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An appraisal of ecotourism's impact on biodiversity conservation: The case of Campo Ma'an National Park, Cameroon

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Ecotourism is often perceived as a strategy for sustainable biodiversity conservation for protected areas. In Cameroon, there is dearth of information on the impacts of ecotourism on biodiversity conservation of protected areas. The main thrust of this study is to examine local population's perceptions of the impact of ecotourism on biodiversity conservation in and around the Campo Ma'an National Park (CMNP). Data were collected from both primary and secondary sources. Primary data were gotten from household survey (N=124), focus group discussions (N=8) and key informant interviews (N=16). From the findings, 44.4% of the local population perceived ecotourism activities contributing to biodiversity conservation of CMNP against 55.6% with contrary views. Spearman rank correlation coefficients and Chi-square test statistics indicated that, variables plausibly influencing local population's perception of ecotourism impact on biodiversity conservation in and around CMNP were age (p<0.10), gender (p<0.50), main occupation (p<0.10), secondary occupation (p<0.10), time spent in the community (p<0.50), and number of children (p<0.50). From the logistic regression model, the main variables affecting the local population's perception were age, gender and time spent in the community. This study recommends the development of ecotourism friendly policies that can accelerate Public Private Partnership for a participatory and sustainable ecotourism approach for biodiversity conservation and livelihood enhancement in and around the CMNP. It also recommends the development of a gender sensitive ecotourism that will fair opportunities for rural women to benefit from ecotourism activities.

Key words: Ecotourism, biodiversity conservation, perception, adjacent population, national parks, Campo Ma'an National Park, South Cameroon.

INTRODUCTION

Ecotourism has often been perceived as a strategy for sustainable biodiversity conservation in and around protected areas (Andrade and Rhode, 2012; Tchamba et al., 2015; Moshi, 2016; Imanishimwe et al., 2018; Sama

and Molua, 2019). Across sub-Saharan Africa, different studies have been undertaken resulting in different findings. Kruger (2003) has highlighted two important factors affecting the level of conservation within protected areas by ecotourism: the type of flagship species and the involvement of the local communities and noted the inevitable participation of local communities in the success of ecotourism projects for conservation goals.

Ecotourism functions as an alternative source of livelihood to those which are environmentally degrading (poaching, illegal timber exploitation, unsustainable farming, etc.), thus contributing to both biodiversity conservation and sustainable community development (Das and Chatterjee, 2015). This is seen through environmental education within protected areas through tourism; alternative livelihood opportunities to the unemployed; benefit-sharing of ecotourism-based conservation revenue to local communities (Sander, 2012; Sunita, 2013; Cheung, 2015).

For ecotourism to contribute to biodiversity conservation, the local population must be engaged, involved and empowered in the ecotourism chain for imperative success in Africa's conservation model (Cheung, 2015). Imanishimwe et al. (2018) investigated the contribution of ecotourism to the conservation of Nyungwe National Park in Rwanda, by examining the integration of local communities in the conservation of the park and ecotourism's contribution to revenue sharing for community development and conservation. The outcome of the study reveals that the number of tourists increased remarkably, suggesting more revenue to be shared. Unfortunately, benefits earned by the local population is not up to their expectations as huge proportion of the benefits is earned by lodge owners in contrast to the promises they were made to belief they will have from ecotourism activities.

Although revenue sharing is an imperative to ecotourism enhancing biodiversity conservation, inadequate revenue sharing from ecotourism to communities have negatively affected biodiversity conservation efforts to reduce threats in and around parks (Kimbu, 2010), with cases of poaching, tree felling and mining, cited among many other illegal activities which are jeopardizing conservation efforts despite ecotourism increase in and around Parks (Kimbu, 2010; Imanishimwe et al., 2018).

Ecotourism shall contribute more to conservation if it is expanded above the traditional 'Big five' species (lions, elephants, buffaloes, leopards and rhinoceros). Such an expansion will increase the viewing preferences and interests of different visitors and can call for attention and stimulate funding to species which are less iconic so as to achieve greater overall biodiversity conservation (Cheung, 2015).

Spenceley (2006), questioned if ecotourism benefits conservation and the local people? The development of large ecotourism groups such as Wilderness Safaris and Conservation Corporation Africa has demonstrated their commitment to conservation efforts and poverty alleviation within the local communities around protected areas in South Africa. In terms of the contribution of ecotourism to conservation efforts, ecotourism, through ecotourism groups have been involved in joint ventures with local communities. This has been through sensitization, employment opportunities, training, scholarship for students in higher learning institutions and benefit-sharing resulting in the reduction of pressure on the conserved biodiversity. The efforts of the ecotourism groups in different communities in South Africa have helped in the conservation of endangered species like Black and White Rhino and Cheetah. Also, the partnership between ecotourism groups and the local communities in South Africa has also contributed directly to conservation through the transformation of degraded farmland within ecotourism communities into world-class wild life destination. For example, 12699 ha of the degraded farm plots in the Munyawana conservancy in the KwaZulu-Natal area was taken over in 1991, resulting in its rehabilitation and restocking with over 1500 animals amongst which were white rhino.

Tieguhong (2008) pointed out that the high expectations of ecotourism to cater for the needs of the local people and the conservation of biodiversity are achievable in the Congo Basin. He further explains that ecotourism accounts for 20% of the total international tourism. The number of protected areas with potentials for ecotourism is also increasing in the Congo Basin, therefore so too could be the revenue from ecotourism. The result of the study also shows that, if all other sources of park revenue like lodging, donations, restaurants and shops are ignored with focus only on maximum entrance fees, the Lobeke National Park will be able to cover its recurrent costs in 31 years and to self-fund the entire park budget in 36 years with an annual growth rate of 10% in the tourism sector. As for the Dzanga-Ndoki National Park, 11 years would be required to cover recurrent costs and 17 years to cover the funding of the entire Park.

As seen from the foregoing, most studies have laid emphasis on the role played by ecotourism in biodiversity conservation around protected areas in general. The specificity of this study lies in the fact that it sought to assess the impact of ecotourism on biodiversity conservation in and around the Campo Ma'an National Park, where a western lowland gorilla habituation project, the first in Cameroon is near completion. The study examined the factors affecting the local population's perception of ecotourism's impact on biodiversity conservation in and around the CMNP, South region of Cameroon. Biodiversity conservation in this study focuses on the efforts made in the sustainable management of protected wildlife species found in and around the park, amongst which are gorillas, chimpanzees, forest elephants, giant pangolin and
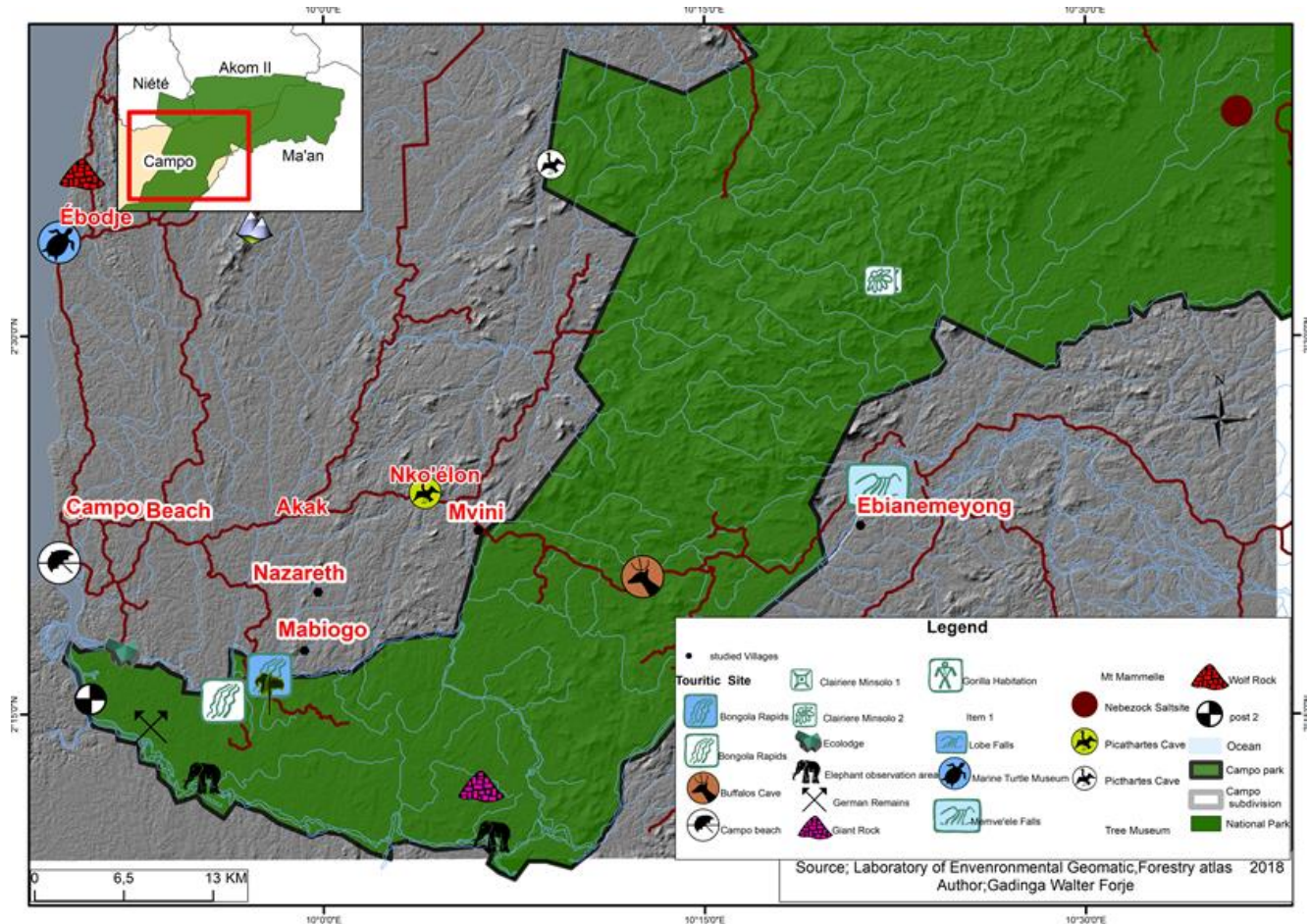
Figure 1. Map of the study area.

marine turtles. The objectives were to:

(1) Assess the local perception of ecotourism on biodiversity conservation in CMNP, and
(2) Examine the factors affecting the perceived ecotourism impacts on biodiversity conservation in the CMNP.

MATERIALS AND METHODS

Description of study area

The investigation was undertaken in communities adjacent to the Campo Ma'an National Park (CMNP), found within the Campo sub-division, south region of Cameroon. The CMNP lies between latitude 2°15'N to 2°30'N and longitude 10°00'E to 10°15'E (Figure 1). Rainfall generally increases as one goes from the interior towards the coast, implying the coast receives more rainfall than the hinterlands. Located close to the coast, the community of Campo receives an average annual rainfall of 2800 mm and while Nyabissan found further inland receives an average annual rainfall of 1670 mm annually (PNCM, 2014; Tchouto, 2006). The mean annual temperature is about 25°C. Some variations however occur

between the western and eastern sections of the CMNP in terms of temperature.

Hydromorphic and ferralitic soils are the most dominant types of soils. Hydromorphic soils are found within the valleys and lowlands; while ferralitic soils develop on acidic parent rocks, and are generally yellowish or reddish in colour. The dense Guineo-Congolese evergreen forest is the main vegetation type (Letouzey, 1985) found around the CMNP and its environs. The CMNP and its environs make up part of the Atlantic basin drainage system. Two main watersheds are found in the environs of the CMNP: The Ntem and the Lobé watersheds, characterized by rivers which flow in a NE-SW direction (Mbenoun, 2017).

Sampling

The study made use of purposive sampling to select suitable communities and sections of the park. The selection of these communities or sections of the park were based on endowments with ecotourism potentials or existing ecotourism facilities. Households with persons indigenous to the community, and persons living in the community for the past 1 year and more were targeted if they practiced activities around the park like: harvesting of Non-Timber Forest Products (NTFPs), farming, tourism and trade, fishing, and hunting. This was due to the fact that such activities are related to biodiversity management in and around the

park. Snowball sampling was used to select the participants for focus group discussions and key informant interviews.

Data collection

Data for the study were collected from primary and secondary sources. With regards to secondary data, data were collected from books and book chapters, scientific articles, dissertations, theses, projects and technical reports and from other internet sources. Emphasis was laid on the relationship between ecotourism and conservation in protected areas in general and national parks in particular.

The administering of questionnaires, key informant interviews, focus group discussions and observations were used to collect primary data. The questionnaires, interviews and questions for focus group discussions were developed by the authors in collaboration with the Wildlife Fund for Nature (WWF) after a reconnaissance survey of the area. The questionnaires for the local population were made up of 27 questions focusing on the socio-economic characteristics, their involvement in ecotourism activities and the perceived impact of ecotourism to conservation in the area. The interview guides and questions for focus group discussion were made up of 15 and 17 questions, aimed at investigating the level of involvement of the local population to ecotourism and the perceived impact of ecotourism to conservation for cross validation of local perception and data triangulation. Both open and close-ended questions were used. The services of a local translator were solicited in each community, to help translate the questions into the dialect.

In order to obtain information on the perceived contributions of ecotourism to biodiversity conservation in and around the CMNP, household surveys were carried out using semi-structured questionnaires. These semi-structured questionnaires were administered to the different actors in the ecotourism sector. A total of 124 questionnaires were administered. The questions were structured to collect information on the role played by ecotourism (positive or negative) on biodiversity conservation in and around the CMNP.

Key informant interviews and focus group discussions were used to collect information on the capacity of ecotourism to enhance biodiversity conservation in and around the CMNP. Information collected through key informant interviews, focus group discussions and direct field observations was mainly used to ascertain the truthfulness of responses obtained during household surveys.

Data analysis

Data collected were coded and inserted into the Statistical Package for Social Sciences (SPSS 19.1) for descriptive and inferential statistical analysis. The main descriptive statistics computed were charts and percentage indices. The main inferential statistics computed were Chi-square test statistic, Spearman rank correlation and the binomial logistic regression.

To determine the non-cause-effect relationship existing between independent variables and the impact of ecotourism on biodiversity conservation in and around the CMNP, the Chi-square test statistic (Equation 1) and Spearman correlation (Equation 2) were used. The Chi-square test statistic and the Spearman correlation are expressed as follows:

$$\text{Chi-square test statistic } (\chi^2) = (a \times d - b \times c)^2 \times N / (a+c) \times (b+d) \times (a+b) \times (c+d) \quad (1)$$

Where a is frequency of males who think ecotourism contributes to biodiversity conservation; b is frequency of males who think ecotourism does not contribute to biodiversity conservation; c is frequency of females who think ecotourism contributes to biodiversity conservation; d is frequency of females who think ecotourism does not contribute to biodiversity conservation; N is the total frequency of all observations.

$$\text{Spearman rho} = 1 - \frac{6\Sigma(di)^2}{n(n^2-1)} \quad (2)$$

where n is the numbers of pairs of values of variables X and Y; di is the difference obtained from subtracting the rank of Yi from the rank of Xi; $\Sigma(di)^2$ is the sum of the squared values of di.

To evaluate the cause-effect relationship existing between independent variables and the impact of ecotourism on biodiversity conservation around the CMNP, the binomial logistic regression (BNL) (Equation 3) was used. The binomial logistic regression model is expressed as follows:

$$BNL = \ln\left(\frac{\hat{Y}}{1-\hat{Y}}\right) = \propto + \beta X \quad (3)$$

where $\hat{Y}$ is the predicted probability of the event (ecotourism contributes to biodiversity conservation); $1 - \hat{Y}$ is the predicted probability of the other decision (ecotourism does not contribute to biodiversity conservation); X are the independent variables (gender, age, occupation, level of education, marital status, etc).

SPSS version 19.1 was used for descriptive and inferential statistical analysis.

RESULTS

Descriptive statistics for independent variables

The main descriptive statistics computed for the independent variables of the study were mean, standard deviation, variance, minimum and maximum (Table 1).

Since most of the variables were qualitative, they were coded using numbers ranging from 0, 1, 2, 3, 4, etc. Based on these, the aforementioned descriptive statistics were computed. Table 1 shows the descriptive statistics for independent variables like community, age, gender, main occupation, secondary occupation, level of education, ethnic group, time spent in the community, marital status and number of children.

Local population's perception of the impact of ecotourism around the CMNP on biodiversity conservation

An analysis of local population's perception of the impact of ecotourism around the CMNP on biodiversity conservation showed that the population had divergent views (Figure 2).

Findings revealed that most of the respondents (55.6%) perceived ecotourism as not contributing to biodiversity conservation; meanwhile 44.4% of the respondents' perceived ecotourism as contributing to biodiversity conservation. This goes to show that the respondents

Table 1. Descriptive statistics for independent variables of the study.

Independent variable	Mean	Std. Dev.	Variance	Min.	Max.	N
Community	4.50	2.83	8.01	1	9	124
Age	2.13	0.75	0.57	1	3	124
Gender	0.66	0.48	0.23	0	1	124
Main occupation	4.07	2.79	7.78	1	11	124
Secondary occupation	2.84	2.87	8.25	0	10	124
Level of education	1.46	1.28	1.65	0	4	124
Ethnic group	2.84	1.70	2.88	1	6	124
Time spent in the community	2.39	0.79	0.63	1	3	124
Marital status	0.73	0.51	0.26	0	2	124
Number of children	3.77	2.53	6.40	0	12	124
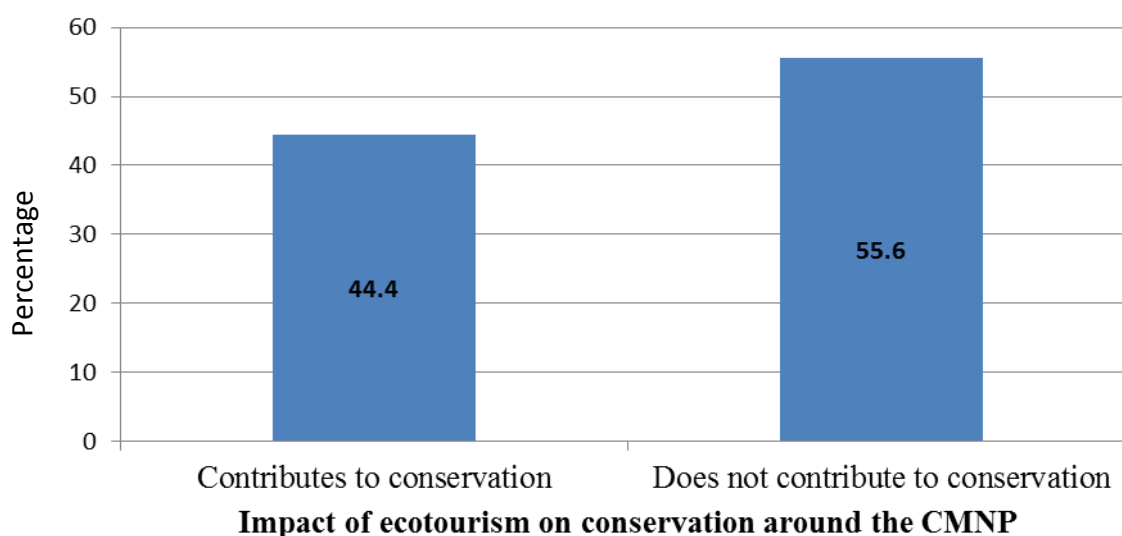
Figure 2. Perceived impact of ecotourism on biodiversity conservation around the CMNP.

had divergent views as far the role played by ecotourism in biodiversity conservation in and around the CMNP is concerned. However, it is clearly noticed that most respondents perceived ecotourism as contributing little to biodiversity conservation in and around the CMNP.

Non-cause-effect and cause-effect relationship between the impact of ecotourism on biodiversity conservation around the CMNP and independent variables

Non-cause-effect relationship between the impact of ecotourism on biodiversity conservation around the CMNP and independent variables

Chi-square test statistic demonstrated the existence of a non-cause-effect relationship between independent variables and the role played by ecotourism in biodiversity conservation in and around the CMNP (Table 2).

The Chi-square test statistics indicated that independent variables like age (χ^2 = 3.95; p<0.10); gender (χ^2 = 4.62; p<0.05); main occupation (χ^2 = 8.50; p<0.10); secondary occupation (χ^2 = 13.68; p<0.10); time spent in the community (χ^2 = 11.45; p<0.05); and number of children (χ^2 = 9.42; p<0.05) had a statistically non-cause-effect relationship with the perceived impact of ecotourism on biodiversity conservation. Meanwhile independent variables like community (χ^2 = 9.24; p>0.10); level of education (χ^2 = 3.98; p>0.10); ethnic group (χ^2 = 9.22; p>0.10); and marital status (χ^2 = 0.49; p>0.10) had a statistically insignificant cause-effect relationship with the perceived impact of ecotourism on biodiversity conservation. This implies that independent variables like age, gender, main occupation, secondary occupation, time spent in the community and number of children

Table 2. Chi-square test statistic showing non-cause-effect relationship between the impact of ecotourism on biodiversity conservation around the CMNP and independent variables.

Independent variable	Description	Contributes to conservation (freq.)	Does not contribute to conservation (freq.)	Chi-square (χ^2)	p-level
Community	Ebianemeyong	11	12		
	Ebodje	10	10		
	Mabiogo	3	11		
	Nazareth	4	7		
	Mvini	3	2	9.24^{ns}	0.323
	Nkoelon	8	7		
	Campo Beach	4	6		
	Akak	2	8		
	Campo	10	6		
Age	≤ 30 years	17	11		
	31 - 45 years	21	31	3.95^*	0.089
	> 46 years	17	27		
Gender	Female	13	29	4.62^{**}	0.034
	Male	42	40		
Main occupation	Hunting	3	6		
	Fishing	11	11		
	Farming	20	34		
	Petty trade	5	6		
	Building	1	3	8.50^*	0.084
	Driving	1	0		
	Gorilla tracking	2	1		
	Working with NGO	7	2		
	Eco-guard	3	4		
	Others	2	2		
Secondary occupation	None	14	21		
	Hunting	10	2		
	Fishing	5	6		
	Farming	13	20		
	Petty trade	3	12		
	Dress making	0	1		
	Gorilla tracking	3	1	13.68^*	0.091
	Working with NGO	5	4		
	Others	2	2		
Level of education	No formal education	12	18		
	Primary	21	27		
	Secondary	7	13		
	High school	5	6	3.98^{ns}	0.409
	Tertiary	10	5		
Ethnic group	Iyassa	13	16		
	Mvae	18	25		
	Bagyeli	8	5	9.22^{ns}	0.101
	Mabi	4	10		

Table 2. Contd.

	Beti	1	7		
	Others	11	6		
Time spent in the community	≤ 5 years	10	14	11.45**	0.045
	6 -10 years	10	18		
	> 10 years	35	37		
Marital status	Not married	18	19	0.49^{ns}	0.783
	Married	35	48		
	Divorced	2	2		
Number of children	0	9	6		
	1	3	6		
	2	12	8		
	3	5	11		
	4	6	10		
	5	6	10	9.42**	0.049
	6	5	8		
	7	6	4		
	8	1	4		
	9	1	2		
	12	1	0		

**, *Significant at 5 and 10% probability levels respectively; ns = not significant.

Table 3. Spearman correlation showing direct and indirect non-cause-effect relationship between the impact of ecotourism on biodiversity conservation around the CMNP and independent variables.

Independent variable	Spearman rho coefficient	p-level
Community	0.018	0.840
Age	-0.153*	0.089
Gender	0.200**	0.032
Main occupation	0.300**	0.012
Secondary occupation	-0.037	0.682
Level of education	0.100	0.290
Ethnic group	0.027	0.769
Time spent in the community	0.287**	0.017
Marital status	-0.047	0.602
Number of children	-0.286*	0.018

**, *Significant at 5 and 10% probability levels respectively; ns = not significant.

plays a plausible significant role in influencing the community perception on the impact of ecotourism on biodiversity conservation in and around the CMNP.

Findings equally showed the existence of a direct and indirect non-cause-effect relationship between independent variables and the perceived impact of ecotourism on biodiversity conservation in and around the CMNP (Table 3).

Coefficients of the Spearman rank correlation showed that independent variables like gender (rho = 0.200; $p<0.05$); main occupation (rho = 0.300; $p<0.05$); and time spent in the community (rho = 0.287; $p<0.05$) all had a statistically significant direct non-cause-effect relationship with perceived impact of ecotourism on biodiversity conservation in and around the CMNP. Independent variables like age (rho = -0.153; $p<0.05$) and number of

Table 4. Logistic regression showing cause-effect relationship between independent variables and impact of ecotourism on the local population around CMNP.

Independent variable	B	p-level	df	Exp (B)
Constant	-1.089*	0.098	1	0.337
Community	-0.063	0.461	1	0.939
Age	-0.683**	0.037	1	0.505
Gender	0.917**	0.045	1	2.501
Main occupation	0.148	0.185	1	1.160
Secondary occupation	0.021	0.776	1	1.021
Level of education	0.156	0.453	1	1.169
Ethnic group	-0.121	0.483	1	0.886
Time spent in the community	0.473*	0.095	1	1.604
Marital status	0.106	0.817	1	1.111
Number of children	0.055	0.610	1	1.057
Number of observations	124			
-2 Log Likelihood	155.762			
Nagelkerke R^2	0.148			

**, *Significant at 5 and 10% probability levels respectively.

children (rho = -0.286; $p < 0.05$) had a statistically significant indirect non-cause-effect relationship with perceived impact of ecotourism on biodiversity conservation in and around the CMNP. On their part, independent variables like community (rho = 0.018; $p > 0.10$), secondary occupation (rho = -0.037; $p > 0.10$), level of education (rho = 0.100; $p > 0.10$), ethnic group (rho = 0.027; $p > 0.10$), and marital status (rho = -0.047; $p > 0.10$) had a statistically insignificant cause-effect relationship with perceived impacts of ecotourism on biodiversity conservation in and around the CMNP. The aforementioned findings indicate that independent variables like gender, main occupation, and time spent in the community play a plausible significant role in enhancing biodiversity conservation in and around the CMNP; meanwhile independent variables like age and number of children play a plausibly significant negative role in the perception on the impact of ecotourism on biodiversity conservation in and around the CMNP.

Cause-effect relationship between the impact of ecotourism on biodiversity conservation around the CMNP and independent variables

A direct and indirect cause-effect relationship existed between independent variables and the perceived impact of ecotourism on biodiversity conservation in and around the CMNP (Table 4).

Based on the coefficients of the logistic regression model, it was found that independent variables like gender (β = 0.917; $p < 0.05$) and time spent in the community (β = 0.473; $p < 0.10$) had a statistically significant direct cause-effect relationship with perceived impacts of ecotourism on biodiversity conservation in and around the CMNP. The independent variable, age

(β = -0.683; $p < 0.05$) had a statistically significant indirect cause-effect relationship with perceived impacts of ecotourism on biodiversity conservation in and around the CMNP. Meanwhile independent variables like community (β = -0.063; $p > 0.10$), main occupation (β = -0.148; $p > 0.10$), secondary occupation (β = 0.021; $p > 0.10$), level of education (β = -0.156; $p > 0.10$), ethnic group (β = -0.121; $p > 0.10$), marital status (β = 0.106; $p > 0.10$), and number of children (β = 0.055; $p > 0.10$) had a statistically insignificant cause-effect relationship with perceived impacts of ecotourism on biodiversity conservation in and around the CMNP. Thus, it is clearly noticed that gender and time spent in the community positively affects the perceived impacts of ecotourism on biodiversity conservation of communities while age negatively affects the perceived impacts of ecotourism on biodiversity conservation.

The binary logistic regression's classification table showed the predicted and observed statistics for the perceived impacts of ecotourism on biodiversity conservation in and around the CMNP (Table 5).

Based on the overall percentage of the perceived impacts correctly classified, it was noticed that up to 66.1% of the perceived impacts of ecotourism on biodiversity conservation was correctly classified. This proves that the predictions of the model are good enough to be used in the study.

DISCUSSION

Local population's perception of the impact of ecotourism on biodiversity conservation around the CMNP

From the perspective of the local population living around

Table 5. Classification table for the logistic regression model.

Observed	Predicted		
	Contributes to conservation	Does not contribute to conservation	Percentage correct
Contributes to conservation	51	18	73.9
Does not contribute to conservation	24	31	56.4
Overall percentage	-	-	66.1

the CMNP, marginally above average think ecotourism activities do not contribute to the conservation of biodiversity in and around the Park. This finding is unprecedented because most studies have found that ecotourism activities around protected areas contribute to biodiversity conservation (Imanishimwe et al., 2018; Das and Chatterjee, 2015; Sunita, 2013; Lambi et al., 2012; Conrad-J et al., 2013; Ajonina et al., 2014; Kruger, 2003) For example, in the Andhra Pradesh region of India, ecotourism contributed to biodiversity conservation in the adjacent forest reserve, by providing alternative livelihood activities to some community members who were involved in illegally timber exploitation (Sunita, 2013). Also, in South Africa, ecotourism groups such as Wilderness Safaris and Conservation Corporation Africa have demonstrated strong commitment to conservation efforts by providing alternatives to poverty alleviation in local communities around protected areas (Spenceley, 2006).

The perceived limited contribution of ecotourism to biodiversity conservation can be linked to inadequate development and non-community-based ecotourism projects. This is visible through poor accessibility, dilapidation of eco-lodges, an almost absence of tourism circuits, those managing ecotourism are not trained in tourism management, the presence of a draft ecotourism plan still to be adopted and implemented and the incapacity of the local population to manage community base ecotourism initiatives, as observed in the field and confirmed by key informants.

The majority of the respondents highlighted environmental education and sensitization as important perceived benefits of ecotourism to biodiversity conservation in the area. However, the degree to which ecotourism contributes to conservation in and around protected areas, is so much linked to the level at which the local population are actively involved in ecotourism activities that can provide better livelihood alternatives (Das and Chatterjee, 2015; Sunita, 2013). Unfortunately, ecotourism is perceived not to have provided a veritable livelihood option to degrading livelihood activities in and around the CMNP like poaching, illegal logging and fishing, thus the perceive limited contribution of ecotourism to biodiversity conservation (Forje et al., 2020). In areas where there is a clear and more equitable benefit sharing of revenue from ecotourism activities, the contribution of ecotourism to biodiversity conservation

and community development is more significant (Imanishimwe et al., 2018). In the CMNP, revenue generated from key ecotourism activities (park entrance fee, camera and car usage fees) are collected by the park authorities and transferred directly into the state treasury, with the other stakeholders like the local communities and the NGOs working in the area exempted from the benefit sharing process. This thus limits revenue that could be used for local development as well as to enhance biodiversity conservation.

Factors affecting the perceived impact of ecotourism on biodiversity conservation around the CMNP

From the different inferential statistical tests and more importantly the logistic regression model, three independent variables (age, gender and time spent in the community) were statistically significant in terms of the factors affecting the perceived impacts of ecotourism on biodiversity conservation in and around the CMNP. Gender and time spent in the community had a direct causal relationship with the perceived impact of the ecotourism on biodiversity conservation in and around the CMNP. This implies that for the variable gender, males were more of the standpoint that ecotourism contributes to biodiversity conservation. These results are different from those of Tran and Walter (2014), where there is a near equality in the involvement of men and women in ecotourism activities resulting in both sexes engaging almost the same in biodiversity conservation in Northern Vietnam. In the CMNP, there is the dominance of men in the ecotourism sector, with very few women involved (Forje et al., 2020). This is most likely responsible for many female perceiving that ecotourism does not contribute to biodiversity conservation. In the Western Highlands of Cameroon, Kimengsi (2019), noticed that, the quasi totality of the female population involved in ecotourism, did not only foresaw ecotourism contributing to biodiversity conservation, but help in fostering biodiversity conservation by participating mainly in environmental education ecotourism activities. This implies that, if there is parity in ecotourism activities, with the introduction of gender sensitive and more inclusive activities, along site environmental education, the perception of the female population of CMNP on the contribution of ecotourism to both biodiversity and

livelihood enhancement will probably change.

In terms of age as a factor influencing the perception of the local population on biodiversity conservation in the CMNP, there was a direct relationship between age and the perceived impact of ecotourism on biodiversity in the area. That is, as the age of the respondent increased, the more they are in concord that ecotourism contributes to biodiversity conservation in the areas. This result is in consonant with the findings of Peake et al. (2009) who noticed that those who are older are more susceptible to ecotourism conservation messages and implicitly may foster biodiversity conservation if the message is understood. It is also in line the findings of Kimengsi (2019), where the likelihood to participate in ecotourism conservation education increased with increasing age. This may be explained by the fact that, the elderly population around the CMNP, have more knowledge on the changing biodiversity status in the area than the younger ones, and are more willing to conserve the area.

From literature, research has not been carried out; establishing how time spent in the community affects the perceived impact of ecotourism on biodiversity conservation. In the CMNP, the variable time spent in the community had an inverse relationship with ecotourism contribution to biodiversity conservation. Members of the local population who had spent more time in the community were more for the opinion that ecotourism does not contribute to biodiversity conservation than their counterparts who had spent less time in the community. Those who have spent more time in the community explained that ecotourism had witnessed some downward trends over the years, with tourism structure dilapidating and the number of tourist reducing. This has thus resulted in limited benefits, pushing some community members into other activities which may be destructive to the environment so as to make earns meet. However, many of those who have stayed for long in the community acknowledged that if ecotourism is improved upon, it will obviously contribute more not just to biodiversity conservation, but will act as a sustained livelihood choice for their communities.

The management implication of the perceived impact of ecotourism on biodiversity conservation in the CMNP

The high perception of ecotourism contributing little to biodiversity conservation in and around the CMNP by the local communities is an indication that ecotourism which has been trumpeted by the second management plan of the CMNP, is still to deliver the desired results. There is thus the need, to develop and implement policies which can promote a better development of the ecotourism sector in and around the CMNP. For this to be done, the government of Cameroon through the inter-ministerial departments charged with the development of ecotourism in the CMNP, should work in collaboration with the communities, conservation and livelihood NGOs and ecotourism enterprises to develop public-private partnership for ecotourism in the environs of the CMNP. Such a public-private partnership should be able to develop gender sensitive and ecotourism products and packages that can provide a more equal opportunity for both men and women. There is a need for a memorandum of understanding between the park management, the local community as well as conservation NGO, stating clearly the quota of income each stakeholder will benefit from ecotourism activities. Such a benefit-sharing mechanism should be fair and transparent to all.

Conclusion

From the findings of the study, the perceived impact of ecotourism on biodiversity conservation in and around the CMNP was varied, slightly above average of the local population perceived that ecotourism does not contribute to biodiversity conservation in and around the CMNP. Different variables affected the perceived impact of ecotourism on biodiversity in and around the CMNP. The factors plausibly affecting the perceived impact of ecotourism on biodiversity conservation were age, gender, main occupation, secondary occupation, and number of children while the factors having a direct causal relationship with the perceived impact of ecotourism on biodiversity conservation were age, gender and time spent in the community. Based on these findings, it is recommended that policy makers and the government accelerate the process of Public-Private Partnership in order to implement participatory and sustainable ecotourism approaches in and around the CMNP for biodiversity conservation enhancement.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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