

BUKOLA M. ADENUGA, MAGDALENA MONTOWSKA

BUSH MEAT CONSUMPTION IN NIGERIA: CONSUMER PERCEPTIONS AND AUTHENTICITY CONCERNS

S u m m a r y

Background. Bush (wild animal) meat consumption is culturally significant in Nigeria, yet concerns about product authenticity remain largely unaddressed. The study aimed to investigate consumer perceptions, preferences and concerns regarding bush meat consumption in Nigeria. This work is among the first to provide an insightful investigation into consumer perceptions, preferences and concerns regarding bush meat authenticity in Nigeria. An online survey was conducted to gather data from Nigerian consumers on consumption habits, authentication concerns, sources of fraud, knowledge of biodiversity protection and governmental interventions. Descriptive statistics were used to summarise the data.

Results and conclusions. Key findings revealed significant concerns about product authenticity among consumers, with nearly half expressing concerns about the authenticity of bush meat. Moreover, a significant proportion of respondents lacked awareness of protected species and had limited confidence in government regulations. The consumers who ate bush meat frequently associated it with sensory appeal and health benefits, whereas non-consumers expressed concerns about its safety and potential health risks. The findings underscore the urgent need for collaborative efforts between government agencies, industry stakeholders and consumers to address food fraud and ensure the sustainable and safe consumption of bush meat. Strengthening consumer protection measures through improved regulatory oversight, public education and the implementation of authenticity verification techniques is crucial for safeguarding public health, biodiversity and consumer trust.

Keywords: food authentication, meat products, bush meat fraud, consumer choice, food safety

Introduction

Bush meat represents a diverse array of wild animals hunted for food, medicinal and cultural purposes. They serve as a significant source of animal protein, macro- and micronutrients and are cherished for their distinctive taste and rich flavor [34]. Embedded within traditional diets and livelihoods across numerous regions of Nigeria, the practice of bush meat hunting and consumption traces back historically, intertwined

MSc. B.M. Adenuga ORCID: 0000-0002-9908-9185; Prof. dr hab. M. Montowska ORCID: 0000-0002-6331-5726; Department of Meat Technology, Poznan University of Life Sciences, Wojska Polskiego 31, 60-624 Poznan; Contact: e-mail: magdalena.montowska@up.poznan.pl

with societal customs where these animals played pivotal roles in rituals, medicinal practices and even the installation of monarchs [7]. While bush meat is typically sourced or hunted in rural areas near lush forests, an intricate supply chain network has evolved, facilitating the movement of these products from primary hunters to urban consumers [17, 32]. Popular bush animals in Nigerian markets include grass cutters, cane rats, antelopes, duikers, civet cats, snails, guinea fowls, crocodiles, monkeys, pangolins etc.

Many individuals who consume bush meat attribute their preference to familial backgrounds, having been raised in households where bush meat was a staple, thus perpetuating the tradition [34]. However, beyond tradition, factors such as health benefits, medicinal properties and affordability have also been significant drivers of bush meat consumption among Nigerians [2]. Despite the higher price tag associated with bush meat compared to more conventional meat types, consumers remain willing to pay the premium [29, 32], sustaining a thriving and lucrative bush meat trade across Nigeria, evidenced by established markets in cities like Lagos, Ibadan and Port Harcourt.

Although the consumption of bush meat is an important source of protein for many people, it poses numerous safety and quality problems. Zoonotic diseases such as Ebola, monkeypox and COVID-19 have been linked to the contact and consumption of wild animals. In addition to public health risks, illegal hunting, species conservation issues and misinformation about the authenticity of products are also a problem. Globally, the need for safe, ethical wildlife products has led to closer scrutiny of the game market [4, 5, 8, 13, 15]. When these products fail to meet required standards, mislabeling and fraud can occur, misleading consumers and contributing to food safety risks. Recent studies have shown that many processed game products do not comply with labelling regulations due to mislabeling, substitution of primary meat ingredients, undeclared species and general misrepresentation, even in a better-regulated European market [4, 5].

The issue of authenticity of meat products is often overlooked in Nigeria. The unregulated nature of the Nigerian meat industry contributes greatly to this ignorance. While there are laws such as the Recall, Disposal and Handling of Unwholesome and Adulterated Food and Food Products Regulations, which were enacted by the National Agency for Food and Drug Administration and Control [23] to regulate food adulteration, many of these laws primarily relate to packaged products, which do not cover meat and bush meat in particular. And when product warnings or recalls are issued, these meat products are often not included, which could lead to a serious lack of awareness among consumers. As a result, more and more consumers are using platforms such as social media to complain about cases of meat fraud (e.g. grasscutter sold as guinea fowl [11], inedible plastic sold as *kilishi* [35]).

In addition, inadequate scientific documentation of meat fraud in Nigeria could also contribute to consumer ignorance. A recent study by Onyeaka et al. [25] found that a significant proportion of respondents were unaware of the term 'food fraud', indicating a general lack of consumer awareness. In sub-Saharan Africa, Nigerian consumers ranked second only to Ghana in concerns about food fraud, with these concerns relating primarily to smuggling and misrepresentation of food and beverages [31]. Another study examined the risks and challenges of food fraud in Nigeria and concluded that the most commonly adulterated products in Nigeria are fats and oils, alcoholic and non-alcoholic beverages, and honey [26]. Like many other studies, this study focused on food fraud in products such as rice, dairy products and oil, while little attention was paid to bush meat.

Despite existing research on the nutritional value [16] and economic importance of bush meat [1], there remains limited understanding of how consumers perceive the authenticity of bush meat and how these perceptions influence consumption behavior. This gap hinders the development of effective regulatory measures and consumer-oriented solutions to authenticity issues in the bush meat sector. To address this gap, it is necessary to explore consumer perceptions of bush meat consumption, particularly by examining the language consumers use to describe the product.

A promising method for gaining insight into consumer perceptions is free-word association, a technique in which respondents are asked to express their initial thoughts on a particular topic [27]. This method helps reveal underlying attitudes, motivations and concerns that may not be captured by structured surveys. Researchers have increasingly used free-word association in food-related studies to better understand consumer behavior. For example, de Andrade, Aguiar Sobral, Ares & Delizan's [14] study on lamb meat found that the words respondents associated with the product reflected their key motivations for consumption, such as tasty, aromatic and healthy. Applying this approach to bush meat can provide valuable insights into how Nigerians perceive the authenticity, safety and socio-cultural importance of bush meat, enabling targeted interventions for sustainable bush meat practices.

In a previous review of the Nigerian meat industry, the importance of incorporating consumer opinions on meat fraud was emphasized as a critical starting point for addressing authenticity concerns in the sector [5, 6] Building on this recommendation, the present study focuses specifically on bush meat consumption in Nigeria, seeking to understand consumer perceptions of authenticity concerns related to the product. This research aims to bridge the gap in knowledge by identifying consumer preferences, perceptions of fraudulent practices, and how these views are influenced by socio-demographic factors such as age and gender. By examining how consumer perceptions of authenticity and safety vary across different demographic groups, this study provides crucial insights into the behavioral drivers of consumption and the underlying

trust issues surrounding bush meat products in Nigeria. This consumer-centric approach is essential for developing more targeted regulatory policies and awareness campaigns to improve food safety and authenticity within the bush meat sector.

Materials and methods

Ethical approvals and considerations

For this study, no ethical committee approval was sought. The survey was conducted anonymously, meaning no personally identifying information (PII) was collected. Therefore, no information could be linked to individual respondents. This study adheres to the ethical guidelines outlined in the Declaration of Helsinki [33] regarding the protection of human research participants. Participation in the survey was entirely voluntary. Participants were informed that they could withdraw from the survey at any time and complete it at their own pace.

Data collection and participants

The survey was developed using Google Forms, a freely available online platform. This platform facilitated the creation of a short URL link for easy sharing and distribution. A combination of convenience and snowball sampling techniques was employed for participant recruitment. The initial distribution of the questionnaire was conducted through personal contacts and social media platforms (WhatsApp, LinkedIn, and Facebook). Respondents were encouraged to share the survey within their networks to broaden participant reach.

The target population for this study consisted of adult Nigerians (18 years old and older) who were willing to participate in the survey. A total of 148 responses were collected. One response was eliminated due to incompleteness, resulting in a final sample size of 147 participants. This group comprised 27 non-bush meat eaters and 120 bush meat eaters.

Questionnaire design

The questionnaire was developed based on previously published studies that assessed consumer perception and consumption of meat products [12, 14]. The initial draft consisted of 20 questions with open-ended comments spread across multiple pages. Following a pilot test with seven participants, the questionnaire was refined. Redundant questions were removed, open-ended responses were replaced with closed-ended options for easier analysis, and the remaining questions were rephrased to encourage click-based answers. Based on feedback, the questionnaire was condensed to a single page for improved user experience. The final deployed version comprised 17 questions covering the following areas: consumption and consumption habits, bush meat and source, bush meat cooking methods (heat treatment), authenticity concerns,

biodiversity protection, regulatory effectiveness, demographics and free-word association task. Participants were asked to list the first three words or phrases that came to mind when they thought of bush meat. Examples were provided for clarity.

The responses were recorded using a combination of multiple-choice questions, multiple-choice grids, checkboxes and rating scales. Attitudinal questions assessing perceptions of bush meat authenticity were measured using a five-point Likert scale (1 = Not at all Concerned to 5 = Extremely Concerned). Frequency-based responses (e.g. how often participants consumed bush meat) were categorized into predefined intervals ('Daily,' 'Monthly,' 'Yearly,' 'Often,' etc.). The questionnaire also included closed-ended categorical questions, some of which provided a middle option to capture respondent uncertainty (Yes/No/Maybe), while others were binary knowledge-check questions (Yes/No) designed to assess familiarity with specific topics. The survey was deployed in September 2024 and ran until December 2024.

Data analysis

Data analysis aimed to explore the relationships between demographic variables (gender and age), bush meat consumption behaviors, and concerns about authenticity. Descriptive statistics were used to summarise the data, including frequency tables and proportions for categorical variables and measures of central tendency (mean) and variability (standard deviation) for continuous variables. Inferential statistics, such as Chi-square tests of independence, were employed to assess the relationship between demographic variables and other selected variables such as concerns about authenticity. The significance level for all statistical tests was set at $p \leq 0.05$.

Prior to analysis, data quality checks were conducted. Incomplete responses were eliminated. Special characters were replaced. Missing values for continuous variables were replaced with the mean, where appropriate. Responses to multi-choice questions were aggregated to simplify analysis while preserving data integrity.

A text analysis was conducted on the open-ended responses to the question "What are the first three words or phrases that come to mind when you think of bush meat?" Responses were cleaned by removing punctuation, converting text to lowercase, and tokenizing words. Word frequencies were calculated and analyzed separately for bush meat eaters and non-eaters. Words were grouped into broader thematic categories, such as taste, health and culture. Counts and percentages of words within each category were computed to compare word usage across groups.

All analyses were conducted using Python v. 3.13.1, leveraging statistical libraries such as SciPy v. 1.15.1, pandas, NumPy v. 2.2.0, and NLTK v. 3.9.1. Data visualization was performed using Matplotlib v. 3.10 and seaborn v. 0.13 to enhance the interpretation and presentation of findings.

Results

Overview summary

The survey gathered responses from 147 individuals, comprising 89 males (60.5 %) and 58 females (39.5 %) (Tab. 1). The majority of respondents fell within the 31 ÷ 40 years age bracket (40.8 %), followed by those aged 18 ÷ 30 years (34 %). A significant proportion of respondents ($n = 127$; 81.6 %) reported consuming bush meat. Regarding concerns about bush meat consumption, nearly half ($n = 69$; 48.6 %) expressed no concerns, while 17.6 % ($n = 25$) were unsure, and 33.8 % ($n = 48$) indicated

Table 1. Characteristics and consumer perceptions of key survey items

Tabela 1. Charakterystyka i spostrzeżenia konsumentów dotyczące kluczowych elementów badania

Survey items / Elementy ankiety	Groups / Grupy	Respondents / Respondenci					
		Bush meat eaters / Jedzący mięso dzikich zwierząt		Non-eaters / Niejedzący		All respondents / Wszyscy respondenci	
		Counts / Liczby	Percentages / Procenty (%)	Counts / Liczby	Percentages / Procenty (%)	Count / Liczby	Percentages / Procenty (%)
Bush meat consumption / Spożycie mięsa dzikich zwierząt	All respondents / wszyscy respondenci	120	81.6	27	18.4	147	100
Gender / Płeć	Male / Mężczyzna	76	63.3	14	51.9	58	39.5
	Female / Kobieta	44	36.7	13	48.1	89	60.5
Age distribution / Dystrybucja wiekowa	18÷30 years / lat	37	30.8	13	48.1	50	34.0
	31÷40 years / lat	53	44.2	7	25.9	60	40.8
	41÷50 years / lat	25	20.8	5	18.5	30	20.4
	>51 years / lat	5	4.2	2	7.4	7	4.8
Consumption concerns / Obawy dotyczące konsumpcji	Yes / Tak	33	28.0*	15	62.5*	48	33.8
	No / Nie	62	52.5*	7	29.2*	69	48.6
	Maybe / Może	23	19.5*	2	8.3*	25	17.6
Authenticity concerns / Obawy dotyczące autentyczności	Yes / Tak	54	46.6	15	62.5	69	49.3
	No / Nie	47	40.5	4	20.8	51	36.4
	Maybe / Może	15	12.9	5	16.7	20	14.3
Protected species awareness / Świadomość dotycząca gatunków chronionych	Yes / Tak	43	36.8	9	36.0	52	36.6
	No / Nie	74	63.2	16	64.0	90	63.4
Regulatory efforts / Działania regulacyjne	Yes / Tak	29	24.2	8	30.8	37	25.3
	No / Nie	91	75.8	18	69.2	109	74.7

Explanatory notes / objaśnienia: *statistically significant association $p \leq 0.05$ / statystycznie istotne powiązanie $p \leq 0.05$

concerns. Approximately half ($n = 69$; 49.3 %) of the respondents highlighted authenticity concerns about bush meat. About two-thirds of respondents indicated a lack of knowledge about protected and endangered species ($n = 90$), suggesting low awareness of wild species biodiversity conservation. Additionally, three out of every four respondents believed that regulatory efforts by the Nigerian government to ensure meat product authenticity were insufficient.

Consumption and non-consumption reasons

Among the 27 respondents who do not eat bush meat, the primary reason cited was eating background, with 29.6 % stating they did not grow up consuming bush meat (Tab. 2). Availability was another significant factor, as 25.9 % indicated bush meat was not readily accessible in their area. Additional reasons included taste preferences (14.8 %), concerns about healthiness (11.1 %), ethical considerations (11.1 %), cultural or religious beliefs (7.4 %), and lifestyle choices (3.7 %). Other self-reported reasons accounting for 22.2 % of responses included concerns about hygiene, dislike of the aroma and allergies, which further limited their willingness to consume bush meat.

Table 2. Reasons for not eating of bush meat

Tabela 2. Powody, dla których nie jedzono mięsa dzikich zwierząt

Reasons for not eating / Powody niejedzenia	Respondents count / Liczba respondentów	Percentage / Procent (%)
I did not grow up eating it / Nie jadłem dorastając	8	29.6
It is not available around my vicinity / Nie jest dostępne w mojej okolicy	7	25.9
Others: hygiene, aroma, allergy / Inne: higiena, zapach, alergia	6	22.2
I don't like the taste / Nie lubię smaku	4	14.8
It is not a healthy form of meat / To nie jest zdrowa forma mięsa	3	11.1
Ethical reasons or biodiversity control / Powody etyczne lub kontrola bioróżnorodności	3	11.1
Consuming it is against my cultural or religious belief / Spożywanie tego jest sprzeczne z moimi przekonaniami kulturowymi lub religijnymi	2	7.4
My lifestyle choice does not permit its consumption / Mój styl życia nie pozwala na jego spożywanie	1	3.7
It is too expensive / Jest za drogie	0	0
I do not know how to prepare it / Nie wiem, jak je przygotować	0	0
Good bush meat can only be eaten in restaurants / Dobre mięso dzikich zwierząt można zjeść tylko w restauracjach	0	0

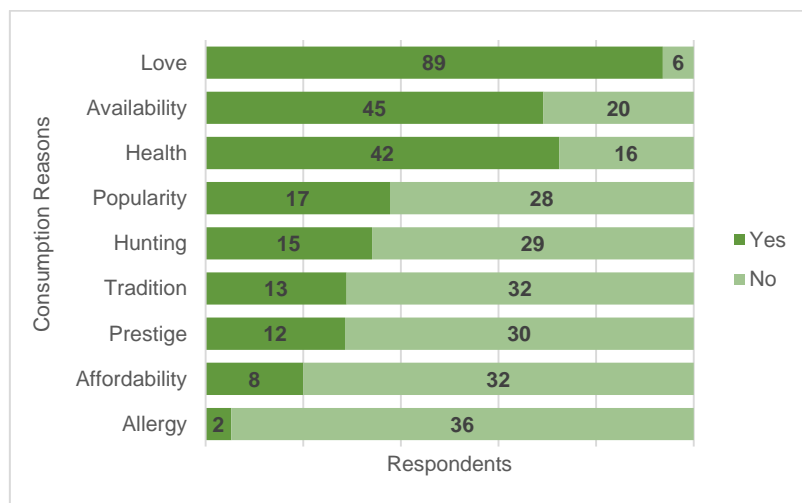


Figure 1. Reasons for bush meat consumption

Rycina 1. Powody spożywania mięsa dzikich zwierząt

Explanatory notes / objaśnienia:

Consumption reasons / Powody konsumpcji; Love / Zamiłowanie; Availability / Dostępność; Health / Zdrowie; Popularity / Popularność; Hunting / Łowiectwo; Tradition / Tradycja; Prestige / Prestiż; Affordability / Przystępność; Allergy / Alergia; Respondents / Respondenci;

For the respondents who consume bush meat ($n = 120$), 74.2 % stated that their main reason was simply their love for bush meat. Availability was another influential factor for 37.5 % of respondents, while 35 % highlighted the health and nutritional benefits as a reason for their preference. Other reasons included the popularity of bush meat (14.2 %), family traditions associated with its consumption (10.8 %) and a sense of prestige or status linked to eating bush meat (10%). A small percentage (12.5%) cited hunting as a reason for consumption. Additionally, two respondents mentioned that their choice to consume bush meat was due to allergies or a dislike of other meat types. Seven others specifically noted their preference for bush meat due to its taste and aroma. The distribution of respondents based on their reasons for eating bush meat is shown in Fig. 1. The non-eating group showed a nearly equal gender distribution, with 51.9 % male and 48.1 % female respondents. In contrast, the eating group had a higher proportion of males (63.3 %) compared to females. Age distribution also differed between the groups; the majority of bush meat consumers fell within the 31 ÷ 40 years age bracket, whereas most non-eaters were aged 18 ÷ 30. Interestingly, a significant portion of non-eaters expressed concerns about the safety or quality of bush meat consumption, including its authenticity. In contrast, the eating group reported fewer overall consumption concerns. However, concerns about the authenticity of bush meat were expressed by both groups. A statistical analysis revealed no significant differ-

ences between the eating and non-eating groups in terms of gender or age distribution (Tab. 3). However, a notable difference emerged regarding consumption concerns. The Chi-square test showed a statistically significant difference ($\chi^2 = 10.7$, $p = 0.0048$) between the gender distribution groups, specifically concerning apprehensions about the safety or quality of bush meat consumption.

Table 3. Determination of association between gender and some survey items using Chi-Square Test of Independence

Tabela 3. Określenie związku między płcią a niektórymi kluczowymi elementami ankiety przy użyciu testu niezależności Chi-kwadrat

Variables / Zmienne	Gender / Płeć		Age / Wiek	
	Chi-square statistic / Statystyka chi-kwadrat	p – value / p – wartość	Chi-square statistic / Statystyka chi-kwadrat	p – value / p – wartość
Bush meat consumption / Konsumpcja mięsa dzikich zwierząt	1.54	0.215	4.25	0.232
Consumption concern / Obawy dotyczące konsumpcji	7.70	0.021*	7.33	0.290
Authenticity concern / Obawy dotyczące autentyczności	1.41	0.495	5.89	0.434
Eating frequency / Częstotliwość jedzenia	3.34	0.765	13.1	0.787
Protected species awareness / Świadomość dotycząca gatunków chronionych	0.34	0.557	1.13	0.769

Explanatory notes / Objasnienia: *statistically significant association / statystycznie istotne powiązanie

Consumption behaviours for bush meat eaters

The survey examined various consumption behaviors, including eating patterns, cooking method preferences, consumption frequency and bush meat choices among the respondents who reported eating bush meat. The results showed that 58.3 % ($n = 70$) of the respondents consumed bush meat occasionally, defined as once or twice a year. Frequent consumers, those who consumed bush meat daily (0.8 %), weekly (5.0 %) or monthly (8.3 %), accounted for only 14.2 % ($n = 17$) of the group. Other respondents reported less frequent consumption patterns, with 9.2 % ($n = 11$) consuming bush meat every two to three months and 15.0 % ($n = 18$) consuming it rarely, approximately once every two or three years. An analysis indicated that eating frequency was not significantly associated with gender or age. These findings suggest that while bush

meat consumption is prevalent among the surveyed population, it is often an occasional or infrequent practice rather than a regular dietary habit for most individuals.

A significant number of respondents reported eating bush meat more frequently when visiting rural areas or their home villages (58.3 %, $n = 70$) or at home (55.8 %, $n = 67$). The respondents also reported consuming bush meat in restaurants, bars and *bukaterias* (38.3 %, $n = 46$). Additionally, many respondents reported eating bush meat at friends' homes (25.0 %, $n = 30$), during events or gatherings (25.8 %, $n = 31$), and even at festivals (0.8%). Remarkably, 31.7 % ($n = 38$) of the respondents mentioned that they personally prepared bush meat themselves.

The most common source of wild meat reported by the respondents was informal sellers, such as roadside vendors, accounting for 54.2 % ($n = 65$) of responses. This was closely followed by local markets, which constituted 42.5 % ($n = 51$). Other sources included gifts from hunting friends or family members ($n = 10$; 23.3 %), catering establishments ($n = 14$; 11.7 %), chance killings such as roadkill ($n = 12$; 10.0 %), specialty shops ($n = 8$; 6.7 %) or hunting trips ($n = 6$; 5.0 %) and visits to villages ($n = 1$; 0.8 %).

The respondents expressed varied preferences regarding the species they consumed. The most commonly eaten species were small game ones, such as bush rats, grasscutters, squirrels and rabbits (85.8 %), while large game species, including lions, baboons and buffalo, were rarely consumed (0.85 %). Other popular species included antelopes (45.8 %), reptiles (21.7 %), deer (21.7 %), wild pigs (13.3 %), wild birds (12.5 %), porcupines and pangolins (2.5 %). Most respondents preferred eating bush meat in soups (65.0 %) or as appetizers (35.0 %). Other forms of consumption mentioned included cold cuts (17.0 %), as a main course (13.3 %), and as an ingredient in other dishes (12.5 %).

The survey also examined the frequency of use of various cooking methods among bush meat consumers. Singeing was used by 72 respondents, with 61.1 % employing it regularly, while 34.7 % used it infrequently. Boiling was the most consistently used method, with 75.6 % of 86 respondents using it regularly and only 16.3 % using it infrequently. Frying was used by 71 respondents, 54.9 % of whom used it regularly, while 33.8 % reported infrequent use. Similarly, stewing was popular, with 65.3 % of 75 respondents reporting regular use, compared to 28.0 % with minimal usage.

In contrast, baking was among the least favored methods, with only 21.2 % of 52 respondents using it regularly and 75.0 % using it infrequently. Grilling was reported by 76 respondents, with 60.5 % indicating regular use and 34.2 % infrequent use. Smoking was a common practice, with 70.2 % of 94 respondents using it regularly and 25.5 % minimally. Sun-drying was moderately practised, with 43.3 % of 67 respondents using it regularly and 47.8 % minimally. These findings highlight the diverse

sourcing methods, species preferences, consumption practices and cooking methods associated with bush meat consumption.

Bush meat authenticity and authenticity concerns

When the participants were asked if they had concerns about eating bush meat, approximately half (48.6 %) responded negatively. There was some variation in the proportion of respondents with consumption concerns between males and females, but no statistically significant association was found between age categories and consumption concerns (Table 3). Nonetheless, authenticity concerns regarding bush meat were reported by 49.3 % of respondents, while 36.4 % had no such concerns, and the remaining respondents were unsure.

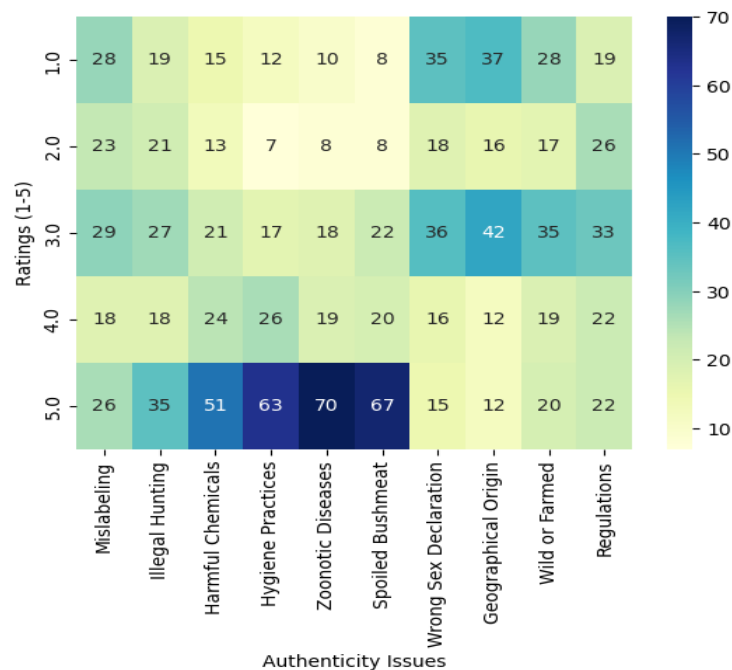


Figure 2. Distribution of respondents based on their concern ratings

Rycina 2. Podział respondentów na podstawie ocen ich obaw

Explanatory notes / Objasnienia:

Ratings / Ocen; Authenticity issues / Kwestie autenticzności; Mislabelling / Niewłaściwe etykietowanie; Illegal hunting / Nielegalne polowanie; Harmful chemicals / Szkodliwe substancje chemiczne; Hygiene practices / Praktyki higieniczne; Zoonotic diseases / Choroby odzwierzęce; Spoiled bush meat / Zepsute mięso; Wrong sex declaration / Błędna deklaracja płci; Geographical origin / Pochodzenie geograficzne; Wild or farmed / Dzikie lub hodowlane; Regulations / Przepisy prawne

To delve deeper into authenticity concerns, the respondents were asked to rate specific worries on a scale of 1 to 5 (Fig. 2). Table 4 shows that the respondents expressed moderate levels of concern (mean = 4), indicating a significant level of worry, about issues such as lack of proper hygiene and handling practices, risk of exposure to zoonotic diseases, sale of spoiled or expired bush meat and the potential presence of harmful chemicals or contaminants. Additionally, the respondents expressed slight concerns (mean = 3) about other issues, including the use of illegal or unsustainable hunting methods, the absence of clear regulations and oversight in the bush meat trade, mislabeling, distinguishing between wild-caught and farmed bush meat, wrong sex declaration and incorrect geographical origin declaration.

Table 4. Respondents main concerns on bush meat authenticity

Tabela 4. Główne obawy respondentów dotyczące autentyczności mięsa dzikich zwierząt

Authenticity concerns / Obawy dotyczące autentyczności	Respondents mean Rating / Średnia ocena respondentów
Lack of proper hygiene and handling practices / Brak odpowiedniej higieny i praktyk obchodzenia się z dzikimi zwierzętami	4
Risk of exposure to zoonotic diseases / Ryzyko narażenia na choroby odzwierzęce	4
Sale of spoiled or expired bush meat / Sprzedaż zepsutego lub przeterminowanego mięsa dzikich zwierząt	4
Potential presence of harmful chemicals or contaminants / Możliwa obecność szkodliwych substancji chemicznych lub zanieczyszczeń	4
Use of illegal or unsustainable hunting methods / Stosowanie nielegalnych lub niezrównoważonych metod polowań	3
Absence of clear regulations and oversight in the bush meat trade / Brak jasnych przepisów i nadzoru w handlu mięsem dzikich zwierząt	3
Mislabelling / Błędne etykietowanie	3
Distinguishing between wild-caught and farmed bush meat / Rozróżnianie mięsa dzikich zwierząt odławianych na wolności i hodowanych	3
Wrong sex declaration / Nieprawidłowa deklaracja płci	3
Incorrect geographical origin declaration / Nieprawidłowa deklaracja pochodzenia geograficznego	3

Consumer knowledge regarding motivations for bush meat fraud was also assessed. Nearly half of the respondents (47.6 %) believed that producers and sellers intentionally undermined bush meat authenticity for economic gain, suggesting a high level of perceived complicity in meat fraud. Conversely, one-third of the respondents (33.6 %) disagreed with this notion, while 18.9 % were undecided. Other areas of knowledge assessed included the respondents' awareness of species conservation and protection. The participants were provided with a small list of species protected under the First Schedule. Results revealed that less than two-thirds of the respondents were

unaware of species protection laws and guidelines, indicating a significant gap in knowledge regarding protected species. Furthermore, the participants were asked about their views on the efforts of regulatory bodies like NAFDAC in combating inauthentic and adulterated meat products. A significant majority (74.7 %) believed that these regulatory bodies were not making meaningful strides in addressing the issue, while only 25.3 % of the respondents disagreed, expressing some confidence in regulatory efforts.

Free word associations for bush meat consumption

Approximately 280 words were mentioned by the respondents when asked to write the first three words, terms or phrases that come to mind when they think of bush meat. Responses included single words, as well as short sentences or phrases. Table 5 shows the frequency of words mentioned by the respondents based on their consumption group.

When analyzing the word choices of non-eaters, a cautious and sceptical sentiment toward bush meat consumption emerged. The responses highlighted concerns related to health and safety, with terms such as ‘risk’, ‘unhealthy’, ‘zoonotic’, ‘dirty’ and ‘safety risk’. These terms suggest that this group is concerned about the potential hazards associated with consuming bush meat, particularly the risk of disease transmission or hygiene issues. Additionally, terms like ‘illegal’, ‘poaching’, ‘extinction’ and ‘conservation’ point to an awareness of the environmental and ethical issues surrounding bush meat trade and consumption. Despite their reluctance to consume bush meat, some non-eaters acknowledged its positive sensory qualities, suggesting that other factors, such as health risks, ethical concerns or availability may be more influential.

In contrast to the cautious sentiment expressed by non-eaters, bush meat consumers exhibited a more positive and appreciative perspective. Terms like ‘taste’ (23 mentions), ‘tasty’ (11), ‘delicious’ (11), ‘sweet’ (10) and ‘flavorful’ reflect the strong appeal of bush meat sensory qualities. Words like ‘natural’, ‘healthy’, ‘nutritious’ and ‘lean’ highlight perceptions of bush meat as a high-quality, healthful and organic food option. Cultural and traditional aspects also emerged, with terms such as ‘culture’, ‘traditional’, ‘enjoyment’ and ‘family’, reflecting the integration of bush meat into social and cultural contexts. Consumers also associate it with uniqueness and adventure, evident in words like ‘wild’, ‘unique’, ‘adventurous’ and ‘rare’, suggesting that bush meat is perceived as a distinctive and valued delicacy. However, a smaller subset of words like ‘risk’, ‘disease’, ‘unhealthy’ and ‘contaminated’ indicated that some consumers remain aware of potential health and safety concerns. Other mentions such as ‘economy’, ‘profitability’ and ‘prestige’ hint at economic and social status associations tied to bush meat consumption.

Table 5. Frequency of word mentions within each consumption group

Tabela 5. Częstotliwość słownych wzmianek w obrębie każdej grupy konsumpcyjnej

Consumption category / Kategoria konsumpcji	Common words / Popularne słowa (n) ^a
Eaters / Jedzący (n=217) ^a	Taste / smak (23), health / zdrowie (13), tasty / smaczny (11), delicious / pyszny (11), sweet / słodki (10), healthy / zdrowy (8), quality / jakość (8), culture / kultura (6), natural / naturalny (6), safety / bezpieczeństwo (5), source / źródło (5), flavor / aromat (5), meat / mięso (4), wild / dziki (4), unique / wyjątkowy (4), flavorful / pełen smaku (5), tasteful / smaczny (3), nutritious / pożywny (3), risk / ryzyko (3), economy / ekonomia (3), fat / tłusty (3), rare / rzadki (2), adventurous / ryzykowny (2), fresh / świeży (2), benefit / korzyść (2), cheap / tani (2), yummy / pyszny (2), availability / dostępność (2), rich / bogaty (2), traditional / tradycyjny (2), enjoyment / przyjemność (2), low / niski (2), nutrition / odżywianie (2), sumptuous / wystawny (2), spicy / pikantny (2), lean / chudy (1), savor / smak (1), sweetness / słodycz (1), bulkiness / objętość (1), different / inny (1), bush meat / mięso dzikich zwierząt (1), nice / miły (1), great / świetny (1), good / dobry (1), originality / oryginalność (1), meaty / mięsny (1), risky / ryzykowny (1), family / rodzina (1), home / dom (1), colorful / kolorowy (1), disease / choroba (1), tenderness / kruchość (1), bush / busz (1), savory / wytrawny (1), appetizer / przystawka (1), clean / czysty (1), food / jedzenie (1), indifference / obojętność (1), memory / pamięć (1), saturated / nasycony (1), taste / smak (2), value / wartość (1), protein / białko (1), sweet delicious great / słodki pyszny świetny (1), tradition / tradycja (1), satisfying / satysfakcjonujący (1), unhealthy / niezdrowy (1), preservation / ochrona (1), profitable / zyskowny (1), sweetly / słodko (1), taste course / smaczne danie (1), raw / surowy (1), interesting / interesujący (1), love / miłość (1), dangerous / niebezpieczny (1), grasscutter / gryzoń (1), pepper / pieprz (1), soup / zupa (1), unavailable / niedostępny (1), conservation / ochrona (1), juicy / soczysty (1), contaminated / zanieczyszczony (1), beer / piwo (1), chewy / gumowaty (1), well / dobrze (1), cooked / gotowany (1), benefits / korzyści (1), game / dzicyzna (1), exotic / egzotyczny (1), prestige / prestiż (1)
Non-eaters / Niejedzący (n=52) ^a	risk / ryzyko (4), wild / dziki (3), health / zdrowie (3), taste / smak (3), healthy / zdrowy (2), unhealthy / niezdrowy (2), flavorful / pełen smaku (2), risky / ryzykowny (1), scares wild / przeraża dziki (1), cautious / ostrożny (1), tasty / smaczny (1), okay / w porządku (1), strange / dziwny (1), unusual / niezwykły (1), shady / podejrzany (1), safety risk / ryzyko bezpieczeństwa (1), dirty / brudny (1), cost / koszt (1), purchase / zakup (1), illegal / nielegalny (1), poaching / kłusownictwo (1), sabotage / sabotaż (1), destruction / zniszczenie (1), consumption / spożycie (1), practice / praktyka (1), health source safety / źródło zdrowia bezpieczeństwo (1), controversial / kontrowersyjny (1), exotic / egzotyczny (1), zoonotic / odzwierzęcy (1), extinction / wyginiecie (1), animal / zwierzę (1), taking / branie (1), source / źródło (1), quality / jakość (1), safety / bezpieczeństwo (1), part / część (1), delicious / pyszny (1), rare / rzadki (1), hygienic / higieniczny (1), conservation / ochrona (1)

Explanatory notes / objaśnienia: ^a word counts / liczba słów

All words provided by the respondents were thematically summarized into 9 groups (Tab. 6). The largest group was 'sensory experiences', comprising approximately 105 words. The other themes included health and nutritional benefits, risk and

safety, culture and tradition, quality and freshness, economy and availability, preference, meat attributes and others (words that did not directly fit into a specific theme).

Discussion

This study found that 81.6 % of respondents consume bush meat, primarily due to its taste, perceived health benefits and socio-economic value. These findings align with Adefalu et al. [2], who reported that consumers were drawn to bush meat for its nutritional value, availability and affordability. Additionally, bush meat consumption is often associated with home settings and village visits, particularly involving extended family, indicating a strong cultural and sentimental attachment. This cultural connection may explain why many non-consumers cited the lack of an 'eating background' as a key reason for abstaining from bush meat.

While cultural factors and perceived benefits drive bush meat consumption, various concerns, including safety and authenticity, also influence consumer decisions. Apart from cultural factors, concerns about availability, hygiene and safety also influenced consumer decisions. Similarly, Ebewore et al. [16] found that 98 % of respondents who had previously consumed bush meat ceased doing so due to risks associated with zoonotic diseases, availability challenges, financial constraints and education levels. This study provides valuable insights into consumer choices by exploring both the factors that drive bush meat consumption and the barriers that discourage it. Protecting consumer choice is a fundamental principle in meat product authentication research [5, 6]. Furthermore, understanding and incorporating consumer preferences is critical in addressing food fraud, as consumer perceptions and attitudes directly shape trust in food safety and authenticity [19, 21].

This study, alongside previous research [2, 18, 34], confirms that small game (e.g. grasscutters, cane rats), antelopes, duikers and wild birds are among the most preferred game meats in Nigeria. In contrast, European preferences lean toward species such as wild boar, roe deer and red deer [12]. This knowledge is crucial for targeted interventions to protect consumer choice, as these commonly consumed species are also the most susceptible to fraud and adulteration. Cases of species substitution are increasingly common, such as a recent incident in which a woman was sold chicken instead of grasscutter [11]. A major contributor to such fraudulent practices is Nigeria's largely unregulated bush meat trade. While a supply chain exists to transport bush meat from hunters to consumers [20], it lacks proper verification and regulatory oversight. For many Nigerians, as observed in this study, bush meat is predominantly purchased from informal markets, such as roadside vendors. This lack of a structured and regulated sales system facilitates widespread misrepresentation and fraud.

Table 6. Thematic analysis of free-word associations related to bush meat

Tabela 6. Analiza tematyczna skojarzeń wolno-wyrazowych związanych z mięsem dzikich zwierząt

Themes / Tematy (n = 270) ^a	Examples / Przykłady	Mention frequency / Częstotliwość wzmianek	Percentage occurrence / Procent występowania (%)
Sensory experience / Doświadczenie sensoryczne	taste, tasty, delicious, flavorful, flavor, tasteful, savor, sumptuous, savory, sweet, sweetness, yummy, rich, spicy, tender, juicy, sweetly / smak, smaczny, pyszny, pełen smaku, aromat, smaczny, smak, wspaniały, wytrawny, słodki, słodczy, pyszny, bogaty, pikantny, delikatny, soczysty, słodko	105	41.5
Health and nutritional benefits / Korzyści zdrowotne i odżywcze	health, healthy, nutritious, nutrition, lean, fat, unhealthy, hygienic, clean / zdrowie, zdrowy, odżywczy, odżywianie, chudy, tłusty, niezdrowy, higieniczny, czysty	46	18.2
Risk and safety / Ryzyko i bezpieczeństwo	risk, safety, risky, cautious, dangerous, shady, illegal, poaching, disease, destruction, extinction, zoonotic, contaminated, sabotage / ryzyko, bezpieczeństwo, ryzykowny, ostrożny, niebezpieczny, podejrzany, nielegalny, kłusownictwo, choroba, zniszczenie, wyginięcie, odzwierzęcy, skażony, sabotaż	45	17.8
Culture and tradition / Kultura i tradycja	culture, tradition, traditional, family, home, memory, practice, preservation, conservation, bush, bush meat, animal, game, grasscutter, prestige / kultura, tradycja, tradycyjny, rodzina, dom, pamięć, praktyka, zachowanie, konserwacja, busz, mięso z buszu, zwierzę, dziczyzna, gryzoń, prestiż	40	15.8
Quality and freshness / Jakość i świeżość	quality, fresh, natural, original, unique, traditional, great, good, satisfying, sumptuous, well, cooked / jakość, świeży, naturalny, oryginalny, wyjątkowy, tradycyjny, świetny, dobry, satysfakcjonujący, wspaniały, dobrze, ugotowany	40	15.8
Economy and availability / Ekonomia i dostępność	availability, economy, cost, cheap, purchase, value, unavailable	11	4.3
Preference / Preferencje	enjoyment, different, interesting, love, appetizer, part, strange, unusual / przyjemność, inny, interesujący, miłość, przystawka, część, dziwny, niezwykły	11	4.3
Meat attributes / Cechy mięsa	meat, protein, meaty, benefits, raw, cooked / mięso, białko, mięsny, korzyści, surowy, gotowany	11	4.3
Others / Inne	bulkiness, colorful, destruction, controversial, memory, soup, beer / objętość, kolorowy, zniszczenie, kontrowersyjny, pamięć, zupa, piwo	9	3.6

Explanatory notes / Objasnienia: ^a word counts / liczba słów

Meat processing can also facilitate consumer fraud. A recently published 20-year analysis of globally reported food fraud revealed that 30 % of reports involving processed meat products were linked with species substitution [28]. Many respondents in this study frequently employ processing methods such as smoking, grilling, boiling, and frying to prepare bush meat, making them more inclined to purchasing processed bush meat. In Nigeria, bush meat is commonly processed before sale to preserve it and extend its shelf life. It is often sold pre-cut or partially processed through frying, smoking or grilling, making it difficult for consumers to identify its true species based on appearance alone. This increases the likelihood of species substitution and food fraud. Charlebois, Schwab, Henn & Huck [10] highlight that food fraud is often undetected by consumers, making them particularly vulnerable. Typically, an unusually low price might serve as a warning sign, but in the case of bush meat where prices are inherently high, consumers may be misled into paying premium prices for adulterated products.

Many Nigerians prefer to consume bush meat in restaurants, likely due to the perceived exotic nature of the dishes and the gourmet-style cuisine often offered. While home preparation remains common, this study found that 38 % of respondents consume bush meat in restaurants or local eateries (*bukaterias*). Home cooking and self-preparation of bush meat may not eliminate the risk of adulteration but can significantly reduce other safety concerns, such as preparation hygiene. This study found that one-third of respondents (33 %) worry about the safety of bush meat consumption. Since the most commonly consumed bush meat consists of small game species, which are often caught using traps set in strategic locations, these traps, if not checked regularly, could lead to the decomposition of the captured animals [9]. Inadequate preservation during hunting, transportation and storage can lead to meat spoilage. To salvage spoiled meat, some sellers may offer it at reduced prices to consumers or establishments like restaurants and bars, which may attempt to mask the spoilage through extensive cooking or marinating [30].

Game meat may also contain lead and other chemical substances from gunshot wounds, potentially posing unknown toxicological risks to humans [22]. Additionally, wild animals like raccoons and foxes may accumulate high levels of heavy metals in their meat, making them unsuitable for human consumption. Stress experienced by game animals before capture or killing can also affect meat quality. Furthermore, unhygienic handling and processing practices expose bush meat to foodborne pathogens, increasing the risk of microbial contamination and subsequent infections in consumers.

Consumer perceptions of food authenticity are primarily linked to deceptive practices that prevent them from making informed choices about the products they consume [21]. In Nigeria, where fraud is deeply embedded in societal structures, consumers may be more likely to overlook certain deceptive practices, such as minor

misrepresentations, due to the prevalence of fraud in Nigerian society [25]. Consumers may only express concern when these frauds directly impact their well-being.

This study found that the respondents were most concerned about authenticity issues that posed health risks, such as poor hygiene, zoonotic diseases, spoiled or expired bush meat and the presence of harmful chemicals or contaminants. In contrast, concerns about mislabeled or misrepresented products were of lesser importance. Additionally, many respondents were unaware of the legal restrictions on hunting and consuming certain species, such as those listed under the First Schedule, which prohibits the killing of all genera of antelope, snake, monkey, tortoise, crocodile, monitor lizard, sea turtle, chimpanzee, pangolin and civet. For instance, pangolins remain one of the most heavily trafficked species worldwide, hunted illegally for their meat and scales despite their protected status [24].

Bush meat fraud is often driven by economic motives, with many sellers and producers deliberately compromising authenticity for financial gain. However, less than half (48 %) of respondents in this study believed that bush meat was intentionally adulterated, suggesting a limited consumer awareness of the extent of food fraud in this sector. This lack of awareness, coupled with weak regulations and enforcement, leaves consumers vulnerable to deception and potential health risks. Raising consumer awareness through education, stricter monitoring and improved labelling standards could help mitigate fraud and ensure greater transparency in the bush meat supply chain.

The free-word association task provided valuable insights into consumer perceptions of bush meat. Consumers who eat it generally hold it in high regard for its sensory appeal, nutritional benefits, and perceived health value, whereas non-consumers tend to avoid it due to concerns about health risks, safety, or biodiversity conservation. These findings highlight an opportunity for regulatory bodies to take a proactive role in balancing consumer demand with conservation and public health concerns. Government agencies such as the Nigeria National Park Service, National Agency for Food and Drug Administration and Control (NAFDAC) and Standard Organization of Nigeria (SON) can play a crucial role in regulating hunting practices and ensuring sustainable wildlife management, while the Federal Competition and Consumer Protection Commission (FCCPC) can play a key role in consumer protection and combating fraudulent practices. Authenticity verification methods, including molecular-based testing, could further enhance consumer protection and confidence in the market.

Although laws such as the Endangered Species (Control of International Trade and Traffic), Amendment Act and bills like the Nigeria Wildlife Protection Bill have been introduced, poor enforcement remains a major challenge. This lack of effective implementation may explain why a significant portion of respondents believe regulatory bodies are not making sufficient strides in safeguarding the nation from inauthentic and adulterated meat products. Strengthening enforcement and ensuring stakeholder

collaboration are essential steps toward restoring trust and improving transparency in Nigeria's bush meat sector.

Limitations

This study, while providing valuable insights into consumer perceptions and preferences regarding bush meat consumption in Nigeria, has several limitations. The use of convenience and snowball sampling techniques may have introduced sampling bias. The sample may overrepresent individuals with higher levels of education, internet access and social media engagement, potentially underrepresenting individuals from rural areas or those with limited access to technology. The study relied on self-reported data through an online survey, which is subject to potential biases such as social desirability bias. The study primarily focused on the consumer perspective and did not extensively explore the economic aspects of the bush meat trade or the perspectives of other key stakeholders, such as hunters, traders and regulatory authorities. The dynamic nature of the bush meat market, characterized by evolving consumer preferences, market trends and regulatory policies, may limit the generalizability of the study findings over time.

Conclusions

1. This study provides valuable insights into consumer perceptions, preferences and concerns regarding bush meat consumption in Nigeria, highlighting the significant role of cultural, social and economic factors in shaping consumer choices.
2. While many consumers appreciate bush meat for its taste, nutritional benefits and cultural significance, others abstain due to concerns about health risks, safety and conservation.
3. The findings also highlight a significant gap in consumer awareness regarding food fraud, as well as the role economic incentives play in driving bush meat adulteration.
4. The lack of stringent regulations and weak enforcement mechanisms further exacerbate the problem, making it easier for fraudulent practices to persist. Strengthening consumer protection measures through improved regulatory oversight, public education and the implementation of authenticity verification techniques is essential for addressing food fraud in the bush meat industry.
5. Addressing bush meat fraud effectively requires a collaborative effort involving government agencies, industry stakeholders, consumers and civil society organizations. By improving transparency in the supply chain and ensuring that consumers can make informed choices, the integrity of the bush meat market can be safeguarded.

6. Future research should explore more advanced methods of food authentication and assess the impact of consumer education on reducing fraudulent practices. Protecting food authenticity is crucial for safeguarding public health, biodiversity, consumer trust and the long-term sustainability of the bush meat sector.

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SPOŻYCIE MIĘSA DZIKICH ZWIERZĄT W NIGERII: POSTRZEGANIE PRZEZ KONSUMENTÓW I OBAWY O AUTENTYCZNOŚĆ

S t r e s z c z e n i e

Wprowadzenie. Spożycie mięsa dzikich zwierząt (z buszu) ma znaczenie kulturowe w Nigerii, jednak obawy dotyczące autentyczności/uwierzytelniania produktu pozostają w dużej mierze nierozwiązane. Celem badania było zbadanie postrzegania, preferencji i obaw konsumentów dotyczących spożycia mięsa pozyskanego z buszu w Nigerii. Niniejsza praca jest jedną z pierwszych, która wnikliwie zbadała postrzeganie, preferencje i obawy konsumentów dotyczące autentyczności mięsa dzikich zwierząt w Nigerii. Przeprowadzono ankietę online, aby zebrać dane od nigeryjskich konsumentów na temat nawyków konsumpcyjnych, obaw dotyczących uwierzytelniania, źródeł oszustw, wiedzy na temat ochrony różnorodności biologicznej i interwencji rządowych. Do podsumowania danych wykorzystano statystyki opisowe.

Wyniki i wnioski. Kluczowe ustalenia ujawniły istotne obawy dotyczące autentyczności produktu wśród konsumentów, przy czym prawie połowa wyraziła obawy dotyczące autentyczności mięsa z buszu. Ponadto znaczna część respondentów nie była świadoma gatunków chronionych i miała ograniczone zaufanie do regulacji prawnych. Konsument, którzy jedli mięso z buszu, często kojarzyli je z atrakcyjnością sensoryczną i korzyściami zdrowotnymi, podczas gdy osoby niebędące konsumentami wyrażały obawy dotyczące jego bezpieczeństwa i potencjalnych zagrożeń dla zdrowia. Wyniki podkreślają pilną potrzebę współpracy między agencjami rządowymi, interesariuszami branży i konsumentami w celu rozwiązania problemu oszustw żywnościowych i zapewnienia zrównoważonej i bezpiecznej konsumpcji mięsa dzikich zwierząt. Wzmocnienie środków ochrony konsumentów poprzez ulepszony nadzór regulacyjny, edukację publiczną i wdrożenie technik weryfikacji autentyczności ma kluczowe znaczenie dla ochrony zdrowia publicznego, różnorodności biologicznej i zaufania konsumentów.

Słowa kluczowe: uwierzytelnianie żywności, produkty mięsne, oszustwa związane z mięsem dzikich zwierząt, wybór konsumenta, bezpieczeństwo żywności. 