



# Analysis of human and wildlife coexistence in national parks; the case study of okomu and cross river national parks, Nigeria

Oghenetejiri Digun-Aweto 

Accepted: 1 May 2024 / Published online: 13 July 2024  
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**Abstract** Human-wildlife conflicts occur in areas where frequent interactions exist between man and wildlife, leading to conflicts. This study undertook a critical analysis of human and wildlife co-existence between two National Parks in Nigeria. Surveys conducted with eight communities shed light on conflicts and how to improve human-wildlife co-existence based on the following criteria: benefit accrued to the community and compensation. A survey was conducted in eight communities to examine the level of conflicts between the communities and wildlife in the area and how to improve human wildlife co-existence based on the adoption of benefit sharing and compensation for crop damage in the management of the two parks. A multistage sampling technique was employed, including a purposive sampling design used to select the communities and a simple random sampling technique used to determine households to participate in the survey. Data was collected from households in communities adjacent to Cross River National Park ( $n=203$ ) Okomu National Park ( $n=198$ ). The results indicate that to improve co-existence with wildlife, The findings of the research recommend more focus on local social and economic benefits, wildlife compensation, and special attention to reducing conflicts through mitigation strategies.

**Keywords** Human · Wildlife · Biodiversity · Conservation · Okomu · Cross-River

## Introduction

Protected Areas are established mainly for the in-situ conservation of flora and fauna (García-Frapolli et al., 2009; Vodouhê et al., 2010; Soulé, 2014). Human-wildlife conflicts are often viewed from the human perspective; these conflicts are usually framed in a negative outlook, but co-existence covers both positive and negative aspects (Woodroffe et al., 2005; Nyhus (2016). These conflicts are influenced by risk perception where there is a wide disparity between perceived and actual risk (Dickman, 2010).

The biggest problem of risk perception is the actual response to the threats, which in some cases, may be exaggerated. In other Human –Wildlife responses to conflict, the situation may increase perceived risk responses leading to an opportunity to perpetrate illegal activities (Eliason, 1999; Groff & Axelrod, 2013; Kahler & Gore, 2015). Human-wildlife co-existence can be defined as a situation involving a sustainable relationship between humans and wildlife within levels that are not detrimental to both parties. The importance of human-wildlife conflicts around Protected Areas has been noted by (Dickman, 2010; Naughton-Treves et al., 2005; Ogra, 2008). Lack of adequate attention to human-wildlife conflicts threatens the conservation goals of Protected Areas mainly

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O. Digun-Aweto (✉)  
TREES, North-West University Potchefstroom,  
Potchefstroom, South Africa  
e-mail: tejiri.aweto@gmail.com

by a lack of local community support for conservation (Dash & Behera, 2012). Without support from local communities, achieving conservation goals can be daunting. Smith et al. (2009) have observed that conservation costs locals in terms of forgone livelihoods and opportunity costs; hence, benefits need to supersede the prices for conservation initiatives to be successful (Green et al., 2018).

## Literature review

Locals living near Protected Areas are increasing due to population increase and dependence on natural resources (Buta et al., 2014). This increased level of interaction leads to increased human-wildlife interactions. Devictor and Godet (2010) also supported the claim made by conservation scientists that about 12% of the earth's surface area is needed to protect the current species on the planet. This observation can be linked to the fortress conservation systems-wide acceptability. Nigeria is not an exception to this system of National Park administration (Ewah, 2012). In Cross River National Park (CRNP), local communities live within and around the park areas. On the other hand, in Okomu National Park (ONP), local communities can be found close to the park. Enaruvbe (2018) noted that there had been an expansion in plantations bordering the National Park, which has increased settlement and attracted ancillary services, thus increasing anthropogenic activities; hence the total number of communities during the time of the research could not be established. Nyhus, (2016) and Benjaminsen and Bryceson, (2012) has submitted that establishment of protected areas can lead to conflicts especially when communities are cut off from their ancestral lands. A situation where local communities are denied access to their resources could also lead to these (Badola et al., 2012; Kaimowitz, 2012; Shibia, 2010; Vedeld et al., 2012; Brockington & Wilkie, 2015).

Due to poaching, logging and the desire for bushmeat, there has been considerable loss of flora and fauna in Cross River National Park (Oates, 1995; Eniang, 2003; Jimoh et al., 2012; Dunn et al., 2014; Agaldo et al., 2016) and Okomu National Park (Digun-Aweto et al., 2019a, b; Enaruvbe, 2018; Ola-leru & Egonmwan, 2014; Uloko & Lameed, 2019) have been on the decline. The research of Brashares

et al. (2004) noted that there had been a similar decline in National Parks and Protected Areas in Ghana, due to the effect of anthropogenic activities, mainly a significant increase in the human population and poaching of wildlife for food and bush meat.

There are three essential issues to consider when dealing with co-existence with wildlife:

First, increasing population, this has led to a higher demand for housing and urban development (Nyhus, 2016). This rise in population also predicts a greater level of human-wildlife interaction, resulting in heightened conflicts within Protected Areas. Additionally, the population growth signifies an expansion of land for agricultural purposes, which, in turn, necessitates the clearance of land for farming. As highlighted by Woodroffe et al. (2005), this habitat loss due to agricultural expansion has contributed to habitat destruction and a subsequent decline in various species.

While policies are essential steps in promoting coexistence, as suggested by Clark et al. (2014), this study emphasizes that a one-size-fits-all approach and simplistic solutions to conflict resolution for peaceful human-wildlife coexistence need to be thoroughly researched. A comprehensive perspective that includes insights from various fields, including natural and social sciences, as well as the humanities, is needed to gain a holistic understanding of these complex issues.

Secondly, the coexistence with wildlife is influenced by human behavior, which encompasses prior interactions and encounters with wildlife, cultural customs, beliefs, traditions, stakeholders' interests, and economic factors (Clark et al., 2014; Decker et al., 2012; Kideghesho, 2008).

Thirdly, the coexistence between humans and wildlife is notably influenced by biological and ecological factors. For instance, migratory animals are at a higher risk of conflicting with farmers and local communities, particularly when their migration routes overlap with those used by community members or when land in these areas has been converted for agricultural purposes (Meretsky et al., 2011). In other instances, the sex of the species plays a pivotal role in establishing coexistence between humans and wildlife. This is particularly evident in species where males have roaming ranges than females. Such areas are more likely to be found within farmlands or human settlements (Loveridge et al., 2010).

The rationale behind selecting these two National Parks is the similar vegetative system (the rainforest). CRNP, established in 1991 while Okomu was established in 1999, was created from the Okomu forest reserve; they, however, have similar rainforest vegetation and are both biodiversity hotspots. This makes it pertinent to examine human co-existence with wildlife because the increase in the competition for natural resources is on the rise. This study was conducted to compare the co-existence levels which influence local communities' support for Protected Area management in both regions (Fig. 1).

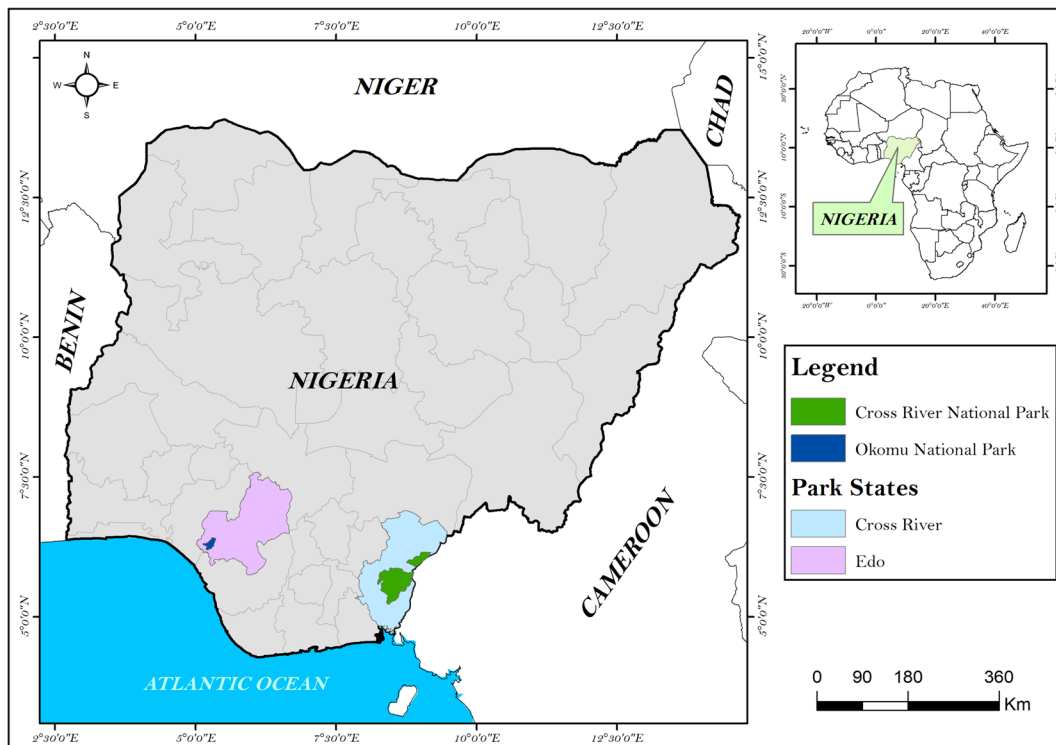
**Materials and methods**

**Study sites**

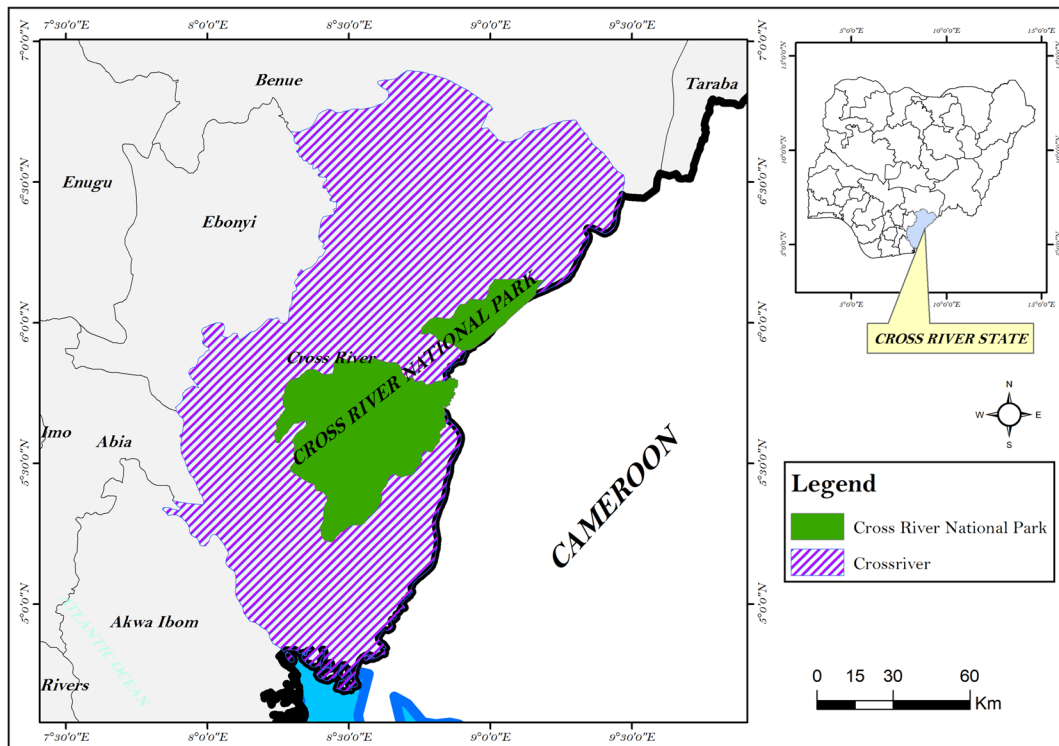
*Cross river national park*

Cross River Nation Park (Fig. 2) belongs to category IV on the International Union for the Conservation of Nature (IUCN), with over 1300-3000 mm

of rainfall annually and temperatures ranging from 15–30 degrees Celsius. The park is a single National Park but has two divisions, namely the Oban division, with an area of 300km<sup>2</sup> (Birdlife International, 2020) and Okwangwo, with an area of 1000 km<sup>2</sup> representing 40% of Nigeria's forest area of the intact canopy (Ezebilo & Mattsson, 2010). The CRNP consists of lowland and submontane rainforest, with tree species such as *Klainedoxa gabonensis*, *Berlinia confusa*, *Lophira alata*, *Coula edulis*, *Hannoa klaineana*, and *Khaya ivorensis*. (Birdlife International, 2020) There are 105 local communities referred to as support zone communities around the park. (Ambe & Onnoghen, 2019). The local economy around CRNP is primarily agriculturally based (Ezebillo, 2013; Adedoyin et al., 2017) and is dependent on non-timber forest products in the park and its environs. The Oban division shares a boundary with the Korup National Park in Cameroun, while the Okwangwo division also shares a common border with the Takamanda National Park, Cameroon. The Okwangwo division has immense biodiversity and is listed as one of the United Nations Biodiversity Hotspots (CEPF,



**Fig. 1** Map of Nigeria indicating the location of CRNP and ONP



**Fig. 2** Cross River National Park

2019). It provides the habitat for endangered cross-river gorilla (*Gorilla gorilla diehli*) (Eniang, 2001). Schmitt, (1996) identified over 1000 species of plants that are endemic to Nigeria and over 1200 species of butterflies (Adedoyin et al., 2017). The floral diversity of the park consists of 1568 species, including flowering plants, lichens and moss (Borokini, 2014).

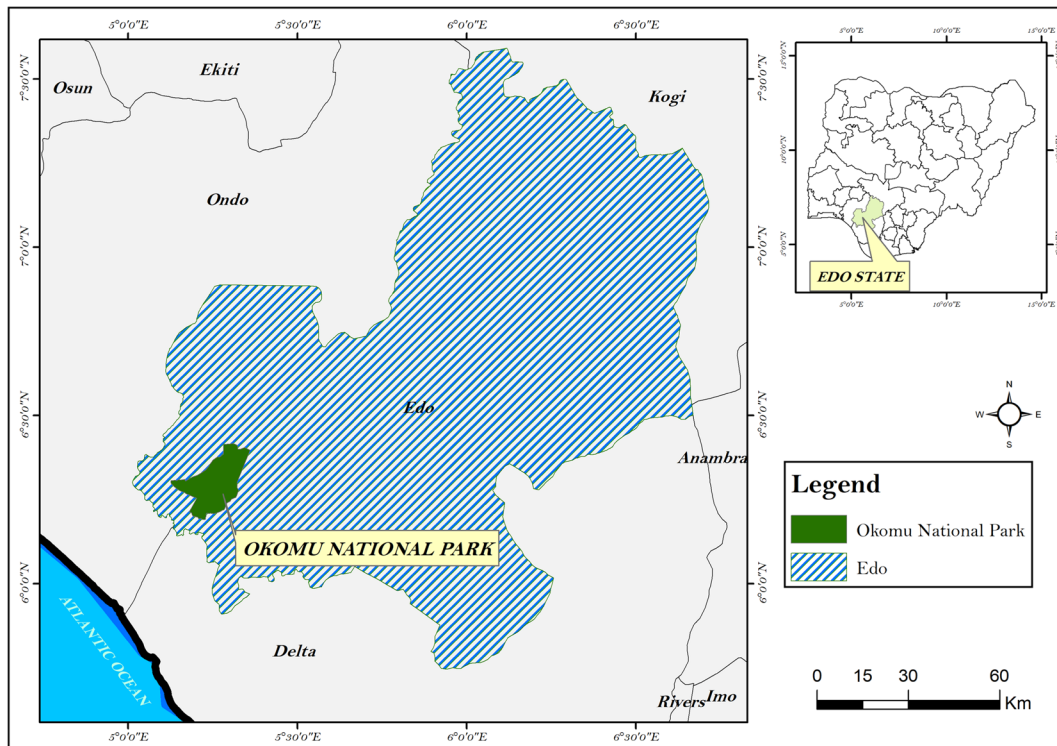
#### *Okomu national park*

Okomu National Park (ONP) (Fig. 3) shares similar vegetation with CRNP (rainforest vegetation), the endangered white-throated monkey (*Cercopithecus eruthrogaster*) and the African forest elephant (*Loxodonta africana cyclotis*), civet cat (*Viverra civetta*), long-tail pangolin *Uromainis tetractyla* and the tree pangolin *Phataginus tricuspis*, are found in the biodiversity hotspot. The survey conducted by (Ajayi, 2002) revealed that the park has about 700 species of butterflies and 94 species of animals. The vegetation in ONP is the guinea-Congo lowland forest. The trees in this area consist of *Ceiba pentandra*, *Pycnanthus angolensis*, *Antiaris Africana*, and *Triplochiton*

*scleroxylon* and mean annual rainfall of 2100 mm (Birdlife International, 2020). The park shares a common boundary with the Okomu Oil palm plantation, and the expansion of the oil and rubber plantation has caused immense damage to local communities in terms of a gathering of non-timber forest products and arable agricultural land (Digun- Aweto et al., 2019b; Badiora et al., 2022).

#### Data collection

A pilot test was first conducted to ensure the reliability of the questionnaire. A reliability coefficient of 0.8 was obtained, indicating good reliability (Ursachi et al., 2015). The rangers who had a good rapport with the communities were selected for this assignment to ensure a good disposition to the survey and to reduce any form of conflict (and to avoid any potential conflict and bias in responses) because some community members were not in cordial relationship with the National Park Service due to past grievances linked to denied park access. This research took into consideration the caution of Ezebillo (2013), who



**Fig. 3** Okomu National Park

stated that locals have the notion that the survey was linked to the government or National Park; he further noted that "the local people are often suspicious about anything that has to do with the government; they may not be willing to participate in the interviews".

The questionnaire was developed based on previous studies (Madden, 2004; Woodroffe et al., 2005; Treves et al., 2006; Ezebilo & Mattsson, 2010; Nyhus, 2016; Digun-Aweto et al., 2019b). Questions on the demographic characteristics of the community members, such as age, gender, occupation, and household size, were asked. The second section comprised questions related to human-wildlife co-existence. Purposive sampling was used to select the communities near Parks, and simple random sampling was used to select four villages from each study site randomly. Households were randomly chosen to select one in every four houses. The research team requested the head of each household visited to complete the questionnaire, but in cases where the head of the household was not present, the interviewer selected the next in line. This information was gathered based on the National Parks' dealings with the community

members. Based on this information, Systematic sampling was used to select households according to the research of Ezebilo et al. (2010). The questionnaires were administered with the help of rangers/park administrative staff who could speak the local language, had regular contact, were familiar with the communities, and were previously trained in administering the questionnaire. In both study locations, there is a thriving bushmeat market that provides a livelihood for local community members (Afolayan, 1980; Fa et al., 2014; Digun-Aweto et al., 2015; Jimoh et al., 2012 & Basse et al., 2010) which could be another reason why some individuals in certain communities were adamant about responding to surveys.

The survey was conducted from November and December 2017 to February 2018 in CRNP, while in ONP, the survey was conducted from November 2018 – February 2019. In Cross River, four communities selected were randomly selected namely: Akampa, Ojor, Ifumkpa, and Okwango, while in ONP, the following communities were also randomly selected namely: Igowan, Arakhuan, mile 3 and Udo. With similar variations in both National Parks and

identical profiles of the local communities living adjacent to the two National Parks, it is expected that similar results in terms of the constituents responsible for peaceful co-existence. The questionnaire comprised of two sections; the first section consisted of information about personal characteristics such as age, gender, level of education, household size and occupation, and the second part consisted of closed-ended questions focused on statements relating to co-existence. The 16 constructs were divided into three groups, namely Co-existence with Wildlife & Conservation (group 1), Compensation (group 2), and Benefits (group 3) using chi square, Turkey post hoc. The data was analyzed using SPSS software version 25 IBM Corp, Released (2017) utilizing descriptives, chi-square tests, analysis of variance and Tukey post hoc test and regression.

## Results

The age distribution of residents of CRNP and ONP indicated that a wide portion of the respondents, with over 75.3% being 35 years and below, while in ONP, just over half (52.9%) were 35 years and below. In terms of educational level, 36.9% had at least secondary education in both CRNP and ONP and tertiary education in CRNP (16.3%) and ONP (47%). Occupation of the respondents was mainly farming, carrying the highest percentage CRNP (30.5%), but in ONP, teaching was the highest reoccurring occupation (39.4%). Educationally, there are higher numbers of individuals with no formal education in CRNP (31.5%) when compared to ONP (8.1%), primary education CRNP (15.3%), ONP (8.1%), secondary educational levels were at par at (36.9%). In comparison, CRNP respondents had a far lesser number of individuals that had obtained a tertiary education (16.3%) than ONP (47%). In both study areas, household sizes with individuals with 1–2 members had percentages CRNP (17.2%) ONP (8.6%), while the largest household groups were the category 3–5 members CRNP (39.2%) and ONP (57.5%) respectively.

The following statements were tested to determine co-existence with wildlife conservation areas among the two communities; locals with plenty of land are more tolerant towards wildlife conflict; community members with multiple sources of income are more tolerant of wildlife conflict; participation in

ecotourism and conservation had improved wildlife tolerance; wildlife needs protection because it brings money. The majority of CRNP respondents (66%) believed that locals with plenty of land are more tolerant towards wildlife, but on the contrary, (64.1%) of respondents in ONP shared the directly opposite view; there were significant differences between the two groups ( $p < 0.05$ ). On the subject of respondents' perspective on community members with multiple sources of income being more tolerant of wildlife conflict, respondents from CRNP claimed that numerous income sources for them improve tolerance towards human-wildlife conflict (54.7%). On the contrary, it seems that residents adjacent to ONP disagreed more with this statement (49.5%). The statement "participation in ecotourism and conservation had improved wildlife tolerance" found that CRNP respondents agreed (88.7%), while in ONP, the respondents reported low agreement levels (34.3%). In terms of revenue generation from wildlife, CRNP respondents reported more levels of disagreement (40.9%), while ONP respondents agreed slightly more that wildlife needs protection due to revenue generation (46%). While CRNP communities are more in support of co-existence with wildlife if certain factors such as more land, multiple sources of income participation in ecotourism, and conservation will help improve their co-existence with wildlife, ONP communities agree in a lesser sense to these statements. Furthermore, residents in communities in ONP were more in favour of the protection of wildlife because of the monetary benefits as opposed to communities around CRNP.

### Compensation/Crop damaged by wildlife in CRNP/ONP

Damage to crops by wildlife is one of the main factors influencing local communities' capabilities to coexist. In CRNP, 61.6% claimed that wildlife needs protection even though crop destruction is perpetrated by animals. At ONP, only 39.4% claimed that wildlife needs protection. Respondents in CRNP agreed to the statement that if there is more labour (job opportunities) available for their farm activities, co-existence with wildlife will be easier (41.9%). In the case of ONP, a higher percentage (53%) disagreed with this statement. Labour availability plays a significant role for farmers, especially during planting operations,

monitoring, and harvesting. Study participants indicated that more labour in areas prone to conflict increased tolerance and disagreed with this statement. High-yielding cash crops destruction by wildlife causes low tolerance; at CRNP (61.6%) disagreed. In ONP, only 30.8% agreed. In the area of compensation for destroyed crops in both parks, the agreement levels reported were about average; at CRNP, it was 52.2%, and at ONP, the percentage was 48.5%. The study revealed that farmer tolerance and their ability to coexist with wildlife is a crucial ingredient for achieving conservation goals. In CRNP, only 52.2% supported this statement. In ONP, it was slightly higher at 54.5%. In both CRNP and ONP, there were somewhat similar levels of agreement with compensation constructs except for more labour availability, with CRNP communities recording higher agreement rates than ONP.

In theory, to improve co-existence with wildlife, local communities see or acknowledge some benefits from conservation areas, be it social, economic, or

other benefits. At CRNP, only 11.8% claimed that the social benefits of wildlife have improved tolerance towards wildlife; at ONP, 33.3% agreed with this statement. In the area of economic benefits at CRNP, 63.1% of the respondents agreed that the economic benefits of wildlife do not reach them, which reduces their tolerance towards wildlife, while at ONP, only 18.7% agreed to this statement. The study revealed that 53.7% of the respondents in CRNP opined that local tolerance for co-existence would increase if benefits reached the communities (53.7%). Still, on the contrary, only 18.7% agreed with this statement among the ONP respondents. In comparison, in CRNP, the social benefits of wildlife tourism (78.3%) play a role in improving co-existence, but a low percentage of 29.8% was recorded at ONP. The results revealed higher agreement percentages for benefit-related statements among CRNP communities than ONP community members, except for social benefits of wildlife, where ONP communities recorded a higher rate (Tables 1, 2, 3 and 4).

**Table 1** Distribution of demographic characteristics of sampled respondents in Cross River National Park and Okomu National Park

|                    |                     | Cross River (N=203) |            | Okomu (N=N198) |            |
|--------------------|---------------------|---------------------|------------|----------------|------------|
|                    | Male                | Frequency           | Percentage | Frequency      | Percentage |
| Gender             | Male                | 141                 | 69.5       | 105            | 53         |
|                    | Female              | 60                  | 29.6       | 93             | 47         |
| Age Range          | 18–25               | 77                  | 37.9       | 53             | 18.1       |
|                    | 26–35               | 76                  | 37.4       | 82             | 34.8       |
|                    | 36–45               | 34                  | 16.7       | 42             | 21         |
|                    | 46–55               | 10                  | 4.9        | 13             | 6          |
|                    | 56+                 | 6                   | 3.0        | 8              | 3.6        |
| Educational Status | No Formal education | 64                  | 31.5       | 12             | 6.1        |
|                    | Primary             | 31                  | 15.3       | 16             | 8.1        |
|                    | Secondary           | 75                  | 36.9       | 73             | 36.9       |
|                    | Tertiary            | 33                  | 16.3       | 93             | 47         |
| Household size     | 1–2                 | 35                  | 17.2       | 17             | 8.6        |
|                    | 3–5                 | 67                  | 32.9       | 114            | 57.5       |
|                    | 6–8                 | 57                  | 28.2       | 52             | 26.2       |
|                    | > 8                 | 43                  | 21.7       | 15             | 7.5        |
| Occupation         | farmer              | 62                  | 30.5       | 27             | 13.6       |
|                    | Hunter              | 21                  | 10.3       | 13             | 6.6        |
|                    | Teacher             | 21                  | 10.3       | 78             | 39.4       |
|                    | logging             | 15                  | 7.4        | 29             | 14.6       |
|                    | Ntfp                | 65                  | 32         | 18             | 9.1        |
|                    | Civil servant       | 19                  | 9.4        | 33             | 16.7       |

Source: Field survey

**Table 2** Co-existence with wildlife conservation at Cross River and Okomu National Parks

| Group 1 (Coexistence with Wildlife & Conservation)                                       | Cross River<br><i>n</i> =203 |                |           | Okomu<br><i>n</i> =198 |                |           | Chi-square test for 'agree response' |          |
|--|------------------------------|----------------|-----------|------------------------|----------------|-----------|--------------------------------------|----------|
|  | Disagree (%)                 | Don't know (%) | Agree (%) | Disagree (%)           | Don't know (%) | Agree (%) | X <sup>2</sup>                       | <i>P</i> |
| Locals with plenty of land are more tolerant towards wildlife conflict                   | 19.2                         | 14.8           | 66.0      | 64.1                   | 24.2           | 11.6      | 188.854                              | <0.05*   |
| Community members with multiple sources of income are more tolerant to wildlife conflict | 27.6                         | 17.7           | 54.7      | 49.5                   | 35.4           | 15.2      | 165.187                              | <0.05*   |
| Participation in ecotourism and conservation had improved wildlife tolerance             | 5.9                          | 5.4            | 88.7      | 34.8                   | 30.8           | 34.3      | 157.072                              | <0.05*   |
| Wildlife needs protection because of wealth  | 40.9                         | 25.6           | 33.5      | 26.3                   | 27.8           | 46.0      | 206.681                              | <0.05*   |

\**P*-value is significant at 0.05 alpha levels

**Table 3** Compensation constructs to improve co-existence with wildlife

| Group 2 (Compensation)   | Cross River<br><i>n</i> =203 |                |           | Okomu<br><i>n</i> =198 |                |           | Chi-square test for 'agree response.' |          |
|--|------------------------------|----------------|-----------|------------------------|----------------|-----------|---------------------------------------|----------|
|  | Disagree (%)                 | Don't know (%) | Agree (%) | Disagree (%)           | Don't know (%) | Agree (%) | X <sup>2</sup>                        | <i>P</i> |
| Wildlife does not need protection because they destroy our crops                                     | 61.6                         | 14.8           | 23.6      | 32.3                   | 28.3           | 39.4      | 193.988                               | <0.05*   |
| In my view, farmers are more tolerant where there is plenty of labour available in the conflict area | 12.8                         | 45.3           | 41.9      | 53.0                   | 33.3           | 13.6      | 216.780                               | <0.05*   |
| Reason for low tolerance to wildlife is because the destruction of high-yielding cash crops          | 61.1                         | 22.2           | 16.7      | 37.4                   | 31.8           | 30.8      | 224.610                               | <0.05*   |
| Compensation for crops can improve tolerance to wildlife damage                                      | 21.7                         | 26.1           | 52.2      | 23.7                   | 27.8           | 48.5      | 18.962                                | >0.05    |
| Farmers' tolerance is a key factor in achieving conservation goals                                   | 7.4                          | 32.0           | 60.6      | 23.3                   | 22.2           | 54.5      | 16.841                                | >0.05    |
| Loss to livestock are less tolerable than loss to crops  | 36.9                         | 44.3           | 18.7      | 34.3                   | 45.5           | 20.2      | 18.314                                | >0.05    |

\**P*-value is significant at 0.05 alpha levels

#### *Analysis of variance between groups and occupation of respondents in CRNP and ONP among the three groups*

The results (CRNP) revealed that there was no statistically significant difference between groups 1 and occupational level  $F(5,197)=1.686$ ,  $p=0.140$  (ns,  $p>0.05$ ) while groups 2 and 3 reported a

statistically significant difference between group 2  $F(5,197)=4.044$ ,  $p=0.002$  ( $p<0.05$ ) and group 3  $F(5,197)=2.607$ ,  $p=0.026$  ( $p<0.05$ ). Turkey's post hoc test for group 2 and group 3 showed differences. In ONP, the results indicated that there was no statistically significant difference in group 3  $F(5,192)=1.493$ ,  $p=0.194$  ( $p>0.05$ ). While group 1 and 2 indicates statistically significant differences,



**Table 4** Benefits of wildlife for improved co-existence

| Group 3 (Benefits of Wildlife)   | Cross River<br><i>n</i> = 203 |                |              | Okomu<br><i>n</i> = 198 |                |              | Chi-square<br>test for 'agree<br>response.' |          |
|--|-------------------------------|----------------|--------------|-------------------------|----------------|--------------|---|----------|
|  | Disagree<br>(%)               | Don't know (%) | Agree<br>(%) | Disagree<br>(%)         | Don't know (%) | Agree<br>(%) | X <sup>2</sup>                              | <i>P</i> |
| Social benefit of wildlife have made me more tolerant to wildlife conflicts                            | 40.9                          | 47.3           | 11.8         | 33.3                    | 33.3           | 33.3         | 144.541                                     | <0.05*   |
| Economic benefits of wildlife do not reach community which reduces wildlife tolerance                  | 13.3                          | 23.6           | 63.1         | 52.0                    | 29.3           | 18.7         | 161.980                                     | <0.05*   |
| I believe that if benefits are sure to reach locals of the community, wildlife tolerance will increase | 33.5                          | 12.8           | 53.7         | 38.4                    | 42.9           | 18.7         | 135.835                                     | <0.05*   |
| Social benefits of wildlife tourism have made the community more tolerant of wildlife                  | 12.3                          | 9.4            | 78.3         | 36.9                    | 33.3           | 29.8         | 167.660                                     | <0.05*   |

\**P*-value is significant at 0.05 alpha levels

group 1  $F(5,192) = 3.758, p = 0.003 (p < 0.05)$  and Group 2  $F(5,192) = 4.038, p = 0.02 (p < 0.05)$ .

*Turkeys post hoc test for occupation*

Compensation, benefits and peaceful co-existence with wildlife and the local community contribute to reducing human-wildlife conflicts. Johnson et al. (2018) noted that compensation is an essential livelihood strategy for mitigating economic losses as a result of livelihood disruption for local communities. Dickman et al. (2010) and Nyhus (2016) also indicated the importance of economic benefits as a means to alleviate the negative impacts of conflicts, while co-existence comprises various management strategies.

Hence the relevance of the post-hoc analysis is to identify significant differences among the occupational groups because occupation plays a paramount role in human-wildlife interactions.

The post hoc tests indicate no significant effects of occupation on Group 1 in CRNP; however, there were significant effects of occupation on Group 1 in ONP  $p < 0.05$  in (Table 5). Post hoc comparisons using the Tukey test indicated that the mean score for hunters ( $M = 9.82$ ) and NTFP ( $M = 10.05$ ) was significantly different from loggers ( $M = 12.45$ ), while the other occupations overlapped both subsets.

Tukey's test (Table 6) showed significant differences in both parks. In CRNP, the hunters significantly differed from civil servants ( $M = 20.33$ ) and loggers ( $M = 20.86$ ), while in ONP, the occupations

**Table 5** Co-existence with wildlife conservation at Cross River and Okomu National Parks

| Tukey B       |          | Subset for alpha = 0.05 |          | Subset for alpha = 0.05 |       |
|---------------|----------|-------------------------|----------|-------------------------|-------|
| CRNP          |          | ONP                     |          | 1                       | 2     |
| Occupation    | <i>N</i> | Occupation              | <i>N</i> |                         |       |
| Hunter        | 21       | Logging                 | 29       | 9.82                    |       |
| Ntftp         | 59       | Ntftp                   | 18       | 10.05                   |       |
| Farmer        | 47       | Teacher                 | 78       | 11.05                   | 11.05 |
| civil servant | 18       | Farmer                  | 27       | 11.22                   | 11.22 |
| Teacher       | 29       | Hunter                  | 13       | 11.38                   | 11.38 |
| Logging       | 29       | Others                  | 33       |                         | 12.45 |

**Table 6** Compensation for wildlife destruction at Cross River and Okomu National Parks

| Tukey B       |    |                       |       |            |    |                       |       |
|---------------|----|-----------------------|-------|------------|----|-----------------------|-------|
| CRNP Group 2  |    | Subset for alpha=0.05 |       | ONP        |    | Subset for alpha=0.05 |       |
| Occupation    | N  | 1                     | 2     | Occupation | N  | 1                     | 2     |
| Hunter        | 21 | 16.76                 |       | Logging    | 29 | 15.89                 |       |
| Farmer        | 47 | 18.85                 | 18.85 | Ntftp      | 18 | 17.00                 | 17.00 |
| Ntftp         | 59 | 19.06                 | 19.06 | Hunter     | 13 | 17.23                 | 17.23 |
| Teacher       | 29 | 19.20                 | 19.20 | Farmer     | 27 | 17.96                 | 17.96 |
| civil servant | 18 |                       | 20.33 | Teacher    | 78 | 18.39                 | 18.39 |
| Logging       | 29 |                       | 20.86 | Others     | 33 |                       | 19.24 |

**Table 7** Benefits of wildlife for improved co-existence

| Tukey B       |    |                       |       |               |    |                       |
|---------------|----|-----------------------|-------|---------------|----|-----------------------|
| CRNP          |    | Subset for alpha=0.05 |       | ONP           |    | Subset for alpha=0.05 |
| Occupation    | N  | 1                     | 2     | occupation    | N  | 1                     |
| Hunter        | 21 | 13.19                 |       | logging       | 29 | 10.55                 |
| Farmer        | 47 | 13.27                 |       | teacher       | 78 | 10.88                 |
| Ntftp         | 59 | 13.79                 | 13.79 | farmer        | 27 | 11.11                 |
| civil servant | 18 | 14.16                 | 14.16 | hunter        | 13 | 11.15                 |
| Teacher       | 29 | 14.58                 | 14.58 | Ntftp         | 18 | 11.55                 |
| Logging       | 29 |                       | 15.58 | Civil servant | 33 | 12.21                 |

indicating significant difference, occurring only in one subset was logging ( $M=15.89$ ) and civil servants ( $M=19.24$ ) (government workers).

In Table 7, the post hoc results indicated that Hunting ( $M=13.19$ ) and farming ( $M=13.27$ ) showed a significant difference in logging ( $M=15.58$ ) in CRNP, with logging having the highest mean, while in ONP, there was no significant difference across occupations.

## Discussion of results

The findings of this research centres on the need to explore the dynamics influencing human wildlife conflicts and wildlife coexistence in two distinct national parks Parks: Cross River National Park (CRNP) and Okomu National Park (ONP). The research works of researchers such as Badola (1998), Gadd (2005), Spiteri and Nepal (2008), Karanth and Nepal (2012) set precedence for this study however some of the findings of this study deviated from the established trends in literature.

**Education and participation** Contrary to the prevalent trend in previous studies, our research discovered a divergence in the relationship between conservation support and education. while previous studies suggested that there was a negative inclination towards protected areas among residents with less education, this study revealed a different trend. ONP respondents had higher educational qualifications did not show as much enthusiasm for conservation as compared to their CRNP counterparts with lower status of education. The role education plays in shaping peoples attitudes and perception towards conservation as highlighted by Nyhus & Tilson (2010) and Rust (2015) remains evident but in this research the widely accepted view to an unexpected turn.

**Agricultural activities and human-wildlife conflict** Agricultural activities in the study area indicated the significance of land availability in finckencing coexistence with wildlife, CRNP communities revealed a higher involvement in farming, hunting and harvesting of non-timber forest products. Hence their support for more land for these activities will help in

improving their ability to coexist with wildlife and support conservation projects. The access to natural resources, arable land and non-timber forest products changes the dynamics of coexistence. Conversely, ONP communities were less engaged in farming and did not share the same perspective thus emphasizing the contextual nature of such dynamics.. A large number of Protected Areas do not have fences and, as such, grant access to individuals, wildlife and also livestock which is similar to the findings of Karanth et al. (2013), who conducted a study in three parks in India (Ranthambore, Kanha, and Nagarhole National Parks). This access to land is beneficial as long as it does not infringe on Protected Area sites Okello (2005) observed that individuals involved in farming operations in adjacent conservation areas usually have negative opinions about Protected Areas because of crop damage caused by wildlife, thus influencing their support for conservation and wildlife.

### Community participation and benefits

This study shed light on varying levels of community willingness to be part of conservation projects in a bid to support coexistence. CRNP communities enthusiasm was driven by an anticipation of economic and social benefits. On the other hand ONP communities were more emphatic about the need for collective tangible benefits that are beneficial to the community. These views were expressed by Digun-Aweto et al., (2019a, b) and aligning with the works of Wijesundara and Wimalaratana (2016) and Mensah (2017).

**Trust and conservation support** The lack of trust between local communities and protected Area management emerged as a very critical factor particularly in ONP. The lack of trust may be borne out of past experiences with management in regarding unkept promises/ the lack of trust was identified as a major barrier negatively influencing coexistence, tolerance and community support for conservation projects. This result echoes the findings of previous studies by Newmark et al. (1993), Madden (2004), Jamal and Stronza (2009), and Nastran (2015). The repercussion of distrust breeds grounds for illegal activities, retaliatory killings, poaching, disregard for conservation laws and illegal logging underscoring the urgent need for interventions to build transparency and trust.

Tchakatumba et al. (2019) noted that the risk-associated costs, and in particular perceived costs accruing to locals due to ensuring co-existence, at the household levels are the highest but lowest at the benefits levels, further noting the lack of involvement and transparency at decision-making levels.

**Occupation and conservation impact** The study delved into the impact of various occupations on coexistence and support for conservation. Occupations such as logging (both legal and illegal) and harvesting of non-timber forest products were identified as activities that have the potential to be detrimental to biodiversity and human wildlife coexistence. Based on these occupation types, the frequency of encounters with wildlife are likely to be higher than other members of the communities engaged in other occupations. Government workers (civil servants) were observed to engage in alternative income generating activities also thereby increasing their likelihood of encountering wildlife.

**Occupational focus for conservation initiatives** Due to the observed impacts of different occupation, this research underscores the importance of tailoring conservation initiatives to focus on occupational nuances around these homogeneous groups of individuals within communities. Specific attention should be paid to hunter groups in protected areas although these groups are peculiar and could be challenging to deal with, the potential negative consequences of hunting endangered species which mirrors the concerns raised by Bergl et al. (2012).

The unexpected findings challenge some already established ideas in literature while highlighting the need for context-specific, nuanced approaches to improve human-wildlife coexistence and approaches to conservation initiatives. Policy makers can develop more effective strategies by taking into consideration education, occupation and community perceptions to foster better human-wildlife coexistence outcomes and garner more support for Protected Areas.

### Conclusion

In conclusion, this research presented a nuanced understanding of how the dynamics are influencing

human-wildlife coexistence in two distinct national parks, Cross River National Park (CRNP) and Okomu National Park (ONP). The impact of education is usually considered to be a positive influence on conservation support. However, this study revealed a deviation from the expected trend where communities with lower educational status showed more support for conservation and coexistence with wildlife. This research found out that respondents with higher education in ONP did not exhibit much enthusiasm for conservation like their CRNP counterparts with lower educational status. This unexpected result highlights the dynamic contextual relationship between education and conservation attitudes cum support for biodiversity conservation.

This study points to the importance of ensuring that conservation initiatives are tailored around occupational nuances within communities paying special attention to occupations that are directly dependent on natural resources cum those that have increased level of contact with wildlife. There is the need for a clear call focusing on human-wildlife coexistence and conservation taking into consideration context specific and nuances in tailoring such initiatives. In the light of this, policy makers need to consider these nuanced differences between community groups to ensure better outcomes and garner increased support for protected areas while improving coexistence with wildlife. This research has highlighted the multidimensional nature of human wildlife interactions, calling for an adaptable and comprehensive approach for sustainable efforts for conservation.

**Funding** Open access funding provided by North-West University. No funding was received to assist with the preparation of this manuscript.

#### Declarations

**Competing interests** The author have no competing interests to declare that are relevant to the content of this article.

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