

# The status of elephants in Kasungu National Park, Malawi, in 2003

Roy Bhima,<sup>1</sup> James Howard<sup>2</sup> and Samuel Nyanyale<sup>1</sup>

<sup>1</sup>Department of National Parks and Wildlife, PO Box 30131, Lilongwe 3, Malawi

<sup>2</sup>26 St Joseph's Road, Sheringham, Norfolk, NR26 8JA, UK

## Abstract

Two tasks were undertaken in this study due to the steady decline in savannah elephant (*Loxodonta africana africana*) numbers within Kasungu National Park in Malawi, in both previous censuses and sightings. The first was to conduct an elephant dung-count survey to obtain a density and abundance estimate for two separate areas of the park. The second was to determine the extent of elephant poaching and the steps necessary to ensure protection of the Kasungu elephants. A density estimate for one area of the park was 0.146 elephants/km<sup>2</sup>, giving an abundance of between 120 and 177 elephants. The other area was devoid of elephant dung and thus an estimate was impossible to make. We discuss elephant distribution and poaching and compare our results with previous studies. This study shows that elephants are confined in their distribution within the park and that they have declined dramatically over the past 25 years and appear to be continuing to do so. Poaching may be controlled by increasing law enforcement activities.

## Résumé

Cette étude a deux objectifs, suscités par le déclin rapide du nombre d'éléphants de savane (*Loxodonta africana africana*) dans le Parc National de Kasungu, au Malawi, déclin constaté tant lors des recensements que dans les observations directes. Le premier consistait à réaliser un comptage des crottes d'éléphant pour en déduire une estimation de la densité et de l'abondance de ces animaux dans deux zones séparées du parc. Le second était destiné à déterminer l'étendue du braconnage des éléphants et les démarches nécessaires pour garantir la protection des éléphants de Kasungu. La densité a été estimée à 0,146 éléphants/km<sup>2</sup> dans une des zones, pour une abondance totale comprise entre 120 et 170 animaux. On n'a trouvé aucune crotte d'éléphant dans la seconde zone, l'estimation était donc impossible à faire. Nous discutons de la distribution et du braconnage des éléphants et nous comparons nos résultats aux études antérieures. Cette étude montre que la distribution des éléphants est confinée au sein du parc, que leur nombre a terriblement chuté au cours des 25 dernières années et qu'il continue à le faire. On peut contrôler le braconnage en renforçant les activités d'application des lois.

## Introduction

The elephant population in Kasungu National Park, Malawi, has been in decline for many years. This is seen from the findings of poached animals, for example, 19 in 1977 (Jachmann 1979), 167 from 1985 to 1992 (Mkanda 1993), counts by different observers as indicated in table 1, and the reduction in actual elephant sightings by patrols as well as tourists. Because the last census had been carried out in 1995/96, it was necessary to perform a further census now to determine the state of the population. It was also necessary to ascertain the effectiveness of the present park patrols and the park's overall anti-poaching record and to discover the major problem areas. The

study was done within a short time and due to limited human and transport resources, our survey had to be designed to take these factors into account.

## Study area

The survey was conducted within the Kasungu National Park, in central Malawi (fig. 1). The park is approximately 2300 km<sup>2</sup> in area and encompasses a large part of the Kasungu plateau. The altitude ranges between 1000 and 1500 m. Plateau areas are covered predominately by closed canopy *Brachystegia* woodland (Jachmann and Bell 1985). Three main rivers flow through the area, the Dwangwa, the Lingadzi

Table 1. Previous elephant densities from estimates by different observers using different methods, showing an overall declining trend from the 1970s to date

Year	Census	No. of elephants	Density (no./km <sup>2</sup> )	Observers
1969	estimate	650	–	Zimmerman (1969) <sup>a</sup>
1972	aerial	1380 ± 150	0.60	Kasungu Research Unit <sup>a</sup>
1975	estimate	2000	0.87	Morris (1977) <sup>a</sup>
1977	aerial	2000 ± 200	0.87	Bell (1978) <sup>a</sup>
1978	droppings	2500 ± 400	1.57	Jachmann and Bell (1978) <sup>a</sup>
1992	aerial	926	0.40	Mkanda (1992)
1996	aerial	391	0.17	Bhima (1996)

No figures are available for the period between 1978 and 1992.

<sup>a</sup>These figures are taken from Jachmann (1979)

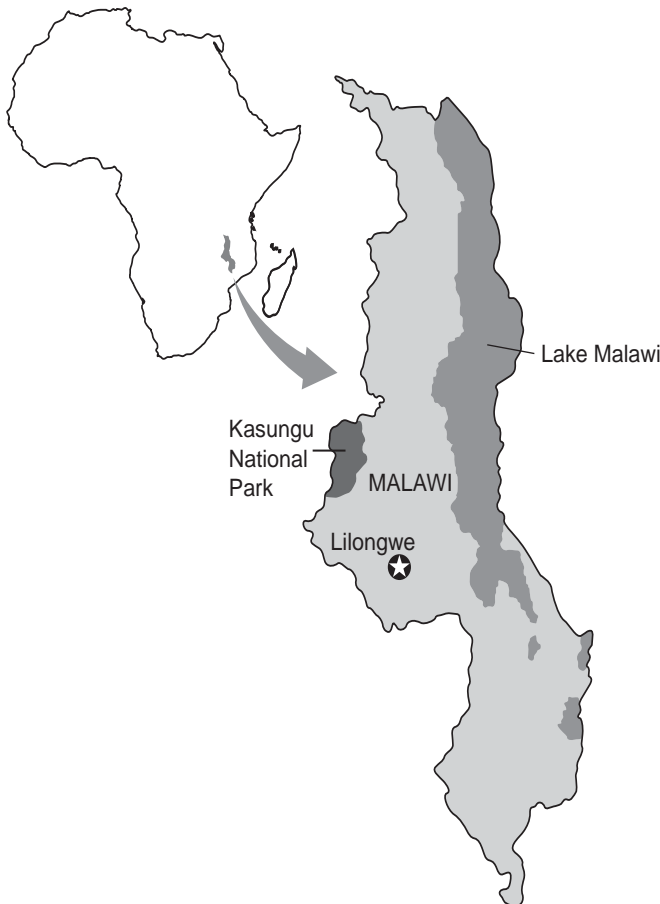


Figure 1. Map of Malawi showing Kasungu National Park.

and the Liziwazi, forming an extensive river network. This drainage system provides better-quality soils with *Combretum* and *Terminalia* woodland on the colluvial soils on the slopes and *Acacia* species on the alluvial soils in the troughs. Mean annual rainfall for the region is 780 mm.

## Methods

### Elephant survey

A count of droppings was conducted to determine an estimate of both the density and the abundance of elephants in the park. This was done following the line transect sampling theory of Buckland et al. (1993). This method was used due to the dense vegetation, which is characteristic of most of the park. It is also a relatively cheap method and produces results within a short time. The standard error and confidence interval produced show the precision of the estimate.

The park was stratified into two areas based on previous observations: a northern area and a central and southern section. Within the central section five transects were sampled covering a distance of 98.1 km. Four transects covering 49.3 km were sampled in the northern section. As only four persons were available to carry out the survey work in the northern area, the survey effort there was less (Jachmann 1979; Bhima 1996). The survey effort was more intense in the central and southern area as previous studies had shown that the concentrations of elephants were higher in it. We altered the design from straight-line transects to rectangular transects. This allowed survey teams to return to the same point on the road from where they had started and thus minimized time wasted travelling between transects on foot. The idea was taken from Buckland et al. (1993), who suggested implementing rectangular transects along a road network in the study area. These rectangular transects

of varying length were randomly placed along the road. A group of boli was considered as one observation (dropping). These boli groupings were easily identifiable even when boli had been dropped apart while an elephant was walking (Jachmann 1996).

Two teams of six people each carried out the dung counts. One compass and one portable GPS per group were used to maintain a certain heading and straight lines. At every dung pile seen, the distance covered along the transect was measured using the GPS. The perpendicular distance from the line to the centre of the dropping was measured using a 30-m measuring tape. The number of boli in each dropping was recorded. Only dung that observers in the group could see from the line was recorded.

The daily decay rate of elephant dung in the park could not be calculated due to the lack of time. Our dry-season decay rate of 0.0059 per day is taken from Jachmann (1991). Jachmann and Bell (1984) calculated the dry-season defecation rate as 15.7 droppings per elephant per day within Kasungu National Park, and we have used this figure as well.

The data were entered into the program DISTANCE version 3.5 for analysis. Using the indirect method of dung counts, this program calculates density and an abundance value of elephants for the area specified. Outliers of the observation data were truncated to allow for a more comprehensive model to be fitted to the data. The program used some models to fit to the available data to estimate the true detection function  $g(y)$ . The true value of  $g(y)$  is not known; furthermore, it varies due to numerous factors such as observer's effectiveness and environment (Buckland et al. 1993). Three properties for a model for  $g(y)$  are, in order of importance, 1) model robustness, 2) shape criterion and 3) efficiency. The best model was selected by various criteria, including the likelihood ratio test, the Akaike information criterion (AIC), and the chi-squared goodness-of-fit test. A bootstrap method was used to calculate variance to select the best model among similar and good models (Buckland et al. 1993; Laake et al. 1994).

### **Law enforcement**

There are nine scout camps in Kasungu National Park. As the park area is about 2300 km<sup>2</sup>, each camp is supposed to cover an area of 230 km<sup>2</sup> in its patrol activities to control poaching.

Each patrol camp is supposed to have at least five

armed men who are meant to conduct three long patrols of seven days each per month in their area. The chances of this happening are slim, however, as the scouts tend to patrol areas near the camp and never venture too far out, returning each night to the camp. They take note of illegal incidents and animal sightings in their patrol area. In this study, we reviewed all patrol reports from 1997 to date for each camp. We looked at the area each camp covered and issues affecting this, elephant sightings during patrols and elephant poaching—that is, animals discovered killed, location of most poaching and the implication of this to the distribution of the elephants.

## **Results**

### **Elephant survey**

We obtained an elephant density estimate for the central and southern region of the park. The density estimated for the location was 0.146 elephants/km<sup>2</sup>, with a 95% confidence interval of 0.12 and 0.177 or an abundance estimate of 117 elephants and a 95% confidence interval of 96 and 142. The DISTANCE program selected the key function model 'Uniform' + cosine (the series expansion) based on the minimum AIC value. However, we were unable to obtain an estimate for the northern area. No elephant dung was seen while we walked our four transects in that area. This absence of dung in the northern area of the park and the higher number of sightings in the central area correlates with the scout patrol reports in these areas.

### **Law enforcement**

Table 2 shows the staffing levels at each camp. All but Lifupa camp, which is the main camp, were below required staffing levels. This makes patrolling difficult, particularly for the six camps with only two and three men, because as they go out on patrol, one must remain in camp to guard the remaining family members. Patrols in these camps tend to be short and concentrated around the camps.

The scout reports of the last five years were analysed for patterns of where elephants were seen most frequently and where the majority of elephant carcasses were found as well as the number of gunshots heard by scouts on patrol. The main camp, Lifupa, recorded elephant sightings throughout the year. This was followed by Lisitu camp. Khalango and Miondwe

camps recorded elephant sightings in the wet and early dry seasons while Dwangwa camp recorded elephants only once, in July. The rest of the camps, Kangwa, Kapusi and Mpayakwe, all located in the north of the park, and Chipiri in the south, did not see any elephants during their patrols.

Lifupa camp also discovered the highest number of poached elephants—19 from 1997 to August 2003. Most of these were shot just east of Lifupa Dam. Also killed were 8 in the Lisitu area, 3 in the Miondwe area and 1 in the Khalango area. No poached animals were recorded in the Chipiri, Dwangwa, Kangwa, Kapusi and Mpayakwe areas. Miondwe camp recorded the highest number of gunshots. Shooting in this area is mostly for antelopes.

## Discussion

The number of elephants in the entire park estimated from this study is extremely low in comparison with previous census and survey work (table 1). Jachmann and Bell (1979) performed dung count surveys in 1978 that indicated a mean density of 1.57 elephants/km<sup>2</sup>. An aerial census in 1984 estimated elephant density at 3.1 elephants/km<sup>2</sup> in the central area of the park, but an overall density of 0.52 elephants/km<sup>2</sup>. In a further aerial census carried out in 1996, elephant densities in the park were estimated as approximately 0.2 elephants/km<sup>2</sup>. The 1996 count had very wide confidence limits and so could have been an under-estimation. The reason for this was the poor stratification of the area, and this study addressed this shortcoming by having one stratum over the central region around Lifupa camp, which is where the vast

majority of elephants are known to congregate (Jachmann and Bell 1979; Bhima 1996). This aggregation of elephants has been attributed to poaching pressure and the relative safety of the area near the tourist camp and park offices where most of the park officials live and work. Poaching is a key external factor in determining differential use of habitat elsewhere (Douglas-Hamilton 1987). In contrast, the northern area of the park and the western boundary, bordering Zambia, have continued to have low numbers (Bhima 1996). Only vegetation can be a constricting factor as permanent water supplies are abundant and not far apart. The most nutritious vegetation is around the Lingadzi and Lisanthu river systems in the central area and around the lower part of the Dwangwa river system in the northern area (Jachmann 1979). Yet elephants are not often seen at some of these sites, suggesting that a factor such as poaching is deflecting them from these areas.

A count in 1992 estimated the total population at 926 elephants, a density of approximately 0.3 elephants/km<sup>2</sup> (Mkanda 1993). This number would have been reduced by 1996 as carcass counts were carried out in the aerial count of 1996 and a high carcass ratio of 12.8% was estimated, showing that this elephant population is definitely decreasing. Although we narrowed the confidence limits in our study, a density of 0.15 elephants/km<sup>2</sup> in the central region of the park is still very low. Elephant mortality due to poaching in earlier years was higher than we recorded. Jachmann (1979) recorded 19 elephants poached in 1977 and Mkanda (1993) recorded 167 from 1985 to 1992. These high levels of poaching have led to a decline in elephant numbers.

Table 2. Law enforcement situation and elephant distribution and poaching in Kasungu National Park from 1997 to 2003

Camp	Number of scouts	Elephant sightings	Gunshots heard and guns confiscated	Elephants discovered killed
Chipiri	4	none	0	0
Dwangwa	3	in early dry season	6	0
Kangwa	2	none	6	0
Kapusi	3	none	4	0
Khalango	3	in wet and early dry seasons	29	1
Lifupa	5	throughout the year	69	19
Lisitu	3	in wet and most of dry season	34	8
Miondwe	3	in wet and early dry seasons	121	3
Mpayakwe	4	none	0	0

The dung count method, however, has been proved in various studies to be one of the most, if not the most, accurate method of counting animal numbers, especially in densely vegetated areas. Barnes (2001) has shown the accuracy of dung counts in comparison with aerial counts for counting elephants and has proved that dung counts give more precise estimates and thus better results. Jachmann (1991) even believes they should be the preferred method for counting elephants in most situations.

The scout patrols in the park are known to be fewer than adequate. With a total of about 50 scouts operating in the park, this means each scout should cover 40 km<sup>2</sup>, an area that is impossible to cover well and regularly. Only nine scout camps exist in various areas of the park (fig. 2). Usually three scouts patrol from one of these camps and this number is often as low as two. This number is not only dangerous in terms of encountering animals but is also inadequate in dealing with any groups of poachers, possibly heavily armed, that they may encounter. Consequently, the scouts do not patrol far from camp. Vast areas of the park are not patrolled at all. To resolve this issue a strategy can be considered of regularly teaming up the scouts of two to three camps to patrol areas together that have not been covered for long periods. An immediate senior supervisor must lead such a patrol.

A major reason for elephant poaching is simply for food for people in the many surrounding villages. A lot of elephant meat has been confiscated in the past. Human settlements are encroaching on the park along many of its borders. The real solution to reducing poaching is to develop these rural areas so that people no longer need to hunt and forage in the park. Bell (1983) reported progress in this regard back in 1982 when a combination of intensified patrols and public relations activity with the government and local leaders produced significant results. Arrested in and around the park were 239 poachers, and 30 muzzle-loading guns, 5 short guns and 1 semi-automatic rifle were confiscated. It seems that initiatives of this kind need to be stepped up once again.

Another future prospect for the area is to develop a transfrontier park between Malawi and Zambia, as Lukusuzi National Park in Zambia is situated across the border from the western boundary of Kasungu. The gap between the two parks, however, is populated with villages. The people here are possibly poaching in the parks or simply poaching animals moving between these two reserves. By forming one

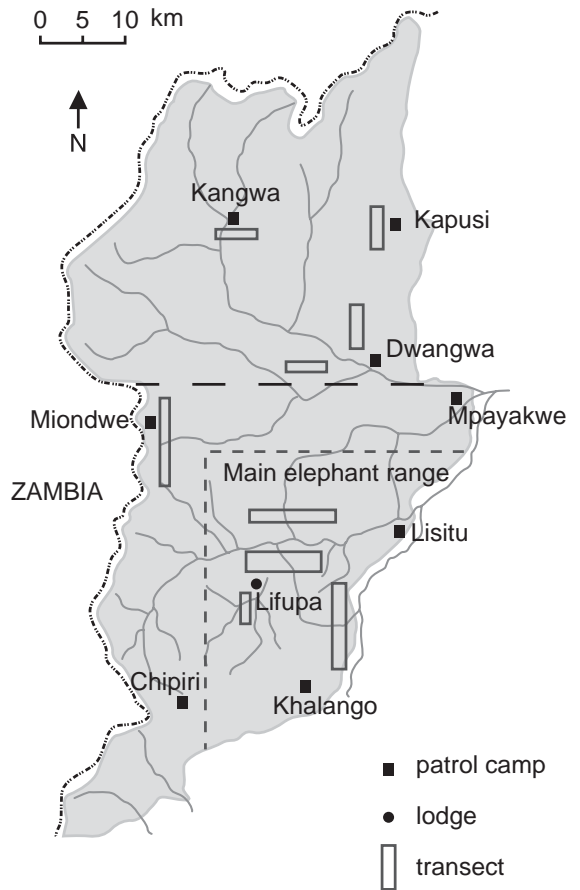


Figure 2. Map of Kasungu National Park showing locations of scout camps and rectangular transects of dung surveys.

larger park, a more cooperative effort can be adopted to minimize poaching and co-manage the park. This will allow resources to be shared and animals to move unhindered in their natural range.

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