
Forest Elephant Populations in the Central African Republic and Congo

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Introduction

The ivory trade is estimated to have reduced the wild population of the African elephant by half in the past decade. Since the revelation at the 1987 CITES (Convention on International Trade in Endangered Species) meeting, that as little as 30% of the estimated 800 tons of ivory leaving Africa in 1986 was traded within the framework of the CITES quota system, efforts to contain the trade's decimating effects have been stepped up.' In the United States this culminated in June, 1989, with a ban on the importation of most forms of elephant ivory under the authority of the African Elephant Conservation Act of 1988.

Until recently almost nothing was known of the elephant population in the Congo and there was a dearth of data about the situation within other central forest areas. To remedy this, and because of the great concern about the status of elephants in Africa, the European Economic Community (EEC) and the World Wide Fund for Nature (WWF) jointly commissioned studies of elephant populations in central Africa. Presented here are the results of surveys carried out in the Central African Republic (CAR) and the People's Republic of Congo (Congo), two of four countries surveyed between January and June 1989 by Wildlife Conservation International.

The Method of Counting

The method used in these studies follows that outlined by Barnes et al. for estimating elephant density in African forests.² Foot surveys of line transects run on a compass bearing were carried

out at each site by a minimum of two observers and a maximum of four. Transect lengths and locations varied due to forest density and distance from camps. An attempt was made to survey at assorted distances from human population centres. Transect lines were also directed perpendicular to watershed drainage in an endeavor to obtain a sample from varied habitats. Along each transect all elephant spoor were noted, as were dung piles, trails, feeding and rubbing sites and water holes.

Only those dung piles seen by the principal observer(s) (Fay or Fay and Agnagna) from the transect line were counted. Dung of all ages was included even if at an advanced stage of degradation. Distance along the transect was recorded using two pedometers per observer, these were calibrated daily using a topofil at a rate of 10% of total transect distance. Other data collected during the census included notes on the vegetation, human disturbance and hunting pressure, and spoor observations of all other large mammals.

Density

Dung densities are estimated by extrapolation from linear correlations between actual dung density and the number of 1/2 km sectors along a transect in which dung is recorded. Two different equations were used depending on the percentage of sectors found to contain dung, as follow:

for transects with <75% of $\frac{1}{2}$ km sectors containing dung,
 $D = 6 + 703p$ ($r = 0.83 + 64\%$)

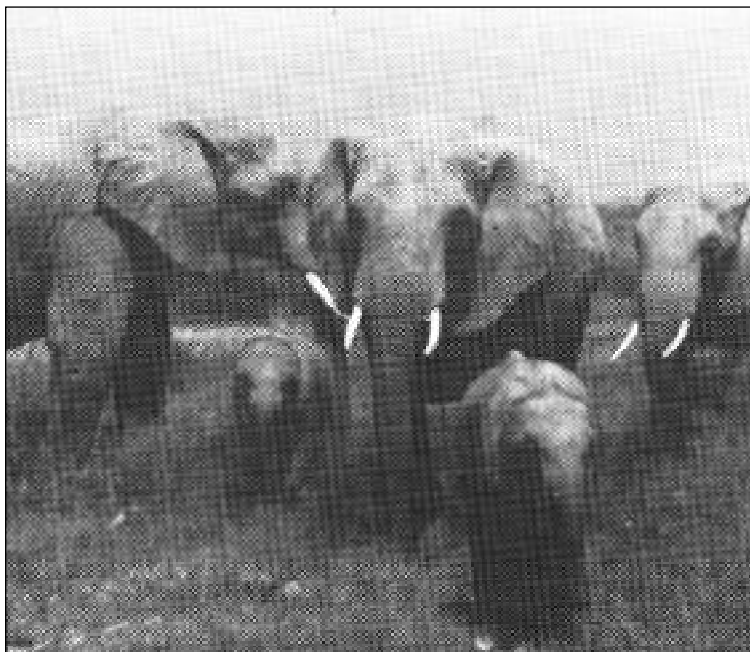
Where p = proportion of sectors containing at least 1 dung pile and D is dung density

for transects with $\geq 75\%$ of $\frac{1}{2}$ km sectors containing dung,
 $D = 110 + 1576p$ ($r = 0.94, \pm 22\%$)

where p = proportion of sectors containing at least 3 dung piles and D is dung density

These equations were derived from data collected in Gabon and we believe that conditions in Congo and CAR were similar to those in Gabon.³ Although the first equation has a greater margin of error than the second, it is employed here because of the low dung densities found in some transects.

To extrapolate elephant density from dung density a conversion factor of 0.0018 is used,⁴ based on the assumption of a dung decay rate of 0.03 and a defecation rate of 17 piles per elephant per day.^{5,6} Three numbers are estimated in calculating elephant density: dropping density, mean number of droppings produced per elephant per day, and mean decay rate of droppings. Barnes et al. suggest that these estimates introduce a margin of error in elephant density calculations of about 25% and that values obtained using this method should therefore be viewed as mere approximations in lieu of more accurate density data.



A family scene in Amboseli, Kenya

The Central African Republic

J. Michael Fay

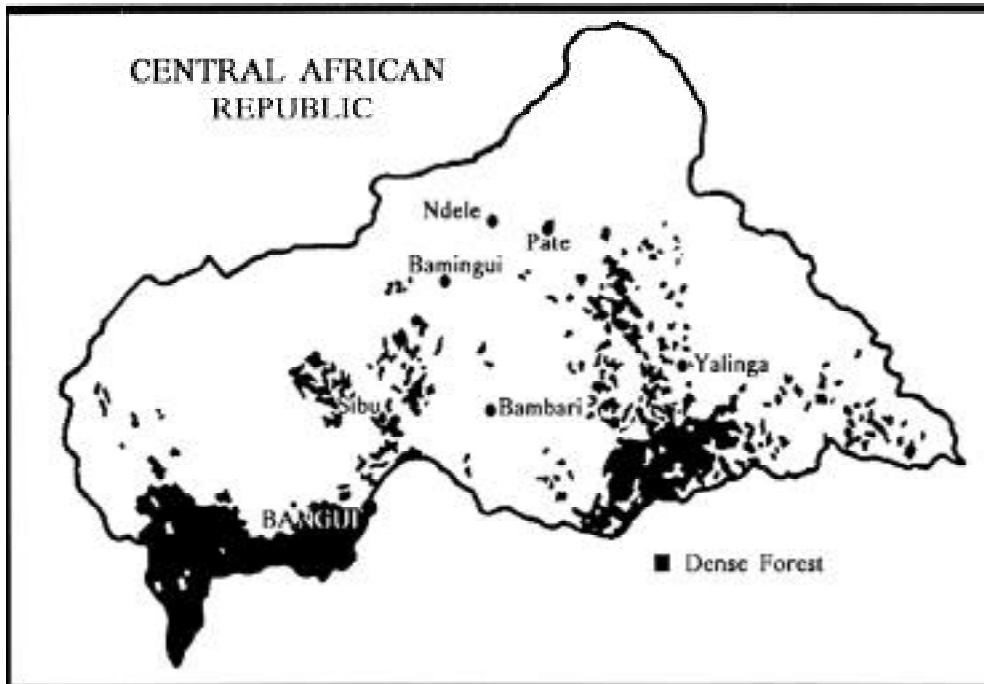


Figure 1. Map of the Central African Republic showing the dense forest areas

The Central African Republic is a country nearly as big as Texas but with only about a quarter of the population; on average, each of its 618,135 km² area supports four people. Much of the eastern half is uninhabited and elsewhere the population is concentrated along the roadsides. If forest outliers, gallery forests and dry forests are included, 92,500 km² or 15% of the country, is covered by forest. The southwest and southeast of the country has a continuous lowland tropical forest covering approximately 40,200 km².

Some 20,000km² of the 35,000 km² of forest in the southwest is occupied by current logging concessions. The forests in the southeast of the country are not commercially exploited but there are several roads through the area and many plantations and slash and burn farms.

Until the early seventies the CAR was home to a very large population of elephants but then, in a few years, poachers killed 80% of the animals of the savannah zone^{7,8}. This level of poaching is largely attributable to the incursion by hordes of Sudanese and Chadian horsemen over the last 15 years. These poachers, well armed with automatic rifles and wide, thrusting elephant spears, arrive in large caravans of horses and camels. In the past the exclusive activity of these bands was elephant and rhino poaching; in the early eighties several caravans were ambushed with over 100 tusks in their possession. Usually the bands stay in CAR territory most of the year killing elephants with impunity. They usually leave at the height of the wet season when hunting on horseback is difficult. At any one time there are probably several tens of these caravans working the eastern CAR,⁹ In the years since 1985, as the rhino has become more or less extinct and the number of elephants greatly reduced, these poachers have resorted to hunting for meat and even honey but,

of course, when they see signs of elephants they continue to pursue them. The continuous pressure will probably be enough to reduce the elephants of the savannah areas of the CAR to virtual extinction in the next five years.

In addition to Sudanese and Chadians there has been a significant number of elephants killed by Central Africans. Three northern tribes are well known for their elephant hunting: Rounga, Goula and Sara; These men account for many elephant casualties in the more specialized habitats such as the gallery forests of northern CAR and the forests of the southeast, where it is not easy to gain access by camel or horse.^{10,11} Government employees have played a not insignificant role in the reduction of elephant populations in the CAR. During

the Bokassa era large numbers of elephants were killed, and their products funnelled through "La Couronne". This poaching activity was probably centred around Bangassou where there were many large-tusked elephants. More recently a large amount of ivory has been leaving the country through the Bangui market as worked products. Currently there are 27 artisans and 41 dealers licensed by the government to deal in ivory products. For a number of reasons much of the ivory that they deal in is unaccounted for and has illegal origins. The ivory trade is alive and well in the Central African Republic.

Study Sites

In May and June, 1989, three areas of the CAR were selected for transects intended to determine the elephant populations. The three study areas corresponded to the main forest blocks found in the CAR. Two of these are in the southwest of the country, bordering on the People's Republic of Congo and Cameroon, and the third is located in the southeast.

Site 1 was in the Ngoto forest on the eastern side of the southwestern forest. The transects at this site were run north-south in the largest remaining block of contiguous forest, southeast of the town of Bambio in the Bambio, Ngoundi, Kenengue triangle; This area is currently being considered as a reserve for an EEC forest conservation project. The most easterly part of this forest block was not surveyed because no elephants have been recorded there for some years.

The vegetation in Site 1 is primarily semi-deciduous dense forest with large areas of *Raphia* spp. swamp along the Mbaere and Bodingué rivers which border the area on the north and south. The human population is relatively dense and there are two major

towns, Bambio and Mbaiki. Much of this forest has already been selectively logged, especially the eastern sector, because it is the forest area closest to the capital and contains the highest density of exploitable *Entandrophragma* spp. trees in the country.

The single greatest influence on the area has been the construction of the '4th Parallel Road'. This is a major highway that has been built in the last four years and runs east-west, bisecting the forest. The road has altered the socio-economics of the area and brought in many settlers who not only live by slash and burn agriculture along its sides but also do a significant amount of poaching. Slash and burn farming is also consuming large tracts of the densest *Entandrophragma cylindricum* stands in the entire country. When complete the road will be the major thoroughfare from Cameroon to the CAR and this will compound the already disastrous effects.

In addition to the '4th' the numerous logging roads in the area have provided vehicular access to most of the forest, in turn bringing a great deal of poaching. The Bodingué and Ngote logging roads are particularly important in this regard.

Site 2 was located in the extreme southwest of the country in the proposed Dzanga-Sangha reserve area. This area was studied extensively in 1986 and 1989 when over 600 km of transect surveys were completed.^{12,13} 'Therefore qualitative observations were made and only one transect laid out in the central part near Ngoubunga, an area of high elephant density. The vegetation is primarily dense semi-deciduous forest with *Raphia* spp. swamp forest along the minor rivers, *Guibourtia demeusii* flooded forest along the Sangha river and *Gilbertiodendron dewevrei* forest along upland watercourses. The forest in the northern section, centred on Bayanga, was selectively logged, at a rate of 0.4 stems per ha, from 1972-1987. There are approximately 1,000 km² of secondary forest in the study area. The human population density is fairly high with four large towns, Nola, Bayanga, Salo and Lindjombo.

Site 3 was centred around Bangassou which is in the forested region of the southeast of the country. The transects were run in two different parts of the forest, the first on the northwestern side, north of Ndanda, and the second to the northeast, north of Fodé. These two areas were chosen because they represented the more isolated and natural forest in the region. Based

on interviews in Bangassou it seemed reasonable to assume that the forests surrounding the town contained very few elephants and these were therefore not surveyed. While the Bangassou forest has never been exploited commercially for lumber, since colonial times it has contained numerous coffee plantations and roads, and has always had a fairly high human population. There are three north-south and two east-west roads running through the area, cutting the forest into wide strips. The forest is not continuous as it includes large areas of laterite shield that carry a short grass savannah vegetation.

The dense forest in this area is generally on shallow soils and in many cases has a dry forest physiognomy dominated by *Anogeissus leiocarpus* and *Margaritaria discoidea*. It contains a low density of exploitable trees and, coupled with the many areas of laterite shield, is not an area to attract commercial endeavour. The human population density in this area is fairly high, centred in the town of Bangassou, with a population of over 15,000. In the past ten years the more remote villages have been abandoned with the result that many of the roads through the forest are all but unused.

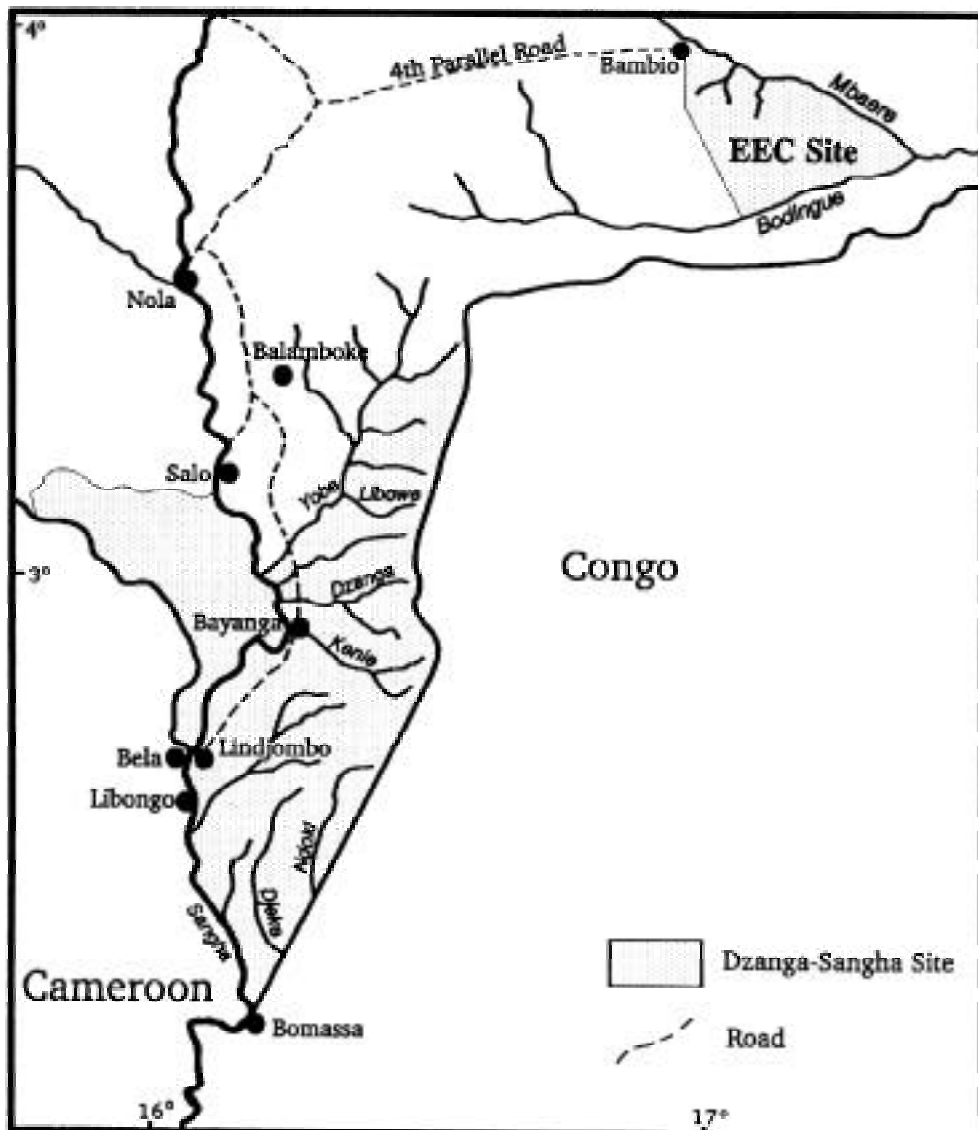


Figure 2. Map of Sites 1 and 2 and the important geographical locations in southwestern CA

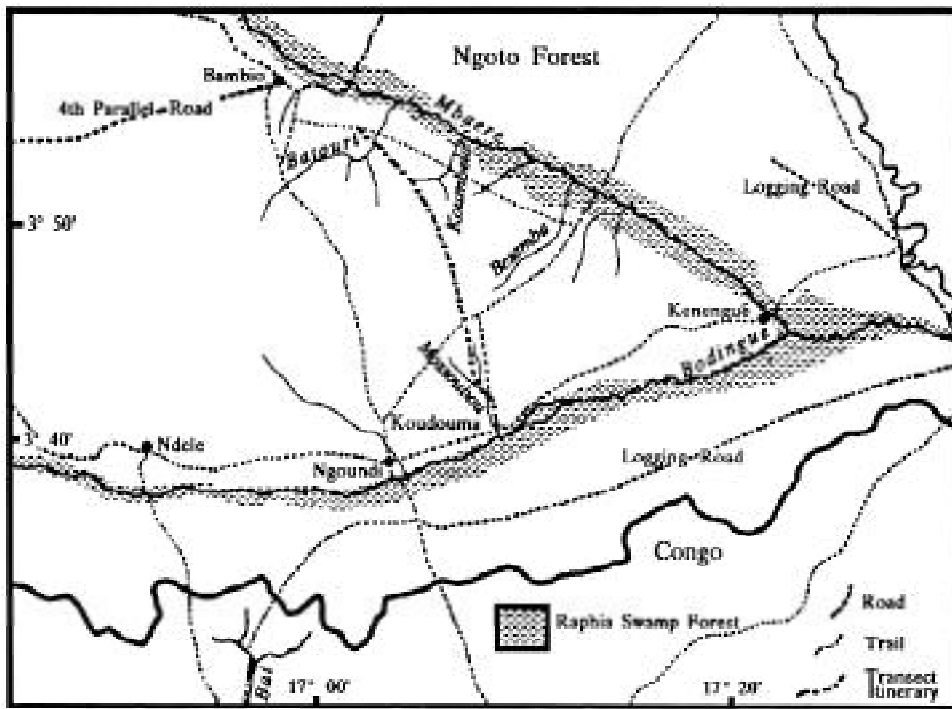


Figure 3. Map of Site 1 in the Ngoto Forest region of southwestern Central African Republic

sectors. The overall elephant dung density was estimated to be 266 piles per km² and this yields an extrapolated density of 0.48 elephants per km². The average distance of all transects from the nearest village was 21.29 km. The lowest dung density of the three areas surveyed was in the Ngoto forests of Site 1 where no piles were found. The average distance of the transects from a village at this site was 12.33 km. The highest dung density was found to be that in the single transect in the proposed Dzanga-Sangha Reserve with an overall dung density of 1,166 piles per km² and an extrapolated elephant density of 2.10 per km². The distance of this transect from a village was 25 km. Site 3, in the southeast, was found to have an intermediate dung density of 336 piles per km² for an density of 0.61 elephants per km². The average distance of the transects in this study site from a village was 23.6 km.

Results

Fourteen transects totalling 147.0 km were completed for the survey countrywide. Dung was recorded in 110 of 294 1/2 km

When elephant dung density for each transect is plotted against distance from the nearest village a significant positive linear correlation results with $r=0.69$ and $p<0.01$

Table I. Raw data for all elephant survey transects

Transect No.	Date	Location	Length of transect	No 1/2 km segments	No 1/2 km segments with dung	Proportion with dung, p	Dung density	Elephant density	Distance from village
Site 1 (Bambio) southwestern CAR.									
37	19 5	Batouri Riv.	9.0	18	0	0.00	0	0.00	11
38	20 5	Koumbela Riv.	11.0	22	0	0.00	0	0.00	16
39	21 5	Besamba	13.5	27	0	0.00	0	0.00	10
Site 1 (Bambio: 3 transects)		33.5	67	0	0.00	0	0.00	12.33	
Site 2 (Bayan a southwestern CAR.									
42	25 5	Bai Hokou	6.0	12	8*	0.67	1166	2.10	25.00
Site 3(a) (Ndanda) southeastern CAR									
43	07 6	Ndanda	16.0	32	0	0.00	0	0.00	8
44	08 6	NE of Ndanda	15.0	30	8	0.27	196	0.34	20
47	11 6	N of Ndanda	11.5	23	7*	0.30	583	1.05	24
48	12 6	N of Ndanda	11.5	23	12	0.52	372	0.67	22
Site 3a (Ndanda: 4 transects)		54.0	108	38	0.35	252	0.45	18.50	
Site 3(b) (Fodé) southeastern CAR.									
52	18 6	Baketekpala	8.5	17	7	0.41	294	0.53	26
54	19 6	Bavougba	4.5	9	6*	0.67	1166	2.10	33
55	20 6	Bavougba	11.0	22	15	0.68	484	0.87	34
56	21 6	Bavougba	15.0	30	16	0.53	379	0.68	33
57	22 6	Bananzi	10.5	21	13	0.62	442	0.80	21
58	23 6	Bananzi	4.0	8	3	0.38	273	0.49	15
Site 3b (Fodé: 6 transects)			53.5	107	63	0.59	421	0.76	27.00
Site 3 (Bangoassou: 10 transects)			107.5	215	101	0.47	336	0.61	23.60
All Sites (14 transects)			147.0	294	110	0.37	266	0.48	21.29

*1/2 km sectors with three or more dung piles

Site Results

Site 1. A total of 33.5 km of transects was completed at this study site. Elephant dung was not observed on any transect but spoor was seen in 25% of the 67 1/2 km sectors. These consisted of very old tracks, found for the most part in the areas farthest from villages. No fresh elephant sign was seen.

Fifty-seven and a half kilometres of non-transect trail was walked in this study site. This consisted for the most part of walking on hunting trails and on the 34.5 km between the villages of Bambio and Ngoundi on a heavily used footpath. Three elephant tracks were seen on these trails between Ngoundi and Bambio. One track, almost at the midway point between Ngoundi and Bambio, was fresh.

On the east side of the Koudouma savannah, near the Bodingué river, the location of elephant dung was known to a local pygmy. About ten dung piles were found in the vicinity of an old village site and along the Bodingué. The guide indicated that this was a major concentration point for elephants of the region. They came to feed on the oil palm nuts that are in abundance there in March-April. Judging from the dung and track density in the area of the old palm plantation, it was estimated that there had been a modest concentration of elephants there about two months previously. No other evidence of concentration of elephants was seen in the transect study area.

During the survey a total of five poaching camps were encountered. Reached by a network of trails, the camps in this area are frequently semipermanent and well used, although often located in areas where the only water to be found is from lianas and *Musanga cecropioides* trees. During the last transect, on the Koudouma savannah, a very large, active camp of villagers and Bayaka pygmies was found. There were at least 15 families in the group at what was primarily a meat and palm wine camp. However, they also had a 9.3 mm elephant gun which they said

had been used seven times in the past two weeks to wound, but not kill, three different elephants. These poachers indicated that there was still a good deal of poaching of elephants in the local area. They were hunting primarily to the north of the Bodingué in the proposed EEC reserve area. The gun was said to belong to a police sergeant residing in Bangui. Just west of this large camp another was found. This was primarily a buffalo, *Syncerus caffer*, hunting camp. Snares, rifles and shotguns are used for this activity. Indeed, it was here that a rather high density of buffalo tracks was noted. The inhabitants of this camp said they would not hesitate to shoot an elephant should the opportunity present itself.

No elephant carcasses were found during the survey at Site 1 either on or off the transects.

Area analysis: Site 1. En route to the start of the transect survey the new 4th Parallel highway was taken. This road is intended to be the major trade route between Bangui and Douala where most imported goods originate. Thus far it has been half completed, going from the main Berberati-Nola road in the west to the town of Bambio; much of its bed was cut through virgin forest. The major problem, as is always the case with new roads, is that it has paved the way for settlers. On the older parts of the road there is an almost continuous band of slash and burn plots and several villages whose *raison d'être* is hunting. It can be conservatively estimated that this road has increased the hunting pressure in the vicinity several hundred-fold particularly to the south where there were relatively high game densities. The road has just been completed to Bambio providing quick and easy access from Berberati and Nola.

Bambio is a town of over 1,000 inhabitants. For many years it was isolated by the poor state of the roads and was probably losing population. The economic mainstays have been coffee growing and hunting but game is now scarce in the immediate area. The fact that many of the camps used by the inhabitants of Bambio are without water is an indication that game populations along the streams have been reduced to levels no longer viable for hunting.

There is a group of elephants that feeds in the fields close to Bambio and apparently frequent the area around the town. This is said to be a relatively recent phenomenon. It is believed these elephants came from the south, probably seeking refuge from hunting pressure there. It was also said that there were many elephants on the Mbaere river upstream from Bambio, but this was not confirmed.

The other main centre of human habitation that affects this site is Ngoundi. This is a large village of over 100 huts just north of the Bodingué river. No road reaches this village. It would appear that

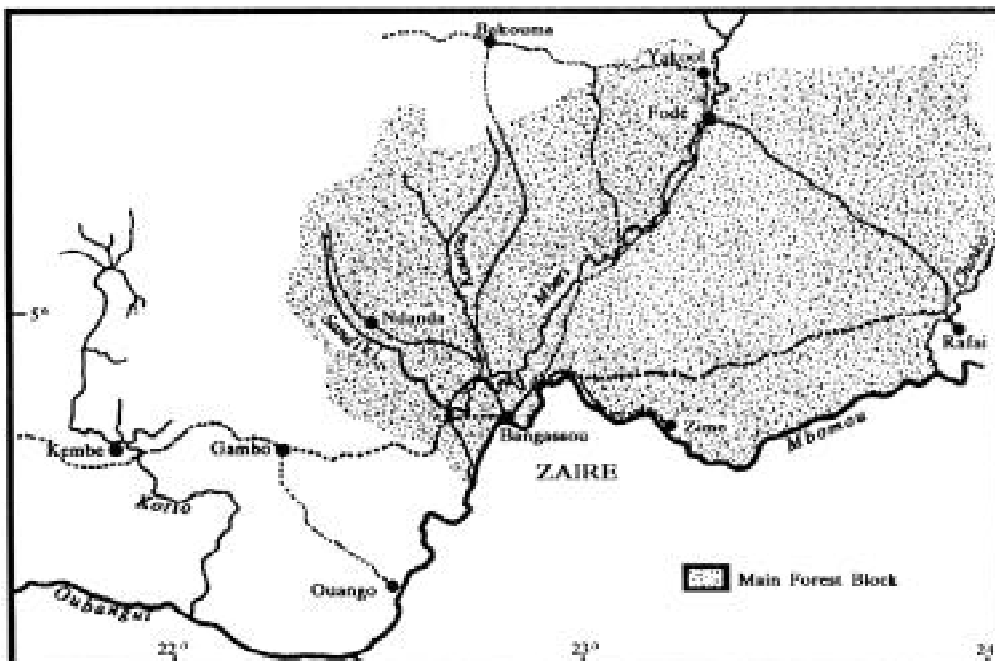


Figure 4. Map of Site 3 in the Bangoussou dense forest region of southeastern Central African Republic

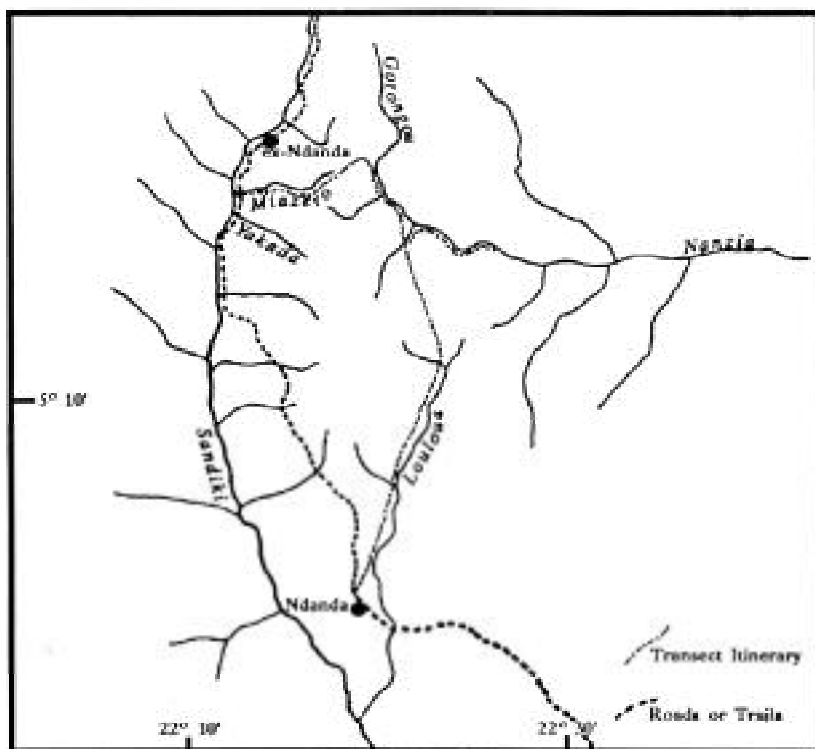


Figure 5. Detailed map of the Ndanda study area of Site 3 in the southeastern CAR

the main activity is poaching; many of the bush-camps seen were of Ngoundi origin. Most of this hunting is for small game such as duikers, pigs and monkeys but there are elephant guns in the village. People from Ngoundi also frequently hunt in the Congo, commonly on the Mbai river just to the south of the CAR village of Ndele. There is an active meat trade in the area because of a new logging road that reaches the Bodingué just south of Ngoundi. This has given very easy access to the markets of Mbaiki and Bangui; from Bangui one can reach the end of the road in about three hours. The entire region has always been an important source of meat for the Mbaiki market and the road has eliminated the only check that remained on poaching, transport. The inhabitants of Ngoundi indicated that the greatest concentration of elephants in the area was on the headwaters of Mossoubou Creek to the northwest of the village, but there was not enough time to go there.

There is no doubt that the game populations in the proposed EEC reserve area are very low. The elephant population is extremely depressed, as is that of buffalo. No sign of bongo, *Tragelaphus euryceros*, or sitatunga, *Tragelaphus spekii*, were noted. The sign of gorilla, *Gorilla gorilla gorilla*, gave the impression of highly disbanded groups that are probably heavily poached. There was little sign of chimpanzee, *Pan troglodytes*, but they do exist; duikers and monkeys are the objects of the greatest hunting pressure.

Site 2. A single transect of six km was completed in the Ngoubunga area just to the west of the Congolese border and within the proposed Dzanga-Sangha Reserve. The elephant density here is extremely high. An indication of this is the large proportion of $\frac{1}{2}$ km sectors in the transect with three or more dung piles. Large elephant trails are common and, for the most part, heavily used. The area contains many clearings that are created in part by elephants.

Two other areas in the proposed Dzanga-Sangha Reserve were surveyed qualitatively. A foot survey of the southern part of the proposed Ndoki park area was done in May. Much elephant sign was noted along and up to ten km east of the Djéke river, and along the Kenié Creek. Traveling west, elephant density drops off significantly at about 3.5 km from the Sangha river and becomes negligible along that river.

The other area surveyed was around the Dzanga clearing where several days were spent observing elephants. They appeared every afternoon at about 3:00 pm, were very calm and often accompanied by bongo, buffalo, hylocheres (*Hylochoerus meinertzhageni*) or potamoheres (*Potamochoerus porcus*). There would be several family groups working the saline on any one afternoon. The total number of elephants at the salt varied between 36 and 87 and included five to eight large bulls, some with tusks of over 20 kg. The number of small elephants was high and, overall, the population appeared to have a normal age structure. There was no evidence of poaching.

During the survey Mr Alain LeFol, a safari hunter, was hunting just north of the Dzanga clearing along the Libowé river. Along the reek he found a large bull elephant dead with several bullet holes in the head. It probably had been shot the previous week. The elephant had escaped the poachers but later died. The tusks were not weighed but appeared to be about 20 kg each. Mr LeFol indicated that the elephant population along the Libowé is very high.

Area analysis: Site 2. The proposed Dzanga-Sangha Reserve area is very large, about 4,500 km². Because of the border nature of the reserve area it is subject to a number of different influences. Traditionally there have been five elephant poaching centres within the CAR that would affect the reserve area: Nola, Salo, BalambokÉ, Bayanga and Lindjombo. The guns in all these have two primary sources, Moslem merchants and government employees. In most of the region there is a lot of diamond trading and so there is a good deal of money about; there is also a well-established, clandestine trade in diamonds. It is very easy for Moslem traders to buy an elephant gun and hire Bayaka to shoot elephants.

Since the establishment of the World Wildlife Fund/US project the amount of poaching has significantly decreased around Bayanga. The now protected, core area lies east of the Sangha and between the Libowé and Kenié rivers and has the highest density of elephants in the proposed reserve. However it is evident that illegal hunting is still practised on a large scale from Nola, Salo and Balamboké to the north and several elephant guns operate out of Lindjombo poaching in the southern area. The project has had virtually no effect on these. In addition there are Moslem traders in the villages of Libongo and Bela, across the river in Cameroon, who employ people to hunt in the proposed Ndoki park. Bomassa, a Congolese village, also provides an important base for poachers.

Site 3. A total of 107.5 km of transects was completed at this study site. The transect survey encompassed two different areas,

Ndanda and Fodé. Both of these are located at the northern edge of the Bangassou forest and probably contain the highest relative elephant densities in the region. The Fodé study area showed a higher elephant density than Ndanda with extrapolated elephant densities of .76 and .45 elephants per km² respectively. The average distance from a village of the Fodé transects was 27.00km and that of Ndanda was 18.50 km.

Transects which crossed savannah or laterite plain accounted for 19.07% of the total distance but only 2.97% of the dung found. The density of elephant dung was found to be approximately seven times greater in the forest than in the savannah areas, 55 piles per km² for savannah and 400 piles per km² in the forest.

At the Ndanda site four walks were taken totaling 48.5 km, two along dry *Raphia* swamp creek beds northwest of Ndanda and the others along the footpath that connects ex-Ndanda with present day Ndanda. The creek beds had very many dung piles, indicating an elephant density of 1.70 per km², but there was no elephant dung at all along the entire trail from ex-Ndanda to Ndanda.

The creek beds were frequented by elephants both to feed on *Raphia* hearts and for water. There was very much evidence of the presence of other species of large mammals, including buffalo, bongo, potamochores and hylochores.

At the Fodé site a total of 61.0 km of non-transect trails was walked. In general, these were hunting trails but the now abandoned Rafai road was also traversed. These paths contained overall a very low estimated elephant dung density with 34 piles per km². Much of the non-transect trail traversed the laterite shield areas and thus represents a largely non-forest sample.

Elephants were twice heard feeding in the *Raphia* swamp vegetation in the Ndanda survey area. They were not seen but on both occasions they sounded like small groups. One striking aspect of the elephant tracks seen here was the very large size of some of the individuals. The tracks of at least two of the individuals seen were of enormous elephants.

No elephant carcasses were found during the transect survey at this site.

Area analysis: Site 3. At the Ndanda site the level of poaching was found to be rather high. Three nights were spent at an elephant poachers' camp. There are a number these camps on the old Ndanda road and also several in the interior forming a chain all the way to the Kourou river. During the dry season, when the creeks in the interior disappear, most of the poachers congregate in camps along the Sandiki river because this has permanent water. Two hunters were already in the camp, one a Goula and the other a Sara, and both owned .375 Winchester rifles. They had been in the Bangassou district for several years, hunting elephants most of the time, primarily in the areas between the Kotto and the Kourou rivers. They said that elephants were no longer very common around the Kotto; more were to be found to the east of the old Ndanda road west of the Kourou. The hunters gave the impression that they shoot any elephant they encounter. There is no season for elephant hunting; it continues all year long. At least three different parties of porters passed through this poachers' camp in three days. They were transporting meat from a camp about ten km farther north to the village of Ndanda. No elephants were shot during the stay in the camp. The people in Ndanda act as brokers for much of the meat and ivory that comes out of the area north of their village. Most of the active inhabitants are involved in the meat trade in some way. A select number of people are elephant specialists.

According to local informants the Sudanese had not yet reached this area, only far to the north along the Bakouma Road.

In the Fodé area the elephant poaching situation paralleled that of Ndanda. Along the semi-abandoned road to Fodé, several small seasonal villages were encountered. In most of these villages there were at least a couple of shotguns and in several there were high-powered rifles. Two nights were spent in one of the camps to get an impression of the level of poaching in the area. The first night there was only a single Nzakara man from Bangassou there. Armed with a 12 gauge shotgun and a .458 elephant gun, he was spending a few months hunting. He had yet to kill an elephant but had shot a hippo in the Mbari about a week previously. He was to leave the next day for a ten-day trip in search of elephants and said he was almost assured of shooting one. The man offered for sale two tusks of 9 kg each which were in his house in Bangassou, the result of his last hunting trip. The next morning another hunter was met as he was passing by on his bicycle. This individual had a shotgun, a leopard skin and two tusks. He

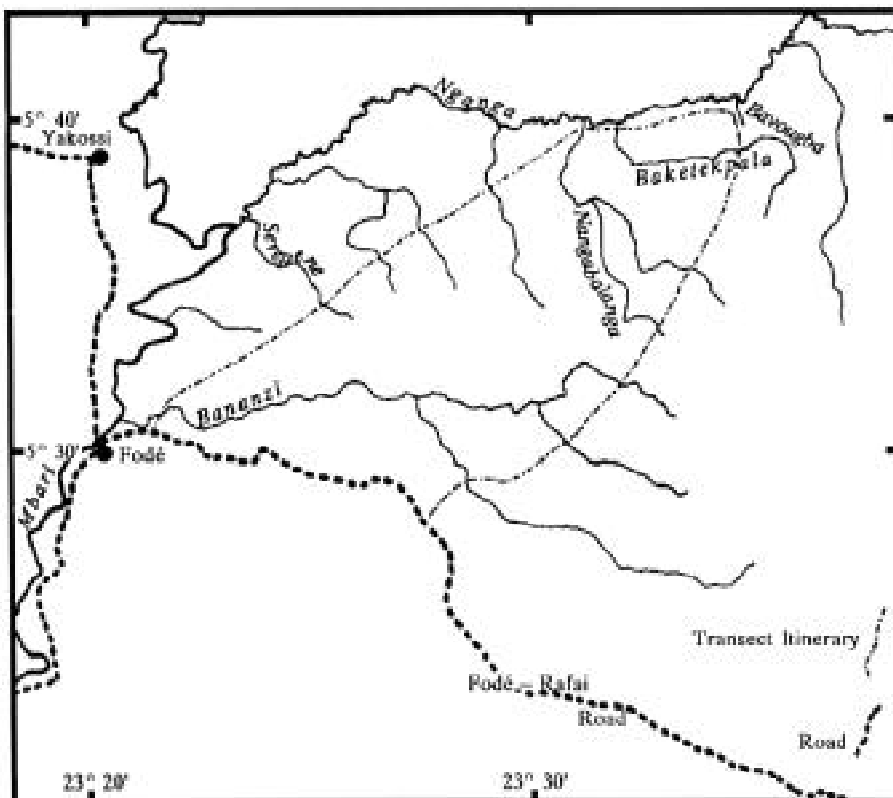


Figure 6. Detailed map of the Fodé study area of Site 3 in southeastern Central African Republic

Table 2. Raw data for all elephant survey non-transects

Transect No.	Date	Location	Length of transect	No 1/2 km segments	No 1/2 km segments with dung	Proportion with dung, p	Dung density	Elephant density	Distance from village
Site 3 (Ndanda) southeastern CAR.									
45	096	Nanzia	9.5	19	10*	0.53	945	1.70	20.0
46	106	Gerengou	6.5	13	7*	0.54	961	1.73	21.0
46a	106	Ndanda Foot.	4.5	9	0	0.00	0	0.00	23.0
49	136	Ndanda Foot.	28.0	56	0	0.00	0	0.00	12.0
Site 3 (Ndanda: 4 transects)			48.5	97	17	0.17	129	0.23	19.0
Site 3 (Fodé) southeastern CAR.									
50	169	Serepene	17.5	35	0	0.00	0	0.00	6.5
51	17 9	Nganga	17.0	34	3	0.09	69	0.12	13.0
53	199	Baketekpala	7.5	15	1	0.07	55	0.10	31.0
59	23 9	Rafai Road	19.0	38	1	0.03	27	0.05	8.0
Site 3 (Fodé: 4 transects)			61.0	122	5	0.04	34	0.06	14.6

*1/2 km sectors with three or more dung piles

offered to sell the leopard skin for 7,500 CFA and the tusks, which weighed about 9 kg each, for 7,000 CFA per kg. The hunters said that tusks that weighed more than ten kilos were purchased in Bangassou for 8,000-10,000 CFA per kg and smaller tusks sold for 4,000-5,000 CFA per kg. Leopard skins were becoming very difficult to sell since Moslem traders did not readily buy because of the difficulties in smuggling them out of the country.

The village of Fodé is much smaller than it once was. It was created as an adjunct to a coffee plantation that has been abandoned since 1975. At present the main occupation is hunting and there are many shotguns and several high-powered rifles in the village. The surrounding bush has an extensive trail system leading into isolated hunting camps. The guide for the survey knew the surrounding area extremely well and recounted many tales of elephant hunting as practised around the village. There are merchants that wait in Fodé for an elephant to be shot. Then, when word is sent of a successful hunt, they hire porters to carry the meat back to the village. Porters are generally paid 500 CFA per piece of meat delivered. The average man can carry five or six pieces and make one round trip in three or four days. The merchants then haul the meat to Bangassou by bicycle. The tusks are either sold in Fodé or transported to Bangassou to be sold to Moslem merchants. No Moslem traders were seen in either Fodé or Ndanda.

The residents of Fodé said that Sudanese horsemen had reached the region several years previously and continued to penetrate the area in large numbers. Even in forest-laterite areas they cut passages through the forest for their camels. They also told of large numbers of Goula and Sara men, saying that these have been hunting in the Mbari and Chinko areas for a long time and have taken a very heavy toll of the elephant population. They said that the elephant population had diminished quite noticeably in the past ten years. Big tusks are no longer a common occurrence.

In Bangassou elephant meat is sold in fair quantity in the public market everyday; it would seem that elephant is the meat of choice in this town. A survey of all of the smaller markets in the town revealed that elephant meat products were sold universally. Another commodity that is in ready supply in Bangassou is ammunition. All of the hunters spoken to said that the purchase of ammunition was extremely easy, all on the black market of course. Almost any calibre of rifle cartridge is readily available for between 4,000 and 7,000 CFA apiece, depending on the season. Shotgun shells cost 350 CFA each and are in abundant supply, both of Congolese (M.A.C.C.) and Central African (Jaguar) manufacture.

Many of the hunters in the Bangassou region have handmade shotguns. These are fabricated in Sudan, Zaire and the CAR. Rather simple, single-shot 12 gauge shotguns, the barrel is made from the steering column of a Land Rover. Many hunters kill elephants with these home-made guns. Normally they make slugs by melting lead into a 14mm socket spanner and then, after double charging a 12 gauge shell, insert the slug. This is sufficient to kill an elephant if the hunter is close enough.

In making a general survey of the Bangassou forest region a drive east along the Mbomou river to the village of Zime was taken. Inquiries about elephants in the area elicited that, while there were a good number on the Zaire side, to the north, all the way to the Bangassou-Rafai road, there were few if any. Some safari hunters suggested that further to the east there was still a significant number of elephants and spoke of an annual transhumance from Zaire. To the southwest of Bangassou, in the forests around Ouango, a few elephants continue to exist¹⁴ and in the not too distant past elephants were present around the village of Gambo to the west of Bangassou.¹⁵

Discussion

Overall the forest elephant population in the CAR is fairly high and compares favourably with that in surrounding countries.

As in the Congo¹⁶ and Gabon,¹⁷ the overriding factor that controls elephant populations and distributions in the forests of the CAR is human hunting pressure. There was a significant positive correlation between “distance of transect from village” and elephant density. This relationship should be viewed as particularly robust because the conditions in the three study sites were very different.

A rather striking conclusion that may be drawn from the results of this study is that elephants know and avoid human trails. Elephants rarely cross these even when they cut access routes to a prime resource, such as the Sandiki river at Site 3a. It is unusual to find elephant dung on a human trail where poaching is occurring. Related to this is the fact that in the Bangassou forests elephants seem to avoid open laterite plain areas despite high elephant density in the surrounding forests. The poachers often joke about the elephants knowing the exact location of camps and trails and how they consciously avoid them.

The first study site, where no elephant dung was recorded in the transects, has been particularly hard hit in recent years by human encroachment and also has a long history of relatively high human activity. The population of elephants in the entire Ngoto forest probably does not exceed 200. Today, with forest exploitation and the 4th Parallel Road, the impact on the remaining, scant elephant population will increase exponentially and will most likely drive the elephant population to extinction in the near future. There are large numbers of guns and hunters. Systematically, when a fresh elephant track is encountered by hunters it is followed and the elephant is eliminated if discovered. There is absolutely no selection because present populations are already so low.

The one hope in this region is the possibility of the establishment of a reserve in the Bambio, Ngoundi, Kenengue triangle. This project is currently being considered by the EEC. Because the area is well defined and bordered on two sides by swamp forest it is afforded natural protection and is small enough to be relatively easy to protect even with the high density of humans in the surrounding area. It would, of course, require patrolling guards. The proposed reserve area still holds important remnant populations of all of the large mammals originally found there; with three to four years of protection the populations of many mammals would probably return to reasonable levels. It would take somewhat longer for gorillas, chimpanzees and buffalos, but it is believed that the populations of these species are viable and would benefit greatly from the establishment of a reserve. The elephant population would be difficult to maintain because of the large home range it needs. If hunting pressure was great enough on the outside elephants might remain inside the reserve on a permanent basis and, if this were the case, a small population of elephants could possibly be maintained.

Until the early seventies Site 2 was virgin forest. There were a few villages along the Sangha river and undoubtedly some elephant poaching. After Slovenia-Bois started operations in the early seventies and a road was opened providing access to the large population centres of the north, the village of Bayanga grew into a small town of several thousand people. Bayanga was then in the centre of one of the densest populations of elephants left on the continent. Throughout the late seventies and especially in the early to mid-eighties poachers started to

make inroads into the elephant population with poaching probably reaching a peak in 1984-1986. At that time the average elephant population density was estimated at 0.6 elephants per km² while, for the area in which the transect in this study was done, Carroll obtained an elephant density figure of 2.63 elephants per km², a figure similar to the present result.^{18,19}

In 1987 the World Wildlife Fund/US funded a conservation project based in Bayanga providing, in principle, protection for over 4,000 km² of forest. Since then security has been effective in much of the reserve area, especially the part with high elephant densities to the east of Bayanga. If the area in which the project currently provides patrols expands to encompass the entire reserve the elephant populations should start to increase, mostly because of compression from areas outside the reserve but also hopefully through natural growth. If progress can be made on establishing a reserve on the east side of the Dzanga-Sangha Reserve in the Congo, and to the west in Cameroon (Appendix I) the elephant population in this area should be on a sound footing for the future. Certainly in the past two years the change in the number and compartment of the elephants in the Dzanga area has improved dramatically.

The most significant result of this survey was proof of a high elephant population in Site 3. Because of the high poaching pressure that the area has experienced in the past 15 years it was logical to assume that the elephant population in the area had all but disappeared. There are several possible reasons for the remaining, relatively high density of elephants in the Bangassou forests. Forests in general have retained a greater percentage of their original elephant populations in the past ten years because it is much harder to hunt in forests; elephants are generally killed there on a one by one basis. Human population density is lower in forests than in surrounding savannah areas, thus forests have a lower intrinsic poaching rate. Another factor of importance in the forest area around Bangassou has been compression. On the west, and primarily caused by Goula and Sara men from the Ndele region, hunting pressure has been high along the Kotto river for a number of years. In 1980 elephants were still fairly common along the Kotto (Fay. pers. obs.); today elephants are rare there. On the eastern and northern sides of the area Sudanese raiders have been poaching for years. As little as 15 years ago many elephants in the 40kg tusk weight range were still coming out of the area just east of the Fodé study area, along the Chinko river. Taken all together, these activities have pushed the elephants from east, west and north into their present concentration.

Certainly the remaining elephant population in the Bangassou region is heavily poached. During this study many elephant hunters were encountered. The infrastructure is in place to traffic the products from this illicit activity which is not overly covert in the region. Perhaps a reserve is not the solution in the Bangassou region because the elephant range is repeatedly divided by human population and activity. Because the inhabitants of the town of Bangassou seem particularly fond of elephant meat and tusks represent a fortune to them, it is going to be impossible to eliminate elephant poaching in the area. However, regulating the trade in arms and ammunition, curbing the sale of elephant meat and tusks and controlling transport on public roads would make it much more difficult for elephant poachers to operate. This would obviously only slow the rate of

poaching but might bring it more into line with the natural rate of increase of the elephant population.

It is difficult to estimate the population of forest elephants in the CAR. If the data obtained in this and earlier studies are used for each of the three study areas taken separately, an estimated total of 6,240 elephants is obtained. This figure does not include CAR forests assumed to have very low elephant density, and also applies average extrapolated densities to large blocks of forest. The estimate must therefore be treated with great caution, and is perhaps better viewed as an order of magnitude.

As in many elephant habitats, poaching in the CAR is common. If the present rate of poaching continues there will be very few elephants left in the country in another five years. Although laws exist to protect elephants there is still a good deal of ivory leaving the country. Much greater control on the ivory trade out

of Bangui should be exercised. Since much ivory is legally exported this should be a relatively easy task. It is recommended that the collection of ivory and hunting of elephants in the CAR remain outlawed.

Table 3. Extrapolated population of forest elephants in the Central African Republic

	Surface Area of Forest	Elephant Density	Population
Site 1	5,000km ²	0.00	0
Site 2	6,000km ²	0.60	3,600
Site 3	5,500km ²	0.48	2,640
Total	165,000km ²		6,240

The People's Republic of Congo

J. Michael Fay and Marcellin Agnagna

Introduction

With an area of 342,000 km² the Congo is about the size of Germany but contains only some 2,000,000 people and, especially as half of these live in the towns and cities, the

countryside is relatively unpopulated. Forests cover 222,300 km², nearly two thirds of the country, and elephants were found throughout them in the 1950s. Since then the country has experienced an influx of capital and an improved transportation infrastructure which has encouraged forest exploitation in isolated areas. These factors, coupled with an explosion in the number of firearms and the rise in the price of ivory, caused the level of elephant hunting in the country to increase dramatically.²² In 1988 Heeketsweiler reported that elephants were disappearing from southern and central Congo and suffering increasing poaching in the north; between 1970 and 1980 an average of 1,675 elephants were killed each year.^{23,24}

Study Sites

Three areas of northern Congo were selected for transects to determine elephant densities. They were examined between February and May of 1989. The south of the country was not surveyed because we believed that the elephant population there was low due to high human population density and intense forest exploitation since the early 1900s.²⁵ The three sites surveyed differed politically, in vegetation and in human impact on mammal populations as summarized below.

Site 1 was located in the vast swamp forests of northeastern Congo found between the Oubangui and Sangha rivers. The soils here are generally permanently saturated, with up to one metre depth of standing water at some times of the year. The swamps are accessible for only a few months during the

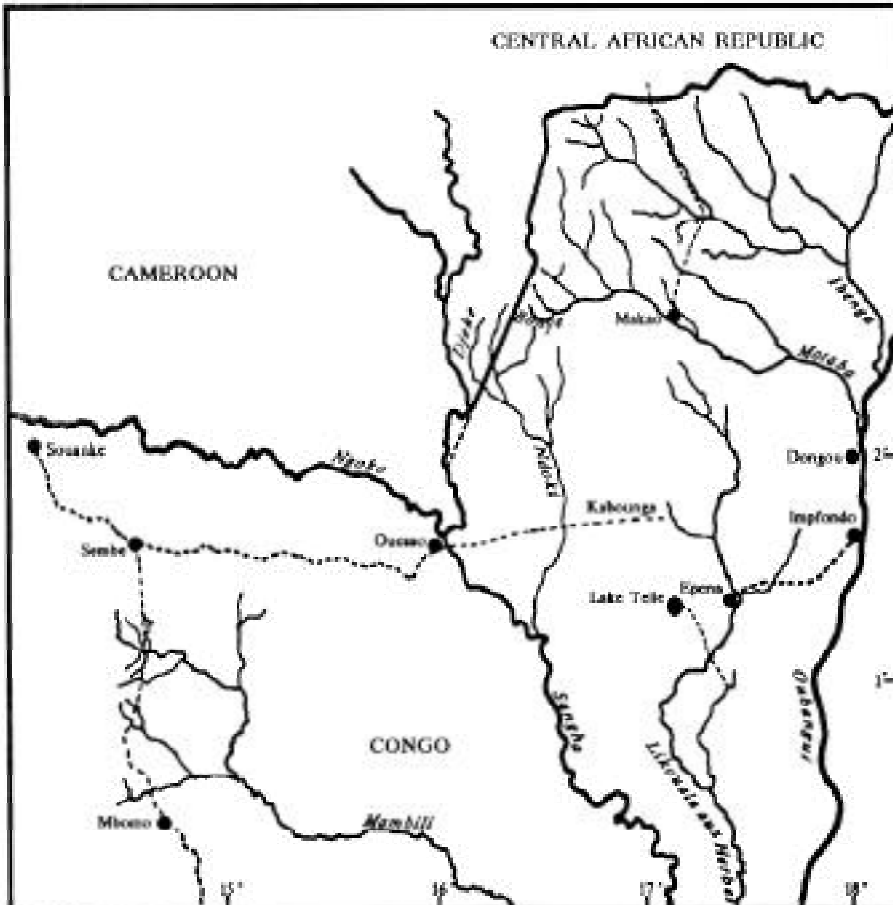


Figure 7. Map of northern Congo showing the three study sites and important geographical details

dry season, affording natural protection against poaching. Human population density is low, less than one per square kilometre, and concentrated along the rivers. People generally do not venture very deeply into the swamp. Transects were run to the south of the Likouala aux Herbes river near Lake Mboukou in an area where a spit of *terra firma* forms a peninsula into the surrounding swamp forest.

Site 2 was located in the forest block in the northeastern part of the country bordered on west and north by the Central African Republic. The vegetation is primarily semi-deciduous forest with large areas of *Raphia* swamp along the major rivers and *Gilbertiodendron dewevrei* forest along upland water courses. As at Site 1, the human population is low and concentrated along the major watercourses. Transects were run between the villages of Makao and Berandjoko which lie half-way up the two principal rivers in the region, the Motaba and Ibenga.

Table 4. Calculated dung and elephant densities for all survey transects, northern Congo

Transect location	Length of transect	No. 1/2 km segments	No. 1/2 km segments with dung	Proportion with dung, p	Dung density	Elephant density	Distance to village
Mbomo-Sembe	95.5	191	131	0.69	491	0.88	37.3
Mboukou	63.0	126	30	0.24	175	0.31	5.6
Likouala	141.5	283	126	0.45	319	0.57	23.9
All transects	300.0	600	287	0.48	343	0.62	23.3

This area was of prime importance because we believed it to hold significant densities of forest mammals. It is, however, extremely vulnerable in that it contains enormous reserves of exploitable timber, most notably *Entandrophragma cylindricum*. The entire region has been surveyed and subdivided into UFAs (Unité Forestière en Aménagement), many of which are open to lease by logging concerns. There are four companies that have started logging in the northeastern and southwestern parts of the region. In the next ten years roads will reach most of the now inaccessible parts of this forest.

Site 3 was located in a large tract of virtually uninhabited forest in northwestern Congo bordering Gabon, northwest of Odzala National Park. This dense forest contains few exploitable trees and is also quite hilly, two factors which will help to conserve the area. On the southern edge of the study area is a road which has been abandoned for over thirty years. The roadside vegetation is secondary, a result of the more than one thousand inhabitants who used to live there and were largely employed in the collection of wild rubber. North of the Ekoutou river the vegetation is primary. The few humans now in this area are concentrated in the two towns at either end of the study area.

Results

A total of 300.0 km of line transects was completed during the survey. Dung was recorded in 287 of the 600 1/2 km sectors. The overall elephant dung density was estimated to be 343 piles per km² implying a density of 0.62 elephants per km².

The lowest dung density of the three areas surveyed was on Site 1, the swamp forest of the Likouala aux Herbes, which gave an

elephant activity in these areas during our dry season survey. Local inhabitants said that the elephants left the swamp forests in the wet season.

At the forest edge east of Lake Mboukou a large water hole showed no recent sign of elephants, only three very old elephant skeletons. The local inhabitants admitted that hunting had been a major activity in the area in the past 15 years and that the elephant population had decreased significantly. They said that Lake Mboukou used to draw large numbers of elephants but that now it was rare to see one on the lake's edge. The Batanga river still holds an important elephant population.

Most of the elephant feeding sites in the swamp forest consisted of *Raphia* spp. and *Pandanus* spp. with *Aframomum angustifolium* being the third most important food item. These are also the three most important gorilla (*Gorilla gorilla gorilla*) foods in the area.

elephant density of 0.31 per km². At this site the average distance of the transects from a village was 5.64 km. The highest dung density was found in the area close to the Gabon border, Site 3, indicating 0.88 elephants per 2, and here the average distance of the transects from a village was 37.27 km. The northeastern Site 2 had an intermediate dung density leading to an estimate of 0.57 elephants per km while the transects averaged 23.9 km from a village.

An ANOVA for unequal sample sizes showed the mean elephant dung densities and mean distance from village to be significantly different ($p < 0.0001$) in the three study sites.

When elephant dung density is plotted against distance from the nearest village for each transect, a significant positive linear correlation results with $r = 0.85$ and $p < 0.001$.

Site Results

Site 1. Surveyed: 7 transects totalling 63 km; 175 piles per km². Elephant dung densities were greatest along the Batanga river west of Lake Mboukou. There was also substantial elephant feeding activity in the swamp forest especially in the northern transects. The peninsula of *terra firma* to the west of the lake had a low density of elephant dung.

A total of 15.5 km of trail was walked from the Likouala aux Herbes to Lake Mboukou. No elephant spoor was recorded on the trail, which was located between the two areas of transects, although we noted many, large, abandoned elephant trails. Throughout the survey we never ventured more than eight km from the *terra firma* into the swamp forest. There was a lot of



Figure 8. Map of Site 1 in the swamp forests of the Likouala aux Herbes

We did not see any live elephants during our survey at Site 1 but a total of six carcasses were found. Only one of these was fresh, the remainder all being several years old. The size and age distribution of the skeletons would seem to indicate that the age curve of the elephants has decreased significantly in recent history.

Site 2. Surveyed: 15 transects totaling 141.5 km; 319 piles per km².

The transect survey was worked from a footpath that connects the two villages highest on the Motaba and Ibenga rivers, Makao and Berandjoko respectively. Elephant activity was most common in the centre of the study area, far from these two villages. Transects were concentrated in two areas, Djemo Creek and the Ipendza river. The Ipendza area showed a slightly higher extrapolated density than did the Djemo, with 0.61 and 0.50 elephants per km² respectively. The average distance from a village for the Ipendza transects was 28.8 km while that for the Djemo transects was 19.8 km. Locally the areas of greatest concentration of elephants were bottom-lands with a high density of *Cyperaceae* and many water holes.

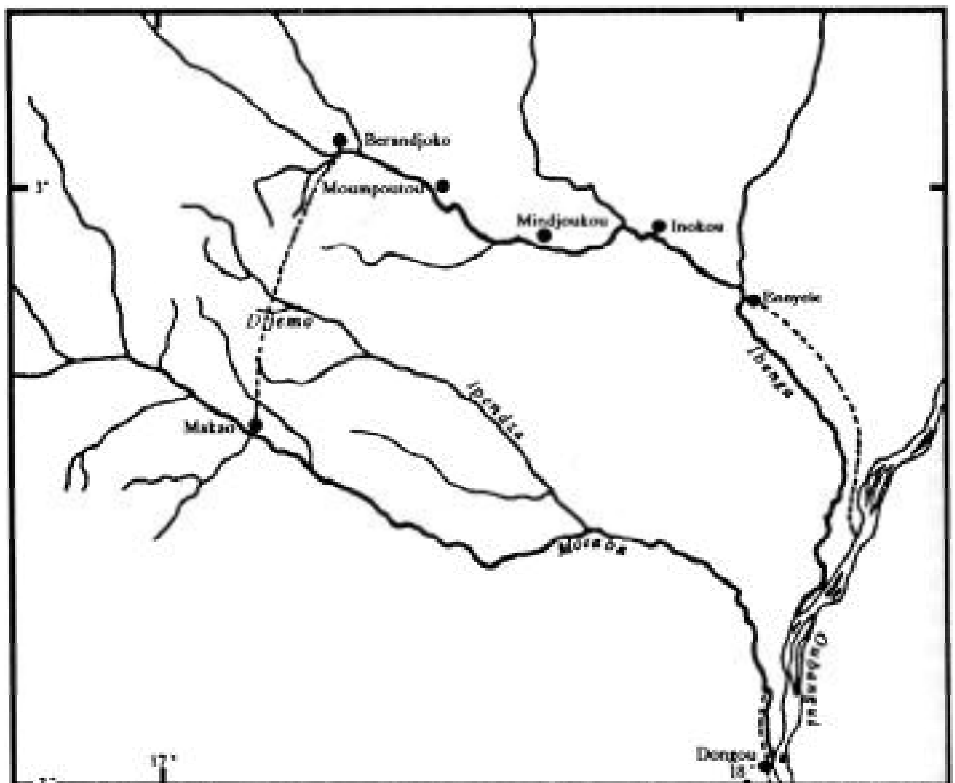


Figure 9. Map of Site 2 in the dense forest area of northeastern Congo

A total of 73 km of non-transect trail was walked from Makao to Berandjoko and elephant sign was infrequent. Only between Djemo Creek and the Ipendza river did we record elephant dung. Close to the villages elephant sign disappeared completely.

We saw a single bull elephant during the survey, a rather small individual with tusks of six to eight kg. On another occasion we encountered a small group of three or four females and sub-adults near the Ipendza river. One individual was seen, a mature female with tusks of one or two kg. These all appeared to be typical forest elephants.

Four elephant carcasses were found in this study area, one freshly killed, the rest dead in the last five years. The carcasses were all of adult males with relatively large tusks.

A cursory survey by Fay in December 1988 on the head-waters of the Motaba indicated that this area holds the highest density of elephants in northeast Congo, comparable to that found in the adjacent Dzanga area in the Central African Republic.^{26,27} The Bonye river possesses many mineral water holes with abundant elephant activity. The elephant trails in the area are sometimes three metres wide and are used regularly.

Site 3. Surveyed: 11 transects totalling 95.5 km; 491 piles per km².

The transect survey in this area was conducted parallel to a trail that goes from the town of Mbomo to Sembe, a distance of some 150 km. This area holds many elephants. The maximum density was found in the 40 km between the Ekoutou and Mambili rivers where there are very many heavily used elephant trails. Proceeding north and south of this core area the elephant densities become progressively lower.



Figure 10. Map of Site 3 in the dense forest area of northwestern Congo along the Gabonese border

A total of 104 km of non-transect trail was walked between Mbanza and Sembe and showed similar results to transects. Elephants were found to be very abundant near the Ekoutou river where we recorded estimates for dung densities of 477 and 551 piles per km², or 0.86 and 0.99 elephants per km². The two non-transects at either end of the survey near Mbanza and Sembe had no elephant dung. On the Sembe side elephant dung disappeared from the trail at 38.5 km away from the village. Dung was first encountered on the Mbanza side at 19.5 km from the village.

During the survey we observed three solitary bull elephants on the same day in the Loungou river area. They were all relatively old males with estimated tusk weights of 10-15 kg. These were probably not exceptional for the area and appeared to be typical forest elephants. A single small (M3) carcass was found in the southern part of the study area.

Discussion

The data presented in this paper show for the first time that there are many forest elephants remaining in the People's Republic of Congo. Elephant densities in northern Congo compare favourably with those of surrounding countries; only in Gabon does one find a denser forest elephant population. Elephants were found in all three study sites although the extrapolated figures for the three areas were significantly different. The primary factor was distance of transect from village. This was clearly demonstrated both when using individual transects for the entire survey and when the pooled data for each of the three study sites were compared. The

relationship of distance from village to elephant population has also been demonstrated in Gabon. The qualitative data showed human hunting pressure to be the major factor determining elephant density, not habitat destruction. At Site 1 elephant poaching started earlier than for the other sites and, coupled with low elephant density, we found very large abandoned elephant trails, unused salt licks and progressively smaller elephant carcasses. Site 2 was found to have a great deal of current poaching activity, an intermediate elephant population and generally large carcasses. Site 3 held numerous elephants, showed little indication of active poaching and very few carcasses. Although the sample size was far from significant, live elephants seen during the study supported the observed trend.

If we extrapolate the relationship of elephant density to human population for the entire north of the country we find that there are potentially six areas of very high elephant density in northern Congo. We avoid using these extrapolations to derive a total population figure for the north of the country but, even so, estimate that there could be 25,000 elephants left there.

It was evident during our study that elephant poaching is proceeding on a grand scale throughout the range of the species in northern Congo. Only those areas that are far from human

populations are relatively undisturbed. Based on the size distribution of tusks exported from the Congo it appears that they come from a population with a fairly normal age curve. For ivory sold between 1986 and 1988 the mode weight was six to seven kg and the mean 12.6 kg. However, if hunting continues on the scale at which it is now practised, on the basis of our stratified data we can only conclude that elephant populations in the Congo will decrease dramatically in the coming decade.

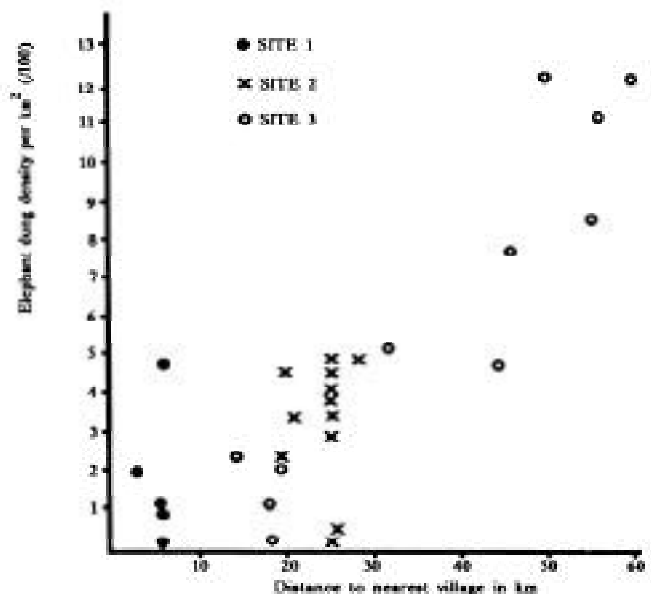


Figure 11. Plot of elephant dung densities versus distance from village for all transects

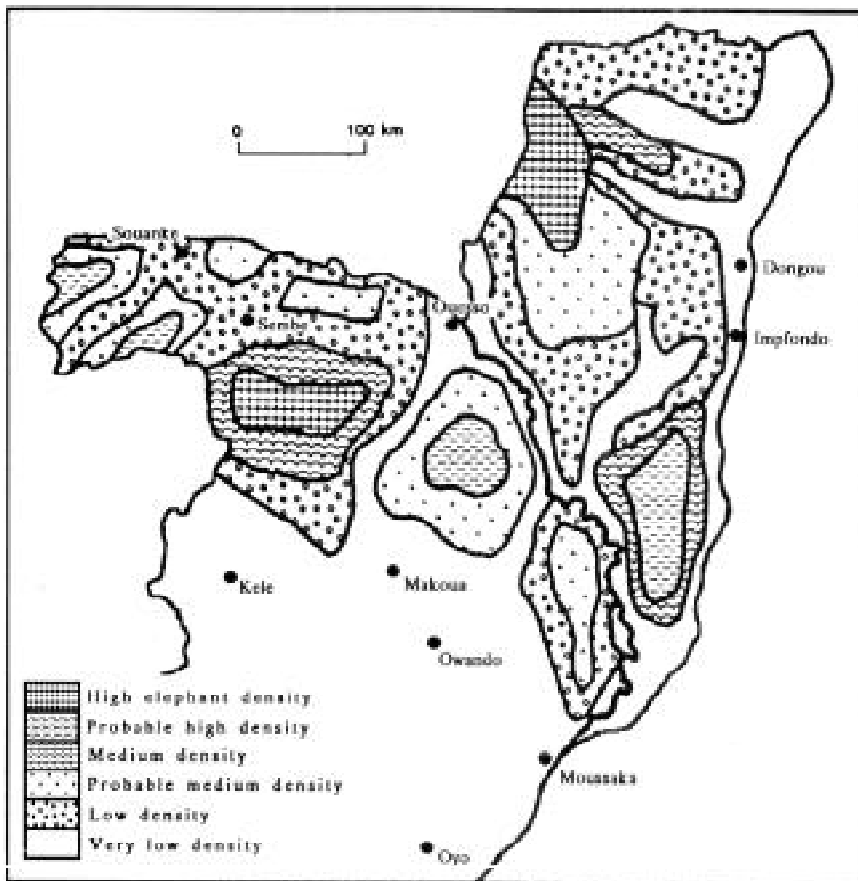


Figure 12. Known and putative elephant populations in northern Congo

Table 5. Forest elephant densities reported for different parts of Africa

Location	Density	Reference
Bia Park, Ghana	0.3	Short ³¹
Tai National Park	0.2	Merz ³²
Korup, Cameroon	0.2	Wildlife Cons. Internl. ²²
Southeast Cameroon	0.2	Wildlife Cons. Internl. ²²
Extreme SE Cameroon	1.8	Wildlife Cons. Internl.
Southwest CAR	0.6	Carroll ¹⁸ 1988, Fay ¹³
Southeast CAR	0.3	Fay 1989 ²⁷
South Equatorial Guinea	0.1	Alers and Blom ³³
Northeast Gabon	0.4	Wildlife Cons. Internl. ²⁹
North Congo	0.6	Fay and Agnagna 1989 ¹⁶
Salonga Park, Zaire	0.2	Wildlife Cons. Internl. ²²

Notes on the dominant forest species

The forests in the CAR sites were composed of:

Site 1: *Entandrophragma* spp., *Polyalthia suaveolens*, *Pachyelasma tessmannii*, *Austranella congolensis*, *Pterocarpus soyauxii*, *Piptadeniastrum africanum*, *Combretodendron macrocarpum*, *Celtis* spp., *Canarium schweinfurthii*, *Strombosia* spp., *Irvingia* spp., *Funtumia elastica* and *Eiythrophleum suaveolens*.

Site 2: *Entandrophragma* spp., *Polyalthia suaveolens*, *Pachyelasma tessmannii*, *Triplochiton scleroxylon*, *Eriobroma oblonga*, *Albizia* spp., *Klainedoxa gabonensis*, *Terminalia superba*, *Gambeya* spp., *Austranella congolensis*, *Pterocarpus soyauxii*, *Piptadeniastrum africanum*, *Combretodendron macrocarpum*, *Celtis* spp., *Canarium schweinfurthii*, *Strombosia* spp., *Irvingia* spp., *Funtumia elastica*, *Eiythrophleum suaveolens* and *Dialium* spp.

Site 3: *Triplochiton scleroxylon*, *Azelia africana*, *Aubrevillia kerstingii*, *Albizia coriaria*, *Erythrophleum suaveolens*, *Parkia filicoidea*, *Berlinia grandifolia*, *Khaya grandifolia*, *Blighia unijugata*, *Chaetacme aristata* and *Klainedoxa gabonensis*.³⁴

In the Congo:

Site 1: *Raphia* spp., *Trichilia* spp., *Lophira alata*, *Guibourtia de meusii*, *Uapaca* spp., *Mitragyna stipulosa*, *Garcinia* spp., *Symphonia globulifera*, *Manilkara* spp., *Alstonia congensis*, *Klainedoxa* spp., *Pandanus* spp., *Aframomum angustifolium* and *Lasiomorpha senegalensis*: the terra firma carries: *Pentaclethra macrophylla*, *Tetrapleura tetraptera*, *Macaranga* spp., *Angylocalyx pynaertii*, *Millettia* spp., *Millettia* spp., *Klainedoxa* spp. and *Panda oleosa*.

Site 2: *Entandrophragma* spp., *Polyalthia suaveolens*, *Pachyelasma tessmannii*, *Austranella congolensis*, *Pterocarpus soyauxii*, *Piptadeniastrum africanum*, *Combretodendron macrocarpum*, *Celtis* spp., *Canarium schweinfurthii*, *Strombosia* spp., *Irvingia* spp., *Funtumia elastica* and *Eiythrophleum suaveolens*.

Site 3: *Klainedoxa gabonensis*, *Coula edulis*, *Irvingia* spp., *Dacryodes* spp., *Parkia* spp., *Pachyelasma tessmannii*, *Daniellia* spp. and is; *Zanthoxylum macrophylla*, *Pentaclethra macrophylla*, *Uapaca* spp., *Macaranga* spp., *Tabernaemontana crassa*,

Tetrapleura tetraptera, *Lophira alata*, *Pycanthus angolensis*, *Barteria fistulosa*, *Megaphrynium macrostachyum*, *Aframomum angustifolium*, *Haumania leonardiana*, *Sarcophyllum prionogonium* and *Hypselodelphys violacea*.

Acknowledgments

These surveys were carried out under difficult conditions in a short amount of time. They could not have been accomplished without the help of Dr. Richard Barnes (Wildlife Conservation International) and the many individuals and institutions in the two countries as listed below:

Central African Republic: Ministre Mbitikon, Directeur Générale Mordomti, Inspecteur Bini, Directeur Doungoubé (Ministère des Eaux, Forêts, Chasses, Pêches et du Tourisme), and Bayaka tracker Mbutu Clément.

People's Republic of Congo: Dr. Ndinga Assitou, M. J. Mokoko Ikonga, M. D. N'Sosso (Ministère de l'Economie Forestiere, Brazzaville), M. Joseph Boukindi (Directeur Regional de l'Economie Forestiere, Impfondo).

We also gratefully acknowledge the local government and Party officials, guides, porters and paddlers, all of whom worked extremely hard to make the mission a success. The projects were carried out by Wildlife Conservation International under contract to the World Wide Fund for Nature as part of the EEC/WWF African Elephant Programme.

Appendix

Nouabale Brief: An Outline for Conservation of Wildlife and Bio-diversity in Northeastern Congo The Nouabale Site Quesso District Sangha Region. People's Republic of Congo

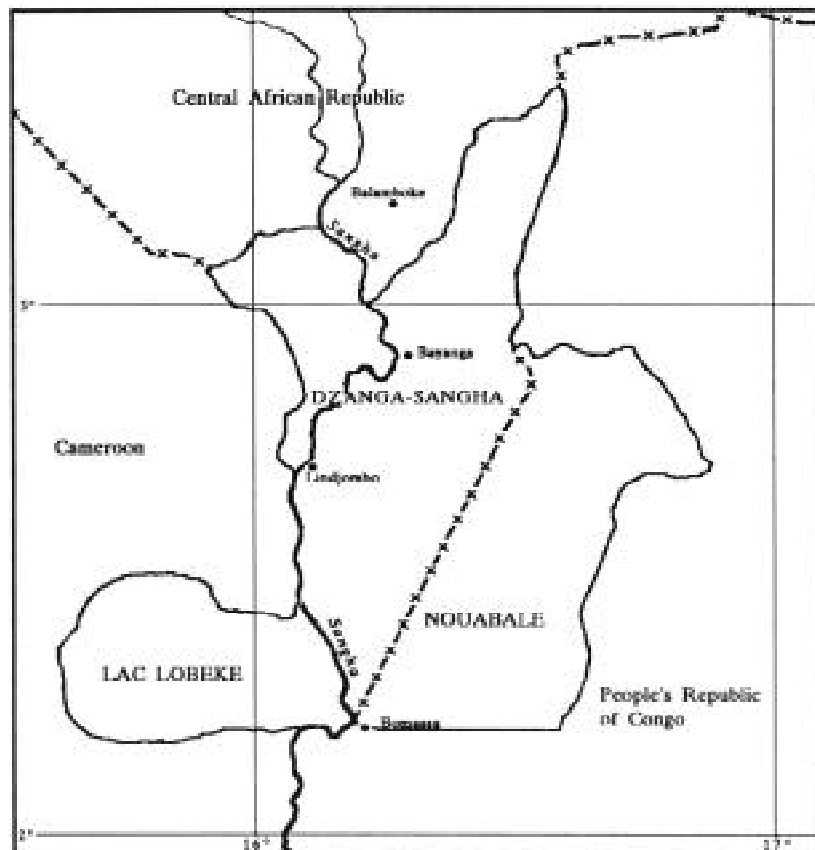


Figure 13. Map showing the location of the three contiguous reserves

In his National Report to the European Economic Community under the umbrella of the project "Conservation and Rational Utilization of Forest Ecosystems in Central Africa", Ph. Hecketsweiler described twelve areas in the People's Republic of Congo (PRC) which have significant conservation potential but currently have no legal status as such.³⁵

In this brief the Nouabale Site in northeastern Congo is discussed. As described by Hecketsweiler, this site is located in the largely unexploited forest block of northeastern Congo, encompasses 458,000 ha on the border with the Central African Republic, and is contiguous with the proposed Dzanga-Sangha Reserve. It contains a part of the Unité Forestière en Aménagement (UFA) of Kabo and the entire Nouabale UFA. At present the site has no legal status as a protected area.

Hecketsweiler lists three reasons for proposing this site for protection:

- 1) Congo currently has no reserve north of the first parallel in the vast northeastern forest block.
- 2) Forest exploitation in the area has not yet reached much of the northeastern block.
- 3) The Central African Republic is considering the creation of a reserve adjacent to the Nouabale site and the combination

of these two would assure the protection and conservation of a large forest block of some 725,000 ha.

During the course of an inventory of fauna, carried out under the auspices of the EEC and completed in May 1989, a preliminary evaluation of the Nouabale area was made. In March 1989 a team headed by J. Michael Fay and Marcellin Agnagna of the Ministry of Forest Economy, PRC, reached the upper Motaba region to survey the fauna and, subsequently, Fay visited the western part of the Nouabale Site.

This initial reconnaissance of the area has shown without doubt that the Nouabale Site possesses some of the highest densities of forest elephant, gorillas, chimpanzees, bongo, and leopard in the greater central African forest block. Based on observations in the Nouabale Site as compared to the adjacent Dzanga-sangha site, where quantitative surveys have already been carried out,³⁷ I estimate an elephant density in the Nouabale Site of 0.9 per km², gorilla densities of 1.0 per km and high densities of chimpanzees, bongo, buffalo and leopard. There are also high densities of a minimum of eight species of monkeys and six species of duikers, sitatunga, giant forest hogs, and potamochores.

At present there is no inventory of the fauna nor has a management plan for the Nouabale Site been written.

Conservation potential. The Nouabale site is not imminently threatened by forest exploitation or excessive poaching and has great conservation potential.

Forest. The Nouabale Site possesses a rich, varied and, to all intent, virgin forest habitat which includes superb examples of *Sterculiaceae-Ulmaceae* semi-deciduous forest (with a high density of *Entandrophragma* spp., *Gilbertiodendron dewevrei* forest and *Raphia* spp. swamp forests.

Fauna. The Site is one of the few areas in the entire central African forest region with an intact fauna. The densities of all species present are probably close to the maximum attainable in a completely undisturbed situation. Proper management could insure the long-term survival of all species within the reserve at levels close to those currently existing.

Dzanga-Sangha Reserve. Because it is located on the CAR border where there will soon be a reserve established that includes a national park of 140,000 ha and a reserve of 300,000 ha, the Nouabale Site is ideally situated. A WWF/US funded project in the proposed Dzanga-Sangha reserve, in place since 1968, has had a dramatic effect on the level of poaching in the area.

Tourism. With the enormous and growing public interest in rain-forests over the past few years, tropical forest parks have great tourism potential. The Nouabale Site is particularly well suited for this purpose as the forest normally has a rather open understorey that presents the primeval image of jungle: huge buttressed trees, abundant lianas, epiphytes and filtered sunlight. The fauna of the area is unparalleled. There are very few sites that have the combination of elephants, gorillas, chimpanzees, bongo and numerous species of monkeys in such numbers.

A unique feature of this area, including Dzanga-Sangha, is that it possesses a large number of the forest saline clearings essential for viewing mammals. For example, in the Dzanga-Sangha elephants are rarely seen in the forest but in the Dzanga clearing it is a daily occurrence to see over eighty elephants accompanied either by bongos, itatungas, buffalos, or bush pigs. Another factor in tourism potential is the presence of Bayaka pygmies in the area. These people are of great interest to tourists, and serve as unparalleled forest guides; tourism could improve their current status as servants to the Bantu population.

Human Impact. At present there is no permanent human habitation within the proposed Nouabale Site. Forest exploitation has not started in the region which possesses virgin forest. There are five points where humans gain access to the region: Bomassa and Makao in the Congo, and Bayanga, Balamboké and Lindjombo in the CAR.

Bomassa is a small village along the Sangha river very close to the border with the Central African Republic. As a village of about three to four families, the inhabitants of Bomassa do not represent a threat to animals in the Nouabale Site. But Bomassa does pose a threat as a staging point for elephant hunters that originate in Kabo and Ouessou, and Libongo and Bela in Cameroon. A number of Senegalese, Chadian and Congolese ivory collectors use this village to get into the Nouabale Site; there are logging roads and footpaths that allow relatively easy access from Bomassa or from Beau Coin, a camp higher up the Sangha.

Makao is the last village going up the Motaba river and is located not far from the proposed eastern border of the Nouabale Site. This is a large village of several hundred inhabitants actually composed of two villages, Makao and Iganga, and several pygmy settlements. Makao is a major staging post for elephant hunters and ivory collectors in the northeastern region. When we arrived at this very isolated spot in March, we found Senegalese and other Moslem traders known to be engaged in the ivory trade. Hunters come from as far away as Brazzaville and Bangui via the Motaba river which joins the Oubangui river at Dongou and, during the wet season, carries regular barge and tug traffic. There are over 20 villages along the Motaba all of which are involved in ivory poaching to some extent. From our brief visit to Makao it would seem that wildlife exploitation is the sole reason for its existence, much of which centres on the ivory trade. Because of the river the inhabitants of Makao can gain easy access to the eastern part of Nouabale Site and poach a significant number of elephants.

Lindjombo, Bayanga and Balamboké are located in the CAR. Each of these three small towns has trails that lead into various parts of the Nouabale Site. For the most part these trails are used by Bayaka people in their hunting and collecting forays

but we have information that elephant poachers also take advantage of them to reach the Nouabale area. This activity is largely underwritten by Moslem traders and government employees in the CAR.

Forestry. Undoubtedly forest exploitation will reach the Nouabale region in the not too distant future. The Nouabale Site, more or less as proposed by Hecketsweiler, has the greatest potential for conservation of wildlife and bio-diversity in the entire region due to the undisturbed nature of the forest and fauna and the absence of any permanent human settlement. If the forests of northeastern Congo are to be exploited it is essential to establish a reserve in the area to protect a portion of this vast region in its natural state.

Development and Management. The procedure for setting up a reserve in the Nouabale region might follow that for the Dzanga-Sangha area in adjacent CAR.

Initial quantitative survey. An in-depth, quantitative survey of animal populations should be carried out throughout the area. This would enable a definitive evaluation of the resource that exists, and should be carried out in the near future. Methods would follow those used by Carroll, Fay and Wildlife Conservation International.³⁸ The survey would concentrate on the populations of elephants, gorillas, chimpanzees, monkeys and bongo.

Comprehensive management plan. A plan similar to that fashioned for the Dzanga-Sangha Reserve should be produced. This document would outline the results of the wildlife survey, suggest the borders of the reserve and describe a plan for its management. It would be desirable to set up a multiple-use reserve such as that proposed in Dzanga-Sangha. A section could be established that would be open to sustainable forest exploitation and agro-forestry, preserve hunting and gathering rights for the Bayaka, protect watersheds, and provide facilities for big-game hunting and tourism. A core park area could be established which would serve as a protected resource of bio-diversity and allow both long-term research on forest ecology and tourism.

Gazetting of reserve. A legal document should be produced delineating the borders of the various components of the reserve, their legal status and the management objectives of each. This document would be presented to the national government for ratification.

Conservation project. A conservation project would be established to achieve the management objectives of the reserve. The project would work in concert with local people and government, the central government, private investors, and international funding and conservation organizations.

Regional objectives. Because of the value of forests to the economies of the countries of the central African region, it is unrealistic to expect any one country to protect completely a huge area. Also wildlife populations, most notably elephants, cross international borders. In this light it is extremely important to approach conservation regionally and the Nouabale Site is perfectly suited to this end. There are three neighbouring countries all of which contain ideal sites for conservation. The CAR has taken the lead but, as it now stands, the proposed

Dzanga-Sangha Reserve has little chance of long-term success if the adjacent areas in Congo and Cameroon are opened to large scale forest exploitation.

If the three countries can work in concert to form a reserve/park system encompassing a very significant block of the most important wildlife habitat in west Africa, the potential for long-term conservation of wildlife and bio-diversity would be enormous. Cameroon has established, or will establish, a reserve in the Lac Lobeke area that has conservation potential equal to that in Nouabale and Dzanga-Sangha. If the borders of this reserve could be extended to the Sangha river and the Nouabale Reserve could be set up, these, together with Dzanga-Sangha, would form an integrated whole spanning three countries and enclosing over 1,000,000 ha.

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