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

[1]NWANJA, E. F., [2]PHILLIP, M., [1]SOTUNDE, A. G.
[1]Department of Forestry and Wildlife, Faculty of Agriculture, University of Calabar, Nigeria,
[2] Department of Geography and Environmental Science, University of Calabar.
Corresponding author: hukfidel80@gmail.com

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 areas in West Africa. Situated in southeastern Nigeria, it forms part of the larger Cross River rainforest ecosystem, renowned for its high endemism and ecological significance. The park harbors several endangered species, including the Cross River gorilla (*Gorilla gorilla diehli*), Nigeria–Cameroon chimpanzee (*Pan troglodytes ellioti*), forest elephants, and numerous rare plant species. Despite its legal protection, the park is under increasing pressure from surrounding communities through agricultural encroachment, logging, bush burning, poaching, and harvesting of non-timber forest products.

Biodiversity encompasses the variety of life on Earth, including genes, species, and ecosystems, and it plays a vital role in sustaining ecological balance, nutrient cycling, and climate regulation (Mora *et al*., 2011; IUCN, 2012). However, the rapid expansion of agricultural frontiers, population growth, and unsustainable resource extraction have accelerated biodiversity loss globally and in Nigeria (FAO, 2010). In Nigeria, biodiversity depletion has reached critical levels due to deforestation, habitat fragmentation, and unsustainable resource extraction. The Cross River region, which contains the largest remaining area of tropical rainforest in the country, has experienced extensive human-induced disturbances. Recent field reports and satellite observations indicate that agricultural expansion and logging continue to encroach upon the Oban Division, threatening its ecological integrity and undermining conservation goals.

Although previous studies have assessed general patterns of biodiversity loss in Nigeria, there is limited empirical information on how specific anthropogenic activities influence biodiversity within the Oban Division of CRNP. This gap hampers effective management and policy formulation for conserving the park's unique biological resources. Understanding the nature and extent of human pressures is therefore crucial for promoting sustainable forest management and community-based conservation strategies.

This study is 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 Method

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).

The figure 3 below 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 now.

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).

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, fuelwood 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) shows representation across all age categories (≤20 to ≥60 years), implying that community members of different generations participate in livelihood activities affecting biodiversity. The majority (31.1%) were aged 21–30 years, followed by 31–40 years (25.2%), and 41–50 years (17.1%). Respondents above 60 years constituted 12.6%, while only 4.4% were under 20 years. The dominance of economically active

youth (21–40 years) suggests a strong link between this age bracket and resource-extractive activities such as farming, hunting, and logging, key anthropogenic pressures in the Oban Division.

Table 2. Age Groups

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 survey2025

Educational Attainment

As shown in Table 3, over half of respondents (54.1%) had no formal education, while 25.2% completed primary school, and only 0.7% attained tertiary education. The low literacy level may limit understanding of conservation policies, hindering participation in biodiversity management. This finding aligns with **Ewah et al. (2020)**, who reported that literacy correlates positively with environmental awareness in protected-area communities.

Table 3. Educational Attainment of Respondents

Educational Attainment	Observed (O)	Expected (E)	$(O-E)^2/E$
Illiterate	73	27	**78.37**
Adult education	18	27	**3.00**
Primary	34	27	**1.81**
Secondary	9	27	**12.00**
Tertiary	1	27	**25.04**
Total χ^2			**120.22**

Source: Field Survey , 2025

Livelihood Activities

Farming (55.6%) remains the dominant livelihood (Table 4), followed by lumbering (22.2%) and hunting (7.4%). These activities are directly linked to habitat degradation and wildlife decline. The predominance of subsistence agriculture reflects economic dependence on natural resources, consistent with findings by **Inah et al. (2019)** in other Cross River National Park communities. However, despite mining and urbanization being cited as emerging threats, their reported participation rates were relatively low (5.9% and 2.2%), possibly due to underreporting or limited access to extractive licenses.

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 identified several economically important species such as *Lophira alata* (Ekki), *Irvingia gabonensis* (Bush mango), and *Baillonella toxisperma* (Mimusops), mainly valued for timber, food, and oil (Table 5). The prevalence of high-value timber species underscores local dependence on forest resources and indicates potential overexploitation risk. Similar findings were reported by **Bisong (2014)**, who noted unsustainable timber extraction within CRNP's buffer communities.

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 test ($\chi^2 = 75.30$, df = 4, $p < 0.05$) revealed a significant difference in the frequencies of anthropogenic activities in the study area. Farming was the most dominant activity, indicating it exerts the greatest pressure on biodiversity, while mining and urbanization were least reported. This suggests that human activities are not evenly distributed and that agricultural expansion is the major driver of biodiversity loss in Oban Division of Cross River National Park.

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.

Implications for Conservation

1. Policy and enforcement: Strengthen wildlife protection laws and local enforcement capacity.
2. Community engagement: Promote conservation education targeting low-literacy populations.
3. Alternative livelihoods: Introduce eco-friendly income sources (e.g., beekeeping, agroforestry).
4. Monitoring: Establish participatory biodiversity monitoring involving local residents.

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.

References

Adetola, B. O. (2017). Perspectives on ecotourism in the support-zone communities of Cross River National Park, Nigeria. *International Journal of Development and Sustainability, 6*(5), 212-228.

Adetola, B. O., & Ofuya, E. (2021). Evaluating the mitigation measures to biodiversity threats in Cross River National Park, Nigeria. *International Journal of Conservation Science, 12*(1), 237-246..

Achieng, A. O., Arhonditsis, G. B., Mandrack, N. E., Febria, C. M., Opaa, B., Coffey, T. J., Irvine, K., Masese, F. O., Ajode, Z. M., Barasa, J. E., & Kaunda-Arara, B. (2023).

Monitoring biodiversity loss in rapidly changing Afrotropical ecosystems: An emerging imperative for governance and research. *[Preprint]*. https://arxiv.org/abs/2303.13984

Ambe, B. A., & Onnoghen, U. N. (2019). Ecosystem services of the tropical rainforest environment: Lessons from the Cross River National Park, Nigeria. *Journal of Geoscience and Environment Protection, 7*, 1-10. https://doi.org/10.4236/gep.2019.711001

Babbie, E. (2007). *The practice of social research* (11th ed.). Belmont, CA: Thomson Wadsworth.

Baillie, J. E. M., Hilton-Taylor, C., & Stuart, S. N. (Eds.). (2004). *2004 IUCN Red List of Threatened Species: A global species assessment.* Gland, Switzerland & Cambridge, UK: IUCN.

Bisong, E. (2014). *Human ecology and natural resources management: Principles, concepts and application.* Port Harcourt, Nigeria: Double Diamond Publications.

Cross River National Park (CRNP). (2011). *Annual report of the Cross River National Park.* Calabar, Nigeria: CRNP Headquarters.

Etta, C. A., Iwara, E. J., Owan, E. J., Uyang, F. A., Arikpo, I. M., Ushie, C. A., Agbor-Obun, D. F., Ebagu, T. E., & Ayeni, Q. O. (2024). Evaluation of Cross River National Park as a catalyst for community livelihood sustenance, Nigeria. *GeoJournal of Tourism and Geosites, 53*(2), 647-656. https://doi.org/10.30892/gtg.53228-1240

FAO. (2005). *Harvesting nature's diversity: Challenge for agriculture.* Food and Agriculture Organization of the United Nations. https://www.fao.org/4/v1430e/v1430e00.htm

FAO. (2010). *Global forest resources assessment 2010: Main report* (FAO Forestry Paper No. 163). Rome: FAO. https://www.fao.org/3/i1757e/i1757e.pdf

Folke, C., Carpenter, S., Walker, B., Scheffer, M., Elmqvist, T., Gunderson, L., & Holling, C. S. (2004). Regime shifts, resilience, and biodiversity in ecosystem management. *Annual Review of Ecology, Evolution, and Systematics, 35*, 557-581. https://doi.org/10.1146/annurev.ecolsys.35.021103.105711

International Union for Conservation of Nature (IUCN). (2012). IUCN Red List of Threatened Species (Version 2012.2). Gland, Switzerland: IUCN. Retrieved from https://www.iucnredlist.org.

Mora, C., Tittensor, D. P., Adl, S., Simpson, A. G. B., & Worm, B. (2011). How many species are there on Earth and in the ocean? *PLoS Biology, 9*(8), e1001127. https://doi.org/10.1371/journal.pbio.1001127

Mashi, S. A., Ikwou, N., Jenkwe, E. D., Oluyori, N. R., & Idris, K. (2025). Forest cover change and land-use dynamics in Okwangwo Division of Cross River National Park, Nigeria: Balancing ecological recovery with socio-environmental pressures. *SSRN*. https://doi.org/10.2139/ssrn.5348358

Ndem, S. E., Owan, E. J., Ayeni, Q. O., Ejikeme, O. B., Utam, E. U., Ugal, B. U., Jerome, A. J., Benjamin, I. J., Ushie, C. A., Ogodo, F. A., Inuaesiet, V. U., & Eja, E. I. (2025). Impact of national park management strategies and programmes on sustainable livelihood of rural communities in Cross River State, Nigeria. *Multidisciplinary Reviews, 8*(7), 2025214. https://doi.org/10.31893/multirev.2025214

Omoigberale, M. O., Ezenwa, I. M., Biose, E., & Otobrise, O. (2020). Spatial variations in the physico-chemical variables and macrobenthic invertebrate assemblage of a tropical river in Nigeria. *ArXiv Preprint*. https://arxiv.org/abs/2006.11664

Udoh, O. S., & Ben, V. (2013). Petroleum industry, environmental laws, and health in Akwa Ibom State: A policy challenge to Nigerian leaders. *International Journal of Social Sciences, 8*(2), 45-58.

United Nations (UN). (2010). *Sustainable Development.* New York, NY: United Nations.

United Nations Environment Programme (UNEP). (2002). *Report of the 6th Meeting of the Conference of the Parties to the Convention on Biological Diversity (UNEP/CBD/COP/6/20/Part 2).* Nairobi, Kenya: UNEP.

UNEP. (2010). *What is biodiversity?* Fact Sheet. United Nations Environment Programme. Retrieved July 4, 2014, from http://www.unep.org/dgef/Biodiversityanddev

William, J. V. (2025). Assessing Nigeria's efforts in biodiversity conservation in protected areas: The case of Cross River National Park, Cross River State, Nigeria. *Scientific Reports in Life Sciences, 6*(1), 85-98. https://doi.org/10.5281/zenodo.14950275