AMENDMENTS TO APPENDICES I AND II

A. PROPOSAL

Transfer of the South African populations of the African elephant (*Loxodonta africana*) from Appendix I to Appendix II.

B. PROPONENT

Republic of South Africa.

C SUPPORTING STATEMENT

1. TAXONOMY

11. Class: Mammalia

12. Order: Proboscidea

13. Family : Elephantidae

14. Species: *Loxodonta africana* (Blumenbach, 1797). Only the nominate race *Loxodonta africana africana* (Blumenbach, 1797) occurs in South Africa (Meester *et al.* 1986) and it includes :

1797 *Elephas africanus* Blumenbach
1798 *Elephas capensis* G Cuvier
1907 *Elephas africanus toxotis* Lydekker

15. Common names :

English:	African elephant
French.	éléphant d'Afrique
Spanish:	elefante africano
Afrikaans:	Olifant
German:	Afrikanischer Elefant
Portuguese:	elefante africano
Zulu:	Ndhlovu
Xhosa:	Ndhlovu
Siswati:	NdhloTsonga: Ndlopfu
Tswana:	Tlou
Sotho:	Tlou
Venda:	Ndou
Sindebele:	Ndhlovu, Nkubu

16. Code number : ISIS 5301415001002001001

2. BIOLOGICAL DATA

21. Distribution

Historical distribution: The recorded distribution of elephants in South Africa begins with a report of their occurrence at Mossel Bay on the Cape south coast by Vasco da Gama,

Portuguese navigator in 1497 (Skead 1980). The continuous record of modern history of South Africa, however, dates from 1652.In that year a provisioning station for ships sailing from Europe to the East Indies was established by the Dutch East India Company in Table Bay, later known as Cape Town. At that time elephants are reported to have occupied much of the territory (Fig.1) later to become South Africa (Skead 1980, 1987; Smithers,1983). The arid central Karoo plains, Bushmanland and the Kalahari are however, unlikely to have supported large or permanently resident populations.

The historical record shows little evidence that the grasslands of the interior, now known as the Highveld of the Orange Free State and southern Transvaal were particularly rich in elephants either. The savanna and woodland regions of the Transvaal and the high rainfall areas on the East Coast as far south as the Cape of Good Hope, however, supported large elephant populations (Smithers, 1983).

No reliable estimate has ever been derived of the total numbers of elephants which may have existed in South Africa, but it is quite likely to have been of the order of 100 000 animals before 1652. The decline in the South African elephant population took place in three phases characterised by:

Settlement

The decline of the species between the years 1652 and 1790 was largely caused by the increase in settlement and human population growth, with the ivory trade playing only a small part. The onset of this process of elephant decline was commented upon early in the historical record by Kolbe in 1731 and Mentzel in 1787 (Skead 1980), and is reflected in Fig. 2.

Ivory Trade

From about 1790 to 1870 the main force eliminating elephants was the growth of the ivory trade and the emergence of professional ivory hunters on a large scale (Skead 1987). These hunters operated as far north as the Zambezi Valley and their ivory was moved southwards to the ports of Durban and Port Elizabeth.

Crop-protection

By about 1870 the large elephant populations had been wiped out. From 1870 to 1920 the shooting of elephants was due, in large measure, to crop protection, especially in the Addo area of the eastern Cape (Stokes, 1941; Hall-Martin 1980). Crop protection mortality was the major cause of the continuing

decline of elephants in the Tembe area until as recently as 1983 (Bosman & Hall-Martin, 1986). Small numbers of elephants from the Kruger National Park are still shot every year for crop-protection purposes on adjoining agricultural land.

As a result of these forces the distribution of elephants was drastically curtailed to four remnant populations permanently resident within the borders of the country by 1910 (Stevenson-Hamilton, 1947; Hall-Martin, 1980). These populations were at Knysna on the Cape south coast, Addo in the Eastern Cape Province near Port Elizabeth, the Sihangwane (Tembe) area of northern Natal, and the Olifants Gorge area of the eastern Transvaal in an area which was proclaimed a game reserve in 1898 and in 1926 became the Kruger National Park (Fig.3).

Current distribution

The distribution of the four elephant populations of South Africa occupied no more than 100 000 ha in total in 1910. Since then the distribution of elephants has changed dramatically as populations increased. By 1991 the elephant range of South Africa had grown to about 2,6 million ha. (Fig.4), and elephants were to be found in 33 discrete populations or ranges (Fig.5).

The change in elephant distribution in South Africa since 1910 is the result of conservation and wildlife management practices largely initiated by the National Parks Board of Trustees of South Africa. An active policy of elephant conservation through protection, management, utilisation and translocation has resulted in South Africa having increasing populations of elephants whose range is steadily growing. Between 1979 and 1991 alone 23 discrete new populations of elephants were established by the translocation of 388 young elephants, largely from the Kruger National Park, to areas where the species had earlier been exterminated. Two small populations (numbering 18 animals) were also established in Swaziland through translocation from the Kruger National Park. Over 93% of translocated calves survived, and stable reproducing populations have been created.

The present distribution of elephant populations in South Africa in relation to rainfall is shown in Fig.6, and the actual size of each range is given i 1990 and 1991 (see Table 2). In sharp contrast to the Pan-African trend where elephant numbers and range are shrinking (Douglas-Hamilton, 1989; Parker and Graham, 1989; Caughley, Dublin and Parker, 1990) the range available to elephants under legal protection and secure management in South Africa has increased by 274 300 ha (11%) under State control, and by 119 430 ha (5%) in private ownership since 1979.

22. Population (estimates and trends): The status of the major elephant populations in South Africa is determined annually during the dry season by means of a total count carried out by helicopter in the Addo and Kruger National Parks and either helicopter or fixed- wing aircraft on private reserves (Dublin, 1989). In the case of Kruger there is a mean 1,4% variation from year to year between the expected and actual count which can be attributed to census technique, weather and other factors which can influence a count. The census at Addo is more

precise (as virtually all animals in the population are individually known). The number of elephants in Tembe, which is a mosaic of forest and dense woodland where aerial counts are not successful, are estimated on the basis of known animals, evidence of movements from tracks and droppings and helicopter counts. Census techniques are designed to yield data on sex and age composition of the elephant populations as well as numbers. In the smaller, recently established elephant populations numbers are determined from aerial census, the known numbers of animals translocated and known mortalities.

The estimates and counts quoted range over the period August 1990 to June 1991. Because the census work is carried out as routine operations in the national parks and on some of the private nature reserves, no detailed descriptions of the procedures followed have been published recently in the formal literature. However, internal reports (eg. Ostrosky, 1988a; Whyte, 1990) are produced for every census carried out. The earlier surveys carried out in the Kruger National Park were, however, published (Pienaar, van Wyk and Fairall, 1966).

The status and potential maximum size of the present populations of African elephant in South Africa - under management regimes similar to that of the Kruger National Park - are shown in Table 2.

Kruger National Park

Estimates of the numbers of elephants in Kruger were made at irregular intervals between 1903 and 1964 as shown in Table 3. During the early years the Park Warden Col. James Stevenson-Hamilton made estimates on the basis of known herds and individually known groups of bulls. By the 1950's rough road counts together with estimates or 'guesses' were being used. The first aerial survey, using a fixed-wing aircraft and covering only part of the Park was carried out in 1960 (Pienaar, et al 1966). The first comprehensive total count by helicopter of elephant and buffalo was carried out in 1967 and has been repeated every year since with the exception of 1979 when insufficient funds were available. The census totals for the period 1967 - 1980 can be found in Hall-Martin (1984). All totals for the period 1967 - 1990 are included in Whyte (1990) and are also presented in Table 3.

The Kruger elephant and buffalo count was carried out from 1967 to 1973 using a Bell 47 helicopter, and from 1974 onwards using a Bell Jet Ranger 206 B helicopter. The pilot is accompanied by a navigator/observer who sits left front, and two observers in the rear seats. The helicopter flies at a height of 600 - 800' above ground, and at a speed of 90 - 100 mph. The census takes 18 days to complete and the total flying time is 125 hours with two pilots taking turns. This flying time includes time taken for placement (ie. base to point where census begins and return to base) and time spent circling over both elephant and buffalo herds during the count. The flight path is traced on a map (1 : 100 000) of the Park and follows all visible drainage lines; these are usually indicated by denser, taller riverine vegetation. The aircraft is usually positioned midway between the watercourse and the watershed as indicated in Fig. 7. Where the riverine fringing vegetation is particularly well developed, or dense enough to hide elephants, the flight path on either the outward or inward leg is set closer

to the drainage line. At the top of the drainage line a wide sweep is flown to the watershed to check not only that there are no elephants in the drainage area counted, but also no elephants close to the watershed in adjoining drainage basins. Such groups are possible candidates to leave the counting area overnight by crossing a watershed and so their position and group composition is mapped and monitored on subsequent flights as well. Because the census is carried out at the height of the dry season, it takes advantage of elephant daily movements. The animals tend to spend the cold winter nights on the watersheds to escape cold air drainage, and they drift down to water in the drainage line during the course of the morning as it warms up, to drink.

Elephant herds can be seen up to 3 - 5 km away depending upon the height and density of vegetation. On open plains even solitary bulls can be spotted at distances of 5 km and further. Breeding herds are circled at heights of 100 - 200' and while they are counted, calves thought to be less than one year old are recorded. Such calves are easy to distinguish up to about 6 months of age on size and the overlap of the pinnae on the head. Young calves are still hairy, older ones have a more "polished" look. The final basis of calf classification depends upon the experience of the observer. In the case of the 1990 census the average length of service in the Park of the observers was 20 years per man and the pilots was 16 years per man. The pilots also contribute towards the estimate of the age of a calf but the final decision is left to one nominated observer throughout the duration of the count. The pilots, however, are also expert at estimating ages of calves because they are involved in the selection for capture of up to 140 calves, 2-4 years old, per year. The position of all elephants counted is plotted on a map.

The method has been unchanged since 1967 and results should therefore be comparable. The accuracy of the Kruger annual elephant census can be assessed by comparing the number of elephant counted with the expected census total for the same year (Fig.8). The expected census total is calculated by adding the number of calves born since the previous survey, to the previous year's total and subtracting the number of animals culled during the year:

Expected total = previous year's total + calves born - cull

Both the expected and observed census totals from 1982 to 1990 are presented in Table 4. The difference between the two sets of totals for the nine year period is not significant ($X2 = 85,955$; $df = 8$; $p < 0.0001$) and the percentage deviation varies from 0,2% to 7,9% ($X = 1,4\%$).

The variation in the calf crop from year to year (as estimated from the air) can be explained by rainfall during the year of conception and is presumably linked to the body condition of the cows. The relationship between the calf crop counted in any year was shown by Hall-Martin, Whyte and Viljoen, (1987) to be described by the expression : $y = 1,403 + 0.048$ ($r = 0,7748$) where y is the calf percentage and x is the rainfall of the year of conception as a percentage of the long-term mean rainfall. This is another indication of the consistency of the methods used and the results obtained.

A further indication of the reliability of the Kruger census and the increasing trend of the population can be derived from the fact that the population has been kept fairly stable at around 7 500 animals over a period of 24 years (Fig.9) during which time nearly 13 000 elephants have been culled in the Park (Hall-Martin, 1991a). Immigration of elephants into the Park cannot be invoked as an explanation as the Park has been fenced off from Mozambique (the main historical source of immigrant elephants) since 1974 (Hall-Martin, 1991a). The long-term mean calf crop (percentage of less than one-year-old calves counted in each annual census) is 6,2% per annum or 476 calves per year. The mean number of elephants culled per year since 1974 (when immigration was effectively ended) is 517 animals. Numbers estimated as born in the Park each year (476) can thus be safely revised upwards to at least 517. This reflects an actual increment of 6,8% per annum of the mean population of 7 642 animals (Hall-Martin 1991a) after natural mortality. Alternatively the observed calf crop could be a lower percentage of an elephant population which is larger than 7 500 animals. Either way these figures indicate a good degree of consistency from year to year.

The elephant population estimates for Kruger are plotted in Fig.10 and the rate of change is indicated for the period 1900 - 1960 as 8,9% which is a reflection of recruitment, immigration and possibly inaccurate early estimates. From 1960 - 1970 the increase was 23,1% per annum which is accounted for by recruitment, massive immigration due to heavy hunting pressure and drought in Mozambique and the implementation of regular, repeatable, accurate censusing. The overall trend 1970 - 1990 is a decline of 0,2% per annum which for all practical purposes represents a stable population. A decline of this magnitude could be turned into an increase simply by relaxing the cull in any year, or a bumper calf crop. The variation in estimated calf crops (2,7 - 11,0%) indicates that a good crop could easily change this trend.

Addo Elephant National Park

Since 1976 the elephant population has been intensively studied and most of the animals are individually known (Hall-Martin 1980). Nevertheless the elephants are counted routinely during the annual game census (eg. Hall-Martin, 1991 b) which is done using a Bell Jet Ranger 206 B III Helicopter following parallel flight paths within clearly defined counting blocks or areas. The height above ground, speed and strip width is adapted according to density of vegetation, light conditions and terrain. In general the Addo census is flown at 35 - 50 mph (ground speed) at about 50 - 100' above ground and flight paths are 200 - 300 m apart. The Addo census is designed for black rhinoceros counting which require a low-flying aircraft to flush them in the dense thicket vegetation. All rhino are known and marked (Hall-Martin, 1986) and the accuracy of the count can be monitored. The elephant count is also checked against known animals, and known births and deaths during the year. The estimates, known population size and counts for the Addo elephant population for 1931 - 1991 is given in Table 5.

The trend of the Addo elephant population from 1931 to 1990 is shown graphically in Fig.11. From 1930 to 1954 the overall rate of increase was only 2,6% per annum. This was largely because the elephants left the Park regularly

to raid crops or to feed on prickly pear (*Opuntia* sp.), and were shot. Only after the completion of the Armstrong fence in 1954 which confined the elephants to the Park, was a more positive recruitment rate possible. The rate of increase between 1954 and 1979 when there was no interference with the population was 6,7% per annum (Fig. 11). The higher rate of increase of 7% per annum which was quoted by Hall-Martin (1980) was based on a 1954 population of 18 animals and not the 20 as shown in Table 5. This high rate of increase has been tempered in recent years by increasing mortalities among sub-adult males killed by bulls in musth (Hall-Martin, 1987) and the disturbance by the translocation of 5 animals to Pilanesberg in 1979. The high mortality recorded (over 6% of the population was killed between 1977 and 1989) may well be related to the high density and the limited range in the Park. This has been slightly alleviated by the recent purchase of land by the Rhino and Elephant Foundation, the Southern African Nature Foundation and the State which has increased the Park area by 34% (Hall-Martin, 1991c).

Tembe Elephant Park

The known data on the Tembe elephant population is summarised in Table 6. The early estimates are guesses based on local knowledge. The figure for 1975 was derived from a helicopter survey and intensive tracking and observation on the ground (eg. Bosman and Hall-Martin, 1986). There were reports of breeding herds in the area in the 1940's, 1954 and 1971 (Ostrosky, 1988b) and again in 1973 (Thomson, 1978). During 1975/76 intensive reconnaissance found evidence only of bulls and no breeding herds of elephant in the Tembe area (Hall-Martin, 1980). All sightings, droppings and spoor records were of bulls. After the 1975 change of government in Mozambique heavy poaching of elephants and illegal settlement in the Maputo Elephant Reserve caused a movement of elephants southwards across the border into South Africa. These immigrants included breeding herds (Klingelhoeffer, 1987). In recent years the estimates of numbers of the Tembe elephants have been based on aerial reconnaissance and sightings of known individuals documented by means of a photo-file (Ostrosky, 1988b). The apparent decline between 1978 and 1986 is due to the figures being based on minimum helicopter counts (Fig.12). Later estimates are helicopter counts supplemented by photo-file records.

The Tembe elephant population has been stable because of poaching mortality affecting these animals when they crossed the international border to Mozambique (Bosman & Hall-Martin, 1986; Ostrosky, 1988a). During the dry season of 1989 the border was sealed with an elephant-proof electrified fence which should stop future elephant movements. This population should then also show a similar rate of increase to other protected populations in South Africa.

Knysna Forest

The only elephant population in South Africa with a less than encouraging recent history is the remnant population in the Knysna Forest. The decline of this population from 1876 - 1981 is shown in Table 7 and Fig.13. In the past these elephants have been a low management priority for the forestry authorities and no specific management or protection action has ever been taken to benefit them (Hall-Martin 1980). Suggestions have also been made that the present

range of the population is not adequate elephant habitat (Hall-Martin, 1980; Koen, Hall-Martin & Erasmus, 1988) but other observers have placed the blame for the decline of this population on poaching and crop protection shooting by smallholders (Carter, 1970). The low point was reached in 1981 when only three elephants - an old bull, an adult cow and a calf could be accounted for (Koen 1981). Recent reports have however confirmed the birth of a calf during early 1989 indicating a slight recovery in the population. To assist this hopeful trend the Minister of Water Affairs and Forestry has recently (June, 1991) taken a decision to start a process of elephant introductions to Knysna. The first two calves in this programme are scheduled to be moved during early 1992 from the Kruger National Park.

Lowveld Private Nature Reserves

The Transvaal Directorate of Nature and Environmental Conservation carries out an annual aerial census of elephants in the Klaserie and Timbavati Private Nature Reserves. The census is done using a Bell Jet Ranger helicopter flying at a height of 250' above ground, the census strip is demarcated by strips attached to the helicopter (P. de Villiers, pers. comm). The census is regarded as a total count. The data derived are shown in Tables 8 and 9.

The population data are also plotted in Figs.14 (Timbavati) and 15 (Klaserie). The fluctuations are most likely explained by movements across the boundary into the Kruger National Park and back again. Such movements by radio- collared animals are well known to researchers in the area. The decline in elephant numbers in Klaserie (Fig.15) after the 1984 drought is clearly indicated.

Translocated populations

The translocated populations are all stable or increasing slowly as they are mostly too young to breed and they are all far below ecological carrying capacity.

The first calf of parents translocated as calves was born in November 1989 in the Pilanesberg National Park. The parents are a bull translocated from Addo at the age of 3-4 years and a cow translocated from Kruger at about 3 years of age. At the time of conception of the calf the bull was about 12-13 years old and the cow was 10 years old. During 1990 a further two calves were reported in Pilanesberg and the first calf born to translocated parents in Natal was reported from Hluhluwe/Umfolozi Game Reserve. Several of the translocated populations represent pioneer groups which will be added to in the future to achieve a more natural age structure of the population over time. The value of the transplanted populations on private land to elephant conservation is not significant. This is because most privately-owned ranges are too small to support viable populations in the long-term (Table 2). This problem may well be overcome by the 'conservancy' concept where adjoining landowners are encouraged to take down their fences so as to allow free range to game within the conservancy area.

23. Habitat (trends). Crude elephant population densities on South African elephant ranges vary from 0,01 elephants/km² in Knysna to 1,84 in Addo (Table 2). With the exception of Addo Elephant and Kruger National Parks, the elephant populations are still well below estimated carrying capacities of about 0,35 elephants/km² in summer rainfall savanna habitats of South Africa. This carrying capacity is determined by the management criteria as applied in the Kruger National Park and is an overall density (Joubert, 1986). However, local densities over substantial areas may vary from 0,28 - 0,42 km² and may be maintained for periods of several years between culling reductions of populations in particular areas (eg. Hall-Martin, et al. 1987). The population size and density recorded for the established populations of Timbavati and Klaserie can be influenced by immigration and emigration - both these reserves adjoin the Kruger National Park and there is a regular two-way movement of elephants. The impact on the habitat can therefore also be intensified at times.

In the Addo Elephant National Park the current population of 162 elephants is at the estimated carrying capacity of the presently fenced area of the Park which is 8 767 ha and can support around 2,0 elephants/km². The recent land purchases which have increased the size of the Park to 11 718 ha will soon be incorporated into the elephant range and lower the effective elephant density to 1,38 elephants/km². The higher carrying capacity at Addo is determined by a different climatic system, with almost year round rainfall, and the nature of the vegetation which is a dense, succulent, evergreen thicket (Hall-Martin 1980; Hall-Martin, et al. 1982). The carrying capacity of Mpongo Park (a private animal park) is also likely to be much higher than the estimate for the drier parts of the country as it is similar to Addo.

Studies on the impact of the Addo elephants on their habitat are under way (Barratt and Hall-Martin, 1990). These studies have measured changes in the species composition, plant volume, biomass, density and height of the vegetation. Because the vegetation at Addo is a dense, low evergreen predominantly succulent thicket with many multi-stemmed shrubs making up most of the plant cover (Hall-Martin, 1980) it is easily studied by methods approximating those described by Anderson & Walker (1974) and Walker (1976). The results of the studies at Addo are expected by the end of 1991 and will include recommendations for the enlargement of the Park to accommodate the elephant population at a level where no degradation of the vegetation will be taking place. This is particularly important because Addo also supports a population of 21 black rhinoceros *Diceros bicornis michaeli* (the Kenya/N. Tanzania subspecies) whose dietary requirements show substantial overlap with the elephants. If the financial means to substantially enlarge the Park cannot be found, then the culling of elephants in the future appears unavoidable. Non-governmental organisations such as the Rhino and Elephant Foundation and the S A Nature Foundation in partnership with the state have, however, recently added 2 951 ha of land to Addo (Hall-Martin, 1991c).

In the Transvaal similar studies on the impact of elephants on their habitat outside the Kruger National Park are being conducted by Nature Conservation Scientists from the Hans Hoheisen Research Centre. The impact of elephants on their habitat in the Kruger National Park has long been studied and debated (Pienaar et.al 1966; Pienaar 1969; van Wyk & Fairall 1969; Coetzee et.al 1979;

Engelbrecht 1979; Hall-Martin 1984; Viljoen 1988; Hall-Martin 1991a). The ecological, philosophical and practical considerations governing the policy of controlling elephant numbers in the Kruger National Park have been reviewed by Pienaar (1983) and Hall-Martin (1991a). The National Parks Board's policy towards elephants aims to maintain biological diversity. Any process, such as the impact of a large elephant population which could impair habitat quality by bringing about large scale rapid vegetation change as has been documented in many other areas in Africa (e.g. Glover, 1963; Napier Bax & Sheldrick, 1963; Laws, 1970; Martin, Craig & Booth, 1989) as well as the Kruger, is therefore held to be incompatible with basic management objectives (Joubert, 1986).

The deleterious effect that a large elephant population has on the dynamics of plant communities, individual species of woody plants, water supplies and interactions with other animal species as well as the effects of drought have all been considered (Pienaar, 1983, Hall-Martin, 1991a). In this regard it should be recognised that the rainfall of the area is low by world standards (Fig.6) and subject to regular cycles of below and above average rainfall (Gertenbach, 1980). The volume of water flowing into the system from outside the Park boundaries is also declining due to increased water utilisation by urban developments, industry and agriculture in the catchment areas of the major perennial rivers feeding the Park (Pienaar, 1985).

An increasing elephant population has also been shown to compete for food and limited water supplies with what are considered rare animal species in the Kruger National Park such as sable *Hippotragus niger*, roan *H. equinus*, tsessebe *Damaliscus lunatus* and eland *Taurotragus oryx* (Pienaar, 1969; Hall- Martin, 1984). Furthermore, the Kruger National Park now supports growing populations of both white rhinoceros Ceratotherium simum and black rhinoceros Diceros bicornis minor, both CITES Appendix I species which are potentially sensitive to competition for grazing, browse and water with an overabundant elephant population. The numbers of white (1 500) and black (210) rhinoceros in the Park the present rate of increase of 6% -9% for white and 9.0% for black (Hall-Martin, 1986) and the potential carrying capacity of the Park for these species makes the Kruger National Park at present the single most important rhinoceros sanctuary in Africa. It is important, therefore, to ensure suitable habitat for these endangered species by controlling the numbers of elephants in the Park so as to avoid the mortality seen elsewhere among black rhino when excessive numbers of elephants and drought destroyed their habitat (Corfield, 1973; Cobb, 1980, Parker, 1983).

Long-term trends.

As far as can be predicted, the management policies followed towards elephants in national parks and game reserves in South Africa will ensure ecological stability. Whether this will result in long-term loss of ecological resilience within the system remains to be seen. The damping down of ecological permutations will, however, ensure that more time is won to better understand ecological processes before elephants are allowed, if ever, to have an overpowering impact on the environment.

The elephant population is, therefore, culled to maintain it at a level which can be carried through drought years without detrimentally affecting the habitat (Joubert, 1986, Hall-Martin, 1984). In reality this means limiting the elephant population to between 7 000 and 7 500 animals or a crude population density of about 0,36 - 0,38 elephants per km² (Hall-Martin, 1984, 1991a). There are several National Parks and Game Reserves (Table 10) with habitat suitable for elephants, which when fenced to a suitable elephant-proof standard, will be restocked. These areas will add a further 543 937 ha to the national elephant range with a carrying capacity estimated at over 2 000 elephants at crude population densities approximately those of equivalent areas. The extent of land in private ownership which is also potentially available for elephants is likely to be less than this, and in smaller, fenced, holdings with less viable populations. The potentially available privately-owned land could accommodate a further 1 000 elephants at crude population densities of around 0,3 - 0,4 elephants per km². The potential maximum elephant population for South Africa, therefore, (Table 2 and 10) is about 13 000 animals, or about 2,1% of the current continental African elephant population.

3. TRADE DATA

31. National Utilisation: The trade in ivory within South Africa from South African sources (Kruger National Park) has never been large. Most ivory sold to local ivory manufacturers was in turn sold as curios to foreign tourists. Since the Appendix I listing, the ivory carvers have gone out of business and curio shop stocks are virtually static. There is also a trade in elephant meat, fat and carcass meal derived from the culling of surplus elephants in the Kruger National Park (Table 11). All these products are consumed within South Africa and yielded US$ 228 224 per year on average between 1985 and 1990 (Table 11) to the management budget of the Park (Hall-Martin, 1990). A well developed elephant leather industry based on skins derived from the cull yielded US$ 394 348 per annum between 1985 and 1989 (Table 11). As was the case with ivory prices for the various grades and cuts of hide were rising steadily (Fig.16). The price of speciality cuts such as trunk skin (Fig. 17) and ear skin (Fig.18) were more variable and subject to fluctuating demand. Most of the elephant hide was exported as tanned and finished leather or as finished leather goods (luggage, brief cases, purses, handbags, wallets etc). The elephant leather industry was worth US$ 0,75-1,50 to the local economy and accounted for 25% of the turnover of Exotan, the company doing the processing. The closure of the elephant leather market resulted in the retrenchment of 30 workers by Exotan and a significant financial loss to the industry and to the National Parks Board. The elephant leather trade, as well as the trade in other derivatives such as bracelets made from elephant tail hairs, and other articles was also of value in Zimbabwe and Botswana (Child & White, 1988; Thomsen, 1988).

32. Legal International Trade: As far as can be established none of the CITES range states who took out reservations after Lausanne (Zimbabwe, Zambia, Malawi, Botswana and South Africa) have sold any ivory since June 1989. This is confirmed by Caldwell & Luxmoore (1990). The state of the legal international trade in ivory was exhaustively reviewed and documented prior to the 7th Conference of the Parties and needs no repetition. Major sources of data are to be found in the Report of the Ivory Trade Review Group (Cobb, 1989). Other

sources of data, all of which refer to the situation pertaining before the Appendix I listing of the African elephant are the reports of R B Martin (1989) on the ivory trade in southern Africa; the consultant report for CITES on the raw ivory trade by Parker (1989), the report on intra-African trade up to 1988 as reflected in Côte D'Ivoire (Friedlein and Hykle, 1989), the Hong Kong ivory trade (Milliken and Melville 1989) and numerous earlier reviews and compilations.

South African trade records concerning the export of ivory (raw and worked) as reflected in Customs statistics are freely available and were extensively quoted by Martin (1989) and Parker (1989). Much has been made of discrepancies between these records and those of importing countries, and between Customs records and the figures given in the CITES annual reports. However, South Africa is a member of a Customs Union that includes Botswana, Lesotho, Swaziland and Namibia. Exports from any of these countries are sometimes recorded as imports from South Africa (in the recipient country) but may not be reflected as exports from South Africa as such goods exported from, for example, Botswana would not have passed through the books of the South African customs authorities. A further complication is that ivory exports are listed by SA Rand values, and not by weight. These values have therefore been converted to US Dollar prices and from that to mass. In some calculations the number of tusks recorded in Customs statistics have been converted to mass using an assumed mean tusk weight of 5.00 kg. This is a very rough mean tusk mass based on data in the ITRG report (Renewable Resources Assessment Group 1989). The scope for inaccuracy in such assumed calculations is great. It is also not always clear that records of imports from South Africa did in fact originate in southern Africa and the possibility of forged waybills or other documentation has not been adequately investigated. The distinction between worked and unworked ivory does not always appear to have been rigidly applied and records of ivory pieces could be either. The South African annual reports to CITES list the export of unworked and carved tusks (Table 12), for which CITES permits were issued by Management Authorities. A more complete picture may be derived from a comparison of WCMC, Cambridge records of Customs data. An analysis of these records, converted to mass, are given in Table 13. The discrepancy between these figures and the CITES report figures are not easy to reconcile, given the several sources of error and the assumptions on which these data are derived as mentioned above. The important point, however, which is made by the data of Table 13, is that raw ivory exports from South Africa from 1980 - 1989 could be accounted for by declared imports. Furthermore, most of the tusks in South African ownership in 1990 were derived from imports.

The data (Table 12 and 13) support the conclusions of Ilsley (1989), Martin (1989) and Parker (1989) and clearly indicate that the legal ivory trade in South Africa was in a phase of decline even though prices were steadily increasing (Table 14 and Fig.19). The major portion of registered stocks of tusks in private ownership has been exported since 1980 - as is clear from a comparison of the number of tusks registered by the various management authorities (Table 15) with the number of tusks still held in South Africa in 1991 (Table 16). A portion of the unworked tusks exported were derived from the Kruger National Park. The mean annual production of ivory from Kruger amounted to 908 tusks weighing 5 192,1 kg per year for the period 1973 - 1991 (Table 17). Ivory sales from the Park yielded US$ 730 900 per year to the Park budget from 1985 - 1989 (Table

11). No ivory has been sold since the Appendix I listing and the current stock of ivory held by the Park amounts to 1196 tusks with a mass of 6 655 kg (Table 18). Sales of elephant leather, most of which entered into international trade yielded US$ 394 348 per year from 1985-1989 (Table 11).

For the purposes of the present submission there is no legal international trade in ivory or African elephant leather. Movements of limited numbers of live African elephants has occurred with the necessary CITES permits (Table 19).

33. Illegal Trade: Relevant data on the illegal ivory trade was compiled in the report of the Ivory Trade Review Group (Cobb, 1989), and in the reports of R B Martin (1989), Parker (1989), and Milliken & Mellville (1989).

Reports on the extent of illegal trade in ivory passing through South Africa have appeared in the media. As the 7th Conference of the Parties drew near the intensity of reports on South Africa's role in the illegal ivory trade increased. That an illegal trade in ivory and rhinoceros horn operating within and through South Africa exists, is not disputed. The recognition of this problem was the major motivation for establishing an Endangered Species Protection Unit (ESPU) within the South African Police. However, virtually no hard evidence has ever been presented to the international community to substantiate claims of this illegal trade other than discrepancies in Customs statistics and the reports of seizures and arrests mostly made by the ESPU. Reports of the movement of up to 100 tons of ivory per year through South Africa, derived mainly from Angolan sources (van Note 1988) have never been substantiated. No complicity of any South African authorities in any illegal ivory trade has been proved though security force involvement is claimed. The integrity of South Africa's CITES authorities, and the reliability of their records have, however, been favourably commented upon (Martin, 1989; Parker, 1989). The Endangered Species Protection Unit within the South African Police has recently made several arrests and certainly disrupted the illegal ivory and rhinoceros horn smuggling rackets (Table 20). Special investigation units were also established by the Transvaal and Cape Provincial Administrations which have achieved a similar degree of success; the Natal Parks Board has recently also expanded its wildlife investigations section for operation outside its formal protected areas. Contacts with similar agencies in other states in the region has been actively pursued.

34. Potential Trade Threats:

341. Live specimens: An increasing trade in live African elephants sold by the National Parks Board has been a positive feature of the elephant culling programme in the Kruger National Park (Hall-Martin, 1990, 1991a). The sale of live elephant calves has resulted in new populations being established within South Africa and overseas (see Table 1 and 2). The trade in live elephants from South Africa should therefore, be seen as a positive development which enhances African elephant conservation nationally and internationally. The export of live elephants since 1986 has been covered by CITES export permits (Table 19).

342. Parts and derivatives: Some of the elephant leather derived from the culling operations in the Kruger National Park, in its processed form, was

sold in the tourism trade and moved from South Africa as personal effects of visitors. Much of the production of elephant skin was exported as tanned leather to the USA and was there used for the manufacture of leather items. The trade in elephant leather did not, in any way, constitute a threat to any elephant population (TRAFFIC 1989). No other elephant parts or derivates (other than ivory and leather) entered international trade.

4. PROTECTION STATUS

41. National: The African elephant enjoys legal protection in all the jurisdictional entities in South Africa. The exact status in each area, and the penalties for infringing on the status of the species, vary somewhat at present. There is, however, an effort underway to ensure uniform penalties for the illegal killing of elephants, or the illegal possession of ivory or trade in ivory throughout the Republic's various jurisdictional areas. Penalties providing for fines of up to R100 000 and/or 10 years imprisonment for the illegal trade in elephants and elephant products, and the illegal hunting of elephants have been enacted in all four Provinces and are also applicable for similar offenses in national parks.

The National Parks Act (No 57 of 1976) as amended prohibits hunting within a park or otherwise wilfully or negligently killing or injuring any animal (Section 21 (1) (c). The penalty for contravention is listed in Section 24 (1)(b): With regard to elephant or rhino - on conviction are liable to a fine of not less than R30 000 and not more than R100 000 or in default, imprisonment for not less than 5 years and not more than 10 years. With a previous conviction any contravention leads to imprisonment without a fine. Section 24(9) makes provision for the forfeit of weapons and vehicle in addition to the fine and imprisonment.

In Natal elephants are classified in terms of Schedule 2 of the Nature Conservation Ordinance No. 15 of 1974 as protected game. Section 37(1) of the Ordinance states that no person shall at any time hunt, capture or keep in captivity any protected game. Section 55 [1a (i)] provides that in the event of a conviction or a contravention of Section 37 a person in the case of the hunting, capture or the keeping in captivity of elephants, shall be liable to payment of a fine not exceeding R100 000 or imprisonment for a period not exceeding 10 years or to both such fine and such imprisonment. Section 51 provides that no person shall export game from Natal unless he obtains a permit from the Natal Parks Board with the prior approval of the Administrator. In terms of Section 55 the penalty for a first offender contravening this section is as in the case of elephants, the same. Section 55(2) provides that upon a second or subsequent conviction, the court may impose double the fine or alternately, double the term of imprisonment, or double the term of imprisonment without the option of a fine.

Elephants are protected wild animals in the Cape Province according to Schedule 2 of the Nature and Environmental Conservation Ordinance (No. 19 of 1974). Section 27 prohibits hunting of protected wild animals without a permit and Section 42(1) makes it an offence to possess any part of the carcass of any wild animal unless legal possession can be proved. Section 44 prohibits the import, export and transport without a permit. This is emphasised in Section 44(b) (ii)

with specific reference to CITES. Penalties for contravening these sections are covered in Section 86(1) (b) : On first conviction a fine not exceeding R 100 000 or imprisonment for a period not exceeding 10 years or to both such fine and imprisonment. Upon a second or subsequent conviction, the court may impose double the fine or alternately, double the fine term of imprisonment without the option of a fine. The confiscation of all goods, firearms, vehicles, etc., involved in both cases in the discretion of the court also exists.

The Transvaal Nature Conservation Ordinance (12 of 1983) lists the elephant as specially Protected Game (Article 15(1) (a)). Protected game may only be hunted under special permit (Article 16(1)). Penalties for contravening this article are listed in Article 16(2) (a) and (b) : A fine not exceeding R100 000 or imprisonment not exceeding 10 years, or both. A conviction also attracts an additional fine not exceeding three times the commercial value of the animal in respect of which the offence was committed. Article 97 lists the elephant as a rare and endangered species in terms of the Washington Convention and Article 98 regulates the international trade in the species and its products according to CITES requirements. Contraventions in terms of Article 98 are subject to penalties as in the case of Article 16(2) (a) and (b) quoted above. Article 32 prohibits the sale of ivory without a valid permit; Articles 37 and 38 prohibit the receipt, possession, acquisition and conveyance of raw products (ivory), Article 112 provides mandatory forfeiture of ivory following any conviction in terms of all articles quoted above.

In the Orange Free State elephant are listed as protected game. Schedule 1 Section 2(1) of the Nature Conservation Ordinance (No. 8 of 1969). No person shall hunt protected game without a permit (Section 2(3)). Export and import of elephants or products, possession, conveyance, processing and manufactures, also requires a permit. The penalty for contravention with respect to elephant is a fine not exceeding R100 000, or imprisonment not exceeding 10 years, or both.

According to the KwaZulu Nature Conservation Act (No. 8 of 1975) all wild animals are protected wild animals (Schedule 4). Section 5(1) prohibits the hunting, buying and selling of protected wild animals without authorization. The sale, donation, possession and transportation of protected wild animals is also prohibited unless under permit (Section 13). The penalties are listed in Section 37 : On a first conviction, R200 or 200 days imprisonment. On a second or subsequent conviction, no less that R400 and no more than R800 or imprisonment of not less than 400 days, but not more than 800 days. In KwaZulu elephants may be hunted legally with a permit. The KwaZulu Nature Conservation Regulations (Notice 29 of 1979) make provision as follows : Any person who kills an elephant shall within 15 days produce the ivory for registration by the Nature Conservation Officer in the region where the elephant was killed. Permits according to Schedules 5 and 13 are, however, not normally issued. Amendments to the Act, which will bring it into line with the penalties of the other agencies are at present being processed.

Bophuthatswana has two Acts that are applicable to elephants. The Bophuthatswana Nature Conservation Act (No. 3 of 1973) classified elephants as protected game (Schedule 1). Section (3)(a) prohibits hunting, buying and

selling without a permit and Section 6 the sale, donation, possession or transport of dead animals without a permit. Section 19 deals with the protection of animals in game reserves and nature reserves - hunting is prohibited. Penalties are listed in Section (28) - for contravening Section (3) (a) a fine not exceeding R100 000 or imprisonment not exceeding 5 years in the case of a first or second conviction. The penalty for a third or subsequent conviction is imprisonment without the option of a fine. The National Parks Act (No. 180 of 1987) prohibits the killing or injuring of any animal (Section 32(1) (c)). Section 36(1) (b) states the penalty for contravening Section 32 (1) (c) with specific reference to elephants. On a first conviction a fine not exceeding R100 000 or imprisonment not exceeding 5 years. Subsequent convictions lead to imprisonment without the option of a fine.

Legislation also provides that all ivory in private and state possession must be registered and marked in accordance with CITES prescriptions. This has been carried out since 1982 (Table 15). In the case of the Transvaal Ordinance regulations may be passed which will provide for mandatory fines of R50 000 or 5 years imprisonment for failure to register ivory.

The illegal hunting, or poaching, of elephants does not represent a threat to any South African elephant population. No elephants have been illegally killed in Addo in the past 50 years, no elephants are known to have been killed illegally at Knysna in the past 20 years; no illegal kills have been made in Tembe either. None of the reintroduced populations of elephants have suffered any losses due to illegal activities. In the Kruger National Park a spate of illegal incidents in 1981-83 resulted in 184 elephants being killed by poaching gangs operating from a neighbouring state. Stepped-up anti-poaching patrols resulted in a number of armed clashes in which the poaching gangs, armed with military weapons, were eliminated. Sporadic incidents of poaching of elephants in the Kruger National Park were recorded in recent years accounting for a further 20 bulls by May 1989. Since July 1989 there has been a marked increase in poaching and a total of 33 elephants were illegally killed. Thirty eight known individuals have been involved in the 33 kills. Of these 20 have so far been arrested, and four have been killed in contacts with Park Rangers. Six military weapons and two hunting rifles have been confiscated in these incidents.

The incidence of illegal killing of elephants in the Kruger National Park though having increased since the Appendix I listing, is low because of the adequate allocation of resources and manpower to the security of the Park (Hall-Martin 1990, 1991 a). Examples of the protection budget within national parks and game reserves in South Africa, as well as outside protected areas, are given in Table 21. It can be seen that the recommended protection effort of one man per 50 km² and expenditure of US$ 200 per km² (Cumming, du Toit and Stuart, 1990) is greatly exceeded in South Africa.

42. International: The status of the African elephant prior to June 1989 was discussed exhaustively in the documentation submitted to the 7th Conference of the Parties held in Lausanne, Switzerland from 1-10 October 1989. Little purpose can be served in attempting to review the situation prior to that date in the present submission. Benchmark reports on the status of the African elephant, throughout its range (Douglas-Hamilton, 1989), are contained in the

report of the Ivory Trade Review Group. The estimate for the numbers of elephants in Africa was 609 000 (Douglas-Hamilton, 1989).

5. INFORMATION ON SIMILAR SPECIES

The Asian elephant *Elephas maximus* is the only other living representative of the Proboscidea. It is also listed under Appendix I. Most threats to the Asian elephant in recent years have been as a result of habitat loss, rather than poaching for ivory (Sukumar, 1989). The poaching of Asian elephants in Laos and Vietnam reported by Martin (1990 b.), and linked by him to a rising ivory price in those two countries, is on a small scale, serving a domestic market and likely to be of little consequence to the survival of the species. No recent reports have linked the African elephant ivory market to factors affecting the Asian elephant (Martin, 1990 b.; Caldwell and Luxmoore, 1990). A recent report on the export of live Asian elephants from Myanmar (Burma) to Europe indicated that these activities constituted a threat to the status of the species in Myanmar (Broad, 1990). Subsequently both the CITES Secretariat and the Commission of the European Communities issued directives against the import of live Asian elephants from Myanmar (Broad 1990). The reported trade in elephant leather in Thailand has been shown to be based on faked products (Elephant and Ivory Information Service No.14 p.47).

6. COMMENT FROM COUNTRIES OF ORIGIN: Not applicable.

7. ADDITIONAL REMARKS

71. AERSG conditions: The opinion of the IUCN/SSC African Elephant and Rhino Specialist Group on the possibility of a split-listing for the African elephant (as was also recommended by TRAFFIC, 1989) has been published, with additional comment in Pachyderm (Western, 1990). The key paragraph for purposes of the present submission is quoted in full : "AERSG considers that the southern African position must be accommodated in the interests of elephant conservation in the region and in the interests of supporting the CITES Convention. The dual listing of African elephants on Appendix I and Appendix II is supported but must be accompanied by strong controls to ensure that trading nations do not become a conduit for illegal ivory". The statement continued to address the split-listing concept and set out five further steps which it urged should be taken if the dual listing was agreed upon. These steps are again quoted from the text of Western (1990):

1. The development, by producer states, of clear and openly stated criteria on which their elephant management programmes are based.

2. The introduction of simple and stringent controls on the movement of both raw and worked ivory between producer states and trading partners to preclude the laundering of illegal ivory.

3. The introduction of mechanisms for routinely verifying the origin of ivory shipments between legal trading partners.

4. The introduction of a moratorium by range states wishing to export ivory until such time as adequate criteria and controls have been developed and implemented.

5. A declaration by each of those states opting for Appendix I on how they intend to deal with confiscated ivory, ivory originating from management programmes such as problem animal control, and ivory from natural mortality. The volumes of ivory involved and its disposal should be clearly and openly reported to the CITES secretariat".

Clearly the first four steps are those which, in the view of the AERSG, are incumbent upon a state wishing to trade ivory from an Appendix II population. The South African management authorities submit that the first of these steps (conditions) has been clearly met in the biological criteria set out above in this submission (Section 2). The question of a moratorium has also been addressed. The South African government, while entering a reservation against the decision of the Conference of the Parties to list the African elephant in Appendix I, nevertheless announced a moratorium on ivory sales from 18 January 1990 until 31 December 1990. This moratorium has subsequently been extended and will now run until the 8th Conference of the Parties has reviewed the present submission. The initiation of the moratorium was to give the ivory ban a chance to work as many of its proponents still claim it is only of temporary necessity and to allow time for a better system of ivory trade control to be developed.

72. Ivory trade controls The proposals on how South Africa intends to meet steps 2 and 3 follow below. The setting up of simple and stringent controls on the movement and trade in ivory is fundamental to South Africa's case as well as to other southern African countries.

721. SACIM

The development of a regional ivory marketing system has been pursued by Zimbabwe, Zambia, Malawi, Namibia and Botswana who are all SADCC member states. The formation of a Southern African Centre for Ivory Marketing (SACIM) was approved in a treaty creating SACIM which was signed during June 1991. The detailed objectives of SACIM have been quoted by Caldwell and Luxmoore (1990). It is still envisaged that the regional auction floor will be set up in Gaborone and ivory will be sold under strict control. South Africa is not a member of SADCC and is not a party to the SACIM treaty.

722. Proposed South African ivory sales.

The South African authorities propose to develop a marketing system for raw ivory that will meet the conditions set by the AERSG, and be sufficiently stringent to attract the support of a majority of the CITES member-states. It is proposed that the system will operate as follows:

Origin of raw ivory

1. For the period between the 8th and 9th Conference of the Parties, and possibly even longer, the only tusks under consideration for sale are those which can be shown to be derived from the Kruger National Park and the Tembe Elephant Park.

2. The tusks have, or will, originate from natural mortality within these two areas; culling (at present only in Kruger) to maintain the ecological viability of the area; or from animals shot for crop-protection purposes or in defence of human life.

3. No confiscated tusks or legal ivory of known origin outside South Africa will be considered eligible for international trade under the proposed system. This other ivory will be considered at some later stage as a separate issue.

Worked ivory

1. No worked ivory, whether of Kruger National Park origin or otherwise will be considered for sale under the present circumstances.

Numbering and control of tusks for sale

1. The tusks accumulated by the management authorities will be numbered and marked according to CITES requirements and the record keeping of all stocks and sales will be entered into bound registers with numbered pages as well as being computerised.

2. Tusks offered for sale will be marked by unique, adhesive, tamper-proof holograms bearing the serial number of each tusk.

3. All ivory to be sold will be accumulated at one point, ideally this should be the ivory store at Skukuza in the Kruger National Park. This store and records will be open for audit and inspection by representatives of the CITES Secretariat at any time.

4. Representatives of the consuming countries will also be allowed facilities to inspect the ivory stock at any time.

Sale of ivory

1. The ivory will be sold on auction at Skukuza once per annum to approved buyers. The buyers will have to be registered as ivory manufacturers in the country of consumption, confirmed as such by the responsible management authority and the sale will not be open to ivory traders.

2. All tusks will leave Skukuza in one sealed consignment to each approved purchasing country, once per annum.

3. A small sample, suitable for isotopic analysis, will be taken from the butt of each tusk, marked with the CITES number of the tusk and

stored for possible future analysis by an independent laboratory if required.

Ivory quota

1. The annual elephant cull of the Kruger National Park is set well in advance and an estimate can, therefore, be given of the annual production of ivory so as to accord with a CITES quota system.

2. The current legal stocks of ivory of South African origin which will qualify for sale under these proposals should be sold in the first year of operation of the system so as to clear all eligible stocks (estimated at no more than 12 000 kg in September 1991).

Requirements for ivory purchasing countries

1. The current stocks of tusks, semi-worked and worked ivory in the possession of potential purchasers will have to be registered.

2. All dealers and manufacturers will have to be approved and registered in some appropriate way by the competent authority in the purchasing country.

3. The purchasing country would be required to have in place, and to be able to implement an effective ban on the export or re-export of ivory or ivory products.

4. The purchasing country would be required to implement an internal auditing system to track new tusks and ivory.

5. The authorities of the purchasing country would be required to also take samples of each tusk suitable for later isotopic analysis if required.

73. Ivory identification: The problems of the laundering of illegal ivory through any trading system approved by the CITES Parties remains the single greatest difficulty to be overcome (TRAFFIC, 1989; Western, 1990; Georgiades, Patton & Western, 1990). Indications as to how this could be done are apparent in the X-ray spectroscopy study of ivory from four different localities (Bell, Kelsall, Rawluk and Avery, 1989). This study showed that chemical differences between ivory reflecting the geochemistry of the area of origin could be measured. A different approach, to test the feasibility of using genetic markers obtained from DNA attached to tusks to identify the elephant population from which the ivory was derived has also been reported (Georgiades, et al. 1990). This technique, however, has several disadvantages as it depends not on testing pure ivory, but on the attached tissue such as dried flesh or bone. The technique could not, therefore, be used on thoroughly cleaned tusks or on worked and polished ivory. In South Africa recent research on the isotopes of carbon and nitrogen contained in elephant ivory and bone has indicated that it is feasible to establish the origin of a piece of ivory (van

der Merwe, Lee-Thorp, Thackeray, Hall- Martin, Kruger, Coetzee, Bell and Lindeque, 1990; Vogel, Talma, Hall-Martin and Viljoen, 1990; Vogel, Eglington & Auret, 1990). Furthermore the inclusion of strontium in the ivory assays added a further refinement to this technology (van der Merwe, et al. 1990; Vogel, Eglington & Auret, 1990). Ivory from clearly defined sub-regions (on the basis of soil, vegetation and rainfall) within an area the size of the Kruger National Park could also be distinguished with absolute confidence. The sourcing of ivory on the basis of its intrinsic isotopic properties offers many advantages over the DNA based methods which require soft tissue rather than ivory as the raw material (Georgiades, et al. 1990).

1. The isotopic analysis techniques can be applied to raw or worked ivory.

2. These techniques require only a small sample of ivory (less than 1,0 g) to be analyzed.
3. The tests can be carried out in numerous laboratories throughout the world, and are based on routine procedures used for the laboratory testing of foodstuffs and other commercial products.

4. The tests cost about $250 per sample and the price is likely to be less for large runs of samples.

5. This technology holds within it the possible makings of an ivory control system which could be developed to limit the laundering of illegal ivory from a source other than that claimed. By judicious sampling the ivory production of an area like the Kruger National Park could be certified as to its origin, and the ivory could be checked at any later stage in the carving, sale or use thereof.

6. An ivory control system based on the isotopic sourcing technology could only function if both supplier and consumer parties agreed to its use. It could also be independently verified by agencies outside of the transactions.

74. Sustainable use and motivation for trade: The complexities of the African elephant ivory trade, the different status of different elephant populations, and the need for controls are recognised by all responsible commentators on the issue. Mechanisms for effective control, so as to allow the sustained use of elephant products from abundant, well- managed populations are the key arguments presented by South Africa. That the sustainable use of wild animals can be an effective strategy for their conservation is clearly recognised in the declaration issued after the donors meeting in Paris in April 1990 (see Elephant and Ivory Information Service No. 10 : p 33-34). More recently, at the General Assembly of the IUCN - the World Conservation Union - held in Perth, Western Australia, a comprehensive resolution entitled "Conservation of Wildlife Through Wise Use As a Renewable Natural Resource" was unanimously accepted. This resolution, reflecting the opinion of a significant body of the world conservation movement, clearly recognised also that the sustainable use

of wildlife resources can enhance the conservation of wildlife populations and their ecosystems because of the economic and other benefits that such use provides. Clause 3, in particular, sums up the views contained in the present submission:

> "Recognises that, consistent with national and international legal obligations and policies, trade in clearly identified products derived from properly managed sustainable use of wildlife carried out in accordance with agreed guidelines and safeguards can confer incentives that enhance the conservation of the species or population involved".

The income derived from the sale of elephant products by the National Parks Board of South Africa flows directly into it's conservation budget out of which, among other activities, the protection of elephants is funded. Between 1985 and 1989 sales of elephant products yielded US$ 1,4 million per year (Table 11). The motivation for the cull, however, is elephant population control and not economic benefit. Nevertheless, with a recurrent expenditure of US$ 2,9 million per annum (Table 21) on Park security and maintenance of the wildlife estate (excluding tourism infrastructure) the contribution of the elephant cull to the economy of the Park is evident. The utilisation of the products of the elephant cull represents, therefore, an example of a sustained use of a natural resource for the benefit of the resource itself and for the people of South Africa. Such a national benefit can only contribute towards the long-term survival of the Kruger National Park and it's elephant population in the face of enormous competing demands for land and resources by a growing, and politically emancipated human population (e.g. Khan, 1990).

It has been argued on economic grounds, that to establish a controlled trade in elephant products, however small, on a sustainable yield basis will in the long term do more to ensure the survival of the African elephant than the present ban on trade (Simmons & Kreuter, 1989; Barbier and Swanson, 1990; Barbier, Burgess, Swanson & Pearce, 1990). The South African proposal allows for a pilot project and a testing of this hypothesis and the technology to control the trade under controlled conditions. It is an opportunity which could be used to develop the technology for much wider application in Africa.

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Table 1 : The legal status and size (ha) of South Africa's elephant ranges in 1991 (For location refer to map numbers in Fig. 4).

Map No.	Location	Size (ha)	Total size (ha)
National Parks (Proclaimed under the National Act of the South African Parliament)			
1	Kruger National Park	1 948 528	
2	Addo Elephant National Park	11 718	1 960 246
National Parks or Game Reserves (proclaimed under legislation of independent or self-governing states within South Africa			
3	Tembe Elephant Park, KwaZulu	29 878	
5	Pilanesberg National Park, Bophuthatswana	58 000	
8	Makuya National Park, Venda	18 500	
9	Letaba Ranch, Gazankulu	40 000	
13	Andover Game Reserve, Gazankulu	7 100	
14	Manyeleti Game Reserve, Gazankulu	22 700	
17	Methethomusha Game Reserve, KaNgwane	8 000	184 178
Game Reserves (Proclaimed under legislation of Provincial Governments)			
6	Hluhluwe/Umfolozi Game Reserve, Natal	90 000	
7	Itala Game Reserve, Natal	30 000	120 000
Forestry Reserve (Proclaimed under legislation of the South African Parliament)			
4	Knysna Forest Reserve	30 000	30 000
Privately owned land (Proclaimed as private nature reserves in terms of Provincial legislation)			
10	Foskor/Phalaborwa Mining	4 100	
16	Sabie Sand Game Reserve	57 200	
11	Klaserie Private Nature Reserve	62 818	
12	Timbavati Private Nature Reserve	78 495	
25	Mabula Lodge	8 000	
33	Mpongo Park	2 500	
23	Touchstone Game Ranch	7 500	
15	Tshakudu Game Ranch	5 000	
18	Mtibi Game Ranch	2 500	
19	Lowhills	3 000	
20	Kwalata Game Ranch	8 000	
21	Rhinoland Safaris	6 800	
24	Vosdal Game Ranch	11 500	
26	Welcome Game Ranch	2 130	
27	Mahlatini Game Ranch	1 500	
28	Rietboklaagte	2 500	
29	Sutton Game Ranch	2 000	
30	Pumalanga	2 500	
31	Phinda Resource Reserve	13 500	
32	Game Valley (Karkloof)	1 500	282 943
			2 577 367

Table 2: Numbers and crude population density (1990/91); area, and potential maximum population for existing elephant ranges in South Africa (Map no. refers to Fig.5).

Map No	Area	Size (ha)	Elephant numbers 1990/91	Density elephants /km²	Maximum elephant population	Date of first introduction
1	Kruger National Park	1 948 528	7 278	0,38	7 500	*
2	Addo Elephant National Park	8 767	162	1,84	220	*
3	Tembe Elephant Park	29 878	80	0,27	119	*
4	Knysna Forest	30 000	4	0,01	30	*
5	Pilanesberg National Park	58 000	41	0,07	174	1979
6	Hluhluwe/Umfolozi Game Reserve	90 000	146	0,16	360	1981
7	Itala Game Reserve	30 000	23	0,08	120	1990
8	Makuya National Park	18 500	40	0,22	65	*
9	Letaba Ranch	40 000	31	0,07	120	1987
10	Phalaborwa Mining Co.	4 100	14	0,34	14	*
11	Klaserie Private Nature Reserve	62 818	395	0,63	238	*
12	Timbavati Private Nature Reserve	78 495	190	0,24	297	*
13	Andover Game Reserve	7 100	10	0,14	27	1987
14	Manyeleti Game Reserve	22 700	10	0,04	86	*
15	Tshukudu Game Ranch	5 000	2	0,04	19	1990
16	Sabi-Sand Game Reserve	57 200	60	0,11	217	1975
17	Mthethomusha Game Reserve	8 000	8	0,10	30	1990
18	Mtibi Game Ranch	2 500	3	0,12	10	1991
19	Lowhills	3 000	3	0,10	11	1991
20	Kwalata Game Ranch	8 000	7	0,09	30	1989
21	Rhinoland Safaris	6 800	6	0,09	25	1991
22	Venetia Mine	35 000	5	0,02	105	1991
23	Touchstone Game Ranch	7 500	10	0,13	26	1990
24	Vosdal Game Ranch	11 500	3	0,03	34	1990
25	Mabula Lodge	8 000	8	0,10	24	
26	Welcome Game Ranch	2 130	5	0,23	8	1991
27	Mahlatini Game Ranch	1 500	5	0,33	6	1991
28	Rietboklaagte	2 500	3	0,12	10	1991
29	Sutton Game Ranch	2 000	4	0,20	8	1990
30	Pumalanga	2 500	3	0,12	10	1990
31	Phinda Resource Reserve	13 500	20	0,15	54	1991
32	Karkloof Falls Safari Park	1 400	2	0,14	11	1988
33	Mpongo Park	2 500	8	0,32	37	1988
			8 590		10 045	

* Natural Population

Table 3 : Estimates of elephant numbers in the Kruger National Park 1903 - 1990

Year	Number	Nature of Estimate	Source
1903	0	Local knowledge	Stevenson-Hamilton 1903a, 1903b
1905	10	Local knowledge	Stevenson-Hamilton 1905
1912	25	Estimate	Stevenson-Hamilton 1912
1925	100	Estimate	Stevenson-Hamilton 1925
1931	135	Estimate	Pienaar, Van Wyk & Fairall 1966
1932	170	Estimate	Stevenson-Hamilton 1932
1933	200	Estimate	Stevenson-Hamilton 1933
1936	250	Estimate	Stevenson-Hamilton 1936
1937	400	Estimate	Stevenson-Hamilton 1937
1946	450	Estimate	Sandenbergh 1946
1947	560	Estimate	Pienaar, Van Wyk & Fairall 1966
1954	740	Estimate	Steyn 1958
1958	995	Estimate	Pienaar, Van Wyk & Fairall 1966
1960	1186	Aerial survey	Pienaar, Van Wyk & Fairall 1966
1962	1750	Fixed-wing survey	Pienaar 1963
1964	2374	Helicopter count *	Pienaar, Van Wyk & Fairall 1966
1967	6586	Helicopter count *	Cited in Hall-Martin 1984
1968	7701	Helicopter count *	Cited in Hall-Martin 1984
1969	8312	Helicopter count *	Cited in Hall-Martin 1984
1970	8821	Helicopter count *	Cited in Hall-Martin 1984
1971	7916	Helicopter count *	Cited in Hall-Martin 1984
1972	7611	Helicopter count *	Cited in Hall-Martin 1984
1973	7965	Helicopter count *	Cited in Hall-Martin 1984
1974	7702	Helicopter count †	Cited in Hall-Martin 1984
1975	7408	Helicopter count †	Cited in Hall-Martin 1984
1976	7257	Helicopter count †	Cited in Hall-Martin 1984
1977	7715	Helicopter count †	Cited in Hall-Martin 1984
1978	7478	Helicopter count †	Cited in Hall-Martin 1984
1979	No census		
1980	7454	Helicopter count †	Cited in Hall-Martin 1984
1981	7343	Helicopter count †	Cited in Whyte 1990
1982	8051	Helicopter count †	Cited in Whyte 1990
1983	8678	Helicopter count †	Cited in Whyte 1990
1984	8273	Helicopter count †	Cited in Whyte 1990
1985	6887	Helicopter count †	Cited in Whyte 1990
1986	7617	Helicopter count †	Cited in Whyte 1990
1987	6898	Helicopter count †	Cited in Whyte 1990

Year	Number	Nature of Estimate	Source
1983	8678	Helicopter count †	Cited in Whyte 1990
1984	8273	Helicopter count †	Cited in Whyte 1990
1985	6887	Helicopter count †	Cited in Whyte 1990
1986	7617	Helicopter count †	Cited in Whyte 1990
1987	6898	Helicopter count †	Cited in Whyte 1990
1988	7344	Helicopter count †	Cited in Whyte 1990
1989	7468	Helicopter count †	Cited in Whyte 1990
1990	7278	Helicopter count †	Cited in Whyte 1990

* Census using Bell G47 helicopter

† Census using Bell Jet Ranger helicopter

Table 4 : A comparison between the observed and expected elephant census totals for the KNP (1982 - 1990).

YEAR	EXP	OBS	DEV (O-E)	%
82	7 890	8 051	161	2.0
83	9 061	8 678	-383	-4.4
84	7 619	8 273	654	7.9
85	7 192	6 887	-305	-4.4
86	7 114	7 617	503	6.6
87	7 270	6 898	-372	-5.4
88	6 824	7 344	520	7.1
89	7 208	7 468	260	3.5
90	7 266	7 278	12	0.2
MEAN				1.4

Table 5 : Numbers of elephant in the Addo Elephant National Park 1931 - 1990[7]

Year	Number	Year	Number
1931	11	1961	32
1932	12	1962	35
1933	15	1963	41
1934	15	1964	43
1935	18	1965	45
1936	21	1966	46
1937	23	1967	52
1938	25	1968	54
1939	23	1969	58
1940	20	1970	59
1941	20	1971	63
1942	20	1972	68
1943	20	1973	70
1944	18	1974	75
1945	18	1975	78
1946	18	1976	89
1947	18	1977	93
1948	19	1978	99
1949	22	1979	102
1950	20	1980	105
1951	18	1981	108
1952	18	1982	112
1953	20	1983	116
1954	20	1984	118
1955	22	1985	120
1956	24	1986	127
1957	26	1987	135
1958	28	1988	140
1959	26	1989	151
1960	29	1990	162

[7] Individually known population from 1931 and from 1978 an annual helicopter census as well

Table 6 : Estimates of elephant numbers in the Tembe Elephant Park, Sihangwane area, 1947 - 1991

Year	Number	Nature of Estimate	Source
1947	35 - 40	Estimate - local knowledge	A.I. Ferraz and H.C. Lugg in Bruton, Smith and Taylor 1980
1971	16	Estimate	T.P. Dutton in Ostrosky 1988b.
1973	15 - 25	Estimate	Anonymous 1978
1974	20 - 40	Estimate and aerial survey	G. Thomson 1978
1976	20 - 30	Helicopter survey and ground tracking	Hall-Martin (1977)
1980	50	Fixed wing survey and photography	A.J. Hall-Martin in Rautenbach, Skinner and Nel 1980
1981	75	Estimate	Klingelhoeffer 1987
1984	39	Minimum helicopter count	Ostrosky 1988b.
1985	32	Minimum helicopter count	Ostrosky 1988b.
1986	35	Minimum helicopter count	Ostrosky 1988b.
1987	41	Minimum helicopter count	Ostrosky 1988b.
1988	80	Minimum helicopter count and known individuals - photo file	Ostroskry 1988b.
1990	80	Minimum helicopter count and known individuals - photo file	E.W. Ostrosky 1991 pers. comm.

Table 7 : Estimates of elephant numbers in the Knysna Forest, 1876 - 1990

Year	Number	Nature of Estimate	Source
1876	400 - 500	Estimate of Capt. Harrison, Conservator of Forests	Phillips 1925
1902	30 - 50	Forestry Dept. Records	Dommisse 1951
1904	20	Forestry Dept. Records	Dommisse 1951
1908	20	Forestry Dept. Records	Dommisse 1951
1910	17	Forestry Dept. Records	Dommisse 1951
1914	13	Forestry Dept. Records	Dommisse 1951
1916	10 - 12	Forestry Dept. Records	Koen 1981
1918	15 - 16	Forestry Dept. Records	Koen 1981
1920	13	Record less 5 killed by Maj. Pretorius	Hall-Martin 1980
1921	12	Forestry Dept. Records	Koen 1981
1924	13	Observations of individuals	Phillips 1925
1925	12	Observations of individuals	Phillips 1925
1928	10 - 13	Observations of individuals	Burton 1968
1931	13	Forestry Dept. Records	Koen 1981
1940	7	Forestry Dept. Records	Roberts 1951
1942	8	Forestry Dept. Records	Roberts 1951
1943	7	Forestry Dept. Records	Roberts 1951
1950	4	Bernard Carp Expedition	Koen 1981
1951	4 - 8	Forestry Dept. Records	Dommisse 1951
1955	7	Fraser Expedition	Koen 1981
1967	7 - 11	Forestry Dept. Records	Burton 1968
1968	7	Individuals identified	Keeping, Smuts and David 1968
1969	10	Individuals identified	Carter 1970
1970	13	Forestry Dept. Records	Koen 1981
1974	6	Forestry Dept. Records	Koen 1981
1976	4	Forestry Dept. Records	Koen 1981
1977	6	Stroebel family records	Koen 1981
1979	4	Forestry Dept. Records	Koen 1981
1981	3	Forestry Dept. Records	Koen 1981
1989	4	Birth of calf - press release	'Die Burger' Cape Town 1989.02.24
1991	4	Forestry Dept. Records	G. von dem Bussche, pers. comm.

Table 8 : **Estimates of elephant numbers in the Klaserie Private Nature Reserve, Eastern Transvaal, 1970 - 1990**

Year	Number	Nature of Estimate	Source
1970	20	Local knowledge	*Research report P.C. Viljoen
1978	125	Aerial census	Research report P.C. Viljoen
1980	180	Aerial census	Research report P.C. Viljoen
1983	146	Aerial census	Research report P.C. Viljoen
1984	184	Aerial census	Research report P.C. Viljoen
1985	119	Helicopter census	Research report P.J. de Villiers
1986	129	Helicopter census	Research report P.J. de Villiers
1988	144	Helicopter census	Research report P.J. de Villiers
1989	268	Helicopter census	Research report P.J. de Villiers
1990	395	Helicopter census	Research report P.J. de Villiers

* All Research reports are official documents of the Chief Directorate of Nature and Environmental Conservation of the Transvaal Provincial Administration, Pretoria

Table 9 : **Estimates of elephant numbers in the Timbavati Private Nature Reserve, Eastern Transvaal 1970 - 1990**

Year	Number	Nature of Estimate	Source
1970	40	Local knowledge	*Research report P.J. de Villiers
1985	39	Helicopter census	Research report P.J. de Villiers
1986	89	Helicopter census	Research report P.J. de Villiers
1988	129	Helicopter census	Research report P.J. de Villiers
1989	153	Helicopter census	Research report P.J. de Villiers
1990	167	Helicopter census	Research report P.J. de Villiers

* All Research reports are official documents of the Chief Directorate of Nature and Environmental Conservation of the Transvaal Provincial Administration, Pretoria

Table 10 : National Parks and Game Reserves identified for elephant introduction in South Africa, 1992 - 2000.

Area	Size (ha)	Potential Density Elephants/km²	Potential elephant population
Zuurberg National Park	24 138	1,0	241
Kransberg National Park	30 000	0,3	90
Vaalbos National Park	22 696	0,25	57
Greater Tembe/Ndumu Elephant Park	45 103	0,25	113
Songimvelo Game Reserve	65 000	0,3	195
Greater St. Lucia Wetland Park	150 000	0,35	525
Mkuze Game Reserve	40 000	0,4	160
Andries Vosloo Kudu Reserve	17 000	1,0	170
Double Drift Nature Reserve	23 000	1,0	230
Madikwe Game Reserve	70 000	0,3	210
Molopo Game Park	8 000	0,25	20
Borakalako Game Reserve	14 000	0,4	56
Botsalano Game Reserve	6 000	0,25	15
Loskop Dam Nature Reserve	16 000	0,3	48
Atherstone Nature Reserve	13 000	0,3	39
	543 937		2 169

Table 11 : Income derived from the sale of elephants and elephant products by the Kruger National Park 1985-1990. All values in US$ converted at the mean rate of exchange for each year.

	1985	1986	1987	1988	1989	1990
Ivory	791 808	912 400	559 514	574 412	816 366	0
Skin	407 140	236 257	346 584	622 253	359 510	0
Meat - tinned	114 939	40 919	47 475	24 920	23 077	43 005
Meat - dried	112 367	33 605	31 999	42 826	38 462	45 153
Meat - fresh	36 394	57 765	74 923	79 795	57 692	53 561
Fat	35 281	13 460	12 129	11 819	4 035	13 116
Carcass meal	68 380	61 273	48 464	55 050	40 928	47 793
Elephant	47 541	-	81 596	43 810	42 500	113 077
TOTAL :	**1 613 849**	**1 355 678**	**1 202 682**	**1 454 885**	**1 382 570**	**315 705**

Table 12 : Export and re-export of tusks from South Africa, 1986 - 1989

Year	No. of ZA-marked comm. tusks	Mass: Kg	Re-exported tusks: non-ZA	Mass: Kg	Carved tusks	Mass: kg	Trophy tusks	Mass: kg
1986	4 203	30 682	118	909	449	-	52	911,8
1987	2 060	14 523	280	2 948	437	-	55	904,1
1988	683	8 086	229	1 344	690	-	-	-
1989	575	8 590	127	1 289	400	-	12	242,2

Table 13 : Comparison of South African ivory imports and exports (kg) by year 1980 - 1989. Data derived from W.C.M.C. records (see text).

YEAR	IMPORTS		EXPORTS	
	Kg	Pieces	Kg	Pieces
1980	22 291	145	11 730	290
1981	19 622	20 900	18 985	285
1982	63 785	5	54 115	263
1983	79 029	2 695	57 748	9 729
1984	45 600	354	52 563	23
1985	61 869	151	79 131	97
1986	32 570	28	31 676	27 050
1987	24 927	85	26 287	45
1988	25 009	2 771	26 953	657
1989	16 174	11	23 810	32
Total	390 876	27 145	382 998	38 471

Table 14 : Mean prices paid for tusks from the Kruger National Park at twice-yearly sales, 1983 - 1989. Prices quoted in South African Rands.

YEAR	1st Tender	2nd Tender
1983	60.00	-
1984	63.00	164.00
1985	210.50	247.83
1986	284.00	269.33
1987	290.83	333.17
1988	407.33	519.17
1989	606.00	727.20

Table 15 : **Summary of ivory marked according to CITES specifications by the management authorities in South Africa 1982-1989.**

Year	Natal		Transvaal		Cape		O.F.S.	
	Tusks	Mass (KG)	Tusks	Mass (KG)	Tusks	Mass (KG)	Tusks	Mass (KG)
1982	53	319,75	4 845	34 520,0	216	2 204,6	0	-
1983	44	673,00	466	5 045,6	456	4 550,7	14	208,04
1984	57	400,97	551	4 831,0	45	609,6	0	-
1985	499	5 376,20	1 547	14 864,0	50	474,2	0	-
1986	1000	10 402,71	2 288	16 119,0	287	2 913,1	48	452,39
1987	158	2 308,02	305	3 880,7	55	515,0	102	832,40
1988			235	2 017,7	-	-	45	546,56
1989			1 740	17 723,3	15	147,2	4	5,0
Total	**1 811**	**19 480,65**	**11 977**	**99 001,3**	**1 124**	**11 414,4**	**213**	**2 044,39**

Table 16 : **Registered ivory stocks held in South Africa in mid-1991.**

	Region	Tusks	Total Weight (kg)
Private Property	Transvaal	2 599	27 616,16
	Natal	1 655	17 986,93
	Cape Province	330	2 705,25
	O. F. S.	244	2 293,98
Dealers	Transvaal	[illegible]	3 834,62
Management Authorities	Transvaal - confiscated	189	1 365,74
	- crop protection	125	903,27
	Natal - confiscated	415	1 300,00
	Cape Province - confiscated	104	852,56
	Kwazulu - confiscated	9	35,80
	- natural mortality	33	428,10
	National Parks Board - culling and mortality	1 196	6 655,10
	S.A. Police - confiscated	200	1 960,00
Total		**7 809**	**67 937,51**

Table 17 : Number of tusks harvested by the National Parks Board from 1973 - 1991.

Year of Harvest	Number of Tusks	Total Weight (kg)
1973	939	4 194,0
1974	1 297	5 478,5
1975	1 592	5 866,5
1976	721	3 226,0
1977	643	4 628,9
1978	906	4 661,6
1979	733	4 488,2
1980	654	3 567,4
1981	954	5 823,7
1982	278	4 388,5
1983	829	6 776,4
1984	2 304	12 087,0
1985	2 044	10 238,3
1986	558	6 359,9
1987	709	3 914,8
1988	525	3 521,0
1989	695	4 544,7
1990	495	2 922,9
1991	383	1 961,7
Mean	**908**	**5 192,1**

Table 18 : Current ivory stocks held by the National Parks Board.

Year of Harvest	No. of Tusks on Stock	Total Weight (kg)
1988	24	123,3
1989	307	1 917,6
1990	490	2 722,0
1991	375	1 892,2
Total	1 196	6 655,1

Table 19: **Exports of live elephants from South Africa, 1986 - 1989.**

Year	No. of live elephants exported
1986	5
1987	20
1988	20
1989	18
1990	33

Table 20 : **Record of arrests and confiscation of ivory and rhinoceros horn by the Endangered Species Protection Unit of the South African Police, 1989 - 1991.**

Case	Date	No. arrested	Citizenship	Rhino horns	Tusks	Other
1	89/02/20	1	Portuguese	-	130	-
2	89/08/10	1	Taiwanese	-	106	-
3	90/10/31	2	Taiwanese	110	-	-
4	90/11/05	2	Taiwanese	29	-	-
5	90/11/06	3	RSA	-	3	-
6	90/12/19	3	RSA	-	1	-
7	90/12/19	3	RSA	-	3	-
8	90/01/07	2	RSA	1	-	-
9	90/01/07	3	RSA	-	1	-
10	90/01/11	2	RSA	1	-	-
11	91/02/04	3	Zambia	21	14	-
12	91/02/04	2	RSA	-	1	-
13	91/02/04	2	Zambia	13	-	-
14	91/02/04	3	RSA	3	4	-
15	91/02/20	2	RSA	1	-	-
16	91/02/21	3	RSA	3	-	-
17	91/02/22	1	Zambia	6	-	-
18	91/02/25	3	RSA	-	-	Dead Animals
19	91/02/25	3	Zaire	-	-	1 060 pieces worked ivory
20	91/02/25	1	RSA	1	-	-
21	91/03/15	1	RSA	7	7	-
22	91/04/11	1	Zaire	-	-	108 ivory blocks

Case	Date	No. arrested	Citizenship	Rhino horns	Tusks	Other
23	91/04/15	1	Zambia	1	-	-
24	91/04/26	1	Zimbabwe	-	1	-
25	91/05/13	2	Zimbabwe	-	2	-
26	91/05/19	2	Zimbabwe	2	-	-
27	91/06/11	1	Botswana	1,2 kg	27 kg	-
28	91/08/27	4	Malawi	1	2	-
29	91/01/03	6	RSA	1	-	-
30	91/05/07	4	RSA	1	-	-
31	91/05/23	3	RSA	2	-	-
32	91/06/03	3	RSA	-	2	-
33	91/06/17	3	RSA	1	-	-
34	91/06/13	2	Taiwanese	55	-	-
35	91/06/22	2	RSA	-	2	-
36	91/06/27	5	RSA	-	2	-
37	91/06/25	1	Malawi	-	6	-
38	91/07/03	2	RSA	-	1	-
39	91/07/03	2	RSA	1	-	-
40	91/07/06	1	Namibia	-	9	-
41	91/07/13	1	RSA	1	-	-
42	91/07/22	1	RSA	-	1	-
43	91/07/29	2	RSA	1	-	-
44	91/07/30	3	RSA	-	2	-
45	91/08/09	2	RSA	1	-	-
46	91/08/09	2	RSA	-	3	-
47	91/08/21	3	RSA	-	1	-
48	91/08/22	3	RSA	1	2	-
49	91/08/13	2	Zaire	-	-	1 115 ivory blocks - 57 kg
50	91/08/21	2	RSA	-	1	-
51	91/08/21	2	RSA	1	-	-
52	91/08/23	1	Taiwanese	-	-	2 667 ivory blocks - 113 kg
53	91/08/28	4	Zambia/Botswana	1	-	-
54	91/09/02	2	Botswana	1	-	-
55	91/09/03	2	Zimbabwe	-	-	2 ivory pieces
56	91/09/09	1	RSA	2	-	-
Total		**125**		**282**	**334**	

Table 21 : **Examples of the allocation of resources to protection of conservation areas in different regions, and by different agencies in South Africa in 1990**

Within protected areas

Region	Area ha.	Protection staff	Protection[1] budget - US$	Operational[2] budget - US$	Km²/ man	Protection[3] US$/Km²	Operational US$/Km²
Kruger NP	1 948 528	209	$2 929 207	$2 606 785	93,2[4]	$ 150,30[4]	$ 133,80[4]
Addo ENP[5]	8 767	13	$ 108 996	$ 73 878	6,8	$1 243,20	$ 842,70
Natal	575 774	922	$7 714 286	$3 857 143	6,2	$1 340,00	$ 670,00
Maputoland[6]	60 000	147	$1 150 000	$ 455 357	4,1	$1 916,60	$ 758,90
Bophuthat-swana	55 000	55	$ 773 822	$ 373 000	27,6	$1 406,90	$ 678,20
OFS	164 479	341	$1 714 286	$ 957 143	4,8	$1 042,11	$ 581,85
Transvaal	224 482	480	$3 250 000	$2 214 286	4,7	$1 447,66	$ 986,32
Cape	1 633 270	449	$8 505 214	$5 783 545	36,4	$ 520,77	$ 354,12

Within administrative regions (Not including protected areas)

Region	Area Km²	Law enforce-ment staff	Protection[1] Budget - US $	Operational[2] Budget - US $	Km² / man	Law en-forcement[3] US$/Km²	Operational US$/Km²
Natal	55 781	108	$ 857 142	$ 428 571	516,4	$ 15,49	$ 7,70
Maputoland[6]	8 500	4	$ 14 285	-	2 125	$ 1,70	-
Bophuthat-swana	4 400	49	$ 377 162	$ 368 839	89,8	$ 85,72	$ 83,83
OFS	127 670	52	$ 750 000	$ 714 285	2 455,2	$ 5,87	$ 5,59
Transvaal	262 499	210	$1 678 571	$1 357 143	1 249,9	$ 6,39	$ 5,17
Cape	721 000	434	$5 670 142	$3 855 696	1 661,3	$ 7,86	$ 5,35

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1 Protection budget includes total annual allocation for salaries, vehicle running costs, recurrent costs (road maintenance, fire control, camp upkeep, etc) and capital expenditure

2 Operational costs are for salaries, travel/subsistance and recurrent costs (eg. transport) only

3 An exchange rate of R2, 80 = $1.00 has been used

4 An additional force of 250 military personnel, permanently deployed in the Park effectively halves the km²/man and has the effect also of doubling the US$/km² spent on protection.

5 The additional 2951 ha reflected in Table 1 and 2 and referred to in the text has not yet been incorporated into the elephant range - fencing is in progress

6 Maputoland (N. KwaZulu) protected areas include forest reserves

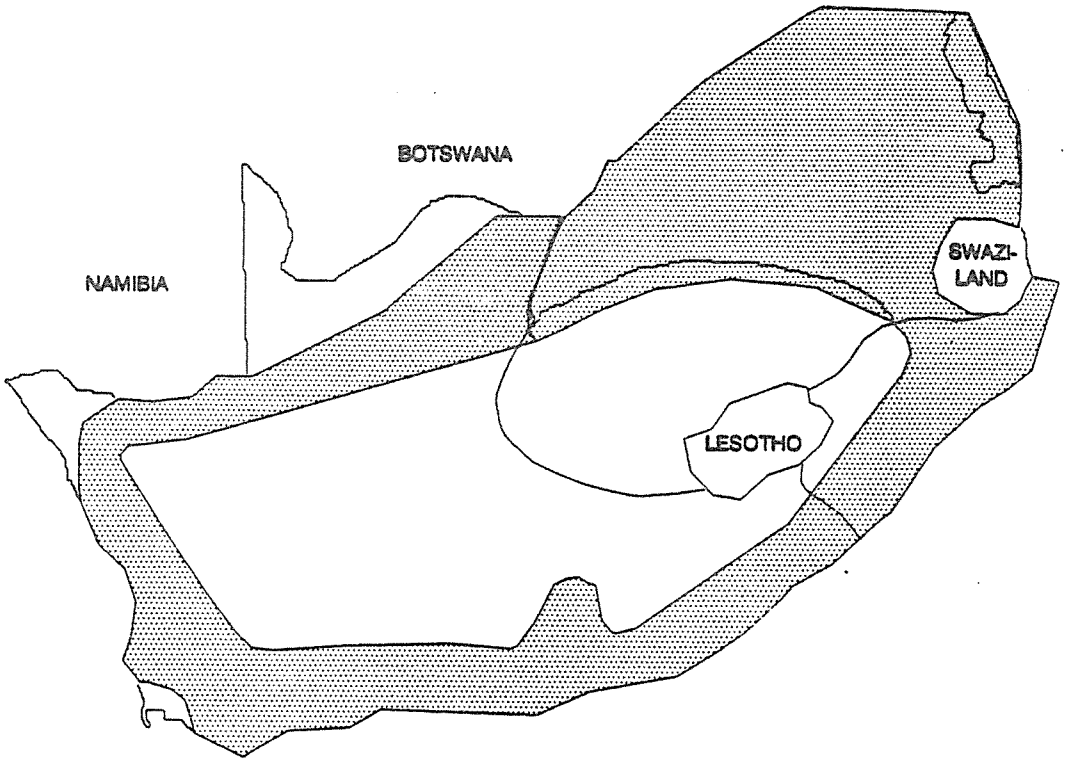


Fig. 1. Distribution of the African elephant in South Africa ca. 1650 (location of the Kruger National Park is shown in outline).

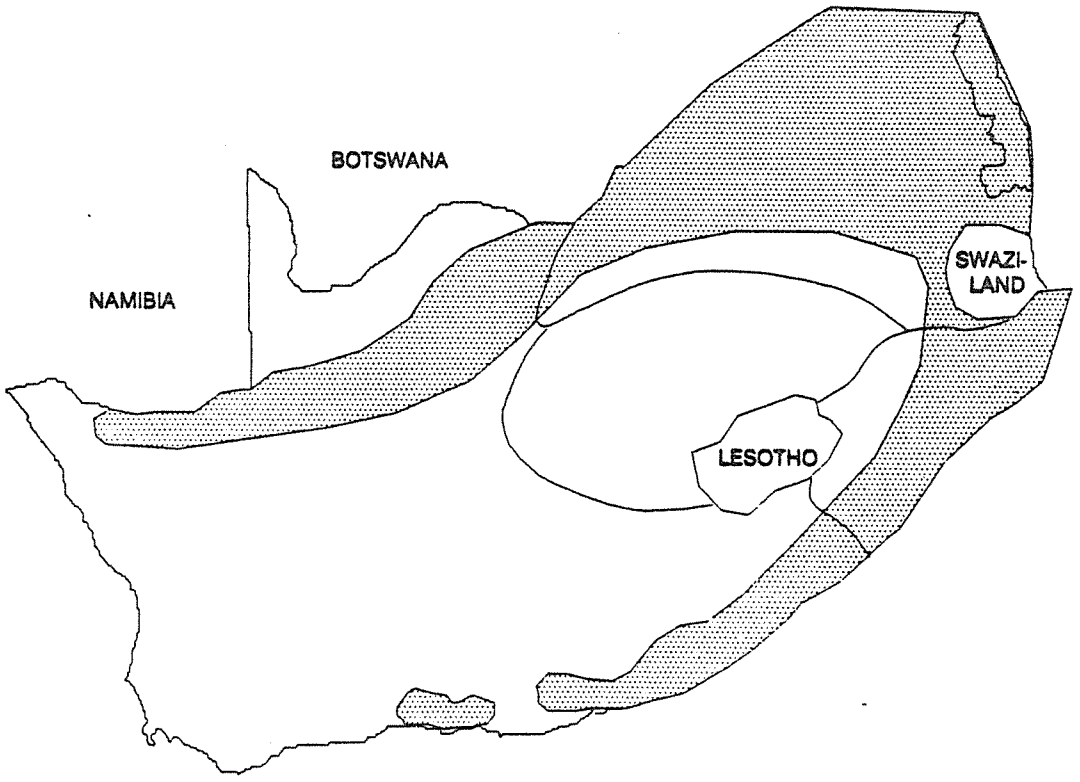


Fig. 2. Distribution of the African elephant in South Africa ca. 1800.

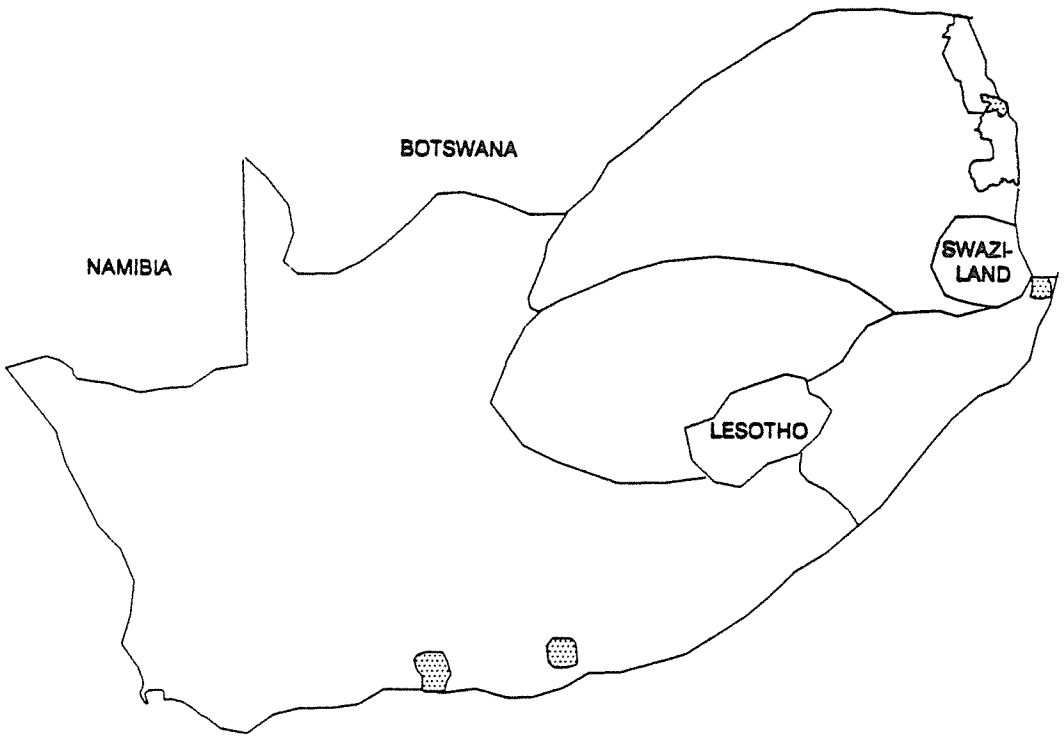


Fig. 3. Distribution of the African elephant in South Africa ca. 1910

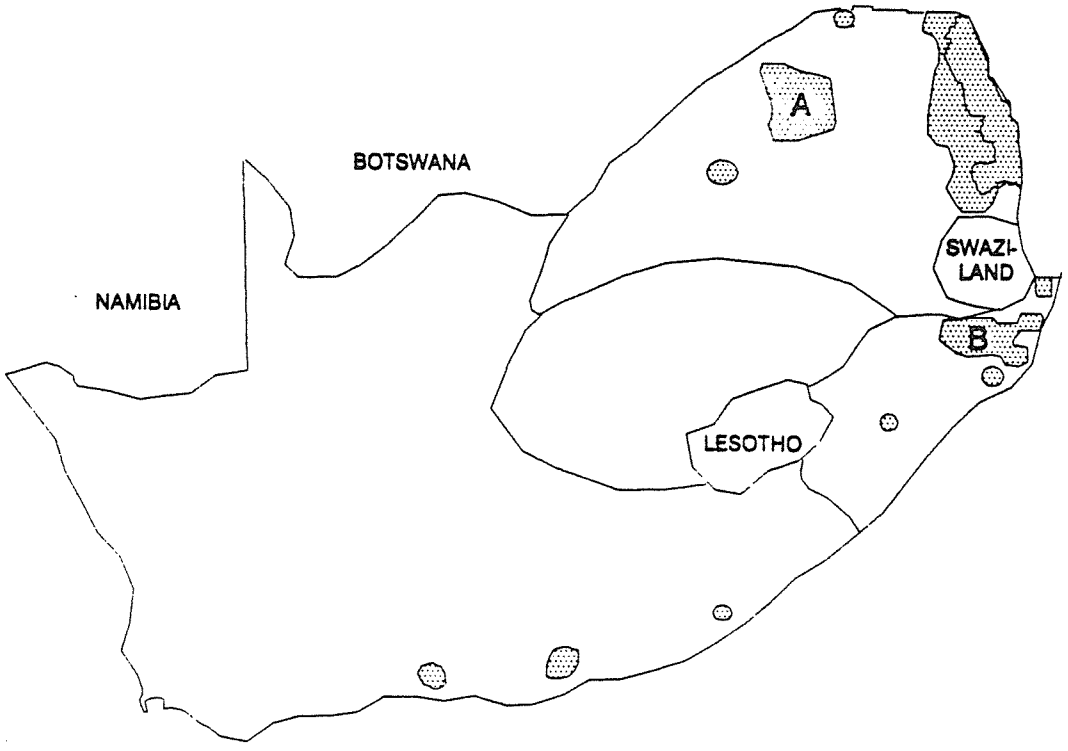


Fig. 4. Distribution of the African elephant in South Africa, 1991 (A and B indicate regions where many small, translocated populations occur on privately owned land).

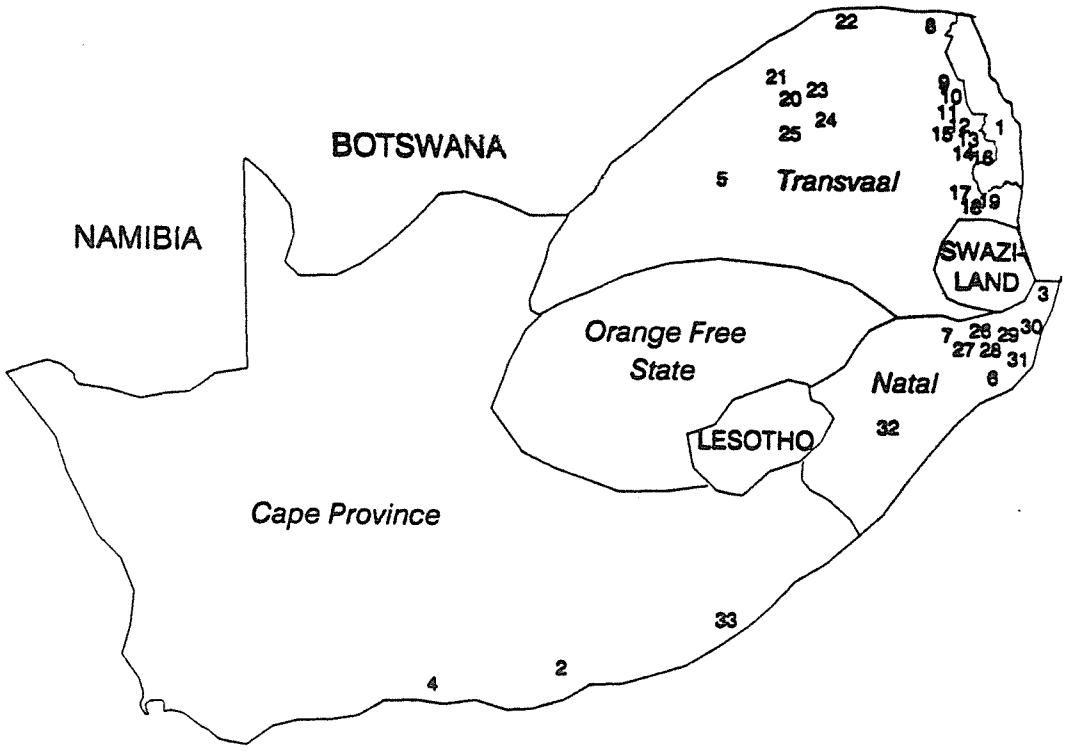


Fig. 5. Localities of all natural and translocated African elephant populations in South Africa, June 1991.

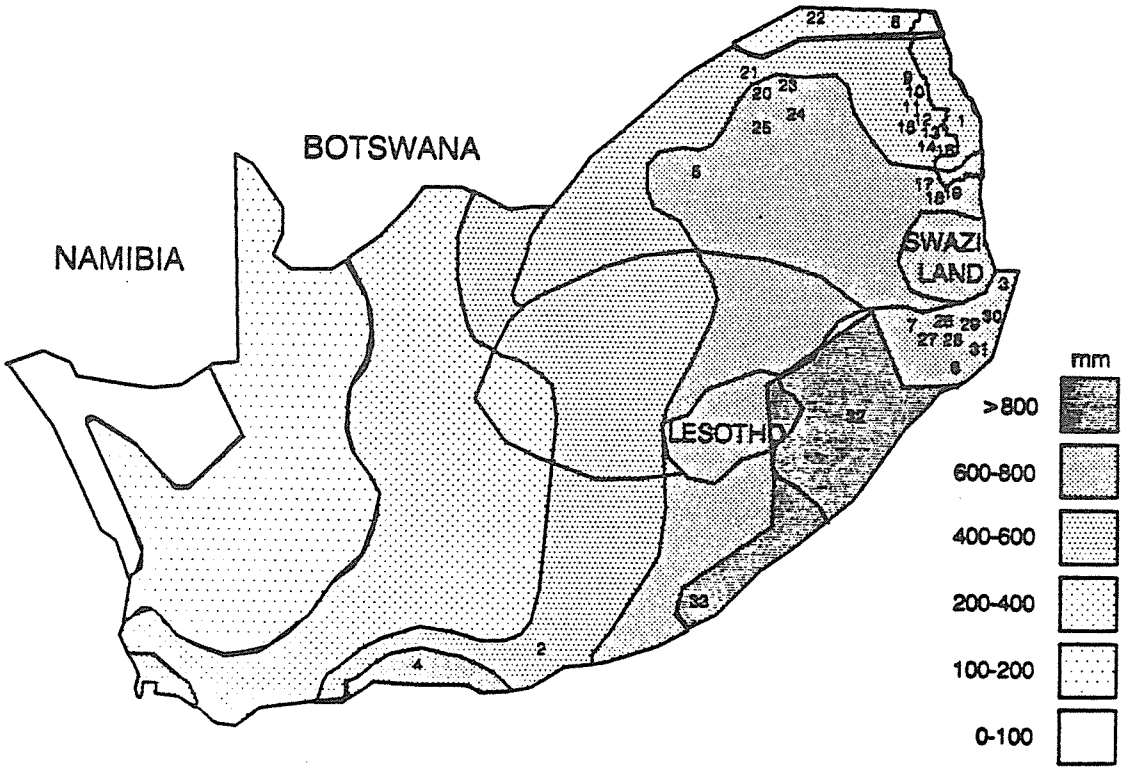


Fig. 6. The distribution of African elephants in South Africa in 1991 relative to generalised mean annual rainfall isohyets.

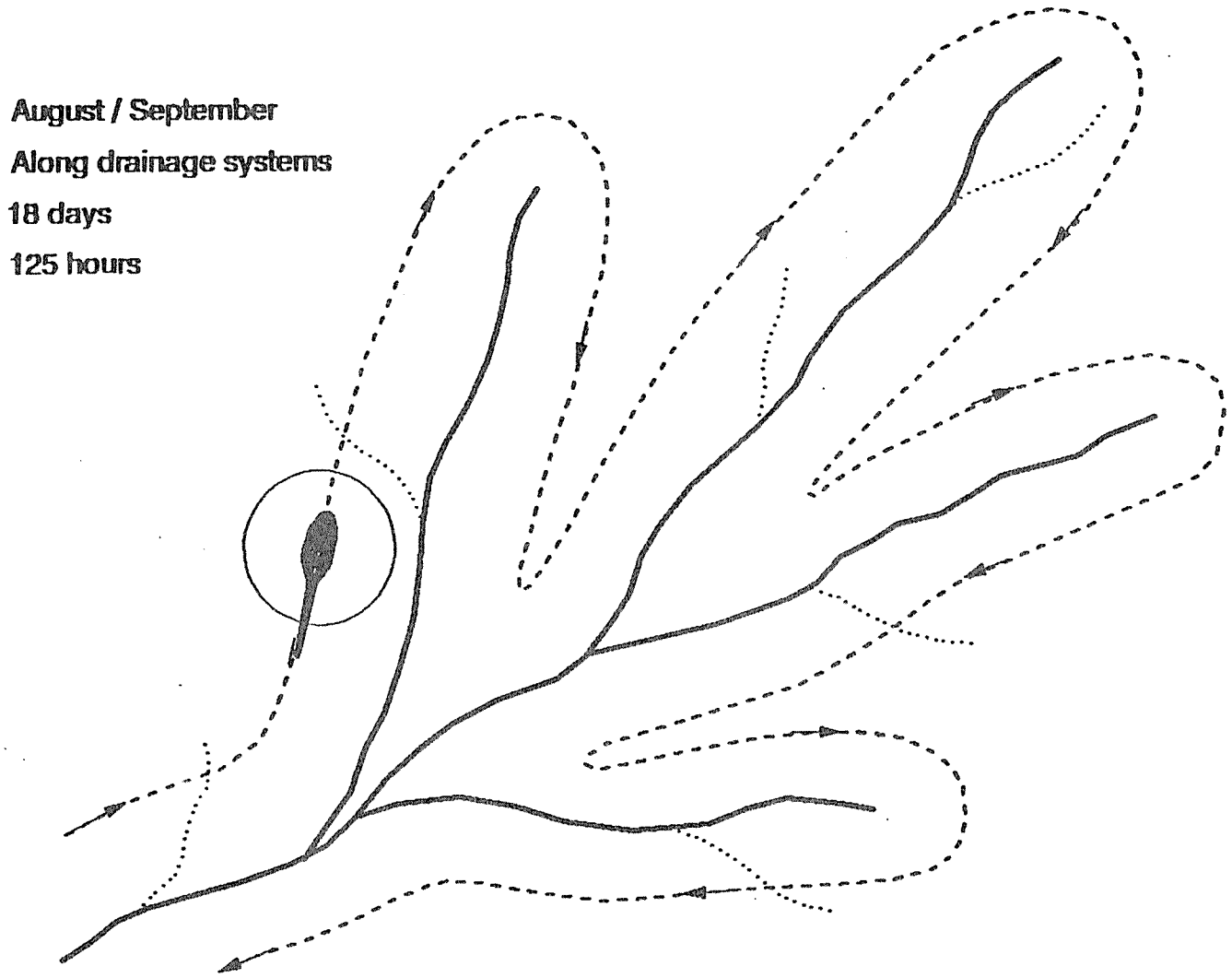
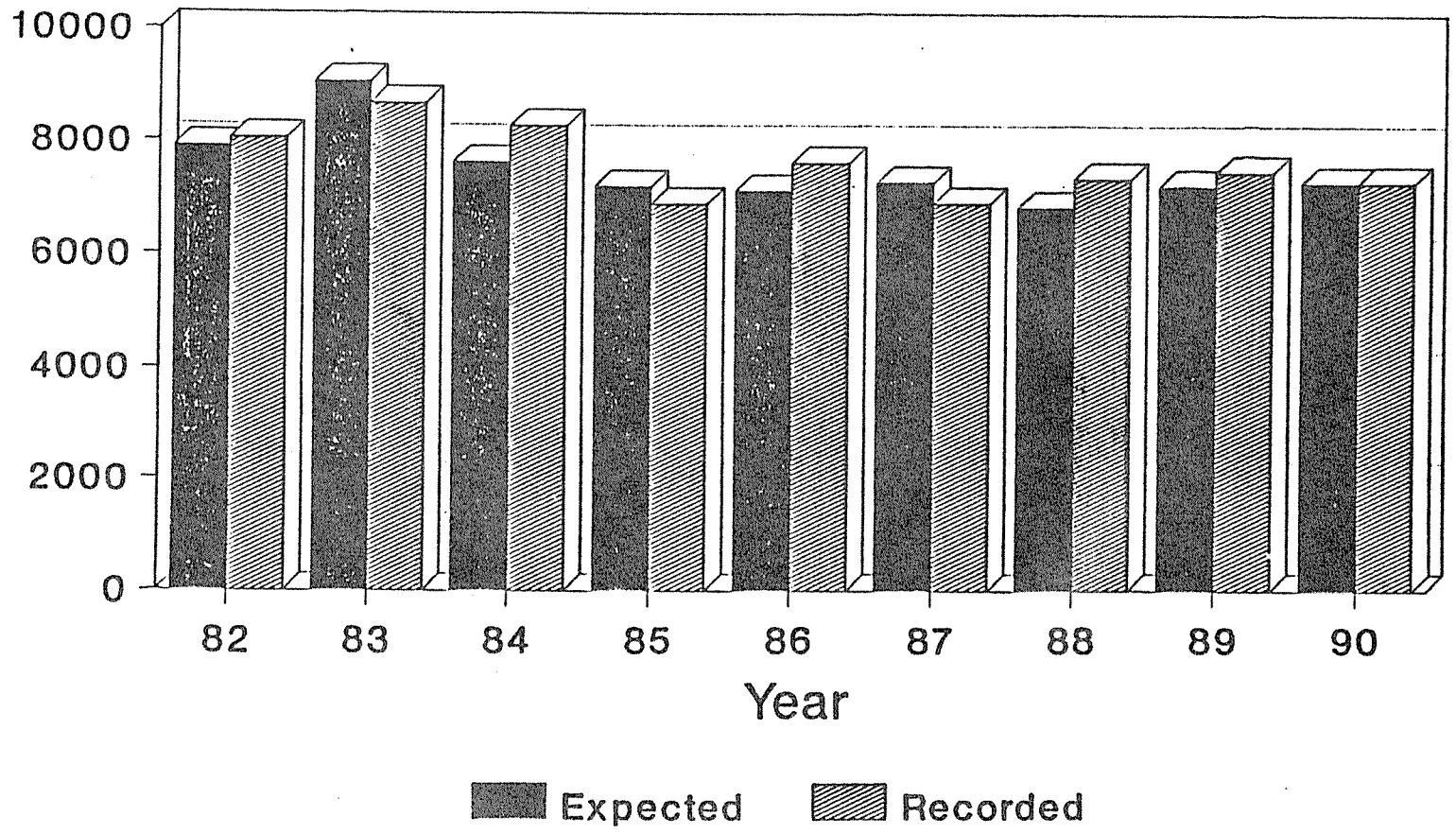


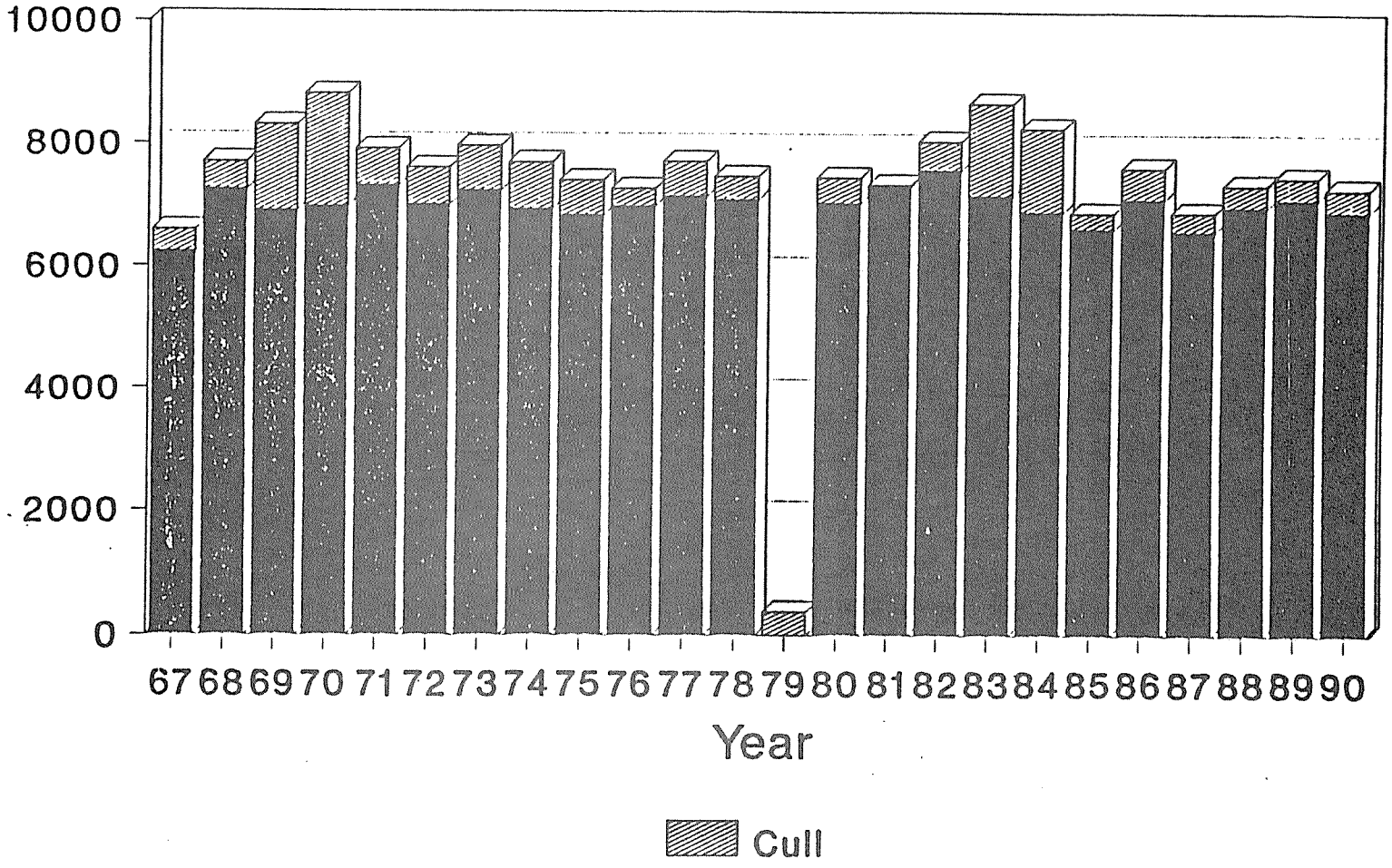
Fig. 7. Schematic representation of helicopter flight path relative to drainage lines during elephant census, Kruger National Park.

Fig. 8. Histograms showing expected numbers and actual numbers of elephants recorded during census in the K.N.P., 1982 - 1990.



E = R + B - C
E: Expected; R: Previous year's total
B: Calves born; C: Cull

Fig. 9. Histograms showing elephant population counted in Kruger National Park and quotas of elephants culled in each year. (1967 - 1990)



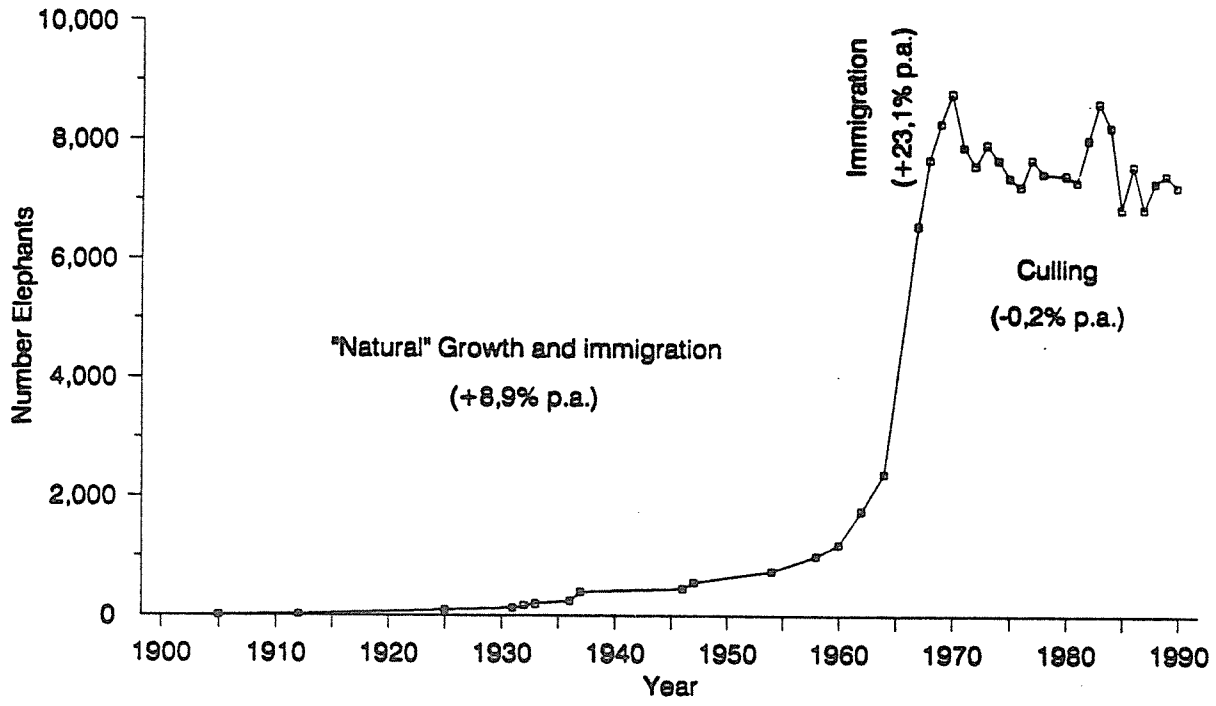


Fig. 10. Trend of the African elephant population in the Kruger National Park, 1900 - 1990.

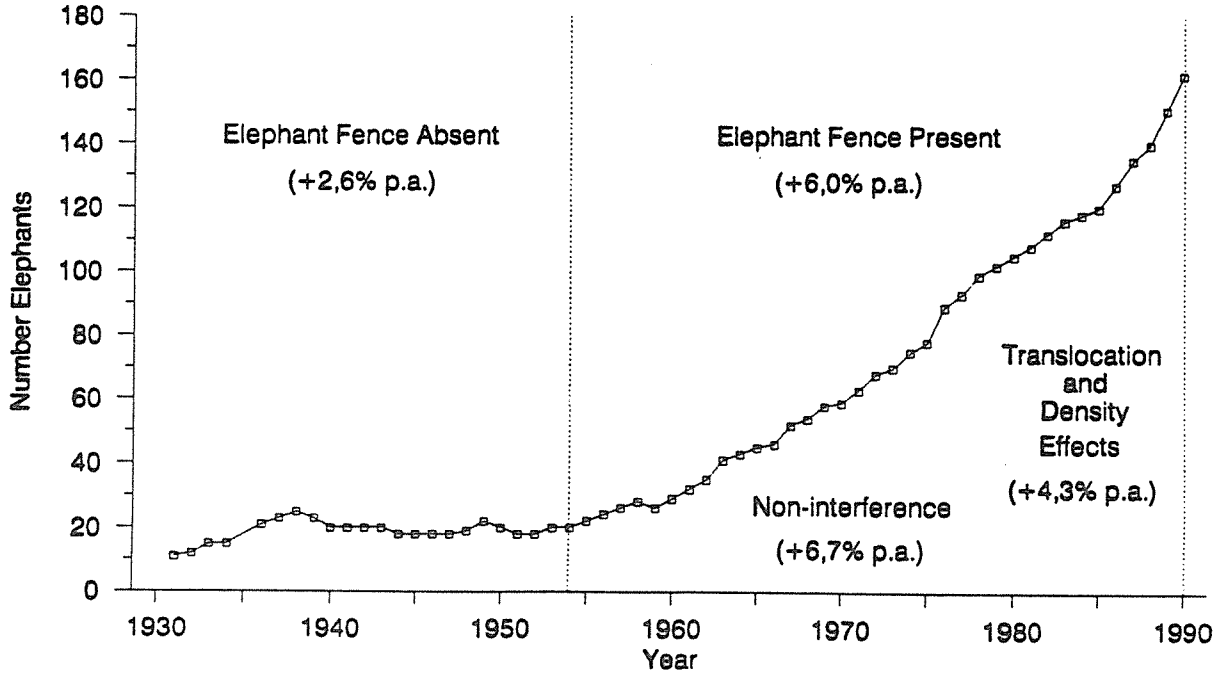


Fig. 11. Trend of the African elephant population in the Addo Elephant National Park, 1930 - 1990. Three phases characterised by no perimeter fence, non-interference, and translocation and musth-related mortality in males are indicated.

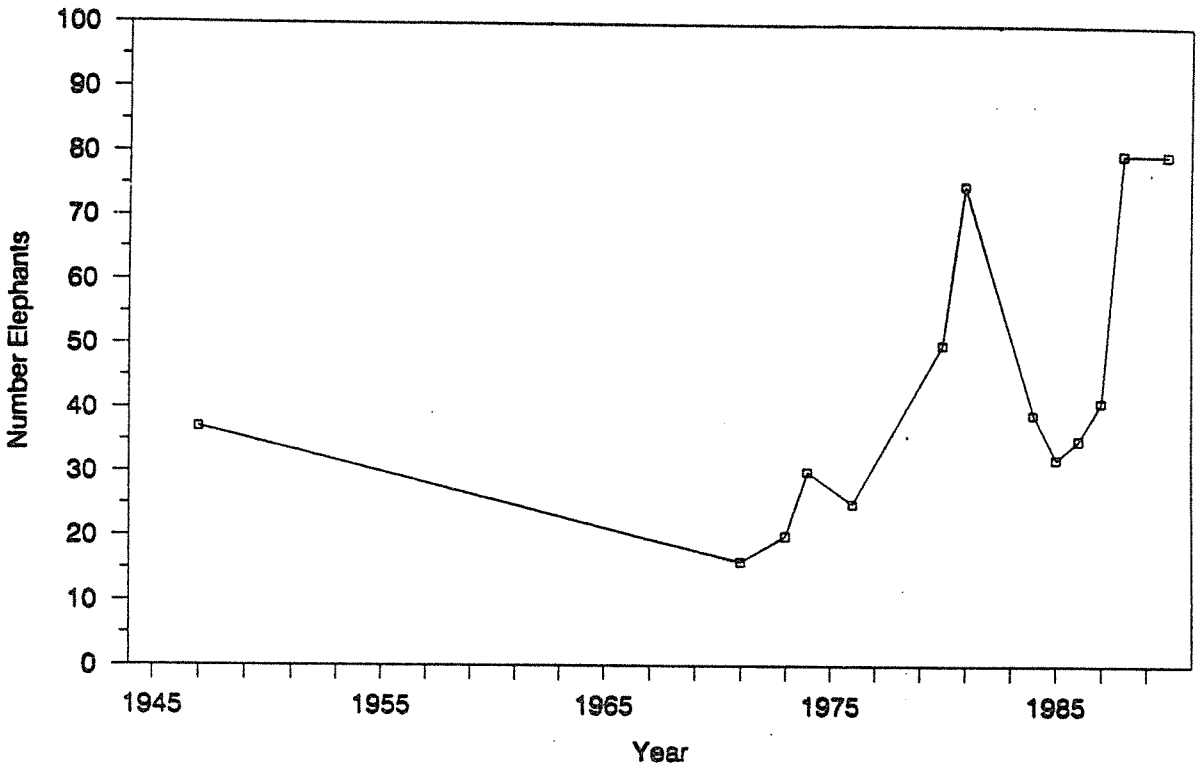


Fig. 12. Trend of the African elephant population in the Tembe Elephant Park, 1945 - 1990.

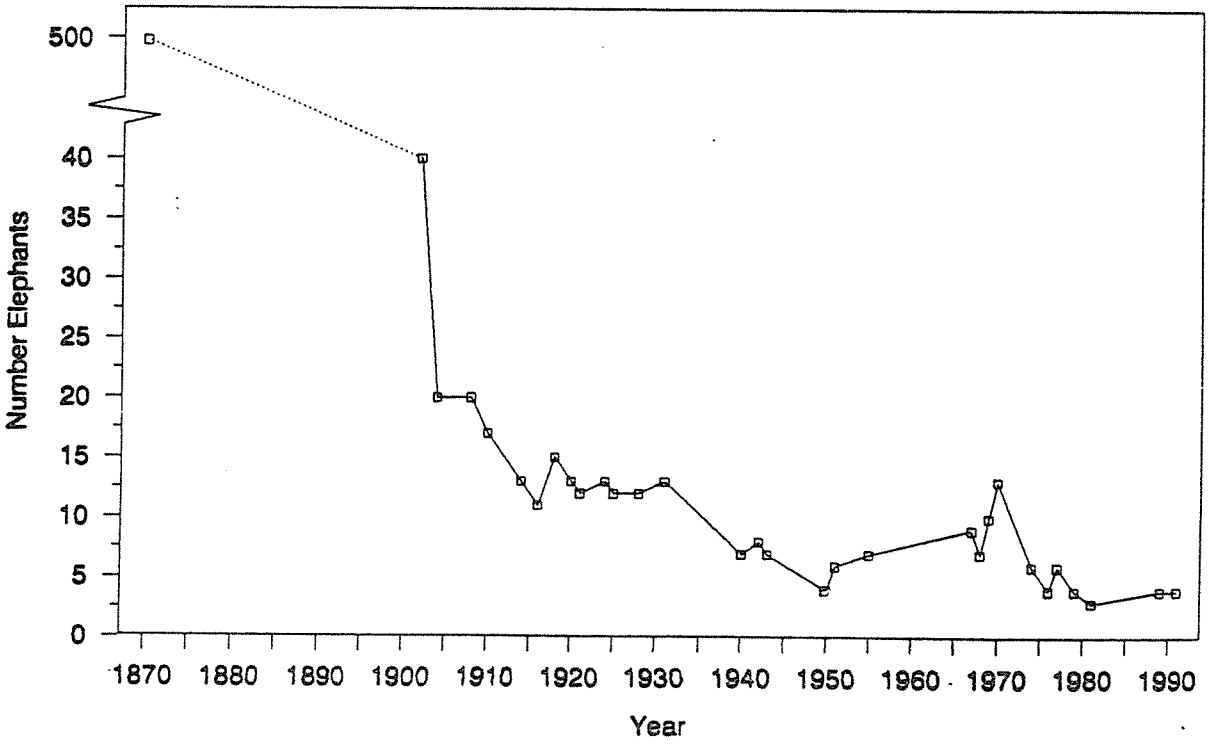


Fig. 13. Trend of the African elephant population in the Knysna Forest, 1870 - 1990.

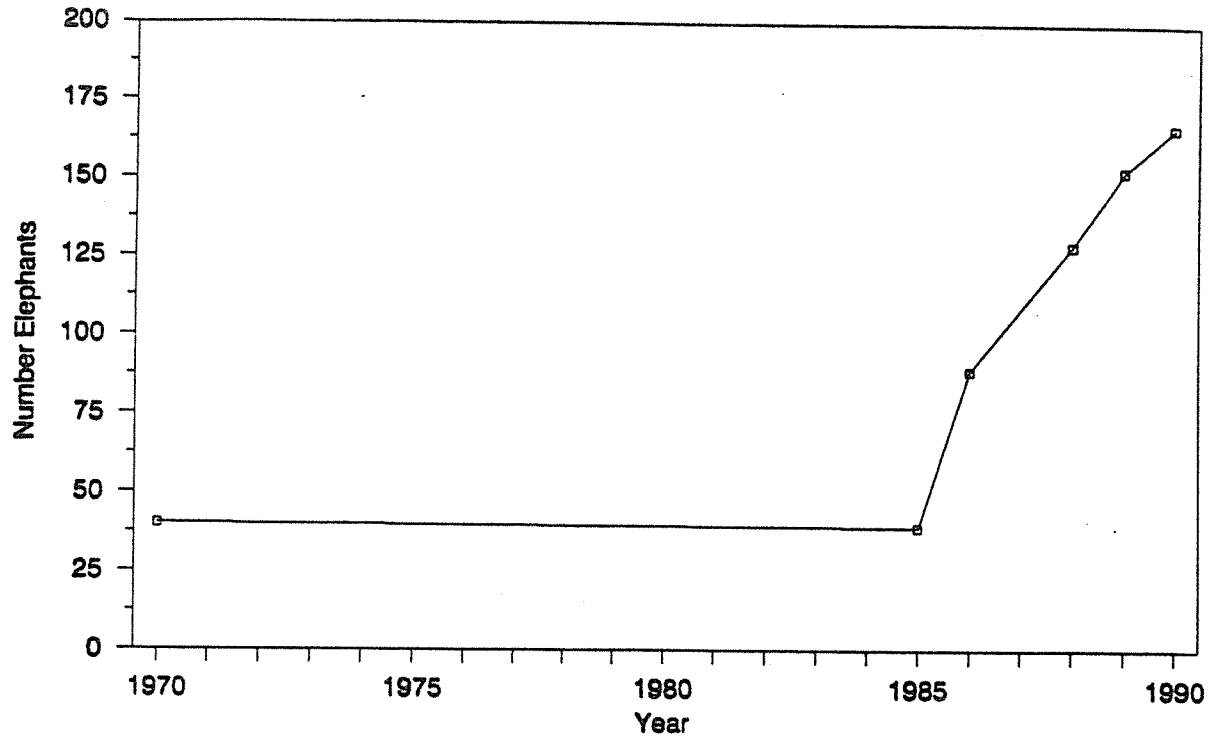


Fig. 14. Trend of the African elephant population in the Timbavati Private Nature Reserve, 1970 - 1990.

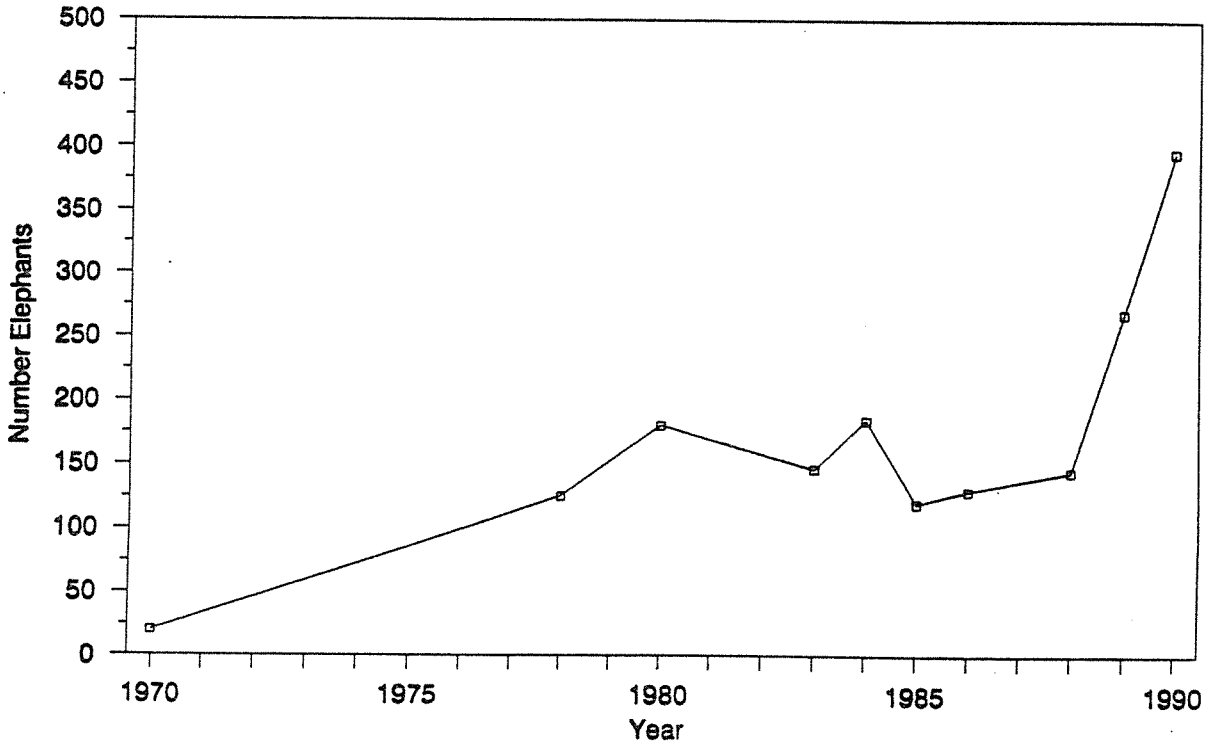


Fig. 15. Trend of the African elephant population in the Klaserie Private Nature Reserve, 1970 - 1990.

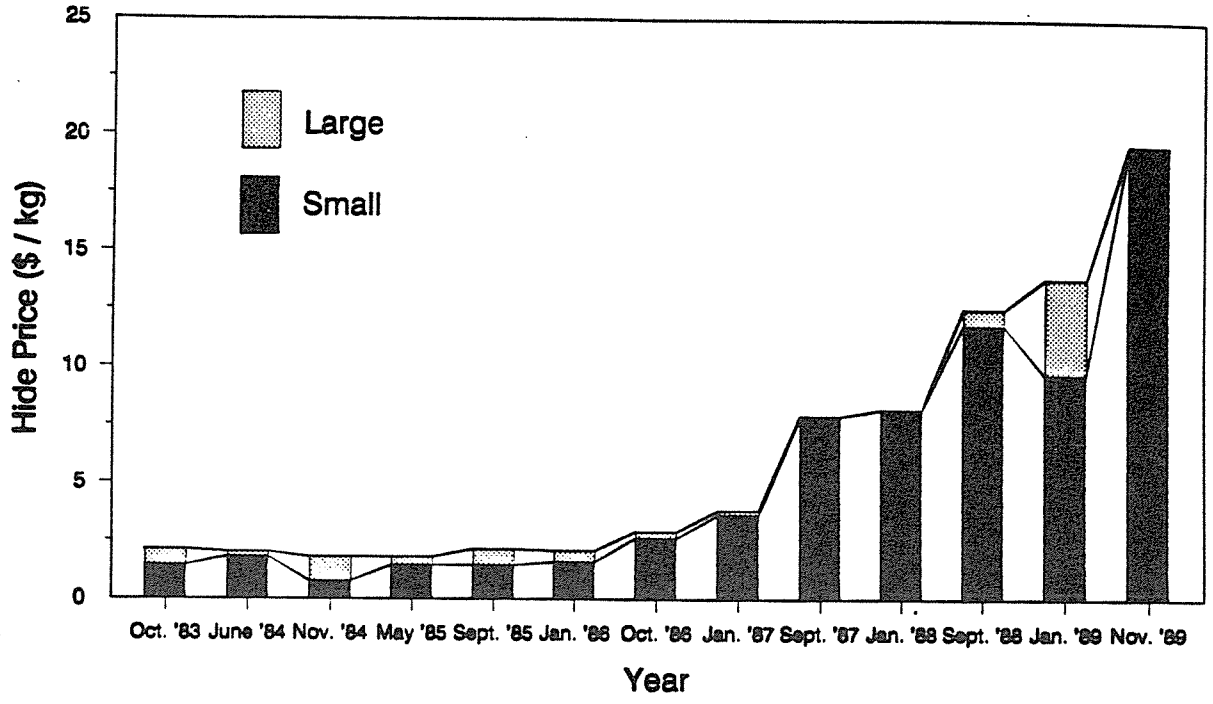


Fig. 16. Tendered prices ($ / kg) for South African elephant skins between 1983 and 1989.

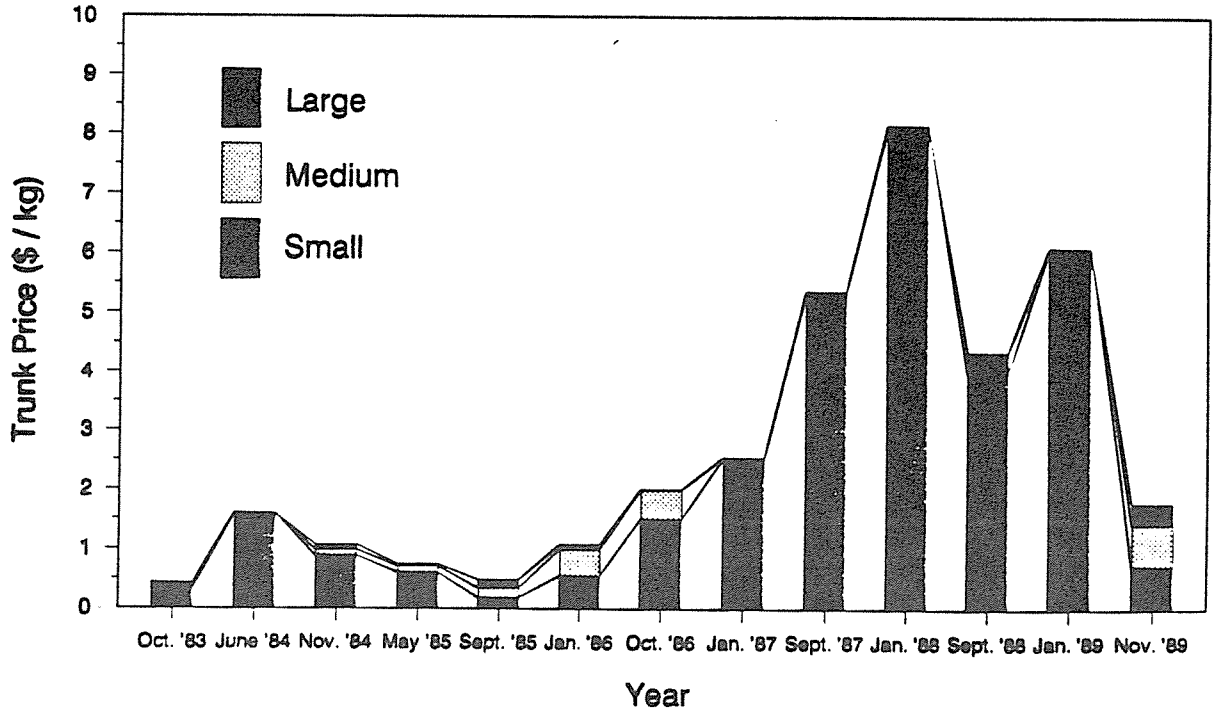


Fig. 17. Tendered prices ($ / kg) for South African elephant trunks between 1983 and 1989.

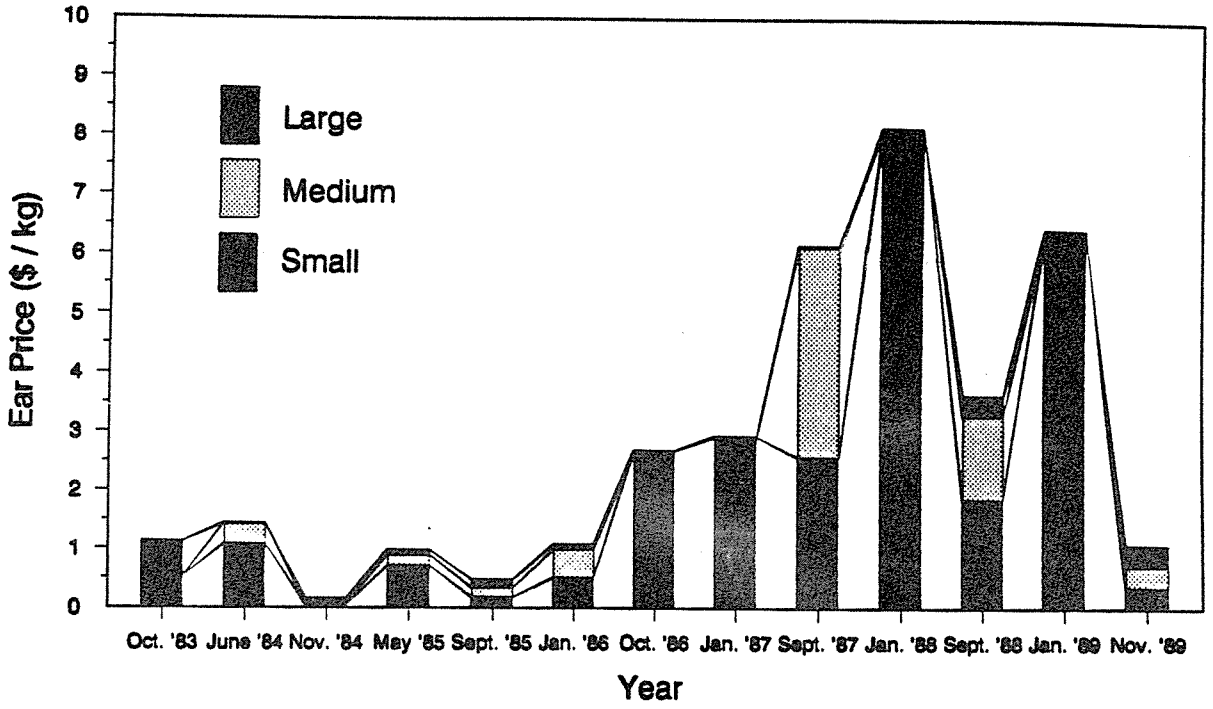


Fig. 18. Tendered prices ($ / kg) for South African elephant ears between 1983 and 1989.

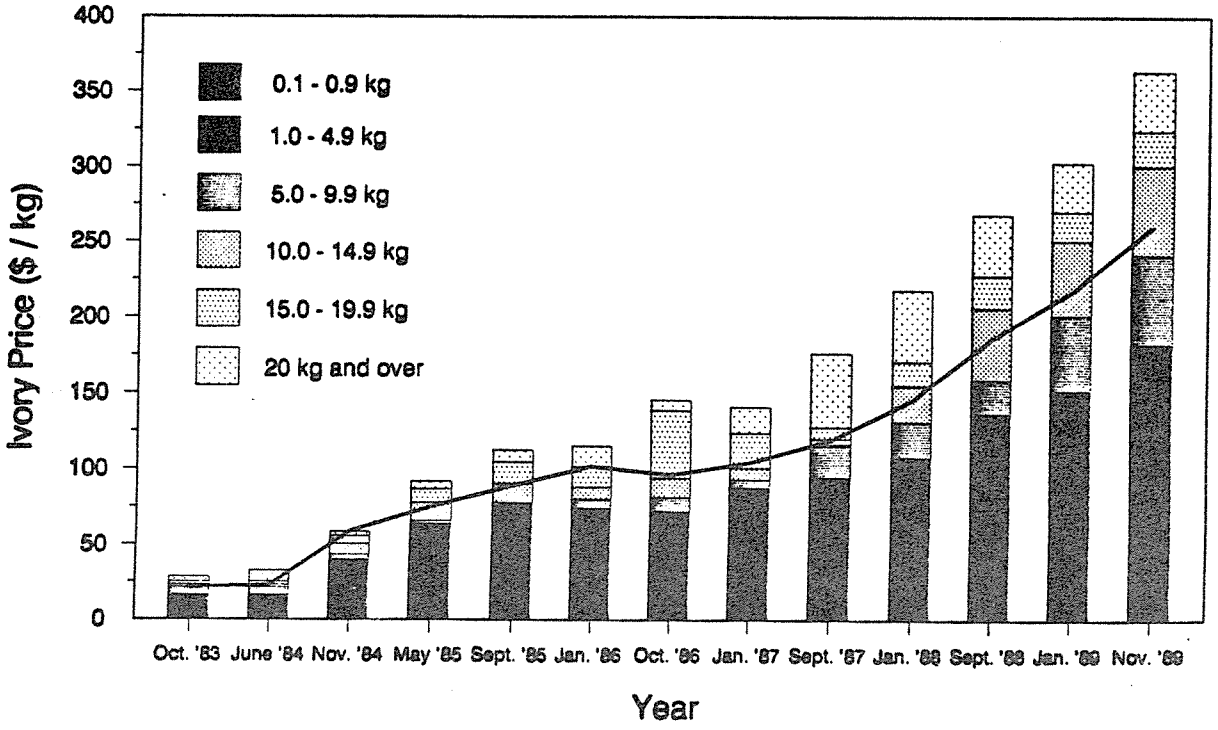


Fig. 19. Tendered ivory prices ($ / kg) for South African ivory between 1983 and 1989 under different tusk weight classes. The mean for all classes is represented by the solid line.