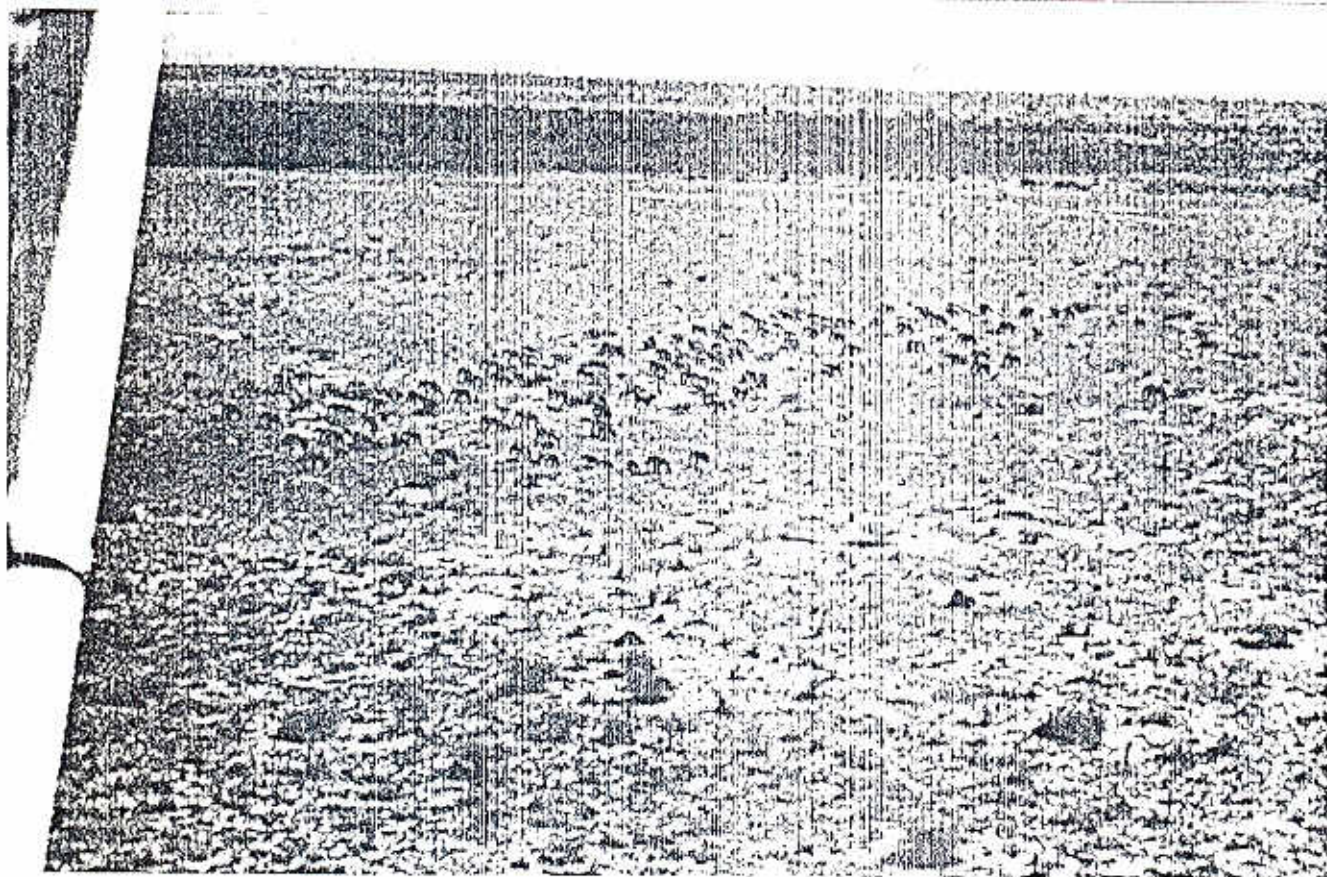


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TSAVO ELEPHANT COUNT 1988



WILDLIFE CONSERVATION AND MANAGEMENT DEPARTMENT
MINISTRY OF TOURISM AND WILDLIFE

TSAVO ELEPHANT COUNT
1988

COMPILED
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EXECUTIVE SUMMARY

In the first week of February, 1988, a total count of elephants, buffalo, and livestock was made in the Tsavo National Park and surrounding areas. Eleven aeroplanes covered some 40,000 km², including the whole national park, large areas of Taita-Taveta, the Galana Ranch, and the Mkomazi Game Reserve in Tanzania (see Map 1).

The objectives were to count all elephants, live and dead, rhinoceros, buffalo, and cattle within the ecosystem. After a brief description of methods the report presents the principal results and compares them with previous surveys. The count was executed by a highly qualified team of Kenyan and other scientists, under the auspices of the Wildlife Conservation and Management Department, and was the first of its kind to be held in ten years. The EEC African Elephant Population Study helped coordinate the operation, and the public responded with generous donations made through the East African Wildlife Society. Cooperating international institutions included WWF, African Wildlife Foundation, United Nations Environment Programme, International Union for the Conservation of Nature, and R.K. Mellon Foundation.

Although rhinos are known to exist in the park, their numbers are now so low that they were not detected at all from the air during this census. Ten years ago they had already suffered a 96% decline from an estimated 5,000 in the early 1970's.

Within the park 4,327 elephants were counted. They have declined by 75% since the last major total count in 1972. Another 1,036 were counted in surrounding areas where they have declined by 87% over the same period. This result confirms the downward trend indicated by sample counts of the Kenya Rangeland Ecological Monitoring Unit (Figure 1), which suggest that of Tsavo Ecosystem's 42,000 elephants living in 1969 only some 5,700 remained by 1987 (Ottichilo, 1981, 1987).

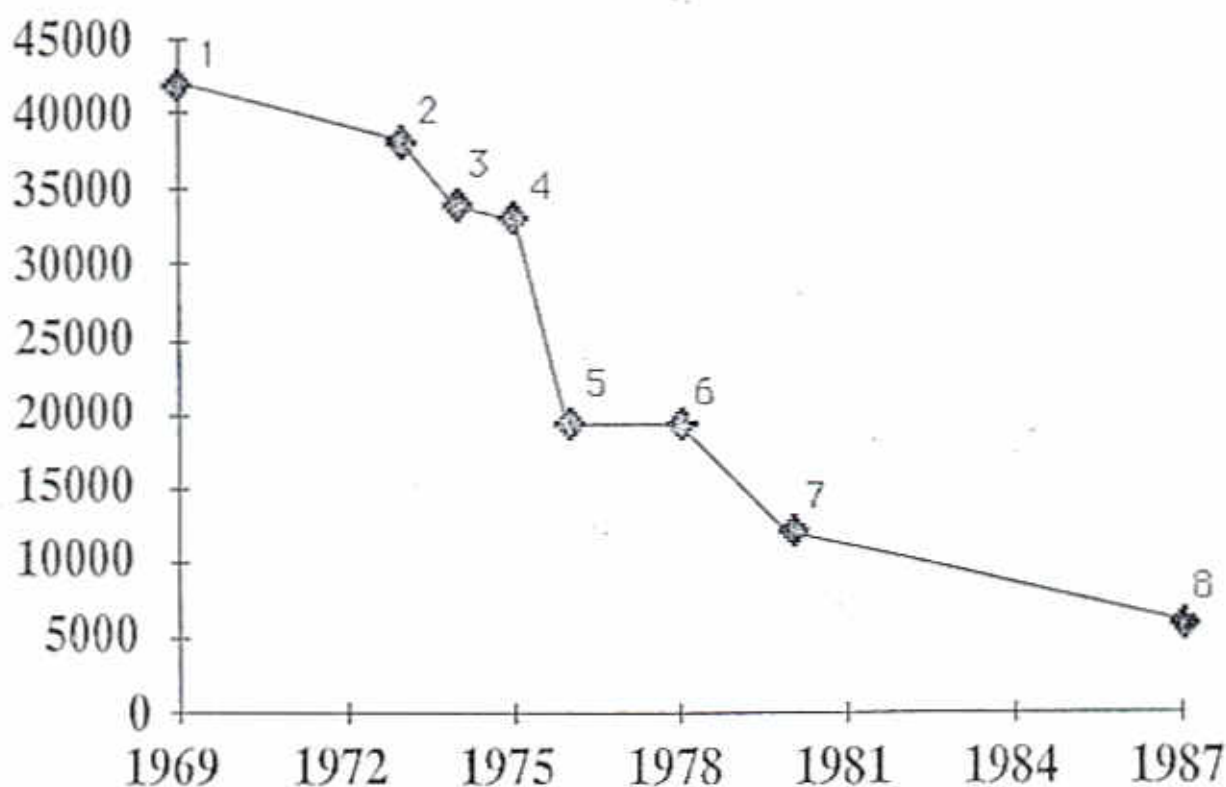
This major change is confirmed by trends in sub-areas of the same ecosystem. The worst affected were the Mkomazi Game Reserve where elephant numbers have fallen by 96%, and the Galana Ranch where they have fallen by 98%. Near the park in the Taita-Taveta District they have decreased by 31%. Only around the Taita Hills and Salt Lick Lodges have they actually increased, which suggests that tourism may offer some degree of protection to wildlife from poaching.

The distribution of elephant carcasses shows that heavy poaching was still continuing through 1987, but mainly on the fringes of the park in the north east and outside in the Galana Ranch, Taita-Taveta and Mkomazi areas. This has been attributed to Somali bandits and others. A few recent carcasses were also seen in Tsavo West National Park. Otherwise, the distribution of older carcasses indicates that prior to 1987 poaching was severe within both parks. In some places their proximity to roads suggests motorized poaching.

Buffalo numbered 3,891 within the park and 5,860 in the whole ecosystem. Since 1970 they have also declined by 49% within the park south of the Galana river, and 76% in the Galana ranch, but have increased in the Taita-Taveta area. The reasons for the decline are unknown, but are possibly due to disease or poaching over the years for meat. Over the long time span there may have been fluctuations which have not been monitored to provide clear trends for this species.

FIGURE 1

TSAVO ECOSYSTEM ELEPHANT TRENDS FROM SAMPLE COUNTS



Sources

- 1 Ottichilo (1981) Revised from Laws' (1969) reconnaissance flights
- 2 Cobb (1976) Single sample count
- 3 Cobb (1976) Mean of four sample counts
- 4 Leuthold in Ayieko (1975) Single sample counts
- 5 WCMD (1976) Mean of two sample counts
- 6 IUCN (1978), KREMU (1978) Mean of three sample counts
- 7 Ottichilo (1981) Mean of two counts
- 8 Ottichilo (1987) Mean of three years of sample counts

8. Encourages tourism within the elephants' prime range, especially the Northern Area of Tsavo East and along the Galana River, both inside the park and in the Galana Ranch, as this should provide employment and discourage elephant poaching in the same way it has in Amboseli, the Mara, and Taita Hills.
9. Revives elephant monitoring in Tsavo and improve liaison with Kenya Rangelands Ecological Monitoring Unit (KREMU) to obtain rapid feedback on all species from their wide-ranging ecosystem sample surveys.
10. Considers making legislative provision for confiscating the proceeds of poaching, as is done in the United Kingdom and the United States in relation to drug trafficking, and consider making the penalties for illegal possession of military type firearms more severe than for illegal possession of other weapons.
11. Draws the attention of the Courts to the need to award substantial punishments, already prescribed by the Wildlife Conservation and Management Act, for poaching and other offences against the Act.

Without such radical measures we can expect Kenya's most important elephant population to dwindle to low hundreds and become insignificant as a national, aesthetic, or economic asset in the foreseeable future, with serious consequences for tourism. With protection Tsavo's elephants can recover. It is not yet too late.

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Cattle, which were never found in the park on any previous surveys, are now deep in the heart of Tsavo East, north of the Galana river, and have encroached upon the western portion of Tsavo West. The total number of livestock estimated within Tsavo East and West was a minimum of 11,000 cattle and 2,400 sheep and goats. The Government is making every effort to eliminate this encroachment from the Tsavo national Park once and for all.

From this report, it is clear that the situation for elephants and rhinos is critical. The trade in ivory and rhino horn is driven by an overseas demand. It cannot be expected that Kenya should assume the sole responsibility for conserving these species, when the rest of the world is consuming their products excessively. Radical measures are therefore needed to prevent the elephant from sinking to insignificant numbers, and the only hope for the park's rhinos at present lies within highly protected rhino sanctuaries.

To solve the poaching problem, there is no substitute for well-trained, specialized, anti-poaching forces, based permanently in the parks. The day to day management of both parks needs to be reorganized by replacing the ineffective outpost system with a centrally controlled, highly disciplined force with good transport, equipment, and communications, operating in self-sufficient units in conjunction with close aerial support and direction. This force should operate very closely with the Kenya Police and, as far as possible, the parks should be allowed to operate on a self-accounting basis.

In the light of these findings we recommend that the Kenya Government :

1. Requests key consumer and transit countries to cooperate with Kenya in eliminating the illegal ivory trade. The CITES treaty and the TRAFFIC offices can be used to obtain information on the dealers in illegal Kenyan ivory.
2. Warns all Kenya's illegal ivory dealers that their activities are regarded as economic sabotage and therefore a threat to national security and will henceforth be treated as such.
3. Investigates suspected local ivory dealers in order to bring them to justice and to eliminate the illegal private trade in ivory.
4. Recognises the priority that should be given to Tsavo National Park in the allocation of resources, and requests international and local donors to do the same.
5. Posts highly motivated field officers to Tsavo and provides the anti-poaching force with adequate transport, equipment, incentives and the operational training appropriate for dealing with bandit poachers armed with automatic weapons.
6. Removes any remaining corrupt or inefficient elements from Tsavo so that motorized poaching by WCMD personnel and collusion between them and the poachers or dealers become practices of the past.
7. Institutes extension programmes for people living around the Tsavo National Park, explaining its advantages and exploring incentives for people to benefit from the park.

INTRODUCTION

Tsavo National Park, created in 1948, covers an area of some 21,000 km² making it one of the largest in Africa. Despite poor soils, erratic rainfall, and semi-arid landscape, it has been the home for many years of large elephant herds, coloured red by the earth, with many impressive tuskers. It has a diverse wildlife, challenging landscape and, not long ago, a population of black rhinoceros regarded as one of the most important in Africa. With the spectacular growth of tourism in Kenya since Independence, Tsavo has become well known to hundreds of thousands of tourists who have visited it from all over the world and carried its reputation home with them.

Unfortunately, in recent years the park has experienced a massive decline of rhinos and elephants as a result of poaching. Rhinos are now seldom seen, but large elephant herds remain the principal attraction of the park. Tsavo National Park is still crucial to the conservation of both species. Indeed, in view of what has happened to them elsewhere, often on a far worse scale, Tsavo is more important now than ever before. To understand the situation which led to the necessity for an aerial survey it is necessary to give a brief account of the history of elephants in Tsavo.

During the 1950's and 1960's the elephants of Tsavo built up numbers through reproduction and immigration in response to effective protection. Early aerial counts in 1962 indicated approximately 11,000 elephants in the park, with another 4,800 in adjoining areas (Glover, 1963). As pioneering counts they were probably large underestimates. There was, however, already concern over vegetation changes resulting from destruction of trees and bushes by elephants, aggravated by drought and increasingly frequent fires. This led to recognition of an "elephant problem" and growing debate as to whether or not elephants should be culled to reduce their numbers and thereby protect the woody vegetation.

The Tsavo Research Project was set up in 1966, and after detailed reconnaissance flying Laws (1969) estimated a minimum population size of 35,000. Recent extrapolation from carcass data suggests that the population may have been much higher (Douglas-Hamilton and Burrill, in press). Ottichilo (1981) has estimated a population of 42,000 at that time.

After considerable debate many observers formed the view that a "laissez faire" policy of letting "nature take its course" rather than culling should be adopted (Laws, 1969; Sheldrick, 1973). The real position of the National Parks Trustees at the time was that since Tsavo National Parks (East and West) did not constitute a self contained ecosystem, any culling that anyone may have wanted to undertake with the desire of influencing the elephant population could have been done outside the park within the species' range. In the drought of 1970-72 some 6,000 elephants died of starvation, mostly in Tsavo East (Corfield, 1973). The drought was prolonged over five years and Sheldrick (1976) estimated that at least 9,000 elephants perished altogether.

Despite this mortality, successive aerial survey estimates, using sample count techniques, indicated that some 35,000 elephants still remained up until the end of 1974 (Cobb, 1976). Some of the losses from starvation may have been compensated by fresh immigration of elephants seeking the relative safety of the park (Leuthold, 1973). Cobb estimated in 1974 that the Tsavo elephant population was declining from all causes, including poaching, at an estimated rate of 4% per annum (Cobb, 1976).

Before the drought had ended, an even greater threat to the elephants intervened. With the rise in the international price of ivory in the early 1970's, the poaching of elephants increased sharply, largely from the bows and poisoned arrows of Wakamba hunters. By 1976 the park was under siege and the well-organized field force was stretched to its limits. The situation worsened further when armed Somali poachers began to shoot in the park. This happened coincidentally at the time of the merger of the former Kenya National Parks and the Game Department into a larger government department, the Wildlife Conservation and Management Department, and the poachers were able to take advantage of the ensuing disruption. Transfers of key personnel, the withdrawal of aircraft based in Tsavo East, low morale amongst park staff, and the introduction of new accounting procedures accompanied by severe financial constraints, all contributed to a decline in efficiency and commitment at a time when the park was facing the worst threat in its history.

Aerial sample counts of the whole Tsavo ecosystem (Figure 1), by the new Wildlife Conservation and Management Department (WCMD), Kenya Rangelands Ecological Monitoring Unit (KREMU) and the International Union for the Conservation of Nature (IUCN), indicated that the elephant population had plunged to about 20,000, the steepest drop occurring in 1976 (Sheldrick, 1976). An incomplete aerial total count was made by the WCMD in January 1978, but cannot be used to arrive at a total elephant estimate for the park. It did however serve to show that rhinos south of the Galana River had decreased by 96% since 1970.

In the neighbouring Galana Ranch, elephant poaching was under some degree of control until the head of their anti-poaching force there was shot dead in 1977. After this loss, the management, unable to derive a benefit from wildlife after the hunting ban of 1977, abandoned the struggle and the Galana elephants fell easy prey to Somali bandits and other poachers (Douglas-Hamilton, 1979). It is, however, to the credit of the ranch management that they have continued to cooperate closely and successfully with WCMD and other arms of the Government in reducing the incidence of poaching in recent months.

In late 1978, in an attempt to stem the downward elephant and rhino trend, a vigorous and well-led anti-poaching campaign was initiated. By 1980 it had reduced poaching in and around Tsavo to its lowest level for several years, despite the continuing high price of ivory. Unfortunately, by then much of the damage had already been done, and two aerial sample counts carried out by KREMU in 1980 indicated that the population had declined to about 12,000 (Ottichilo, 1981).

Aerial surveillance by senior WCMD officers suggested that poaching remained at a relatively low level between 1980 and 1982 but began to increase again, particularly with firearms, in 1983, when anti-poaching efforts had slackened for a number of reasons. This deterioration was independently reflected in further surveys by KREMU between 1982 and 1987, when increasing numbers of recent elephant carcasses were seen. An analysis of three years of KREMU data suggests that by 1987 only about 5,700 elephants remained in Tsavo and Taita-Taveta (Ottichilo, 1987; Burrill & Douglas-Hamilton, 1987).

It was against this background that the new Director of WCMD, Dr. P. M. Olindo, was appointed by H.E. President Daniel arap Moi in 1987 to reverse this trend and help save Kenya's rhino and elephant populations.

The Director re-instated detailed aerial reconnaissance of Tsavo and surrounding areas in August 1987 (Woodley & Hamilton, 1987). In this reconnaissance all elephants seen were recorded, and most of the 65 hours of flying time was devoted to areas in which elephants were relatively numerous, or where there were signs of their presence, such as tracks, droppings, and utilisation of vegetation or watering points. Approximately 4,350 elephants were seen in Tsavo and on the Taita-Taveta ranches. Several fresh and recently killed carcasses without tusks were seen (Woodley & Hamilton, 1987). In the last few months of the year an upsurge in poaching in and around the park made it imperative to conduct a full-scale count to determine the current status of elephants and rhinos as soon as possible.

The WCMD's awareness of the need for a very high confidence in the results of the count prompted the Director to invite Dr. I. Douglas-Hamilton, consultant for the European Economic Community and World Wildlife Fund African Elephant Population Study, to coordinate the fund raising programme for the count, and together with Mr. P.H. Hamilton, Senior Biologist of the department, help organize the survey, and compile the final report.

The response of the public to the appeal was beyond expectation. Within ten days Sh168,974/- in cash was donated by conservation organisations, industry, and private individuals. The funds were channelled through the East African Wildlife Society. An even larger donation was made in kind, in the form of fuel, aircraft flying time, the services of experienced pilots, observers, scientists and the accommodation of participants in Tsavo East and West, Taita-Taveta, and on the Galana Ranch. Eleven aeroplanes took part, four of them departmental. This enthusiastic response demonstrated strong public concern about the elephants of the Tsavo ecosystem and was an excellent example of the spirit of "Harambee" in action.

There was also a regional component. The Tanzanian Wildlife Division welcomed the chance to census Mkomazi and arranged the necessary flight clearances. Professor Hirji, Director of the Serengeti Wildlife Research Institute, participated as an observer.

This report presents the results of the count and discusses their implications for the future of the elephant and rhino in Tsavo, with recommendations for stopping the present decline in the Executive Summary.

METHODS

Total aerial counts rely heavily on the experience of those involved. We were fortunate in being able to draw on the services of Wildlife Department personnel, as well as qualified scientists from elsewhere, with years of experience not only of flying and aerial counting but also of Tsavo. At the same time, young wildlife officers from the Research Section, who had not participated in aerial counts before, were given the opportunity to do so in order to facilitate technology transfer. As far as possible, crews of aircraft were chosen to blend experienced with inexperienced observers. After completion of the count of Tsavo and Taita-Taveta, some members of the team went on to Galana Ranch where they joined the local management in censusing the ranch.

The principal objective of the present census was to count Tsavo's elephants, rhino, buffalo and livestock, in such a way that the results could be compared with previous counts of the last 25 years. The methods needed to be consistent with those used in earlier counts. Dead elephants were also counted.

All groups of over 25 elephants and buffalos were photographed with 35mm cameras using 400 ASA Kodacolor film following methods described by Norton-Griffiths (1978). Large groups often required several overlapping shots for complete coverage. After the census the animals in these herds were counted as accurately as possible from the photographs. Cattle, sheep and goats were recorded but not photographed; their numbers were merely estimated. Coverage of livestock in adjoining areas was less complete as some crews failed to record these animals outside the park.

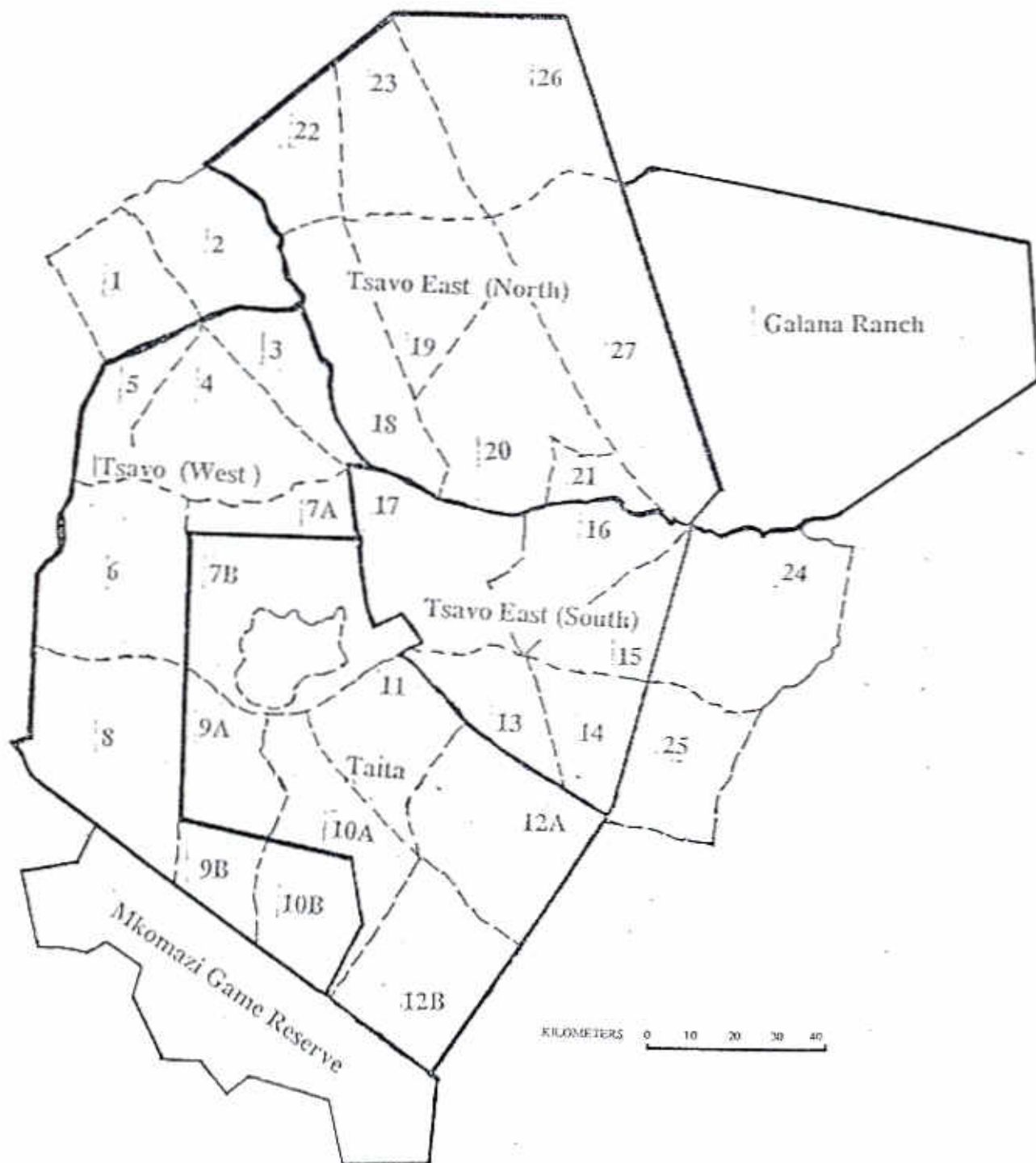
Dead elephants were divided into four categories following the criteria developed by Douglas-Hamilton and Hillman (1981). These were:

1. "Fresh", in which the carcasses still have flesh beneath the skin giving the body a rounded appearance, where vultures are probably present, and where a liquid putrescent pool of body fluids is still moist on the ground. This category applies to carcasses thought to be no more than 3 weeks old.
2. "Recent", in which carcasses less than one year old may be distinguished by the presence of a rot patch around the body which has killed and discoloured the vegetation. Skin is usually present, and the bones are relatively unscattered, except in areas of high predator density.
3. "Old", in which carcasses have usually decomposed to a skeleton, with bright white bones, clearly visible, but where the rot patch has disappeared or where vegetation is beginning to grow once more. The skin may still be present in arid areas, but will have disappeared in wetter zones. This category applies to dead elephants that have died more than one year previously.
4. "Very Old" in which the bones are beginning to crack and turn grey. The skeletons from the air no longer stand out as distinct entities and are difficult to see. Bones may exist in this form for 10 years or more but for the purposes of aerial survey, almost all have vanished after seven years, even in arid areas. In wetter areas like Murchison Falls in Uganda, dead elephants have almost entirely vanished from view from the air after four years.

For the purposes of analysis, these four categories were condensed into two: those less than a year old which were collectively called "Recent" and those more than a year old, called "Old".

The park and adjoining areas of Machakos, Taita-Taveta, Kwale, Kilifi, and Tana River districts, were divided up into 27 blocks (see Map 1), varying in size from 255 to 1,960 km². In addition the 6,135 km² Galana Ranch, was divided into five blocks, and the 3,125 km² Mkomazi Game Reserve into two blocks. A total count on this scale, covering some 40,000km² has never been attempted before. In this respect it most nearly approached the "Tsavo Ecosystem" as defined by Cobb (1976).

Tsavo National Park and Surrounding
Areas Showing Blocks Counted



The eleven aircraft were all single engine high wing Cessnas (180, 182, 185, 206) or Piper Supercubs. They were flown systematically back and forth across each block at heights of 400-700 feet above the ground at speeds of 130 to 170 k.p.h., depending upon type. When necessary, animals were circled for counting or photography. The two Supercub pilots assisted in observing and flew more slowly than the larger, four-seat Cessnas and spaced their flight lines closer together. Flight paths were marked on a map and the locations of animals were numbered and recorded serially on data sheets.

The whole count took five days and involved approximately 130 hours of actual counting time, representing mean rates of search of 280 km²/hour inside the park and a slightly higher rate of 358 km²/hour outside.

Information on all the species was summarised block by block and the distribution plotted on maps for comparison with previous total counts. In presenting the results we have divided the census zone into Tsavo West, Tsavo East (North), Tsavo East (South), Taita-Taveta, Galana Ranch, and Mkomazi Game Reserve. The boundary dividing Tsavo East (North) from Tsavo East (South) is the Galana river. Although Block 3 is administered by the Warden of Tsavo East, for the purposes of analysis it was treated as part of Tsavo West, which ecologically it more closely resembles.

The count took place during a time of transition between wet and dry seasons. Although the rains were over and the country was drying up, there were still areas of green vegetation with active water-holes in all of the main parts of the ecosystem. It was in these areas that most of the elephants were concentrated, and this distribution, rather than a more uniform one, assisted the count in achieving its objectives. In addition, the background of green vegetation made the red elephants easier to see. The census therefore took place under conditions favourable for counting.

RESULTS

All Species Totals

Total counts are considered to give minimum population estimates. The results for the 1988 census for elephants (live and dead), buffalo, cattle, and "shoats" appear in Table 1. There were no rhinos seen. The Tsavo ecosystem still supports a minimum of 5,300 elephants and 5,800 buffalo. 81% of the elephants and 66% of the buffalo counted were within the national park. For the first time livestock were counted in large numbers within the park boundaries where they are being kept illegally. Over 11,000 cattle and 2,300 sheep and goats (shoats) were seen. The majority of elephant and buffalo outside the park occurred in the Taita-Taveta census zone.

Detailed descriptions and trends for each species are described below.

TABLE I:

ALL ANIMALS TOTALS - 1988

	ELEPHANTS	DEAD ELEPHANTS		BUFFALO	CATTLE	SHOATS
		OLD	RECENT			
<i>TSAVO EAST (NORTH)</i>	770	848	47	528	3384	1790
<i>TSAVO EAST (SOUTH)</i>	2283	389	5	1084	385	0
<i>TSAVO WEST</i>	1274	360	6	2279	7360	570
<i>TOTAL PARK</i>	4327	1597	58	3891	11129	2360
<i>TAITA</i>	853	92	22	1019	5657	7122
<i>GALANA</i>	90	368	57	667	15400	0
<i>MKOMAZI</i>	93	133	12	245	14275	4185
<i>REMAINDER</i>	0	69	13	38	3802	1600
<i>TOTAL NON-PROTECTED</i>	1036	662	104	1969	39134	12907
<i>TOTAL ECOSYSTEM</i>	5363	2259	162	5860	50263	15267

NB. The cattle and shoat figures are estimates only.

No rhinoceros were seen in over 130 hours of aerial counting, even though at least seven are known to live in the Tsavo West rhino sanctuary. Unlike 5 years ago, rhino are now seen only very occasionally during hundreds of hours of routine aerial patrolling of the park. Even those that lived around Voi Safari Lodge and the Tsavo East headquarters have been eliminated, and the situation in Tsavo West is only slightly better.

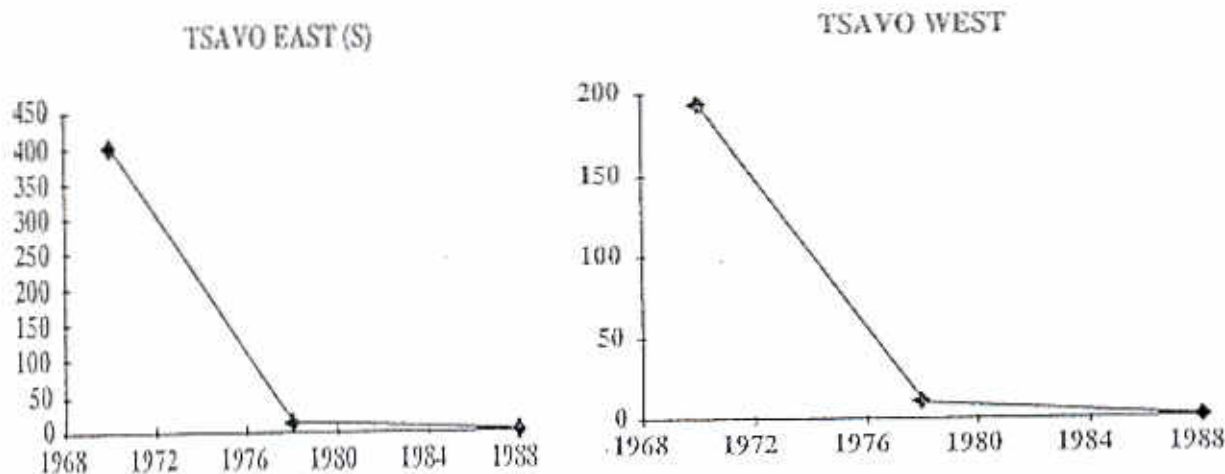
It must be remembered, however, that rhinos are very difficult to spot from the air. They are often solitary and tend to conceal themselves in the heat of the day. Even in the best conditions, as many as two to five rhino may be missed for every one seen, depending on the habitat, visibility conditions, type of aircraft, flight pattern, and experience of the observers.

Their population trends, however, can be deduced from comparison of total count data. These indicate that between 1970 and 1978 rhino numbers plunged by 96% within the national park. It is impossible on the basis of this survey to say how many rhinos remain, but the total is unlikely to exceed one hundred and may well be less. Formerly they were estimated at more than 5,000 (Cobb, 1976).

Until control of the park can be restored, the only hope for the remaining rhinos lies in the enclosed and well-protected Ngulia Rhino Sanctuary in Tsavo West, and any outlying rhinos need to be translocated there for protection as soon as translocation funds have been identified and committed.

FIGURE 2:

RHINO TOTAL COUNTS 1968-1988



Elephants

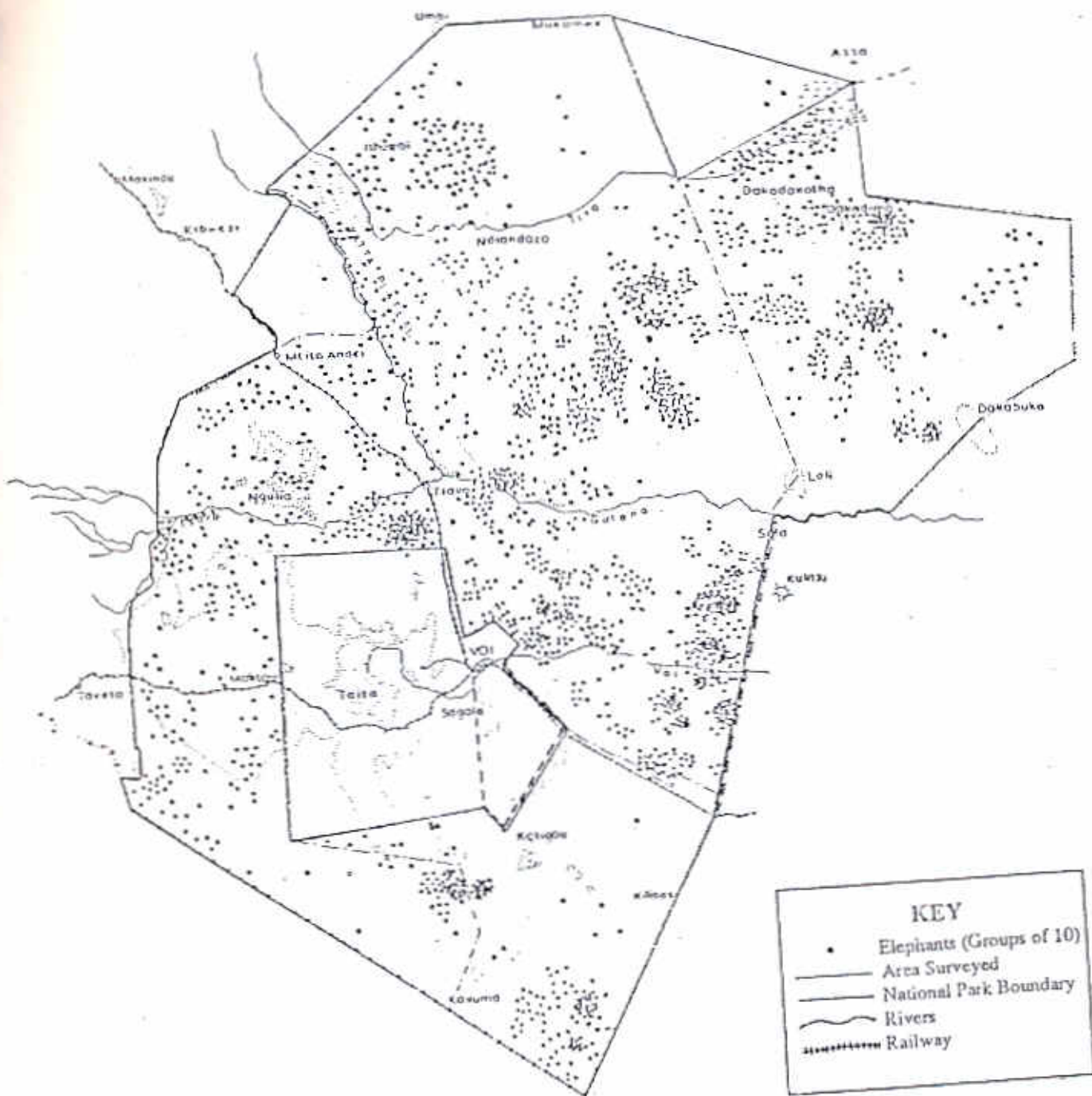
The number of elephants counted within the Park was 4,327. This represents a decline of 75% since the 1972 total count. Another 1,036 were counted in surrounding areas where they have declined by 87% (Table 2). This result confirms the downward trend indicated by sample counts of the Kenya Rangeland Ecological Monitoring Unit (Figure 1), which suggest that of Tsavo's 42,000 elephants living in 1969, only some 5,700 remained by 1987 (Otichilo, 1981, 1987).

TABLE 2:

TSAVO ELEPHANT - TOTAL COUNTS

	1962	1965	1968	1969	1970	1972	1973	1978	1988	% CHANGE '72 - '88
TSAVO EAST (N)	5224	8056		6619		6435	9011		770	-88%
TSAVO EAST (S)	4189	4744		5709	6008	6633	3955	2469	2283	-66%
TSAVO WEST	1386	2238		8134	6592	4419	9208	1938	1274	-71%
TOTAL PARK	10799	15038		20462		17487	22174		4327	-75%
TAITA				500		1235		79	853	-31%
GALANA			1430	2964		4379	500	1076	90	-98%
MKOMAZI			3000			2067		667	93	-96%
REMAINDER						100	300		0	
TOTAL NON-PARK				3464		7781	800		1036	-87%
GRAND TOTAL FOR AREA COUNTED				23926		25268	22974		5363	-79%

1972 Census Distribution Showing Numbers of Elephants



The elephants are now mostly concentrated in a central core in the northern part of Tsavo West, the southern part of Tsavo East, and in Taita-Taveta around the Taita Hills and Salt Lick Lodges. By contrast Tsavo East (N) and the Galana Ranch are almost devoid of elephants, and the large population which roamed from Tsavo West into Taita-Taveta and across the Tanzanian border into Mkomazi Game Reserve is all but gone. This was so even in substantial green areas with water where elephants might have been expected. Even in the core area their numbers have thinned out significantly since 1962 (Appendices 5-7).

The numbers and trends in each census zone are presented in Table 2 and Figure 3. Tsavo East (North) which contained over 6,000 elephants in 1972, now has 770, a decline of nearly 90% in 16 years. These losses were mostly caused by poaching. A similar decline in Galana Ranch, also due to the same cause, has reduced numbers there by 98%, from nearly 4,400 in 1972 to the 90 of today. The early fluctuations in these two zones can be explained by movements of elephants from one zone to another.

Most of Tsavo East's elephants now occur south of the Galana River. The 2,283 counted there in 1988 compare with over 6,600 in 1972, indicating a 66% decline. In this part of the park drought has almost certainly played a greater role in the reduction than in Tsavo East (North), (Corfield, 1973). Nevertheless poaching has been a major cause of mortality since 1976, although it has been less severe than in Tsavo East (North), probably because the southern area is more frequented by tourists. By contrast, visitors have been excluded from Tsavo East (North), and the area has become not only a free-for-all poaching ground but also the preserve of Orma herdsmen and their livestock for the last eight years. Efforts are now under way to evict these people together with their stock.

In Tsavo West all the evidence points to a decline since 1972, little less marked than that in Tsavo East as a whole. The number of elephants in all parts of Tsavo West has fallen by 71% from 4,419 in 1972 to 1,274 in 1988. This has occurred not only in the relatively remote and unpatrolled southern area bordering the Mkomazi, where elephants have been virtually eliminated, but also in the northern portion.

By contrast, the 31% decline in the Taita-Taveta zone, from 1,235 in 1972 to 853 in 1988, has been less severe. The magnitude of this decline may be partly masked if underestimates were made on previous total counts which covered areas outside the park much less thoroughly than those inside. However, on a more detailed scale, local patterns show both a decrease and an increase (Appendix 3). In the eastern Block 12 (Kasigau-Kilibasi, Map 1) elephants have declined from 1,150 in 1972 to 262 today. But around the Taita Hills Game Sanctuary (Blocks 9A & 10A) they have increased from 85 in 1972 to 552. This decrease is related to heavy poaching in the east, and the increase to the protection afforded by tourism around the Taita Hills and Salt Lick Lodges.

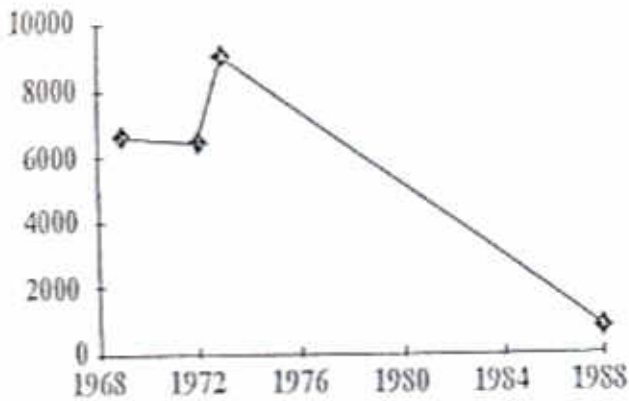
The Mkomazi Game Reserve population was estimated at about 3,000 in 1968 (Watson, et al. 1969). By 1978 this number had dropped to 667 (IUCN, 1978) and continued to decline to 93 in this count. Extrapolating, this represents a decline of 96% from 1972 to 1988. There is evidence that poaching was the cause of these losses.

In conclusion, the analysis of numbers and trends in the six census zones confirms the overall picture of elephant decline.

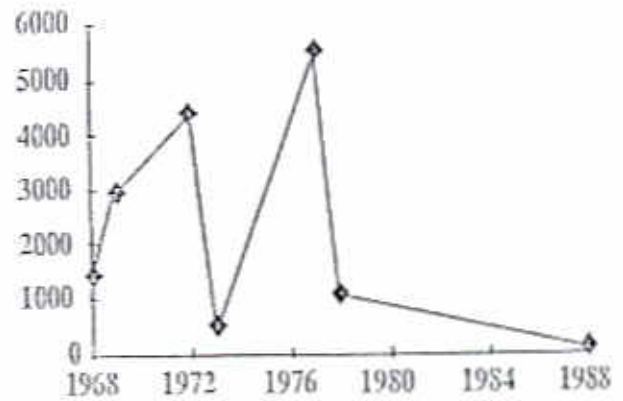
FIGURE 3

ELEPHANT TOTAL COUNTS
1968 - 1988

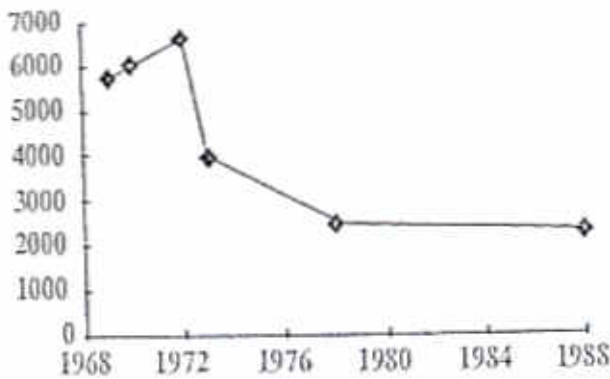
TSAVO EAST (N)



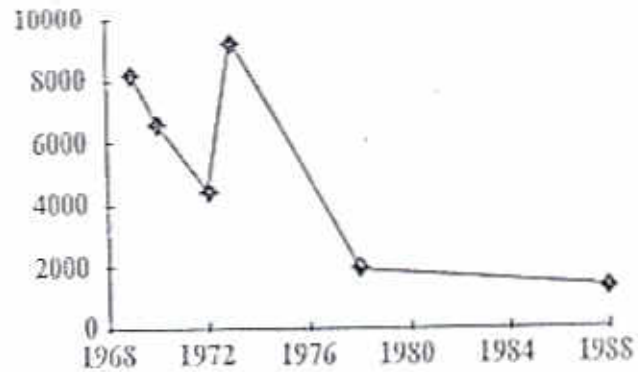
GALANA



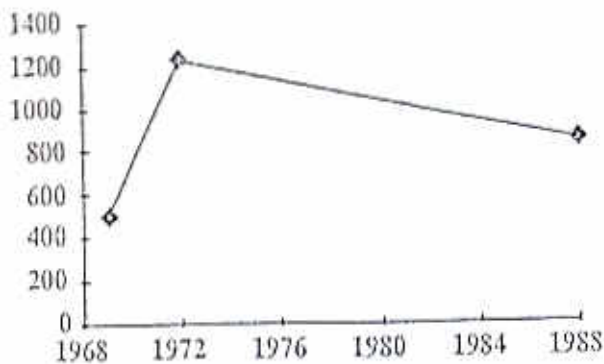
TSAVO EAST (S)



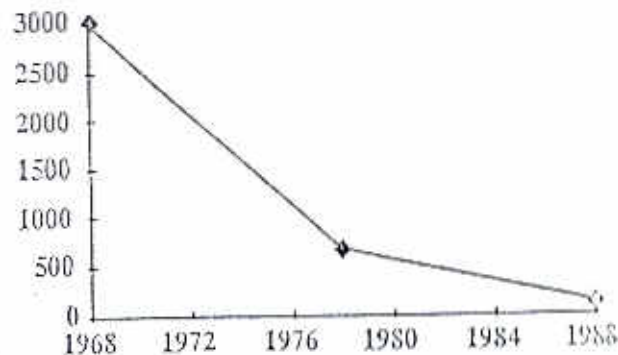
TSAVO WEST



TAITA



MKOMAZI



Age Structure of Elephants

During the course of the count some qualitative observations were made of the age structure of elephants by Dr Joyce Poole in Tsavo East (South) and in Mkomazi. She has considerable experience of judging the age of elephants at Amboseli, and commented that, within the park, groups of elephants were composed mainly of calves (0-5 yrs.) and large adults (21+ yrs.) old. Although there were some juveniles (6-10 yrs.), there was an obvious gap in the number of young adults (11-20 yrs). A high proportion of calves appeared to be less than two years old. Except in a few cases, the largest elephants in these groups were females. Very few all-male groups were observed and most individuals were under 30 years of age.

From these observations it appears that in Tsavo East (South) there is still a fair proportion of matriarch elephants. The poaching has not yet eliminated all the older females as it has elsewhere. This suggests that ivory poaching has been less severe in the core of the elephants' range than on the periphery. By contrast in Mkomazi, for example, the signs of heavy poaching were more obvious. A wounded five year old was seen alone. Two groups, each of six individuals, were composed entirely of animals under seven years old. One group of eight elephants comprised seven calves led by a tuskless 25 year old female. No adult males were seen at all.

Dead Elephants

Within the ecosystem, 2,421 dead elephants were counted. Their real numbers must be much higher since carcasses and skeletons are difficult to see and many are missed. From data where sample counts and total counts have been made simultaneously it has been calculated that two to three times as many carcasses exist as are seen on total counts (Douglas-Hamilton, 1984; Dublin & Douglas-Hamilton, 1987). Using these correction factors gives a dead elephant estimate of 5,000 to 7,000. It is thought that most of them had died within the previous eight years.

Dead elephants were distributed throughout the six census zones (Table 1, Maps 4 & 5). This high mortality is supported by reports of poaching within the park increasing. These carcass counts also accord well with the reduction from the 12,000 elephants estimated in 1980 (Otlichilo, 1981) to the 6,000 or so of today.

Of all the carcasses 162, or 7%, were "recent" (less than one year old). These were found mainly on Galana Ranch and Kulalu Ranch (Block 24) and the adjoining portion of Tsavo East (North) but extended through Taita-Taveta into Tsavo West and the Mkomazi Game Reserve (Map 4). Most of these carcasses were less than seven months old and reflect an upsurge in poaching by Somali bandits and others. The high proportion of recent carcasses (41%) south of Bachuma (Blocks 12A & 12B) suggests that heavy poaching has only recently started as there are few "old" carcasses relative to other zones. Five fresh carcasses were discovered here on the count showing that poaching is going on now. The only area which had no "fresh" or "recent" carcasses was the area around Taita Hills Lodge (Table 3, Appendix 1).

Map 5 is believed to show the distribution of old elephant carcasses reasonably well, although there is some under-representation in Tsavo West, where the more lush vegetation tends to obscure carcasses fairly quickly, and in the northeast portion of Tsavo East (South) where one crew seems to have missed many carcasses. By contrast the dearth of old carcasses in Blocks 1 & 2 and the eastern part of Blocks 24 & 25 reflects the fact that elephants no longer occupy these areas.

TABLE 3:

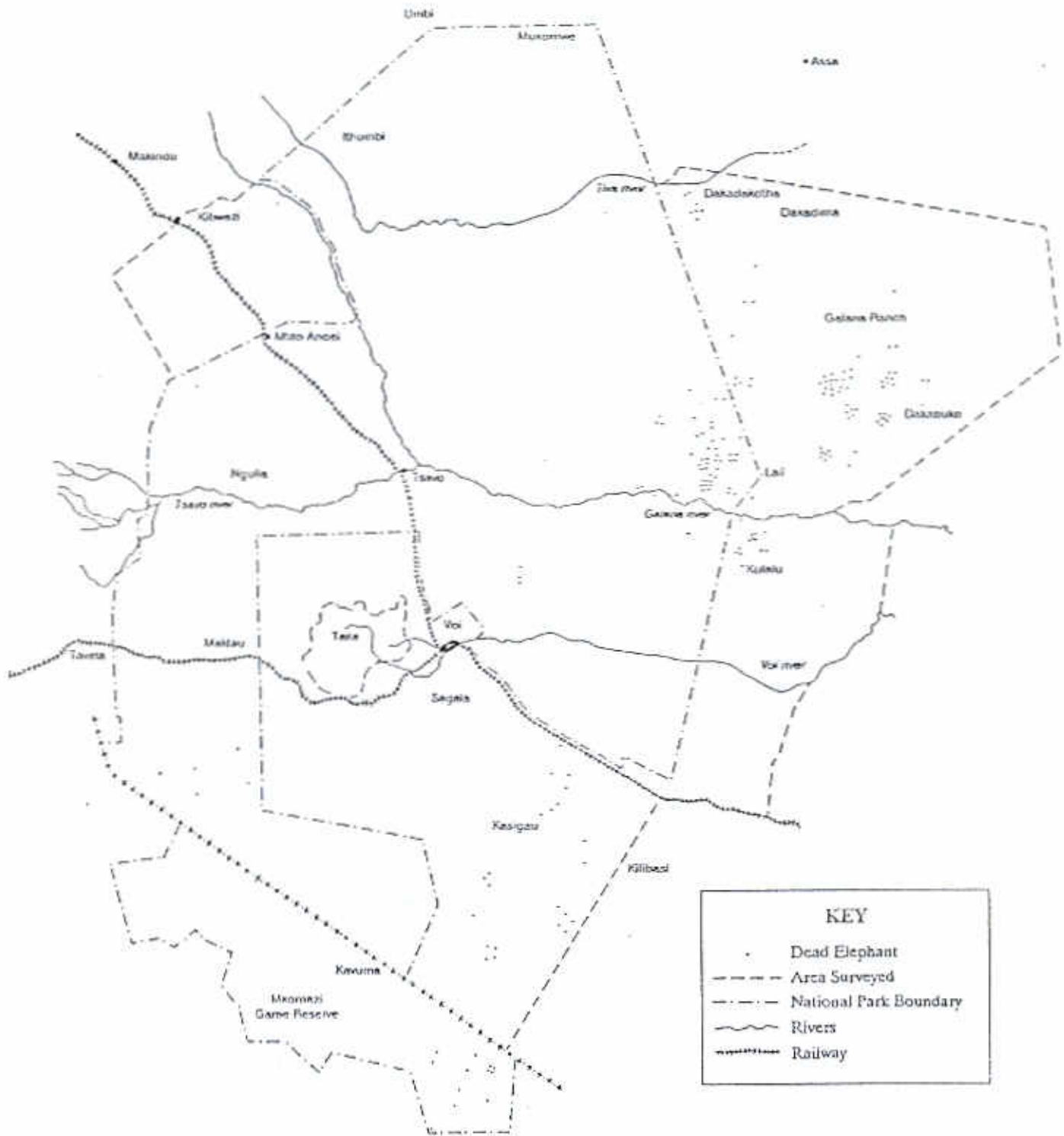
DEAD ELEPHANTS

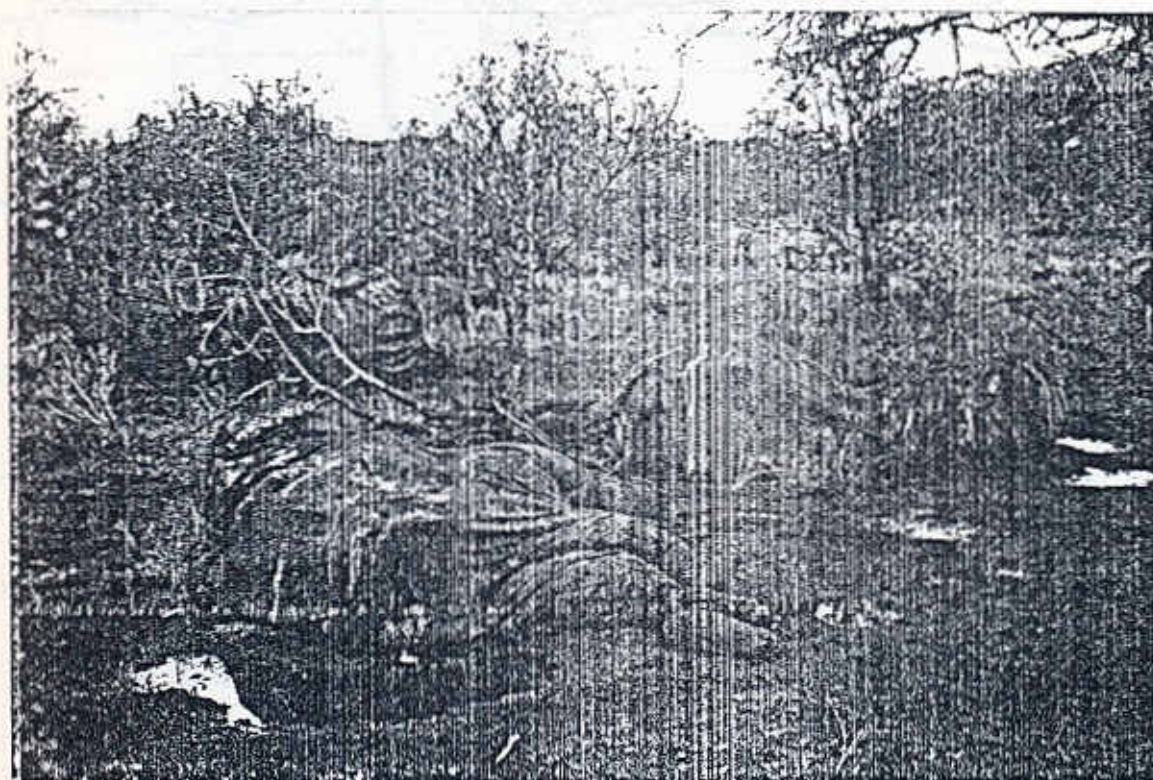
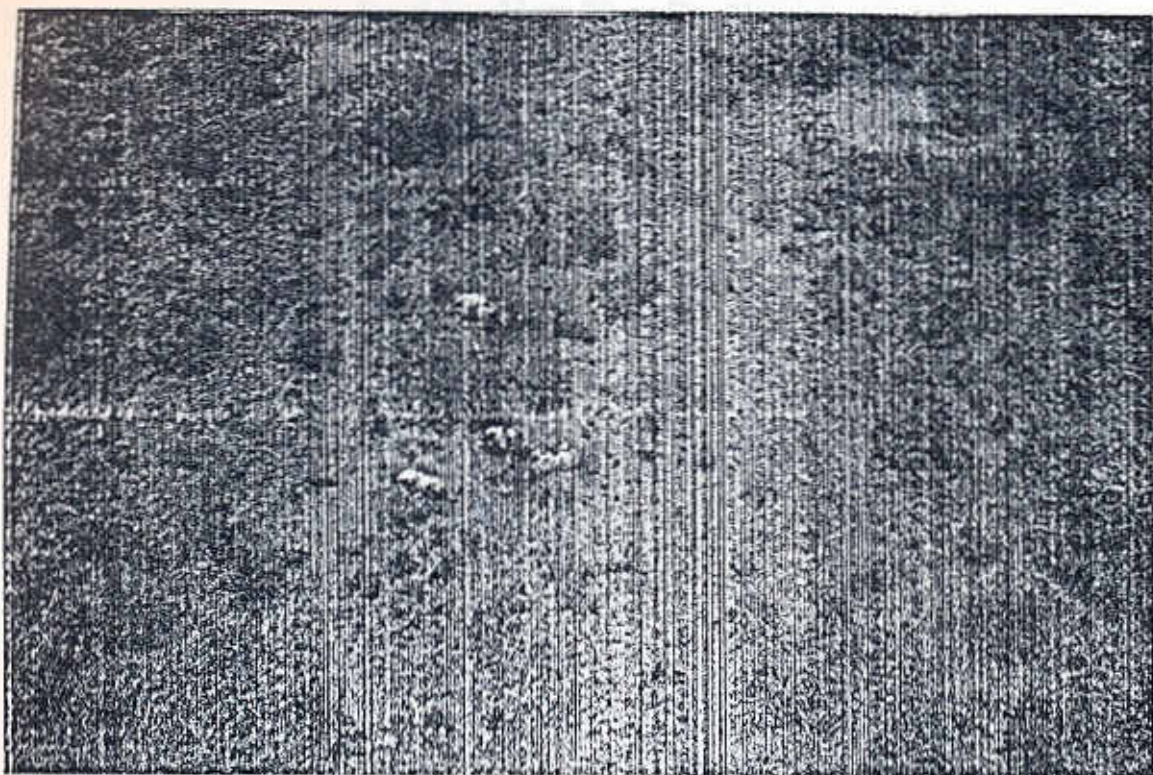
	<i>LIVE</i>	<i>TOTAL DEAD</i>	<i>RECENT DEAD</i>	<i>% RECENT</i>
<i>TSAVO EAST (NORTH)</i>	770	895	47	5%
<i>TSAVO EAST (SOUTH)</i>	2283	394	5	1%
<i>TSAVO WEST</i>	1274	366	6	2%
<i>TAITA</i>	853	114	22	19%
<i>GALANA</i>	90	425	57	13%
<i>MKOMAZI</i>	93	145	12	8%
<i>REMAINDER</i>	0	82	13	16%
<i>TOTAL</i>	5363	2421	162	7%
<i>TAITA SUBDIVISIONS:</i>				
<i>AROUND TAITA HILLS LODGE (BLOCK 9A, 10A)</i>	522	52	0	0%
<i>BACHUMA SOUTH (BLOCKS 12A, 12B)</i>	262	54	22	41%

As the 1983/84 drought did not cause any observable mortality of adult elephants, the cause of almost all of these deaths can only be poaching. This is borne out by the observation that virtually every elephant skull seen had the tusks hacked out, compared with only 61% prior to 1980 when drought was a significant cause of death (Otúchilo, 1981). Furthermore the obvious location of many old carcasses close to the roads suggests that they had been victims of motorized poaching. This was particularly evident in parts of Tsavo East, both north and south of the Galana, and was quickly noted by observers with no previous experience of such a phenomenon.

Distribution Showing Numbers Of Elephants Dead For Less Than One Year

(Census Carried Out In February 1988)





Elephants shot by armed bandit poachers in Taita District, November 1987.

TABLE 4

TSAVO BUFFALO - TOTAL COUNTS

	1965	1970	1988	% CHANGE '70 - '88
TSAVO EAST (N)	1547		528	
TSAVO EAST (S)	1459	2805	1084	-61%
TSAVO WEST	1691	3838	2279	-41%
TOTAL PARK	4697		3891	
TAITA	590		1019	
GALANA	2000	2732	667	-76%
MKOMAZI		115	245	113%
REMAINDER	741		38	
TOTAL ECOSYSTEM - 1988 -			5860	

Buffalos

The count revealed 3,891 buffalo in the park and 1,969 outside, giving an ecosystem total of 5,860 (Table 4). 39% of these were in Tsavo West, mostly north of the Tsavo River, and 27% in Tsavo East, mostly in the southern area. The remaining 34% were distributed between Taita-Taveta, Galana Ranch, and Mkomazi. Most of those in Taita-Taveta were either in the Taita Hills Game Sanctuary and on the neighbouring Lualenyi Ranch or near the Tanzanian border adjoining the Mkomazi Game Reserve.

An unexpected trend of declining buffalo numbers was found in the park and on Galana Ranch (Table 4, Figure 4). Between 1970 and 1988 a 41% decline has occurred in Tsavo West 61% in Tsavo East (South), with a 76% decline on Galana Ranch. The reasons for this apparent trend are unclear. Although some buffalo may have been missed, the reduction in numbers was so widespread, irrespective of aircraft crews, that we believe the indication is genuine and not due to undercounting. There have been no reports of heavy mortality due to disease, or starvation, although it is possible that calf mortality may have occurred without being noticed. Nor can it be satisfactorily explained by emigration outside the park, although numbers in Taita-Taveta have increased modestly, probably as a result of the protection offered by the Taita Hills Game Sanctuary, where in the 1965 count buffalo were not recorded.

The decline in Tsavo East (North), which seems to have been of the order of 66% since 1965 (Table 4), offers one possible clue. Buffalo there have virtually disappeared, particularly in blocks 18 and 22 bordering the Athi River and the northern boundary. These blocks and Block 3 adjoin dense Wakamba settlement and have been subject to persistent subsistence poaching during the past decade. The same process has taken place in Block 2, which had nearly 700 buffalo in 1965. Buffalo are popular with the Wakamba poacher because they easily succumb to poisoned arrows and provide a large supply of good meat.

We suggest, therefore, that subsistence and commercial poaching for meat has been largely responsible for the decline of buffalo in Tsavo East (North), and to a lesser extent in Tsavo West and Tsavo East (South), where traditional hunting has probably been supplemented by motorized poaching with rifles. On Galana Ranch heavy snaring by Giriama along the Galana River and on the east side of the ranch may also have had a negative impact. Other species which provide game meat may have been similarly affected. Vanishing game trails and a noticeable decline of animals such as kongoni in the southern portion of Tsavo West suggest that the loss of buffalo may be symptomatic of a more general decline of the region's wildlife.

Yet another factor acting against the buffalo, along the Tiva in Tsavo East (North) and in the western portion of Tsavo West, is the erosion, overgrazing, and disturbance caused by thousands of Orma and Masai cattle illegally in the park. Similarly, the Mkomazi Game Reserve has been almost entirely taken over by the Wakwawe Masai since 1974. Although Galana Ranch is well managed, with no overgrazing, the increase in cattle numbers from 13,000 in 1974 to 20,000 in 1988 cannot have been in the buffalo's favour, especially as cattle tend to monopolize the waterpoints and best grazing.

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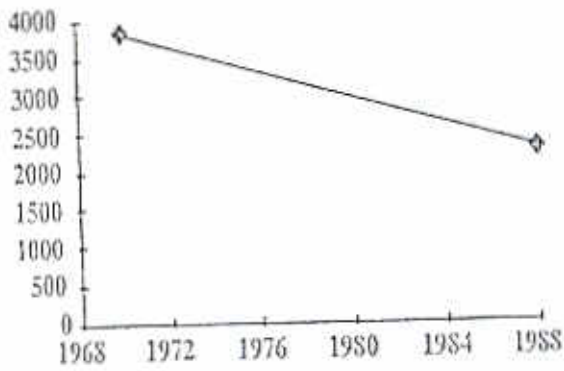
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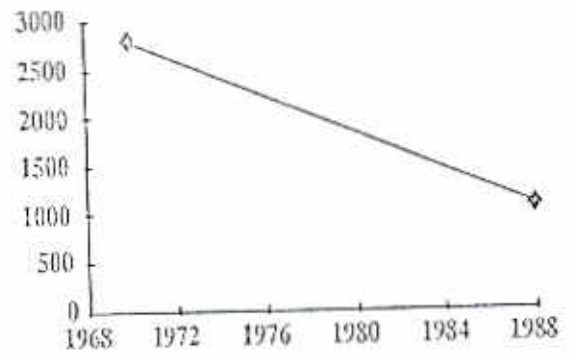
FIGURE 4

BUFFALO TOTAL COUNTS 1970 - 1988

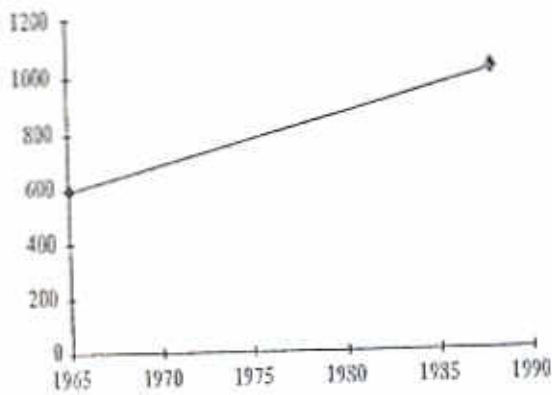
TSAVO WEST



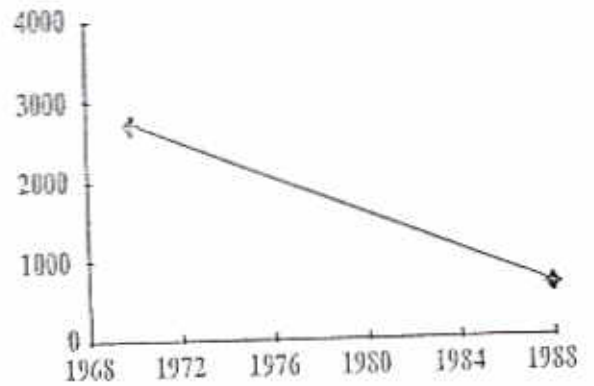
TSAVO EAST (S)



TAITA



GALANA



Livestock

This was the first total count in which livestock have ever featured, for the simple reason that in previous years there were no livestock within the national park. Since 1978, however, the situation has changed and the present count revealed over 11,000 cattle and 2,300 sheep and goats (shoats) illegally residing in Tsavo East and West. As these figures are estimates rather than photographic counts, the true figures are likely to be at least 25% higher, for most observers tend to underestimate the numbers of animals occurring in large herds. The actual livestock population of the park is therefore nearer 14,000 cattle and 3,000 shoats and even these figures are probably underestimates.

Two-thirds of the cattle and shoats were found in Tsavo West along the entire western portion between the Chyulu Hills and Lake Jipe. These are mostly Masai livestock from neighbouring Kajiado District that have been grazing illegally in Tsavo West in increasing numbers since 1982, culminating in the invasion during the 1984 drought when 30,000 cattle and accompanying settlements penetrated up to 25 km into the interior and occupied 20% of the park (Hamilton, 1986). Although the present encroachment is on a reduced scale, the Wildlife Department has so far not been able to prevent it and thousands of cattle continue to be driven daily into the park from the settlements all along the western boundary. The resulting overgrazing, trampling, and erosion have severely damaged at least half of the 500km² currently occupied and the process was still continuing at the time of going to press. Other encroachments along the Tanzanian border and near Kasigau indicate a similar loss of control over the southeastern portion of the park, where boundaries, roads, and airfields have deteriorated since 1976 and are seldom patrolled. The Government intends to make every effort to eliminate this encroachment from Tsavo National Park once and for all.

In Tsavo East (North) the 3,300 or so cattle and 1,700 shoats seen belong to nomadic Orma pastoralists who moved up the Tiva River into the park from Tana River District in 1981 and have been there more or less ever since (Hamilton, 1986). Although they usually confine themselves to the Tiva, this count showed that they had moved further westwards than at any time in the last eight years and are now much more widely distributed, taking advantage of green areas elsewhere and the lack of any control over their movements by the park administration.

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DISCUSSION

After the loss of virtually the entire rhino population, the central question raised by this count is whether or not elephants can continue to survive in Tsavo in meaningful numbers, and if so, for how much longer. The other question that arises relates to what policy changes are necessary if Tsavo National Park is to be saved from total destruction by both the poachers and the herdsmen.

To summarize we are no longer talking of an ecosystem population of 12,000 animals, as in 1980 (Ottichilo, 1981). Numbers have continued to decline to the 5,363 counted in this census, a figure supported by KREMU's sample count average of 5,700 for the years 1985 to 1987 (Ottichilo, 1987). This decrease is independently substantiated by the present count's estimate in round figures of 6,000 dead elephants, most of which are believed to have died in the last eight years but particularly after 1982 when poaching increased again. Even after allowing generously for undercounting, it is now unlikely that the Tsavo ecosystem contains more than 6,000 elephants, over 80% of which are in the national park.

It seems true, therefore, to say that the Tsavo ecosystem's elephants have roughly halved in numbers in the last eight years. This represents an average loss of about two elephants per day. If this rate of off-take continues, the remaining elephant population will be halved again within the next five years and reduced to mere remnants, close to extinction, within eight years. In reality it is likely that as numbers dwindle to the low hundreds the rate of off-take will decrease, as it becomes harder for the poachers to find the remaining elephants at a profit. However, if the price of ivory rises, which is likely as elephants become scarcer (Douglas-Hamilton, 1987), there is a real risk that poachers will not give up until they have taken the last ivory-bearing elephant, just as they persist now in hunting down the few remaining rhinos. The examples of Galana and Mkomazi show that populations of several thousand elephants can be reduced to less than a hundred within a decade. Furthermore, those elephants are still being hunted, judging by the recent carcasses seen during this count.

Fortunately elephant numbers in Tsavo have not yet fallen so low that the species is in immediate danger of extinction. However, the remaining population is severely threatened by the current activities of armed poachers using firearms and will continue to decline if this threat is not removed immediately. Further unchecked elephant declines will have an adverse effect on tourism, which is now one of Kenya's main sources of foreign exchange. Tsavo's principal attraction is its elephants, and the park will not have the same interest for tourists - or Kenyans - if these disappear. Visitors are already complaining about the apparent lack of elephants and their nervousness, particularly in Tsavo East.

The elimination of elephants would have ecological consequences, too, for the removal of these large browsers would inevitably result in an increase in the woody vegetation. Such a change would not necessarily be undesirable in some parts of the park. However, it would not be in the interests of the Taita-Taveta and other ranches which, in the absence of elephants and without fire, could face a severe bush encroachment problem and a resulting reduction of their grazing capacity for cattle within ten years (Wijngaarden, 1985). There are already signs of this starting to happen on Galana and there is an added risk that tsetse fly will increase again as bush encroachment restores their habitat.

From this it is obvious that the greatest single management requirement in Tsavo now is the reinstatement of effective anti-poaching measures of the type developed in Tsavo East during the 1960's (Sheldrick 1976) and which proved so successful that they led, ironically, to the creation of an elephant

over-population problem. The Wildlife Conservation and Management Department still has the basic human and material resources to restore the integrity of the park and regain control over poaching, provided that carefully selected personnel can be given training, equipment, leadership, guidance, and incentives for this difficult and dangerous task. In addition, there is need for financial assistance to provide for new vehicles and the repair of old ones, the improvement of communications, and further development of the successful Ngulia Rhino Sanctuary in Tsavo West. However, only the Government can spearhead effective anti-poaching, just as it is only the Government that can take action against the illegal ivory dealers in Kenya whose activities are harming the elephants and encouraging the armed bandits whose illegal military weapons also represent a threat to law and order and national security.

Kenya, however, cannot reasonably be expected to eradicate elephant poaching without united international action to prevent or apprehend traders dealing in ivory of illegal origin. The ban on private trade in ivory in Kenya needs to be reinforced by other countries preventing illegal Kenyan ivory from being imported and entering their markets. If the CITES ivory export quota system, endorsed by the African parties of CITES at Ottawa in 1987, were working properly, it could greatly help in the identification of illegal dealers. The establishment of a TRAFFIC office to monitor trade in wildlife species in East Africa would also help significantly in this respect.

Finally, much closer monitoring of the remaining elephant populations needs to be linked with the anti-poaching effort so that the Government can be kept better informed than has been the case over the past ten years. A goldmine of information on elephants and other species lies within the archives of KREMU. The analysis performed a year ago on five years of KREMU elephant data provided the first confirmation that Tsavo's elephants had declined to their present levels. The WCMD Research Section should develop close links with KREMU and set up the capability of analysing the KREMU raw data in relation to the special needs of conservation and management.

Tsavo is the country's largest national park and, together with the surrounding area, still contains nearly one third of Kenya's total remaining elephant population, currently estimated at about 20,000. Because of its size, Tsavo offers the space that elephants, being large nomadic animals, require in dry country with erratic rainfall, and on the whole its vegetation is now in better condition than at any time since 1970. Because of its geographical location, there are relatively few points of serious conflict with adjoining human populations and agricultural settlement, with the notable exception of the Taita Hills where much could be done to reduce the problem. But with its Northern Area, particularly, Tsavo offers a huge expanse of excellent habitat where elephants could survive in large numbers, if sufficiently protected, without coming into conflict with man. This cannot be said of any other national park in Kenya.

If human encroachment can be removed from Tsavo and the elephants protected, all other wildlife, including the remaining rhino, will benefit, and Tsavo could regain its place amongst the greatest national parks of the world. It is not yet too late and there is hope. The recent security operations carried out in Coast Province have shown the Government's concern. Further evidence of the Government's resolve is shown by the appointment of a new Director and Deputy Director of Wildlife by H.E. The President in 1987, the dismissal of 27 senior Wildlife Department officers for corruption and incompetence in 1988, the declared intention to introduce a Code of Discipline for the Department, and the recent bilateral agreement on poaching with the Somali Republic to cooperate closely in combating the poaching menace.

In taking these measures, the Kenya Government has shown its will to act, and deserves the fullest support of the nation and the international community in its determination to halt poaching and restore the national parks to their former high standard. With these developments there is indeed hope for Tsavo and its elephants.

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APPENDIX 1:

ALL ANIMALS BLOCK TOTALS - 1988

	ELEPHANTS	DEAD ELEPHANTS		BUFFALO	CATTLE	SHOATS
		OLD	RECENT			
<i>TSAVO EAST (N)</i>						
18	3	48	0	17	0	0
19	27	172	0	10	630	290
20	188	171	0	22	1225	150
21	90	119	3	88	0	0
22	12	73	0	25	150	0
23	0	39	0	195	359	510
26	0	22	0	0	645	565
27	450	204	44	171	375	275
<i>SUB-TOTAL</i>	770	848	47	528	3384	1790
<i>TSAVO EAST (S)</i>						
13	209	44	0	573	250	0
14	262	58	1	158	0	0
15	403	29	0	9	0	0
16	347	11	1	35	0	0
17	1062	247	3	309	135	0
<i>SUB-TOTAL</i>	2283	389	5	1084	385	0
<i>TSAVO WEST</i>						
3	431	66	0	54	0	0
4	140	33	0	947	0	0
5	7	79	1	828	2760	0
6	211	14	0	256	1850	300
7A	64	5	0	49	0	0
8	421	104	5	5	1630	0
9B	0	31	0	0	0	0
10B	0	28	0	140	1120	270
<i>SUB-TOTAL</i>	1274	360	6	2279	7360	570
<i>TOTAL PARK</i>	4327	1597	58	3891	11129	2360
<i>TAMBA</i>						
7B	69	3	0	70	0	0
9A	348	30	0	513	3499	15
10A	174	22	0	20	2158	900
11	0	5	0	49	0	0
12A	119	8	8	0	0	2547
12B	143	24	14	367	0	3660
<i>SUB-TOTAL</i>	853	92	22	1019	5657	7122
<i>REMAINDER</i>						
1	0	0	0	0	0	0
2	0	5	0	38	0	0
24	0	42	13	0	0	0
25	0	22	0	0	3802	1600
<i>SUB-TOTAL</i>	0	69	13	38	3802	1600
<i>GALANA</i>						
90	90	368	57	667	15400	0
<i>MKOMAZI</i>						
93	93	133	12	245	14275	4185
<i>TOTAL NON-PROTECTED</i>	1036	662	104	1969	39134	12907
<i>TOTAL ECOSYSTEM</i>	5363	2259	162	5860	50263	15267

NB. Figures for cattle and shoats are estimates not counts.

APPENDIX 2:

TSAVO RHINO BLOCK TOTALS 1970 - 1988

	1970	1978	1988	CHANGE '70 - '78
<i>TSAVO EAST (S)</i>				
13	15	0	0	-100%
14	23	0	0	-100%
15	22	3	0	-86%
16	141	2	0	-99%
17	202	8	0	-96%
<i>TSAVO EAST (S) TOTAL</i>	403	13	0	-97%
<i>TSAVO WEST</i>				
3	12	2	0	-83%
4	84	5	0	-94%
5	32	2	0	-94%
6	27	0	0	-100%
7A	16	0	0	-100%
8	21	1	0	-95%
9B			0	
10B	2	0	0	-100%
<i>TSAVO WEST TOTAL</i>	194	10	0	-95%

APPENDIX 3:

TSAVO ELEPHANT BLOCK TOTALS 1968 - 1988

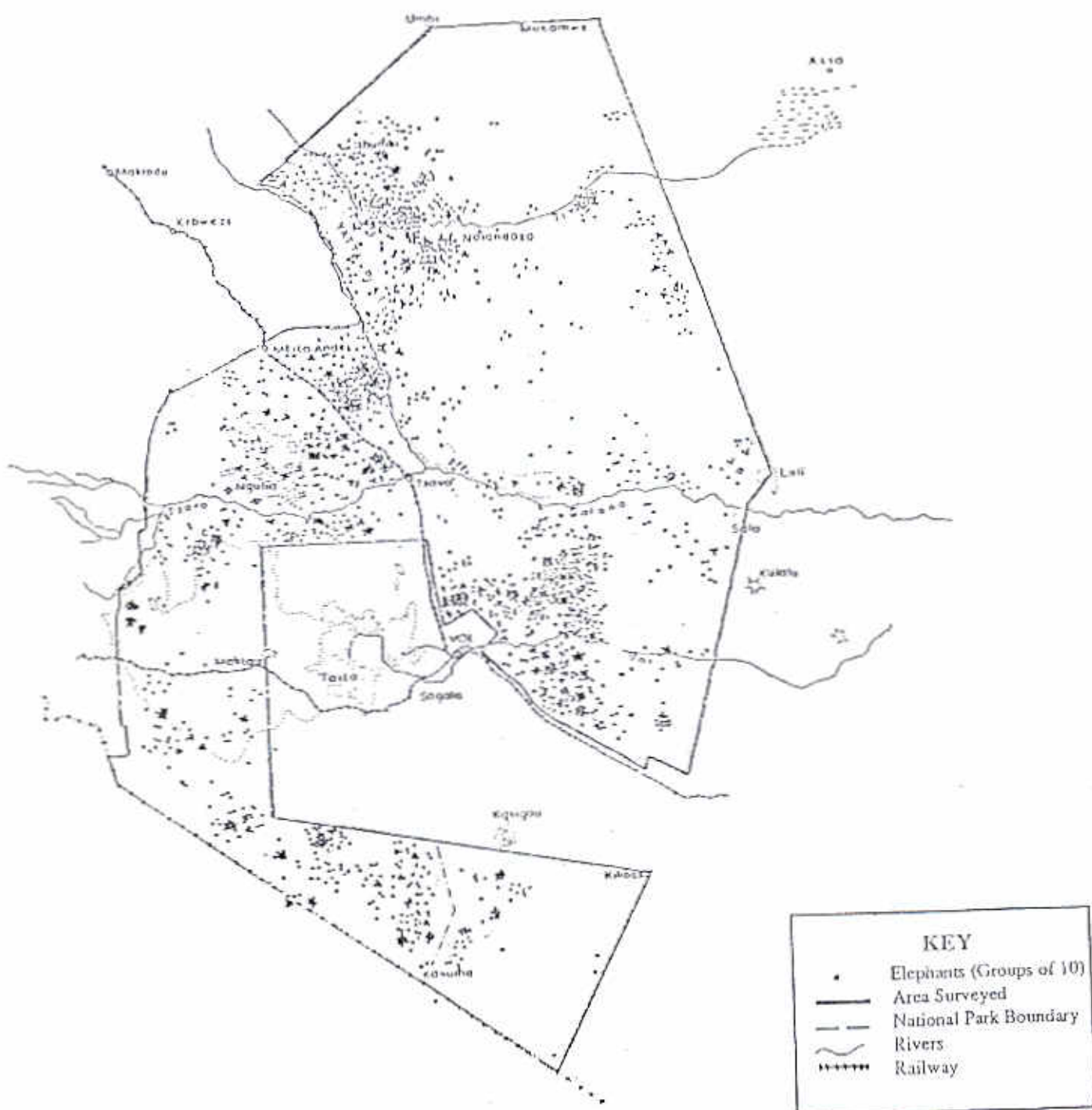
	1968	1969	1970	1972	1973	1978	1988	% CHANGE '72 - '88
<i>TSAVO EAST (N)</i>								
18		1029		1164	1258	203	3	-100%
19		1102		1066	1536		27	-97%
20		130		1500	264		188	-87%
21		583		237	51		90	-62%
22		1170		358	964	2	12	-97%
23		1166		914	2544	9	0	-100%
26		335		150	385	6	0	-100%
27		1104		1046	2009		450	-57%
<i>SUB-TOTAL</i>		6619		6435	9011		770	-88%
<i>TSAVO EAST (S)</i>								
13		1444	879	501	592	124	209	-58%
14		186	609	1536	26	30	262	-83%
15		187	560	1847	257	40	403	-78%
16		617	1930	604	885	237	347	-43%
17		3275	2030	2145	2195	2038	1062	-50%
<i>SUB-TOTAL</i>		5709	6008	6633	3955	2469	2283	-66%
<i>TSAVO EAST SUB-TOTAL</i>		12328	6008	13068	12966	2469	3053	-77%
<i>TSAVO WEST</i>								
3		1369	713	185	914	38	431	133%
4		2166	1079	706	2936	1089	140	-80%
5		115	441	415	189	24	7	-98%
6		1048	1541	588	897	74	211	-64%
7A		636	706	1231	1185	304	64	-95%
8		984	1062	732	1625	361	421	-42%
9B				17		42	0	
10B		1816	1050	545	1462	6	0	-100%
<i>SUB-TOTAL</i>		8134	6592	4419	9208	1938	1274	-71%
<i>TOTAL PARK</i>		20462		17387	22174		4327	-75%
<i>TAITA</i>								
7B							69	
9A						4	348	
10A				85		43	174	
11						0	0	
12A		232		13		32	119	
12B		268		1137			143	
<i>SUB-TOTAL</i>		500		1235		79	853	-31%
<i>REMAINDER</i>								
1							0	
2							0	
24				50	300		0	
25				50		0	0	
<i>SUB-TOTAL</i>				100	300		0	
<i>GALANA</i>	1430	2964		4379	500	1076	90	-98%
<i>MKOMAZI</i>	3000			2067		667	93	-96%
<i>TOTAL ECOSYSTEM</i>		23926		25268	22974		5363	-79%

APPENDIX 4:

TSAVO BUFFALO BLOCK TOTALS 1965 - 1988

	1965	1970	1988	% CHANGE '70 - '88
<i>TSAVO EAST (N)</i>				
18	503		17	
19	320		10	
20	277		22	
21	6		88	
22	430		25	
23	11		195	
26	0		0	
27	0		171	
<i>SUB-TOTAL</i>	1547		528	
<i>TSAVO EAST (S)</i>				
13	0	1000	573	-43%
14	127	4	158	3850%
15	40	1	9	800%
16	639	1000	35	-97%
17	653	800	309	-61%
<i>SUB-TOTAL</i>	1459	2805	1084	-61%
<i>TSAVO WEST</i>				
3	180	782	54	-93%
4	443	533	947	78%
5	385	1082	828	-23%
6	117	570	256	-55%
6	566	357	49	-86%
7A	0	4	5	25%
8	0	0	0	
9B	0	510	140	-73%
10B	0			
<i>SUB-TOTAL</i>	1691	3838	2279	-41%
TOTAL PARK (SOUTH ONLY)				
	3150	6643	3363	-49%
<i>TAITA</i>				
7B	0		70	
9A	0		513	
10A	0		20	
11	0		49	
11	0		0	
12A	590		367	
12B	590		1019	
<i>SUB-TOTAL</i>				
<i>REMAINDER</i>				
1	60		0	
2	679		38	
24	2		0	
25	0		0	
25	741		38	
<i>SUB-TOTAL</i>				
<i>GALANA</i>	2000	2732	667	-76%
<i>MKOMAZI</i>		115	245	113%
TOTAL ECOSYSTEM - 1988 -				
			5860	

Distribution Showing
Numbers of Elephants
(Census Carried out in April 1969)



PEOPLE WHO MADE THE COUNT POSSIBLE

We are grateful to H.E. President Daniel Arap Moi and his Government for the atmosphere of peace and stability prevailing in the country which allowed a count such as this one to take place. There are few places in Africa where eleven pilots and aeroplanes, and fifty personnel supported by the Government, institutions, industry and individuals can cooperate to make such a major endeavor at such short notice. Many donors contributed generously in cash and in kind, and are gratefully acknowledged in the front of the report. The work of individuals was equally significant and we are specially grateful to the following people.

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