Socio-economic drivers of bushmeat consumption in the northern Angolan province of Uíge

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Abstract The overexploitation of wildlife for bushmeat consumption poses a significant threat to biodiversity in sub-Saharan Africa, particularly in Angola, where the problem remains largely unexplored. This study provides the first overview of the regional bushmeat trade in Uíge Province and an analysis of consumption patterns in this socio-economic context. We provide data on the range of species hunted and their respective conservation status, and highlight the sources and structures underlying this regional trade. We conducted qualitative expert interviews with nine bushmeat traders from four communities and a quantitative consumer survey of 204 citizens of Uíge. More than 60% of the respondents consumed bushmeat at least once per week and 23% hunted regularly, indicating that this practice is deeply rooted in society. Of the 16 species sold in the central market in Uíge, five are categorized as threatened or Near Threatened on the IUCN Red List, highlighting the need for control measures. Large parts of the population consider bushmeat consumption to be an integral part of their culture but our results indicate that younger and better educated Angolans are moving away from these traditions and are less likely to practice traditional hunting. These findings suggest that access to comprehensive education and environmentally sustainable livelihoods is key to reducing the unsustainable use of wildlife resources.

Resumo A exploração excessiva da vida selvagem para consumo de carne de caça representa uma ameaça significativa para a biodiversidade na África subsariana, particularmente em Angola, onde este problema encontra-se pouco explorado. Este estudo fornece a primeira visão geral do comércio regional de carne de caça na província do Uíge e faz uma análise dos padrões de consumo num contexto socioeconómico. Pela primeira vez, fornecemos dados sobre o leque de espécies caçadas e o seu respetivo estado de conservação, e destacamos as fontes e estruturas subjacentes ao comércio regional. Realizámos entrevistas qualitativas a nove comerciantes de carne de caça de quatro comunidades e um inquérito quantitativo aos 204 consumidores do Uíge. Mais de 60% da população consome carne de caça pelo menos uma vez por semana e 23% caçam regularmente, o que indica que esta tradição está profundamente enraizada na sociedade. Das 16 espécies vendidas no mercado central do Uíge, cinco estão classificadas como ameaçadas ou quase ameaçadas na Lista Vermelha da IUCN, o que evidencia a necessidade de medidas de controlo. Grande parte da população considera o consumo de carne de caça como parte integrante da sua cultura, mas a tendência é que os angolanos mais jovens e mais instruídos estão a afastar-se destas tradições e são menos propensos a praticar a caça tradicional. Estes resultados sugerem que o acesso a uma educação abrangente e a meios de subsistência ambientalmente sustentáveis é fundamental para reduzir o uso insustentável dos recursos faunísticos.

Keywords Angola, bushmeat, conservation, poaching, species exploitation, sub-Saharan-Africa, subsistence hunting, wildlife trade

The supplementary material for this article is available at doi.org/10.1017/S0030605324001492

Introduction

Angola is a country with high biodiversity and ecosystem diversity (Burgess et al., 2004; Huntley & Ferrand, 2019), with 940 bird, 291 mammal, 278 reptile, 111 amphibian and c. 6,850 plant species known to occur in the country (Goyder & Gonçalves, 2019; Huntley et al., 2019). However, compared to most other African countries, Angola is still relatively under-represented in biodiversity studies, as research was limited by the instability of a protracted post-independence civil war since 1975, which only ended in 2002. Updating the IUCN Red List assessments for Angola will require extensive research to gain a better understanding of the spatial distribution and conservation status of species (Huntley et al., 2019). Pressure on wildlife populations because of illegal hunting and habitat loss is high and likely to increase as the Angolan population is expected to reach an estimated 77.5 million by 2050 (United Nations, 2019). As the majority of suburban and rural Angolan families still practice subsistence farming (ITA, 2022), hunting of wild animals is prevalent despite national and international efforts to protect

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Received 9 November 2023. Revision requested 23 January 2024. Accepted 1 October 2024.

threatened species. For large proportions of the population bushmeat obtained via traditional subsistence hunting is an important source of protein (Nasi et al., 2008), and hunting is integral to the local culture.

Hunting for sport, utility and subsistence in Angola is regulated by several national laws, some of which are contradictory or imprecise, undermining the effectiveness of current hunting and conservation regulations. Sport and commercial hunting require licences and compliance with state regulations, whereas subsistence hunting is the only form of hunting for which no licence is required (Article 98 of the Forest and Wildlife Bases Law; No. 6/17; FAO, 2017). While the trade and commercialization of hunting products of any kind are prohibited according to Article 122 of Law No. 2/14 and punishable by up to 3 years' imprisonment, Article 163 of Law No. 6/17 contains exceptions for species that are otherwise protected, rare or threatened (Diário da República, 2014). Although in theory there is a comprehensive legal basis for the regulation of hunting practices, no adjustments have been made to it since the end of the colonial era (i.e. since 1957), when the still-valid Law No. 2873/99 (Imprensa Nacional de Angola, 1971) was issued by the then Ministry of Agriculture, Rural Development and Fisheries with regard to the definition of sustainable hunting seasons and the modalities and conditions for issuing licences.

Our main objective in this study was to describe and quantify traditional subsistence hunting. In addition, we aimed to identify the socio-economic drivers of bushmeat consumption and trade, to better understand the possible political and administrative impediments to controlling these practices and determine measures to remove these barriers. With this assessment we hope to lay the foundations for effective control of this under-regulated sector whilst providing perspectives on how to balance biodiversity conservation and sustainable livelihoods for the well-being of future generations in Angola.

Study area

We collected data in the province of Uíge, Angola, during January–March 2022. The province borders the Democratic Republic of the Congo to the north and east, the Angolan provinces of Malanje, Cuanza Norte and Bengo to the south and the province of Zaire to the west (Fig. 1). More than 1.4 million people, most of whom belong to the Kikongo-speaking Bakongo ethnicity, inhabit an area of 58,698 km² (Censo, 2014) that is divided into 16 municipalities, of which we visited six during the period of research. Originally, much of the province was covered by closed forest formations and a forest–savannah mosaic (Barbosa, 1970), but anthropogenic impacts such as agricultural

FIG. 1 Location of Angola in Africa, and location of the study area (Uíge Province) and the capital city (Luanda) in Angola.

expansion and unregulated slash-and-burn cultivation (Göhre et al., 2016) have led to the deforestation of large areas within the province. This has facilitated access to the forest interior and formerly remote areas, which can lead to increased hunting pressure (Kleinschroth & Healey, 2017). A large proportion of the population of the province consumes wild animals regularly and bushmeat is offered for sale publicly at markets, at the roadside and in restaurants (Gonçalves et al., 2019).

We selected the study sites in consultation with the academic administration of Kimpa Vita University. We specifically targeted markets known as urban trading centres with a high concentration of wildlife products.

Methods

Bushmeat market records

During January–March 2022 we visited the Praça Grande (the central market of Uíge) between 09.00 and 10.00 on 38 non-consecutive days. Vendors at two adjacent bushmeat stalls exclusively and constantly sold meat from wild animals, and individual vendors occasionally offered small quantities of bushmeat in the area where pork, beef and chicken were sold. We documented the species offered, the quantity per species and the type of product for sale (i.e. fresh, whole animal carcasses; parts such as head, legs or offal; or preserved meat).

Expert interviews

We interviewed nine bushmeat vendors using a previously approved questionnaire (Supplementary Material 1). In interviews lasting c. 30 min, we asked participants in-depth

questions about the acquisition of their goods, availability of species and different methods of meat preservation. We mainly conducted the interviews in Portuguese, although in some cases students of Kimpa Vita University assisted with translation into Kikongo or Lingala, the two predominant local languages of the region. We visited markets on Saturdays, which is the main day of trade and commerce in the area. In the municipalities of Songo, Mucaba, Negage and Puri, we visited the main towns with the same respective names, and in the municipality of Quitexe the settlement of Vista Alegre.

Consumer survey

For the consumer study we surveyed adult residents of Uíge Province and students at Kimpa Vita University. Prior to commencing the survey, we tested the questionnaire on a small group of students and lecturers for comprehensibility. Using the approved questionnaire (Supplementary Material 2), we then asked survey respondents about their consumption of meat in general and bushmeat in partciular, their motives for bushmeat consumption, their own hunting habits and experiences in their social environment. Questions were also asked about the Covid-19 pandemic and its influence on personal bushmeat consumption, and on the participant's family size, employment and level of education.

The first participant group consisted of 99 non-student residents of the city of Uíge, the suburbs of Katalambanza and the nearby settlement of Cassexe. We conducted the interviews in 20 min face-to-face sessions in public places and private homes. The second group comprised 105 adult students in the nursing programme at Kimpa Vita University, located on the outskirts of Uíge city. We visited the university and the student living accommodation, and with the help of university lecturers distributed a questionnaire (primarily multiple-choice questions; Supplementary Material 3), which participants completed in their own time.

Results

Bushmeat market records

Throughout the study period, we documented 1,524 individual animals of 16 species sold as bushmeat at the central market in Uíge, with a daily mean of 40 animals on offer (Fig. 2; Plate 1). Four of these species had not been reported in the study area prior to this survey (Table 1). The occurrence of the greater cane rat *Thryonomys swinderianus* in Angola has been debated previously (Kingdon, 2019) and the species is not listed for Angola on the IUCN Red List (Child, 2016). Our record confirms its presence in the country, as we have seen physical evidence of this species. Three of the species recorded are categorized as

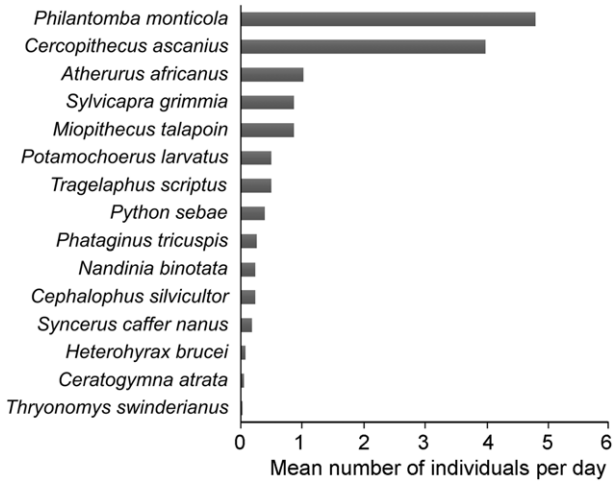

FIG. 2 Wild meat trade in the central market of Uíge Province, Angola: mean numbers of individuals per species observed per survey day. We documented the Egyptian fruit bat *Rousettus aegyptiacus* 990 times but excluded it from individual-based statistics as they were commonly sold in bulk.

Near Threatened, one as Vulnerable and one as Endangered on the IUCN Red List (Table 1). Five species are listed under Appendix II and one under Appendix I of CITES (CITES, 2022). These categorizations are not always congruent with those on the National Red List of Angola (Table 1; Ministério do Ambiente, 2018). The Egyptian fruit bat *Rousettus aegyptiacus* accounted for nearly two-thirds of the individual animals offered as bushmeat in Uíge. However, we excluded it from some of the subsequent quantitative analyses and discussions because of its small body size and typical sale unit of five to eight individuals. Excluding this bat, almost 80% of the documented animals belonged to four species (in descending order by the number of individuals): the blue duiker *Philantomba monticola*, red-tailed monkey *Cercopithecus ascanius*, African brush-tailed porcupine *Atherurus africanus* and common duiker *Sylvicapra grimmia*. Larger mammals such as the African buffalo *Syncerus caffer*, yellow-backed duiker *Cephalophus silvicultor* and bushbuck *Tragelaphus scriptus*, as well as the most common reptile, the Central African rock python *Python sebae*, were never offered as whole carcasses but always as parts (e.g. limbs, offal, head, or parts of the torso). In contrast, smaller species such as the blue duiker, red-tailed monkey, southern talapoin monkey *Miopithecus talapoin*, white-bellied pangolin *Phataginus tricuspis* and African palm civet *Nandinia binotata* were sold as fresh, whole carcasses in more than 65% of cases.

Not all species that are caught are also sold as bushmeat at markets or along roads. Rodents in particular were the most hunted taxon, followed by primates and duikers, whereas market surveys showed a different pattern: mainly duikers, primates and large rodents were observed in the markets.

https://doi.org/10.1017/S0030605324001492 Published online by Cambridge University Press

TABLE 1 Wildlife species sold as bushmeat at the central market in Uíge Province, Angola (Fig. 1), with their corresponding distribution areas and indication whether they are extant in Uíge Province, their conservation status according to the global IUCN Red List and the Red List of Species of Angola, listing on CITES Appendices, and indication whether hunting the species is explicitly prohibited or permitted according to Angolan law. Note that five of the species listed are not explicitly covered by current legislation, so their status under hunting law is unclear.

Species Name						Red List status			Hunting	
Scientific	Kikongo	English	Portuguese	Distribution[1]	Extant in Uíge Province	IUCN Red List[2] (most recent assessment)	Red List of Species of Angola[3]	CITES Appendix	Prohibited	Permitted
Atherurus africanus	Nzekele	African brush-tailed porcupine	Porco Espinho	SSA		LC (2016)				
Cephalophus silvicultor	Mvanda, Mwudi	Yellow-backed duiker	Bambi grande de dorso amarelo	WCA	x	NT (2016)		II	x	
Ceratogymnaatrata	Mvondo	Black-casqued hornbill	Calau de casco preto	WCA	x	LC (2016)				
Cercopithecus ascanius	Kima, Nkewa	Red-tailed monkey	Macaco de cauda vermelha	SSA	x	LC (2018)		II	x	
Heterohyrax brucei	Cantapedra	Bush hyrax	Cantapedra	SSA		LC (2014)				
Miopithecustalapoin	Kima, Nkewa	Southern talapoin monkey	Talapoim angolano	ANG[4]	x	VU (2018)		II		
Nandinia binotata	Mbongui	African palm civet	Civeta de palmeira Africana	SSA	x	LC (2015)				x
Phataginus tricuspis	Nkaka, Pregisa	White-bellied pangolin	Pangolim	SSA	x	EN (2019)	Vul	I	x	
Philantomba monticola	Nsexi, Nsesi	Blue duiker	Seixa	SSA	x	LC (2016)		II		x
Potamochoerus larvatus	Ngulu a mfutu	Bushpig	Porco do mato	SSA		LC (2015)				x
Python sebae	Mboma, Giboia	Central African rock python	Python rock Africano	SSA	x	NT (2019)		II		x
Rousettus aegyptiacus	Ngembe	Egyptian fruit bat	Murciélago frugívoro de Egipto	SSA[5]	x	LC (2016)				
Sylvicapra grimmia	Kimpiti	Common duiker	Cabra do mato	SSA	x	LC (2016)	AEx			x
Syncerus caffer	Pacaça	African buffalo	Pacaça	WCA		NT (2018)	AEx		x	
Thryonomys swinderianus	Cambuige	Greater cane rat	Ratazana	SSA[6]		LC (2016)				
Tragelaphus scriptus	Nkai	Bushbuck	Veado	SSA	x	LC (2016)				x

[1]ANG, Angola (including Cabinda); WCA, West-Central Africa; SSA, sub-Saharan Africa (beyond WCA).
[2]LC, Least Concern; NT, Near Threatened; VU, Vulnerable; EN, Endangered.
[3]AEx, Espécies Ameaçadas de Extinção (Species Threatened with Extinction); Vul, Espécies Vulneráveis (Vulnerable Species).
[4]Range extends into the south-western Democratic Republic of the Congo.
[5]Range extends into the Middle East.
[6]Range extends into Cabinda but not into the main territory of Angola.

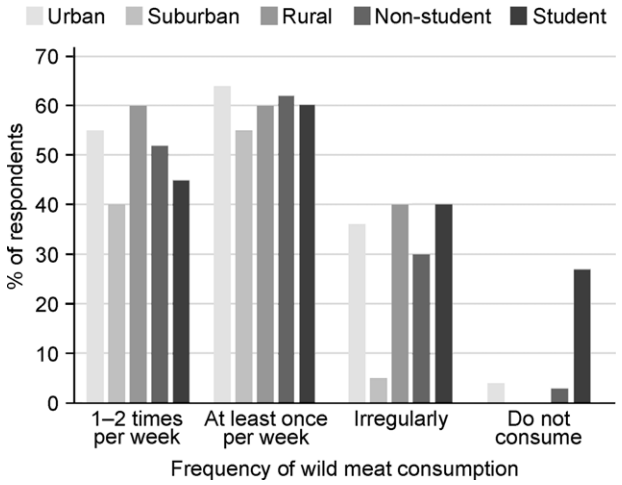

FIG. 3 Frequency of bushmeat consumption amongst the survey respondents in Uíge Province, Angola. Respondents included 99 non-student residents (69 urban, 20 suburban, 10 rural) and 105 students at Kimpa Vita University.

Although more than 96 % of the animals caught were rodents, only a few were documented as bushmeat in the markets.

Expert interviews

We conducted expert interviews with nine female vendors with a mean age of 30 years; four were from Uíge city, two from Mucaba, two from Songo and one from Puri.

Seven vendors worked with a mean of nine local hunters, who supplied them with fresh, unprocessed bushmeat. Four vendors purchased their goods from intermediaries and arranged their own transportation, and three reported working with intermediaries locally referred to as *grossistas*, who transport animals between different locations, taking advantage of differences in local availability and reselling their goods to market traders or restaurants at higher prices. Two of the four vendors from Uíge city relied exclusively on this latter source.

All vendors reported that blue duikers and red-tailed monkeys were readily available as bushmeat in the area. In contrast, species not easily available included the greater cane rat (mentioned by six vendors), African buffalo and bushpig *Potamochoerus larvatus* (each mentioned four times). Six vendors stated that the price of several species had at least doubled in the last 5–10 years.

Only one vendor reported a negative experience with the authorities in connection with the sale of bushmeat, whereas five vendors stated that police officers were part of their regular customer base.

Consumer survey

The non-student participant group comprised 34 women and 65 men, with a mean age of 37 years. Sixty-nine participants lived within the city of Uíge, 20 in the surrounding suburbs and 10 in the countryside. Fifty-nine per cent of these respondents had completed secondary education; the remaining 41% had not attended or completed any formal education. The majority of respondents stated that they consumed bushmeat at least once per week (Fig. 3). Amongst the non-student respondents, the number of species regularly consumed was highest for rural residents and lowest for city dwellers (Fig. 4c). People consumed a wide variety of species, with most non-student respondents reporting that they regularly consumed meat from at least six wildlife species (Fig. 5). In suburban and rural areas, more respondents stated that they hunted at

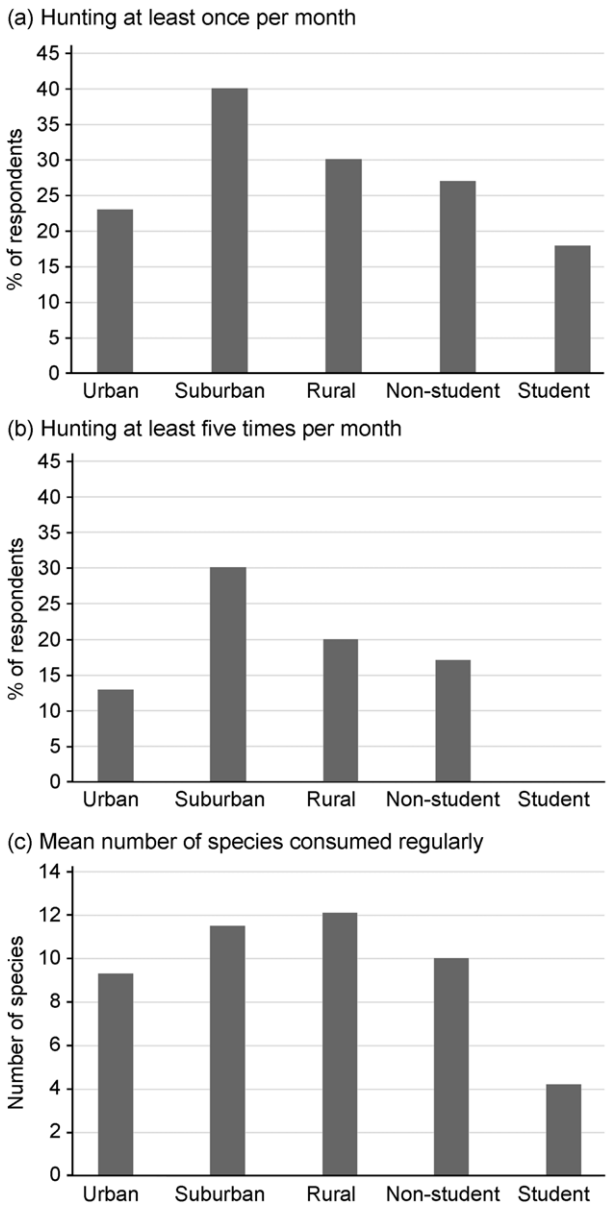

FIG. 4 Data from quantitative surveys in Uíge Province, Angola. (a) Percentage of the respective group that goes hunting at least once per month. (b) Percentage of the respective group that goes hunting at least five times per month. (c) The mean number of wildlife species whose meat the respondents consume regularly.

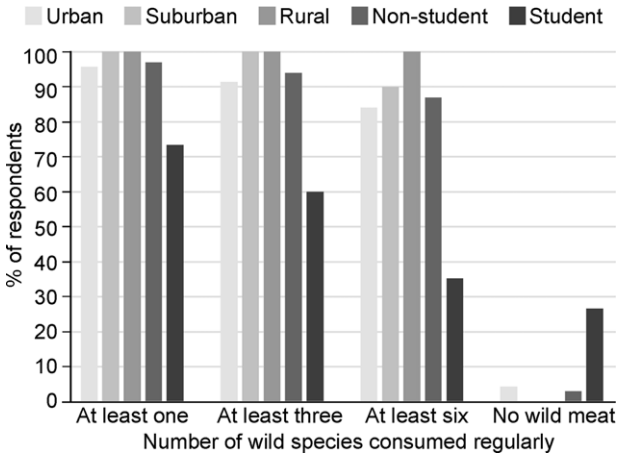

FIG. 5 Percentages of each respondent group who stated they regularly consume at least one, three or six wild species, or no wild meat at all.

least once per month than in urban areas (Fig. 4a). Of the respondents that hunted regularly, 48% reported that they hunted solely for personal use, and only four percent said they hunted for commercial purposes. Fifty-one percent of the respondents had at least one relative who hunts. When asked why people eat bushmeat, 71% selected taste as the main reason. Forty per cent of the respondents also mentioned cultural reasons as a motive, whereas economic reasons and general availability were less of a motivation, only mentioned by 26 and 32% of the respondents, respectively. When questioned about the Covid-19 pandemic and the possible spread of SARS-CoV-2 by biological vectors, more than one-third of respondents stated that they could imagine animals such as bats, rodents or pangolins playing an important role in the transmission of the virus from animals to humans.

PLATE 1 Wild meat sold in the central market in Uíge Province, Angola, and on the roadside within the province. (a) Common duiker *Sylvicapra grimmia*, (b) meat from the shoulder and flank of an African buffalo *Syncerus caffer*, (c) head of a rock python *Python sebae*, (d) white-bellied pangolin *Phataginus tricuspis*, (e) Egyptian fruit bats *Rousettus aegyptiacus*, (f) bushbuck *Tragelaphus scriptus*, (g) head and upper torso of a bushpig *Potamochoerus larvatus*, (h) four red-tailed monkeys *Cercopithecus ascanius* and a blue duiker *Philantomba monticola* and (i) black-casqued hornbill *Ceratogymna atrata*. Photos: L. G. Bolognino de Orth.

The student respondent group comprised 49 women and 56 men, with a mean age of 27 years. All respondents had completed secondary education and were in their first to fifth year of study at the university. The majority stated that they consumed bushmeat at least once per week but the proportion of respondents who reported not consuming bushmeat at all was almost 10 times higher than in the non-student group (Fig. 3). When asked about their motives for eating bushmeat, taste was again mentioned most frequently, followed by cultural reasons and general availability, whereas economic reasons were not generally mentioned. Compared to the non-student group, fewer respondents stated that they hunted monthly (Fig. 4a), and far fewer reported having a family member who hunts. None of the students hunted frequently (i.e. at least five times per month), whereas 17% of the non-student respondents reported hunting frequently (with the highest percentage amongst the suburban respondents; Fig. 4b). When questioned about the possible transmission of SARS-CoV-2 to humans by biological vectors, considerably more respondents in the student group agreed with this possibility compared to respondents in the non-student group.

Discussion

Our results show that bushmeat is widely consumed in Uíge Province and is an important part of the local diet in both urban and rural areas. Despite the legislative basis that prohibits the hunting, distribution and possession of protected species, bushmeat is widely available in the city of Uíge and in the adjacent municipalities, including meat of nationally and internationally protected species. Hunting is largely considered an intergenerational tradition and the consumption of bushmeat is part of the local culture; for example, *carne de caça* (game meat) is frequently offered for sale in restaurants. This is finding contrasts with the growing interest in biodiversity research and conservation in Angola in recent years.

The Angolan government has increased efforts to protect natural resources from illegal activities such as uncontrolled hunting, fishing or logging by implementing a number of laws (FAO, 2017, 2022). However, our findings suggest that these laws are not sufficient to effectively regulate bushmeat exploitation in Uíge Province. Of the 38 mammal species officially protected from hunting in Angola (Law No. 243/22; FAO, 2022), four (red-tailed monkey, white-bellied pangolin, yellow-backed duiker and African buffalo) were regularly sold on the central market in Uíge. Although we have observed the first three species in the wild, the origin of the meat from African buffalos remains unclear. This species is only known from Quiçama National Park in the province of Bengo and in a sparsely populated region in the south-west of Malanje. The presence of its meat on the market in Uíge, however, suggests that this species may be hunted locally; if buffalo meat was sourced from the species' known distribution areas in the south of Angola, it would be more efficient (and thus more financially rewarding) to transport it to the more easily accessible capital of Luanda rather than to Uíge (Fa et al., 2019). Although the African forest buffalo *Syncerus caffer nanus* is categorized as Endangered on the Red List of Angola (Ministério do Ambiente, 2018), its occurrence in Uíge has never been confirmed. Given the distribution patterns recently uncovered in other vertebrate groups such as amphibians and reptiles, with West and Central African forest taxa reported from the Serra do Pingano forest ecosystem (Ernst et al., 2020) and recent reports of previously overlooked populations of the forest elephant *Loxodonta cyclotis* in northern Angola (Vaz Pinto, pers. comm., 2025), it is probable that the African forest buffalo occurs and is hunted in the study area. As buffalo meat was relatively common in the market in Uíge and more than half of the survey respondents stated they regularly consumed buffalo meat, there is a need to clarify the taxonomic identity and geographical origin of this meat so as to implement specific and effective protection measures.

Because of continued high demand for pangolins, especially in the Asian market, the white-bellied pangolin is of particular conservation concern both at the national and international level. Hunting, trafficking or possession of pangolins is punishable by imprisonment of at least 60 days or a fine (Law No. 2/14; Diário da República, 2014). However, the low fine of c. AOA 14,000 (equivalent to USD 33 at the time of the study; OANDA, 2022) according to Decree No. 243/22 (FAO, 2022) does not reflect this conservation priority and is not a strong deterrent. The price paid for a whole pangolin in the market in Uíge was equivalent to USD 5–7 during our study period, whereas pangolin meat is traded for USD 300/kg in China and Viet Nam, and pangolin scales for USD 480–760/kg on the traditional Asian medicine market (Challender et al., 2015). This profitability associated with the international pangolin trade significantly contributes to the hunting pressure faced by these species. Despite its legal protection status and the potential penalties associated with illegal trade, the white-bellied pangolin was openly sold in Uíge Province, as carcasses and live individuals, and was consumed regularly by 37% of the respondents in our survey.

Monkeys and duikers made up a large proportion of the bushmeat products sold in Uíge. This is in accordance with the results of a previous study conducted in six southern provinces of Angola (Bersacola et al., 2014). The large amount of primate meat sold (mainly red-tailed monkey) is remarkable not only in comparison to other Angolan provinces but to other African regions in general (Batumike et al., 2021). Just two species of primates accounted for more than one-third of the total products sold in Uíge (excluding the Egyptian fruit bat), almost three times as much as

reported in a comparable study conducted along the main roads between Huambo and Uíge (Bersacola et al., 2014). The red-tailed monkey alone accounted for 29% of the total bushmeat on the central market in Uíge. The less common southern talapoin monkey accounted for a further 6%; this species is endemic to northern Angola and areas adjacent to the western Democratic Republic of the Congo, is categorized as Vulnerable on the IUCN Red List (Maisels et al., 2020) and is undergoing significant population decline because of habitat loss at key forest sites in its geographical range in Angola (Bersacola et al., 2015; Göhre et al., 2016). Hunting thus presents a significant threat to this species. Although this information was available before the adoption of National Decree No. 243/22 regulating the use of wildlife (FAO, 2022), the species is not listed there. An amendment to include this species is therefore needed urgently.

The consumption of bushmeat, particularly of primates and bats, is consistent with the history of zoonotic diseases in sub-Saharan Africa, especially in rural areas, which are often under-served medically (WHO, 2022). In 2004 and 2005, Uíge Province was the epicentre of the largest and deadliest outbreak of Marburg haemorrhagic fever in the world, infecting over 270 people and causing more than 200 deaths (Ndayimirije & Kindhauser, 2005). Bats, particularly fruit bats such as *R. aegyptiacus*, are known vectors of Marburg virus (Amman, 2012). During our 2-month study period we counted 990 individual bats being sold in the central market in Uíge alone, demonstrating the significant potential for disease transmission in this densely populated urban centre. Three different ministries are currently responsible for implementing environmental legislation in Angola, which makes it difficult to enforce these laws. Better education, stricter enforcement of environmental laws and a clear allocation of responsibilities amongst government authorities would contribute to improved national healthcare.

In a previous study conducted in six Angolan provinces, the authors reported observing several police checkpoints where no checks for bushmeat trafficking were being conducted, either because the police officers were not trained to carry out such checks or because they did not consider them a priority (Gonçalves et al., 2019). Our own observations in the province of Uíge confirm these findings: we frequently witnessed abuse of power and bribes demanded openly to pass inspections by the authorities, even in obvious cases of criminal behaviour. Corruption is a serious problem in Angola (with a score of 32/100 in a list of the Corruption Perception Index, the country ranks 121 out of 180 countries, whereby a lower rank value denotes less corruption; Transparency International, 2024), which is a major impediment to implementing and enforcing wildlife protection laws.

We found that the incentives for hunting and the targeted species differed between commercial and subsistence hunters. Whereas the former mainly select profitable species (e.g. larger mammals that bring a high financial return per individual), the latter mainly hunt small mammals to meet the demand for bushmeat in private households. Similarly, Bersacola et al. (2014) found that the public bushmeat trade in central Angola involves mostly duikers (54%) and primates (13%). It appears that smaller animals are used for subsistence and local consumption, whereas for larger animals it is profitable to transport them to markets in the cities. This explains the apparent discrepancy between the high consumption rates (more than 60% of respondents in our study consumed bushmeat regularly) and the comparatively small quantities of bushmeat offered in the markets of the provincial capital, where there are almost 400,000 inhabitants (City Population, 2022). Although commercial bushmeat trade and urban consumption increase hunting pressure on large mammals in particular, availability of particular species in bushmeat markets is only a weak indicator of their actual declines in a given area (Rowcliffe et al., 2003).

Bushmeat consumption in Uíge Province is high compared to other African countries; for example, in studies conducted in Malawi and Tanzania, only 39% and 17% of respondents, respectively, had consumed bushmeat at least once in the preceding 10 months (Fischer et al., 2014; van Velden et al., 2020). Studies from the north-eastern Democratic Republic of the Congo reported that more than 60% of households ate bushmeat more than once per week (Van Vliet et al., 2019), comparable to the findings of our study in Angola. The proportion of hunters in Uíge is also high (23% of all respondents), reflecting the considerable number of subsistence hunters operating alongside those engaged in commercial bushmeat trafficking.

Although hunting is an important cultural element in Angolan society, our socio-economic analysis revealed that the consumption of bushmeat is increasingly being viewed critically by the urban population, particularly by students in higher education. This trend is partly explained by a greater awareness of common disease vectors such as bats and pangolins (Liu et al., 2020) and therefore of the health issues related to wildlife consumption. Although traditional subsistence hunting provides meat as an essential part of the daily diet of the majority of the rural population, urban residents tend to hunt less themselves and instead buy commercially available meat from the markets.

Notwithstanding the signs of a potential behavioural shift in bushmeat consumption, especially amongst the younger generation, the rapid population growth in Angola (City Populations, 2022) will probably lead to an increase in bushmeat demand in future and thus to increased hunting pressure. This can only be countered by consistent enforcement of existing environmental laws together with proactive and effective prosecution of people involved in illegal wildlife trade.

At the same time, and just as importantly, alternative livelihoods need to be created for people who make a living from the wildlife trade or rely on subsistence hunting for food. To ensure that conservation measures are implemented sustainably and have a long-term impact, it is essential to invest in the education sector to improve both environmental and civic education, especially for the rural population of Angola. Ultimately, young Angolans must push for a fundamental change in the current system and must actively advocate for the sustainable use of natural resources and for effective management that ensures the long-term conservation of ecosystems and wildlife populations.

Author contributions Study conceptualization: TL; data collection: LGBdO, MM; data curation: LGBdO; design of the methodology: RE, MM, TL; writing, preparation of figures: LGBdO; revision: RE, TL; supervision: RE.

Acknowledgements We thank the staff of Kimpa Vita University for their support, specifically Maria de Fátima for organizational support and C. Mabel Creagh Peña for distributing the questionnaires to students; agronomy students Dongala do Nascimento Pedro Morais and Lourenço Afonso for their help with translating survey questions into Kikongo and Lingala; and the survey respondents for participating in this study and providing the data. We thank the editors and the two anonymous reviewers for their useful comments and suggestions that helped to improve the manuscript.

Conflicts of interest None.

Ethical standards This research abided by the *Oryx* guidelines on ethical standards, complied with Angolan law, involved no animal testing or collection of specimens, and was approved by the Ethics Committee Office of Kimpa Vita University.

Data availability All data used in this publication were collected by the authors and are available from the corresponding author upon reasonable request.

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