Vol. 6 No. 2 Special Edition, September (2023)
JOURNAL OF ENVIRONMENTAL AND TOURISM EDUCATION
ISSN: 2659-0794 (PRINT) ISSN:2659-0808(ONLINE)
Content Available at: **https://jeate.net/index.php/Jete/issue/archive**

Indigenous Practices and Forest Conservation in Calabar Education Zone of Cross River State, Nigeria

Asuquo, Edung Etim asuquoedung1@gmail.com	A	Department of Environmental Education Faculty of Arts and Social Science University of Calabar Calabar
Effiong, Angelica Dominic effiongangelica@gmail.com	B	
Etim, Genevieve Edung genevieveetim5gmail.com	C	

Keywords
Sustainable human activities,
Slash and burn agricultural practices,
poaching,
Biodiversity conservation.

Correspondence:
genevieveetim5gmail.com

Received: 09/08/23
Revised: 28/08/23
Accepted: 31/08/23
Published: 09/09/23

Abstract

This study assessed the relationship between sustainable human activities and biodiversity conservation in Cross River State. To achieve this purpose, slash and burn agricultural practices, and poaching were operationalized as sub-independent variables while biodiversity conservation was treated as the dependent variable. The study's population comprised of 1,108,323 (estimated census of the Local Government Areas selected for the study) people while a multi-stage purposive sampling approach was employed to select a sample of 696 respondents from 7 communities. Correlational survey design was adopted as the research design. A questionnaire tagged "Sustainable Human Activities and Biodiversity Conservation Questionnaire" (SHABCQ) served as the instrument for data collection. Two research hypotheses were formulated for the study. Pearson Product Moment Correlation was used in analysing the data at .05 level of significance. Findings revealed that each of slash and burn agricultural practices, and poaching were significantly but negatively related to biodiversity conservation. Based on the findings, it was recommended among others that, more emphasis be made on creating practical awareness concerning the need to avoid any activity that would in any way whatsoever increase greenhouse gases in the atmosphere.

Introduction

As a concept, biodiversity refers to the variability among all living organisms from every environmental source including, inter alia, terrestrial, aquatic and the varied ecological complexes of which they are part, which includes diversity within species, between species and of an ecosystem **(**Imarhiagbe & Egboduku, 2019). Thus from the definition, it can be said to be synonymous with life on planet Earth. It can also be viewed as the wealth of all life forms found on earth as it encompasses all species of plants, animals, microorganisms, the ecosystems and ecological processes. Biodiversity on the planet is a rich natural resource in terms of economics, culture, aesthetics, science, and education, providing huge monetary and non-monetary advantages to humanity (Gaston, 2000) as it supplies essential bio resources that allow humanity to continue to survive on our planet.

Biodiversity plays a vital role in the livelihoods and survival of people as it provides diverse ecosystem (provisioning, support, regulating, cultural and spiritual) services, such as climate regulation, nutrient and water cycling, water purification, moderation of floods, soil formation/retention and renewal of soil fertility, decomposition of waste, resistance against invasive species, pollination of plants, and regulation of climates as well as pest and pollution control by ecosystems, provision of food and medicine, wide range of raw materials, energy needs, aesthetic values and the opportunity to apply Biomimicry i.e., the study of natural products to solve human problems (Agrawal, Cashore, Hardin, Shepherd, Benson & Miller, 2013; Philip, Akintoye, Olorundami, Nkpena, Ukata & Harrison, 2014).

Conservation of biodiversity involves conserving essential ecological diversity to enhance a sustainable continuity of the diverse services provided by biodiversity to mankind. The two major methods to conserve biodiversity are single-species and ecosystem approach (Imarhiagbe & Egboduku, 2019). The single-species method involves maintaining the variable population of select species. These select species are utilized as factors of the environment's health, the welfare of other species, the value of the given protected area, and the effect of habitat alteration. On the other hand, the ecosystem method involves protecting and conserving of a specified ecosystem, often designated as a protected area. It encompasses numerous species, enabling the numerous species to benefit from the conservation process.

Cross River State is endemic to a very rare type of tropical rainforest (the Lower Guinean) which is only typical of West Africa (Enuoh & Bisong, 2014). As at 1960, the state's 17 forest reserves as designated by the colonial masters had a total of 6,101km^2. The forests are home to, and endemic to species such as the African rainforest elephant (loxodonta cyclotis), the Cross River gorilla (gorilla gorilla diehli), Sclater's guenon monkey (cercopithecus sclateri), Preuss's red colobus (procolobus preussi), the drill (mandrillus leucophaeus) and the bare-headed rock fowl (picarthates oreas) and some exotic flora species (habenaria prionociaspedon, cola philippi jonesii, prunus africana and ancistocladus korupensis) (Odey, Eyamba & Chapman, 2006; Borokini, 2014).

Specifically, the Cross River National Park was created in 1991 to ensure the conservation of flora and fauna species due to certain unique reasons which then included - (i) not only does it house about 78% of all primate species recorded in the country presently but also, it houses the rarest great ape in the world – the Cross River Gorilla (*gorilla gorilla dielhi*); (ii) it is one of the three parks in the country through which Nigeria fulfils her international obligations under the "Endangered Migratory Species Treaty"; (iii) it is part of the first "trans-boundary conservation" initiative within the unique Guinea-Congolian forest zone; (iv) it is an area of very high biological diversity, and; (v) it houses more than 90% of the last remaining stands of the unique Lower Guinean rainforest type in the country (Isiugo & Obioha, 2015; Adetola, 2017). Worthy of mention here is that the uniqueness of the national park's wildlife species is the main reason why the Nigerian head office of the WCS Biodiversity Research Program was established in the state since 2001.

As at 1994, a forest inventory report carried out by the state government revealed that four of the 17 forest reserves had been totally cleared while the rest vegetation cleared ranged from 16%-87% (CRSG, 1994). In each of 2002 and 2003, DFID assisted Cross River State Forest Inventory Projects undertook an assessment of the State's forest and subsequently revealed that out of over 2 million hectares of rainforest originally found within the State, only 729,000 hectares was left (Enuoh & Ogogo, 2018). Yet another inventory report in 2006 by the Cross River Environmental Capacity Development (CRE) indicated that more forests within the area were being lost. In 2019, Krause, Nielsen, Guia-Diaz, Lehsten, Olsson and Zelli (2019) revealed that the estimated forest loss in Cross River State was 49,100 ha from 2001–2016, or a 3.9% decrease (at 30% canopy cover), with the highest losses recorded after 2013. Lastly, Fitz, Adenle and Speranza (2022) reported that forest fragmentation across the state had sharply increased between 2000-2020 with peaks of increase being noticed mainly between 2015-2020 and with such rates, the remaining forests could all be lost by 2035. Noteworthy is that in 2009, the United Nations designated the Oban Division of the Cross River National Park as a Global Biodiversity Hotspot. In conservation parlance, a Global Biodiversity Hotspot is an area which has less than 25% of its original biodiversity left.

Aside the forests being cleared, issues of decline in flora and fauna species in the forests are replete based on observations. According to the Wildlife Conservation Society (WCS) (2016), some wildlife species endemic to the area have been reported to be on the verge of extinction, i.e., on the red list of the International Union for the Conservation of Nature - IUCN. They include the African forest elephant (loxodonta Africana cyclotis), the Cross River Gorilla (gorilla gorilla dielhi), the Nigeria-Cameroon chimpanzee (pan troglodytes ellioti), the Niger Delta red colobus monkey (procolobus epieni), the Preuss's red colobus monkey (procolobus preussi), the Preuss's guenon (allochrocebus preussi preussi), the drill (mandrillus leucophaeus leucophaeus) and the grey-headed rock-fowl (picathartes oreas). Bisong and Buckley (2014) reported that about half of the 86 commercially exploited tree species within the state were identified as being threatened towards extinction with some species requiring urgent conservation attention. For Ogar, Bisong and Eka (2016) logging activities within the state's

forests had grossly depleted a wide variety of non-timber forest products towards the brink of being critically endangered. From all of the reports, issues like establishment of large scale agricultural farms, illegal logging, crude and unchecked farming practices, etc., were pointed as major drivers of deforestation while additional issues of illegal poaching and use of chemicals for both fishing and hunting contributed to wide scale biodiversity loss.

The fundamental aim of biodiversity conservation is to sustainably maintain all species and population of species for present and future use. Due to the strategic importance of the forests in Cross River State, it was designated as a pilot state for the implementation of the UNREDD+ project in Nigeria due to its sizeable tropical forest cover (Amuyou, Wang, Bisong & Antonarakis, 2021). In addition, the presence of numerous local and foreign biodiversity consortiums like CIDA, ODA, United Purpose, WWF, NGOOCE among others is a testament to the value attached to protecting the environment of the region. Emphasis on the necessity of conserving the state's biodiversity appears to have more foreign interest than local-based interest (Osunsina, Osunsina, Ogunjinmi, Oduntan, Yisau & Umunna, 2023), thus it is pertinent that studies investigate local-based issues plaguing biodiversity loss in the area.

There are many factors which are connected with biodiversity conservation in the state. Research works have shown that sustainable human activities can be connected with their positive or negative resource conservation practices towards biodiversity. Sustainable human activities such as slash and burn agricultural practice and poaching are some sustainable human activities engaged in by community dwellers which make them adopt either positive or negative resource conservation practices towards biodiversity (Enuoh & Ogogo, 2018). Slash and burn agricultural practice refers to the cutting down and burning of dried out foliage by farmers for easy clearing of a farmland. While some researches have reported that it serves to add manure to the soil after burning (Stefan & Lindsey, 2013), some other researches have observed that it contributes to top-soil erosion (Marc, 2018; Njoku, Ejiogu & Duru, 2022). Poaching refers to the unlawful capture or killing of wildlife on public or private land. Researches are seemingly inconclusive whether subsistence poaching has the same far-reaching consequences as large-scale poaching with arguments that the former is somehow more sustainable than the latter (Haas & Ferreira, 2018; Zyambo, Kalaba, Nyirenda & Mwitwa, 2022).

With the cited research evidences, it is presupposed that the sustainable human activities of slash and burn agricultural practices, and poaching could apparently be connected with biodiversity conservation. Therefore, based on the premise that sustainable human activities could probably be related with biodiversity conservation, this study ascertained sustainable human activities as a correlate of biodiversity conservation in Cross River State, Nigeria.

Statement of the problem

Despite the grave and alarming reports concerning biodiversity loss in the state's forests in recent times, researchers have continuously revealed reports of unchecked forest clearings for large scale mono-crop agricultural land uses, indiscriminate bush burnings for farmland planting and many crude agricultural practices as ways in which the state's biodiversity have been managed from an agro-based dimension. In addition to the agricultural issues, large scale fuel-wood extraction, unauthorized and illegal logging unsustainable harvesting of non-timber forest products, unauthorized and illegal poaching and utilization of chemicals/poisons for hunting and fishing are ways which have been reported of how the forest and its resources have been managed from the wildlife management aspect in recent times. It is as a result of the worrying issues stated above that this study ascertained the relationship between sustainable human activities and biodiversity conservation in Cross River State, Nigeria.

Purpose of the study

The purpose of the study was to investigate the relationship between sustainable human activities and biodiversity conservation in Cross River State.

Statement of hypotheses

1. There is no significant relationship between slash and burn farming agricultural practices and biodiversity conservation
2. Poaching has no significant relationship with biodiversity conservation

Literature review

Slash and burn agriculture is one of the oldest farming practices in tropical countries. It refers to the act of cutting down forest vegetation and burning it on the spot (Thomaz & Staffan, 2020). It is also referred to as shifting cultivation and swidden agriculture, both practices of which are major drivers of deforestation in the tropical regions. Slash-burn, synonymous with deforestation, typically results to considerable emissions of carbon dioxide (CO_2) and other greenhouse gases (GHGs) (e.g., NO_2, SO_2, SO_3, NO, CO) from vegetation and the soil, as well as causing changes in runoff and local climate which ultimately contribute significantly to global warming by depleting the ozone layer (Njoku, Ejiogu & Duru, 2022). In his investigation, Marc (2018) stressed that bush burning brings about changes in the microclimate at the interface between the soil and the atmosphere. According to Jamala, Boni, Abraham and Teru (2012), atmospheric CO_2 continues to increase as a result of – (i) absence of green vegetation to absorb it, and; (ii) burning of trees on fire in order to remove forest-related debris during forest clean-up. Human activities are presumed to be more responsible for the increase in levels of CO_2 and other greenhouse gases in the environment due to bush burning which is currently thought to be a major contributor of global warming (Ubuoh, Ejekwolu & Onuigbo, 2017).

On the other hand, slash and burn allows farmers to conduct farming activities easier because it enhances removal of forest debris faster, and also, less human effort is needed. In addition,

it improves the fertility of the soil. It also provides farmers with a good source of income and food during periods of uncertainty especially when the forest is being burnt hunting wildlife species becomes easy (Stefan & Lindsey, 2013). Despite its seeming many advantages, the practice is recognised to have a consequential impact on the environment and some of the effects include deforestation which results to biodiversity loss. It also causes the water table to be depleted due to its significant contribution to soil erosion (Jamala *et al.*, 2012). While providing a source of income and employment to many people in the tropics, agriculture has ensured the loss of green vegetative cover due to slash and burn practices. Worthy of note is that the fire has a consequential effect on soil fungus, animal populations, moisture content, micro and macro organisms, organic matter as well as facilitating erosion (Njoku, Ejiogu & Duru, 2022).

Buba, Akosim, Barau, David, Danba, Kwaga, Shitta and Vanaruwa (2016) identified threat types to the conservation of *Pan Troglodytes Ellioti* in the Gashaka-Gumti National Park in Taraba State. A survey research design was applied and the study's population comprised of park staff. The study's aims included identifying threats to the conservation of the specie in the park and data was analysed using descriptive statistics. The result revealed that illegal bush burning for agricultural purposes was the major threat to the conservation of the specie in the park. Yaro, Okon, Bisong and Ukpali (2016) appraised effect of forest encroachment on rural livelihoods among community dwellers in the Akamkpa Division of Cross River National Park by employing a mixed methods approach. Community dwellers in support zone communities of the park composed the population and one of the inquiries for the study was to examine human activities that enhance biodiversity loss/deforestation. Data analysis with frequency counts and percentage scores revealed that slash and burn agricultural activities ranked the 2nd most prevalent human activity that served to drive biodiversity loss in the park's support zone.

Ogah, Terfa and Ugorja (2017) verified agricultural extensification and biodiversity loss in Cross River State. Applying a survey research design, the population consisted of rural dwellers in proximity of forests in Ikom. Inclusive in the study's objectives was an assessment of agricultural practices that exacerbated biodiversity loss in the area. With multiple regression analysis, slash and burn agricultural practices were found to significantly impact on biodiversity loss.

In an assessment of tropical deforestation and biodiversity loss in Cross River State, Enuoh and Ogogo (2018) utilized a cross-sectional survey design. Members of communities in proximity of government/community forest reserves constituted the population. Posers raised by the study involved ascertaining the major drivers of biodiversity loss in the investigated areas. Data analysis with descriptive statistics showed that slash and burn agriculture practices served as one of the prominent drivers. Still on the same poser, qualitative responses by the locals revealed them reporting that the slash and burn agricultural practices were mainly driven by large scale plantation farmers and not those who engaged in either subsistence or medium

scale farming. Ugbe, Dawaki and Japheth (2021) analysed effect of anthropogenic activities on sustainable management of forest/its resources in communities surrounding the Cross River National Park. The study used a survey research design and communities around the Okwangwo area of the park formed the population. One of the study's enquiries was to examine the various anthropogenic activities which affected biodiversity loss within the area. Data analysis with descriptive statistics indicated the respondents agreeing that farming activities with specific attention to slash and burn practices served as the most profound activity which contributed to biodiversity loss.

Egbonyi, Ephraim, Omoogun and Egbonyi (2022) probed socio-economic activities and forest degradation among forested communities in Ikom Education Zone of Cross River State. Applying an ex-post facto research design, the population was made up of registered farmers in the area. The study sought to identify the socio-economic activities that impacted upon forests and consequentially, biodiversity loss in the area. Data obtained was analysed with judgmental mean scores and the result showed that slash and burn agricultural practices was an agreed socio-economic activity which impacted negatively on biodiversity loss in the area. The effect of population growth on biodiversity loss in Boki, Cross River State was examined by Oko, Odey and Anake (2022) in a study hinged on a survey research design. The population consisted of rural dwellers in support zone communities to the Okwangwo national park section. The study's aims involved examining the causes of biodiversity loss in the area. Analysis of data with descriptive statistics showed that agricultural practices of slash and burn were fingered as the main factor that facilitated biodiversity loss.

Poaching refers to the illegal capture or killing of wildlife on either private or public land (Matungwa & Wawa, 2021). It can be broadly categorized into two - subsistence and commercial poaching. Subsistence poachers illegally hunt wildlife for food and at times, for small-scale commercial trade while commercial poachers do so strictly for money, most often at the behest of someone else or a syndicate. It is not a new phenomenon as people have poached wildlife for millennia by using customary techniques. The techniques vary from area to area. The most common illegal hunting/poaching technique is snaring. It is very undesirable from a conservation perspective as it is highly efficient, extremely difficult to control/contain, unselective in terms of the gender, specie or condition of animal captured (Skidmore, 2023). It is wasteful and has severe animal welfare consequences as a result of the manner of capture and confinement, and frequent incidents of severe, non-lethal wounding of wildlife.

Other common illegal poaching/hunting methods include the use of rifles, muzzle-loaders, shotguns, dogs, fire, and in some cases, gin traps, pitfall traps and poison. In recent times, commercial poachers, with most being outfitted by criminal syndicates, equip themselves with rocket-propelled grenades, rocket launchers, M16 assault rifles, night vision goggles, helicopters, explosives, and encrypted communications as they most often encounter and kill park rangers in addition to the wildlife which they poach (Duffy & Humphreys, 2016).

Wildlife poaching/trafficking and illegal hunting are the most noticeable and widespread phenomena that compromise the integrity of biodiversity at the global level (Haas & Ferreira, 2018). It is a global problem that has been resulting in drastic population decline and local extinctions of some wildlife species. Poaching results both in human and wildlife deaths and has far-reaching negative ecological effects mostly for those who engage in it on a large-scale basis.

The negative ecological consequences of large scale poaching/illegal hunting includes overall wildlife population declines, reductions in biodiversity, local disappearances of many species from both within and outside protected areas and associated loss of ecosystem functionality, reductions in the effective sizes of protected areas due to edge-effects and, in some cases, complete collapse and disappearance of wildlife populations (Zyambo, Kalaba, Nyirenda & Mwitwa, 2022). In addition to severe ecological impacts, illegal hunting on large and unsustainable scales can confer serious negative economic and social impacts (Haas & Ferreira, 2018). Economic consequences include major negative impacts on wildlife industries which can preclude the option to develop wildlife-based land uses. Social consequences include negative impacts on food security in the long term through the loss of a potentially sustainable supply of meat protein through legal hunting, the loss of tourism-based employment and the loss of wildlife heritage.

An enquiry of wildlife poaching in Cross River National Park was investigated by Jacob, Nelson, Udoakpan and Etuk (2015) by utilizing a descriptive survey design. Communities within proximity of the Oban section of the park formed the population and the respondents were quizzed concerning areas which included data on hunting methods, individual hunting or in groups, frequency of hunting, distance covered during hunting expeditions, and variety of animals hunted.

Data analysis was with descriptive statistics and the result showed that they mostly hunted with their guns, they mostly favoured hunting in groups of up between 3-4, they mostly hunted on a daily basis, most had to cover distances of up to 10km, and they mostly hunted porcupines, grass-cutters, deer, monkeys and warthogs due to the decline of other species within the forest.

Odewumi and Abatcha (2018) analysed threats to the conservation of the endemic Grey Necked Rock-Fowl in the Okwangwo Division of the Cross River National Park by using a survey research design. Rural dwellers and park staff within the area composed the population. The study's main objective was to identify the severity of threat factors to the conservation of the specie and data collected was analysed with descriptive statistics. The result showed that various forms of hunting and/or poaching ranked among the top threat factors to the conservation of the specie. An evaluation of biodiversity conservation issues and their consequences on ecotourism management in Gashaka Gunti National Park in Taraba State was conducted by Yager, Alarape, Enogela and Tyowua (2018). The researchers applied a survey

research design while the population consisted of support zone communities and park staff. One of the study's aims was to inquire issues impacting on biodiversity conservation in the park. Analysis with descriptive statistics indicated that poaching/illegal fishing ranked the 2nd most pronounced factor impacting on biodiversity conservation in the park.

Krause, Nielsen, Guia-Diaz, Lehsten, Olsson and Zelli (2019) investigated the future of primates vis-à-vis conservation struggles in Cross River State forests by adopting a mixed methods approach. Indigenes of a rural community adjoining the Afi Mountain Wildlife Sanctuary including forestry experts (from NGOs) and authorities from government-based agencies made up the population. The study's enquiries included verifying whether the locals (hunters) experienced any technical/financial barriers to their hunting/poaching activities around and within the wildlife sanctuary, and also whether the primates were still in abundance in the forests. Using content analytical technique to analyse the obtained data, the finding revealed the respondents reporting that they had no technical/financial barriers to their hunting/poaching activities as even banks within the area were willing to give loans for them to purchase equipment/resources for their hunting activities. They also added that the number of animals in the forest had declined sharply thus, they had to go very deep into the forest before they can at least make some kills.

Wildlife conservation and poaching in Old Oyo National Park in Oyo State was examined by Ojo (2019) in a study hinged on a survey research design. Community dwellers and park staff formed the population. The study's objectives included assessing the pattern of poaching and the frequency of poaching. Analysis with descriptive statistics showed that the poachers worked in groups of at least 5 persons, they went deep into the forest (at least 5 km on a poaching operation), they hunted on a daily basis and they hunted any animal in sight. Akinsorotan, Olaniyi, Oguntuase and Raheem (2020) probed both the dynamics and socioeconomic drivers of illegal hunting/poaching of wildlife animals for consumption in Oba Hills Forest Reserve in Osun State. With a survey research design, the population encompassed those dwelling in proximity to the reserve. The pattern of illegal hunting and whether animals were selectively hunted was inquired of the respondents. With descriptive statistics, the result showed that most of them indicated that hunters mostly operate in groups and it is carried out daily. They also reported that animals were not selectively hunted.

Socio-economic factors and human activities of support zone community members in Gashaka Gumti National Park were investigated by Yaduma, Adaeze, Oluwole and Zacharia (2020). A survey research design was used and community members in the investigated area served as the population. An enquiry of the anthropogenic activities that affect biodiversity the most was conducted and the data obtained analysed with descriptive statistics. The result showed that illegal hunting/poaching was included among the activities which hampered biodiversity conservation in the park.

Methodology

The study adopted a correlational survey approach. The population of the study consisted of community dwellers in proximity to the Cross River National Park's two Divisions and also, other state/community forest reserves. From the population, a sample of 696 respondents was drawn using a multi-stage purposive sampling approach. The purposiveness was in line with selected LGAs and communities therein having large forest tracts within them. Seven LGAs and one community each therein were sampled for the study. The data collection instrument was tagged the "Sustainable Human Activities and Biodiversity Conservation Questionnaire" (SHABCQ). It has sections A and B. Section A was designed to obtain data of the respondents' demographics while Section B elicited responses concerning slash and burn agricultural practices, and poaching (6 items each) and biodiversity conservation (9 items), all with a response rubric of strongly agree (SA), agree (A), disagree (D) and strongly disagree (SD).

The instrument was validated by two experts in Measurement and Evaluation in the Department of Educational Foundations and two experts in the Department of Environmental Education who ascertained the degree to which the items on the instrument measured what it is expected to measure. The reliability of the instrument was ascertained by conducting a trial test with 30 respondents from communities that were not part of the sample and the obtained data was analysed using the Cronbach Alpha reliability method. The reliability coefficients for belief systems concerning slash and burn agricultural practices, and poaching were .88 and .74, respectively while that for biodiversity conservation was .83. The data collection for the study was done by the researchers in conjunction with 4 research assistants lasted about 8 weeks. The data collected were analysed using Pearson Product Moment Correlation (PPMC) technique and tested at .05 level of significance.

Presentation of results

Ho:1

The first hypothesis stated that there was no significant relationship between slash and burn farming agricultural practices and biodiversity conservation. To test this hypothesis, slash and burn farming agricultural practices and biodiversity conservation were compared using PPMC. The result of the analysis is presented in Table 1.

Table 1

PPMC analysis of slash and burn farming agricultural practices and biodiversity conservation in Cross River State (N=696)

Variables	$\bar{x}$	SD	R	p-level
Slash and burn farming agricultural practices (X)	13.84	5.07	.-536*	.000
Biodiversity conservation (Y)	16.16	2.78		

The result of the analysis in Table 1 revealed that slash and burn farming agricultural practices produced a mean score of 13.84 with a standard deviation (SD) of 5.07 while biodiversity

conservation produced a mean score of 16.16 with an SD of 2.78. The result further revealed that the calculated r-ratio of.-536 obtained with a p-value of .000 is greater than the critical value of .088 and this met the condition required for significance at the .05 level, albeit negatively. Hence, the null hypothesis that there is no significant relationship between slash and burn farming agricultural practices and biodiversity conservation was rejected, thus indicating that slash and burn farming agricultural practices had a significant negative relationship with biodiversity conservation in Cross River State.

Ho: 1

The second hypothesis stated that poaching has no significant relationship with biodiversity conservation. To test this hypothesis, poaching and biodiversity conservation were compared using PPMC. The result of the analysis is presented in Table 2.

Table 2

PPMC analysis of poaching and biodiversity conservation in Cross River State (N=696)

Variables	$\bar{x}$	SD	r	p-level
Poaching (X)	14.31	2.61		
			.-714*	.000
Biodiversity conservation (Y)	16.16	2.78		

*Significant at .05. p<.05.

The result of the analysis in Table 2 revealed that poaching produced a mean score of 14.31 with an SD of 2.61 while biodiversity conservation produced a mean score of 16.16 with an SD of 2.78. The result further revealed that the calculated r-ratio of .-714 obtained with a p-value of .000 is greater than the critical value of .088 and this met the condition required for significance at the .05 level but negatively. Hence, the alternate hypothesis that poaching has a significant relationship with biodiversity conservation was accepted, meaning that poaching had a significant but negative relationship with biodiversity conservation in Cross River State.

Discussion of Findings

The result of the first hypothesis revealed that slash and burn farming agricultural practices had a significant negative relationship with biodiversity conservation. This implied that the act of engaging in slash and burn farming agricultural practices was detrimental to biodiversity conservation. Perhaps, the effect of the fire on the micro-organisms in the soil, the contribution of the practice to topsoil erosion and its potential to pollute the air with greenhouse gases was more detrimental than its seeming advantages which include easy land preparation for planting and easy pickings of dead/burnt wildlife. The finding is in consonance with those of Buba *et al*., (2016), Ogah *et al*., (2017) and Ugbe *et al*., (2021) who all revealed that slash and burn farming agricultural practices were detrimental to biodiversity conservation.

The result of the second hypothesis revealed that poaching has a significant but negative relationship with biodiversity conservation. This meant that act of people engaging in illegal capturing/killing of wildlife was negatively linked to biodiversity conservation. Presumably, could it be that the finding is as a result of the illegal capturing/killing of wildlife tending more towards being unsustainable than engaging in lawful capturing/killing of wildlife? The finding is in line with those of Odewumi and Abatcha (2018), Krause *et al*., (2019) and Akinsorotan *et al*., (2020) who all reported that poaching was consequential to biodiversity conservation.

Conclusion and Recommendation

Biodiversity is synonymous with life as it encompasses all forms of life and their ecological functions, including their habitats and their ecological functions also. Sustainable biodiversity conservation is a necessity as there is no substitute for the loss of natural biodiversity. Overexploitation of the bio-resources by people would only serve to cause more damage to the existing ones as they may cease to function in friendly manners to mankind. Already with the advent of increasing rate of invasive species, global warming, and consequentially climate change, there is serious need for people to address the issue of unsustainable biodiversity conservation before it gets to an irreversible point.

Based on the finding, it is recommended that more emphasis be made on creating practical awareness concerning the need to avoid any activity that would in any way whatsoever increase greenhouse gases in the atmosphere. Also, there should be more efforts towards ensuring that much of the foreign aid pumped into the state by national and international conservation consortiums be channelled towards creating alternative protein sources for rural community dwellers.

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

Agrawal, A., Cashore, B., Hardin, R., Shepherd, G., Benson, C., & Miller, D. (2013). *Economic contributions of forests*. Paper presented at the 10th Session of the United Nations Forum on Forests held at Istanbul, Turkey between 8th – 19th April; 2013

Akinsorotan, O. A., Olaniyi, O. E., Oguntuase, B. G., & Raheem, T. (2020). Dynamics and socioeconomic drivers of illegal hunting of wildlife animal for consumption in Oba Hills Forest Reserve in Southwest Nigeria. *Journal of Applied Science and Environmental Management, 24*(2), 287-298

Amuyou, U. A., Wang, Y., Bisong, F., & Antonarakis, A. S. (2021). Livelihood impacts of forest carbon protection in the context of Redd+ in Cross River State, Southeast Nigeria. *Sustainability, 13*(5081), (e-journal). Retrieved on 05/08/2023 from https://doi.org/10.3390/su13095081

Bisong, F. E., & Buckley, P. (2014). Threat status of commercially exploited trees in the Nigerian rainforest. *Journal of Forestry*, 4, 536-546

Borokini, T. I. (2014). A systematic compilation of endemic flora in Nigeria for conservation management. *Journal of Threatened Taxa, 6*(11), 6406-6426

Buba, U., Akosim, C., Barau, W. B., David, D. L., Danba, E. P., Kwaga, B. T., Shitta, E. A., & Vanaruwa, P. P. (2016). An investigation of threat types to the conservation of *Pan Troglodytes Ellioti* at Kwano Forest of Gashaka-Gumti National Park, Nigeria. *Journal of Research in Forestry, Wildlife & Environment, 8*(3), 62-72

Cross River State Government (CRSG) (1994). *Cross River State Forestry Project (ODA Assisted). Forest Inventory Report on Cross River State.* Calabar: CRSG

Duffy, R.V., & Humphreys, J. (2016). Poaching, wildlife trafficking and human security. *Whitehall Papers, 86*(1), 22-37

Egbai O. O., Oba D. O., Ambe B. A., Abang, P. O., Eneyo, V., & Ocheche C. A. (2021). Agro-ecological Influence on the Nutrient Status and Physico-Chemical Dynamics of the Ultisols of Rural Ehom, Cross River State, Nigeria. Environment and Ecology Research 9(4): 204-208, 2021 http://www.hrpub.org https//:DOI: 10.13189/eer.2021.090408

Egbonyi, E. E., Ephraim, I. E., Omoogun, M. R., & Egbonyi, D. E. (2022). Socio-economic activities and forest degradation in Ikom Education Zone of Cross River State, Nigeria. *Resources and Environment, 12*(1), 11-16

Enuoh, O. O. O., & Bisong, F. E. (2014). Global sustainable development agenda: An implication for conservation challenges in Cross River State, Nigeria. *Journal of Sustainable Development, 7*(4), 211-224

Enuoh, O. O. O., & Ogogo, A. U. (2018). Assessing tropical deforestation and biodiversity loss in the Cross River Rainforest of Nigeria. *Open Journal of Forestry*, 8, 393-408.

Fitz, J., Adenle, A. A., & Speranza, C. I. (2022). Increasing signs of forest fragmentation in the Cross River National Park in Nigeria: Underlying drivers and need for sustainable responses. *Ecological Indicators*, 139, (e-journal). Retrieved on 05/08/2023 from https://doi.org/10.1016/j.ecolind.2022.108943

Gaston, K. J. (2000). Global patterns in biodiversity. *Nature*, 220-227.

Haas, C. T., & Ferreira, M. S. (2018). Finding politically feasible conservation policies: The case of wildlife trafficking. *Ecological Applications, 28*(2), 473–494

Imarhiagbe, O., & Egboduku, W. O. (2019). Conservation and utilization of biodiversity - Implications to the Nigerian environment. *JOJ Wildl Biodiversity, 1*(4), 0093-00102

Isiugo, P. N., & Obioha, E. E. (2015). Community participation in wildlife conservation and protection in Oban Hills area of Cross River State, Nigeria. *Journal of Sociology and Social Anthropology, 6*(2), 279-291

Jacob, D. E., Nelson, I. U., Udoakpan, U. I., & Etuk, U. B. (2015). Wildlife poaching in Nigerian National Parks: A case study of Cross River National Park, *International Journal of Molecular Ecology and Conservation, 5*(4), 1-7

Jamala, G. Y., Boni, P. G., Abraham, P., & Teru, C. P. (2012). Evaluation of environmental and vulnerability impact of bush burning in Southern Guinea Savanna of Adamawa State, Nigeria. *American Journal of Experimental Agriculture, 2*(3), 359-369

Krause, T., Nielsen, T., Guia-Diaz, L., Lehsten, V., Olsson, O., & Zelli, F. (2019). What future for primates? Conservation struggles in the forests of Cross River State, Nigeria. *Sustainability Science*, 14, 1515–1529

Marc, L. (2018). *What Is the Greenhouse Effect*? Available at https://www.livescience.com/37743-greenhouse-effect.html

Matungwa, L. M., & Wawa, A. I. (2021). The effectiveness of anti-poaching techniques in combating wildebeest poaching in Serengeti National Park Tanzania. *Journal of Forestry and Nature Conservation, 90*(3), 24-39

Njoku, R. F., Ejiogu, C. C., & Duru, C. C. (2022). Impact of slash and burn agricultural practice on selected towns of Owerri West Local Government Area, Imo State, Nigeria. *International Journal of Research and Innovation in Applied Science (IJRIAS), VII*(XII), 44-52

Odewumi, O. S., & Abatcha, M. (2018). Threat to the conservation of Grey Necked Rock-Fowl (*Picathartes Oreas*) in Cross River National Park, Nigeria. *Journal of Applied Science and Environmental Management, 22*(4), 525-530

Odey, S., Eyamba, P., & Chapman, K. (2006). Gender mainstreaming for environmental projects. Retrieved on 15/07/2015 from *www.onesky.ca/files/uploads/Gender-mainstreaming_Handbook_FINAL.pdf*

Ogah, O. M., Terfa, T. P., & Ugorja, C. L. (2017). Agricultural extensification and biodiversity loss in Ikom, Cross River State, Nigeria. *International Journal of Agricultural Science, Research and Technology in Extension and Education Systems (IJASRT in EESs), 7*(2), 103-110

Ogar, T. O., Bisong, F. E., & Eka, Z. O. (2016). Logging effects on non-timber forest products (NTFPs) availability in Etung Rainforest Ecosystem, Cross River State, Nigeria. *Applied Ecology and Environmental Sciences, 4*(1), 1-6

Ojo, I. O. (2019). *Wildlife conservation and poaching in Old Oyo National Park, Oyo State, Nigeria*. Ph.D Dissertation submitted to the Department of Sociology, Faculty of Social Sciences, University of Ibadan, Oyo State, Nigeria

Oko, P. E., Odey, D. U., & Anake, C. B. (2022). Impact of population growth on biodiversity loss in Boki agro-ecological rainforests, Cross River State, Nigeria. *Global Journal of Pure and Applied Sciences*, 28, 99-105

Osunsina, I. O. O., Osunsina, O., Ogunjinmi, A. A., Oduntan, O. O., Yisau, M. A., & Umunna, M. O. (2023). Biodiversity conservation and rural development: Inseparable options for protected area management. A case study of four Nigerian National Parks. *Nature Conservation Research, 8*(1), 84-95

Philip, F., Akintoye, O. A., Olorundami, T., Nkpena, C. O., Ukata, S. U., & Harrison, E. U. (2014). Forest resources of Cross River State: their potentials, threats and mitigation

measures. *IOSR Journal of Environmental Science, Toxicology and Food Technology, 8*(6), 64-71

Skidmore, A. (2023). Exploring the motivations associated with the poaching and trafficking of Amur Tigers in the Russian Far East. *Deviant Behavior*, *44*(3), 331-358

Stefan, H., & Lindsey, N. (2013). Slash-and-burn agriculture, effects of. In S. A. Levin (ed.), *Encyclopedia of Biodiversity*, 2nd ed., Vol. 6, (pp. 551-562). Waltham, MA: Academic Press

Thomaz, E., & Staffan, R. (2020). Slash-and-burn agriculture in southern Brazil: Characteristics, food production and prospects. *Scottish Geographical Journal, 136*(1-4), 176-194

Ubuoh, E. A., Ejekwolu, C. C., Onuigbo, I. V. (2017). The effect of burnt and un-burnt land on soil physicochemical characteristics in Ekeya-Okobo Local Government Area, Akwa Ibom State, Nigeria. *Journal of Applied Science and Environmental Management, 21*(5), 923-929

Ugbe, J. A., Dawaki, S. A., & Japheth, H. D. (2021). *Effect of anthropogenic activities on sustainable management of forest and forest resources in Cross River National Park*. In Book of Proceedings of the 7th Biennial Conference of the Forests & Forest Products Society, held at University of Uyo, Uyo, Nigeria between 26th - 30th April, 2021

Wildlife Conservation Society (WCS) (2016). *Wildlife conservation society – Nigeria program conservation strategy (2012-2016)*. Retrieved on 11/08/2018 from https://nigeria.wcs.org/DesktopModules/Bring2mind/DMX/Download.aspx?...

Yaduma, Z. B., Adaeze, J. E., Oluwole, M. O., & Zacharia, B. (2020). Socio-economic characters and activities of support zone communities in Gashaka Gumti National Park. *Open Access Library Journal, 7*(e6200), (e-journal). Retrieved on 09/08/2023 from https://doi.org/10.4236/oalib.1106200

Yager, G. O., Alarape, A. A., Enogela, O. M., & Tyowua, B. T. (2018). Biodiversity conservation problems and their implication on rangeland and ecotourism management in Gashaka-Gumti National Park, Nigeria. *Journal of Research in Forestry, Wildlife & Environment, 10*(1), 119-129

Yaro, M. A., Okon, A. E., Bisong, F. E., & Ukpali, O. (2016). Impact of forest encroachment on rural livelihood in Akamkpa Division of Cross River National Park, Nigeria. *Journal of Environment and Earth Science, 6*(2), 76-86

Zyambo, P., Kalaba, F. K., Nyirenda, V. R., & Mwitwa, J. (2022). Conceptualising drivers of illegal hunting by local hunters living in or adjacent to African Protected Areas: A scoping review. *Sustainability, 14*(11204), (e-journal). Retrieved on 12/08/2023 from https://doi.org/10.3390/su141811204