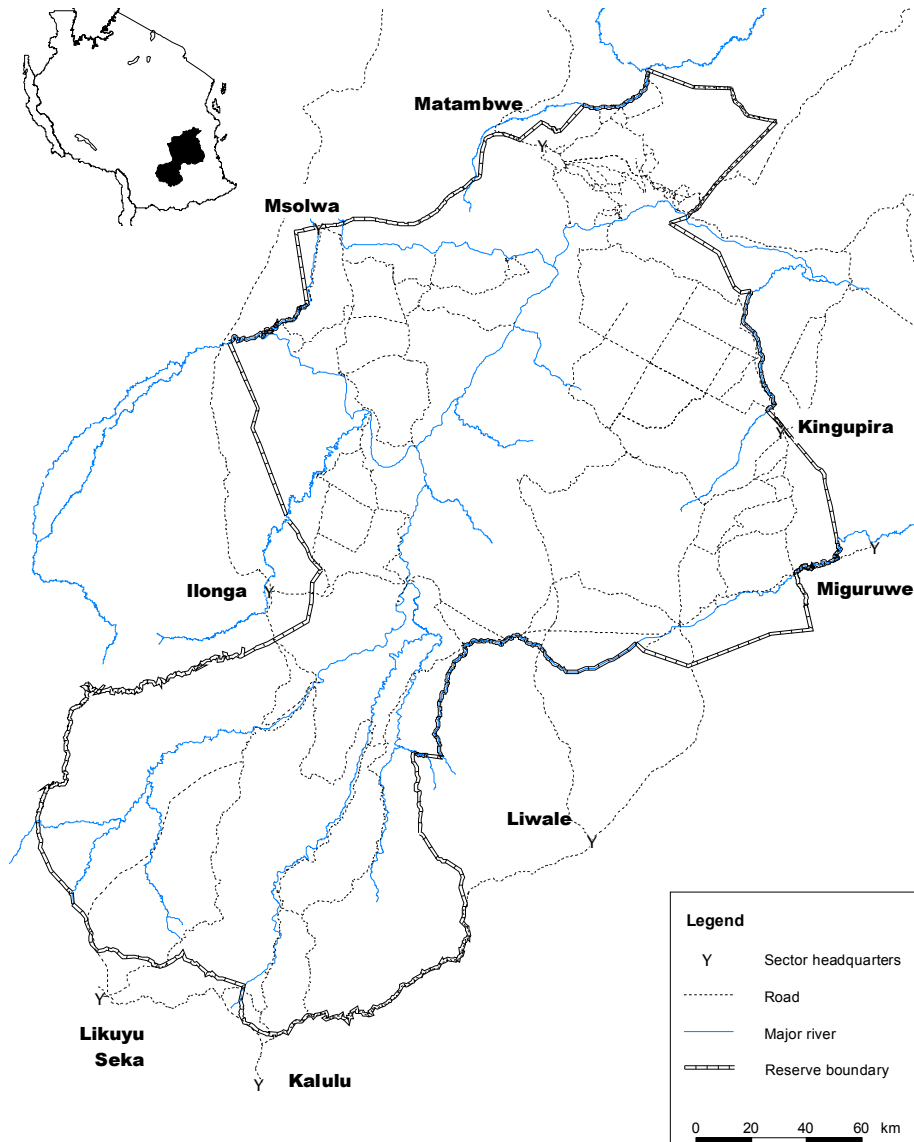


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Ludwig Siege, Rolf D. Baldus (Eds.)

**From Decline to Recovery
The Elephants of the Selous**



**Deutsche Gesellschaft für Technische Zusammenarbeit
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From Decline to Recovery: the Elephants of the Selous

by Dr. Ludwig Siege

The Selous:

With about 50,000 square km or 6% of Tanzania's land surface, the Selous Game Reserve (SGR) is the largest protected area in the World. Nowadays a "World Heritage Site", the Selous was founded primarily as an Elephant Reserve.

Other protected areas on the Selous periphery, such as Mikumi and Udzungwa National Parks, and Kilombero Game Controlled Area, conserve other habitats not represented in SGR itself, and add a further 10,440 sq.km to the area under protection. Numerous village Wildlife Management Areas are in the process of being established in 7 Districts around the Reserve. The adjacent areas of low population density contribute an additional 40,000 to 50,000 sq.km to the ecosystem.

There is evidence that elephants migrate to and from Northern Mozambique through corridors in Songea and Tunduru Districts.

Much of what is uninhabited Game Reserve now was populated in the past. Large tracts of the Selous did not contain important numbers of elephants. Areas like Madaba in the center of the Selous, which are now strongholds of elephants, were important villages up to the middle of the century. Political events like the MajiMaji uprising in 1905, resettlements to combat sleeping sickness and later the Ujamaa villagisation policy contributed to the depopulation of the area. The ranges for wildlife in the Selous ecosystem have actually increased over this period, so that the elephants now roam over an area larger than 100,000 sqkm.

Recent developments:

With the consolidation of the Reserve after 1950 elephant numbers began to increase, culminating in a figure of more than 110,000 in the first overall aerial survey of the Selous ecosystem in 1976. At that time, commercial ivory poaching was already on the increase. The next count in 1986 revealed a huge drop to 55,000 animals, and in 1989 the numbers had gone down even further to around 30,000. Large scale commercial poaching was rampant during much of the 1980's, reaching its peak between 1986 and 1989. The administration was starved for funds and antipoaching efforts were largely unsuccessful.

In 1986 the desperate situation of the Selous elephants was becoming clear, and the Government of Tanzania took first steps to come to grips with the deteriorating situation. Internal ivory trade was banned. A study to propose ways to rehabilitate the reserve was carried out, an aerial census conducted and the international community was approached for assistance. Germany - together with WWF, AWF and FZS - reacted in 1987 and extended its bilateral development cooperation to the reserve.

The Selous Conservation Programme (SCP), a joint activity of the Tanzanian and German Governments has since then supported the reserve administration itself and aims at reducing the conflicts between the reserve and the local population by implementing Village Wildlife Management in the buffer zones bordering the reserve.

In 1989, Tanzania had responded to the poaching situation by carrying out "Operation Uhai", an antipoaching campaign supported by army and police. Tanzania was also in the forefront to facilitate the ivory trade ban at the CITES-Conference of Parties in 1989.

A Management Plan was developed for the Selous and since 1992 the situation of the administration of the Reserve was improved through a retention scheme, which allows the Selous to keep app. 50% of the tourist and hunting revenues. Presently around 1,8 Mil. US\$ per year are retained for management.

The surveys:

Since 1976 aerial surveys of the Selous have been carried out. The surveys have all used the Systematic Reconnaissance Flight Method of Norton-Griffiths, but covered varying census zones. Since 1986, the coverage has become more consistent, even though the total area surveyed was enlarged to cover new Wildlife Management Areas under the SCP.

In Annex 1 the results of the different surveys are shown in form of a table.

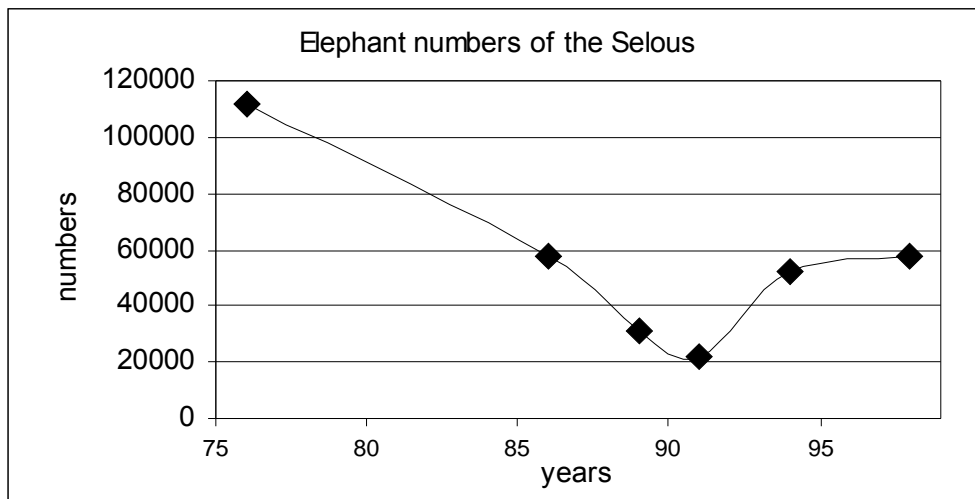
The first survey, carried out in 1976, was never fully processed and there is no comprehensive report available on its results. The important findings are, however, referred to in the censuses of 1981 and 1986.

In 1979 a wildlife census of the Rufiji River Basin was carried out in the course of the planning of the Stiegler's Gorge Dam Project, which, fortunately for the Selous, was discontinued in the early 1980ies. It covered around 6,900 sq.km and is of limited value here, as it merely confirmed the trends established in the more comprehensive surveys of 1976 and 1981.

The survey of 1981 covered around 35 % of the total census zone. Its figures were extrapolated where possible and are shown in the table.

The censuses of 1986, 1989, 1991, 1994, and 1998 are more consistent as to the area covered, density of transects, sample size, observer experience.

The graph below illustrates the development of the elephant numbers in the entire Selous zone.



Interpretation:

The graph shows the fluctuation of the population in the last 22 years. It shows the effect of the heavy poaching in the 1980ies, but it also shows that the interventions of the Government came right in time to save the Selous elephants.

The good survival of elephants in the 1960s and 1970s had allowed a healthy population of bulls and older cows to develop. This was killed off largely by poachers during the 1980s. The number of carcasses found increased steadily, while the elephant numbers declined. The census reports of the 1980ies contain appeals to the authorities to take serious measures to stop the massacre.

While some of the mature bulls of that period still existed, the majority was gone by 1989. The same, albeit to a lesser extent, applies to the older cows and by the end of the 1980ies the Selous elephant population had returned to the highly disturbed state in which it was found when anti poaching operations began in earnest about 1956.

Since 1989, which could be seen as the turning point for the fate of the Selous elephants, the populations have increased by an average of around 6,5%. (Regression analysis of elephant numbers since 1989 shows an increase of 6,44 % p. a).

These figures, however, do not indicate the shape the elephant herds are in. Age structure and sex ratio cannot be determined on systematic reconnaissance flights.

Observations on the ground show that the elephant herds are breeding very well. The herds, which in the Selous are rarely larger than 30 animals, have almost always many young ones of different

age with them. They are now relaxed and far from the disturbed state they were in 1990, when the poaching was brought to a halt. Older animals, however, seem to be underrepresented.

Poaching and elephant carcasses:

The 1994 and 1998 survey results suggest a healthy breeding population in the Selous area with little human interference. The very low number of elephant carcasses (59 and 62, all outside the reserve) found during the surveys supports this. The carcass ratio, the main indicator for elephant poaching in an aerial survey, is close to nil now for some years. This proves that the antipoaching activities have largely been successful.

Mortality seems to be even lower than one would have expected from natural causes alone in a population with a normal age structure. The probable reason for this is that the poaching in the 1980ies has removed many of the old animals, so that the natural die-off from old age is significantly lower than in a population with a normal age structure.

There are presently only few signs of elephant poaching in the Reserve, but more poaching incidents have been reported from outside.

The poaching levels since 1995 are shown in Annex 2.

There is an increase of poaching since 1997, but still on a low level. The Selous management is able to target these incidences specifically and investigations have in several cases led to prosecution of the perpetrators.

The poaching incidences are concentrated largely in the North-Eastern part of the Selous and special measures have been taken to fight this outbreak.

How the surveys are conducted:

All surveys carried out so far were sample surveys and fixed wing aircraft have been used. In a sample survey, a certain percentage of the total area, usually 4 to 5 percent is counted, and the results are subjected to statistical analysis and projected to the total area.

The results of aerial surveys need careful interpretation to avoid misleading conclusions. This is all the more important in the Selous because of its vastness, dense vegetation and resulting from this, lack of other survey data, with which the aerial survey results could be compared.

No allowance has been made in any of the surveys for the various undercounting biases of fixed wing aircraft sample counts, which would have been of particular importance under Miombo woodland conditions as encountered in large parts of the SGR and its bufferzones. Visibility there is very much impeded and animals tend to hide especially during day time hours when flights are usually carried out. Transects are flown at high speed and there is usually a substantial observer bias leading to underestimation of animal numbers.

It has been proven that - apart from the density of the vegetation, which might hide animals totally - the main determining factor for the accuracy of an aerial survey is the contrast of colour between the animal surveyed and its background, which is made up by soils and vegetation. The surveys of the Selous distinguish only between dry and wet season counts and make no specific reference to the particular conditions of the vegetation cover at the time of the counts.

Scientists assume a conversion factor of 1.11 for elephants under similar conditions (Norton-Griffiths for the Ruaha, quoted from Selous Census 1981). This means that the Selous ecosystem now probably contains over 60,000 elephants. There is also evidence of elephants moving to and from Mozambique and projects are under preparation to establish the movements and to introduce management in the corridors.

The steep rise of the elephant figures between 1989 and 1998 cannot be explained by the natural increase of the population alone. The growth rate of 6.5% is close to the maximum natural increase of elephant populations under optimal conditions as per Clef's population model (Clef, 1988).

The most probable explanation is, apart from the natural recruitment, that after poaching was brought to a stop, elephants became more relaxed and dared to stay in the open again during daytime. This made them more visible from the air. As aerial survey flights are normally carried out between 8⁰⁰ and 12⁰⁰ hrs and in the early afternoon, it is believed that in the 1986 and 1989 counts many animals were hiding in thickets and thus were overlooked from the air. This means that the actual elephant figures in these years were probably higher than the counts were showing.

The figures indicate that the natural growth of the elephant populations in the nineties was obviously not hampered by the lack of old bulls, which were naturally the main target of the poachers, as they were bearing the large ivory.

This contradicts statements from some elephant experts, who claim that old bulls are indispensable for the reproduction. It seems that elephant cows readily accept younger bulls for breeding when old ones are not available.

The crop protection issue:

Elephant ranges are nowadays increasingly hemmed in by human populations and form "islands", in contrast to former times, where the settlements were islands surrounded by elephants and other wild animals.

The Selous is in a better situation as compared to other protected areas, because the human population density in the ecosystem is still quite low, but even around the Selous elephants do great damage to crops during the rainy season and can destroy the livelihood of many families in one night.

The Tanzanian Government policy is to destruct crop-raiding elephants only as the ultima ratio. Shooting crop raiding elephants is now actively discouraged around the Selous. Non-lethal crop protection measures have been tested near the boundary of SGR at Kingupira in a pilot programme (flares, blank cartridges). Even though the elephants run, when the flares and blanks are fired, the long term effects of these measures are not yet clear. Villages claim frequently that animals driven away from fields by using flares and blanks learn that there is no danger for them and that they return to the fields before long. It seems that a certain amount of crop protection shooting is unavoidable to prevent loss of life and high level crop damage.

To involve the local people in the management of the wildlife on their land Community Based Conservation (CBC) programmes have been put in place in communities around the Selous in accordance with the Wildlife Policy of the Tanzanian Government.

Before, subsistence cultivators gained no legal benefit from wildlife although they could derive great benefits from the illegal killing of game for meat and other products. Elephants had provided some with an illegal income from ivory in the 1970ies and 80ies, but this opportunity has now greatly declined.

These programmes are based on the assumption that the local populations around the Selous will protect the elephant and its environment only, when the elephants contribute to the well being of the people there, through tourism, but also through sustainable meat hunting, resident- and safari hunting.

Annex 2 shows that the incidences of elephant poaching are concentrated in areas, where CBC-programmes have not been introduced. The North-West of the Selous is not covered with a community programme under the SCP and elephant poaching is highest there, whereas in Liwale and in the South of the Selous only very few poaching incidences have been recorded. The West (Ilonga, Msolva) is also not part of the scheme and 5 poached elephants have been found there in 1999. Under an AfDB-financed programme the western areas will in future be included into the CBC-programme.

The elephant population trends of the Selous ecosystem make it easy to predict that conflicts between humans and elephants will increase in the future. Human populations increase, as do the elephants. With the elephants less harassed by poachers, crop damage and damage of human life increases. It is hoped that the stronger involvement of the communities in conservation on their land will lead to a higher level of tolerance, as far as elephants are concerned. Elephants can only exist in proximity to humans where they are tolerated. This tolerance is stretched beyond its limits when cultivation is destroyed or human life is lost. CBC is certainly not the panacea for the survival of the elephants in the proximity of men, but it leads to higher tolerance of wild animals by the villagers and thus to less calls for the destruction of marauding elephants.

Annex 1:

Compilation of Elephant Numbers of the Different Surveys carried out in the Selous:

Census year/month	1976 dry & wet	1981 April wet^{1,2}	1986 Oct.	1989 Sept.	1991²June wet	1994 Sept.	1998 Oct.
Selous Game Reserve							
Selous Game Reserve (sq.km)	43,000	43,000	43,000	42,822	41,991	43,626	43,378
population in SGR	82,628	63,550	42,841	24,548	12,262	31,743	41,670
density SGR ³	1.83	1.292	1.00	0.499	0.249	0.646	0.961
95% confidence limit SGR	n/a	n/a	40.0	28.5	26.0	28.9	32.8
carcasses SGR	3,305	n/a	8,143	5,326	0	0	0
carcass ratio SGR in %	4.0	n/a	19.0	21.6	0	0	0
Entire Survey Area							
Entire Survey Area (sq.km)	81,975	19,550	85,125	78,648	78,551	91,366	98,725
population ESA	111,649	85,504	57,719	30,889	22,208	52,234	55,672
density ESA	1.362	1.155	0.678	0.392	0.283	0.572	0.564
95% confidence limit ESA	n/a	12.0	20.0	23.4	15.9	20.5	27.1
carcasses ESA	7,842	9,881 ³	12,040	6,742	0	59	62
carcass ratio ESA in %	6.9	11.6	20.8	21.8	0	0.001	0.001
Selous Census Zone							
Selous Census Zone (sq.km) ⁵	74,000	74,000	85,125	73,947	72,658	75,443	68,151
population SCZ	109,419	85,504	57,719	29,597	20,290	47,860	47,171
density SCZ	1.479	1.155	0.678	0.400	0.279	0.634	0.692
95% confidence limit SCZ	17.0	12.0	29.5	28.3	22.4	20.3	28.5
carcasses SCZ	6,493	9,881	12,040	6,669	0	59	62
carcass ratio SCZ in %	5,9	11.6	20.8	22.5	0	0.001	0.001
outside SGR							
area outside SGR	38,975	n/a	42,125	35,826	36,560	47,740	55,347
population outside SGR	30,941	21,954	14,878	6,341	9,824	20,491	7,655
density outside SGR	0.794	n/a	0.353	0.177	0.269	0.429	0.138
carcasses outside SGR	3,404	n/a	2,829	1,416	0	59	62
carcass ratio outside SGR in %	11.0	n/a	19.0	22.3	0	0.003	0.008

1. The 1981 census covered only 35% of the Selous area. The figures given here are extrapolated. Data on carcasses are from the dry season.

2. Wet season data are only of limited value here, as they are not comparable with the dry season ones due to different visibility conditions.

3. *The size of the SGR is given at 50,000 sq.km in the Wildlife Conservation Act. In the censuses, however, different estimates have been used. The figures given here are based on the newest GIS-based estimate of 49,200 sq.km.*
4. *SCZ has been defined differently over the years for unknown reasons .Thus results are difficult to compare.*

Annex 2: Elephant poaching figures in Selous Eco System 1995 to 2000

Elephants found dead in the Selous and surrounding areas (1995 - 2000)															
Poaching							Natural Death								
Poached Elephants inside Selous Game Reserve							Dead Elephants inside Selous Game Reserve								
Sector	95	96	97	98	99	2000	total	Sector	95	96	97	98	99	2000	total
Matambwe	1	1	2	1	2	0	7	Matambwe	1	0	0	0	2	0	3
Kingupira	0	0	0	5	9	2	16	Kingupira	0	0	0	0	4	0	4
Liwale	0	0	0	0	0	0	0	Liwale	0	0	0	0	0	0	0
Kalulu	0	0	0	0	2	0	2	Kalulu	0	0	0	0	0	0	0
Likuyu	0	0	0	0	0	0	0	Likuyu	0	0	0	0	0	0	0
Ilonga	0	1	0	0	0	0	1	Ilonga	0	0	0	1	0	0	1
Msolwa	0	0	0	0	0	1	1	Msolwa	0	0	0	0	0	1	1
total	1	2	2	6	13	3	27	total	1	0	0	1	6	1	9
Poached Elephants outside Selous Game Reserve							Dead Elephants outside Selous Game Reserve								
Sector	95	96	97	98	99	2000	total	Sector	95	96	97	98	99	2000	total
Matambwe	1	0	0	0	2	1	4	Matambwe	0	0	0	0	1	0	1
Kingupira	0	1	1	3	1	0	6	Kingupira	0	0	0	0	0	0	0
Liwale	1	1	0	0	0	0	2	Liwale	0	0	0	0	0	0	0
Kalulu	0	0	0	0	0	0	0	Kalulu	0	0	0	0	0	0	0
Likuyu	0	0	0	1	1	0	2	Likuyu	0	0	1	1	0	0	2
Ilonga	1	0	0	1	4	0	6	Ilonga	0	0	0	0	0	0	0
Msolwa	0	0	1		1	0	2	Msolwa	0	0	0	0	0	0	0
total	3	2	2	5	9	1	22	total	0	0	1	1	1	0	3
Poached Elephants total							Dead Elephants total								
Sector	95	96	97	98	99	2000	total	Sector	95	96	97	98	99	2000	total
Matambwe	2	1	2	1	4	1	11	Matambwe	1	0	0	0	3	0	4
Kingupira	0	1	1	8	10	2	22	Kingupira	0	0	0	0	4	0	4
Liwale	1	1	0	0	0	0	2	Liwale	0	0	0	0	0	0	0
Kalulu	0	0	0	0	2	0	2	Kalulu	0	0	0	0	0	0	0
Likuyu	0	0	0	1	1	0	2	Likuyu	0	0	1	1	0	0	2
Ilonga	1	1	0	1	4	0	7	Ilonga	0	0	0	1	0	0	1
Msolwa	0	0	1	0	1	1	3	Msolwa	0	0	0	0	0	1	1
total	4	4	4	11	22	4	49	total	1	0	1	2	7	1	12

Source: Selous Game Reserve Monitoring Section

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