

# Population survey of elephants in Okwangwo Division, Cross River National Park, Nigeria

Emmanuel Obot,<sup>1\*</sup> Clement Edet,<sup>2</sup> Gabriel Ogar<sup>3</sup> and Joy Ayuk<sup>2</sup>

<sup>1</sup>Nigerian Conservation Foundation, Lekki Conservation Centre, PO Box 74638, Victoria Island, Lagos, Nigeria; email: eaobot@yahoo.com; \*corresponding author

<sup>2</sup>Cross River National Park, Okwangwo Division, PO Box 1028, Calabar, Nigeria

<sup>3</sup>Living Earth Nigeria Foundation, PO Box 8060, Port Harcourt, Nigeria

## Abstract

Between March 1997 and May 1998, a census of elephant populations using dung counts was carried out along five different trails constructed in Cross River National Park, Okwangwo Division, Nigeria. The survey covered 139 km of trails. Estimated elephant density was 0.3 elephants per km<sup>2</sup> with a variation of 0.2–0.5 elephants per km<sup>2</sup>. This study is the first record of elephant population densities since the area became a national park in 1991. There appears to be a seasonal local migration of this population between Cross River National Park and the neighbouring Takamanda Forest Reserve in Cameroon; the elephants spend most of the rainy season in Cameroon and the dry season in Cross River National Park. Reasons to explain this migration were not apparent during this survey. Protection of this population will depend on closer cooperation with authorities in the Takamanda Forest Reserve.

## Résumé

Entre mars 1997 et mai 1998, on a réalisé un recensement des populations d'éléphants en se servant du comptage des crottes le long de cinq pistes différentes construites dans le Parc National de Cross River, Division d'Okwangwo en Nigeria. L'étude se faisait sur 139 km de piste. La densité d'éléphants fut estimée à 0,3 / km<sup>2</sup>, avec une variation comprise entre 0,2 et 0,5 éléphants au km<sup>2</sup>. Cette étude est le premier rapport sur la densité des éléphants depuis que la région est devenue un parc national, en 1991. Il semble qu'il y ait une migration saisonnière de la population entre le Parc National et la Réserve Forestière voisine de Takamanda, au Cameroun. Les éléphants passent la plus grande partie de la saison des pluies au Cameroun et la saison sèche dans le Parc National de Cross River. Les raisons de cette migration n'ont pas été perçues lors de cette étude. La protection de cette population dépendra de la coopération plus étroite avec les autorités dans la Réserve forestière de Takamanda.

## Introduction

Nigeria has lost 96% of its original lowland rainforest and consequently a considerable percentage of forest-dwelling and -dependent fauna. In 1991 Cross River National Park was created to protect the remaining 4% of relatively undisturbed rainforest. This report presents the results of the first attempt to estimate elephant (*Loxodonta africana cyclotis*) populations in the park.

## Study area

Cross River National Park is made up of two discontinuous sectors—the southern Oban Hills Division

and the northern Okwangwo Division. This study was carried out in Okwangwo Division, which lies between 6°4' and 6°29' N and 9° and 9°27' E. Together with the Mbe Mountains it covers 920 km<sup>2</sup>, lying south-east of Obudu with the eastern boundary extending along the Cameroon border. It is part of the Guinea–Congolia–Sudania Regional Transition Zone with an afro-montane archipelago-like centre of endemism in Obudu Plateau and the Sankwala Mountains (figs. 1, 2).

With the contiguous Afi River Forest Reserve to the west and Takamanda Forest Reserve (Cameroon) to the east, the Okwangwo Division of Cross River National Park lies within the core of a continuous

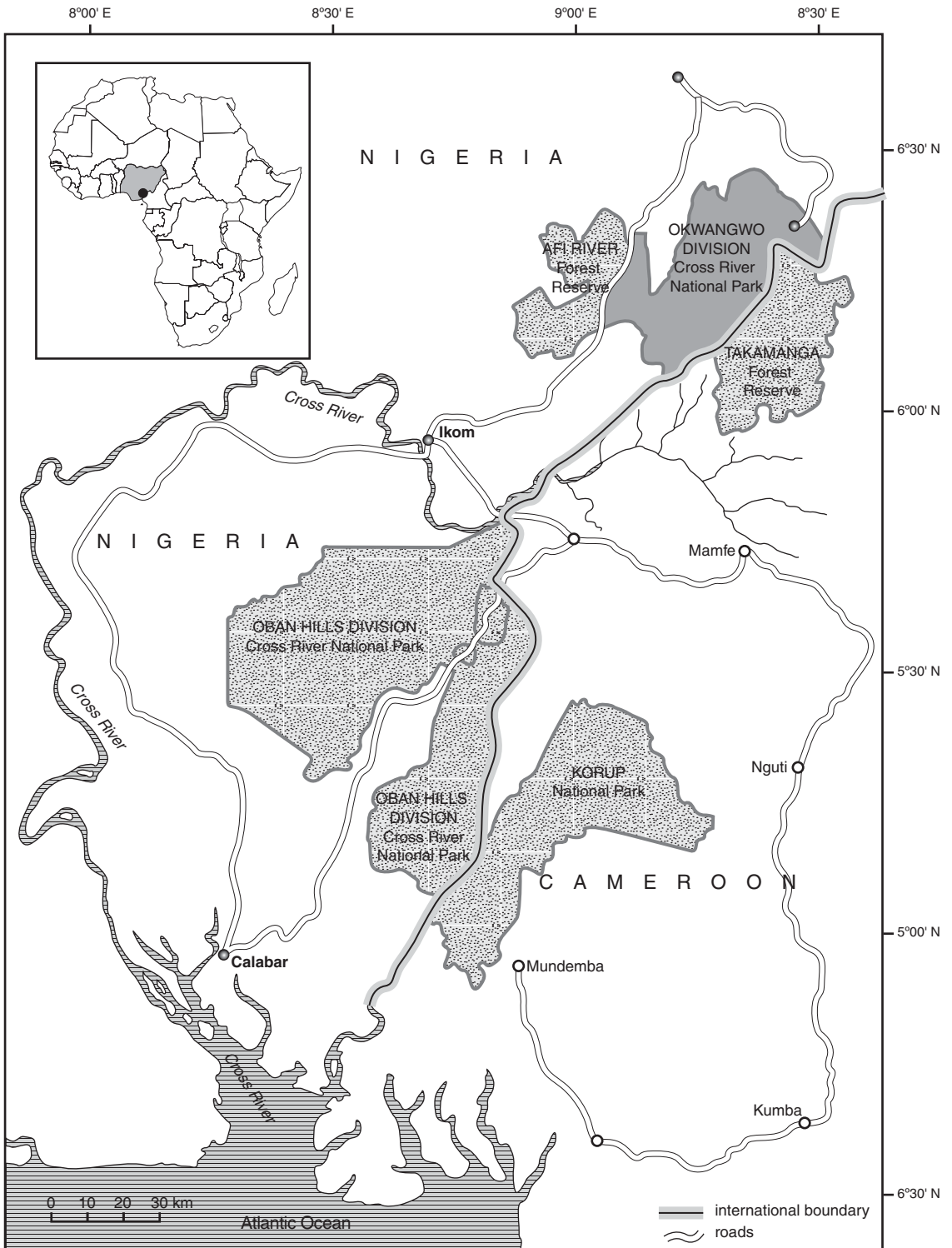


Figure 1. Location of Cross River National Park.

moist tropical rainforest system of more than 1800 km<sup>2</sup> that is completely or partly protected.

Topography is generally rugged, with many disjunct and connected ridge systems, isolated peaks and rock outcrops. Land, generally at elevations of 150 m, rises to around 1500 m in the Sankwala Mountains and to odd peaks of up to 1700 m on the Obudu Plateau. Three main rivers, Oyi, Bemil and Okon—all tributaries of the Cross River—drain the park area (fig. 2).

The climate is tropical with a distinct rainy season between March and November, and a dry season between December and February. Rainfall is heavy: up to 4280 mm distributed unevenly within the nine-month rainy season. Ambient temperatures are high but lower temperatures (14–16°C daily minimums and 18–25°C daily maximums) are recorded on the highland areas of Obudu Plateau and the Sankwala Mountains. A detailed account of the flora of Okwangwo Division is given in Obot (1996), who segregated the vegetation into four major types: lowland rainforest in low-lying areas, ridge and hill forest on the slopes of the Mbe Mountains, submontane forest on the Obudu Plateau, and savanna woodland in the Ikwete Hills. Soils in the lowland area are heavily leached, extremely infertile and ferrallitic while in the highlands they are generally ferruginous and susceptible to erosion. For specific accounts of the Obudu Plateau and the Sankwala Mountains see Hall and Medler (1975), Medler and Hall (1975) and Keay (1979).

## Method of study

### Census

In an earlier survey of elephant populations in the Oban Hills sector of the park, Dickinson (1995) found the line-transect method impractical in view of

the dense vegetation, rugged terrain, low density, and rather patchy distribution of elephants. Okwangwo Division is within the same lowland rainforest complex with a similar vegetation structure. Moreover, preliminary recognizance studies suggested a low-density, highly mobile population. In this study, therefore, human trails were regarded as adequate transects because elephants in the study area seem to search out hunter and gatherer camps, where they eat fruit of the bush mango (*Irvingia* sp.), gathered and processed in such camps.

All records of sightings of elephants and their activities in the park area had occurred in the central lowland area in Okwangwo in the north, Bamba in the east and Bashu on the southern border of the park (figs. 2, 3). This area, approximately 239 km<sup>2</sup>, was

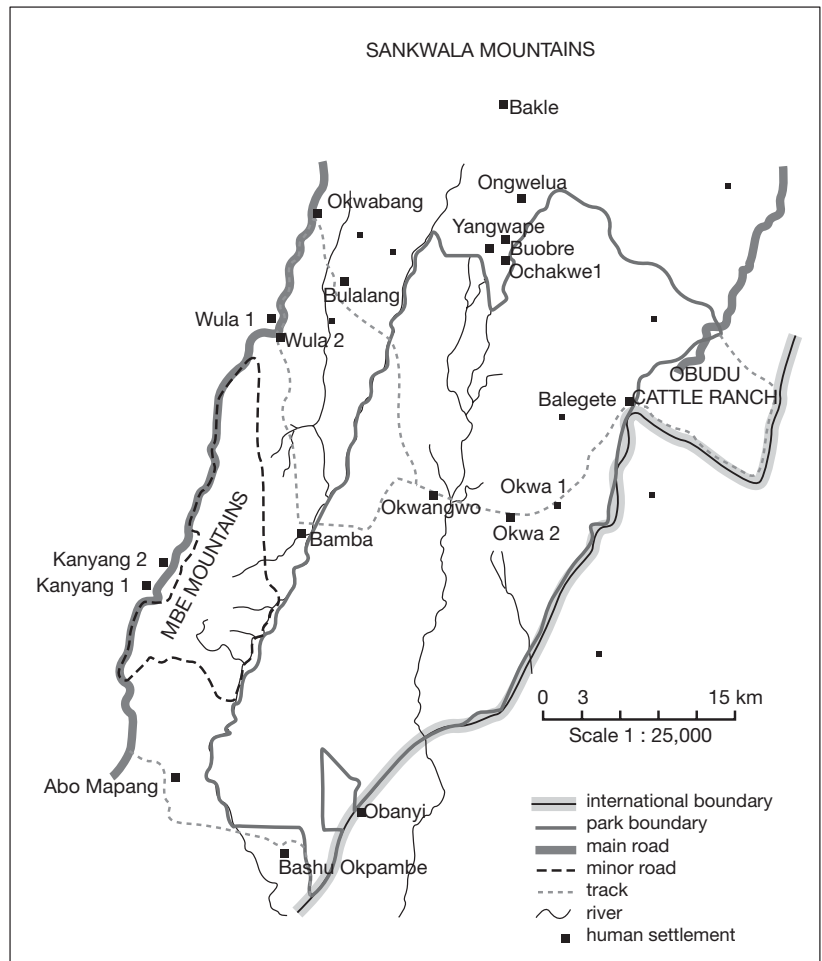


Figure 2. Cross River National Park, Okwangwo Division, with the proposed Mbe Mountains extension and the Obudu Cattle Ranch.

determined by counting 1-km<sup>2</sup> grids within which elephants had been sighted or their activities recorded since November 1994. Randomly placed transects were started from known landmarks—such as village, river, rock formation—and terminated at predetermined landmarks such as known camps frequently used by gatherers. These landmarks were georeferenced using a portable Garmin 40 Global Positioning System (GPS) where possible. (The Garmin GPS 40 does not operate properly under heavy tree canopy.) Several GPS points for mapping were also taken along the transect.

Elephant dung piles of all ages were counted within a fixed width of 5 m on both sides along each transect.

### Density

One method of estimating dung densities is by extrapolating from linear correlations between actual dung density and the number of 0.5-km segments along a transect in which dung was recorded (Fay and Agnagna 1991). The relationship was:

$$D = 9.688 + 25.016p \quad (r = 0.804)$$

where  $D$  is dung density and  $p$  is the number of 0.5-km segments containing dung.

To extrapolate elephant density from dung density, a conversion factor of 0.00231 was used based on a dung decay rate of 0.0462 estimated for the Oban Hills sector of the park (Dickinson 1995) and a defecation rate per elephant of 20 dung piles per day, estimated for Cameroon (Tchamba 1992). Thus, elephant density  $E$  is given by

$$E = D(0.0462/20) \text{ elephants per km}^2$$

where  $D$  is dung density with a dung decay rate of 0.0462 (Dickinson 1995) and a defecation rate per elephant of 20 dung piles per day (Tchamba 1992).

## Results and discussion

Table 1 summarizes data collected during this survey. Within the park elephants occupied a home range of approximately 239 km<sup>2</sup> from Okwangwo in the centre of the park through Bamba on the eastern park boundary to Bashu in the south (figs. 2 and 3).

The distance covered in the five transects was 139 km. The mean length of transects was 27.8 km. Mean dung density was 134.75 piles per km<sup>2</sup>. The extrapolated elephant density is therefore 0.3 elephants per km<sup>2</sup>. This adds to 74 elephants for the home range of approximately 239 km<sup>2</sup>. The lowest individual transect estimate was 47 animals in transect 4, the highest 130 animals in transect 3. There are perhaps anywhere between 50 and 130 animals. In Okwangwo Division interviews with hunters and farmer-gatherers suggest that there are 10 groups of elephants with 15 individuals per group. These add up to 150 animals within the home range. This number compares favourably with our estimate of a maximum of 130 elephants.

Albeit so, this is a very small population. Elephant hunting for tusks and for meat was extremely intense in the Okwangwo area before the national park was created. This slaughter has been controlled by ongoing anti-poaching patrols, and these anti-poaching activities must be sustained if this small population is to survive.

Table 1. Summary of dung count data along transects

Transect no.	Length of transect (km)	Segments, 0.5-km (no.)	Segments with dung 0.5-km (no.)	Dung density (km <sup>2</sup> )	Elephant density (km <sup>2</sup> )	Estimated no. of elephants	Sampling period
1	58	116	5	134.8	0.31	74	rainy season
2	15	30	4	109.7	0.25	61	rainy season
2	43	86	9	234.8	0.54	130	dry season
4	14	28	3	84.7	0.20	47	dry season
5	9	18	4	109.7	0.25	61	dry season
Totals	139	278	25				
Mean	27.8			134.75	0.311	74.39	
Significance	21.51			58.67	0.136	32.39	

## Elephant distribution

Elephant distribution within the park, indicated with 1-km<sup>2</sup> blocks around GPS points where elephant activities were recorded, is shown in figure 3. The elephants occupy the central lowland area of the park between Okwangwo in the northern, Bamba in the eastern, and Bashu on the southern borders of the park (figs. 2, 3).

There is a strong seasonal migration of the population between the park and Takamanda Forest Reserve, Cameroon (fig. 1) with elephants spending most of the rainy season (March–August) in Cameroon and the dry season in Okwangwo Division. The long-term survival of this population depends on protection efforts complementary with Takamanda. At present, however, Takamanda is managed as a forest reserve where limited hunting is permitted. While anti-poaching activities are being intensified in Cross River National Park, evidence exists showing that poachers wait in Takamanda for the elephants during the seasonal migration. This emphasizes the great need

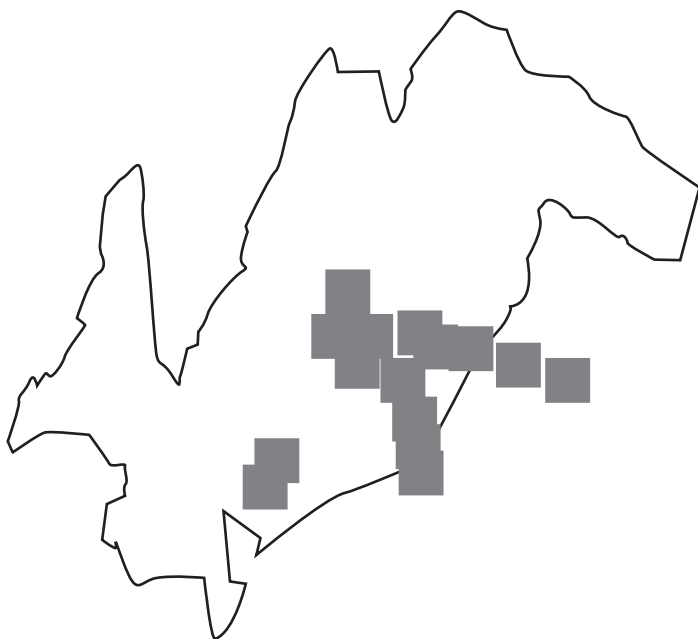


Figure 3. Elephant distribution, shown in 1-km<sup>2</sup> blocks around GPS points where elephant activities were recorded, in Cross River National Park, Okwangwo Division.

for cross-border cooperation between authorities in Takamanda and conservation agencies in Nigeria. Such cooperation will protect not only the elephant populations but the entire fauna and flora of the Okwangwo–Takamanda block of rainforest.

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