Elephant reintroductions to small fenced reserves in South Africa

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Abstract

The Elephant Management and Owners Association has been collecting information on translocated elephants in South Africa for nearly 10 years. In 2001 a database was initiated and detailed information collected by means of a questionnaire. This paper deals with the question of whether the translocation of elephants can be termed successful according to the short-term indicators of natural reproduction, mortality rate and population growth. Between 1979 and 2001, over 800 African elephants, *Loxodonta africana,* were reintroduced to over 58 reserves in South Africa. The mean founder population size was 26.4 (minimum = 2 and maximum = 227). Thirty-eight reserves (68% of 56 reserves) have shown an increase of greater than 10% of the initial population. An average of 56% of the adult females that were translocated gave birth within 2 years, that is, were pregnant at the time of capture. When young orphans were translocated on their own, mortality was relatively high (18% of 226 animals), but mortality decreased when complete family groups were moved. This analysis confirms the short-term success of translocating elephants in small fenced reserves. However, there have been a range of behavioural problems, mainly linked to disrupted social structure, and these need to be studied further and managed.

Résumé

La *Elephant Management and Owners Association* (Association de Gestion et des Propriétaires d'Eléphants) récolte des informations sur les éléphants déplacés en Afrique du Sud depuis près de dix ans. En 2001, une base de données a vu le jour et des informations détaillées ont été récoltées au moyen d'un questionnaire. Cet article parle de la question de savoir si le déplacement d'éléphants peut-être qualifié de réussi d'après les indicateurs à court terme que sont la reproduction naturelle, le taux de mortalité et la croissance de la population. Entre 1979 et 2001, plus de 800 éléphants d'Afrique (*Loxodonta africana*) ont été réintroduits dans plus de 58 réserves en Afrique du Sud. La taille moyenne de la population fondatrice était de 26,4 (minimum 2 et maximum 227). Trente-huit réserves (68 % des 56 réserves) présentent une augmentation de plus de 10 % de la population initiale. En moyenne, 56 % des femelles adultes qui ont été déplacées ont mis bas dans les deux ans, cela signifie qu'elles étaient gravides au moment de la capture. Lorsque de jeunes orphelins étaient déplacés seuls, la mortalité était assez élevée (18 % sur 226 animaux), mais la mortalité diminuait lorsque des groupes familiaux étaient déplacés au complet. Cette analyse confirme le succès de la translocation d'éléphants dans de petites réserves clôturées. Cependant, on a observé toute une série de problèmes comportementaux, liés principalement à la rupture de la structure sociale, et ceux-ci doivent être étudiés et traités davantage.

Introduction

Over the last 20 years, translocation of African elephants *Loxodonta africana* to private or to other smaller state reserves has become a welcome option to removing surplus elephants in South Africa. Previously within the country only Kruger National Park (KNP), Tembe Elephant Park and Addo Elephant National Park had elephants. Translocation was initiated in KNP in the late 1970s but became popular with private landowners

only in the early 1990s. Acquisition of surplus elephants from KNP seemed an ideal option for many game reserves to enhance their tourism potential and at the same time to create populations outside the KNP complex. The Elephant Management and Owners Association (EMOA) has been collecting information on translocated elephants in South Africa for nearly 10 years. In 2001 a database was initiated and detailed information was collected by means of a questionnaire. To date 58 reserves within the country have elephants outside the KNP complex (see Results).

The aim of this paper is to document the history of these introductions and to assess their success in the short term. Defining success is extremely difficult, as it depends on the management objectives of a particular reserve. In the long term, a successful introduction would result in a viable population of elephants. However, as most introductions have been in place for only 10–15 years, it is impossible to assess long-term population viability. In addition, the size of the reserves to which elephants have been introduced, and the fact that these reserves are fenced and thus prohibit gene flow, means that each individual population could never be genetically viable. We therefore define success as a short-term measure, depending on whether the elephants have settled in the reserve and whether the population is reproducing. In this paper we aim specifically to 1) document the history of reintroductions to fenced reserves in South Africa, and 2) assess the short-term success of these translocations through studying elephant reproduction, mortality and population growth. Further, we discuss some problems with translocation into small, confined areas.

Methods

EMOA has been collecting information on translocated elephants for the past 10 years. In 2001 a comprehensive survey was conducted of all elephant populations outside the KNP complex. This complex includes KNP as well as all adjacent private and state reserves that are not fenced separately from KNP and therefore share common wildlife. The survey consisted of a written questionnaire that was completed by either the owner or the reserve manager, with additional information obtained in some instances from the relevant conservation authority. Where uncertainty existed a site visit was conducted. To ensure confidentiality to the private owners, only state reserves will be named. All private reserves are identified by a two-letter code.

The analyses include only wild, free-ranging elephant populations. All populations with the exception of Addo Elephant National Park and Tembe Elephant Reserve are introduced elephants. With minor exceptions all elephants originated from KNP. All reserves are fenced, and elephant populations are therefore isolated from each other.

In addition to the survey, EMOA collated qualitative information on introductions, particularly on incidents that occurred on reserves. We have included such information as we have available.

In the following the term ‘founder population’ is used solely for the purpose of first introduction and does not imply any biological or demographic factors.

History of elephant translocation

The elephant population in KNP had increased from an estimated 25 in 1908 to 6586 in 1967 (Whyte 2001), the year in which the first aerial census was conducted and management was initiated to keep the elephant population at a level of around 7000 (Whyte 2001). Changing land-use practices in South Africa have resulted in ranch land reverting to wildlife areas, and these have afforded the opportunity of reintroducing elephants to areas where they previously occurred. However, in the late 1970s translocation equipment allowed moving elephants only smaller than 2 m at shoulder height. This meant that until 1994 only juveniles could be captured and translocated during the massive culling operations; at that time, new techniques were acquired and entire family groups could be moved. Adult bulls over 20 years of age could be moved only from 1998, when appropriate equipment was developed.

A consignment of 26 juveniles was sent to zoos in the USA in 1966, but it was only in 1978 that translocation to wild areas was initiated. The very first 27 young elephants not destined for captivity went to Namibia in 1978, followed by another 61 young elephants during the next si years (KNP database 1996).

Other South African conservation agencies considered reintroducing elephants into reserves from which they had been extirpated, and the first eight elephants were moved to Pilanesberg Game Reserve from Addo Elephant National Park in 1979. Following this initial unsuccessful introduction (only one survived), in 1981, a further 18 young animals from

KNP were introduced, and in 1983 another 24 young animals followed. In 1982, two 19-year-old females were introduced from the USA, and two young animals from Namibia. A further 25 young animals were introduced in 1992, another 32 in 1993, and 6 large bulls were introduced in 1998, bringing the total to 117 introduced elephants (see Slotow and van Dyk 2001 for details).

Between 1981 and 1993, 172 elephants were introduced to Hluhluwe-Umfolozi Park (1981 = 8; 1983 = 8; 1984 = 10; 1985 = 30; 1986 = 6; 1987 = 18; 1988 = 35; 1989 = 35; 1990 to 1993 = 22) (data supplied by Natal Parks Board). During or shortly after the introduction process, 23 of the young orphans died.

Although the above introductions were successful, in that elephants remained within the reserves and reproduced (first young born in Pilanesberg Game Reserve in 1989, Slotow and van Dyk 2001), no further movements occurred until 1990 (fig. 1). Private landowners perceived translocation as an ideal way of establishing new populations and of enhancing the tourism potential of their game reserves. In 1990 the first seven private game reserves started purchasing juvenile elephants (fig. 1); since then, about four new reserves per year have purchased elephants.

In 1994 culling was temporarily put on hold at KNP, and this ended the supply of cull orphans available for translocation to new areas. In 1993 Clem Coetzee in Zimbabwe pioneered the technique of moving entire family groups. That same year the first large cross-border translocation of 200 female elephants and their offspring took place from Gonarezhou National Park in Zimbabwe to Madikwe Game Reserve in North West Province of South Africa. Simultaneously a translocation of 470 elephants within Zimbabwe (from Gonarezhou National Park mainly to the SAVE Conservancy) took place (JG du Toit pers. comm.). This began a new era of translocating elephants and since 1994 only entire cow-and-calf groups have been moved to new locations.

By 1997 KNP had developed specific transport trucks to transport large bulls, and between 1998 and 2002 about 118 adult bulls were translocated within South Africa—93 from KNP, the others were migrants, mainly from across the border, or animals who had broken out of a reserve.

By 2002, over 800 elephants had been translocated out of KNP. Most state reserves suitable for elephant introduction had acquired elephants by 1996, with only one state reserve having obtained elephants since then.

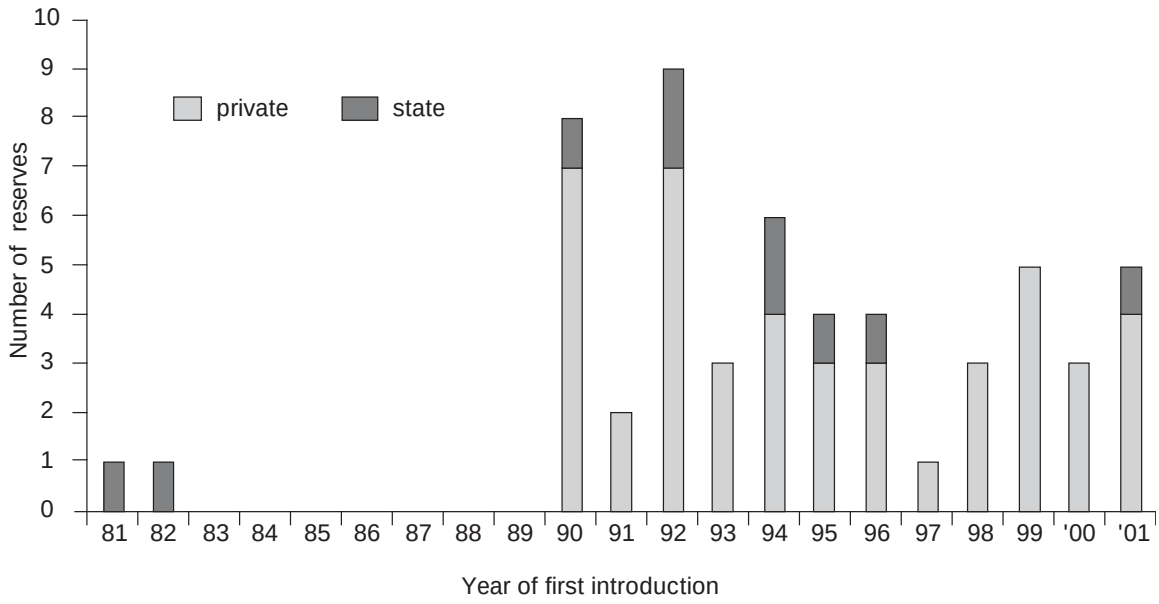

Figure 1. Year of first introduction of elephants to the reserves. Where multiple introductions to a single reserve occurred, only the year of first introduction is shown. The first successful introduction of animals from KNP to Pilanesberg occurred in 1981. The translocation of animals from KNP to Hluhluwe-Umfolozi Park started in 1982. Note that there were a series of introductions to the first two parks in the period from 1983 to 1989, but only the date of the first introduction to each reserve is shown.

At the time of the survey 58 reserves in South Africa had free-ranging elephant—12 state owned and 46 privately owned. Limpopo (Province) contains 50% (2 state, 27 private) of the reserves; it and KwaZulu-Natal (5 state, 12 private) make up 79% of the reserves with elephants in South Africa (fig. 2).

Distribution of elephants outside the KNP complex

Elephants were reintroduced into four major regions: Zululand in KwaZulu-Natal, the Waterberg and Hoedspruit areas in Limpopo, and a few in Eastern Cape (fig. 2). These patterns reflect the change in land use in those areas to game farming. Additional introductions have since taken place in the Eastern Cape and also a single introduction in 2003 to the Western Cape. Most of the elephant introductions have been to the savannah biome, with a few to the thicket biome, particularly in the Eastern Cape (fig. 2).

Number of elephants introduced

The minimum founder population size was 2 and the maximum was 227 with a mean founder population size of 26.4 (standard error 4.6) in the 57 reserves included in the analysis. Almost half of the reserves received 10 or fewer elephants (fig. 3). Above that level there is an even spread of introduction number. There was a significant increase in founder population size with increasing area (fig. 3). This is not surprising. However, there was a wide range away from the regression line. This indicates that there was little standardization in the initial density. Tenty-one reserves stocked above this predicted line, with some reserves stocking as much as 60% above the norm for that area, given the patterns of introduction across all reserves.

Thirty-nine reserves initially stocked at a density of < 0.2 elephants/km^2 (fig. 3). Several reserves initially stocked at levels much higher, and in fact at or above what may be considered an ecologically sensible stocking rate.

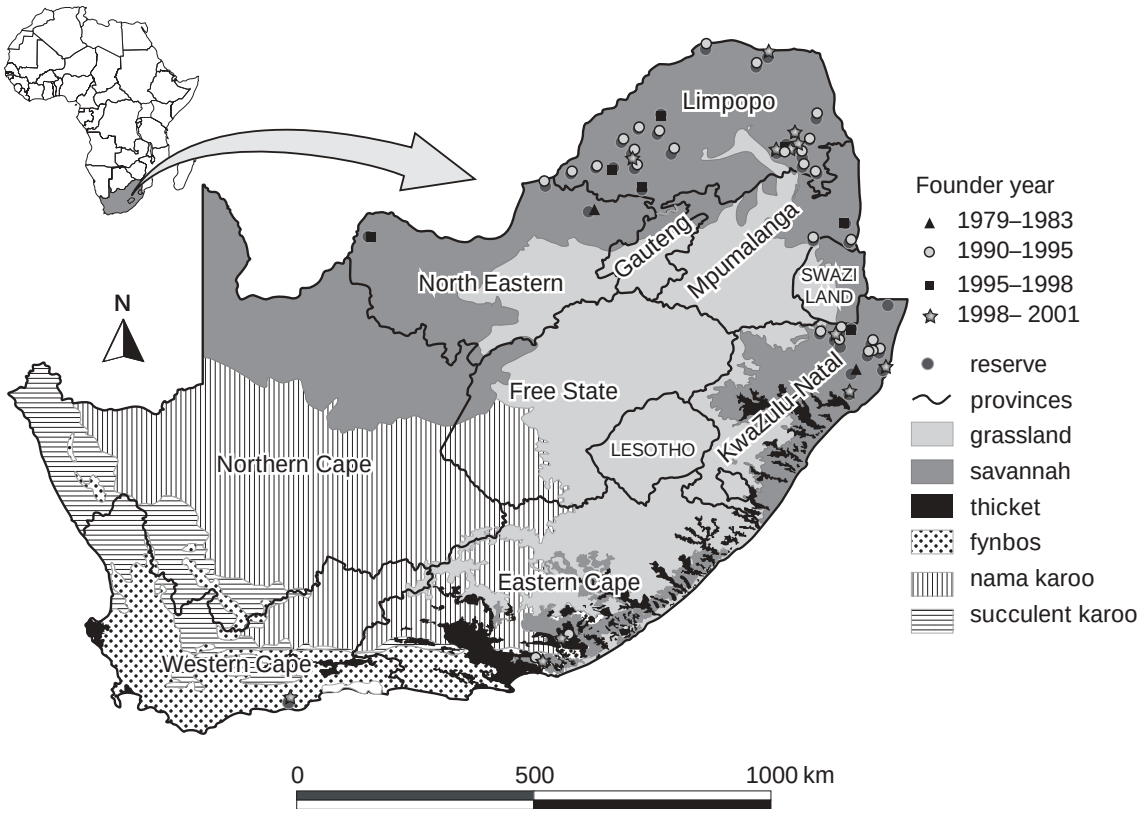

Figure 2. Distribution of reserves to which elephants had been introduced up to 2001 (Low and Robelo 1996).

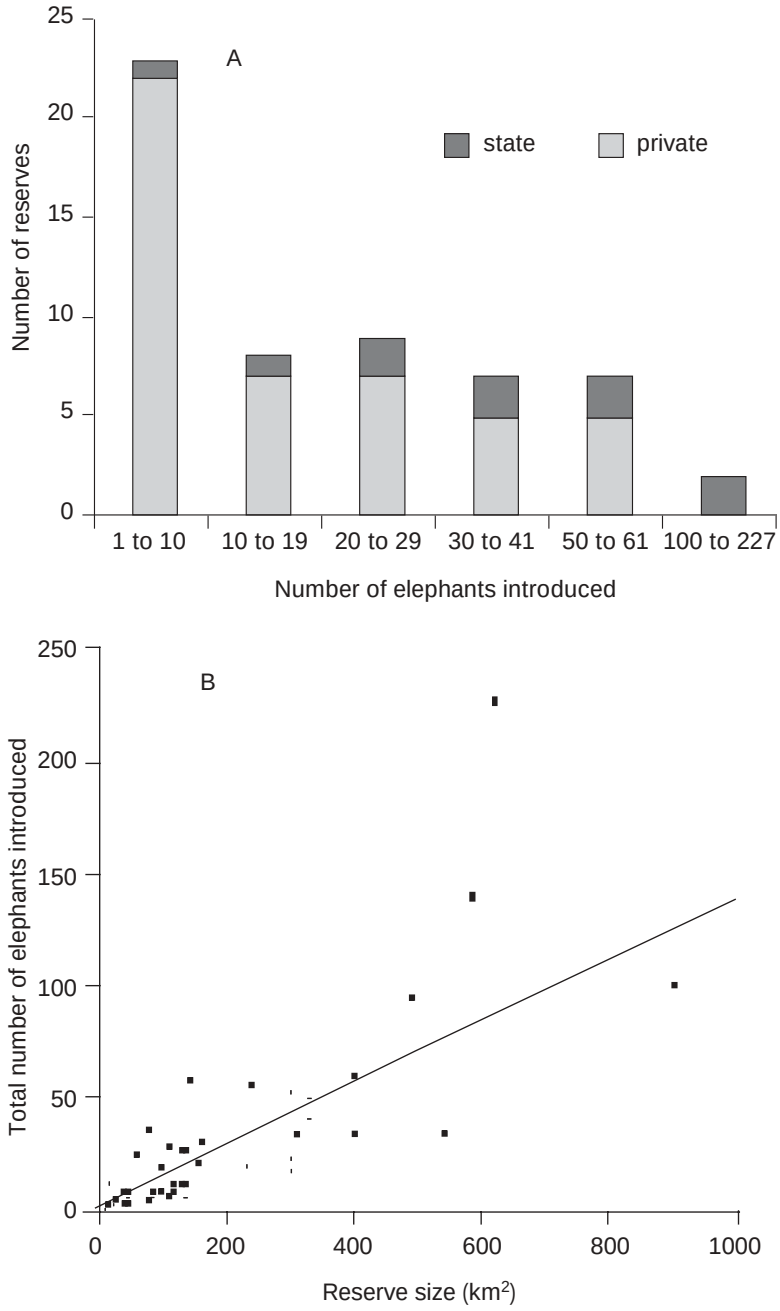

Figure 3. Number of elephants introduced to reserves in South Africa (founder population size). A. Frequency distribution of introduction totals. B. Introduction total relative to reserve size. Note that for multiple introductions values are the sum of all introductions to a reserve.

Population change

Thirty-eight reserves (68% of 56 reserves) have shown an increase of greater than 10% of the initial population (fig. 4). Of the reserves that showed no change, less than three years had elapsed since introduction in 5, and 10 had founder populations < 10 (< 5 adult females). The two reserves that showed a decline had 5 and 12 founders—all young orphans in the latter. Some reserves showed an alarmingly high population increase of up to 16% per annum (average population increase of 7.4% p.a.) (Slotow et al. in prep.).

Movement of pregnant females

For those reserves for which we have details of births per year since introduction we assessed how soon elephants were breeding. At 21 of the 23 reserves elephants had given birth within two years of introduction (table 1). We counted the number of adult females introduced and divided the number of births by that figure to get the percentage of females that gave birth over that period. An average of 56% of the adult females that were translocated gave birth within two years (standard error 8%). This means that those elephants were pregnant at the time of capture. In two additional reserves no adult females were translocated, but three of the subadult females gave birth within two years.

The important point to note here is that the effective founder population was actually much larger than originally thought because many of the females being introduced were pregnant.

Mortalities

Until 1994 only young animals were moved, and mortality was 17.5% (table 2), mainly due to the ig-

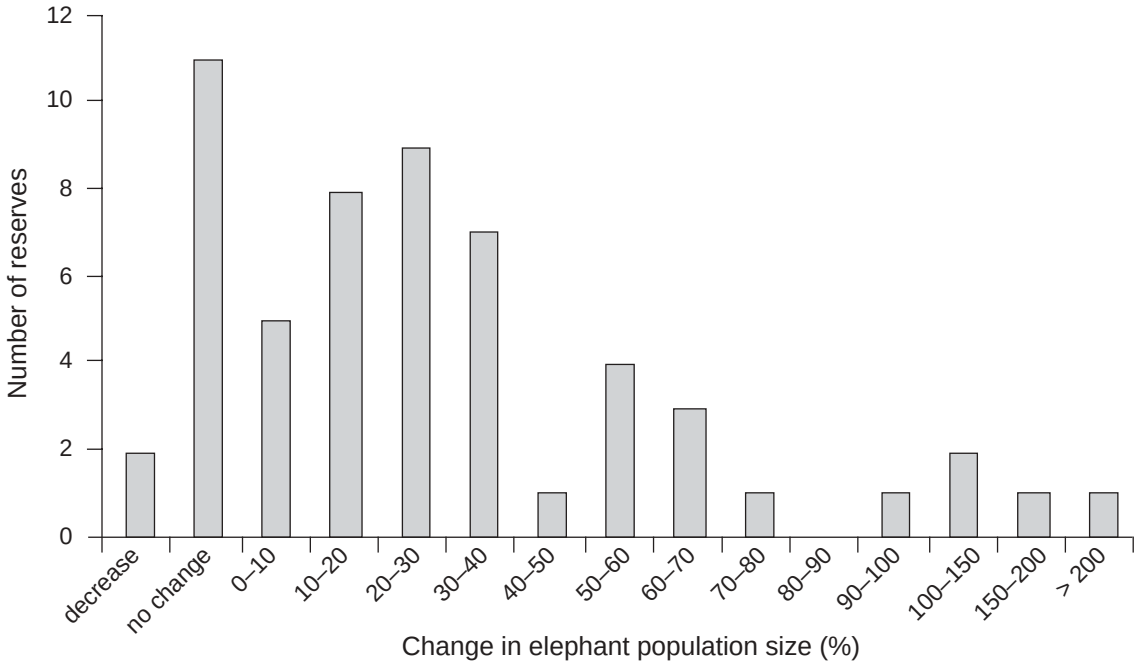

Figure 4. Change in elephant population size since introduction. Note that the number of years since introduction is not considered.

norance of most owners on how to raise very young elephants. Most deaths occurred shortly after introduction, and mainly very young calves were affected.

During 1994 the first family units were translocated; a few deaths occurred, mainly of young calves, probably due to stress. Some problem animals, including matriarchs, had to be shot after they broke out of a reserve. Thanks to better management and boma technology these incidents do not occur any more. Few deaths, other than through problem animal control or hunting, have been experienced to date after the elephants settled down in their respective reserves. Interestingly more males than females died between 1995 and 2002. Of the deaths not due to management intervention by culling or hunting, 46 were males and 22 females. Of the males, 12 were adults, 2 subadults, 12 juveniles and 8 calves, and 12 had no details given. Of the female mortalities, 2 were adults, 2 subadults, 5 juveniles (> 3 years), 2 calves and 11 had no details given.

Discussion

Since the initiation of translocation at KNP in 1978 over 800 elephants have been moved, including about 118 adult bulls. In the earlier days only juveniles were captured and moved during the yearly culling operations. After 1994, when culling was put on hold, entire family groups were moved.

To date 58 reserves have free-ranging elephant populations distributed over four main regions in South Africa. The minimum founder population size was 26.4 (range 2–227); 38 reserves have shown an increase greater than 10% of the initial population. All populations with over 15 founding individuals are growing at present, some of them more rapidly than the owners might wish. In 21 out of 23 reserves females gave birth within two years of introduction, indicating that they were pregnant at the time of capture, a fact totally ignored by decision-makers. One would expect a decrease in this growth figure over the next few years, especially on those reserves with few adult or subadult males.

Technology, equipment, and experience with capture, movement and introduction of elephants has increased over time. Although initially a large number of mortalities were associated with translocating orphaned juveniles, mortality resulting from the translocation process is now a rare event.

The results emphasize the broad short-term success of reintroducing elephants to small reserves in

Table 1. Effect of pregnancy at time of translocation

Reserve	Total	Total adult and subadult females	Births in 2 years	Births in 4 years	Adult and subadult females breeding in 2 years (%)
Madikwe	227	148	25	62	17
Az	56	19	5	6	26
Wd	50	25	30	30	120
Vt	41	9	4	0	44
Nz	36	12	2	0	17
St Lucia Park	34	13	1	0	8
Pg	30	7	5	7	71
Kz	28	15	2	0	13
Mk	27	15	6	8	40
Sd	26	8	4	0	50
Kw	21	7	1	0	14
As	20	10	4	9	40
Mg	20	8	2	2	25
Lp	12	6	1	0	17
By	10	3	1	0	33
Sh	9	6	3	0	50
CR	9	4	1	0	25
Kg	9	4	3	0	75
Mw	8	2	2	0	100
Wk	8	6	2	0	33
Mm	8	2	0	0	0
TT	8	3	3	0	100
Sb	7	3	1	0	33
Eb	5	2	0	0	0
Tk	3	1	1	0	100

South Africa, based on the criteria that the populations have not only persisted, but that they are reproducing at a rapid rate.

We now have the capacity to successfully create elephant populations. However, a number of intrinsic problems have not been dealt with. We have very little understanding of the long-term consequences of translocation on elephant society and behaviour. Movement of young animals without adults has led to problems with both males and females becoming aggressive to people (resulting in some deaths), vehicles, or other species such as rhino (Slotow et al. 2000; Slotow and van Dyk 2001; Slotow et al. 2001) or buffalo. Disruption of the social structure of a group of elephants leads to abnormal behaviour (Garaï 1997). Possibly this has also been the cause of some matriarchs becoming aggressive and some bulls and adult cows attempting to break out (Garaï and Carr 2001). Managers will have to deal with the legacy of past mistakes long into the future.

Recently suggestions of removing individual elephants out of the herds could have serious consequences on behaviour, and studies in this respect are needed. Already in some instances where the matriarch was either left behind (Gonarezhou National Park to Madikwe) or shot (due to break out and aggressive behaviour), the rest of the family was left without the knowledge carrier and security provider (Moss 1988; McComb et al. 2001; Kurt and Garaï in press). How this will affect future learning possibilities of the rest of the group and the general and individual behaviour patterns remains to be seen and studied. Overpopulation and high density are always referred to in an ecological sense. Little thought has been given to social density. In view of the high densities seen on some reserves, this topic needs investigation.

The challenges that lie ahead are great. Eventually elephant populations on small reserves will be faced with problems of genetic drift and bottleneck effects. Managers will be faced with serious challenges and will require alternatives to regulate their populations. Habitats have to be protected from being overused to the point of extinction, or their biodiversity from being seriously affected. At the same time the social, behavioural and other requirements of the elephants must not be compromised. Clearly we need to think fast before the whole well-intended translocation process turns into a disaster to the animals themselves. Owners and officials need to come up with plans to connect populations and provide possibilities for elephants to exchange genes, use larger areas and meet with social partners in order to live out their behavioural requirements according to their genetic make-up.

Although additional populations will no doubt be founded in the future, the number of elephants being translocated out of KNP is decreasing rapidly. A number of factors are driving this trend:

1. The permitting system for introducing elephants

Table 2. Mortalities of juvenile elephants in the early days of translocation for the years 1992–1994 (during this period only animals < 10 years old were moved)

Size class	Elephants introduced (no.)	Deaths (no.)	Cause of death
2, 3	43	2	mothers stressed, calves died
2, 3, 4	31	5	4 unknown, 1 killed by other elephants
1, 2, 3	30	2	1 male unknown, 1 male resold, died after long trip
2, 3	26	4	1 pneumonia, 2 accident, 1 stress, cold and constipation
2, 3	17	1	stress, was alone
1	12	8	stress, malnutrition
3	12	1	overdose of M99
3, 1	10	1	smallest died of stress
3	8	2	1 bullied, 1 killed by rhino
1	8	1	killed by lightning
2	6	1	snakebite?
1	6	3	sand colic, stress, sold, malnutrition?
2	4	1	killed by lion
1	4	1	would not eat branches
1	3	3	stress, malnutrition?
1	3	3	salmonella
3	3	1	pneumonia and stress
Overall	226	40	17.7%

Size classes: 1 = 1.20–1.34 m shoulder height; 2 = 1.35–1.48 m; 3 = 1.49–1.80 m; 4 = 1.8–2.1 m

is becoming more rigorous. The reasons are that problems and consequences of overpopulation experienced on many small reserves have suddenly become an issue and options available to the owners are limited. Official regulatory bodies therefore are taking a cautious approach.

2. Problems with managing elephant populations (that is, dealing with overpopulation) have led to owners and managers being more cautious with introducing elephants onto smaller reserves, partly due to habitat destruction and partly due to limited future management options. The only tools left to managers to deal with overpopulation are culling, immunocontraception and translocation. The first two are expensive, and translocation possibilities are limited, as certain factors need to be taken into account, such as natural separation into subgroups of animals before they are moved.
3. The number of large reserves able to hold family groups and bulls is limited.
4. Many of the reserves have already reached overpopulation and these elephants are now also available as a source for translocation (for example, Madikwe Game Reserve). The consequence is that KNP cannot rely on translocation within South Africa to alleviate the problem of growth in elephant populations. Now even small reserves are facing a dwindling market for their surplus elephants.

Translocations raise issues in two senses: ethical and social (that is, how we affect elephants), and practical (how the elephants affect us).

Ethical issues such as stress through high human densities have been and are currently being investigated (Burke et al. 2002; Pretorius and Slotow 2002). Management effects of immunocontraception are currently being studied at Makalali Game Reserve and a few other private reserves. The effects of other management interventions such as splitting groups, hunting and culling still need more study.

Practical issues include habitat use by elephants and how this affects management decisions and biodiversity. Decisions that are taken now have consequences long into the future. Landowners who introduce elephants have a responsibility to manage them in a sound, ethical manner into the future.

It is vital that we continue to study and understand the effects of past, present and future management interventions on elephant behaviour. In that way we can try to avoid making or repeating the errors of the past.

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