

## Status and past and present distribution of elephants in the Kaokoveld, South West Africa/Namibia

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The status and the past and present distribution of elephants (*Loxodonta africana*) in the Kaokoveld are examined. The elephants of the Kaokoveld are divided into a western and eastern 'resident' population with a transitional population in between. In 1983, 357 individual elephants were identified with 70 in the western desert-dwelling population, 207 in the eastern population and 80 in the transitional population. A distinction is made between permanent distribution and occasional wanderings. The available records indicate that elephants were present in the northern Namib Desert long before the advent of western man. From the present data it is also clear that man had little or no influence on the occupation of the western areas by elephants, but since 1880 man has caused a decline in elephant distribution and numbers. Currently the elephant's status there seems relatively stable following intensified law enforcement. However, with the small population sizes, the situation remains vulnerable.

Die status, en huidige en voormalige verspreiding van die olifante (*Loxodonta africana*) in die Kaokoveld word bespreek. Die olifante word basies in 'n oostelike en westelike bevolking verdeel, met 'n derde oorgangsbevolking tussenin. Gedurende 1983 is 357 olifante in die Kaokoveld geïdentifiseer met 70 in die westelike bevolking, 207 in die oostelike en 'n verdere 80 in die oorgangsbevolking. In hierdie studie word 'n onderskeid tussen permanente besetting en ongereelde swerftogte getref. Beskikbare rekords dui daarop dat olifante in die noordelike Namibwoestyn teenwoordig was voor die koms van blankes in die gebied. Uit die huidige navorsing is dit ook duidelik dat die mens min of geen invloed op die westelike besetting van die olifante gehad het nie. Sedert 1880 was daar 'n drastiese afname in die olifantgetalle. Op die oomblik is die bevolkings egter relatief stabiel na 'n verskerping in wetstoepassing, maar met die klein bevolkings bly die olifante se toekoms in die weegskaal.

The study of the distribution of a species is often an integral part of the study of its ecology, and a knowledge of historical changes in distribution is a prerequisite for species conservation programmes. This paper examines the past and present distribution and status of all elephants (*Loxodonta africana*) in the Kaokoveld (Kaokoland, Damaraland and the Skeleton Coast Park). Emphasis is placed on the desert-dwelling elephants that occupy the northern Namib Desert region west of the 150 mm isohyet (Figure 1) in the Kaokoveld.

A primary aim of the initial study was to discover trends in population density and distribution of, and to examine the hypothesis that the occupation of the Namib Desert by elephant is a recent phenomenon induced by human disturbance and pressure during the last 20 years (Schoeman 1982, 1984). Secondly, it was to provide information for the elucidation of habitat requirements, movements, dispersion and relationships with other elephant populations.

### Study area

The Kaokoveld as here defined (Between 11° 45' and 14° 35' E / 17° 00' and 22° 40' S), encompasses Kaokoland, Damaraland and the Skeleton Coast Park, and is situated in the north-western corner of South West Africa. Covering approximately eleven million hectares, the Kaokoveld is desert to semi-desert with a mean annual rainfall of 19 mm in the west to 350 mm in the east. It is divided into five bioclimatic zones (Figure 1),

based on the isohyets and vegetation, according to the division of Loxton, Hunting and Associates (1974a, 1974b).

The vegetation ranges from a *Colophospermum mopane* savanna in the east to a sparsely vegetated desert in the west with only isolated and arid adapted plants, mainly restricted to the dry watercourses. Topographically the area can be described as mainly mountainous, intersected by large broken valleys with sandy, gravel or stony plains predominantly in the west. The drainage is well defined with dry river courses draining mainly from east to west. For the location of place names mentioned in the text, refer to Figure 2.

### Methods

The past distribution of elephants in the Kaokoveld was based on published works, journals of travel, hunting, geological and historical reports, newspaper cuttings, rock engravings and place names. An attempt was made to study all published material of travellers to the region, but in most cases only incidental information of this nature was available.

Information on the recent distribution and status of the elephants was obtained during two study periods; the first of two-and-a-half years between 1975 and 1978 (Viljoen 1980) and the second of three years between 1980 and 1983. Data accumulation involved travelling some 130 000 km by vehicle, 370 h of aerial surveys and uncounted kilometres on foot. Direct sightings of ele-



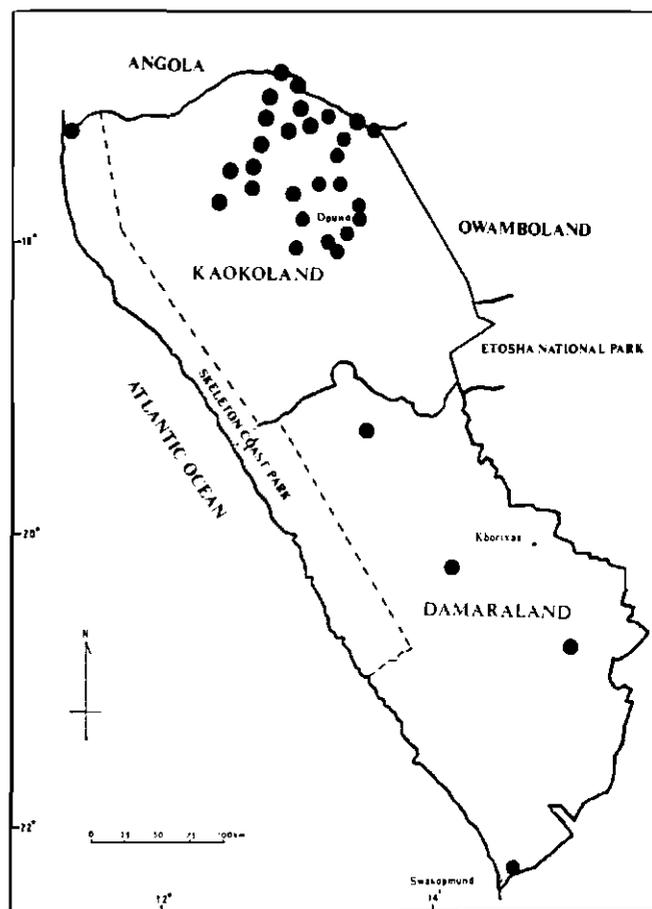
according to a newspaper report (in Vedder 1937), an expedition was undertaken by the Governor of Mossamedes to the Kunene Mouth. They could travel only a short way (about 3 km) up the Kunene River because of the rocky terrain. The Governor reported that 'Game, especially elephants were seen in great numbers'. After the expedition many elephant-hunting trips were undertaken to the Kunene Mouth.

In 1861 Andersson (1861) reported elephants at a waterhole in the Omaruru River. The first reliable record of elephants actually occurring in the northern Namib Desert, however, came from Hartmann (1897, 1902) during his epic journey through the Kaokoveld. Hartmann reported seeing herds of elephant, giraffe, impala and rhinoceroses in the Marienfluss. Also on a journey from the Nadas Waterhole (Okau) to the Kunene River, they encountered much game, including elephants.

Most of the information on elephant distribution in eastern Kaokoveld before 1900 came from the Dorslandtrekkers who hunted elephants in that area from 1880 to 1908 (Von Moltke 1945). Their hunting covered a large part of the Kaokoveld, of which they obtained first-hand knowledge, and they were also the first who quoted elephant numbers. The accuracy of the numbers is, however, doubtful as the hunting area covered was much larger than the present-day Kaokoveld and was, in most cases, based on hearsay or on a memory span of 45 years (Von Moltke 1945). In the numbers and dates quoted, there are many conflicting statements. For example a certain D.J.Robbertse stated (in Von Moltke 1945) that 2 000 elephants were hunted in the Kaokoveld between 1880 and 1908. At a later stage he mentioned that he only joined the hunting in 1894 and that they shot between 50 and 182 (page 150) or 130 to 160 elephants (page 273) a year. From his description it was also clear that these figures include all elephants that were shot in Angola and Ovamboland. Robbertse remarked that they had shot only bulls and that there still must have been thousands of elephants left in the Kaokoveld (in 1945).

An interesting observation was made by F.Robbertse who apparently counted 3 000 elephants in 8 herds in a valley west of Okorosave. He is quoted by D.J. Robbertse 45 years later and confirmed by J.H. Robbertse (Von Moltke 1945). The number of elephants must have been an overestimate, as it is well-known how difficult it is to count elephants accurately in bushy country and also the valley in question would be hard put to harbour 3000 elephants. Whatever the case, the Dorslandtrekkers knew the Kaokoveld better than anybody else at that time and their locality descriptions are regarded as accurate even if their numbers of elephants seen and shot are questioned.

The elephant records reported for the Kaokoveld prior to 1900 are summarized in Figure 3. It would appear that elephants were widely distributed over the whole of the eastern Kaokoveld and probably in the northern Namib Desert as well. How many elephants there actually were, will never be known, but the mere fact that the Dorslandtrekkers hunted there for 28 years with practically no restrictions indicates that there must



**Figure 3** Definite records of elephant distribution in the Kaokoveld before 1900. Compiled from available literature (see text) together with on-site rock engravings of elephant.

have been a large viable population. Of the 2 000 elephants claimed to have been shot by the Dorslandtrekkers a large percentage must have been shot in the Kaokoveld. An original total population of between 2 500 and 3 500 elephants is estimated as a base to enable the above-mentioned hunting pressure. The estimation is based on the mean number of elephants shot per year (2 000 divided by 28 years) and the yearly calving increment of 2,7% for Kaokoland (Viljoen 1980). Population growth rate is unknown and was probably negative if Shortridge's (1934) estimate of 1 000 elephants in the Kaokoveld, 34 years later, is taken into account.

#### Distribution and status between 1901 and 1960

Accounts of elephant distribution and numbers between 1900 and 1960 were still mostly based on short trips to the region. There were many reliable reports although nobody made a complete survey and large tracts of land remained unexplored. Whereas most narratives dealt with the east of the Kaokoveld, more and more travellers also moved into the west (Woods 1946; Lundholme 1951; Green 1952), reporting elephants throughout their travel routes. Again information is mostly available from incidental reports only. Where reports dealt specifically with the fauna of the Kaokoveld, many of them were

based on hearsay. For example, Shortridge (1934) stated that elephants 'were widespread except along the coast', yet his travel routes show that he visited only the east of the Kaokoveld far from the coast.

The most comprehensive and reliable source of information on elephant distribution in the west is that of Woods (1946, 1949, 1956 in Green 1952) who surveyed large areas on foot. He reported elephants from Otjimbingai, Okumutati, the Munutum River, near Angra Fria on the coast, Sanitatas, the Hoarusib River all the way to Purros, Orupembe and in the Ondondojango Valley in the west. Other western observations were those of Lundholme (1951), Green (1952) and Anon (1952) during the Carp expedition in 1951. All reported elephants from Orupembe, Sanitatas and Okumutati and stated that spoor or droppings were seen over the entire region from the Kunene River to the Ugab River. March (1944) encountered elephants at the Gomatum River and at Purros.

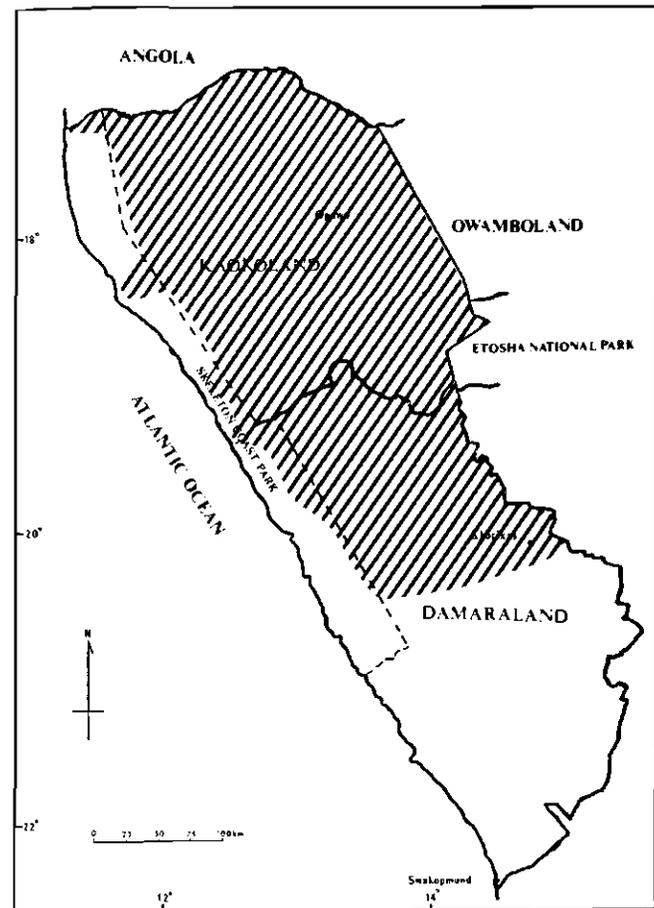
In the east it emerged that elephants were widespread over virtually the whole Kaokoveld with the possible exception of the area south of the Ugab River. This information was compiled using the observations of Baynes (1923), Maydon (1932), Krenz (1933), Shortridge (1934), Fischer (1936), Wellington (1938), March (1944), Woods (1946, 1949 and 1956, in Green 1952), Green (1952), Heck (1956), Minnaar (1957), Bigalke (1958) and De Villiers (1981). This information is represented in Figure 4.

There was a great difference of opinion regarding the status of these elephants and estimates range from 250 to 20 000 (Manning 1923, in Shortridge 1934). In between there were the assessments by Oorlog, an Ovahimba chief in the region, who estimated 500 elephants, Steinhart with 1 200 to 1 500 (in Shortridge 1934), Shortridge (1934) with 600 to 1 000, Schoeman with 1 200 to 1 500 (in Green 1952), P. Robbertse with 10 000, Woods with 600 (both in Green 1952) and Bigalke (1958) with 800. From studying the travel routes and time spent in the region by the various authors, it is clear that most of the above-mentioned figures must have been guesswork. Another problem was that the boundaries of what was then known as the Kaokoveld were not clearly defined and some estimates, probably those by Oorlog and Woods only include the present-day Kaokoland, while others such as Shortridge's included the whole of Kaokoland, Damaraland and parts of the Outjo district. However, in the light of more recent surveys (Le Roux 1978; Viljoen 1980) it is concluded that there may have been anything between 600 and 1 000 elephants residing in the Kaokoveld by 1960.

Woods (in Green 1952) was the first to distinguish between elephant groups and he counted 100 elephants in the Hoarusib River near Purros which he regarded as being most of the 'Namib elephants'. According to available records of Woods's travel routes (Woods 1946, 1949, 1956), this probably only refers to elephants residing in the present-day Kaokoland.

#### Distribution and status between 1961 and 1980

Reports for this era were the first to be based on actual



**Figure 4** Distribution of elephants in the Kaokoveld between 1900 and 1960 (see text).

counts during ground as well as aerial surveys. Some reports, however, must still have been guesswork, such as that of Odendaal (1964) who reported a total of 3 000 elephants with no sustaining surveys or references. Another problem is that most of the surveys were concentrated in the Kaokoland region (north of the Hoanib River) of the Kaokoveld and little information is available for the Damaraland region up to 1975.

In 1968 the first aerial survey was conducted by the then Department of Nature Conservation and Tourism, S.W.A. in which 211 elephants were counted in the Kaokoland region (Joubert 1972). In 1969, during another aerial survey, 279 elephants were counted of which 145 were seen in the west of Kaokoland, 86 in the northern drainage basin at Omuhonga and 52 in the eastern regions (Joubert 1972; De Villiers 1975). Unfortunately some confusion exists about the latter figures because different numbers are quoted in different reports concerning the same aerial survey (Joubert 1972; De Villiers 1975). As both the 1968 and 1969 surveys were less than 15 h in duration it has to be concluded that they could only have been attempts at total counts in parts of the Kaokoland (total area is 4,9 million hectares) and that the actual numbers of elephants in Kaokoland at that time were much larger.

The latter statement is supported by a study by Owen-Smith (1970) who spent two-and-a-half years as

agricultural officer in the Kaokoland region. Owen-Smith estimated the elephant population in 1970 to be between 700 and 800 of which 200 occurred in the eastern sandveld, 100 to 160 in the northern drainage basin, 200 to 300 in the sub-desert region and the rest in the Beesvlakte and the mountains south of Sesfontein. Owen-Smith's (1970) detailed information on the 1970 distribution of elephants in the Kaokoveld is presented in Figure 5.

In February 1975 another aerial survey, which included both Kaokoland and Damaraland, was conducted by the Department of Development and Co-operation. According to De Villiers (1975) 260 elephants were counted of which 190 occurred in Kaokoland and 70 in Damaraland. In the east 123 were counted with 91 in the Beesvlakte and 32 at Omumborombonga. In the western regions 137 were counted with 33 on the plains south of Sesfontein, five in the Hoanib River, 13 in the Hartmann Valley and 86 in a valley east of Sanitatas. The total duration of this survey was less than 25 h and large tracts, such as the eastern sandveld were not included in the survey, whereas single transects only, were flown in others. This survey can also only be regarded as a partial count yielding a minimum figure for the elephant populations.

Joubert & Mostert (1975), in their report on the distribution and status of mammals in S.W.A., stated

that there were approximately 200 elephants residing in Kaokoland with another 100 to 150 in Damaraland. These numbers are probably based on the results of the previous aerial surveys (Joubert 1972; De Villiers 1975).

Between 1975 and 1977 a detailed long-term field study was undertaken to determine the distribution and status of the larger mammals in Kaokoland (Viljoen 1980, 1982a). Ground surveys were used in conjunction with three aerial surveys of 40, 25 and 25 h duration respectively. A total of 207 different elephants was counted with a possible estimated maximum of 250 in Kaokoland in 1977. This number varied seasonally because of movements of eastern elephants to and from Damaraland, Ovamboland, Angola and the Etosha National Park.

It was found that the elephants in Kaokoland consisted of three separate geographic groups and that no contact between these groups existed (Viljoen 1980). It seemed as if these three groups represented different populations, namely:

(i) The northern population in the Kunene drainage basin, which consisted of only eight cows and no bulls for at least three years (between 1975 and 1978). For all practical considerations this group was regarded as extinct.

(ii) The eastern population with a minimum of 134 elephants. There was a marked seasonal fluctuation in their numbers. The most westerly distribution of this population was the Kowarib Schlucht. Calves, less than one year old formed 2,7% of the population.

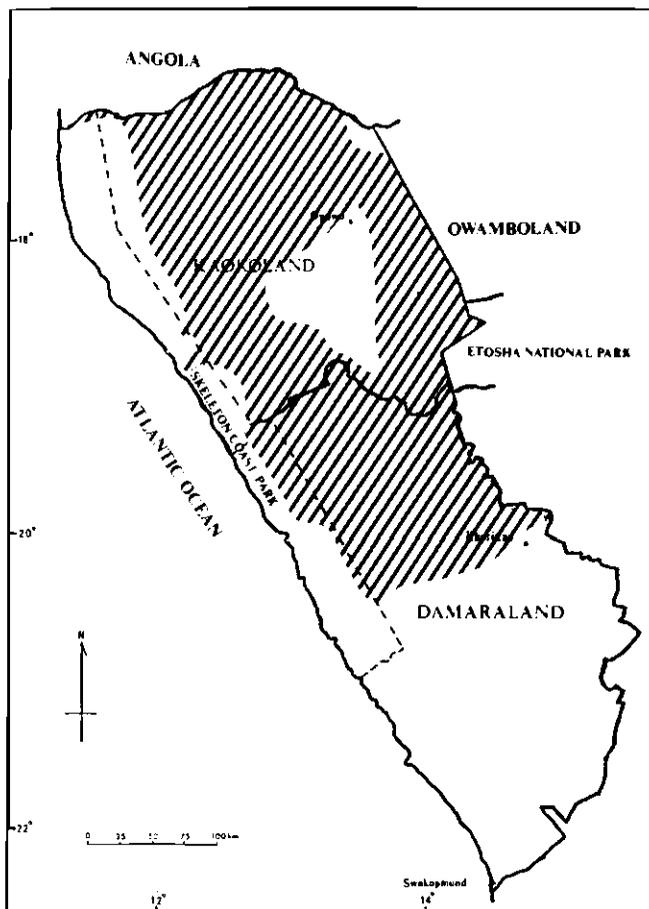
(iii) The western population, restricted to the area west of the 150 mm isohyet. During surveys (Viljoen 1980) a maximum of 65 elephants was counted in the Kaokoland region. No calf survived during the study period and this population had a negative growth as a result of hunting.

Unfortunately this study (Viljoen 1980) covered only the Kaokoland region but one aerial survey was conducted in Damaraland in 1977 (Visagie 1977) in which 82 elephants were counted of which 59 occurred in the western desert regions. As mentioned previously, a short-term survey such as the latter does not allow for conclusions and consideration of seasonal movements as borne out by the results of an aerial survey one year later in Damaraland in which 135 elephants were counted (Le Roux 1978). This latter survey is also assumed to be an undercount as the flight duration was only 10 h.

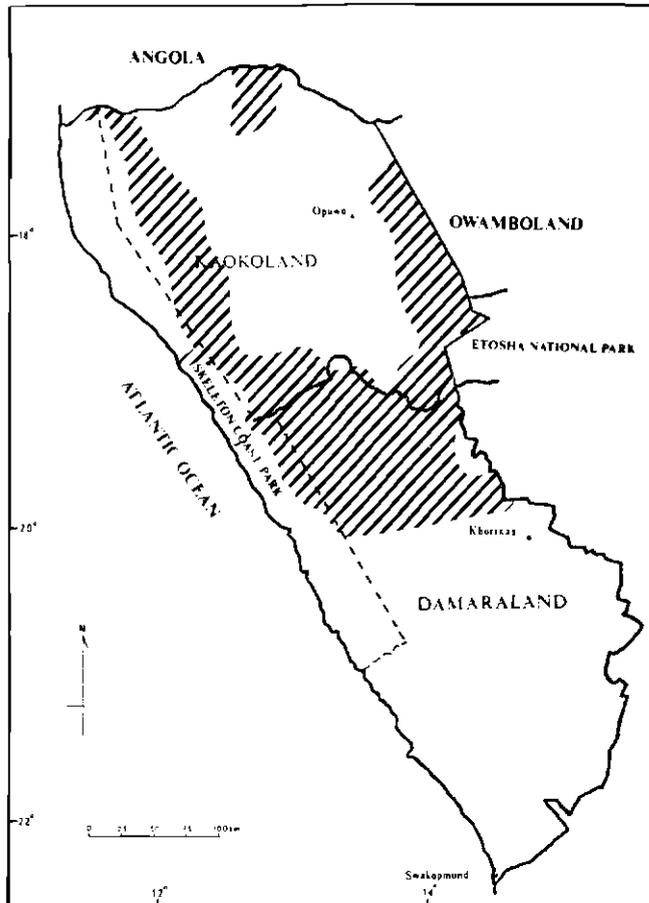
Figure 6 is a consolidation of the 1975–1977 study in Kaokoland (Viljoen 1980) and the aerial surveys of Visagie (1977) and Le Roux (1978) in Damaraland to represent the distribution of elephants in the Kaokoveld in 1977. A total population of 500 elephants in the Kaokoveld is suggested for this period using the information of Visagie (1977), Le Roux (1978) and Viljoen (1980). This number is supported by the findings of the present study in which 357 live elephants and 123 elephant carcasses were counted in 1983.

#### Distribution and status between 1981 and 1983

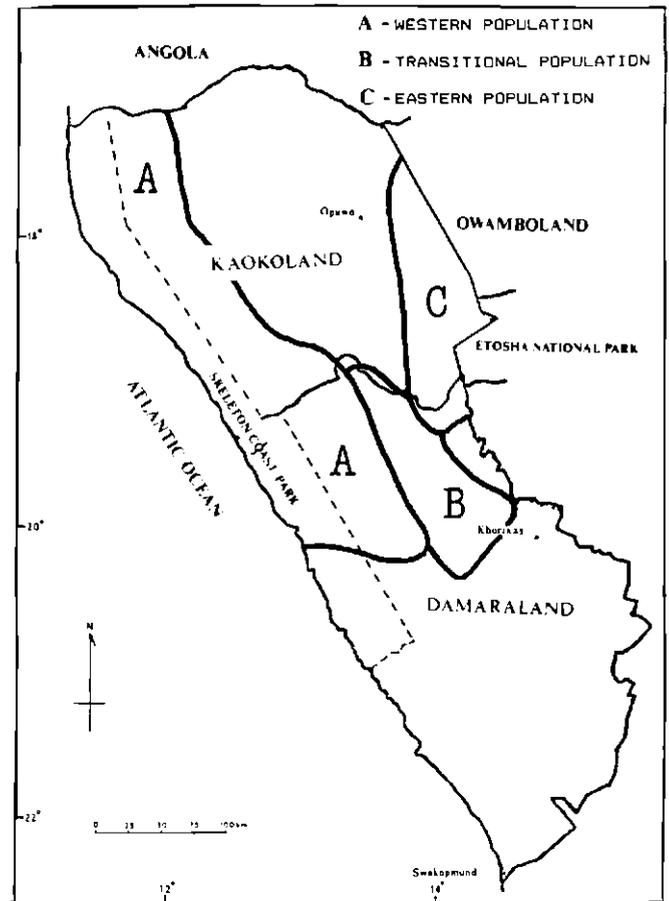
Ground surveys between 1980 and 1983 were supplemented by twelve 10-h aerial surveys, three 25-h



**Figure 5** Distribution of elephants in the Kaokoveld during 1970 (Owen-Smith 1970; Joubert & Mostert 1975).



**Figure 6** Distribution of elephants in the Kaokoveld during 1977 (Visagie 1977; Le Roux 1978; Viljoen 1980).



**Figure 7** Ranges of the three elephant populations (heavy solid lines) within the Kaokoveld.

aerial surveys and one 85-h overall total aerial count (Viljoen 1982b). A total of 357 individual elephants was counted. During the same period 123 elephant carcasses were found of which 107 showed positive signs of having been shot, nine died of unknown causes, five from the eastern population probably died as a result of the drought and in two cases the circumstances pointed to the elephants being chased to death by vehicle.

Viljoen (1980) found separate elephant populations in Kaokoland. Extended surveys during this study, which included Damaraland and the Skeleton Coast Park, confirmed these findings. Three areas of elephant occupation were found; one in the east of the Kaokoveld and one in the west with a third concentration in the south-east (Figure 7). In between there were areas of low or no elephant occupation. Such a situation can be brought about in two ways: either elephants are moving seasonally between a wet and dry season range, making little use of the areas between the ranges, or else separate populations exist in the Kaokoveld. Since no movement between the three centres of occupancy was detected during the study period it is concluded that the ranges represent three discrete elephant populations in the Kaokoveld.

These populations were identified as the eastern population, the western population and the transitional population. Each population had a definable geographic range and separate movement patterns. Also there is a

vast difference in the range of climate and habitat occupied by the recognized populations and therefore in the survival strategies of the three elephant populations. For example, the western elephants occupied a true desert, known as the northern Namib Desert, with an annual rainfall of less than 150 mm and a vegetation density of less than one shrub per hectare whereas the eastern elephants utilized a habitat with an annual rainfall of more than 250 mm and a maximum vegetation density of 2 085 trees and shrubs per hectare (Viljoen 1980). While no contact between the eastern and western populations was detected during the study period, there could have been possible genetic exchange via the transitional population. This latter population made infrequent contact with the eastern and western populations on the fringes of their distribution range.

The remnants of the northern population (Viljoen 1980), which might have been part of the eastern population, have since become extinct.

The distribution and status of each population is discussed below.

#### *The eastern elephant population*

This population inhabits the eastern regions of the Kaokoveld, bordered by Ombombo Owambo in the north, the Huab River in the south and in the west by the Joubert Mountain range extending down to the

Grootberg Mountain range. A total of 207 different elephants was counted in this region with a possible maximum of 250 depending on the season. There was a marked seasonal fluctuation in the population density as these elephants migrated freely to and from the Etosha National Park and Ovamboland and sometimes into the Outjo district. Movement patterns were generally north-west south-east orientated.

The highest concentration of 140 elephants occurred in the vicinity of Otuzemba in the eastern sandveld, with a second concentration of 50 elephants around the Ombonde River in the Beesvlakte. The calving percentage, calculated as the percentage of calves less than one year old in the whole population, was 1,9 in 1983. During the present study elephants of the eastern population made no direct contact with the western population nor were there any western migrations or movements.

#### *The western elephant population*

Some 4,5 million hectares in extent, the focus of the distribution range of the western elephant population is situated in the northern Namib Desert of S.W.A. The northern Namib Desert is bordered in the north by the Kunene River, in the south by the Huab River, in the west by the Atlantic Ocean and in the east by a line that can be roughly drawn from the Marienfluss in the north to Die Riet on the Huab River in the south. This line also roughly corresponds with the 100-mm isohyet although it extends to the 150-mm isohyet in the south.

As the present study was mainly aimed at the western elephant population, each of the elephants in this population was individually identified. In 1980 this population consisted of 86 individuals but in 1983 there were only 70 individuals left. This is the total number of desert-dwelling elephants and during the study period there was no migration to areas outside this bioclimatic zone and no immigration from the east took place. The only fluctuation was at the Kunene River where six elephants that occurred there moved freely to Angola and back. Movement patterns were generally north-south orientated. Within the western elephant population five different groups were distributed as follows:

- (a) Six cows utilized the Kunene River west of the Marienfluss from where they moved into the northern Hartmann Valley and southern Angola. They were more or less isolated from the rest of the population but on two occasions they moved down to the Hoarusib River to make contact with the elephants there.
- (b) In the Hoarusib River west of Leyland's Drift, four elephants mostly utilized this section of river but also frequently moved to the Hoanib River and up to the Khumib River.
- (c) The Hoanib River group consisted of 31 elephants which utilized a wide area on both sides of this river bed.
- (d) The Hunkab area which was mostly frequented by five adult bulls.
- (e) The Wêreldsend area where 24 elephants utilized the Uniab, Barab and Aub Drainages north and west of the

veterinary fence.

Between 1980 and 1983 the calving percentage was 1,38 although no calf survived as a result of illegal hunting and disturbance. In 1984 the calving percentage was 2,7 (S. Brain pers.comm. 1986).

#### *The transitional elephant population*

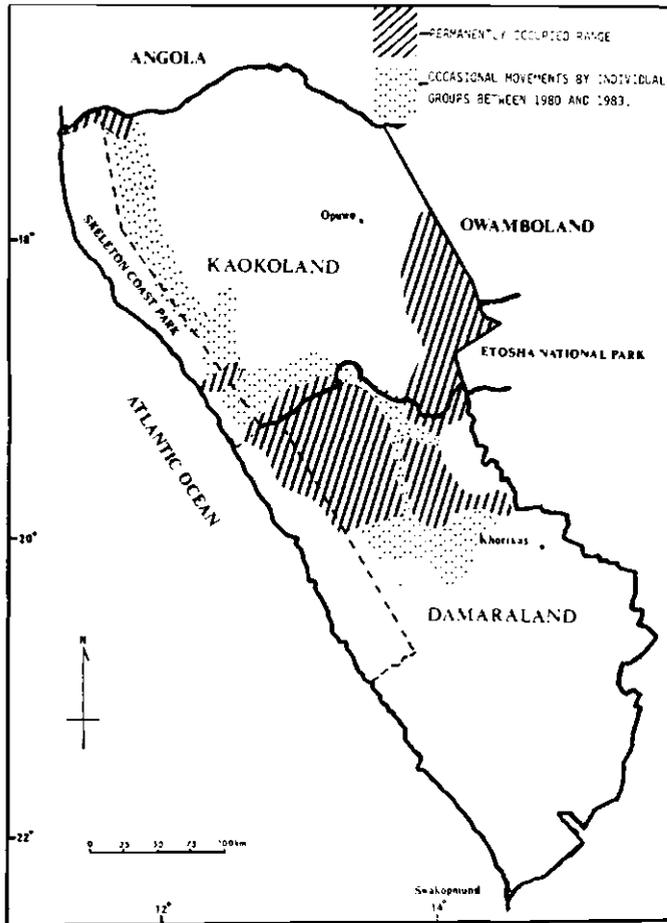
The somewhat artificial classification of this population is justified by the following factors. These elephants utilized an area on both sides of the 150-mm isohyet. They made contact with both the western and eastern populations on an infrequent basis. During the rainy season they moved north-east to the vicinity of Omumborombonga where they made contact with members of the eastern population. During the dry months they moved south-west where they infrequently made contact with herds of the western population. The extent of their natural movements was unclear as a veterinary line which was erected in 1976 cut right through their home ranges and disrupted their natural migration routes. With the absence of the veterinary fence it might have been possible to have made a clearer division as to the population relationship of these elephants but at present their movements are to a large extent influenced by this fence.

This population inhabits the Grootberg Mountain range area, bordered by the Omumborombonga-Khoraxa-Ams waterholes in the north, the farms Palmwag, Juriesdraai, Spaarwater and Bergsig in the west and the Huab River up to Tweelingskop and Nantis in the east. A total of 80 elephants was counted in this region. Their calving percentage was 1,3 at the end of 1983.

The 1983 distribution of elephants in the Kaokoveld is represented in Figure 8. This only refers to the permanent distribution of the elephants and does not include occasional infrequent movements outside their permanent home ranges. For the sake of clarity the extent of these vagrant movements is also shown on the map. An interesting phenomenon was that even these vagrant movements never took the elephants outside the bioclimatic zones in which each population is resident.

#### *Overall trend in numbers*

Despite the shortcomings of earlier descriptions and information, a clear picture emerges regarding the population trend. Prior to 1800 there is no information on the numerical status of these elephants but it is certain that they were already present in the northern Namib Desert. Round about 1880 an estimated minimum of 2 500 elephants must have been in the Kaokoveld based on the number of elephants shot by the Dorslandtrekkers. Figure 9 is a graphic representation of the author's interpretation of the population trend through different time periods using the most reliable estimates. This data was compiled by using the information provided by Shortridge (1934), Von Moltke (1945), Green (1952), Bigalke (1958), Owen-Smith (1970), Visagie (1977), Le Roux (1978), Viljoen (1980) and the present study. As can be seen from Figure 9,



**Figure 8** Distribution of the elephant (*Loxodonta africana*) in the Kaokoveld during 1983.

the time that a reduction in distribution range can be detected, there must already have been a drastic decline in numbers.

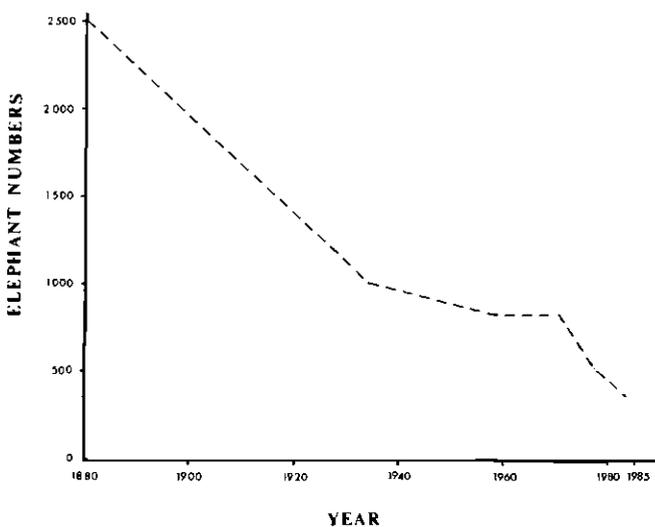
The sharp decline since 1970 in elephant numbers and distribution is especially noticeable in the Kaokoland region where the northern elephant concentration and the largest part of the western population have disappeared over a period of only seven years (Figures 5 and 6). The northern elephant population had declined from 160 in 1970 (Owen-Smith 1970) to eight cows in 1977 (Viljoen 1980) and by 1980 they were extinct. Similarly, the western population had declined from 300 in 1970 to 65 in 1977 and at present there is a maximum of 39 at any one time in Kaokoland. The recent drastic decline in elephant numbers in Kaokoland is attributed to the following factors:

- (i) With the availability of reliable four-wheel-drive vehicles, previously inaccessible areas became within easy reach of any hunter.
- (ii) Since about 1970 the local people (who were not regarded as hunters) were provided with guns and ammunition by the traders in Angola in exchange for ivory (B.J. Van Zyl pers. comm. 1977). This apparently reached large-scale proportions in mid-1970 with the resultant extermination of the northern elephant herds.
- (iii) More and more outsiders, who were inclined to poach and who possessed the necessary arms and ammunition, moved into the region.
- (iv) Although legislation regulating hunting in the area has existed since 1907 (Wellington 1967), practically no law enforcement was applied until fairly recently. A Nature Conservation Officer was appointed to the region in 1973 but he was stationed in Windhoek and visited the Kaokoveld only infrequently. The inaccessibility and size of the area also made law enforcement practically impossible.
- (v) The current war in the area resulted in a heavy influx of weapons and people causing a sharp increase in poaching and a decrease in law-enforcing patrols.
- (vi) With the abolition of permits to enter the area in 1978, there was a sharp increase in uncontrolled tourism with the resultant increase in disturbance. In an area with limited food and water resources this probably had a drastically negative effect on elephant population growth.

It was only as recently as 1982, through information supplied during the course of this study and by officials of the Namibia Wildlife Trust and the Endangered Wildlife Trust that effective law enforcement took place.

Since then the Department of Agriculture and Nature Conservation, South West Africa, has appointed more Nature Conservation officials for the region with a resultant decline in poaching. At the moment the situation is relatively stable, but with the low numbers of these elephants this could change overnight.

Historical distribution of the desert-dwelling elephants  
One of the reasons for determining the past distribution of elephants in the Kaokoveld was to try and establish the permanency and origin of the desert-dwelling



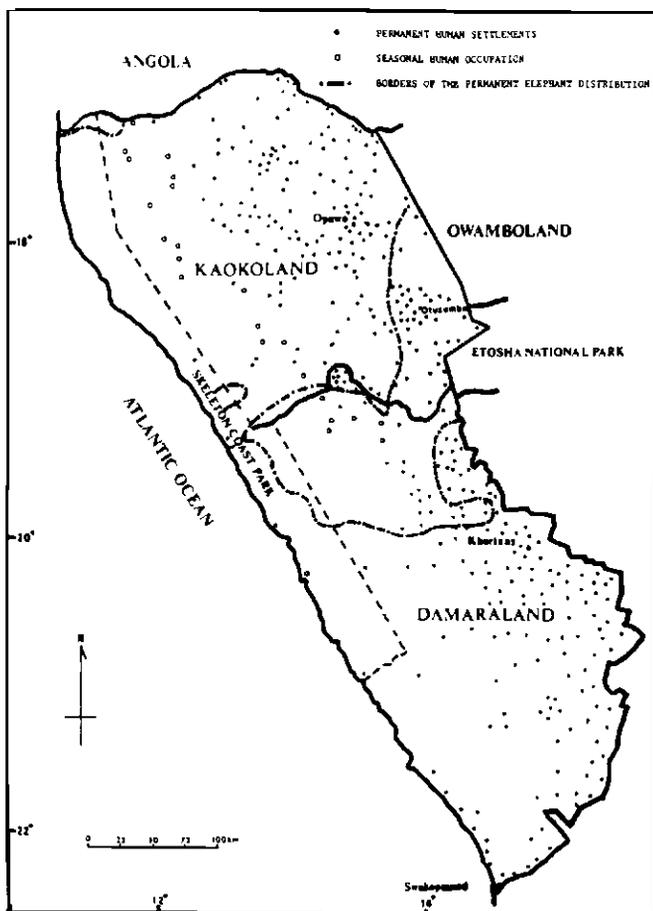
**Figure 9** Trends in elephant numbers in the Kaokoveld since 1880, based on estimates by selected authors ( see text).

there probably was a sharp decline in elephant numbers after 1880, with the intensive hunting of the Dorslandtrekkers. After this period the population remained relatively stable until 1970 when there again was a drastic decline. This is even more clear in studying the various distribution maps, bearing in mind that by

elephants. Unfortunately a satisfactory explanation regarding the origin of these elephants will probably never be found. Why and when these elephants moved into an atypical and seemingly unsuitable habitat while there was typical 'elephant habitat' in the east, remains a mystery. The theory that these elephants were forced into the west by human activities and development in the east (Schoeman 1984), is unacceptable because of the following facts.

(a) Before 1900 the human population in the Kaokoveld must have been very low (Van Warmelo 1962) and long before there was any development or large-scale hunting in the east, there were reports of elephants occurring in the west (Alexander 1838; Hartmann 1897, 1902; Vedder 1937; Vierech & Rudner 1957). These early reports indicate that elephants utilized all the larger river courses in South West Africa right down to the Atlantic Ocean. This might have been a seasonal occurrence, but all previous travellers in the region reported elephants in western Kaokoveld, regardless of the season. Even at present, development in the eastern Kaokoveld is on a small scale and consists mainly of five all-weather roads, seven small schools, one veterinary fence and two hospitals.

(b) The biggest concentration of elephants in the Kaokoveld coincides with one of the largest human settlements in the east, at Otuzemba (Figure 10). Here



**Figure 10** Human settlements in the Kaokoveld in relation to the present elephant distribution.

elephants drink during the night while the waterholes are utilized during the day by the Hereros and their animals. This process has been in existence for a long time (Owen-Smith 1970) and while the elephants are hunted and harassed from time to time, they show no inclination to leave. This is in spite of the fact that they seasonally visit the nearby Etosha National Park, but they always return to their original home ranges. There is nothing to prevent them from staying in the Etosha National Park or from moving west.

(c) The present study has shown that the elephants in the Kaokoveld showed a marked attachment to their various home ranges in spite of having unlimited movement in nearly all directions. They could be driven out of their home ranges or temporarily moved out over long distances but the elephants always returned to their original home ranges. This behaviour has caused the extermination of entire herds. Examples of this are the northern elephant population which numbered 160 in 1970 (Owen-Smith 1970) but by 1977 they were shot out except for eight cows. These cows were hunted almost continuously until they too were killed in 1980 in the same area. Another example is the elephant herds of the middle Hoarusib River where Woods counted 100 elephants in 1951 (in Green 1952) but by 1977 they had dwindled to 14 (Viljoen 1980). In 1980 there were only four cows left who were continuously harassed and shot at by the resident people. Although these cows temporarily joined other herds for short periods they repeatedly returned to their original home range until they too were killed in April 1981. Similarly elephants that frequented the Hartmann Valley – Kunene River region numbered 40 in 1970 (Owen-Smith 1970), eight in 1977 (Viljoen 1980) and at present consist of only six cows and no bulls. Although these cows had on two occasions joined elephants in the western Hoarusib River, they returned the distance of 195 km back to their original home range.

As there was no evidence to the contrary — no new influx of elephants and no sudden increase in numbers in a certain area — it is concluded that current gaps in the elephant distribution in the Kaokoveld were created not by forcing them out but by shooting them out.

(d) In the northern Damaraland region where the highest concentration of desert-dwelling elephants occurs, there is nothing to prevent these elephants from moving east as there is an uninhabited corridor, at the narrowest 60 km wide, from the coast right through to the Etosha National Park. In fact this corridor is used extensively by Hartmann zebras (*Equus zebra hartmannae*), Burchell's zebras (*Equus burchelli*) and by the elephants from the eastern population, in spite of the western fence of the Etosha National Park and one main road. The eastern elephants use this corridor to move west, up to the Kowarib Schlucht, during the rainy season and then return east with the onset of the dry season. The desert-dwelling elephants showed no inclination to move east out of their bioclimatic zone at any time.

It is concluded that the origin of the desert-dwelling elephants was not a recent occurrence nor was it induced

by man, in fact all the available evidence points to the contrary. A possible explanation might be that it was a process of natural dispersion as a result of elephant-overpopulated conditions in the east long before the interference of man.

### Discussion

The main facts emerging from the data presented above concern the historical existence of a distinct and permanent desert-dwelling elephant population in the northern Namib Desert region of the Kaokoveld. However, the elephant population is on the decline with a live animal to carcass ratio of 2,9:1 in 1983. The primary cause of decline seems to be illegal hunting as 87% of the dead elephants found, were shot.

While it is generally accepted that elephants are capable of utilizing a wide variety of habitats ranging from semi-desert with an annual rainfall of 300 mm, to tropical forests with an annual rainfall of 2 000 mm or more (Laws 1970), the presence of elephants in a desert is regarded as atypical and marginal. As far as is known, such conditions exist in only two areas in Africa, namely in the northern Namib Desert of South West Africa and on the edges of the Sahara Desert in Mauritania and Mali. Little is known of these elephants in north Africa and the survival of those in Mauritania is uncertain (Douglas-Hamilton 1980). In Mali approximately 500 elephants survive in the Gourma area with an annual rainfall of between 300 and 550 mm (Guillemont 1986). These elephants reputedly move around in large herds and cover distances of 800 km (Bosman & Hall-Martin 1986). Similar to the northern Namib Desert, these elephants are also dependent on food maintained by water run-off from higher rainfall areas such as the seasonal flooding of the Niger River flood plains. Another similarity is that the Mali elephants also share the waterholes with the tribesmen's cattle by drinking during the night. The climatic regime of the Mali elephants, however, seems to be more on par with that of the eastern Kaokoveld (rainfall > 250 mm), although the mean temperature in Mali is higher (Grove 1971).

It is beyond the scope of this paper to discuss the desert-dwelling elephant's adaptational strategies in detail, but the salient proof of their adaptation to the northern Namib Desert environment was manifested during the five-year drought which lasted from 1976 to 1982 when more than 80% of the other large mammals died (Viljoen 1982b). As far as could be ascertained not one of the desert-dwelling elephants died as a result of the drought. The factors contributing to the elephant's survival include their mobility, their ability to extend periods between drinking bouts for up to four days, their feeding on a higher level than the other mammals thus eliminating competition, their unspecialized food requirements, and, probably most important, their intimate knowledge of resource distribution within their environment. While it might be argued that these elephants are dependent on the riverine vegetation which is maintained by water run-off from higher rainfall areas in the east, so do most of the other so-called desert

mammals like the gemsbok *Oryx gazella* and the springbok *Antidorcas marsupialis* (Viljoen 1980; Louw & Seely 1982) and most of them did not survive the drought. The desert-dwelling elephants thus seemed to be better adapted to the desert environment than most other large mammals.

While the desert-dwelling elephants are not regarded as a separate subspecies, they represent an ecotype which illustrates the ultimate capacity of the African elephant to adapt to marginal conditions. Their conservation is not only of aesthetic and scientific importance, but as Comrie Greig (1979) pointed out, the continuing evolution of living organisms depends upon the maintenance of genetic variability. The conservation of genetic variability within each species is best accomplished by maintaining ecotypes as far as possible in their historical, geographic or topographic locations and not by combining genotypes in one panmictic population through allowing certain genotypes to become extinct or through translocation. The African elephant, by virtue of its mobility is already regarded as a species with little genetic variation (Fairall 1982) and by preserving ecotypes, the flexibility or adaptability of the species involved will be improved in the long term.

In addition, implementation of the proper conservation programmes to ensure the survival of the desert-dwelling elephants in the northern Namib Desert will automatically also conserve the large variety of mammals, birds and endemic plants, reptiles and insects in an area renowned for its topographic grandeur. In the northern Namib Desert with its low agricultural and mining potential (Loxton *et al.* 1974a & 1974b) this could provide a viable source of income for the local people through controlled tourism. However, although the Department of Agriculture and Nature Conservation of South West Africa has suppressed illegal hunting in recent years, uncontrolled tourism is becoming a problem. To date no effective measure has been taken to ensure the survival of any animal in the Kaokoveld and only through the declaration of the area as a conservation area with the proper control and management will this end be achieved. Negligence and protracted petty arguments over the conservation status of these elephants will only lead to their extinction, a point too well illustrated by the current plight of the Knysna elephants.

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