

## PRESENCE AND DISTRIBUTION OF RELICT *LOXODONTA CYCLOTIS* (AFRICAN FOREST ELEPHANT) POPULATIONS IN SOUTHERN NIGERIA

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### ABSTRACT

*Loxodonta cyclotis* (African forest elephant) populations in Nigeria are small, confronted with increasing habitat fragmentation and face a high risk of extirpation. This study was aimed at establishing the presence and determining the distribution of *L. cyclotis* populations in Omo Forest Reserve (OFR), Ogun State, Okomu National Park (ONP), Edo State and the Oban (CRNP\_Ob) and Okwango (CRNP\_Ok) Divisions of Cross River National Park (CRNP), Cross River State in Southern Nigeria. Interviews, direct field observations and recce surveys incorporating the 'travel recce' method were used for data collection. Direct sighting, camera trap footages, presence of poached carcass and signs of *L. cyclotis* activities verified the presence of *L. cyclotis* populations while field collated spatial information was used to create distribution maps in the study areas. This study established the presence of elephants in the study sites and the results provide valuable information which is useful as a tool to guide in the development of future management plans to assist in assessing the demographic changes over time, sensitise and to raise awareness of the plight of relict *L. cyclotis* populations in Southern Nigeria.

**Keywords:** Distribution, Forest elephants (*Loxodonta cyclotis*), relict populations, Southern Nigeria, vulnerable species.

### INTRODUCTION

African forest elephants, *Loxodonta cyclotis*, are classified as Vulnerable species on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (CITES, 2016). They play important roles, ecologically as keystone species whose impact on the ecosystem is disproportionately large relative to their abundance (Beaune *et al.*, 2013; Maisels *et al.*, 2013, Turkalo *et al.*, 2018) and economically as drivers of tourism (Blanc *et al.*, 2007). They also play cultural roles as icons of the African continent (Carruthers, 2010) and in traditional medicine preparation (Soewu, 2008). These roles could be utilised to promote the conservation of this species (Reddy and Workneh, 2014).

The numbers of forest elephants have declined greatly in most known ranges and they exist in small fragmented populations (Chase *et al.*, 2016) isolated by human habitation and development, or in dense forests (Thouless *et al.*, 2016). In recent times, they have been extirpated from large portions of their habitat due to a number of anthropogenic pressures, which are considered threats to their survival (Chase *et al.*, 2016; Thouless *et al.*, 2016).

Threats faced by elephants include poaching for ivory (Wittemyer *et al.*, 2014; Milliken *et al.*, 2016; 2018; Chase *et al.*, 2016; Lindsay *et al.*, 2017; Turkalo *et al.*, 2018) and meat consumption (Obot, *et al.*, 2005; Stiles, 2011; Turkalo *et al.*, 2018). Others are habitat loss and forest fragmentation (Oates *et al.*, 2008; Ikemeh, 2009a; UNEP, 2013; Chase *et al.*, 2016; Lindsay *et al.*, 2017; Turkalo *et al.*, 2018) due to land use changes/pressure and a dense growing human population (Bouché *et al.*, 2011; Reddy and Workneh, 2014; Turkalo *et al.*, 2018) involved in farming and hunting (Obot *et al.*, 2005; Oates *et al.*, 2008). This is also driven by uncontrolled and illegal logging and the expansion of monoculture tree plantations (teak, gmelina, oil palm and rubber plantations) in the study locations (Oates *et al.*, 2008). The loss of habitat often leads to isolation of populations and Human–Elephant Conflict (Ahlering *et al.*, 2011; UNEP *et al.*, 2013; Ngcobo *et al.*, 2018). Lack of effective implementation of existing wildlife protection laws is also a challenge.

Nigeria, one of the thirty-seven (37) African elephant range states, has small, fragmented and isolated populations of the two subspecies of the African elephant; savannah elephants (*Loxodonta africana*) in the North and forest elephants (*L. cyclotis*) in the South. Such small populations face a high risk of extirpation (Zacarias *et al.*, 2016). Insufficient scientific data (Ikemeh, 2009a), and the cryptic nature of illegal killings of forest elephants makes estimation of rates of decline and impacts difficult to quantify (Maisels *et al.*, 2013; Wittemyer *et al.*, 2014). This is compounded for forest elephants due to difficulties in carrying out population surveys in forest habitats (Eggert *et al.*, 2003; Hedges, 2012; Schuttler *et al.*, 2012).

The estimated elephant range in Nigeria according to the 2016 African Elephant Study Report (AESR) was 20,088 km<sup>2</sup>, with an estimated total elephant population of 94 although there could be an additional 169 to 463 elephants in areas not systematically surveyed. The savannah elephant populations in Kambari Game Reserve (GR), Sambisa GR, Marguba Forest Reserve (FR), Chad Basin National Park (NP) and Gashaka Gumti NP were listed as lost populations

(Thouless *et al.*, 2016) in the AESR as it was believed that the species no longer inhabited the locations. Even with its very small and continually dwindling elephant populations, Nigeria is heavily implicated in the illicit ivory trade (Milliken *et al.*, 2018). Export figures showed that Nigeria trades annually a volume of ivory exceeding that of its current live elephant populations. Most large consignments of ivory from Nigeria were believed to constitute ivory from the Central African sub region (Milliken *et al.*, 2016; 2018).

The known forest elephant ranges in Southern Nigeria are Andoni Island, Okomu National Park (ONP), Omo Forest Reserve (OFR), Cross River National Park (Okwango division) (CRNP\_Ok) and Taylor Creek (Blanc *et al.*, 2007). Akure, Ofosu and Idanre Forest Reserve s (Ikemeh, 2009b) and Ifon Game Reserve (Adeleke *et al.*, 2008) were recently added as known ranges in the updated 2016 AESR (Thouless *et al.*, 2016) (Table 1). The estimated numbers of forest elephants in most of these ranges are from old surveys. In the 2016 AESR, estimates of 30 for OFR and 12 for ONP were derived from guesses in 1994 and 2015 surveys respectively while the estimate of 74 from the 1998 dung count in CRNP\_Ok was retained since no surveys have been carried out since then (Thouless *et al.*, 2016). There was no estimate for the forest elephants population in Cross River National Park, Oban Division (CRNP\_Ob) which is distinctly separated from CRNP\_Ok by a land mass of over 50 km<sup>2</sup> of discontinuous forest interspersed with human habitation (Ogogo *et al.*, 2014). Surveys in OFR, gave estimates of 35 (Oates *et al.*, 2008) and 28 (Amusa *et al.*, 2017). Ikemeh, (2009a) recorded signs of forest elephant activities in her study. Amusa *et al.* (2017) recorded 33 forest elephants in ONP.

**Table 1: African Elephant Status Report (AESR) for Southern Nigeria populations**

INPUT ZONE	AREA (km <sup>2</sup> )	SURVEY DETAILS <sup>1</sup>			POPULATION ESTIMATES						95% C.L.	Cause of Change <sup>2</sup>	PFS <sup>3</sup>
		Type	Reliability	Year	1995	1998	2002	2007	2011	2016			
Andoni Island	215	OG	D	2011	30	30	6	6	6	2	12*	NG	2
<b>Cross River NP (Okwango)</b>	<b>239</b>	<b>DC</b>	<b>E</b>	<b>1998</b>	-	<b>74</b>	<b>74</b>	<b>74</b>	<b>74</b>	<b>74</b>	<b>56</b>	-	<b>1</b>
Ifon GR	283	OG	D	2007	-	-	-	-	-	5	3*	NP	2
<b>Okomu NP</b>	<b>1,082</b>	<b>OG</b>	<b>D</b>	<b>2015</b>	<b>40</b>	<b>30</b>	<b>40</b>	<b>40</b>	<b>40</b>	<b>12</b>		<b>NG</b>	<b>2</b>
<b>Omo FR</b>	<b>1,300</b>	<b>OG</b>	<b>E</b>	<b>1994</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>30</b>	<b>20*</b>	-	<b>2</b>
Taylor Creek	145	OG	E	1993	25	30	25	25	25	25		-	2

KEY TO TABLE 1

<sup>1</sup> SURVEY DETAILS

**Type:** DC: Dung Count; OG: Other Guess.

**Survey Reliability** is keyed A – E (Best to Worst).

<sup>2</sup> Cause of change: NG: New Guess; NP: New population; — : No Change

<sup>3</sup> PFS (Priority for Future Surveys) is ranked from 1 to 5 (highest to lowest).

**Source:** Blanc *et al.*, 2007; Thouless *et al.*, 2016

The aim of this study was to establish the presence and determine the distribution of forest elephant populations in some protected areas (PAs) in Southern Nigeria. This became necessary because of the urgent need to verify if this cryptic species is still present in these locations as surveys have not been carried out in most known ranges in Southern Nigeria for over a decade and sighting of forest elephants are rare. Results from this study will assist conservation managers in assessing demographic changes over time, guide in the development of future management plans in these sites. It will also sensitize the populace by raising awareness on the importance and plight of these relict forest elephant populations.

## **MATERIALS AND METHODS**

Appropriate authorisations to work in the Okomu National Park (ONP) and Cross River National Park (CRNP) (Oban and Okwango Divisions) were granted by the Conservator General, National Parks Service, Abuja. The Director General, Nigeria Conservation Foundation (NCF), Lekki, Lagos, granted the permission to use the Omo Forest Reserve (OFR), under the auspices of the Omo-Shasha-Oluwa Forest Initiative. Ethical approval was not required because this study involved non-invasive surveys of forest elephant signs/activities.

## **STUDY SITES**

OFR covers an area of about 1,368.06 km<sup>2</sup> and lies between latitudes 6° 35' and 7° 05' N and longitudes 4° 19' and 4° 40' E (Oke, 2013) in Ogun State (Figure 1). ONP is located between latitudes 6° 15' and 6° 25' N and longitudes 5° 9' and 5° 23' E in Edo State. The Park is on an area of about 202 km<sup>2</sup> (Olaleru and Egonmwan, 2014) located within the larger Okomu Forest Reserve (1,121 km<sup>2</sup>). The Oban division, CRNP, in Cross River State lies between latitudes 5° 15' and 5° 25' N and longitudes 8° 30' and 8° 45' E (Jimoh *et al.*, 2012) and covers an area of approximately 3,000 km<sup>2</sup>. The Okwango division lies between Latitudes 6° 17' and 6.28° 33' N and Longitudes 9° 14' and 9.23° 33' E (Ogogo *et al.*, 2014) and covers an area of about 920 km<sup>2</sup>.

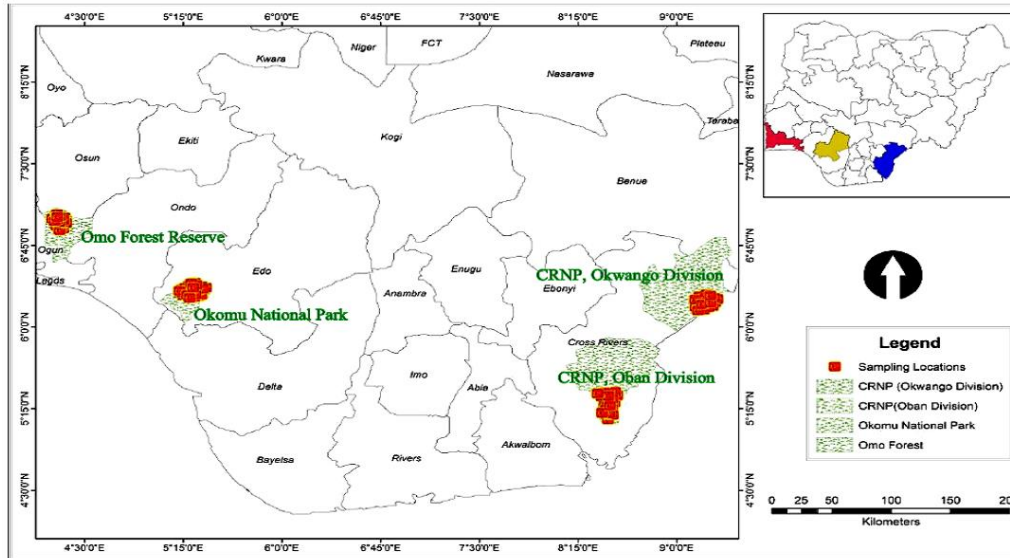


Figure 1: Map of the study locations

## FIELD SURVEYS

The surveys were carried out between December to March of 2013 - 2014 and 2014 - 2015. It served as a preliminary survey of a larger forest elephant genetic population study in the locations. Protected area staff and residents within and around the study sites were randomly interviewed to obtain first-hand knowledge on the occurrence of forest elephants in the areas. Other methods used were the direct field observations and recce sampling method incorporating the ‘travel recces’ method (Hedges and Lawson, 2006; Munshi-South, 2011; Jathanna *et al.*, 2015).

Compartments in the protected areas (PAs) were used as grids and the search teams were made up of five people including the protected area staff. The search teams followed paths of least resistance within the grids and searched for forest elephants signs such as their trails, dung piles, footprints, mud baths and other signs of forest elephants activities in the compartments and especially in the ‘hotspots’, where they were likely to be found (Hedges and Lawson, 2006; Munshi-South *et al.*, 2008; Munshi-South, 2011). Forest elephant signs encountered were noted and their locations recorded using the Global Positioning System (GPS) equipment (GARMIN 765). The point coordinates recorded were imported into ArcMap to generate the distribution maps. Camera trap footages and photos of chance encounters with forest elephants were also used to verify presence of the species in the study sites.

## **RESULTS AND DISCUSSION**

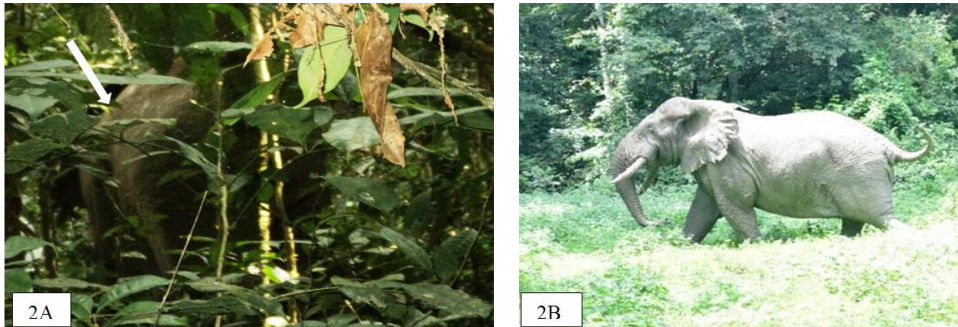
Results from interviews and direct observations showed that forest elephants were present in all the study sites. Though signs of forest elephant activities (Plates 1A – E) were observed, cases of direct sighting are rare. There were direct sightings of a lone forest elephant (Plate 2A) and a group of two forest elephants in CRNP\_Ob on January 31, 2015, at the elephant transect in Erokut. One forest elephant (Plate 2B) was also sighted at Lake 94 in ONP on March 17, 2017 while collecting faecal samples for the genetic study. Reports of direct sighting of forest elephants were given by Non Timber Forest Products (NTFPs) gatherers in the Okwango Division of the CRNP during this study.

Camera trap video footages of forest elephants were recorded in OFR on December, 2015, February 11, 2016 and April 8, 2016 (Plates 3A and 3B) and in ONP on July 2, 2014 and August 7, 2016 (Plates 4A and 4B). Poaching was recorded in OFR in 2012 and on August 8, 2013 as evidenced by the charred remains of the forest elephant carcass on Plates 5A – 5D.



**Plates 1A – 1D: Signs of forest elephant activities in the study sites**

**Plate 1A: Paths created by forest elephants; Plate 1B: Uprooted tree; Plate 1C: forest elephant dung and Plate 1D: forest elephant footprint**



**Plates 2A and 2B: Forest elephants sighted in Plate 2A: Elephant transect, Erokut, Cross River National Park, Oban Division and Plate 2B: Lake 94 in Okomu National Park**



**Plates 3A and 3B: Camera trap footages of forest elephants in Omo Forest Reserve**



**Plates 4A and 4B: Camera trap footages of forest elephants in Okomu National Park**



**Plates 5A – 5D: Charred bones of a poached forest elephant in Omo Forest Reserve**

Destruction and raiding of crops in farmlands close to these PAs were the main evidence of movements of forest elephants out of the PAs. Recent reports indicate that the elephant population in OFR roamed across the Lagos-Benin Express road to the Waterside area of Imobi-Itasin-Epe Lagoon at the border of Ogun and Lagos State. From field observations, ONP forest elephant population is believed to be completely isolated and there was no possible interchange with neighbouring forest elephant populations but its activities were prominent on the fringes of the Babul Range of the Park. This road acts as the boundary of ONP and separates the Park from farmlands given that there is no buffer zone in ONP. Forest elephant populations in CRNP\_Ob, migrated to Korup National Park, Cameroun and those in CRNP\_Ok, migrated to Takamanda National Park, Cameroun corroborating the 2016 AESR (Thouless *et al.*, 2016).

Forest elephant activities in ONP were prominent on the fringes of the Babul Range of the Park. This road acts as the boundary of ONP and separates the Park from farmlands given that there is no buffer zone in ONP. Results from the interviews indicated that the threats to sustainability of wildlife in the study sites were development in and around the forest, logging activities, hunting activities, bush fires, population growth, farming, rock blasting and mono-plantations - Oil Palm, Teak, gmelina and rubber plantations. Rock blasting with its accompanying noise and earth tremors, which the communities attest has reduced drastically, was exclusive to CRNP\_Ob.

The distribution maps in Figures 2A – 2D showed that the forest elephants did not transverse the length and breadth of the protected areas they inhabit, this can be attributed to anthropogenic threats which have resulted in forest degradation and fragmentation. In this study, the key factors influencing the presence and distribution of forest elephants included development in and around the forests due to growing human population, hunting and collection of NTFPs. Forest lands converted to settlements, farmlands and monoculture plantations resulted in habitat loss and forest fragmentation. Studies by Theuerkauf *et al.*, (2001) and Mamo *et al.*, (2012) also indicated that the main influences on the spatial distribution of forest elephants were human presence and habitat structure.

The decline or loss of natural forest cover may also have reduced the ranges of forest elephants in this study and limited them to a portion of the forests as shown on the distribution maps. A study carried by Adedeji and Adeofun, (2014) in Omo-Shasha-Oluwa FRs showed that between 1986 and 2002, natural forest habitats decreased by 10% while monoculture plantations and non-forest areas



increased by 6% and 5% respectively. This rate of loss of natural forests need to be curbed as the condition of natural habitats is important for biodiversity as degraded or fragmented habitats are less likely to be able to support their full complement of species (Aichi Biodiversity Target 5) especially a wide ranging keystone species like the forest elephant. To solve the effect of fragmentation, van Aarde and Jackson, (2007) proposed the management of fragmented populations as metapopulations; this would combine and analyse the results of different surveys to increase their reliability. This approach would be a good strategy to conserve these fragmented forest elephant populations in Southern Nigeria forests.

To effectively protect wildlife in potentially safe habitats at site level, a buffer zone should be introduced in ONP and wildlife in OFR evaluated and monitored, as a matter of priority, before it becomes a “paper park”, devoid of wildlife, like most PAs in Nigeria. Though OFR houses a Strict Nature Reserve and the only Biosphere Reserve in Nigeria, most of the forest is degraded and the forest perimeter is on a steep decrease (Oates *et al.*, 2008; Ikemeh, 2009a). OFR was the only site in which forest elephant carcass was encountered during this study. Collaboration between the Nigerian and Cameroonian governments will facilitate increased permeability of the CRNP\_Ob - Korup NP and CRNP\_Ok - Takamanda NP corridors to allow natural dispersal between the populations. This will help conserve the forest elephants and other animals that use the corridors.

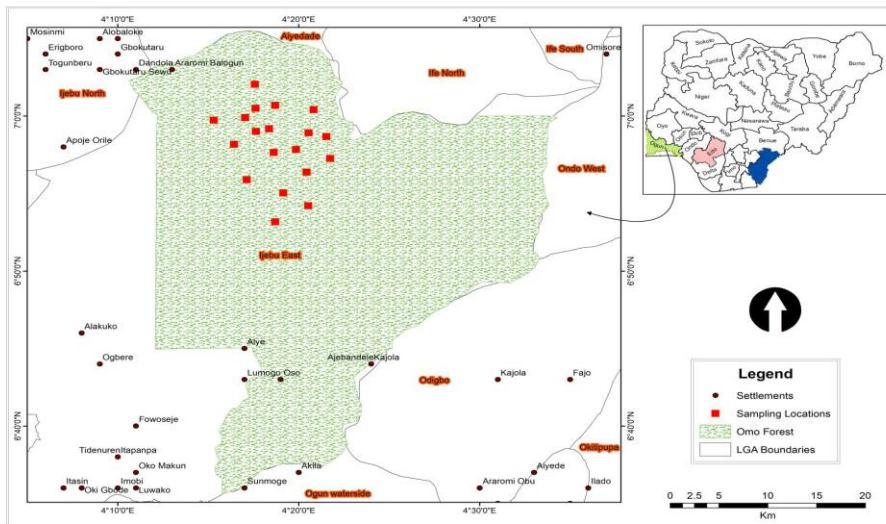
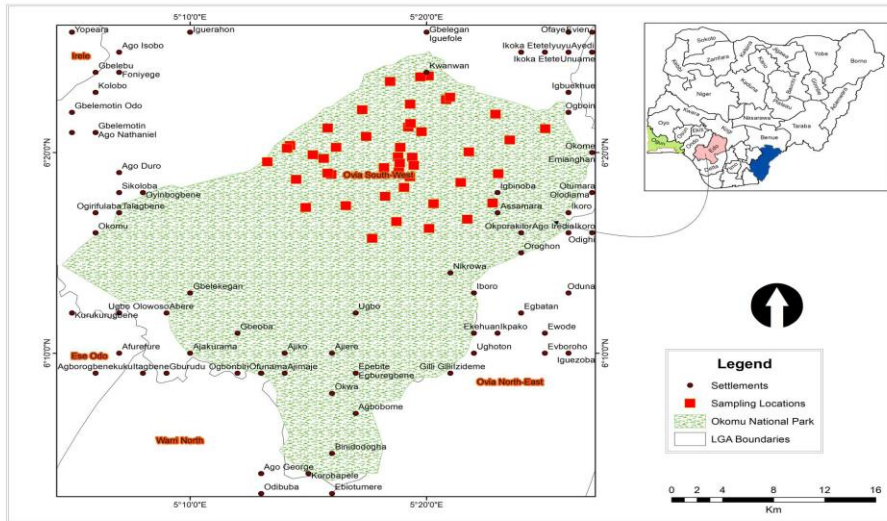
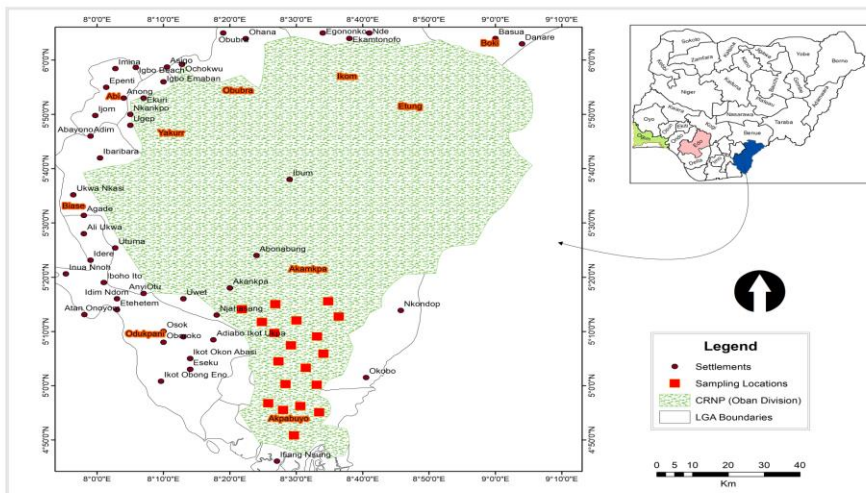


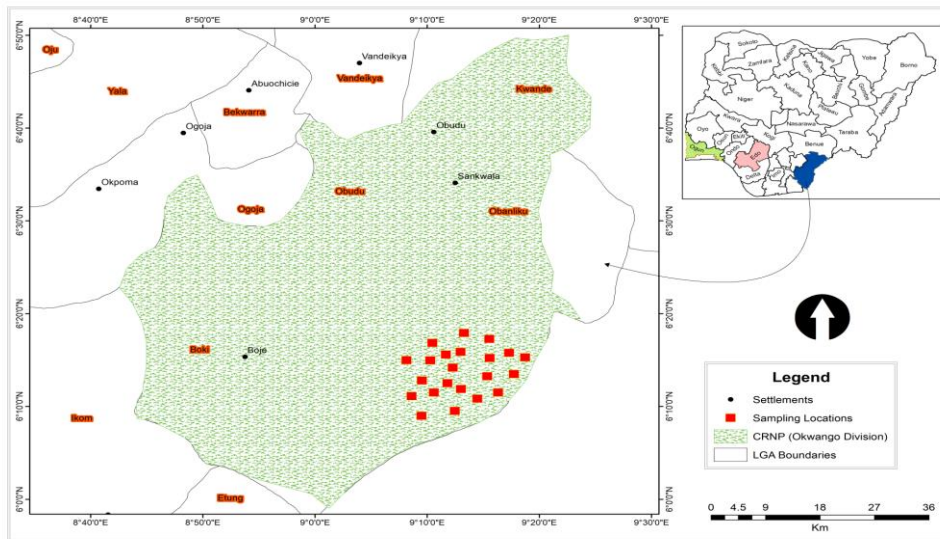
Figure 2A: Distribution map of forest elephants in Omo Forest Reserve



**Figure 2B: Distribution map of forest elephants in Okomu National Park**



**Figure 2C: Distribution map of forest elephants in Cross River National Park, Oban Division**



**Figure 2D: Distribution map of forest elephants in Cross River National Park, Okwango Division**

Forest elephants roam outside PAs and their coexistence with humans on intensively used agricultural land is not possible. Present conservation efforts need to be improved upon to enhance their protection. Guaranteeing the viability of forest elephant populations and other wildlife in Southern Nigeria will therefore require ecosystem restoration, effective mitigation methods to curb Human Wildlife Conflicts (HWC), further investments in law enforcement in the existing PA network and in infrastructure for ecotourism to ensure the long-term financial viability of the PAs. It is of paramount importance that the maintenance of biodiversity and the integrity of PAs be included in our political and economic planning.

## CONCLUSION

Results from this study established the presence of forest elephants in these locations though cases of direct sighting are rare. The populations in all the study locations are small, but OFR and ONP populations are completely isolated and face higher risks of extirpation. A species management and monitoring plan should be put in place to help conserve these relict forest elephant populations in Southern Nigeria. There is also an urgent need to carry out a simultaneous nationwide population survey of elephants in Nigeria to update their population status and raise awareness on the plight of the precarious forest elephant populations in the country.

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