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Research Article

Assessing the patterns of crime on a nature reserve in Nigeria

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Abstract

The incidences of illegal activities around nature reserves have dire effects on biodiversity and significant environmental, social, and economic consequences. Therefore, this study examines the fundamentals of crime on nature reserves in and around Omo Forest Reserve (OFR) in Nigeria. Data were gathered using mixed methods, including focus groups, in-depth interviews, and questionnaire administration. Eight randomly selected enclaves within a 5-kilometer radius of Omo Forest Reserve were included in the study. A systematic random sampling was used to administer 164 questionnaires in the selected enclaves. Additionally, convenience sampling was used to interview administrators of Omo Forest Reserve. The collected data were analyzed using descriptive statistics. Findings show that the majority of residents in the study area were male (63% of the respondents), and they are actively involved in crime in the nature reserve, with few women playing subordinate roles in the crime. All respondents identified illegal logging and deforestation as the primary types of crime in the nature reserve. The respondents also indicated that dwellers of the communities surrounding the reservoir, hunters, and corrupt officials of the forest reserve are among the top perpetrators. Lack of law enforcement was mentioned as the major influencing factor, while alternative employment opportunities will serve as a major preventive measure. Moreover, the study found that crime on the nature reserve was on the rise in the study area. The study concluded that the increasing lack of law enforcement, growing demand for natural resources, lack of political stability, and mounting pressure for land access pose a great challenge that is likely to escalate crime in nature in the study area in the future. This study offers policy and research recommendations that engage with relevant stakeholders.

Keywords: Forest reserve; criminality; conservation; wildlife; Omo Forest Reserve

1 Introduction

Crime generally has been a persistent aspect of human existence since the earliest stages of civilization. Over time, as societies grew more advanced, the complexities of criminality also increased (White & Ronald, 2015). These complexities often stem from the combination of individual influences, such as upbringing, personality, and psychological conditions, and broader societal issues like poverty, inequality, and exclusion (Lynch & Stretesky, 2019). However, despite the establishment of legal frameworks, crime remains a significant challenge (Ward, 2014), with gaps between laws and enforcement enabling persistent violations, including crimes against humanity and nature. While high-profile crimes such as kidnapping, human trafficking, and terrorism capture substantial public attention due to their direct impact on human lives (Smith et al., 2020), environmental offenses, commonly referred to as 'crimes against nature reserves', receive less visibility despite their extensive consequences for biodiversity and ecological systems.

According to the United Nations Environment Programme (Nelle-

mann & INTERPOL, 2016), illegal logging driven by agricultural expansion accounts for more than 30% of global timber, contributing to deforestation and climate change. Similarly, wildlife trafficking has decimated populations of endangered species, pushing them to the brink of extinction. The 2019 Global Assessment Report on Biodiversity and Ecosystem Services further indicates that up to 1 million of the estimated 8 million plant and animal species on Earth face the risk of extinction, with many likely to occur within the coming decades (Consalo, 2020). The impact of these crimes extends beyond ecological degradation; they also have far-reaching social and economic consequences (Lambrechts, 2016) . These crimes do not only threaten individual species but also disrupt entire ecosystems, leading to cascading effects on food chains, water systems, and climate regulation (UNODC (United Nations Office on Drugs and Crime), 2020) . Moreover, the transnational nature of many environmental crimes, facilitated by corruption and weak regulatory frameworks, makes them particularly challenging to address on a global scale (Barber et al., 2021) .

In Africa, the continent's rich biodiversity and natural resources have increasingly become targets for environmental crimes. Poaching, for instance, has ravaged populations of elephants and rhinoceroses, driven by international demand for ivory and rhino horn, which are used in traditional medicine or as luxury items (Lawson & Vine, 2014) . In South Africa, home to most of Africa's rhinoceroses, this crisis has escalated despite efforts to strengthen anti-poaching laws and increase surveillance (Congressional Research Service, 2021) . In Nigeria, the consequences of crime on nature reserves are particularly severe. Approximately 70-80% of the country's original forest cover, including coastal and mangrove forests, has been lost due to unsustainable logging and agricultural expansion (United Nations Country Team, 2022). Furthermore, wildlife in Nigeria is under significant threat, with recent estimates indicating that 6,000 fauna species are either threatened or extinct (Ayanniyi et al., 2024) . Besides, previous studies in Nigeria (see, for instance, Badiora and Oresanwo (2022, 2024)) have found crime against wildlife to be on the rise in different regions in the country and has become a topic of national concern, even with regional and global interest.

Given these pressing issues, this research focuses on the Omo Forest Reserve (OFR), a vital conservation area in Ogun State, Nigeria. It investigates the types, characteristics, and causes of crime on nature reserves in the region. For this study, crime on nature reserves are illicit activities that damage the environment and wildlife, including illegal logging, mining, fishing, forest conversion, environmental pollution, wildlife habitat encroachment, and animal trafficking done through a variety of means where animals and their parts are trafficked. Specifically, the study aims to answer the following questions: What is the socio-economic profile of the people living around Omo Forest Reserve, Ogun State, Nigeria? What are the types and characteristics of crime on nature reserves prevalent in the reservoir? Who are the perpetrators of crime on nature reserves in the study area? What are the factors influencing the occurrence of crime in nature reserves in the OFR? What are the efforts put in place to prevent crime on nature reserves in the study area? By addressing these questions, this study provides valuable insights that can inform policies on conservation and crime on nature reserve prevention, contributing to better protection for Omo Forest Reserve and similar areas in Nigeria and beyond. Furthermore, by integrating both qualitative and quantitative methods, this study contributes to the growing body of literature on crime in nature reserves in Nigeria, providing valuable insights into the administration of natural reserves and the preservation of biodiversity. The remaining sections include pertinent details regarding the study's location, research methodology, findings, and discussion. The article concludes with recommendations on addressing crime on nature reserves in the study area and future research directions.

2 Materials and methods

2.1 Description of study area

Nigeria occupies a special geographic position in sub-Saharan Africa and the variation in climate and geographic features endows her with one of the richest biodiversity in Africa. Its diversity of natural ecosystems ranges from semi-arid to mountain forests, rich seasonal floodplain environments, rainforests, vast freshwater swamp forests, and diverse coastal vegetation (Oluduro & Gasu, 2012). Nigeria's Niger Delta contains the largest tract of mangroves in sub-Saharan Africa. The individual components of biodiversity, such as genes, species, and ecosystems, provide the country with a wide array of goods and services. Nigeria's biodiversity is not only a matter of environmental significance but also of substantial socio-economic and cultural value (Yager et al., 2019) . One key attraction in Nigeria's natural endowment and biodiversity is its buoyant forest estate and ecology.

Nigeria is home to a diverse array of forest ecosystems, including mangroves, freshwater swamps, tropical rainforests, and savannah woodlands (Food and Agriculture Organization of the United Nations, 2019) . These forests are rich in diverse flora and fauna, providing a variety of forestal goods to the country. They also provide human settlements with eco-hospitality resorts, thereby supporting their social well-being. These forest reserves are distributed across the country, in various ecological zones, with the southern region, particularly the states of Cross River, Ogun, Edo, and Akwa Ibom, boasting the highest concentration. The Cross River National Park, renowned for its unique fauna and vegetation, is Nigeria's most prominent forest reserve. Additionally, other notable forest reserves in the country include the Afi Mountain Wildlife Sanctuary in Cross River State, the Omo Forest Reserve in Ogun State, and Okomu National Park in Edo State. These reserves hold significance not only for their biodiversity but also for their potential in supporting ecotourism, research, and conservation efforts.

This study is carried out in Omo Forest Reserve in Ogun State, Nigeria. Omo Forest Reserve is a tropical rainforest in Ogun State, Nigeria, and was named after the Omo River that runs through it. Geographically, it is located between latitude 6°15´N and 6°41´N and longitude 2°42´E and 4°14´E and is approximately 135 kilometers (84 miles) northeast of Lagos and 80 kilometers (50 miles) east of Ijebu Ode. It shares boundaries with other forest reserves in Osun State (i.e. Ago-owu and Shasha forest reserves) and Oluwa forest

reserve in Ore, Ondo State (Figure 1). This natural reserve encompasses 130,500 hectares (322,000 acres/1305 km2) and is blessed with a diverse range of animal species like antelopes, bushbucks, duikers, African elephants, chimpanzees, white-throated monkeys, and forest buffalo, some of which are critically endangered (Akande et al., 2020). Similarly, Omo Forest Reserve is home to numerous majestic tree and plant species, including common trees like Melina (Gmelina arborea), African mahogany (Khaya ivorensis), African ebony (Diospyros crassiflora), and Iroko (Milicia excelsa). These dominate the forest canopy, while the undergrowth is teeming with ferns, orchids, and other plant species.

Omo Forest Reserve comprises varied ecosystems such as rainforests, savannah woods, wetlands, and riverine habitats, as well as wildlife, which all form an important part of Nigeria's natural history (Ajayi, 2022) . The Forest Reserve experiences a tropical climate with distinct wet and dry seasons. The rainy season generally lasts from March to October, with a long rainy season from March to July and a shorter one from September to November. The dry season typically occurs from November to March. Temperatures are generally high and humid throughout the year. The study area has an average daily high temperature of 32 degrees. High humidity and hot temperatures make the weather pleasant at times but also tropical humid (Amusa et al., 2017). It is warm to hot all year round, inviting bathing at average water temperatures of 27 degrees.

Omo Forest Reserve is bordered by 45 villages with about 50,000 people living in and around the reservoir (Amusa et al., 2017) . For centuries, the local communities surrounding Omo Forest Reserve have had a strong connection to the forest, relying on its resources for their livelihoods, cultural practices, and traditional knowledge. The forest provides them with food, medicinal plants, fuelwood, and materials for handicrafts. However, this symbiotic relationship between humans and nature is gradually becoming parasitic as more crimes on nature reserves are committed daily (Ajayi, 2022) . Over the years, the forest has been continuously threatened by large-scale illicit logging and incursions by a growing human population involved in farming and hunting in the surrounding areas.

2.2 Sampling procedure

The respondents were selected using a multi-stage selection process that considered the geographic proximity of various communities to the protected Omo Forest region. The Jungle 4 J4 areas, comprising 27 enclaves, were deliberately chosen due to their closeness to the nature reserve (around a 3-hour travel distance or 5-kilometer radius) and the diverse population of reserve employees and residents. From this area, eight communities based on the villages bordering the reservoir were randomly selected: Osoko, Aberu, Fowowa, Bashiru, Oloji, Erinla, Onimatisan, and Etemi, with population sizes of 430, 420, 390, 300, 380, 400, 500, and 345, respectively. Subsequently, a systematic random sampling technique (see Makwana et al. (2023)) was employed to select one out of every twenty residents, totaling 164 participants and representing approximately 5% of the households within these eight communities.

The research utilized a convenience sampling approach to conduct a focus group discussion with Omo Forest Reserve authorities, which included both reserve workers and community members. It should be noted that following the sampling methodology employed, a total of 164 questionnaires were distributed, and 160 were successfully retrieved from the study area.

2.3 Method of data collection

The study employed a mixed-methods approach, utilizing both quantitative and qualitative research techniques. Structured questionnaires were administered to residents living within a 5-kilometer radius of the Omo Forest Reserve in Ogun State, Nigeria. This specific distance was chosen because previous research by De Jong and Stewart (2019) has suggested that communities close to protected areas tend to be more directly involved in and affected by crime on nature reserves. Additionally, semi-structured interviews were conducted with the reserve workers and some community dwellers, while the focus group discussion involved some reserve workers (managers, PRO officers, ecologists, and maintenance crew) and some community members to gain a deeper understanding of their perspectives on crime on nature reserves and associated issues.

Each focus group discussion comprised a minimum of five participants. For qualitative research, there is no strict number that is agreed on to reach data saturation. Nevertheless, this study took advice from Ho (2006), who claimed that a focus group should be small enough to allow for rich and deep data analysis. If more data is needed after one focus group, the researcher may need to conduct at least one more. The average duration of these focus group discussions was thirty minutes. Previous studies have established focus groups should last between 30 and 90 minutes to capture robust data and should consist of 2 to 12 participants (Ho, 2006) . Throughout the administration of the questionnaires and focus group discussions, the study ensured the maintenance of confidentiality and the prevention of any assault. Each respondent was provided information about the purpose and objectives of the study and was given the option to participate or withdraw at any time. The data obtained from the focus group discussions was analyzed using narrative reporting techniques.

Data collection was conducted in September 2023. The questionnaires were administered to the heads of households or their designated representatives within the selected communities. English served as the primary language for the questionnaire administration and interviews. However, the instrument was occasionally interpreted into the participants' native languages to bridge any language barriers.

The questionnaire covered the socio-economic characteristics of respondents, the types of perpetrators, and factors influencing them, as well as the precautionary measures to prevent crime in nature reserves in OFR. Regarding the types of crime on nature reserves, the respondents were asked to express their point of view using one of the three-point Likert scales: Rarely (R), Occasionally (O), and Always (A), while the respondents expressed their view on the time of day each type of crime on nature reserves occurs by choosing either Morning, Afternoon, or Night. Concerning the perpetrators of crime

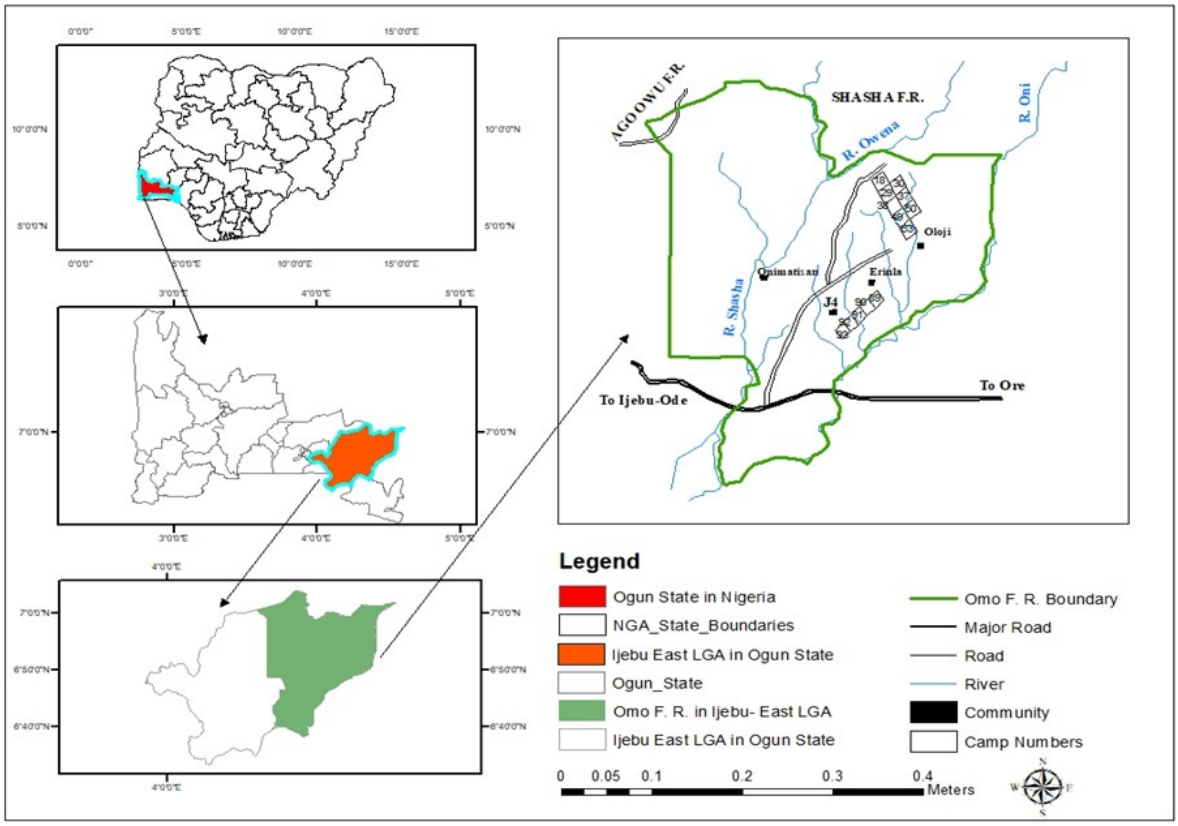

Figure 1: Location of Omo Forest Reserve in the context of Nigeria and Ogun State

on nature reserves, the respondents rated each perpetrator using one of the three-point Likert scales: Agree (A), Neutral (N), and Disagree (D). One of the three-point Likert scales: Agree (A), Neutral (N), and Disagree (D) was used by the respondents to rate the factors influencing crime on nature reserves.

2.4 Data analysis

Descriptive statistics were generally used in this study, and it was analyzed using the statistical software (SPSS 16.0). The socio-economic distribution of respondents and preventive measures of crime on nature reserves were analyzed using the frequency distribution. However, mean indices ranking and frequency distribution were used in analyzing the types, causes, and perpetrators of crime on nature reserves in OFR. The mean indices were used to summarize the Likert scale into three different indices: Perceived Frequency Index (PFI) and Relative Agreement Index (RAI). Each of the rating categories received a weight value of 1, 2, and 3 to calculate the PFI and RAI. Additionally, the Summation of weight values (SWV) was discovered. This SWV is the result of multiplying the number of respondents by the weight value assigned to a rating. This was adapted from the work of León-Mantero et al. (2020) and can be stated mathematically as:

$$SWV = \sum_{i=1}^{5} X_i Y_i \tag{1}$$

Where: SWV is the summation of the weight value, X_i is the number of respondents to rating and Y_i is the weight assigned to a value (1, 2, and 3)

The SWV is further divided by the total number of respondents ($n = 160$) to achieve the PFI and RAI. This is mathematically expressed as:

$$PFI = \frac{SWV}{\sum_{i=1}^{5} X_i} \tag{2}$$

$$RAI = \frac{SWV}{\sum_{i=1}^{5} X_i} \tag{3}$$

The summation of the PFI/RAI is then divided by the total types, perpetrators, or factors influencing crime on nature reserves identified to get the Mean Index (MI) for the study area. The mean deviation for each type is then derived by subtracting the PFI from the mean index.

3 Results and Discussion

3.1 Description of residents' socio-economic characteristics

Findings revealed that the study area is predominantly inhabited by males (62.5%), with most residents being youths (83.1%), aged 16–50 years, while adults above 50 years make up 16.9% of the population. The community is generally well-educated, as 96.3% of respondents have at least a primary school education, leaving only 3.7% without formal education. Regarding employment, 50.8% of the population engage in primary production activities such as farming, while civil and public servants account for 45.6%, and the unemployed represent a small fraction (3.8%). These primary economic activities, according to Smith et al. (2019), significantly influence crime in nature reserves.

Demographically, most inhabitants are non-indigenes (70.6%), and 63.8% of the population have lived in the area for one to ten years, suggesting a substantial level of familiarity with the environment. The study area also exhibits ethnic diversity, with respondents representing various Nigerian tribes, including Hausa, Fulani, Igbo, and Yoruba. Nevertheless, the dominant tribe is Yoruba (especially the Ijebu and Egba extractions of the Yoruba tribe), representing 72.5% of the respondents. Respondents' average length of stay in the study area is 11.4 years, while some 5% of the respondents have been residing in the study area for more than 30 years. The primary reason cited for residing in the area was proximity to places of work, particularly for those involved in primary production. Additionally, 72.5% of respondents reported being aware of crime on nature reserves, while 51.9% admitted to direct involvement in such activities within or outside the study area.

These findings indicate that the heads of households in the communities around the reserve are primarily young adult males. This demographic trend is likely linked to the physically demanding nature of their dominant occupations, which include animal and crop production.

3.2 Types and incidences of crime on nature reserves

From the summary presented in Table 1, findings revealed that illegal logging, with a Perceived Frequency Index (PFI) of 2.33, is the most prevalent type of crime on nature reserves in Omo Forest Reserve (Figure 2). This observation aligns with site visits where trucks were frequently seen transporting felled trees out of the reserve throughout the day. Despite measures to protect wildlife, most animals are confined to the core protected area of the reserve (known as Omo Reserve), located approximately three hours from the campground. This strategic placement has helped reduce wildlife trafficking but has not eliminated it. Wildlife trafficking and illegal hunting (Figure 3), ranked as the second most common crime on nature reserves (PFI = 2.27), remain significant issues and indicate that despite the existing body of laws guiding forest reserves in Nigeria, indiscriminate hunting and shooting of animals as well as trafficking them in whole and parts still run effectively in protected areas. Other notable crimes on nature reserves in descending order include environmental pollution (PFI = 2.10), habitat destruction, including loss, degradation, or fragmentation of natural habitats (PFI = 1.98), and illegal fishing (PFI = 1.90).

During a focus group discussion with the crop production department at OFR, a participant remarked: "[...] Although many of the trucks moving in and out of the reserve are from authorized bodies, some unauthorized vehicles exploit the reserve. These unauthorized vehicles enter through unregulated exit points, fell precious trees like teak, and transport them via illegal routes [...]" (Male, 40 years, reserve staff). The evidence strongly indicates that illegal logging is the dominant crime on nature reserves in the reserve, corroborated by prior research from Charles et al. (2021), who identified illegal logging as a major driver of crime on nature reserves. The timing of these crimes was also explored. While Open City Crime Data analysis (Grawert & Cullen, 2017) suggests that crimes are more likely to occur at night, a specific study was conducted at OFR to determine the timing of crime on nature reserves. The results showed that most crimes occur at night, with perpetrators leveraging the cover of darkness. This vulnerability is exacerbated by limited security measures, as security guards operate from 6 a.m. to 6 p.m., leaving the reserve unmonitored overnight.

A security guard commented: "[...] the gates of the reserve are only manned during our shifts from 6 a.m. to 6 p.m., there is no security presence at the checkpoints [...]" (Male, 35 years, reserve staff). An interview with a reserve official further revealed an incident where poachers were apprehended the night before our visit. These individuals were caught illegally felling trees and killing animals. Their lack of official markings or certification as authorized loggers led to their capture. The forest reserve officer said: "[...] ust last night, we apprehended four individuals a monkey, two antelopes, a bushbuck, and a duiker that were killed indiscriminately with gunshot. If you had arrived yesterday, you could have been lucky to see them with the illegal trees and lifeless animals. We have moved them to the police custody for prosecution [...]" (Male, 40 years, reserve staff). From these discussions, it is evident that crime on nature reserves is significantly more frequent at night, highlighting the critical need for enhanced nighttime security measures to mitigate these activities. Besides, findings show evidence of offenders' arrests. However, whether justice would be served remained unanswered.

3.3 Perpetrators of crime on nature reserves

Crime on nature reserves does not occur in isolation but is largely driven by human activities. To understand the key offenders, a survey was conducted to identify those responsible for crime on nature reserves within Omo Forest Reserve. The results, summarized in Table 2, revealed that community dwellers are the primary perpetrators, with a Relative Agreement Index (RAI) of 2.86, while abattoir owners are the least involved, with an RAI of 1.53. These findings support the assertion by Smith et al. (2019) that individuals living in or near protected areas are often the main contributors to crime on nature reserves in those regions. Other notable perpetrators, ranked in descending order of RAI, include hunters (RAI = 2.64), corrupt officials (RAI = 2.51), farmers (RAI = 2.43), reserve workers (RAI = 2.25), and miners (RAI = 2.18). This highlights the significant

(a) (a) (b) (b)

Figure 2: Illegally felled Melina trees (Gmelina arborea) apprehended by the rangers (Photo Credited: Odofuwa)

Table 1: Types of crime on nature reserves in the study area

Types	R	(1) O	(2) A	(3) SWV	PFI	MD
Illegal logging and deforestation	37	34	89	372	2.33	0.26
Wildlife trafficking and illegal hunting	42	33	85	363	2.27	0.2
Environmental pollution	34	77	49	335	2.10	0.03
Habitat destruction (i.e. loss, degradation, or fragmentation of natural habitats)	54	56	50	316	1.98	-0.09
Illegal fishing	55	66	39	304	1.90	-0.17
Wildlife habitat encroachment	65	56	39	294	1.84	-0.23

involvement of local community members and corrupt officials in crime on nature reserves within the reserve.

Opinions varied, however, regarding the primary offenders. A community dweller claimed thus: "[...] Most of these perpetrators are reserve workers, especially the rangers, as they have access to the restricted parts of the reserve where the wildlife is kept [...]" (Female, 45 years, community dweller). Similarly, a senior public servant in the reserve stated: "[...] Many of these crimes are caused by reserve officials and workers. They engage in hunting wildlife, often for personal consumption or sales, and sometimes act under pressure from higher-ranking corrupt officials demanding bushmeat [...]" (Male, 50 years, reserve staff).

Other perspectives pointed to external actors. A respondent suggested that:"[...] Offenders often come from outside communities, such as Ore in Ondo State and Ijebu-Ode in Ogun State. The lack of security at reserve checkpoints and the multiple entry and exit points encourage this behavior [...]" (Male, 28 years, reserve staff). Furthermore, another respondent highlighted the role of external stakeholders regarding the issue thus: "[...] International organizations permitted to plant cash crops in the reserve indirectly contribute to crime on nature reserves. Their absence results in the employment of individuals who may engage in illegal activities within the reserve [...]" (Male, 30 years, Reserve staff). In conclusion, the findings indicate that community dwellers, corrupt officials, and reserve workers are the primary perpetrators of crime on nature reserves in the study area. This underscores the need for targeted interventions to address these groups and reduce the prevalence of such crimes.

(a) (a) (b) (b)

Figure 3: Forest wildlife/animals (African civet - Civettictis civetta and Ogilby's duiker – Cephalophus killed by poachers for bushmeat trade (Photo Credited: Odofuwa)

3.4 Factors influencing crime in nature reserves

After identifying the types and perpetrators of crime on nature reserves in Omo Forest Reserve (OFR), it became evident that several factors contribute to these activities. Understanding these factors is crucial for addressing the underlying causes of crime on nature reserves, including societal dynamics, economic pressures, and gaps in legal frameworks. From Table 3, the lack of law enforcement emerged as the most influential factor (RAI = 2.68), followed by the demand for natural resources (RAI = 2.49). This indicates a significant deficiency in the enforcement of rules and regulations within the reserve. The absence of security at checkpoints after 6:00 p.m., as previously discussed, exemplifies this issue. Other factors influencing crime on nature reserves, ranked in descending order of RAI, include public awareness (RAI = 2.48), political instability (RAI = 2.38), consumer demand (RAI = 2.26), land conflicts (RAI = 2.23), rapid urbanization (RAI = 2.13), and technological advancement (RAI = 1.21).

An interview with a reserve official provided insight into the inadequacies of enforcement mechanisms. He explained: "[...] The guard room in the reserve is our only means of detaining offenders. When criminals are caught at night, they are held there until morning before being handed over to the Ogbere Police Division, the nearest police station. However, the guard room is poorly secured, allowing some offenders to escape before being transferred [...]" (Male, 33 years, reserve staff). Additionally, in a focus group discussion with cocoa specialists, it was revealed that all buildings within the reserve are government-owned and constructed, primarily temporary structures made of bricks. Private construction or land sales are prohibited, minimizing the impact of rapid urbanization. However, land conflicts do occur, particularly when one farmer encroaches on another's farmland.

Table 2: Perpetrators of crime on nature reserves in the study area

	Types	A	(1) N	(2) D	(3) SWV	RAI (2.36)	MD
1	Community dwellers are the perpetrators of crime.	143	12	5	458	2.86	0.5
2	Hunters are the offenders of crime on nature reserves.	116	30	14	422	2.64	0.28
3	Corrupt officials are the culprits of crime on nature reserves.	104	34	22	402	2.51	0.15
4	The guilty party of crime on nature reserves is farmers.	94	40	26	388	2.43	-0.07
5	The perpetrators are the reserve workers.	78	60	22	376	2.35	-0.01
6	Miners are the perpetrators of crime on nature reserves.	73	42	45	348	2.18	-0.18
7	Abattoir owners are the culprits of crime on nature reserves.	64	57	39	245	1.53	-0.83

Table 3: Factors influencing crime on nature reserves in the study area

Factors	**A (3)**	**N (2)**	**D (1)**	**SWV**	**RAI (2.36)**	**MD**
Lack of law enforcement	125	18	17	428	2.68	0.32
Demand for natural resources	90	58	12	398	2.49	0.13
Lack of public awareness	95	46	19	396	2.48	0.12
Political instability	83	55	22	381	2.38	0.02
Consumer demand	70	61	29	361	2.26	-0.10
Conflict of land	70	57	33	357	2.23	-0.13
Rapid urbanization	62	56	42	340	2.13	-0.23
Technological advancement	71	52	37	354	1.21	-1.15

A reserve official also highlighted the influence of political and workplace pressures, stating: "[...] Often, senior colleagues in other public sectors of Ogun State, or even politicians, request bushmeat or wood. We are compelled to fulfill these demands to avoid losing our jobs or facing false accusations of involvement in unrelated crimes [...]" (Male, 44 years, reserve staff). These discussions underscore the significant role of the lack of law enforcement as the primary factor influencing crime on nature reserves in OFR. Inadequate security measures and systemic corruption contribute to the persistence of these activities, demanding urgent attention to strengthen enforcement mechanisms and reduce vulnerabilities.

3.5 Preventive measures of crime on nature reserves

Studies have shown that the best and most effective solutions often come from the people who live in an area. Their long-term presence gives them a deep understanding of the local challenges and the practical ways to address them. In this study, respondents provided valuable insights into addressing crime on nature reserves in the Omo Forest Reserve (OFR), leveraging their lived experiences to propose practical measures. As summarized in Table 4, employment opportunities (15.8%) emerged as the most favored preventive measure. Respondents believe that providing jobs can redirect potential offenders toward more productive activities, encapsulating the idea that "an idle hand is the devil's workshop". They highlighted the poor state of the Nigerian economy as a contributing factor to high crime rates, including those impacting nature.

The second most advocated measure was awareness programs on crime on nature reserves (15.1%). In a statement one of the respondents, emphasized the importance of education and advocacy, stating that: "[...] More programs about the environment should be organized. These will help sensitize the public on the importance of nature, the adverse effects of certain actions, and how individuals can contribute to improving environmental health [...]" (Female, 40 years, reserve staff). Other suggested measures included implementing anti-corruption initiatives (14.1%), strengthening environmental laws (13.3%), leveraging technology and data (12.5%), supporting local communities (12.1%), reducing demand for illegal products (10.8%), and fostering international cooperation (6.3%).

The Chief Security Officer (CSO) of the reserve highlighted critical technological and infrastructure needs. He noted: "[...] As you may have noticed, there is no stable telecommunication signal in the reserve. This hinders our ability to contact external security agencies, leaving us to handle threats with limited resources. Additionally, the vastness of the reserve and its dense vegetation restrict our visibility. If equipped with stable network access and drones, we could significantly improve security and monitor activities across the reserve [...]" (Male, 43 years, CSO). This discussion underscores the importance of enhancing the reserve's security infrastructure and prioritizing public education about environmental preservation. By combining these efforts with robust law enforcement and economic interventions, crime on nature reserves in OFR can be effectively mitigated.

4 Conclusion and implications for policy and future research

This study examined the types, perpetrators, influencing factors, and preventive measures for crime on nature in Omo Forest Reserve (OFR), Ogun State, Nigeria. Findings reveal illegal logging/deforestation as well as wildlife/animal trafficking and poach-

Table 4: Preventive measures to curb crime on nature reserves

Measures	Freq.	Percent (%)
Employment opportunities	128	15.8
Awareness programs	122	15.1
Implement anti-corruption measures	114	14.1
Strengthening environmental laws	108	13.3
Use of technology and data	101	12.5
Support local communities	98	12.1
Reduce demand for illegal products	88	10.8
International corporation	51	6.3
Total	**810****	**100**

**Higher than the number of respondents due to multiple responses.

ing as the two most prevalent types of crime in nature reserves in the study area. Dwellers of the communities surrounding the reservoir were identified as the primary perpetrators, aiding and abetting the crime with contributing factors including inadequate law enforcement, urbanization high demand for natural resources, and limited public awareness. The study concludes that despite the existing legislation, crime in nature reserves still runs smoothly in protected forests, and this underscores the urgent need to develop effective strategies to mitigate crime and safeguard the critical resources essential to sustainable planning. Alarmingly, the trend of crime in nature in the reserve appears to be increasing, necessitating a comprehensive approach to address these issues holistically and ensure a safe, sustainable environment.

This study offers practical recommendations aimed at addressing the challenges of crime on the resources in the study area. As lack of law enforcement is a major issue being experienced in the reserve, the government should create and put into effect strict rules and regulations that target environmental crimes in particular. They should also ensure that environmental offenses have harsh enough punishments to discourage future offenders. More public awareness initiatives should be organized to inform people about the value of environmental protection and the penalties for crimes against it. This can also be tackled early by including environmental education in school curricula to encourage conservationist behavior from an early age. More funds should be provided for the smooth running of the reserve, especially in terms of technological tools like GPS monitoring, drones, and satellite images to help keep an eye on susceptible locations. Given the level of the reserve officials' involvement in crime on nature reserves, there should be a system that ensures that no official stays in the reserve for more than two years at a time. This will guarantee the reduction of corrupt officials in the reserve per time. The community dwellers should also be involved in decision-making and conservation initiatives by creating neighborhood-based monitoring initiatives where residents assist in reporting and stopping environmental offenses. Initiatives to repair and revitalize regions that are damaged by crime on nature reserves should be put in place. This will help to rejuvenate the health and status of nature. Finally, the government should offer substitute means of subsistence to populations dependent on practices that contribute to nature offenses, especially illicit logging or poaching.

Despite its contributions, the study has certain limitations. The one-month duration of fieldwork constrained the depth of investigation into reserve activities. Future research should extend fieldwork duration to gain a more comprehensive understanding of operations within the reserve. Additionally, the study employed primarily descriptive analysis and a relatively small sample size. Future research should consider larger samples, time-series data on crime in nature reserve incidents, and more sophisticated data analysis techniques. Lastly, while this study captured perspectives from community dwellers, most respondents were nature reserve workers. Future studies should ensure a balanced representation of responses from nature reserve administrators, community members, and other stakeholders, including international organizations involved in conservation efforts. Also, future studies could test the correlation between a resident's socioeconomic characteristics and the prevalence of wildlife crime. For instance, new studies could determine if crime on nature reserves varies by tribe or level of education, among others, using factor analysis and regression models. Caution should also be exercised when extrapolating findings, as the non-randomized selection of park staff may influence the outcomes. By addressing these limitations, future research can build on the findings of this study to advance understanding and offer even more robust strategies for combating crime on nature reserves and preserving the ecological integrity of natural reserves.

Competing interests

The authors have no conflicts of interest.

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References

Ajayi, K. (2022). Omo forest reserve: Balancing conservation and community livelihoods. *Nigerian Tribune*. https://tribuneonlineng.com

Amusa, T. O., Omonu, C., Olabode, E., & Newton, N. J. (2017). Population status and distribution of forest elephants (loxodonta cyclotis matschie, 1900) in okomu national park and omo forest reserve, south-western nigeria. *Journal of Research in Forestry, Wildlife & Environment*, *9*(2), 44–56.

Ayanniyi, O. A., Ayeni, O. H., Ibitoye, O. S., Wealth, A. S., Murtala, M. O., Oshe, L. N., & Chiawa, O. C. (2024). The silent crisis: Navigating nigeria's endangered wildlife amidst the empty forest – unveiling threats, igniting conservation efforts, and illuminating potential solutions. *World Scientific News*, *190*(2), 216–236.

Badiora, A. I., & Oresanwo, G. A. (2022). People, wildlife and contest for space in okomu national park, nigeria: The experience of the host communities and managerial perspective. *International Journal of Real Estate Studies*, *16*(1), 100–111.

Badiora, A. I., & Oresanwo, G. A. (2024). Women and illegal trade in wildlife: A nigerian case study. *Deviant Behavior*, 1–15. https://doi.org/10.1080/01639625.2024.2361833

Barber, C. V., Winfield, K., & Petersen, R. (2021). Nature crime: Understanding and tackling a key threat to the climate and land use agenda. *Climate and Forests 2030: Resources for Funders*.

Congressional Research Service. (2021). *Wildlife poaching and trafficking in africa: An overview* (tech. rep.). Congress Research Service. https://www.congress.gov/crs-product/IF11923

Consalo, K. Z. (2020). Fighting back from the brink: International efforts to prevent illegal trafficking in endangered species. *Environs: Environmental Law & Policy Journal*, *43*, 67.

De Jong, D., & Stewart, J. (2019). Illicit exploitation of natural resources. In C. C. Jalloh, K. M. Clarke, & V. O. Nmehielle (Eds.), *The african court of justice and human and peoples' rights in context: Development and challenges* (pp. 590–618). Cambridge University Press.

Food and Agriculture Organization of the United Nations. (2019). *Wetland wildlife resources of nigeria* (Occasional Paper No. 78). Food & Agriculture Organization. Rome, Italy.

Grawert, A., & Cullen, J. (2017). Crime in 2017: Updated analysis. *Brennan Center for Justice, New York University*.

Ho, D. G. (2006). The focus group interview: Rising to the challenge in qualitative research methodology. *Australian Review of Applied Linguistics*, *29*(1), 5–1.

Lambrechts, D. (2016). Environmental crime in sub-saharan africa – a review and future challenges. *Politikon*, *43*(2), 155–158. https://doi.org/10.1080/02589346.2016.1213692

Lawson, K., & Vine, A. (2014). *Global impacts of the illegal wildlife trade: The costs of crime, insecurity, and institutional erosion* (tech. rep.). Chatham House, London. https://www.chathamhouse.org/sites/default/files/public/Research/Africa/0214Wildlife.pdf

León-Mantero, C., Casas-Rosal, J. C., Pedrosa-Jesús, C., & Maz-Machado, A. (2020). Measuring attitude towards mathematics using likert scale surveys: The weighted average. *PLoS ONE*, *15*(10), e0239626. https://doi.org/10.1371/journal.pone.0239626

Lynch, M., & Stretesky, P. (2019). Green criminology: Conceptions, conflicts, and opportunities. *Critical Criminology*, *27*(3), 305–318.

Makwana, D., Engineer, P., Dabhi, A., & Chudasama, H. (2023). Sampling methods in research: A review. *International Journal of Trend in Scientific Research and Development*, *7*(3), 762–768.

Nellemann, C., & INTERPOL. (2016). *The rise of environmental crime – a growing threat to natural resources, peace, development, and security* (tech. rep.). UNEP/INTERPOL Rapid Response Assessment. Nairobi, Kenya.

Oluduro, O. F., & Gasu, G. N. (2012). A critical appraisal of the legal regime for biodiversity conservation in nigeria. *Canadian Social Science*, *8*(4), 249–257.

Smith, J., Johnson, A., & Martinez, C. (2019). Understanding the dynamics of nature reserve degradation: A case study from ireland. *Environmental Management*, *45*(3), 478–489.

Smith, J., Johnson, A., & Thompson, L. (2020). Understanding the drivers of nature crime for targeted conservation interventions. *Conservation Science Journal*, *45*(3), 210–225.

UNODC (United Nations Office on Drugs and Crime). (2020). *Wildlife crime report: Trafficking in protected species* (tech. rep.). UNODC. Vienna International Centre, Vienna, Austria.

Ward, J. (2014). *Are problem-solving courts the way forward for justice?* (Working Paper No. 2). Howard League for Penal Reform. London, United Kingdom.

White, R., & Ronald, C. (2015). Critical criminology and the struggle against climate change ecocide. *Critical Criminology*, *23*, 383–399.

Yager, G. O., Abete, M., & Chenge, I. B. (2019). Evaluation of range flora and fauna composition of a community forest in north-central nigeria. *Sustainability, Agriculture, Food and Environmental Research*, *7*(1), 21–36.