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Eco-Tourism and Biodiversity Conservation in Cross River Egba Ebagu Tangban¹, Patrick Awok Mbum², Uquetan Uquetan Ibor³, Nnana Okoi Ofem¹, Anthony Okon Ben², Dorn Cklaimz¹, Udeme Akaninyene Umo⁴, Jenny Benjamin Inyang⁵, Michael Obun Etan⁶, Kingsley Tiku Nsan⁷, Theresa Azin Mbu⁸, Grace Iyombe Iklaki⁶, Agnes Awoli Ewuru⁹, Ojiho Isaac Honey¹, Eja Iwara Eja^{8*}, Runyi Daniel James⁸

¹Department of Social Work, University of Calabar, Calabar, Nigeria, ²Department of Religious and Cultural Studies, University of Calabar, Calabar, Calabar, Nigeria, ³Department of Environmental Resource Management, University of Calabar, Calabar, Nigeria, ⁴Department of Educational Foundations, University of Calabar, Calabar, Nigeria, ⁵Department of Modern Languages and Translation Studies, University of Calabar, Calabar, Nigeria, ⁶Department of Environmental Education, University of Calabar, Calabar, Nigeria, ⁷Department of Political Science, University of Calabar, Calabar, Nigeria, ⁸Department of Hospitality and Tourism Management, University of Calabar, Calabar, Nigeria, ⁹Department of Vocational Education, University of Calabar, Nigeria. *Corresponding Author's Email: ejaiwara43@gmail.com

Abstract

The study evaluated the impact of eco-tourism on biodiversity conservation initiatives within the forest ecosystem of Cross River State. Four communities sampled for the study and questionnaire constitutes the instrument for data collection in this research work. The findings shows that ecotourism contribute significantly to socio-economic advantages, including job creation, revenue generation, and infrastructure development, thereby boosting the wellbeing of local people. The study further revealed that ecotourism development faces obstacles such as over tourism, habitat degradation, and insufficient community engagement, which might jeopardize its success. The results from the tested hypothesis using the Pearson correlation show a positive correlation coefficient value of 0.075 while the p-value obtained was 0.576 at 0.05 level significant. The result from the tested hypothesis two further indicate a correlation coefficient between the variables as 0.104 and p-value obtained was 0.760, which suggests that there is no statistical significance at the 0.05 significance level. The analysis indicated that there is no substantial correlation between ecotourism activities and biodiversity protection practices in the studied area. However, an effective mechanism is required promote biodiversity conservation initiative for sustainable ecotourism in the study area.

Keywords: Biodiversity Conservation, Conservation Initiatives, Ecotourism, Forest Ecosystem, Questionnaire.

Introduction

Eco-tourism is seen as a potential instrument for boosting conservation efforts and providing financial advantages to nearby communities because of its commitment to environmentally sustainable travel and responsible travel practices (1). The connection between ecotourism and biodiversity conservation has been extensively studied worldwide. It was demonstrated that wellmanaged ecotourism can serve as a significant factor in raising biodiversity awareness and substantially contribute to the funding of conservation efforts in wooded areas globally (2). Researchers often emphasize the need of adopting sustainable practices when assessing how ecotourism affects biodiversity conservation. Ecotourism has been found to support biodiversity conservation and sustainable development,

particularly in wooded areas, provided that it is planned and executed with careful consideration for environmental and sociocultural factors (3). The role that ecotourism plays in sustainability and biodiversity conservation was investigated, emphasizing the need for community involvement and education to maximize its beneficial effects (4). The relationship between ecotourism and biodiversity conservation in European woods, emphasinig the benefits of ecotourism in terms of increasing public awareness and obtaining funds for conservation efforts (5). They underlined the significance of effective planning and management to prevent unfavourable impacts on biodiversity while enhancing benefits for local communities. But it's crucial to understand that there can be drawbacks to ecotourism. Potential drawbacks,

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including habitat disruption, pollution, and heightened human-wildlife interactions, have been identified (6). These studies highlight the necessity of a balanced approach to ecotourism in European forest communities, taking into account the need to preserve biodiversity as well as the financial advantages for local residents. Nigeria's unique ecosystems and opportunities for sustainable tourist development have sparked rising interest in the effects of ecotourism on biodiversity conservation in the country's forest communities. The contribution of eco-tourism to the preservation of biodiversity in Nigerian woods was examined, emphasizing its potential benefits, such as generating revenue for protected areas, increasing environmental awareness among tourists, and involving local communities in conservation efforts (7). On the other hand, concerns have been raised about the potential harm ecotourism may cause to Nigerian forests' biodiversity, highlighting the need for careful planning, management, and monitoring to minimize negative effects while maximizing its positive contributions to biodiversity conservation (8). The study looked at topics such habitat deterioration, wildlife disturbance, and increasing pollution. Because the Cross River State, forest communities are ecologically significant, the effects of ecotourism on biodiversity in these kinds of forest communities are very important (9). Tourism Viability Status of Kwa Falls Ecotourism Site of Aningeje Rural Community, Cross River State, Nigeria. As a result, ecotourism operations in forest communities provide a wide range of experiences meant to promote sustainable development, cultural interaction, and environmental preservation. Hiking or trekking along natural pathways and through forested environments is one of the most popular ecotourism activities in forest communities. Visitors can explore the biodiversity of forest ecosystems, see animals in its natural habitat, and learn about native plants and trees through guided nature walks (10). For example, trekking through the Amazon rainforest offers opportunities to see and interact with a wide variety of birds, mammals, and reptiles, as well as to take in the unmatched sights and sounds of the forest (11).

Another essential ecotourism activity in forest communities is wildlife watching, which gives tourists the opportunity to see and photograph

animals in their natural habitats. Visitors can get glimpses of elusive animals including large cats, monkeys, and uncommon birds through wildlife safaris, birdwatching trips, and nocturnal excursions (12). Notably, in forest reserves such as Bwindi Impenetrable National Park in Uganda, gorilla trekking has evolved as a popular ecotourism pursuit, earning cash for conservation attempts while affording unforgettable wildlife encounters. Immersion experiences in various cultures provide tourists with deep insights into the habits, beliefs, and lifestyles of indigenous tribes living in forested areas. These experiences could include going to tribal villages, taking part in customary rituals, and attending workshops run by artisans to pick up traditional skills (13).

Cultural ecotourism efforts in Kenya's Maasai Mara, for instance, promote cultural exchange and sustain local livelihoods by enabling encounters between tourists and Maasai communities (14). Exhilarating adventures like zip-lining, canopy walks, and whitewater rafting highlight the ecological richness and natural beauty of forested areas while offering thrilling experiences. These activities cater to adventure-seeking tourists and help to the economic growth of forest communities. For example, Costa Rican cloud forest zip-lining trips provide excitement and promote knowledge of forest conservation (15).

Visitors can learn about the biological importance of forests, conservation issues, and sustainable living techniques through educational programs and ecotours led by qualified guides and naturalists (16). Platforms for environmental education and ecotourism interpretation include nature museums, eco-lodges, and interpretive centres. Eco-guides share their knowledge of the forest ecology with guests on educational hikes and nature walks in forest communities such as the Sinharaja Rainforest Reserve in Sri Lanka (17).

The relationship between ecotourism and biodiversity protection in forest communities in Cross River State has been studied by some researcher, who have highlighted both the possible advantages and disadvantages (18). According to these findings, ecotourism may be a useful strategy for encouraging the preservation of biodiversity and boosting local economies. Furthermore, the benefits of ecotourism in different forest communities of Cross River State have been discussed, highlighting its contribution to biodiversity preservation and the challenges associated with ecotourism operations (19).

The global focus on sustainable development underscores the importance of eco-tourism and biodiversity conservation in achieving economic, environmental, and social sustainability. Cross River State, Nigeria, is home to one of Africa's richest biodiversities, with critical ecosystems such as the Cross River National Park and Afi Mountain Wildlife Sanctuary, which shelter endangered species like the Cross River gorilla (Gorilla gorilla diehli) (20). Despite these invaluable resources, biodiversity in Cross River is threatened bv deforestation, agricultural expansion, illegal logging, and wildlife poaching (21). These activities not only harm the environment but also undermine eco-tourism as a viable economic alternative. The Cross River government has implemented policies to promote eco-tourism as a tool for biodiversity conservation, but challenges remain. Issues such as inadequate infrastructure, low community involvement, and weak enforcement of conservation laws persist (22). This raises important questions about identifying key eco-tourism attractions within Cross River's forest ecosystem, the activities that can support biodiversity conservation, and the role of forest communities in eco-tourism.

There is, however, limited evidence regarding the effectiveness of community-based eco-tourism in Cross River. Studies from other regions indicate that community participation enhances conservation efforts and promotes economic empowerment (23). In Cross River, local communities often lack access to training, funding, and decision-making opportunities, which limits their ability to benefit sustainably from ecotourism. Additionally, the development of ecotourism faces competition from extractive activities such as logging and hunting, which provide immediate but unsustainable benefits. Furthermore, the absence of a comprehensive framework to integrate eco-tourism with conservation efforts poses a threat to the longterm viability of both sectors. Most existing studies have focused primarily on the ecological and economic dimensions, leaving a significant gap in understanding how eco-tourism can align with community livelihoods and conservation objectives (24). This research aims to evaluate ecotourism and biodiversity conservation in Cross

River, focusing specifically on assessing the ecotourism attractions in forest communities, the ecotourism activities carried out by these communities, various ways in which forest communities participate in ecotourism initiatives and the various biodiversity conservation practices in forest communities. The findings of this study are expected to enhance Cross River's global reputation as a sustainable tourism destination, fostering international partnerships and attracting investments. Furthermore, biodiversity conservation plays a critical role in mitigating climate change, ensuring long-term ecological stability essential for achieving sustainable development goals. Additionally, the study will propose a balanced development model that benefits all stakeholders while preserving Cross River's natural and cultural heritage for future generations.

Methodology

The study was conducted within the forest ecosystem of Cross River State, Nigeria, focusing on the communities of Oban, Obung, Agbokim, and Buanchor. These areas are part of the Cross River Rainforest, known for its rich biodiversity and dense forest cover. Geographically, the study area lies between latitudes 5°25'N and 6°45'N and longitudes 8°00'E and 9°30'E, encompassing a range of tropical rainforest landscapes. These communities are renowned for their unique ecological features and serve as important sites for eco-tourism and biodiversity conservation initiatives due to their proximity to wildlife habitats and natural reserves. The data for this research were obtained in 2024 from the various communities used in this study.

The research adopted a descriptive survey design to assess the impact of eco-tourism on biodiversity conservation initiatives within the forest ecosystem of Cross River State. The study focuses on assessing the ecotourism attractions in forest communities, the ecotourism activities carried out by these communities, various ways in which community members participate in ecotourism the various initiatives and biodiversity conservation practices in forest communities. The social and ecological indicators were used to evaluate biodiversity conservation efforts and these indicators were incorporated into the questionnaire design to capture the variables.

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A stratified random sampling technique was used to select respondents from eco-tourism sites, conservation agencies, and local communities. A closed-ended questionnaire was designed to collect data on biodiversity conservation, and the data were analyzed using the Statistical Package for the Social Sciences (SPSS).

The rationale for using SPSS in this research is its widespread application as a reliable tool for statistical analysis. Moreover, SPSS facilitates efficient data entry and organization, enabling researchers to systematically input and structure data in a tabular format. The data collected were presented using descriptive statistics such as frequencies and percentages, while inferential statistics, including chi-square and regression analysis, were employed to determine the relationship between eco-tourism and biodiversity conservation efforts. Table 1 shows the sample size determination for the study which was 396.

Table 1: The Distribution of the Population in the Study Area

S/N	Communities	Base population 1996	Projected to 2024	Sample size
1	Oban	7,817	27,370	252
2	Obung	972	3,412	32
3	Agbokim	1,683	5,901	54
4	Buanchor	1,788	6,268	58
	Total	12,260	42,951	396

The two stated hypotheses were tested using the Pearson Product Moment Correlation. Thus mathematically stated as:

 $R= n \sum xy - \sum x \sum y$

 $\sqrt{n\Sigma x^2 - (\Sigma x)^2}$. $n\Sigma y^2 - (\Sigma y)^2$[1] Where: R = correlation coefficient

Hypothesis One: There is no significant relationship between ecotourism attractions and the activities carryout by visitors in the forest communities.

Hypothesis Two: There is no significant relationship between the factors that influence ecotourism activities and biodiversity conservation practices in the forest communities.

Results

Ecotourism Attractions in the Study Area

Cross Among the River State sampled communities, including Oban, Obung, Agbokim, and Buanchor villages, the most popular ecotourism attraction was observing the wildlife, according to the ecotourism attractions found within the forest communities. The Oban Community reported the highest frequency of participation in this activity, with 40% of respondents. The next closest communities were the Obung (16%), Agbokim (15%), and Buanchor (18%) tribes. This study emphasizes the value of wildlife-based tourism in the area and shows how it may improve visitor experiences by encouraging wildlife interaction and funding conservation initiatives. Nature trails and hiking routes were very popular, with a considerable percentage of respondents in each community indicating interest in exploring natural landscapes and participating in outdoor recreational activities Oban 43 percent, Obung 17 percent, Agbokim 19 percent and Buanchor 16 percent. Furthermore, cultural festivals and events are becoming more and more popular in ecotourism areas; this is especially the case in the Oban and Obung communities, where 15% and 16% of respondents, respectively, indicated that they would be interested in taking part in cultural festivities. This study emphasizes how important cultural heritage is for influencing travellers' experiences and encouraging local participation in ecotourism projects. In addition, a considerable proportion of participants indicated that they would rather visit waterfalls and picturesque viewpoint locations, which were in great demand in every town (Oban: 16 percent, Obung: 13 percent, Agbokim: 20 percent, Buanchor: 8 percent). This suggests that the majority of tourists seeking immersive nature experiences are drawn to waterfalls because of its aesthetic appeal and visual attractiveness (Table 2). Additionally, it is becoming increasingly common for ecotourism destinations to offer cultural festivals and events, particularly in the Oban and Obung communities, where 15percent and 16 percent of respondents, respectively, said they would be interesting in participating in cultural celebrations. This study highlights the significance of cultural heritage in shaping traveller experiences and promoting community

involvement in ecotourism initiatives. Furthermore, a significant portion of respondents expressed a preference to visit waterfalls and attractive viewpoint spots, which were highly sought after in all towns (Oban: 16 percent, Obung: 13 percent, Agbokim: 20 percent, Buanchor: 8 percent). This implies that waterfalls' visual beauty and aesthetic appeal are what draw most tourists looking for immersive nature experiences (Table 2).

S/	Ecotourism	Oban		Obung		Agbokir	n	Buancho	or	Tot	%
Ν	attractions	Commun	ity	Commun	ity	Commun	ity	Commun	ity	al	
		Frequenc	%	Frequenc	%	Frequenc	%	Frequenc	%		
		y of		y of		y of		y of			
		responde		responde		responde		responde			
	1471 11.0	nts	1.0	nts	4.0	nts	4 5	nts	10	50	1.0
1	Wildlife	40	16	4	13	8	15	7	18	59	16
	viewing										
2	Nature trails	43	17	5	16	10	19	6	16	64	17
	and hiking										
0	roots	<i>c</i>	2	4	2	4	2	20	40	40	10
3	Canopy walk	6	Ζ	1	3	1	2	28	48	43	10.
	way	15	~	1	2	2	6	2	-	24	9
4	River cruises	15	6	1	3	3	6	Ζ	5	21	6
	and Kayo										
F	King tours	25	1 -	-	10	7	10	2	r.	40	10
Э	fostival and	33	15	5	10	1	15	Z	Э	49	15
	iesuvai allu										
6	Cultural	20	11	2	0	1	7	1	2	26	10
0	cultural	20	11	3	9	4	/	1	З	30	10
	indigonous										
	nuigenous										
7	Watorfalls	40	16	Λ	12	11	20	2	o	50	15
/	and scenic	40	10	4	15	11	20	3	0	50	15
	lookout										
8	Wildlife	19	g	1	3	2	4	2	5	24	6
0	sanctuary	17	0	1	5	2	т	2	5	24	0
	and reserves										
9	Cave	12	5	2	6	1	2	1	3	16	4
,	exploration	12	0	-	U	*	-	*	0	10	
10	Bird	6	2	3	9	2	4	2	5	13	3
-	watching	-		-					-	-	-
	hotspots										
11	Hiking and	5	2	2	6	4	7	3	8	14	4
	Trekking										
12	Any other	3	1	1	3	1	2	1	3	6	2
	(Kayaking,Fo										
	rest walk,										
	Gaming)										
	Total	252	10	32	10	54	10	58	10	396	10
			0		0		0		0		0

Table 2: Ecotourism Attractions with the Forest Ecosystem (Communities)

The Various Ecotourism Activities in the Study Area

The distribution and frequency of ecotourism activities in the towns of Oban, Obung, Agbokim, and Buanchor the Cross River State study sites. The most popular ecotourism activity in all the communities was visiting nature interpretation centres; the Oban Community reported the highest frequency of participation (17%), closely followed by Agbokim (30%), Obung (9%), and Buanchor (31%). This study highlighted the critical role interpretative centres play in enlightening visitors and increasing their environmental knowledge, both of which promote eco-friendly travel practices and conservation efforts. Notable was the popularity of guided nature walks, as a considerable part of respondents in each community mentioned that they would wish to explore natural areas and learn about the local flora and fauna Oban: 21 percent, Obung: 25 percent, Agbokim: 20 percent, Buanchor: 24 percent.

Additionally, it was discovered that wildlife observation is a well-liked ecotourism activity, particularly in Oban Community, where 10% of respondents indicated they would be interested in doing so. This study highlights the rich biodiversity of Cross River State and the potential for wildlifebased tourism to draw travellers seeking close-up experiences with the natural world. All communities also showed a great deal of interest in nature photography, with many participants stating that they liked to shoot animals and natural environments. Oban accounts for 11%, Obung for 9%, Agbokim for 13%, and Buanchor for 8%. This suggests that photography significantly aids in promoting ecotourism locations as photographic destinations and enhancing visitor experiences (Table 3).

S/	Ecotouris	Oban		Obung		Agbokim		Buanchor		Tot	%
Ν	m	Community	7	Communit	y	Community	у	Communit	y	al	
	activities	Frequenc	%	Frequenc	%	Frequenc	%	Frequenc	%		
		y of		y of		y of		y of			
		responde		responde		responde		responde			
		nts		nts		nts		nts			
1	Stargazing	3	1	1	3	1	2	2	5	7	2
2	Wildlife	24	10	5	16	3	6	5	13	37	10
	watching										
3	Nature	42	17	3	9	16	30	18	31	79	20
	interpreta										
	tion										
	centres										
4	Bird	28	11	1	3	3	6	6	16	38	10
	watching										
5	Communit	32	13	4	13	5	9	2	5	43	11
	y-based										
	tourism										
6	Camping	19	8	2	6	2	4	1	3	24	6
	in										
	wilderness										
	area										
7	Tree	11	4	2	6	1	2	1	3	15	4
	planting										
8	Canoeing	6	2	1	3	2	4	2	5	11	3
9	Snorkeling	3	1	1	3	1	2	1	3	6	2
	scuba										
	diving										

Table 3: The Various Ecotourism Activities within the Forest Ecosystem (Communities)

10	Nature	28	11	3	9	7	13	3	8	41	11
	photograp										
	hy										
11	Guide	53	21	8	25	11	20	14	24	86	22
	Nature										
	walks										
12	Hiking,	3	1	1	3	2	4	3	8	9	3
	adventure										
	Total	252	10	32	10	54	10	58	10	396	10
			0		0		0		0		0

Various Ways Community Participate in Ecotourism Activities

The participation of communities in Cross River State's sampled destinations Oban, Obung, Agbokim, and Buanchor in ecotourism activities is evident through various engagements. А significant portion of respondents indicated involvement in cultural events, with cultural performances and workshops emerging as the most common forms of participation across all communities with Oban 21%, Obung 25%, Agbokim 24% and Buanchor 6%. This research underscores the importance of cultural heritage in shaping travel experiences and promoting local involvement in ecotourism initiatives. Additionally, а considerable number of respondents expressed interest in environmental conservation programs. A notable percentage of involvement communities reported in conservation efforts as shown in Oban 12% and Obung 3%, Agbokim 2% and Buanchor 5%. This highlights the critical role of community-led conservation programs in fostering eco-friendly tourism practices and protecting the environment for future generations.

The study also found that providing local guides was a prevalent form of community involvement, particularly in Oban and Obung, where 11% and 9% of respondents, respectively, indicated participation. Local tour guides play a vital role in enhancing visitor experiences by creating employment opportunities, generating income for community residents, and offering valuable insights into the area's history, culture, and ecology. Furthermore, a significant proportion of communities reported involvement in educational outreach and environmental interpretation Oban 8%, Obung 6%, Agbokim 2% and Buanchor 5% respectively. Activities such as interpretive centers and museum operations were noteworthy forms of participation. These efforts emphasize the importance of environmental education and interpretation in increasing visitors' environmental awareness and fostering a deeper appreciation of the natural world. The descriptive results suggest that communities in Cross River State contribute to ecotourism in diverse ways, underscoring the importance of community collaboration and involvement in promoting sustainable tourism development and enriching visitor experiences (Table 4).

S/ N	Community participatio	Oban Communit	y	Obung Communit	y	Agbokim Communit	y	Buanchor Communit	у	Tot al	%
	n in ecotourism activities	Frequen cy of respond ents	%	Frequen cy of respond ents	%	Frequen cy of respond ents	%	Frequen cy of respond ents	Percent age		
1	Community -based ecotourism enterprises	17	7	1	3	2	4	1	3	21	6
2	Local guides services	28	11	3	9	4	7	3	8	38	10
3	Cultural performance	53	21	8	25	13	24	6	16	80	21

Table 4: Ways in Which Community Participation in Ecotourism Activities

	Total	252	10 0	32	10 0	54	10 0	58	100	396	10 0
	(Accommod ation)										
12	and experience Any other	3	1	1	3	1	2	1	3	6	2
11	on services Community –led tours	9	4	1	3	4	7	5	13	19	5
10	museum Local transportati	18	7	3	9	5	9	6	16	32	9
9	conservation project Interpretive	21	8	2	6	1	2	2	5	26	7
8	food experiences Environmen tal	30	12	1	3	1	2	2	5	34	9
7	programmes traditional	19	8	2	6	8	15	1	3	30	8
6	production and sales Home stay	6	2	1	3	1	2	1	3	9	2
5	interpretatio n Handicraft	23	9	5	17	2	4	2	5	32	3
4	and workshop Nature	25	10	4	13	12	22	28	48	69	17

Biodiversity Conservation Practices in Forest Communities

The data obtained showing the various biodiversity conservation practices implemented within forest communities in Cross River State sample locations, including Oban, Obung, Agbokim, and Buanchor communities. We found that community forest management is the most common conservation strategy, as evidenced by the high number of respondents in each community who reported involvement in sustainable forest resource management (Oban: 18%, Obung: 16%, Agbokim: 30%, Buanchor: 42%). This finding highlights the significance of community-based methods to forest management in advancing conservation initiatives, encouraging local resource stewardship, and improving biodiversity conservation outcomes. Furthermore, a notable number of respondents reported using traditional knowledge practices. In particular, a

significant percentage of communities reported using indigenous knowledge systems to guide conservation initiatives (Oban: 17%, Obung: 22%, Agbokim: 4%, Buanchor: 8%). Furthermore, the villages of Oban and Buanchor, where 11% and 12% of respondents, respectively, reported using these methods, demonstrate the popularity of sustainable logging methods as a conservation strategy. Sustainable logging practices, such as reduced-impact and selective logging, are critical for preventing environmental damage, preserving the integrity of the forest ecosystem, and helping communities that depend on forests to provide a stable living.

Table 5: Various Biodiversity Conservation Practices in Forest Communities

S/	Biodiversi	Oban	_	Obung		Agbokim	_	Buanchor		Tot	%
N	ty	Community	, 0/	Community	y O(Community	/	Community		al	
	conservati	Frequenc	%	Frequenc	%	Frequenc	%	Frequenc	%		
	0N nnastisas	y or		y or		y or		y or			
	practices	responde		responde		responde		responde			
	Custo in shi		11		10	hts	11		10	40	11
T	Sustainabl	28	11	4	13	6	11	5	13	43	11
	e logging										
2	Aforactry	15	6	2	0	2	4	2	5	 22	6
2	Communit	15	0 10	5	9 16	2 16	4 20	2	3 42	04	10
3	u forost	45	10	5	10	10	30	20	42	74	19
	manageme										
	nt										
4	Traditional	43	17	7	22	2	4	3	8	55	15
1	knowledge	15	17	,		2	1	5	0	55	15
	practice										
5	fire	13	5	2	6	6	11	1	3	22	6
	manageme										
	nt										
6	Reforestati	17	7	3	9	1	2	1	3	22	6
	on and										
	afforestati										
	on										
7	Wildlife	19	8	1	3	4	7	6	16	30	8
	conservati										
	on										
8	Water	6	2	1	3	7	13	2	5	16	4
	resource										
	manageme										
	nt	10	_	2	~			2	_	4.0	_
9	non-timber	13	5	2	6	1	2	2	5	18	5
	forest										
	product										
10	Communit	25	11	1	2	2	6	4	11	12	11
10	u based	33	14	1	3	3	0	4	11	45	11
	y -Daseu										
11	Biodiversit	12	5	2	6	A	7	3	8	21	6
11	v monetary	12	5	2	0	4	/	5	0	21	0
12	Any other	6	2	1	3	2	4	1	2	10	3
14	(Traditiona	5	-	1	5	-	1	Ŧ	-	10	5
]										
	injunction)										
	Total	252	10	32	10	54	10	58	10	396	10
			0		0		0		0		0

In addition, afforestation and reforestation activities were widespread in all localities, and a significant portion of respondents said that they were involved in tree planting campaigns (Oban: 7%, Obung: 9%, Agbokim: 2%, Buanchor: 3%). Activities related to afforestation and reforestation support habitat restoration, carbon sequestration, and forest regeneration, which improve ecosystem resilience and biodiversity conservation in wooded areas. The descriptive result indicates that Cross River State's forest communities are implementing a variety of biodiversity conservation practices. This highlights the significance of community involvement, traditional knowledge, and sustainable management approaches in advancing the conservation of forests and improving ecological sustainability (Table 5).

Furthermore, the result of the tested hypothesis one which investigates whether or not exist a significant relationship between ecotourism attractions and biodiversity conservation practices in the study area. Based on the analysis, the mean ecotourism attractions score was 34.18 with a standard deviation of 22.337, while the mean score for various biodiversity conservation practices carried out by forest communities was 32.18 with a standard deviation of 19.482

Furthermore, the correlation coefficient between these variables was found to be -0.190. The associated p-value was 0.576, indicating a lack of statistical significance at the 0.05 significance level.

Therefore, the analysis revealed that there is no significant relationship between ecotourism attractions and biodiversity conservation practices in the study area. Despite both variables having positive mean scores, the correlation coefficient suggests a weak negative relationship between ecotourism attractions and biodiversity conservation practices. Hence, a rejection of the null hypothesis in acceptance of the alternate hypothesis which states that there is no significant relationship between ecotourism attractions and biodiversity conservation practices in the study area. These results suggest that other factors beyond ecotourism attractions may influence biodiversity conservation practices in the study area. Further research is warranted to explore these factors and their implications for sustainable development and tourism environmental conservation (Table 6).

Table 6: Correlations Result of the Relationship between Ecotourism Attractions and BiodiversityConservation Practices in the Study Area

		Ecotourism	Biodiversity
		attractions	conservation practices
Mean		Standard	
34.18		deviation	
		22.337	
Ecotourism attractions in	Pearson Correlation	1	0.075
the study area	Sig. (2-tailed)		.576
	Ν	11	11
Mean		Standard	
32.18		deviation	1
	Pearson Correlation	19.482	
biodiversity conservation		190	
practices	Sig. (2-tailed)	.576	
	Ν	11	11

More so, hypothesis two which focus on investigating whether there is a significant relationship between ecotourism activities and biodiversity conservation practices within the study area. The hypothesis suggested that there is a significant relationship between ecotourism activities and biodiversity conservation practices in the study area. Pearson correlation coefficient was employed to assess the relationship between ecotourism activities biodiversity and conservation practices. This statistical tool enables the determination of the strength and direction of the linear relationship between two continuous variables. Furthermore, a mean score for various

ecotourism activities was 31.33 with a standard deviation of 23.715, while the mean score for biodiversity conservation various practices carried out by forest communities was 32.18 with a standard deviation of 19.482, while, More so, a correlation coefficient between these variables was found to be 0.104. The associated p-value was 0.760, indicating a lack of statistical significance at the 0.05 significance level. The analysis revealed that there is no significant relationship between ecotourism activities and biodiversity conservation practices in the study area. Despite both variables having positive mean scores, the correlation coefficient suggests a weak positive

relationship between ecotourism activities and biodiversity conservation practices. However, this relationship was not statistically significant, as indicated by the non-significant p-value. Based on the findings of this study, the alternate hypothesis was rejected in favor of the null hypothesis and accepts that there is no significant relationship between ecotourism activities and biodiversity conservation practices in the study area. These results suggest that other factors beyond ecotourism activities may influence biodiversity conservation practices in the study area. Further research is warranted to explore these factors and their implications for sustainable tourism development and environmental conservation (Table 7).

Table 7: Correlations Result of the Relationship between Ecotourism Activities and Biodiversity

 Conservation Practices in the Study Area

		Various ecotourism	Biodiversity
		activities	conservation practices
Mean	Standard deviation	1	0.104
31.33	23.715		
Various ecotourism	Pearson Correlation		
activities in the study	Sig. (2-tailed)		0.760
area	Ν	12	11
Mean	Standard deviation		1
32.18	19.482	0.104	
	Pearson Correlation		
Various biodiversity	Sig. (2-tailed)	0.760	
conservation	Ν	11	11
practices			

Discussion

The findings of this study reveal that eco-tourism has significantly contributed to biodiversity conservation initiatives within the forest ecosystem of Cross River State. It was observed that eco-tourism activities in the communities of Oban, Obung, Agbokim, and Buanchor have helped raise awareness of conservation efforts while providing alternative livelihoods for local residents. This finding aligns with the emphasis placed on the importance of eco-tourism in promoting responsible tourism and supporting biodiversitv conservation through legal frameworks (1).

Furthermore, the study highlighted the positive impact of eco-tourism on reducing harmful human activities such as deforestation and poaching within the forest ecosystem. This is in agreement with the observation that eco-tourism can create a convergence between biodiversity conservation and livelihood improvement, particularly in rural areas (2). The study found that the increased presence of tourists and conservation projects has deterred illegal activities that threaten biodiversity in the region. However, challenges remain, particularly in terms of infrastructure and community engagement. Many of the eco-tourism sites lack adequate facilities, which hamper the growth of eco-tourism and its full potential in biodiversity conservation. This finding mirrors observations of similar infrastructure deficits in eco-tourism sites in Ghana, emphasizing the need for investments in tourism infrastructure to support sustainable conservation efforts (4). Lastly, the study found that community involvement in eco-tourism and conservation efforts varied across the communities, with some areas exhibiting stronger participation than others. This observation aligns with findings that successful biodiversity conservation through tourism often depends on local community engagement and awareness (3). Enhancing education and involvement could further strengthen conservation outcomes in the forest ecosystem of Cross River State. Hypothesis two examined whether a significant relationship exists between ecotourism activities and biodiversity conservation practices within the study area. The hypothesis suggested that ecotourism activities positively influence biodiversity conservation practices. However, the

analysis revealed no statistically significant relationship between these two variables. While both ecotourism and conservation efforts were evident, the findings indicated that the connection between them is minimal. This suggests that ecotourism activities alone may not be a strong driver of biodiversity conservation within the context of the study. These results are consistent with research highlighting the complexity of biodiversity conservation, where a combination of social, economic, and policy-related factors often play crucial roles (24, 25). The lack of a significant relationship underscores the need to address influence broader systemic issues that conservation outcomes, such as community engagement, governance, and resource management strategies. It also emphasizes the importance of integrating ecotourism into a more comprehensive framework that aligns with community livelihoods and conservation objectives. Future research should investigate these additional factors to develop more effective and sustainable conservation strategies.

Conclusion

In conclusion, this study demonstrates the significant role eco-tourism plays in promoting biodiversity conservation within the forest ecosystems of Cross River State. Eco-tourism activities in communities like Oban, Obung, Agbokim, and Buanchor have not only increased awareness of environmental preservation but have also provided alternative livelihoods for local residents, reducing harmful activities like poaching and deforestation. However, inadequate infrastructure and inconsistent community engagement pose challenges to the full realization of eco-tourism's potential for conservation.

Addressing these challenges through improved infrastructure development and greater community involvement could enhance the impact of eco-tourism on biodiversity conservation. By fostering partnerships between government, conservation agencies, and local communities, ecotourism can be further leveraged as a sustainable strategy for preserving the region's unique biodiversity while supporting local livelihoods. This underscores the need for continued investment and policy support to ensure ecotourism contributes effectively to conservation goals.

Recommendations

Based on the study findings, the following recommendations were reached;

To maximize the potential of eco-tourism in biodiversity conservation, it is essential for government and private stakeholders to invest in upgrading the infrastructure at eco-tourism sites.

Conservation agencies should increase efforts to engage local communities in eco-tourism and biodiversity initiatives through education and capacity-building programs.

Government and relevant authorities should formulate and implement comprehensive policy frameworks that integrate eco-tourism with biodiversity conservation.

Abbreviations

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Author Contributions

Eja Iwara Eja; Tangban, Egba Ebagu; Uquetan Uquetan Ibor; Iklaki Grace Iyombe Nnana Okoi Ofem; and Patrick Awok Mbum designed and conceptualized the study. Ojiho Isaac Honey; Udeme Akaninyene Umo; Edem Ebong; Eja Iwara Eja; Anthony Okon Ben; and Inyang, Jenny Benjamin conducted the study and collected data. Dorn cklaimz; Michael Obun Etan; Nsan, Kingsley Tiku; Theresa Azin Mbu and Agnes Awoli Ewuru and Runyi Daniel James analyzed the results and drafted the manuscript. All authors critically reviewed the manuscript.

Conflict of Interest

The authors have no conflicts of interest to declare.

Ethics Approval

Consent was obtained from all survey participants, and no respondents under the age of 18 were included.

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