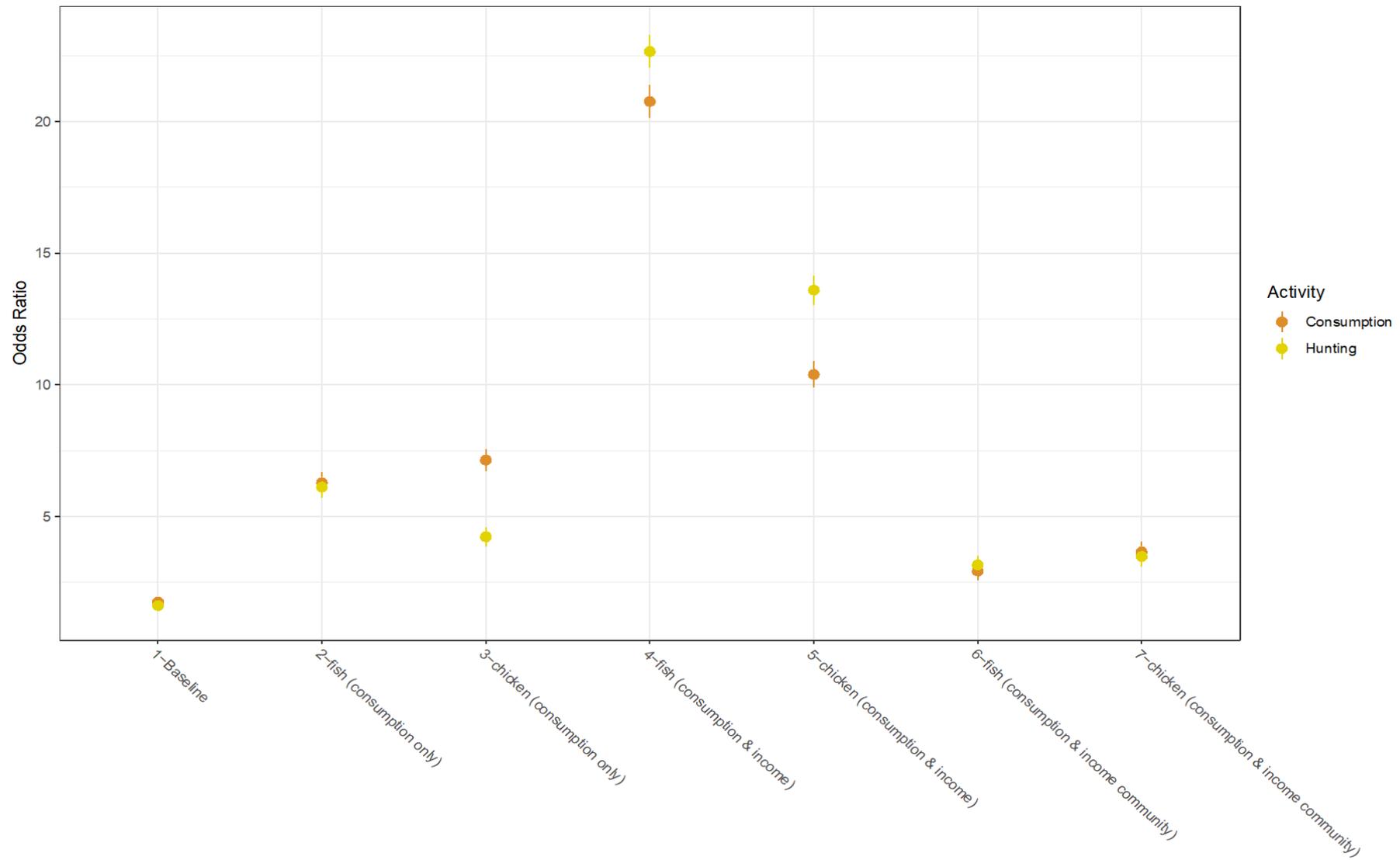
was the main reason cited in villages 2 and 3 for the fish farming scenario, while providing an alternative source of income was the primary reason for all villages for the chicken farming scenario, again supporting that chicken projects would likely act as an income rather than a wild meat alternative. Several participants in each village also mentioned that being busy with this project would mean that they no longer had time to go hunting, as long as the project was successful and resulted in enough food and income for the household.

These results indicate the importance of hunting as a source of income as well as food, and the lack of alternative livelihood as well as protein options around the Dja Reserve. They also suggest that fishponds that allow participants to generate both food and income all year round may be the most suitable alternative if properly implemented, as the next section discusses.

#### **4.3.3 Household vs community scale projects**

The predicted reduction of both hunting and consumption with fish or chicken farming was conditional on the projects being offered at the household rather than the community scale. Community-level projects offer both food and income for a reduced level of household effort, in exchange for cooperation with the wider community. Therefore, the research team expected them to be popular with respondents. However, households were significantly less likely to reduce their consumption and hunting when the projects were implemented at the community level, compared to the household level scenarios (Figure 8). Perceived community-level conflicts, mistrust both within the community and towards conservation Non-Governmental Organisations (NGOs) who may administer such projects, and poor benefit-sharing among community members in favour of those in elite positions, were commonly cited reasons for why community-level projects would not be as successful as household-level projects. However, many participants were still willing to try, if such a project were presented to them.

Figure 8: The likelihood that each scenario will reduce household level hunting and consumption across all villages, based on respondents' responses to the scenario interviews.



#### 4.3.4 Additional barriers to the successful implementation of wild meat alternative projects

While the scenario interviews focused on exploring the effect of wild meat alternative project design on the reduction of wild meat hunting and consumption, the open nature of these conversations meant that participants often shared insights into their current or past experiences of alternative projects, which have important implications for the design and success of future projects both in the Dja region and more generally. The following points were raised primarily by interviewees in villages 3 and 4, who are currently involved in wild meat alternative projects, and who have also taken part in previous projects of a similar nature.

Participants shared how, when trying to sell the fish and other products produced as part of wild meat alternative and livelihood initiatives, they were prevented from selling their produce by ecoguards. The ecoguards regularly come to meet them when they cross the river to the nearby town, and either take their produce from them or threaten them with jail unless they pay a hefty bribe. This is because they are meant to have a 'identification of source' certificate to show where their produce has been sourced from before they can sell it. However, they can only get this certificate from the town, and ecoguards reportedly block people's entry to the town rather than providing assistance, which they are well placed to provide given their knowledge and understanding of the permitting system. Participants suggested that ecoguards are acting this way because they don't get paid enough in their jobs, and because ecoguards are not able to take their usual bribes from people who are no longer trading in wild meat or conducting illegal activities. As such, the ecoguards continue to use their power over local people to collect bribes, despite their activities now being legal. Projects must attempt to identify such barriers to wild meat alternative projects, as such issues can result in people feeling let down and frustrated with conservation NGOs and park staff, for penalising them for trying to make a living in a sustainable way.

Village 3 is c.70-80km from the main town. During the rainy season, bike travel can be expensive. Travel costs, combined with the bribes being charged by the ecoguards upon arrival in the town, mean that participants can end up giving away the majority of their potential earnings. For example, the research team were informed that a large bucket of fish can sell for up to 60,000 CFA in town. Bikes can cost up to 12,000, plus ecoguards sometimes bribe over 20,000 for release from custody, where people are put when they don't have the necessary permit. In addition, villagers are expected to pay various different ministries in order to obtain the 'source' certificate, meaning that sometimes project participants may return home with profits of under 10,000 CFA (1/6 of the price of a bucket of fish, US\$13, hardly worth it for all their efforts). Hunting and selling wild meat may be, under these conditions, a preferable way to make a living, because the effort required to go out any hunt in the way they always have done is less than the effort required to take part in and establish a new activity, and because the money that can be earned from hunting outweighs the money that can be earned from taking part in the alternatives. These barriers need to be removed for the alternative offered to be perceived as 'easier to access' than wild meat, so that it can result in benefits that can sustain people and their families in the same way that hunting would.

Many interviewees shared their frustrations with the way some past project resources were shared and managed within the community. Smaller households and older participants stated that in some cases, the distribution of resources (e.g. building materials, seedlings), was a 'free for all', and households with more children or 'hands on deck' were able to take a larger proportion that were meant to be distributed equally among participant households. Future initiatives need to ensure that there is always someone on the ground and available to answer questions in the early stages of a project, and to facilitate a fair distribution of resources and support (with fair being defined by the community members themselves).

Challenges with resource sharing and participation can result in open mistrust of the intentions of NGOs. Some respondents shared that, while they see project staff travelling in large cars, and making their living from establishing these projects, nothing long-term or sustainable changes for them despite years of questionnaires and attempted projects. They see some NGOs to be partners of the ecoguards, and as such also view NGO employees as trying to line their own pockets, without any real intention of doing anything to help them. While this was not the feeling of all the people interviewed, project implementers must consider how their actions, and failures, can have deep and long lasting impacts on the well-being of people, and on their subsequent willingness to take part in 'yet another' unsustainable project.

## 5. Discussion and wider context

This study provides an assessment of the drivers of wild meat preference and consumption, in four different villages around the Dja Faunal Reserve, as well as insights into how households in all four villages may engage with a series of different potential wild meat alternative projects. In this section we summarise the results from this research and discuss how it relates to the wider literature, specifically the literature reviewed by IIED (Booker, 2019).

### 5.1 Key drivers of wild meat consumption and avoidance

#### 5.1.1 Availability

The two most preferred species in this study, blue duiker and porcupine, are both abundant, resilient to overhunting and of least conservation concern (Rowcliffe et al., 2003; Bruce et al., 2017). Studies in the north-west Lebialem division of rural Cameroon, also found species that were most available and abundant; such as porcupine, guenon and blue duiker all ranked highly according to taste (Wright and Priston, 2010).

An exception in all villages, was participants' love of the two small pangolin species (white and black bellied pangolin), both class A protected species and Endangered on the IUCN Red List. Pangolin are the world's most traded mammal species, commonly hunted for their scales for their meat and scales (Challender and MacMillan, 2014; Ingram et al., 2018). The interviews with participants revealed a real taste preference, and a reluctance to stop hunting them as a result. Authors of a study in Equatorial Guinea and Tanzania found that while consumer preferences for species are largely driven by taste, these preferences can change because of availability (Kümpel, 2006; Ndibalema and Songorwa, 2008). It may be then, that the preference for pangolin and its high salience, suggests viable populations of pangolins still remain close to these study villages and that as populations decline, so could local preferences for this species. A preferable option is finding ways to incentivise consumers away from this species, which, given the strong taste preference and added potential future benefit of value from trading the scales, may be a significant challenge. However, people aren't yet making a lot of money from the scales within these villages, so perhaps this isn't an impossible task.

#### 5.1.2 Taste and health

The review by Booker (2019) found that, of 26 papers that noted taste as a driver of food choice, only six provided detailed insights as to whether this was a primary driver (Ladele et al., 1996; East et al., 2005; Schenck et al., 2006; Kumpel et al., 2009; Mwakatobe et al., 2012; Chausson et al., 2019). Our study provides in-depth understanding of the role of taste and other drivers for wild meat consumption in rural areas. Wild meat demand is often linked in the literature to availability and affordability in rural settings, and taste is viewed as a secondary driver of food choice (Spira et al., 2019). However, our findings contradict this; taste was the primary driver of wild meat preference and consumption in all four villages, and availability and health were secondary drivers.

Previous studies in Equatorial Guinea found that consumers' top three most preferred foods were fresh fish or wild meat species (i.e. red snapper, porcupine and blue duiker), and wild meat was regarded as a healthier, more nutritious food choice than frozen, domestic meat options (East et al., 2005; Kümpel et al., 2006, 2010). While frozen meats or fish are not currently an option in our study villages due to a lack of electricity, the results of our study do support these findings. Fish in particular, but also pangolin and porcupine, were deemed by some as healthy meats (Figure 5a). Further, some of the 'darker' wild meats, such as yellow-backed duiker and dwarf antelope were commonly associated with stomach problems and worms, and the free-ranging nature of domestic animals such as chicken and ducks raised health concerns for some who consider them dirty. Another study also found that reasons for the preference of wild meat over domestic meat include taste, health, habit, ease, price and culture (Abernethy and Ndong Obiang, 2010). This supports the premise that fresh wild meat and fish are preferred options over domestic meat in the study villages. A study of rural hunting communities in Nigeria found that survey respondents stated a preference for wild meat over domestic meat (84% of

n=327) and the authors connected this to cultural ties (i.e. cultural group, hunter within family and traditions linked to festivals and holidays) related to wild meat consumption (Friant et al., 2015).

While participants keep chickens and livestock (e.g. pigs, goats) in some villages, these are only consumed in emergencies, or for special occasions. Chicken was the second favoured non-wild meat alternative after fish, and was commonly cited as being a tasty meat. It was also cited as an available wild meat alternative in some of the villages. However, we learned how chicken, while a tasty meat, is usually reserved for special occasions or to sell in times of financial need. Consuming chicken on a regular basis at home could require a large cultural shift in the mindset of many people in these villages, who are simply not accustomed to eating chicken as a regular protein source. As such, it is likely that wild meat alternative projects that offer chicken would more likely result in chickens being reared and sold in nearby towns where demand for chicken was greater than it is in the villages, rather than acting for protein replacement. Therefore, chicken raising would become an additional activity alongside wild meat hunting, as opposed to fulfilling its intended role as a wild meat alternative, which has been the outcome in many previous alternative livelihood and wild meat projects (see Wright et al., 2016; Wicander and Coad, 2018). This may not necessarily be a bad thing, as it would reduce some people's dependence on hunting for income. However, if reduction in hunting for consumption is the end-goal, chicken-raising would need to be combined with other interventions that could replace wild meat as a source of protein. It is important that external partners and researchers try to recognise that their own cultural biases (e.g. towards chicken as an acceptable protein source) may shape what they deem to be an appropriate protein alternative.

### 5.2.3 Tradition and appearance

One result that may come as a surprise was people's avoidance of large primates such as gorilla and chimpanzee for meat. Participants in all villages commonly cited being put off by the species' appearance and abiding by traditional avoidance of these species. Consumption of large primates in rural areas, and demand for these species in urban markets, are common themes in the literature (see Tagg et al., 2018). As such, one may question the validity of the findings in this study and maybe suspect that people were not answering truthfully because of the protected status of great apes. However, interviews were participant-led; it was up to participants to mention the species of importance to them and they were never asked to discuss a specific species (so mentions of gorilla and chimpanzee came from them not the researchers). Also, 25% of participants in villages 3 and 4 cited concerns about the law as a reason for not consuming gorilla and chimpanzee. If others were concerned about the law, they might also have been expected to cite legal issues over tradition or appearance as a reason not to consume these species. By contrast, participants openly shared their preference for pangolin species because they tasted good, despite them also being known to be protected. As such, we don't expect social desirability bias to be the reason for our results. In their study in North-West Cameroon, Wright and Priston (2010) also found that gorilla and chimpanzee were absent from their ranks of preferred species. The authors found that traditional beliefs that humans transform into chimpanzees and gorillas appeared to influence hunting habits, stating "the risk of accidentally murdering a person in disguise, and the subsequent ill fates this may bring, sufficiently deterred many individuals from hunting apes" (Etiendem et al., 2011). Booker (2019) describes how taboos in two studies led to less consumption of wild meat (Jenkins et al., 2011, Reuter et al., 2016). One of these studies found a clear relationship between taste preference and taboos; with taboo species receiving low rankings in terms of taste preference (Jenkins et al., 2011).

While gorilla and chimpanzee were cited as species to avoid consuming by participants, it does not mean that these species are never consumed. Jenkins et al. (2011) found in Madagascar that taste was not an important driver of wild meat consumption, but human-wildlife conflict may play a role. For example, the Vasa parrot were not preferred but was commonly eaten, perhaps because it is considered a crop pest. Gorilla and chimpanzee have also been reported to raid crops (Enouh et al., 2014) and hunters regularly report fear of encountering them in the forest, more so than forest elephants (the Author, personal observation during PhD research in the study area from 2015-2018). As such, it may be that gorillas and chimpanzees are killed when encountered and then eaten, although they are not targeted or consumption in these study villages.

## 5.2 Individual-level differences in drivers of consumption

### 5.2.1 Age and gender

The review by Booker (2019) showed that relatively few studies that undertook gender-disaggregated analyses found any differences in consumption patterns or preferences between genders (e.g. Fa and Gracia Yuste, 2001; Ndibalema and Songorwa, 2008; Mwakatobe et al., 2012). Further, the review identified just two studies that explored the impact of age on consumption of wild meat and these studies were from urban contexts (i.e. Luiselli et al., 2017; Hema et al., 2019). Our study showed that no sociodemographic variables predict the reasons cited for preferring certain species. However, age did dictate the frequency of wild meat consumption. In their studies in the urban areas of Burkina Faso, Niger, Nigeria and Togo, Hema et al. (2019) and Luiselli et al. (2017) found young people consumed less wild meat than older participants because it was becoming less socially acceptable. Our results contradict these; older participants eat wild meat less regularly, and some also select different species that are considered to be softer meats, due to cited challenges of chewing through tough meats.

We found that age and gender also affected the reasons cited for avoiding a species; women were more likely to cite tradition as a barrier to consumption than men, discussing concerns in particular over maternal health, and menstruation. The diverse practices and beliefs of hunter-gatherer communities of the Congo, referred to as 'Ekila', described by Lewis (2008) have interesting parallels to these themes raised by participants. Lewis explains how Ekila can refer to menstruation, blood, taboo, a hunter's meat, animals' power to harm humans, and particular dangers to human reproduction, production, health, and sanity. Certain animals are 'Ekila' while others are not, although the species that are Ekila can change with time and location. For example, Lewis reports how buffalo, bongo antelope, black-fronted duiker and sitatunga have huge and dangerous Ekila, and how eating other species can result in difficulties in pregnancy, or child defects. This is interesting, because, although working within predominantly Bantu villages, participants had very similar concerns as the Baka regarding large duiker and antelope species, as reported by Lewis.

### 5.2.2 Wealth and ethnicity

While we identified some qualitative ethnicity-based differences in the reasons cited for avoiding species (e.g. Baka linking gorillas and chimpanzees with their ancestors), we found no significant statistical effect of ethnicity, wealth or participants' livelihoods. Booker (2019) found mixed results on the impact of ethnicity on consumption and preferences; four studies reported ethnicity-based differences in wild meat consumption and species preference (e.g. Fa et al., 2001; East et al., 2005; Ndibalema and Songorwa, 2008; Ceppi and Nielsen, 2014) and two studies found no difference by tribe or ethnicity (Mwakatobe et al., 2012; Boakye, 2018).

We also found that wealth was not a significant explanatory factor in either the rate of wild meat consumption, or the reasons cited for wild meat preference or avoidance. Additionally, financial reasons for consumption were not mentioned once for the wild meat species that were mentioned by >10% of the respondents. These results contradict many studies and the common narrative in studies of wild meat, that affordability is the main reason why rural households consume wild meat (Kiffner et al., 2015). Studies of urban wild meat consumers and traders in Cameroon show that those from middle-upper income brackets are demanding wild meat as a sign of wealth and to meet luxury and social status-seeking desires, while those from lower economic classes rely on wild meat (often of different species) to buffer their food security needs (Randolph, 2016). It is possible that the variation in wealth between households was insufficient within these villages to detect significant effects of wealth on consumption and preferences, or that the study area was not wealthy enough for people to have the ability to make these choices.

### 5.3 Village-level differences in avoidance and consumption

Previous studies in the Democratic Republic of Congo have found that motivations for consumption varied between localities; some consumed wild meat because of its availability, while in another locality it was consumed predominantly due to taste preferences (Spira et al., 2017). In our study, we found the drivers of species consumption to be quite consistent across all four villages. However, we did identify differences in the species and reasons cited for avoidance, as well as the rate of wild meat consumption.

Village-level differences in totem species may reflect local traditional beliefs (Ceppi and Nielsen, 2014) – a finding supported by other studies (McNamara et al., 2016; Mavah et al., 2018). Wild meat consumption was much more frequent in village 1, which was the remotest village closest to the reserve, than all the other villages. Booker (2019) also found four studies where wild meat consumption was greater in areas closer to harvestable wildlife populations (e.g. a protected area, (Foerster et al., 2012; Mgawe et al., 2012; Mwakatobe et al., 2012; Luiselli et al., 2019).

### 5.4 Implications for wild meat alternatives in the Dja Faunal Reserve

Alternatives should be viewed by their recipients as providing equal or greater benefits for less effort than hunting if uptake of these alternatives is to be sustainable. They should be both easy to establish and to maintain if they are to provide enough of an incentive to stop hunting in the forest (in particular in village 1 where the forest is abundant and hunting is relatively easy). Importantly, they should provide both food and income to reduce both consumption and need to hunt for income.

The alternative protein itself must be perceived as healthy and to have a good taste. Importantly, alternatives must be available all year round, or fill the gap when river fish are not widely available and during the lean agricultural seasons, when hunting increases to account for a decline in food and income availability.

When developing wild meat alternative projects, designers must consider how individual, household and village level factors may affect the type of alternative preferred, as well as the type of project design. In particular, they must consider the effect of taste, tradition, perceived health and cultural perceptions of alternatives prior to establishing projects. For example, differences in the perceptions of meat must be understood before implementation.

Initiatives may want to target hunters and younger people, who eat and hunt wild meat more regularly in these study villages. However, given the overall preference for household-level activities, wild meat alternative projects must be accessible to all generations, to enable households comprised of older people to access alternatives and possibly income without being dependent on others.

In this study area, household-level projects were preferred. Project implementers should explore the local and regional power dynamics, structures and barriers to participation before implementing projects, and in particular understand whether household or community projects are preferred. Once designed, initiatives need to be well supported by regular or permanent in-village presence in the early stages of a project to assist the community and respond to any emerging difficulties in early stages of project development and in the fair management of resources. External barriers to trade must be identified and dealt with promptly to prevent participants from 'dropping out' because of a loss of benefits from the project.

While the universally preferred project in our scenario interviews was household-level fish ponds for consumption and income (92% of households stated that this scenario would result in a decline in hunting and would prevent them from hunting in the reserve, and illegal species within the community forest), wild meat consumption and the drivers of preference are influenced by age and gender. Combined with the significant village level differences in meat preferences, variation in the rate of wild meat consumption and availability of current viable and legal alternatives, this study shows how important conducting a preliminary study is for the subsequent success of an alternative project. As such, we recommend that anyone considering implementing a wild meat alternative project in the Dja Faunal Reserve, or more broadly across sub-Saharan Africa, follows a similar process of local

engagement to explore the factors underlying meat and project design preferences, which will determine the success of subsequent projects.

## Bibliography

- Abernethy KA, Ndong Obiang AM. 2010. Bushmeat in Gabon. Technical Report, Ministère des Eaux et Forêts. Libreville, Gabon.
- Alexander JS, McNamara J, Rowcliffe M, Opong J, Milner-Gulland EJ. 2015. The role of bushmeat in a West African agricultural landscape. *Oryx* **49**:643–651.
- Booker F. 2019. Why Eat Wild Meat? Preliminary findings from a literature review on the key drivers of wild meat as a food choice. International Institute for Environment and Development (IIED). November 2019.
- Bruce T, Wachter T, Ndinga H, Bidjoka V, Meyong F, Ngo Bata M, Easton J, Fankem O, Elisee T, Taguieteu PA, Olson D. 2017. Camera-Trap Survey for Larger Terrestrial Wildlife in the Dja Biosphere Reserve, Cameroon: Diversity and Intactness of the Larger Vertebrate Fauna. Zoological Society of London, Technical Report
- Ceppi SL, Nielsen MR. 2014. A comparative study on bushmeat consumption patterns in ten tribes in Tanzania. *Tropical Conservation Science* **7**:272–287.
- Challender DWS, MacMillan DC. 2014. Poaching is more than an enforcement problem. *Conservation Letters* **7**:484-494
- Chausson AM, Rowcliffe JM, Escoufflaire L, Wieland M, Wright JH. 2019. Understanding the Sociocultural Drivers of Urban Bushmeat Consumption for Behavior Change Interventions in Pointe Noire, Republic of Congo. *Human Ecology* **47**:179–191.
- Croissant Y. 2019. mlogit: Multinomial Logit Models. R package version 1.0-1.
- Diendhiou Y, Diawara B. 2015. Rapport de mission de suivi reactif conjointe UNESCO/UICN a la reserve de faune du Dja. Yaounde.
- East T, Kümpel NF, Milner-Gulland EJ, Rowcliffe M. 2005. Determinants of urban bushmeat consumption in Río Muni, Equatorial Guinea. *Biological Conservation* **126**: 206–215.
- Effiom EO, Birkhofer K, Smith HG, Olsson O. 2014. Changes of community composition at multiple trophic levels due to hunting in Nigerian tropical forests. *Ecography* **37**:367–377.
- Etiendem DN, Hens L, Pereboom Z. 2011. Traditional knowledge systems and the conservation of cross river gorillas: A case study of Bechati, Fossimondi, Besali, Cameroon. *Ecology and Society* **7**:484-494
- Fa JE, Gracia Yuste JE. 2001. Commercial bushmeat hunting in the Monte Mitra forests, Equatorial Guinea: Extent and impact. *Animal Biodiversity and Conservation* **24.1**:31:52.
- Foerster S, Wilkie DS, Morelli GA, Demmer J, Starkey M, Telfer P, Steil M, Lewbel A. 2012. Correlates of Bushmeat Hunting among Remote Rural Households in Gabon, Central Africa. *Conservation Biology* **26**:335-344
- Furlow CA. 2003. Comparing Indicators of Knowledge within and between Cultural Domains. *Field Methods* **15**: 51-62
- Hema EM, Ouattara V, Parfait G, Di Vittorio M, Sirima D, Dendi D, Guenda W, Petrozzi F, Luiselli L. 2019. Bushmeat consumption in the West African Sahel of Burkina Faso, and the decline of some consumed species. *Oryx* **53**:145-150
- Ingram DJ et al. 2018. Assessing Africa-Wide Pangolin Exploitation by Scaling Local Data. *Conservation Letters* **11**:1–9.
- Jenkins RK, Keane A, Rakotoarivelo AR, Rakotomboavonjy V, Randrianandrianina FH, Razafimanahaka HJ, Ralaiarimalala SR, Jones JP. 2011. Analysis of patterns of bushmeat consumption reveals extensive exploitation of protected species in eastern Madagascar **6**:12

- Kiffner C, Peters L, Stroming A, Kioko J. 2015. Bushmeat Consumption in the Tarangire-Manyara The consumption of meat from wild animals , known as bushmeat , is a common practice in many parts of. *Tropical Conservation Science* **8**:318–332.
- Kümpel NF. 2006. Incentives for sustainable hunting of bushmeat in Río Muni , Equatorial Guinea. PhD Thesis.
- Kumpel NF, Milner-Gulland EJ, Cowlshaw G, Marcus Rowcliffe J, Rowcliffe M. 2009. Assessing Sustainability at Multiple Scales in a Rotational Bushmeat Hunting System. *Conservation Biology* **24**:861–871.
- Ladele AA, Joseph K, Omotesho OA, Ijaiya TO. 1996. Sensory quality ratings, consumption pattern and preference for some selected meat types in Nigeria. *International Journal of Food Sciences and Nutrition*. **47**:144-145
- Lau JD, Hicks CC, Gurney GG, Cinner JE. 2018. Disaggregating ecosystem service values and priorities by wealth, age, and education. *Ecosystem Services* **29**:91–98. Elsevier B.V.
- Lewis J. 2008. Ekila: Blood, bodies, and egalitarian societies. *Journal of the Royal Anthropological Institute* **14**:297–315.
- Luiselli L et al. 2017. Rehashing bushmeat – Interview campaigns reveal some controversial issues about the bushmeat trade dynamics in Nigeria. *Revue d'Ecologie (La Terre et la Vie)* **72**:3–18.
- Mavah GA, Funk SM, Child B, Swisher ME, Nasi R, Fa JE. 2018. Food and livelihoods in park-adjacent communities: The case of the Odzala Kokoua National Park. *Biological Conservation* **222**:44–51.
- McNamara J, Rowcliffe M, Cowlshaw G, Alexander JS, Ntiama-Baidu Y, Brenya A, Milner-Gulland EJ. 2016. Characterising wildlife trade market supply-demand dynamics. *PLoS ONE* **11**:1–18.
- Mwakatobe A, Røskaft E, Nyahongo J. 2012. Bushmeat and food security: Species preference of sundried bushmeat in communities in the Serengeti - Mara ecosystem, Tanzania. *International Journal of Biodiversity and Conservation*.
- Ndibalema VG, Songorwa AN. 2008. Illegal meat hunting in serengeti: Dynamics in consumption and preferences. *African Journal of Ecology* **46**:311–319.
- Quinlan M. 2005. Considerations for Collecting Freelists in the Field: Examples from Ethobotany. *Field Methods* **17**:219–234.
- Randolph SG. 2016. The social, economic and cultural dimensions of bushmeat in Yaounde, Cameroon. PhD Thesis.
- Reuter KE, Randell H, Wills AR, Janvier TE, Belalahy TR, Sewall BJ. 2016. Capture, movement, trade, and consumption of mammals in Madagascar. *PLoS ONE* **11**:1–25.
- Rowcliffe M, Milner-Gulland EJ, Cowlshaw G. 2005. Do bushmeat consumers have other fish to fry? *Trends in Ecology and Evolution* **20**:274–276.
- Royle A., Nichols J. 2003. Estimating abundance from repeated presence-absence. *Ecology* **84**:777–790.
- Schenck M, Nsame Effa E, Starkey M, Wilkie D, Abernethy K, Telfer P, Godoy R, Treves A. 2006. Why people eat bushmeat: Results from two-choice, taste tests in Gabon, Central Africa. *Human Ecology* **34**:433–445.
- Spira C, Kirkby A, Kujirakwinja D, Plumtre AJ. 2019. The socio-economics of artisanal mining and bushmeat hunting around protected areas: Kahuzi-Biega National Park and Itombwe Nature Reserve, eastern Democratic Republic of Congo. *Oryx* **53**:136–144.
- St John FA V, Brockington D, Bunnefeld N, Duffy R, Homewood KM, Jones JPG, Keane AM, Milner-Gulland EJ, Nuno A, Razafimanahaka HJ. 2016. Research ethics: Assuring anonymity at the individual level may not be sufficient to protect research participants from harm. *Biological Conservation* **196**:208–209.

- Tagg N., Maddison, N., Dupain, J et al. 2018. A zoo-led study of the great ape bushmeat commodity chain in Cameroon. *International Zoo Yearbook* **52**:182-193
- Travers H, Clements T, Milner-Gulland EJ. 2016. Predicting responses to conservation interventions through scenarios: A Cambodian case study. *Biological Conservation* **204**:403–410.
- van Vliet N, Nasi R. 2008. Hunting for Livelihood in Northeast Gabon : Patterns , Evolution , and Sustainability. *Ecology And Society* **13**:33.
- Wicander S, Coad L. 2018. Can the Provision of Alternative Livelihoods Reduce the Impact of Wild Meat Hunting in West and Central Africa? *Conservation and Society* **16**:441–458.
- Wright JH, Hill NAO, Roe D, Rowcliffe JM, Kümpel NF, Day M, Booker F, Milner-Gulland EJ. 2016. Reframing the concept of alternative livelihoods. *Conservation Biology* **30**:7-13
- Wright JH, Priston NEC. 2010. Hunting and trapping in Lebialem division, Cameroon: Bushmeat harvesting practices and human reliance. *Endangered Species Research* **11**:1–12.

## Appendices

### Appendix 1: The IUCN Red List Categories and Criteria

(Modified from the IUCN Red List 2020)

IUCN Red List Category	Criteria
Not evaluated	-
Data Deficient	There is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology known, but appropriate data on abundance and/or distribution are lacking
Least Concern	Species is evaluated against the IUCN Red List criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened
Near Threatened	Species is evaluated against the IUCN Red List criteria and does not qualify for Critically Endangered, Endangered, Vulnerable, but is close to qualifying for or is likely to qualify for a threatened category in the near future
Vulnerable	Best available evidence indicates that it meets any of the criteria A-E for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild
Endangered	Best available evidence indicates that it meets any of the criteria A-E for Endangered and it is therefore considered to be facing a very high risk of extinction in the wild
Critically Endangered	Best available evidence indicates that it meets any of the criteria A-E for Critically Endangered and it is therefore considered to be facing an extremely high risk of extinction in the wild
Extinct in the Wild	Species are known only to survive in cultivation, in captivity or as a naturalised population(s) well outside the past range.
Extinct	No reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat throughout its historical range have failed to record an individual

## Appendix 2: Full list of preferred and avoided species

Cited by participants across all villages

**Species that are both cited as preferred and avoided are highlighted in green.**

Species	SumSalience	SmithsS	Order	Prefer or avoid
African golden cat	2.67	0.01	carnivore	avoid
Agile mangabey	1.33	0	primate	avoid
Bay duiker	3.17	0.01	ungulate	prefer
Bay duiker	2.83	0.01	ungulate	avoid
Black colobus	60.85	0.13	primate	avoid
Black duiker	1.29	0	ungulate	avoid
Blue duiker	109.73	0.21	ungulate	prefer
Blue duiker	7.05	0.02	ungulate	avoid
Boa	1	0	reptile	prefer
Boa	2	0	reptile	avoid
Bongo	0.25	0	ungulate	avoid
Bosman poto	3.68	0.01	primate	avoid
Brush-tailed porcupine	243.28	0.46	rodent	prefer
Brush-tailed porcupine	3	0.01	rodent	avoid
Buffalo	1	0	ungulate	avoid
Cane rat	25.22	0.05	rodent	prefer
Cane rat	9.57	0.02	rodent	avoid
Cat	2.67	0.01	rodent	avoid
Catfish	1.6	0	fish	prefer
Catfish	1	0	fish	avoid
Cephalophe sp	4.67	0.01	ungulate	avoid
Chicken	16.87	0.03	galliform	prefer

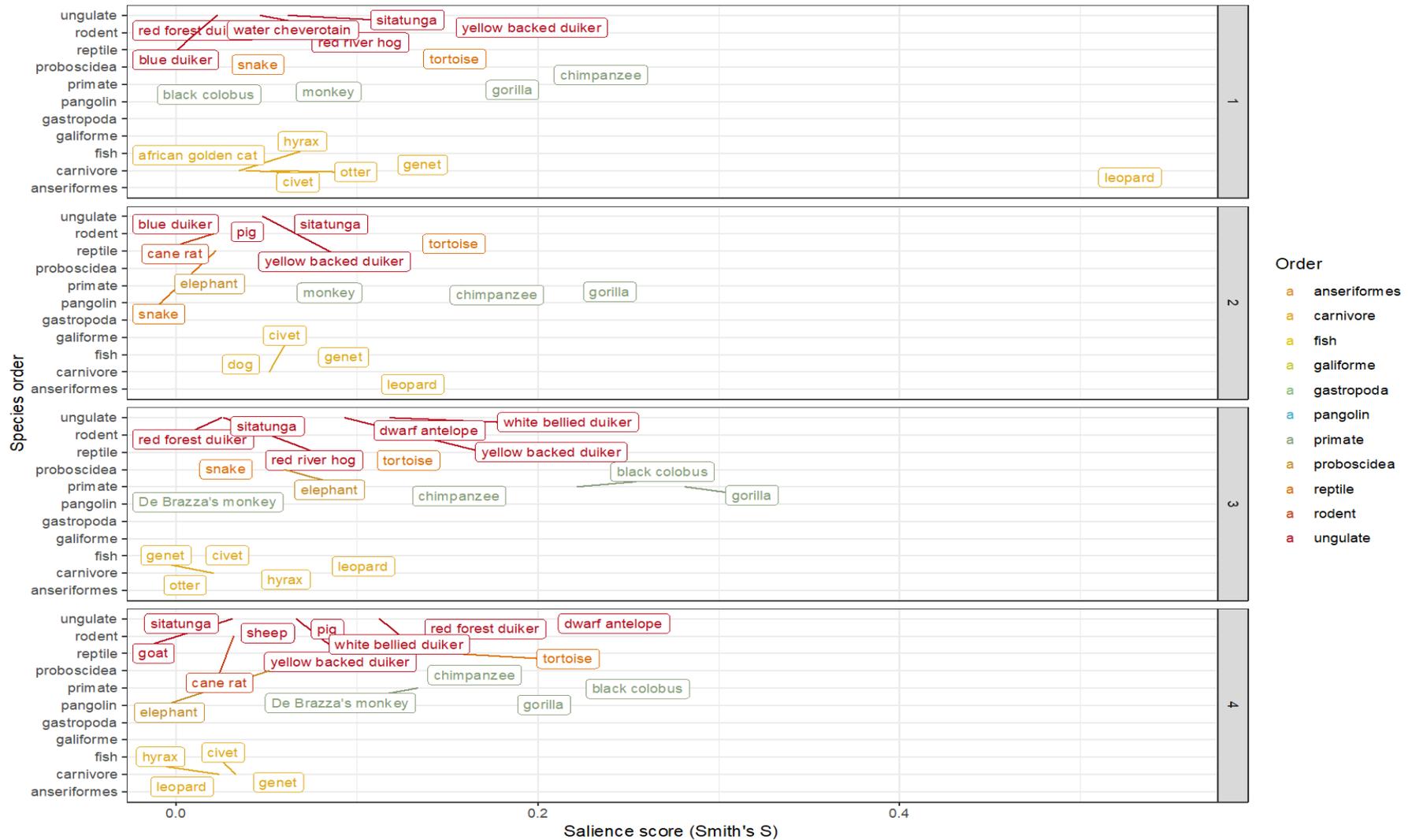
Species	SumSalience	SmithsS	Order	Prefer or avoid
Chicken	1.75	0	galiforme	avoid
Chimpanzee	76.71	0.16	primate	avoid
Civet	19.6	0.04	carnivore	avoid
Cow	15.2	0.03	ungulate	prefer
Cow	0.5	0	ungulate	avoid
Crocodile	3.17	0.01	reptile	avoid
Crocodile	0.75	0	reptile	prefer
De Brazza's monkey	21.13	0.05	primate	avoid
Dog	4.42	0.01	carnivore	avoid
Duck	0.5	0	anseriformes	avoid
Dwarf antelope	38.35	0.08	ungulate	avoid
Elephant	18.68	0.04	proboscidea	avoid
Elephant	7	0.01	proboscidea	prefer
Fish	59.58	0.11	fish	prefer
Genet	26.98	0.06	carnivore	avoid
Genet	9.22	0.02	carnivore	prefer
Giant pangolin	10.05	0.02	pangolin	prefer
Giant pangolin	3.85	0.01	pangolin	avoid
Goat	5.2	0.01	ungulate	prefer
Goat	5.92	0.01	ungulate	avoid
Gorilla	114.09	0.24	primate	avoid
Green mamba	1.7	0	reptile	avoid
Hyrax	12.2	0.03	carnivore	avoid
Leopard	73.63	0.16	carnivore	avoid

Species	SumSalience	SmithsS	Order	Prefer or avoid
Lizard	2	0	reptile	avoid
Mandrill	1.33	0	primate	avoid
Molerat	3.5	0.01	rodent	avoid
Mongoose	2.5	0.01	carnivore	avoid
Monitor lizard	5.25	0.01	reptile	prefer
Monitor lizard	6	0.01	reptile	avoid
Monkey sp.	19.63	0.04	primate	prefer
Monkey sp.	15.1	0.03	primate	avoid
Mouse	1	0	rodent	avoid
Otter	9.27	0.02	carnivore	avoid
Pangolin	71.43	0.13	pangolin	prefer
Pangolin	2.33	0	pangolin	avoid
Peters duiker	22.27	0.04	ungulate	prefer
Pig	15.45	0.03	ungulate	avoid
Pig	11	0.02	ungulate	prefer
Putty nosed monkey	0.6	0	primate	prefer
Putty nosed monkey	0.33	0	primate	avoid
Red forest duiker	22.12	0.05	ungulate	avoid
Red river hog	44.88	0.08	ungulate	prefer
Red river hog	8.2	0.02	ungulate	avoid
Red-tailed guenon	0.5	0	primate	avoid
Sheep	6.66	0.01	ungulate	avoid
Sheep	1	0	ungulate	prefer
Sitatunga	25.52	0.05	ungulate	avoid

Species	SumSalience	SmithsS	Order	Prefer or avoid
Sitatunga	2.83	0.01	ungulate	prefer
Snail	4.83	0.01	gastropoda	avoid
Snake	12.58	0.03	reptile	avoid
Squirrel	0.25	0	rodent	avoid
Tortoise	60.04	0.13	reptile	avoid
Tortoise	1.33	0	reptile	prefer
Viper	2	0	reptile	avoid
Water chevrotain	6.27	0.01	ungulate	avoid
White bellied duiker	29.3	0.06	ungulate	avoid
Yellow-backed duiker	37.64	0.08	ungulate	avoid
Yellow- backed duiker	0.2	0	ungulate	prefer

### Appendix 3: The saliency of species cited as 'avoided'

Villages 1 to 4





This project report summarises research conducted around the Dja Faunal Reserve in south-eastern Cameroon. The research aimed to understand local food preferences and the importance of wild meat for food security, and explore which wild meat-alternative projects could result in the greatest reduction in household hunting and consumption of wild meat.

We found that younger people consumed wild meat more often than the elderly. Taste, ease of access and health were the key drivers of species preference, while taste, health, tradition and in some cases, appearance, were the key reasons for species avoidance. The species that people prefer to eat are often abundant and non-protected. Household-level alternative projects were preferred, but initiatives may also want to target hunters and younger people, who eat and hunt wild meat more regularly. Overall, alternatives should be viewed by their recipients as providing equal or greater benefits for less effort than hunting, if uptake of these alternatives is to be sustainable.



## Project Materials

---

Biodiversity, Natural Resource Management

---

Keywords:  
Alternative Livelihoods, Protected Areas, Conservation, Wild Meat, Bushmeat, Cameroon



International Institute for Environment and Development  
80-86 Gray's Inn Road, London WC1X 8NH, UK  
Tel: +44 (0)20 3463 7399  
Fax: +44 (0)20 3514 9055  
[www.iiED.org](http://www.iiED.org)

Funded by:



This project is funded by the UK Government's Darwin Initiative, a grants scheme that helps protect areas rich in biodiversity but poor in financial resources. The views expressed do not necessarily reflect the views of the UK Government.