

The Distribution and Number of Forest Dwelling Elephants in Extreme Southeastern Cameroon

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Introduction

The forests of southeastern Cameroon, although poorly studied, contain some of the largest and least disturbed populations of rainforest mammals in Central Africa. A reconnaissance survey by Wildlife Conservation International (WCI) in 1989 estimated an elephant density of 1.8 per km² for extreme southeastern Cameroon; our recent and more extensive survey suggests 4.5 elephants per km² is a better figure. Similar surveys in contiguous parts of the Central African Republic and the People's Republic of Congo reported elephant densities of 0.86 and 0.9 respectively (Carroll, 1988; Fay and Agnagna, 1991). Within this ecosystem the Central African Republic has established the Dzangha-Ndoki National Park with its associated Dzangha-Sangha Dense Forest Special Reserve and the Nouabale-Ndoki park/reserve system is proposed in the Congolese portion (Fay and Agnagna, 1989). None of the Cameroonian sector has any effective protected status and, increasingly, the wildlife of the area is threatened by poorly conceived logging practices and over-hunting. Sponsored by the Cameroon Government's Institute of Animal Research, Wildlife Conservation International, the World Wildlife Fund (US) and the European Community, our survey team conducted a series of biological surveys in the region during October - December 1990 and March - May 1991. Two of our objectives were to propose boundaries for a series of regional reserves, and to provide data on the number and distribution of elephants that later could be used to plan a more comprehensive elephant survey.

Study Area

The Republic of Cameroon covers an area of 475,442 km² and in 1988 had a population of 11.2 million (Horta, 1991). Tropical rainforest covers the southern two-fifths of the country, about 200,000 km² (Fig 1) (Gartlan, 1988).

The three sites surveyed in southeastern Cameroon are very similar biologically and share a common climate and geological history. The vegetation is of the

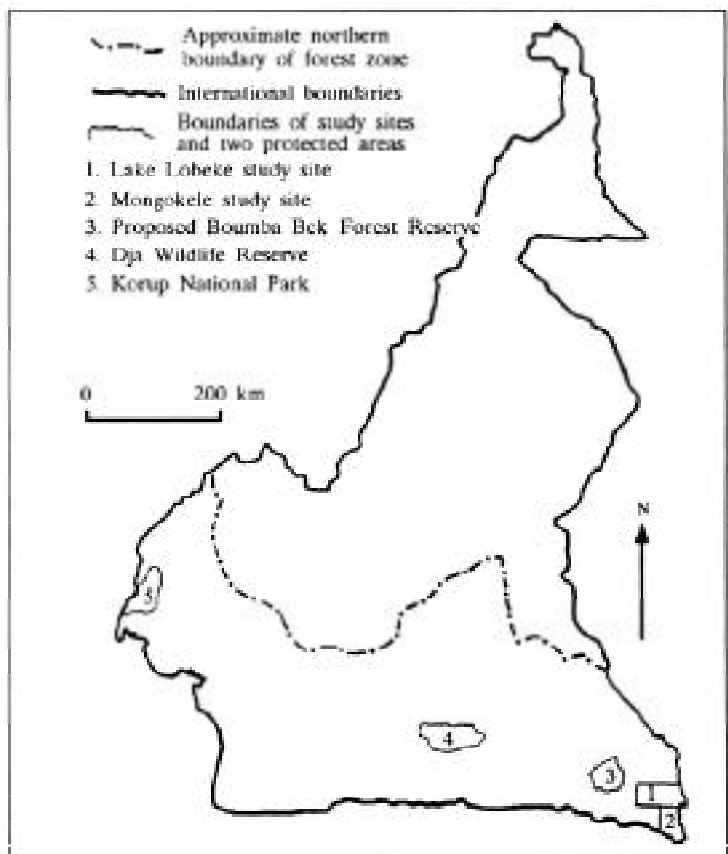


Figure 1 : Map of Cameroon showing the forest zone, the three study sites in extreme SE Cameroon and the locations of Korup National Park and Dja Wildlife Reserve

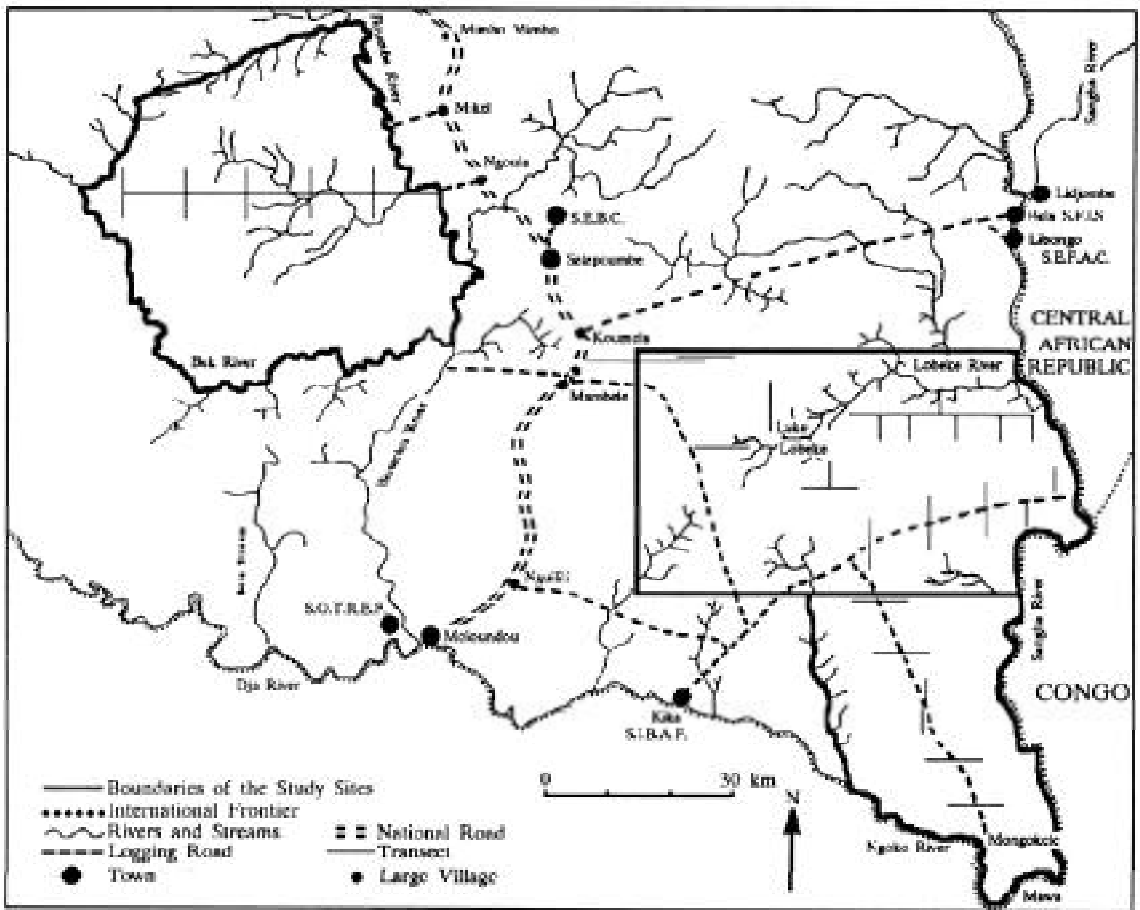


Figure 2 : Map of the study sites in southeast Cameroon showing the locations of the transects

Congolese forest type. Seventy to eighty percent of the Lake Lobeke and Mongokele sites has been selectively logged over the last 30 years, but the proposed Boumba Bek Forest Reserve is still in a natural state. The climate is equatorial with two wet and two dry seasons. Precipitation is about 1,600 mm a year with an average annual temperature of 25. The terrain is a series of plateaus traversed by shallow valleys and lies between 400-720 m in altitude, with occasional depressions. The Lake Lobeke and Mongokele study sites and 80% of the proposed Boumba Bek Forest Reserve lie within Moloundou Subdivision, the southeastern-most subdivision of Boumba and Ngoko Division, in Cameroon's East Province. The area of the subdivision is 15,567 km² of which the study sites occupy 5,594 km² or 36% of the total area.

The human population of the subdivision is 24,000. This represents 1.54 inhabitants per km², which is lower than the average of 4.0 inhabitants per km² for the Eastern Province as a whole. The population is concentrated in

five logging towns and in villages along the national road that runs due south to the subdivisional capital of Moloundou on the Ngoko river. Although the study sites include some of the more remote and sparsely populated forest regions in Cameroon, no part is over 30 km from a motorable road or navigable river. Despite this apparent accessibility, large blocks of the forest are seldom visited by man.

Methods

Surveys were made on foot along transects in each of the three study sites (Fig 2). An effort was made to distribute the transects uniformly over the areas surveyed. Transect lines were run on compass bearings directed perpendicularly to watersheds in order to sample varied habitats. Each observer recorded distances along transects at the Lake Lobeke study site with two pedometers. These were calibrated daily using a topofil over half the total transect distance. For the surveys of the Mongokele and Boumba Bek study

Sites the length of transects was recorded using topofilms over the entire measured distance. Abandoned logging roads and hunting trails were surveyed on foot while moving between transects. All elephant dung piles seen by the principal observers within two metres of either side of the transect baseline were recorded. For analysis only continuous segments of transect, logging road or hunting trail 5.0 km or longer in length were considered. Five kilometres is considered the optimum length (Barnes *et al*, 1988).

To obtain the numbers in appearance classes A-D, as defined by Barnes and Jensen (1987), we multiplied the number of dung-piles by 0.74.

A rough estimate of elephant density was obtained using figures developed by Barnes and Jensen (1987) and revised by Barnes and Barnes (1991).

$$\text{Elephant density} = \frac{\text{dropping density} \times \text{decay rate}}{\text{defecation rate}}$$

With a decay rate of 0.0233 and a defecation rate of 17/day the conversion factor is $0.0233/17=0.0014$ (Barnes and Barnes, 1991; Wing and Buss, 1970).

Results

Dung Density

A total of 326.50 km of transects were surveyed. This included 58 line transects each 5.0 km long, or 290.0 km in all, 117.0 km of logging roads and 23.50 km of hunting trails. Table 1 presents a summary of results from the transect data gathered in the three study sites. Table 2 compares dung densities recorded on transects with those recorded on abandoned logging roads in the same areas. In Lake Lobeke dung densities were significantly greater on abandoned logging roads ($t=3.30$, $df=36$, P). For

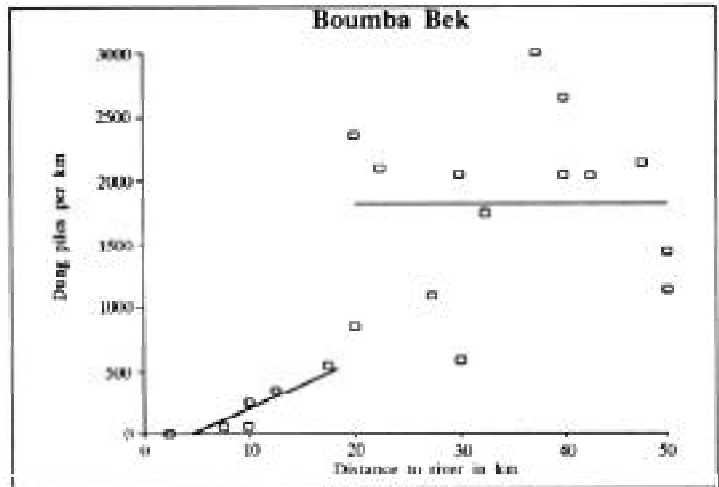


Figure 3: The variation of dung-pile density with distance from the Boumba river (the eastern boundary of the proposed Boumba Bek Forest Reserve)

Mongokele, Table 2 shows a similar increased dung density on abandoned logging roads, but here the difference is not significant ($t=0.91$, $df=20$, N.S.). Due to the small sample size, the data from hunting trails were not analyzed.

Elephant Distribution in Relation to Human Disturbance

Our results support the findings reported by Barnes *et al* (1991) in Gabon, which show a positive correlation between elephant dung density and distance from zones of human activity such as villages and roads.

Figure 3 shows how elephant dung-pile densities in an area of the proposed Boumba Bek Forest Reserve vary with distance from the nearest source of human disturbance. It demonstrates that the sampled area can be divided into two zones. From the Boumba river, where there are very few elephants, the density increases with distance from the river up to 20 km; this is shown by the regression line. From 20.0 to 50.0 km from the river there is no change in dropping density; the mean density is shown by the horizontal line. This result supports our subjective impression

Table 1: Estimated elephant dung density (D) and elephant density (E) for the three study sites in SE Cameroon

Location	km sampled	km ²	D	E	Area of site km ²	Number of elephants
Lake Lobeke	140	2.8	4,479	4.64	2,414	11,202
Mongokele	50	1.0	4,225	4.38	850	3,723
Boumba Bek	100	2.0	1,372	1.42	2,330	3,312

that human influence extends only a short distance from the river into the eastern part of the reserve.

If the logging road that runs due south to the village of Mongokele is divided into segments of 20 km each, a very steeply decreasing gradient of elephant dung density is noted as Mongokele is approached (Table 3). A 20.0 km transect cut perpendicularly to the single national road in the subdivision (Table 4) also shows that human activities have a profound impact on elephant distribution.

Table 3: Average elephant dung density for three 20km Intervals of abandoned logging road, in the Mongokele study area

Distance from Mongokele village -	Dung densities/km ²
0 - 20km	0
20 - 40km	4,600
40 - 60 km	13,908

Table 4: Average elephant dung density for four 5km Intervals of transect from a roadside band in Moloundou subdivision

Distance from highway	Dung density/km ²
0-5km	0
5-10km	0
10 - 15km	0
15 - 20km	2050

Discussion

Elephant Density in the Lake Lobeke Mon gokele Area

Our findings support earlier data suggesting that the Lake Lobeke area holds the highest density of forest dwelling elephants yet surveyed in Africa (Table 5) (WCI, 1989). This very high density is found over all the Lake Lobeke study site and the northern two-thirds

Table 5: Estimated forest dwelling elephant densities reported from different parts of central Africa

Location	Density	Reference
Korup National Park	0.2	WCI 1989
Salonga National Park	0.2	WCI 1989
NE Gabon	0.4	WCI 1989
SE CAR	0.48	Fay 1991
SW CAR	0.86	Carroll 1986
NE Congo (Ndoki area)	0.9	Fay and Agnagna 1990
Extreme SE Cameroon	1.8	WCI 1989
Lake Lobeke study site	4.64	This study

of the Mongokele study site. We estimate the total elephant population in this area is 14,688 (3,264 km² x 4.5 elephants/km²). Based on our results and known distances from human population centres, the same density may exist in up to 5,000 km² of extreme SE Cameroon. A warning that this robust elephant population faces possible compression and destruction is suggested by the small number of elephants in the southern third of the Mongokele study site (Stromayer and Ekobo, 1991). It would appear that elephants have been driven out of this area by persistent human hunting pressure.

Possible Habitat Preferences of Forest Dwelling Elephants in SE Cameroon

The extremely high elephant densities we encountered in the Lake Lobeke - Mongokele areas as opposed to those in the area of the proposed Boumba Bek Forest Reserve probably can be attributed to the preference displayed by forest dwelling elephants for secondary forest (Barnes *et al*, 1991). If compression of the elephant population due to human pressures was the driving force, one would expect higher elephant densities in the proposed Boumba Bek Forest Reserve. Boumba Bek is undisturbed primary forest with no logging roads and difficult for humans to penetrate while the Lake Lobeke - Mongokele site has a dense network of logging roads and a recent history of intensive elephant hunting. Regardless of the true explanation for the distribution of the extremely high densities of elephants found in SE Cameroon, these populations still appear both large and healthy, and promise excellent and perhaps unparalleled conservation potential.

Methodology

In both the Lake Lobeke and Mongokele study sites, elephant dung pile densities on transects were very much lower than those on abandoned logging roads. This is because elephants are attracted to the food provided by the secondary vegetation that grows along the latter (Barnes *et al*, 1991). Table 2 shows that roadside densities have a higher variance than those on transects. The results clearly show that elephant dung pile counts made on abandoned logging roads are misleading measures of elephant density.

Our estimates of the numbers of elephants are based on dung counts, an indirect way of assessing a population. We were unable to determine elephant defecation or dung decay rates for the SE Cameroon study sites and were forced to rely on values for these

variables taken from other forests in Africa. For these reasons the final estimates of elephant numbers should be viewed with caution. We emphasize that ours was a preliminary survey of the elephant population that shows the order of magnitude of its size. It should be followed by a more detailed survey to give an accurate estimate of the number of elephants.

Current Threats to the SE Cameroon Elephants and some Recommendations for their Protection

Interviews with government officials, local villagers and expatriates residing in the subdivision suggest that elephant hunting has been proceeding on a large scale for at least the last ten years. This ten-year period closely correlates with the building of a



This accident, which befell us in November, 1990, illustrates the dangers of traveling on abandoned logging roads. Large tree trunks spanning a stream bed had rotted through, leaving a 'trap' concealed by vegetation. The vehicle came to rest on its axles, half suspended over a 12 foot drop to the river bed below.

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logging road infrastructure that provides easy access to previously remote areas of the region. Among expatriate senior staff of logging companies the consensus is that the elephant population has been halved since the roads were built, and that at least one elephant was killed per day in Boumba and Nyoko Division throughout the decade. Several of our sources indicated that the current international ban on the transport and sale of ivory has had a slight but perceptible 'braking' effect on elephant hunting in the region.

Currently there is no effective anti-poaching programme in the area. Teams of hunters, some of whom specialize in hunting elephants year-round, operate almost freely. They are often armed with semi-automatic weapons for which ammunition is readily available in nearby Congo. Less well-equipped hunters simplify their task by first incapacitating the elephants with large snares made of thick cable and attached to heavy toggles. Local traders are said to be instrumental in supplying weapons and ammunition to hunters, in buying tusks and in transporting ivory out of the subdivision. It is also rumoured that certain government officials play a significant role in this illegal trafficking.

Due to the high biodiversity and great densities of elephants, leopards, gorillas and other endangered mammals present in Cameroon's southeastern-most forests, the area has an extremely good potential for conservation efforts. Although Korup National Park already exists in southwestern Cameroon and Dja Wildlife Reserve in central Cameroon, no measures have been taken to safeguard representative portions of Cameroon's Congolian forests in the southeast. We recommend the establishment of a minimum of two protected areas in Moloundou subdivision. One encompassing the general areas of the Lake Lobeke and Mongokele study sites and another consisting of, at a minimum, the western two-thirds of the proposed Boumba Bek Forest Reserve. The creation of these reserves would be complementary, as much of the Lake Lobeke and Mongokele sites have been logged in the last 30 years, whereas the proposed Boumba Bek Forest Reserve has not. Additionally, the conservation potential of the Lake Lobeke — Mongokele unit will be considerably enhanced by its adjoining both the Dzangha-Sangha protected area in the CAR and the proposed Nouabale-Ndoki protected area in the Congo.

The three Cameroon sites embrace a total of 5,594 km², which is about 2.8% of Cameroon's total forested area, and 1.2% of the total national area. Granting these areas protected status would be consistent with Cameroon's stated national policy of conserving at least 20% of the

country as National Parks and Forest Reserves. Serious land-use management conflicts are not anticipated in the region because there is only a small human population, the potential for plantation agriculture is poor and exploitable trees are few in number.

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