

Population structure and spatial distribution of mammals in Cross River National Park, Cross River State, Nigeria

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ABSTRACT

Inadequacy of information on variations in seasonal population structure and spatial distribution of mammalian species in Cross River National Park affects their management and conservation. A survey of mammals was therefore carried out in the Park (Oban and Okwangwo divisions), to ascertain species population structure and spatial distribution. The survey involved direct and indirect observation of animals using line transects for day time visual counts. Data collected were presented in form of descriptive statistics and maps. The mammalian species observed in the park were Blue Duiker, *Philantomba monticola*; Red Flank Duiker, *Cephalophus rufilatus*; Buffalo, *Syncerus caffer*; Forest Elephant, *Loxodonta africana*; Putty Nose Monkey, *Cercopithecus nictitans*; Mona Monkey, *Cercopithecus mona*; Red River Hog, *Potamochoerus porcus*; Cane Rat, *Thryonomys swinderianus*; Tree Squirrel, *Paraxerus cepapi*; African Giant Squirrel, *Protoxerus stangeri*; Porcupine, *Atherurus africanus*; Mongoose, *Herpestes naso*; Civet Cat, *Viverra civetta*; Tree Pangolin, *Manis tricuspis*; Galago *Galago senegalensis*; and Red Tailed Monkey, *Cercopithecus ascanius*. The proportion of adults to juveniles varied among the mammalian species. Oban Ranges contained significantly more adults than juveniles in both dry and wet season (for most species) while Okwangwo Range had more juveniles than adult in both dry and wet season. This is an indication of serious effects of deleterious anthropogenic activities in Oban division. The greater number of juveniles in Okwangwo division gives an insight to the wanton number of animals of same species killed in Oban on annual basis. The decimating population structure could lead to local extinction of species if more effective conservation strategies are not adopted. There was a cluster distribution of animals during wet season in Oban division unlike in the dry season. Distribution of animals was influenced by availability of food and water during dry season. Introduction of well planned, properly implemented and consciously monitored ecotourism that encourages participation of host communities will improve conservation and population structure of the species.

Keywords: Biodiversity Conservation, Cross River national park, population structure, spatial distribution, mammals.

INTRODUCTION

Over the years, protected areas have been set aside from human activities for different reasons which includes scenic beauty, protection of a single species, hunting reserve, waters catchment and possibly because the land is worth little for other purposes (Pressey, 1994). Eventually, these protected areas became national parks and game reserves. Information on spatial distribution, abundance and population structure is very important to the understanding of their significance as ecological driving force and their development for tourism purposes. This information is also vital in evaluating conservation hotspots, ecotourism potential for game viewing, the nature and extent of wildlife - human conflicts and sustainable harvesting of bush meat by local communities (Newmark *et al.*, 1994; Naughton – Trevee, 1998).

There is no protected area in the world where encroachment is not experienced, though the form and rate differs. In the case of Nigeria every game species including those abundant in national parks are under pronounced threats of either hunting or habitat destruction. Destruction of wildlife habitats has remained the leading threat to biodiversity in Cross River National Park. Evidence of unchecked human activities like deforestation, unchecked hunting of wildlife, grazing of livestock, farming activities, socio-economic, and environmental pollution with negative effect on the survival of mammals in Cross-River National Park have been documented. A greater percentage of this destruction is centered on the forest ecosystems found in tropical Africa, Asia and America (FAO, 1991). Previous findings underscore the global significance of this biodiversity hotspot and provide solid evidence that it is extremely

threatened (Eniang, 2003; John, 2002). It therefore becomes imperative to conduct periodic assessments of bio resources (especially the mammals) of the park. The variations in the seasonal population of mammalian adults and juveniles in the two divisions of the park have been reported by Oruh *et al.* (2019).

However, knowledge of spatial distribution of mammals and seasonal variation of individual species in the park is very relevant for conservation and ecotourism development purposes. Such information are needful for predicting the likely conservation status of different species in the face of prevailing anthropogenic influences (Ijeomah *et al.*, 2011). It also gives an insight concerning the migratory tendency of species as influenced by changing habitat condition. The study therefore assesses the population structure and spatial distribution of mammalian species in the two divisions of Cross River National Park.

METHODOLOGY

Study Area

The study was carried out in Cross River National Park (CRNP) located in Cross River state of Nigeria. It has two separate sections, Oban division and Okwangwo division which were established in 1988 and 1991 respectively. CRNP has a total area of approximately 4000km² most of which consist of the primary moist tropical rainforests in the North and Central parts, with mangrove swamps on the coastal zones. Parts of the park belong to the Guinea-Congolian region, has been identified as a biodiversity hotspot as it has one of the oldest rainforests in Africa (CRNP, 2010). The park lies within longitude 5° 5¹ and 6° 29¹ N and Latitude 8° 15¹ and 9° 30¹ (Figure 1).

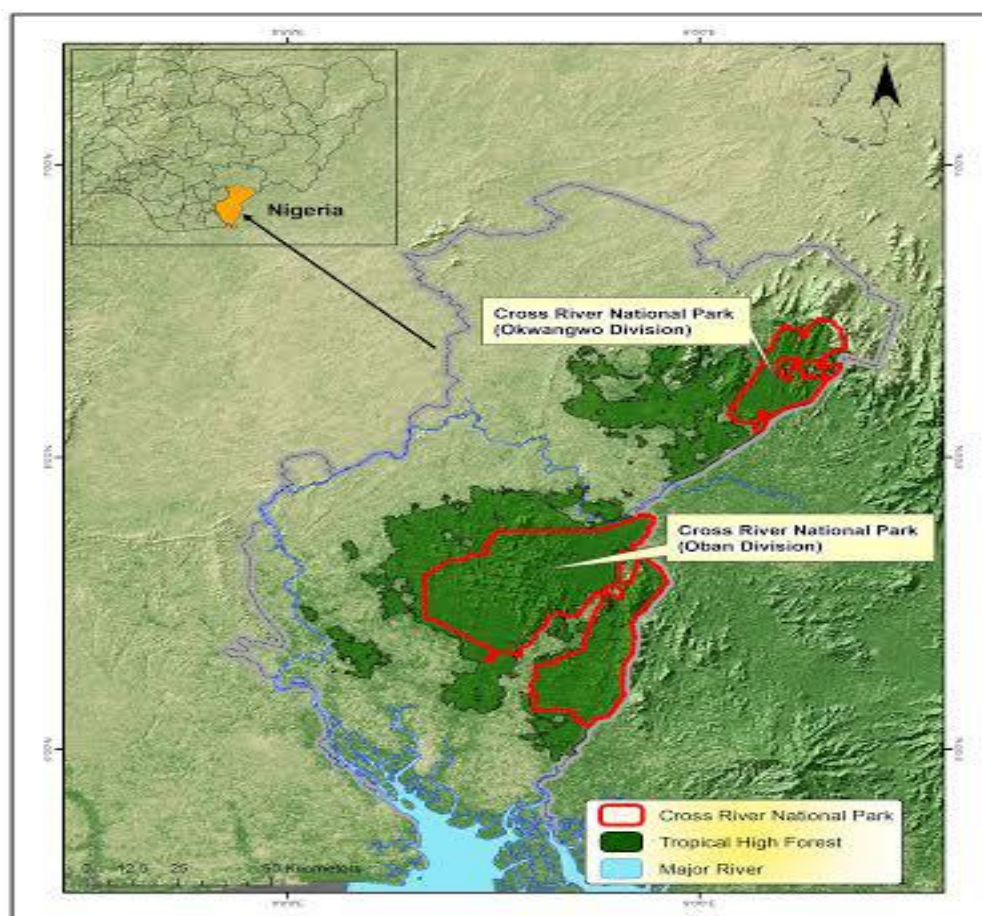


Figure 1: Map of Cross River State showing Cross River National Park.

Source: Oruh *et al.*, 2019.

Sampling Techniques

A census of mammals was conducted in the park using day time visual counts, nest and dung counts, searching at natural stream, and fresh water marsh during daytime as well as *ad hoc* records of all sightings, tracks, and signs of mammals observed. Censuses were carried out five days in a week from 6.30am to 12.00pm for both wet and dry seasons. The census lasted from February to July being a period of six months

Direct observation involving the use of two line transects in each sector as described by Sutherland (1999) and Bibby and Hill (1998) was used for the survey of mammals. This

involved walking along the established transects in Oban division and Okwangwo division on each site making visual observations on both sides of the laid transect. This involved walking along the established 3km transect in Oban division and 1km transect in Okwangwo division on each site making visual observations on both sides of the laid transect. However, averages of the values for Oban were taken (before analysis) to enable comparison with the values from Okwangwo as was done by Oruh *et al.* (2019). Incursions were made at 50m interval to either right or left sides of transect and the area criss-crossed in search of mammals up to

a distance of 100m from the point of entry in line with Norton-Griffiths (1996). When the target animals (mammals) are sighted, the species, number, group size, activity when first sighted and activity after sighting were recorded in accordance with Oruh *et al.* (2019). Any animal that has not reached the age for sexual maturity was recorded as a juvenile while individual animal that are sexually matured were identified as adults.

Data Analysis

Data collected were presented using descriptive statistics and spatial distribution maps. The spatial distribution maps were scaled depending on the mammalian species present and frequency of sighting.

RESULTS

Population structure of species

Results on the structure of mammalian species sighted in both divisions are presented in figures 2 to 5 for wet and dry seasons respectively.

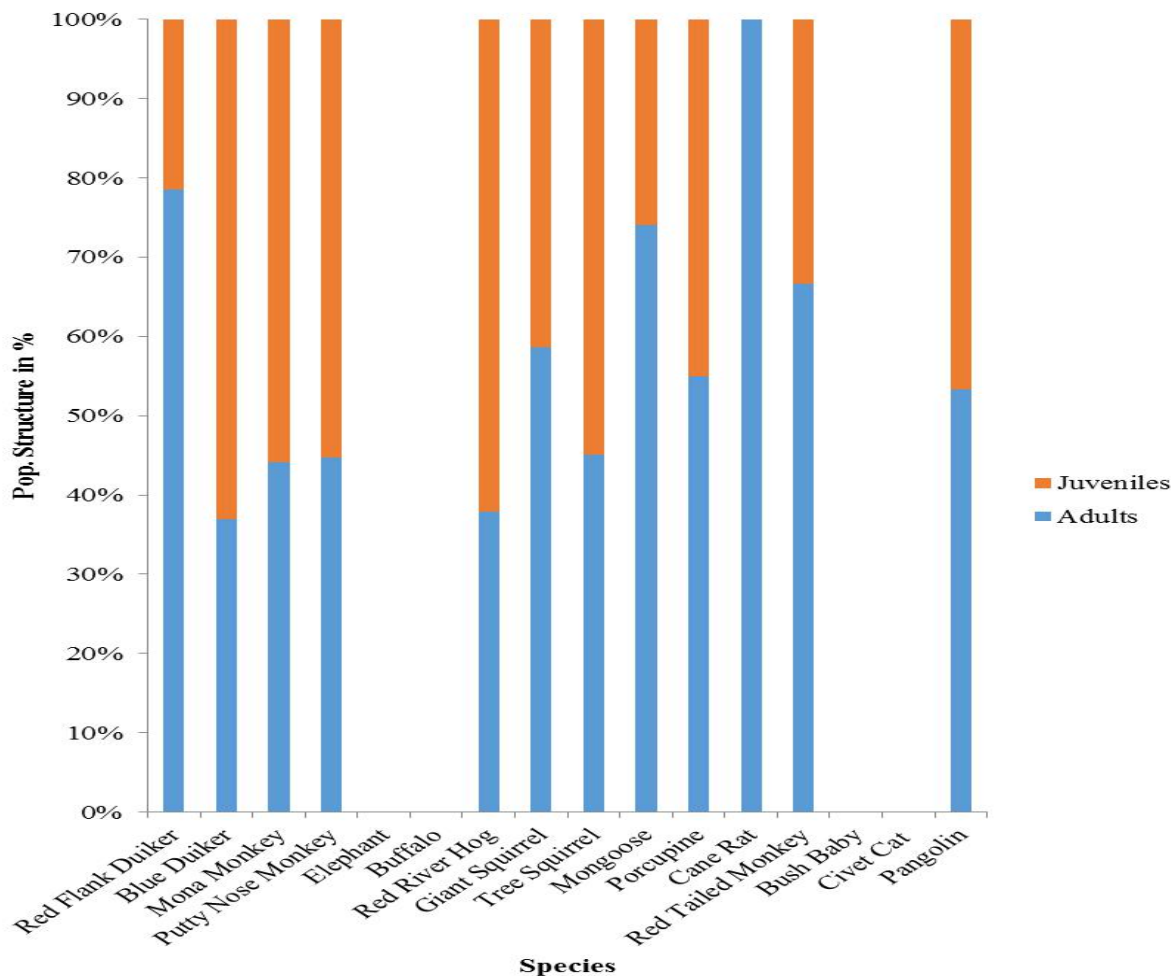


Figure 2: Population structure of mammalian species sighted during Dry season in Oban division
Source: Field Survey, 2016.

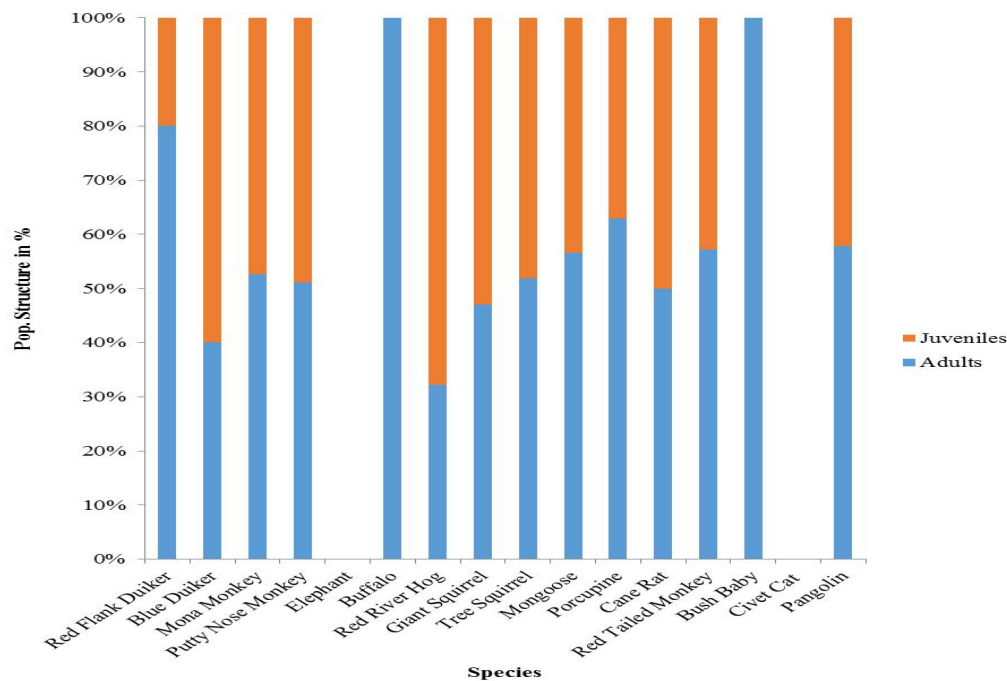


Figure 3: Population structure of mammalian species sighted during wet season in Oban division
Source: Field Survey, 2016.

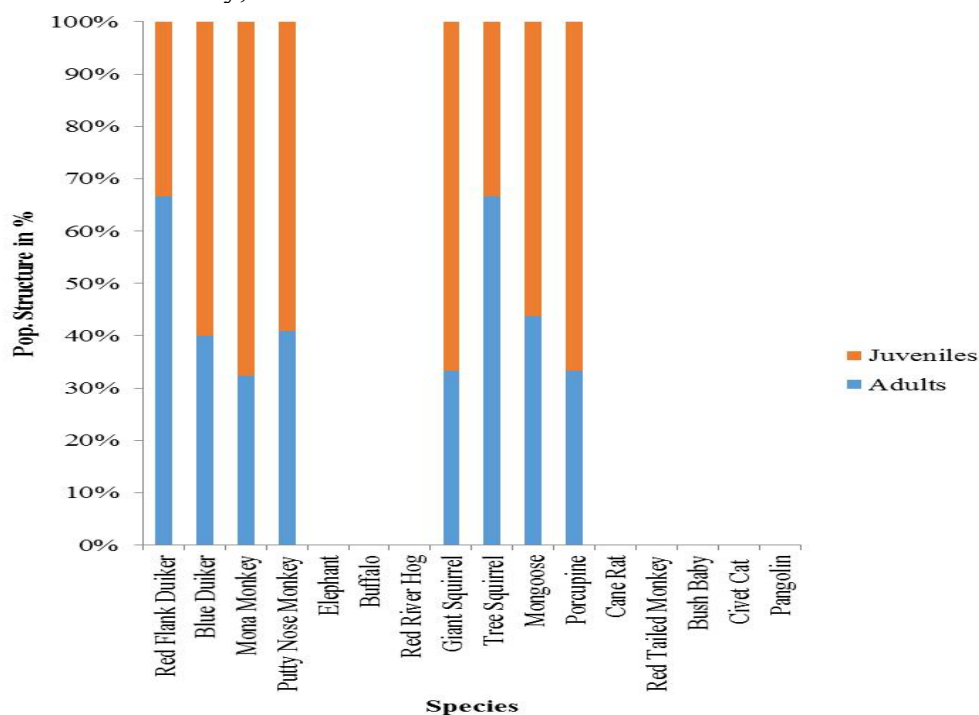


Figure 4: Population structure of mammalian species sighted during Dry season in Okwangwo division
Source: Field Survey, 2016.

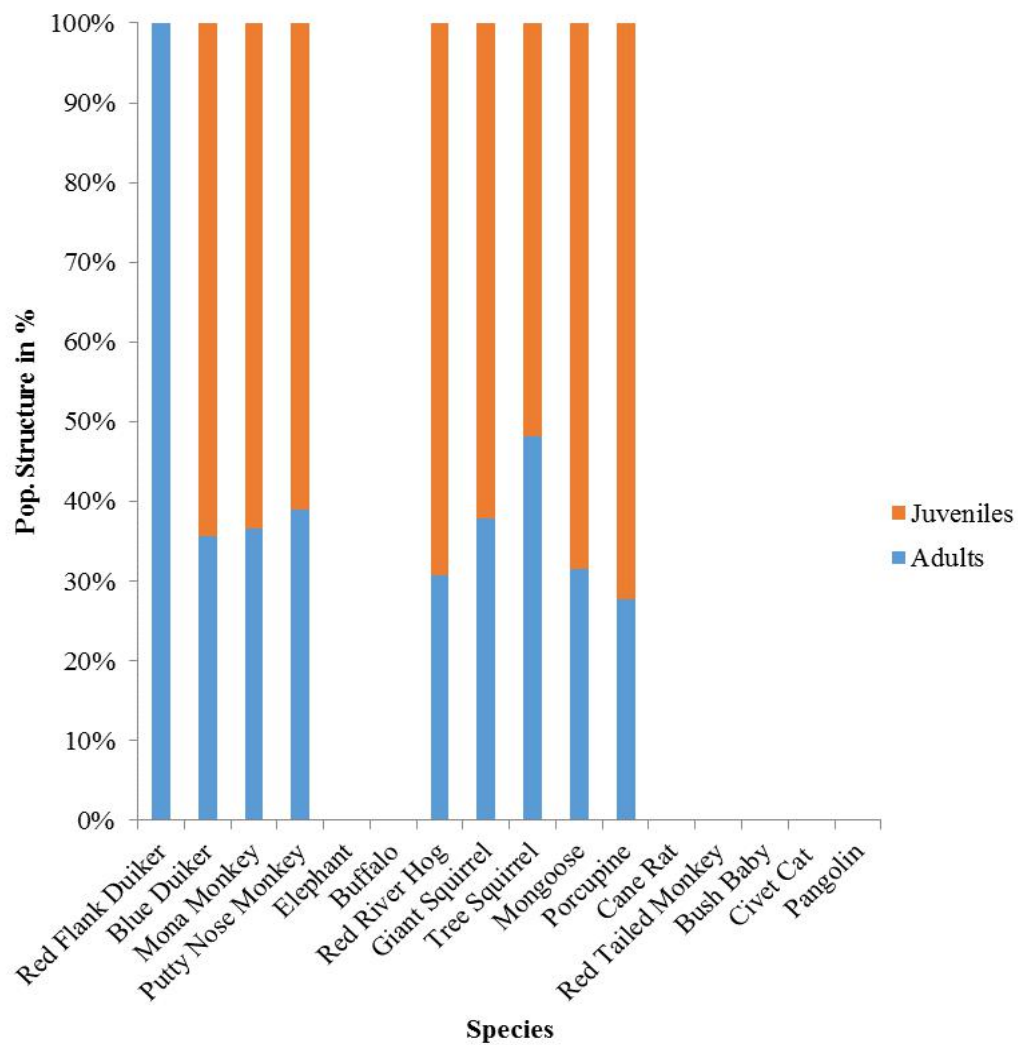


Figure 5: Population structure of mammalian species sighted during Wet season in Okwangwo division

Source: Field Survey (2016).

Spatial Distribution of Mammals in Oban and Okwangwo divisions

The results for spatial distribution of mammals in both divisions are presented in figures 6 to 9.

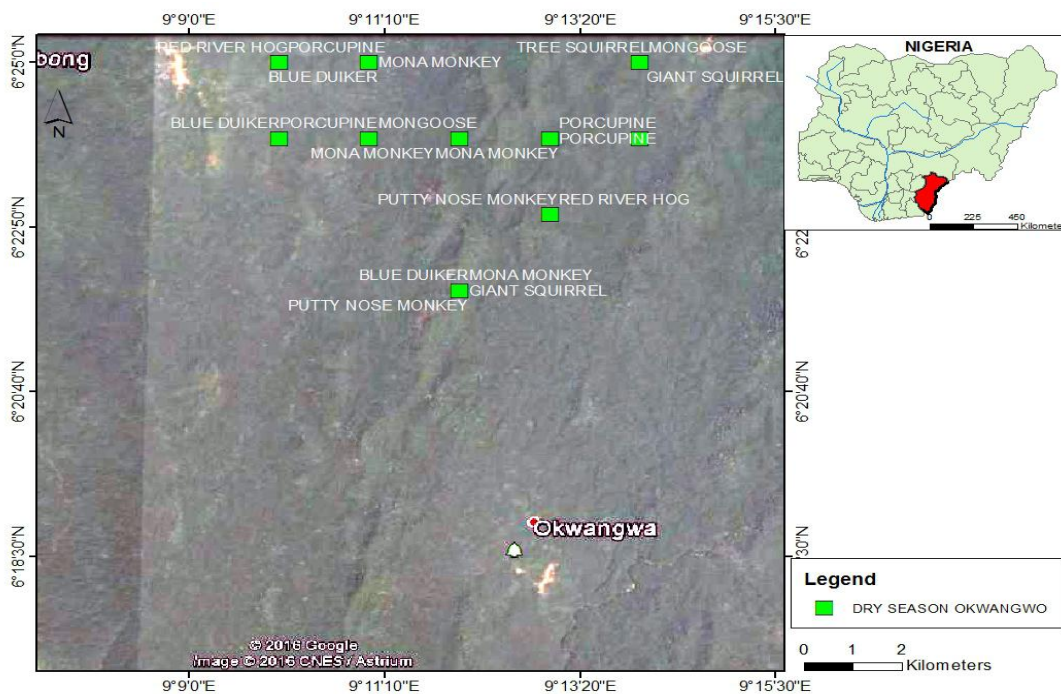


Figure 6: Spatial distribution of mammals in Okwangwo division for dry season
Source: Field Survey, 2016.

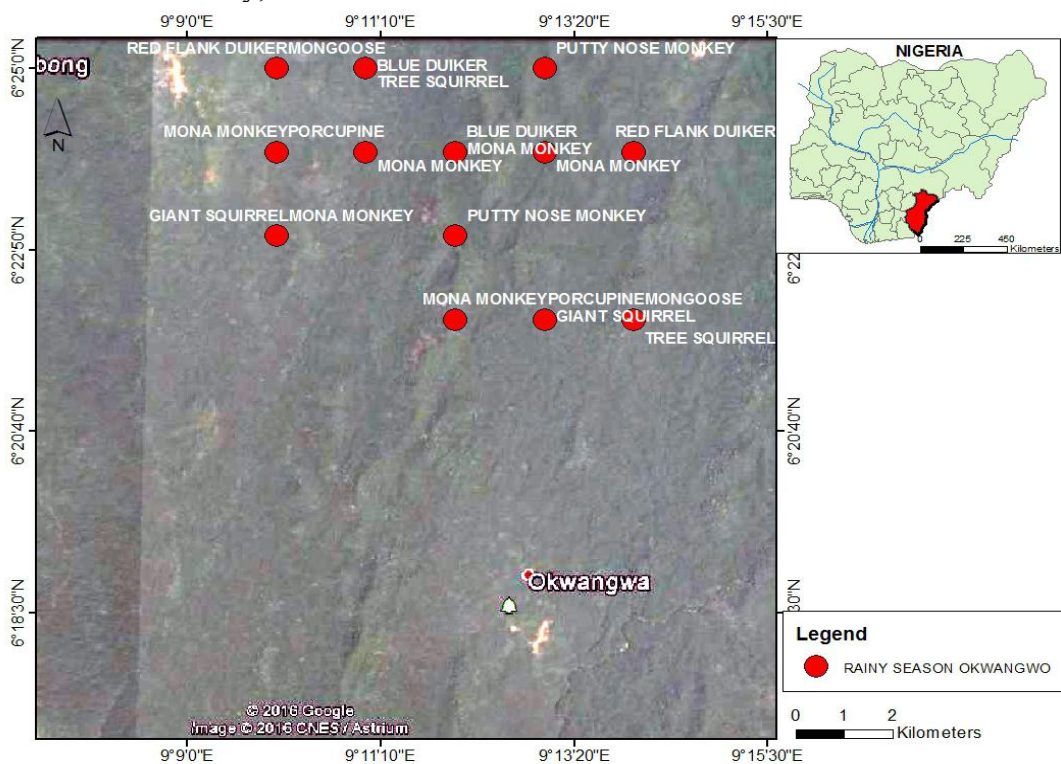


Figure 7: Spatial distribution of mammals in Okwangwo division for wet season
Source: Field Survey, 2016.

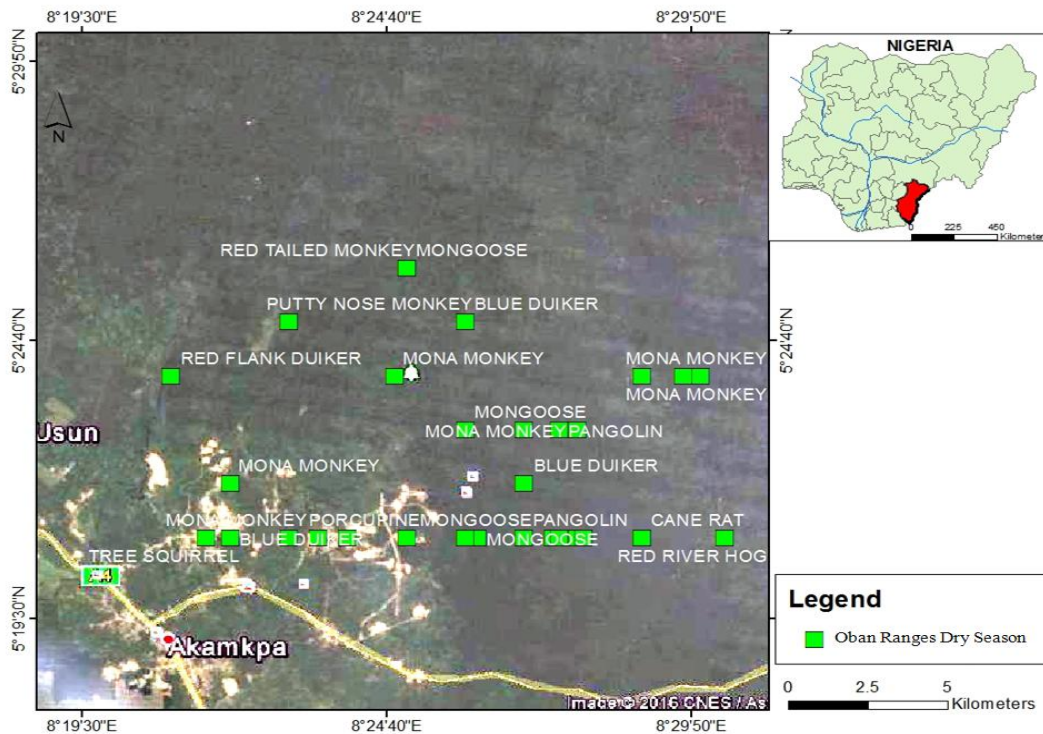


Figure 8: Spatial distribution of mammals in Oban division for dry season
Source: Field Survey, 2016.

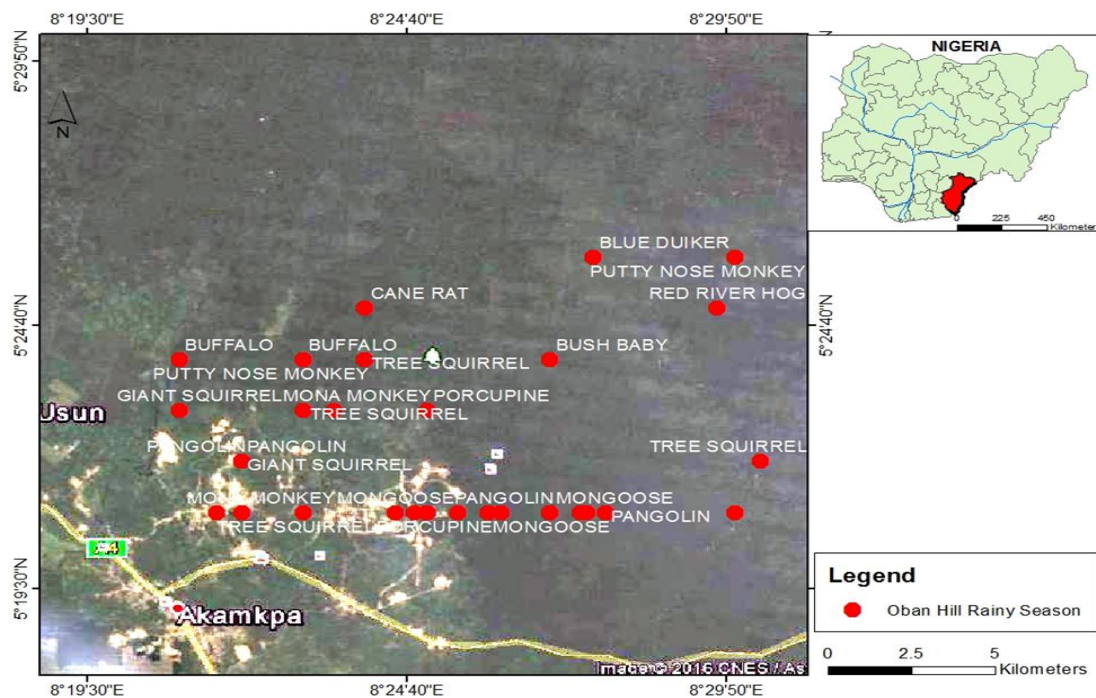


Figure 9: Spatial distribution of mammals in Oban division for wet season
Source: Field Survey, 2016.

DISCUSSION

The proportion of adults to juveniles varied among mammalian species. Adults outnumbered Juveniles for many mammalian species during the dry and wet season in Oban division and Okwangwo division while juvenile outnumbered adults in other species during the dry and wet season in Oban division and Okwangwo division. On division basis, the result indicated that there were more adults than juveniles in Oban division for both dry and wet season, although *Thryonomys swinderianus* (no Juvenile sighted) in Oban division during dry season and no juvenile sighted for *Syncerus caffer* and *Cercopithecus ascanius* during the wet season. The reduction in number of juveniles for most species for only a season could be attributed to seasonal effect of changes in habitat in terms of level of environmental variables, but occurrence of these reductions in both seasons implies a decreasing population structure for the species involved. This is a pointer to decimating population structure which tends towards local extinction for the respective species. Among the few species with higher percentage of juveniles than adults in Oban were Putty nose Monkey (*Cercopithecus nictitans*), Mona monkey (*Cercopithecus mona*), Red flanked duiker (*Cephalophus rufilatus*) and blue duiker (*Philantomba monticola*). These species are known to be very agile animals whose juveniles can easily escape from danger alongside the adults. The juveniles of Red river hogs (*Potamochoerus porcus*) are hard and very agile to equally escape from danger. In the case of Tree squirrel (*Paraxerus cepapi*) the juveniles are more decimated by predators than poachers because the move on tree canopies. This result is in agreement with the findings of Ijeomah and Efenakpo (2011) that many juveniles of crocodile in Niger delta region of Nigeria hardly grow to adult size as they stray out to feed and always get entangled in fishing nets

sets by fishermen. It does not also mean that adult individuals of species were not affected by the decimating factors in Oban division but juveniles were more vulnerable to be killed - the fleeing movement and fastness of adults than the juveniles when disturbed by human activities exonerates many adults from death. The vulnerability level of population stage of a species is habitat dependent.

Juveniles outnumbered adult's population of mammalian species in Okwangwo division (in both the dry and wet seasons) except for *Cephalophus rufilatus* (no sighted juvenile) during the dry season as shown in Figure 4. This is an indication of growing population structure, and shows that the level of decimation of mammals in Okwangwo division is less than that of Oban. Mammalian species of all stages move more freely in Okwangwo than Oban division. This agrees with the findings of Ijeomah *et al* (2013) that animals move more freely in Oli than other ranges of Kanji Lake National Park. Although Getachew and Afework (2015) noted that older animals frequently rank higher in social level and may be caught first and more often than the juveniles, it does not mean that juveniles were not decimated at all in Okwangwo division -the level of anthropogenic impact in the division is less. The difference in the number of juveniles for same species of same breeding rate in similar season gives an insight of wanton number of juveniles killed in Oban division. Comparatively, there were more young individuals during the wet season than the dry season. This may be due to the correlation between rainfall and seasonality in reproduction. This could be associated with the influence of rainfall, which facilitates the growth of ground cover and availability of food, which in turn, enhances breeding. This agrees with the report of Afework and Leirs (1997), Tilaye (2005), Makundi *et al.*, (2006)

and Fichet-Calvet *et al.*, (2009) on the positive effect of rainfall on population dynamics. that during the wet season, young individuals represent the basis of the pyramid. The observations made in the current study suggest that breeding of most of the small mammalian species in the study area was during the wet season. Generally Oban division has the highest proportion of mammal's population during the wet season. However, Serekebirhan *et al.*, (2011) have noted that there is a continuous breeding of these species throughout the year. Besides rainfall, which is linked to reproduction, dietary requirement of mammals obviously change in quality and quantity within seasons, increasing during the wet season. Such variations certainly determine the peak period of pregnancy and survival of the mammal species.

The population of mammals were not evenly distributed in both areas (Oban and Okwangwo divisions) as indicated from the different transect. The spatial distribution maps are scaled depending on the mammalian species present and frequency of sighting. The field observations suggest that high concentrations of mammals in some areas of the park could be related to availability of food, shelter, less hunting and farmland encroachment. Findings by Oruh *et al* (2019) reported of reduced poaching activities in Oban division during wet season due to the inability of poachers to access the area. The clustering of many species in Oban division during wet season indicates abundance of food. When food is abundant individual animals feed freely unlike in the time of scarcity (as always experienced during dry season) when animals spread and migrate to far distances to search for food. However, animals tend to congregate in riparian environments for water, succulent vegetation and prey species during dry season. The

spatial distribution maps gives insight on when to site species at different seasons of the year in the two divisions of the park. The cluster distribution of animals makes citing of the species easy by tourists.

CONCLUSION

The population structure of mammalian species showed that the proportion of adults to juveniles varied with species and with division. Adults outnumbered juveniles for many species during the dry and wet season for Oban division while juvenile outnumbered adults in most species during the dry and wet season in Okwangwo division. Many mammalian species in Oban have decimating population structure and therefore requires a more serious and effective conservation effort to prevent threatened species from becoming locally extinct.

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