IMPACT OF ANTHROPOGENIC ACTIVITIES ON BIODIVERSITY IN OBAN DIVISION, CROSS RIVER NATIONAL PARK, AKAMKPA, NIGERIA

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Abstract
Human activities have exerted significant pressure on global biodiversity, with increasing habitat loss, deforestation, poaching, and unsustainable resource exploitation threatening numerous species. In Nigeria, particularly within the Oban Division of Cross River National Park, the expansion of agriculture, logging, and hunting continues to endanger both flora and fauna. This study assessed the impact of anthropogenic activities on biodiversity in selected communities surrounding the park. Data were collected through household surveys, field observations, and key informant interviews, while both descriptive and inferential statistical techniques were employed to analyze patterns of resource use and their ecological implications. Findings reveal that agricultural expansion, fuel wood extraction, and poaching are the most significant drivers of biodiversity loss in the area. The study highlights the urgent need for enhanced community participation in sustainable forest management and the development of alternative livelihoods to reduce pressure on the park's resources. The results provide valuable insights into the human dimensions of biodiversity conservation in Nigeria's most ecologically significant protected area.

Keywords: Anthropogenic activities, forest degradation, biodiversity conservation, Cross River National Park.

Introduction

Cross River National Park (CRNP), particularly the Oban Division, represents one of the most biologically diverse regions in West Africa. Located in southeastern Nigeria, the park forms part of the extensive Cross River rainforest ecosystem, which is renowned for its high level of endemism and outstanding ecological significance. The Park harbours several globally endangered species, including the Cross River gorilla (Gorilla gorilla diehli), the Nigeria–Cameroon chimpanzee (Pan troglodytes ellioti), forest elephants, as well as numerous rare and endemic plant species. Despite its designation as a protected area, the park is increasingly threatened by human activities emanating from surrounding communities, notably agricultural encroachment, logging, bush burning, poaching, and the harvesting of non-timber forest products.

Biodiversity refers to the variety of life forms on Earth, encompassing genetic, species, and ecosystem diversity, and it plays a fundamental role in maintaining ecological balance, nutrient cycling, and climate regulation (Mora *et al*., 2011; IUCN,

2012). However, rapid population growth, expansion of agricultural frontiers, and unsustainable exploitation of natural resources have significantly accelerated biodiversity loss at global, regional, and national scales (FAO, 2010). In Nigeria, biodiversity depletion has reached alarming levels, largely due to deforestation, habitat fragmentation, and uncontrolled resource extraction. The Cross River region, which contains the largest remaining tract of tropical rainforest in the country, has been particularly affected by human-induced disturbances. Recent field observations and satellite imagery indicate that agricultural expansion and logging activities continue to encroach upon the Oban Division, thereby threatening its ecological integrity and undermining established conservation objectives.

Although previous studies have documented general patterns of biodiversity loss in Nigeria (FAO, 2010; IUCN, 2012; Bisong, 2014), empirical evidence on the specific effects of anthropogenic activities on biodiversity within the Oban Division of Cross River National Park remains limited (Adetola & Ofuya, 2021). This knowledge gap constrains effective conservation planning, management decisions, and policy formulation aimed at safeguarding the park's unique biological resources. A clear understanding of the nature, intensity, and spatial extent of human pressures is therefore essential for promoting sustainable forest management and strengthening community-based conservation strategies (Folke *et al*., 2004; Ayivor & Gordon, 2012).

This study was designed to:

1. Identify the major anthropogenic activities occurring within and around the Oban Division of CRNP.
2. Assess their impacts on biodiversity and ecosystem functions.
3. Examine local community perceptions, participation, and awareness of conservation practices.
4. Recommend strategies for mitigating human-induced pressures and enhancing biodiversity conservation in the park.

By addressing these objectives, the study provides site-specific insights into the human dimensions of biodiversity loss, contributing to improved management and sustainability of one of Nigeria's most critical forest ecosystems.

Materials and methods

Research Design

The study adopted a **cross-sectional survey design** aimed at assessing the impact of anthropogenic activities on biodiversity in the Oban Division of Cross River National Park (CRNP), Akamkpa Local Government Area, Nigeria. This design enabled the collection of data from multiple communities at a single point in time, allowing for comparisons across villages and identification of human-induced pressures on biodiversity.

The Study Area

The study area (Cross River State and the Cross River rainforest) is contiguous in landmass with the forest of southern Cameroon, and Cameroon's Korup National Park, lying between latitude 5˚28' and 6˚55'

North of the Equator, and longitude 8˚50' and 9˚28' East of the Greenwich meridian. FAO (2010) estimates that around 2.9% of Nigeria's forest covers consist of primary forest which is relatively intact, and the bulk of it is in South Eastern Nigeria (Cross River State). The State shares common boundaries with the Republic of Cameroon in the East, Benue State of Nigeria in the North, Ebonyi and Abia States of Nigeria in the West, Akwa Ibom State of Nigeria in the South West, and the Atlantic Ocean in the South (CRNP, 2011).

Figure 3 shows the map of the study area (Oban division of the Cross River National Park).

The study was conducted within Nsan, Obung, Netim, Oban, Aking, Ifumkpa, Okrala and Orem where massive gravel (quarry activities), lumbering, hunting and farming have taken place for decades.

Data were gathered by intentional and inadvertent sampling techniques. Questionnaires, interviews, and direct field observations were employed. The sample comprised 135 respondents from the eight clans of Nsan, Obung, Netim, Oban, Aking, Ifumkpa, Okrala and Orem. The survey was segmented into four areas.

Section A gathered general information about the respondents.

Section B generated inquiries regarding human activities that jeopardize biodiversity and the human environment in the region.

Section C prompted questions concerning the repercussions of such activities and the degradation of biodiversity.

Section D raised questions about strategies that could be implemented to mitigate the detrimental effects of human activities and biodiversity loss in the area.

An open-ended questionnaire was designed for respondents to identify all places where human activities contribute to biodiversity destruction, along with their implications and potential cures. Each item had a specific allocation of points: Logging: 20 points, Hunting: 20 points, Farming: 30 points, Mining: 30 points. Total scores were computed by aggregating scores via the Likert scale and employing basic percentage analysis. Content validity was assessed, and a reliability coefficient of r = 0.75 was achieved by the test-retest approach (Colin Phelan and Julie Wren 2006).

Fig. 3: Map of the study area. Source: (CRNP, 2011)

Sampling Procedure

A multi-stage sampling approach combining purposive and random sampling techniques was employed. At the first stage, three villages Obung, Nsan, and Aking were purposively selected from the eight villages in the Oban Division due to their proximity to the park boundary and active dependence on forest resources.

In the second stage, the households within each selected village formed the basic sampling units. Household lists were obtained from village leaders to serve as sampling frames. Using simple random sampling**,** 45 households were selected from each of the three villages, giving a total of 135 respondents.

The choice of 135 respondents aligns with the recommendation by Bailey (2018) that a minimum of 30 cases is adequate for statistical analysis regardless of population size. This sample size was considered sufficient to capture variations in community perceptions and activities while remaining feasible within available time and financial resources

Data Collection Methods

Primary data were obtained through structured questionnaires**,** key informant interviews**,** field observations**, and** transect walks**.**

- **Questionnaire:** The instrument comprised four sections designed in alignment with the study objectives:

  - *Section A:* Socio-demographic characteristics of respondents.
  - *Section B:* Types and frequency of anthropogenic activities (e.g., farming, hunting, logging, fuel wood collection).
  - *Section C:* Perceived impacts of these activities on biodiversity and ecosystem services.
  - *Section D:* Awareness, participation, and attitudes toward conservation and sustainable forest management.

  The questionnaire included both closed- and open-ended items rated using a **five-point Likert scale.**

- **Scoring system:** Anthropogenic activities were scored based on respondents' frequency of engagement and perceived intensity of impact on biodiversity, categorized as *low (1–2 points)*, *moderate (3 points)*, and *high (4–5 points)*. The scoring was validated through expert review by two conservation scientists and a statistician before administration.
- **Reliability:** The instrument was pre-tested in a nearby community not included in the main sample. Using the **test–retest method**, a reliability coefficient of **r = 0.75** was obtained, indicating acceptable internal consistency.
- **Key Informant Interviews:** Conducted with park officers, community leaders, and forest guards to complement household survey data and provide qualitative insights on biodiversity threats and conservation challenges.
- **Transect Walks:** Guided by local informants and park staff, transect walks were conducted within buffer

zones and park fringes to identify visible signs of anthropogenic activities (e.g., tree felling, farmlands, hunting traps, fire traces). Observations were documented using GPS and photographs for validation.

Data Analysis

Data collected were coded and analyzed using descriptive statistics (frequencies, percentages, and means) to summarize respondents' characteristics and activity patterns**.** Inferential statistics such as Chi-square tests and correlation analyses were used to examine relationships between socio-economic variables and levels of participation in conservation activities.

Ethical Considerations

Ethical approval was obtained from the Department of Forestry and Wildlife Management, University of Calabar. Prior to data collection, respondents were informed about the study's purpose, assured of confidentiality, and asked to provide **informed consent** verbally or in writing. Participation was entirely voluntary, and respondents were free to withdraw at any point without consequence. Community leaders also granted permission for fieldwork within their jurisdictions.

Results and Discussion

Socio-demographic Characteristics

The age distribution of respondents (Table 2) indicates that all age categories were represented, with a clear dominance of economically active individuals. Respondents aged 21–30 years constituted the highest proportion (31.1%), followed by those aged 31–40 years (25.2%) and 41–50 years (17.1%). This age structure suggests that the majority of community members engaged in livelihood activities are within the most productive and physically active age brackets. These groups are more likely to participate in resource-extractive activities such as farming, logging, and hunting, which intensify pressure on biodiversity in the Oban Division of Cross River National Park. The implication of this demographic pattern is significant, as conservation challenges in the park are closely linked to livelihood demands of young and middle-aged adults. Similar observations have been reported in other protected-area buffer communities in Nigeria, where youth-driven subsistence activities are major contributors to habitat modification and wildlife decline (Inah et al., 2019).

Table 2: Age Groups the respondents

Age-group(Years)	Frequency	Percentage (%)
≤20	6	4.4
21–30	42	31.1
31 – 40	34	25.2
41 – 50	23	17.1
51 – 60	13	9.6
>60	17	12.6
Total	135	100

Source: Field survey 2025

Educational Attainment

Educational attainment among respondents was generally low (Table 3), with over half (54.1%) having no formal education, while only 0.7% attained tertiary education. The Chi-square result (χ^2 = 120.22) shows a significant deviation from expected educational distribution, highlighting a pronounced educational imbalance within the study communities. Low literacy levels have direct implications for biodiversity conservation, as limited formal education constrains understanding of conservation regulations, ecological processes, and long-term environmental consequences of unsustainable resource use. This finding corroborates Ewah et al. (2020), who demonstrated that low educational status in protected-area communities is associated with weak conservation awareness and poor compliance with environmental policies. In the Oban Division, this educational deficit likely contributes to continued encroachment, illegal hunting, and logging despite the park's protected status.

Table 3: Educational Attainment of Respondents

Educational Level	**Frequency**	**Percentage (%)**	**Expected (E)**	**$(O - E)^2 / E$**
Illiterate	73	54.1	27	78.37
Adult education	18	13.3	27	3.00
Primary	34	25.2	27	1.81
Secondary	9	6.7	27	12.00
Tertiary	1	0.7	27	25.04
Total	**135**	**100.0**		**χ^2 = 120.22**

Source: Field Survey, 2025

Livelihood Activities

Farming was identified as the dominant livelihood activity, engaging 55.6% of respondents (Table 4), followed by lumbering (22.2%) and hunting (7.4%). These activities are directly linked to forest clearance, habitat fragmentation, and wildlife depletion. The predominance of farming reflects a subsistence-based economy highly dependent on land and forest resources, leading to agricultural expansion into forest margins and buffer zones of the park. This pattern aligns with findings from Bisong (2014) and Inah et al. (2019), who reported that agriculture remains the most pervasive driver of forest degradation in Cross River National Park. Although mining and urbanization were reported at lower levels (5.9% and 2.2%, respectively), their ecological impacts can be disproportionately severe where they occur, particularly through soil disturbance, pollution, and permanent land-use change. The relatively low reporting of these activities may reflect limited access to mining licenses or underreporting of illegal operations rather than their absence.

Table 4: Main Livelihood Activities of Respondents

Activity	Frequency	Percentage (%)
Farming	75	55.6
Trading	9	6.7
Hunting	10	7.4
Lumbering	30	22.2
Mining	8	5.9
Urbanization	3	2.2
Total	**135**	**100.0**

Source: Field Sure 2025

Local Ecological Knowledge of Tree Species

Respondents demonstrated substantial knowledge of economically valuable tree species (Table 5), including Lophira alata, Irvingia gabonensis, and Baillonella toxisperma, which are primarily exploited for timber, food, and oil. The prominence of high-value timber species underscores the degree of dependence on forest resources for livelihoods and income generation. While local ecological knowledge can be beneficial for conservation, its current application in the study area appears largely extractive rather than sustainable. Continuous harvesting of these species without replanting or management accelerates forest degradation and threatens species regeneration. Similar trends have been observed in other parts of the Cross River rainforest, where unsustainable timber extraction persists despite conservation initiatives (Bisong, 2014).

Table 5: A list of tree species known to the communities in villages and their uses

Plant species	Common name	Frequency	Plant type	Benefit from tree
Lohpira alata	Ekki (Iron wood)	4	Tree	Timber
Baillonella toxisperma	Mimusops	2	Tree	Timber and oil
Ceiba pentandra	Silk cotton tree	2	Tree	Timber
Brachystegia eurycoma	Okwen	4	Tree	Timber
Irvingia gabonensis	Bush mango	5	Tree	Timber, food
Garcinia manii	Chewing stick	6	Shrub	Chewing stick
Melicia excels	Iroko	3	Tree	Timber
Nuclear diderrichi	Opepe	3	Tree	Timber
Piptadeniastrum Africana	Small leaf	4	Tree	Timber
Tectona grandis	Tick	1	Tree	Timber
Gnectum africanum	Salad leaf	8	Vine	Vegetable

Source: Field survey, 2025.

Causes of Wildlife Decline

The Chi-square analysis of reported causes of wildlife disappearance ($\chi^2 = 75.30$, df = 4, $p < 0.05$) revealed significant variation among anthropogenic activities (Table 6). Farming emerged as the most influential driver of biodiversity loss, followed by hunting and lumbering, while mining and urbanization were less frequently reported. The dominance of farming as a cause of wildlife decline reflects extensive land clearing, habitat loss, and increased human–wildlife conflict. Hunting further exacerbates biodiversity loss through direct removal of wildlife, often targeting large mammals and primates of conservation concern. These findings are consistent with studies across sub-Saharan Africa, which identify agriculture, hunting, and logging as primary threats to biodiversity in protected-area buffer zones (Nkem et al., 2007; Ayivor & Gordon, 2012). Although mining was less frequently cited, its ecological footprint remains substantial where present. Moreover, the reliance on self-reported data suggests the possibility of underreporting sensitive or illegal activities, particularly hunting and logging, due to fear of sanctions or social desirability bias.

Table 6: Reported Causes of Wildlife Disappearance by Activity Type

Activity	Observed (O)	Expected (E)	$(O-E)^2/E$
Farming	55	27	29.04
Hunting	25	27	0.15
Lumbering	8	27	13.37
Mining	5	27	17.93
Urbanization	7	27	14.81
Total	135		$\chi^2 = 75.30$

Source: Field Survey, 2025.

Discussion

The findings corroborate studies across sub-Saharan Africa (e.g., Nkem *et al*., 2007; Ayivor & Gordon, 2012) showing that anthropogenic activities, especially agriculture, lumbring and hunting, drive biodiversity loss in protected area buffers. The dominance of farming underscores the challenge of balancing subsistence needs with conservation goals. Low literacy and limited livelihood alternatives compound this issue, as communities depend heavily on forest resources for income and nutrition.

The relatively low incidence of mining, despite its ecological footprint, suggests spatial or reporting constraints rather than absence. Self-reported data may understate illegal activities like hunting, reflecting a social desirability bias. Furthermore, while timber and NTFPs provide crucial income, unsustainable extraction without replanting accelerates forest degradation.

The study's cross-sectional design captures a snapshot of current pressures but cannot establish temporal trends in species decline. However, integrating community perceptions with observed species absence provides valuable baseline data for CRNP management.

Conclusion

This study revealed that anthropogenic activities, particularly farming, hunting, logging, and mining, are major contributors to biodiversity degradation in the Oban Division of Cross River National Park. High dependence on forest resources for livelihood and low literacy levels among residents exacerbate the situation. Despite the park's protected status, inadequate enforcement and poor community engagement continue to undermine conservation efforts. Sustainable biodiversity management requires integrated approaches that address both environmental and socio-economic dimensions.

Recommendations

1. **Strengthen Environmental Education and Awareness**: There is an urgent need to intensify environmental education programs among support zone communities of the park. Awareness campaigns should focus on the importance of

biodiversity, the consequences of unsustainable resource use, and the benefits of conservation.

2. **Promote Alternative Livelihood Opportunities**: Since most of the residents depend on farming, hunting, and logging for survival, providing alternative income-generating ventures such as beekeeping, snail farming, and poultry practices will help reduce pressure on forest resources.
3. **Enhance Law Enforcement and Policy Implementation**: The enforcement of existing environmental conservation and wildlife protection laws should be strengthened to reduce illegal hunting, logging, and encroachment within the park.
4. **Community Participation in Conservation Programs**: Local communities should be actively involved in decision-making and management processes of the park through community-based forest management (CBFM).
5. **Improve Access to Education**: The study revealed a low level of formal education among respondents. Government and non-governmental organizations should invest in adult literacy and rural education programs to improve understanding of conservation policies and sustainable natural resource management.
6. **Conduct Regular Biodiversity Monitoring and Research**: Periodic biodiversity assessments should be conducted to monitor changes in species composition and population trends. This will provide up-to-date information for adaptive management and policy review.
7. **Strengthen Collaboration among Stakeholders**: Effective biodiversity conservation requires synergy among the National Park Service, local communities, NGOs, traditional authorities, and government agencies.

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