Chapter 1

Introduction

My study is one of several conducted between 1999 and 2004 in the Maputaland region under the auspices of the University of Pretoria's Conservation Ecology Research Unit. In this dissertation I focus on the demography of the two principal sub-populations of savanna elephants (*Loxodonta africana*) living in the region. This study uses well established techniques to estimate the sizes of the two sub-populations. The synthesis of this information will contribute to the design of a Transfrontier Conservation Area (TFCA) in the region that will reunite the population fragments and, therefore, enable the population to function as a single entity. The present chapter puts my study into context with the recent history of the savanna elephants and provide a rationale for this investigation.

The Maputaland area of northern KwaZulu-Natal and southern Mozambique has been identified as an important area of biological diversity and is characterised by relatively high levels of endemism (White 1983; van Wyk 1994). In accordance with recent conservation ideologies directed at so called 'hotspots' (Myers, Mittermeier, Mittermeier, de Fonseca & Kent 2000), a very high percentage of global terrestrial biodiversity can be protected on a small proportion of the Earth's land surface (Mittermeier, Myers & Thomsen 1998). As such an area, Maputaland deserves priority attention to afford protection to all its biota.

This area, with the addition of eastern Swaziland, has been identified as an ideal place in which to establish a TFCA which would strive to conserve the biological diversity, increase the level of protection awarded to the area, improve the social and economic welfare of local communities and increase the capacity of the

national partners to manage natural resources (van Aarde 1999; Hanks 2001). Its importance is further enhanced as the TFCA would span from mountains to the ocean and so include a great diversity of habitat types.

Perhaps the most important biological factor available to allow the TFCA concept to work in this region is the presence of the savanna elephant. The elephant fits the criteria for it to be considered a 'flagship species', defined as a species that attracts public interest (Simberloff 1998; Caro & O' Doherty 1999; Williams, Burgess & Rahbek 2000). Elephants can also be considered a 'keystone species', *i.e.* a species whose importance in its ecosystem's functioning is far greater than would be expected from its biomass and abundance (Mills, Soulé & Doak 1993; Boswell, Britton & Franks 1998; Caro & O' Doherty 1999; Jordán, Takács-Sántas & Molnár 1999). The elephant is an animal of popular interest, is able to generate tourist income and is attractive to funding agencies and donors.

Elephants presently occur on both sides of the South Africa/Mozambique frontier in Maputaland and these animals were previously considered as belonging to one population (Hall-Martin 1980, 1992; Klingelhoeffer 1987). Events over the last 20 years have fragmented this population into at least two sub-populations through the construction of electric fences. The existing population fragments are located in the Tembe Elephant Park (TEP) in South Africa and the Maputo Elephant Reserve (MER) in Mozambique. Prior to my study estimates for TEP were 130 elephants, with up to five breeding herds present (although survey techniques used suggested a population far below this figure; see Matthews 2000) and an estimate of 205 elephants for MER (de Boer & Baquete, 1998; de Boer, *et al*., 2000; Ntumi 2002).

These estimates were suspected to be unreliable and very little was known about sex ratios, although they were understood to be heavily male biased in TEP with

far more bulls than females (69% of the TEP population was estimated to be adult bulls; KwaZulu-Natal Nature Conservation Service 1999). De Boer *et al*. (2000) stated that the population in MER then comprised mainly of breeding herds with a very low incidence of lone bulls.

At the onset of the present study very little reliable information was available, therefore, on population variables such as sex and age structures, fecundity rates and survival schedules. A study dedicated to elephant demography would, therefore, be a prerequisite for efforts directed at the conservation management of the species in the Maputaland region.

Due to changes in the political climate and the cessation of military conflict in Mozambique the situation in the region has changed dramatically. It may now be possible to reunite the two population fragments. The linkage would be provided by the Futi Corridor, an established elephant dispersal route, and would be conducted as part of the proposed TFCA. Although habitat corridors can be species specific and may not stop species loss (Boswell *et al*. 1998), in the case of Maputaland the proposed corridor is an established elephant route and is large enough to effectively unite TEP and MER sub-populations. The removal of the elephant-proof fence between TEP and the Futi drainage line could effectively reunite the elephant sub-populations and the landscapes in which they occur. It may be possible, therefore, to use the reunification of the elephant population, at species level or fine scale, to ensure the restoration of the Maputo/Futi/Tembe ecosystem at landscape level or coarse scale (Schwartz 1999). As fragmentation of elephant populations is common in southern Africa, I give an outline of the history of fragmentation and its inherent problems.

The distribution of elephants in the pre-colonial (pre circa 1840) era

During pre-colonial times elephants were distributed throughout Africa where landscapes were favourable (Owen-Smith 1988; Spinage 1994). Prior to the nineteenth century people probably did not have the technology to hunt elephants at levels that would have affected their distribution (Alpers 1975). In the pre-colonial era elephants were hunted for meat and ivory using pits, weighted spears and axes (Alpers 1975). In southern Mozambique they were also exposed to specialist elephant hunters (Hedges 1978 cited in Merrett & Butcher 1991). In response to the decimation of human populations in many areas of Africa by war, slavery and disease elephants may have been more numerous and widespread at the onset of the colonial period than before (Selous 1925; Adams & McShane 1992). The commercial ivory hunters who decimated elephant populations and fragmented their distribution came later and were at the forefront of the colonisation of Africa (Selous 1925).

The distribution of elephants in southern Africa during the colonial period (1840s-1960s)

Prior to the arrival of European settlers, elephants inhabited 'woodlands' from the Cape Province to the Sudan (Fitzsimonds 1920). Elephants had long been hunted for ivory, and populations may already have been depleted at the onset of the colonial period (Alpers 1975; Milner-Gulland & Beddington 1993; Whyte 2001). During the colonial period commercial hunting for ivory with increasingly advanced rifles and the expansion of European settlement (with associated habitat transformation) accelerated elephant population decline in Africa, and caused their range to contract (Fitzsimonds 1920; Selous 1925; Kittenberger 1929; Cumming *et al*. 1990; Milner-

Gulland & Beddington 1993). The elephant hunter H.A. Bryden predicted that the rate of ivory extraction in the late 1800s would cause the extinction of elephants in southern Africa (Bryden 1889). The spread of traders, use of fire arms, and ability to haul large volumes of ivory on ox-wagons almost validated his prediction, as elephants were nearly exterminated from southern Africa in the period of 60-70 years preceding 1900 (Bryden 1903) as "before the resistless march of the railway and the man with the breechloader the game inevitably disappears" (William Finaughty, elephant hunter, in Tabler 1957). By the turn of the nineteenth century elephants were 'scarce' south of the Zambezi River and in large areas of east Africa (Kittenburger 1929) and rare over most of southern, eastern and western Africa (Owen-Smith 1988).

Colonial authorities, in response to the widespread loss of large mammals, introduced hunting restrictions and established game reserves and parks. In 1858 the Cape Colony issued strict protection measures for elephants. This was followed in 1860 and 1876 with protection measures ordered for elephants in the Addo Bush the Knysna Forest respectively. This did not, however, halt their persecution (Skinner & Smithers 1990). At the turn of the nineteenth century the elephant populations of South Africa had been fragmented into four small populations: the Addo bush (now Addo Elephant National Park, proclaimed in 1931 with a population of 11 elephants, see Hall-Martin 1980), Knysna Forest in the former Cape Colony, the Sabie Game Reserves (proclaimed in 1898, re-proclaimed as the Kruger National Park in 1926, see Whyte 2001) in the former Transvaal and in Maputaland, Natal (Fitzsimonds 1920; Haagner 1920).

Game protection initiatives were tabled for continent-wide control under the Convention for the Preservation of Wild Animals, Birds and Fish, held in London in 1900. Although Rhodesia (now Zimbabwe) passed its first game laws in 1902

(Skinner & Smithers 1990) and by 1920 elephant hunting was controlled by colonial governments in 'most, if not all, of the African States' (Fitzsimonds 1920), these initiatives proved ineffective. In the 1890s the first colonial game reserves were established in South Africa, with other colonial administrations following suit, *e.g.* the Wankie (Hwange) National Park, Rhodesia, in 1930 and The Maputo Elephant Reserve, Mozambique, in 1932.

The distribution of elephants in Maputaland

The elephant population of Maputaland was hunted commercially from at least the 1850s (Merrett & Butcher 1991), with large scale hunting for ivory in the Delagoa Bay (Maputo) hinterland, Tongaland (Maputaland) and Zululand (Northern KwaZulu-Natal) between 1850 and 1875 (Baldwin 1863; Leslie 1875; Bryden 1889; Merrett & Butcher 1991). Considered common in these areas at the beginning of the 1850s, elephants in northern Natal/Zululand were largely hunted out by the 1880s (Bruton & Cooper 1980; Merrett & Butcher 1991) with a 'few' around St. Lucia and only remaining 'in numbers' in Maputaland (Sclater 1900). In 1918 "Zululand's last elephant was found dead" but "occasionally elephants cross the Zululand border from Portuguese territory" (Fitzsimonds 1920). Haagner (1920) reported that populations were present in southern Mozambique, "especially Gazaland and Mapotoland, where herds of varying size still exist, but which the farmers in the neighbourhood seem determined to exterminate".

The population must have recovered, as large numbers of elephants were present in Maputaland in recent historical times. Smithers & Tello (1976) reported that over 500 were killed between the Maputo River and the Swaziland border in the 1940s as a crop protection measure. During the 1940s elephants were also observed in

the Ingwavuma district in South Africa (Lugg 1970). Elephants from Gaza repopulated the Kruger National Park from about 1900 after European hunters almost exterminated them between 1880 and 1896 (Whyte 2001). By the 1970s Smithers & Tello (1976) considered elephants in Maputaland as increasing and 'abundant' in the Maputo Elephant Reserve, after the banning of professional meat and ivory hunting in Mozambique in the early 1960s.

The distribution of elephants in the post-colonial era

Independence came to most African states in the 1960s and 1970s. Post independence, European conservation models which stress the economic value of wildlife were initially maintained, often ignoring the associated costs and creating social tensions (Parker 1983). More recently new models for conservation have been developed which better address the conservation needs of Africa (*e.g.* Hanks 2001; Western 2003). Where colonial attempts to conserve elephants were successful, by independence some countries faced the problem of too many elephants in conservation areas, leading to vegetation change (e.g. Buechner *et al*. 1963; van Wyk & Fairall 1969; Laws 1970; Barnes 1983) with potential impacts on species composition (Owen-Smith 1988). In response to local over-abundance elephant control programmes were instituted (Laws, Parker & Johnstone 1975; Hanks 1979; Whyte, van Aarde & Pimm 1998; van Aarde, Whyte & Pimm 1999). Outside of protected areas elephant populations continued to decline due to the expansion of human agricultural activity (Parker & Graham 1989a) and the inability of governments to control human competition with elephants (Parker & Graham 1989b).

During the 1970s and 1980s many countries in Africa experienced civil war and ethnic strife, fuelling the killing of elephants (Douglas-Hamilton 1987). By the

1970s concerns of elephant population decline were voiced but data to support the decline was lacking (Douglas-Hamilton 1987; Barnes *et al*. 1999). It has been estimated that in 1979 about one million elephants existed covering a range of some 7.3 million km^2 (Spinage 1994). These elephants were found in many fragmented sub-populations (Douglas-Hamilton 1987). Marked declines in elephant populations due to illegal hunting for ivory continued in the 1980s in east, west, central and some parts of southern Africa, although populations increased or stabilised in Botswana, Zimbabwe and South Africa (Douglas-Hamilton 1987; Thouless 1999). In 1976 the African elephant was placed on Appendix II of the Convention of International Trade in Endangered Species of Flora and Fauna (CITES). By 1987 estimated elephant range was reduced to 5.9 million km^2 (Spinage 1994) and in 1990 the African elephant was moved to Appendix I of CITES. Blanc *et al*. (2003) estimate that present elephant range covers 5 346 000 km^2, of which 35% is known range and 65% is possible range.

South Africa has recently experienced a significant increase in areas managed for conservation (Wynberg 2002). This increase includes areas under private ownership and these areas are important contributors to the protection of biodiversity in the country (Wynberg 2002). As a result elephant range has increased, as animals were translocated on to state and private land, or elephant range has expanded into areas contiguous with parks (*e.g.* the Klaserie, Timbavati and Sabi Sands private reserves adjacent to Kruger National Park; see Hall-Martin 1992). Although private landowners have changed from agriculture or ranching to wildlife as a land use option the motive is usually profit (Duffy 2000). Some private conservation areas support small elephant populations sourced from the Kruger National Park (Hall-Martin 1992), and may be of little conservation value unless intensively managed.

Despite the frequent failure of western approaches to wildlife conservation in post-colonial Africa (Parker 1983), perhaps most notably for the elephant, western interests, especially protectionist NGOs, continue to try and dictate conservation practice (Adams & McShane 1992; Bonner 1993; Gibson 1999; Duffy 2000), recommending areas are set aside for elephants. Western conservation organisations have subsequently been accused of imperialism or of wanting to re-colonise Africa (Adams & McShane 1992; Gibson 1999).

Partly in response to claims of imperialism, and partly as a result of a more holistic approach to conservation, a new paradigm of ecosystem conservation, which includes humans as an integral part of the system has been identified (Parker 1983; Gibson 1999; Duffy 2000). This paradigm needs to address the fact that elephants and humans are unable to co-exist above certain human population densities (the absolute density is dependent on local conditions, see Parker & Graham 1989b) and that human population increase is one of the leading causes of elephant population decline (Douglas-Hamilton 1987; Parker & Graham 1989a). If areas are set aside for elephants there is concern that reserves would become island ecosystems in a sea of transformed habitat (Owen-Smith 1988). Rather than setting aside 'island' populations of elephants, perhaps there is a greater need for conservation models for national parks and other areas that are broader and integrate conservation with other land uses (Parker 1983; Hanks 2001; Wynberg 2002).

The consequences of fragmentation for elephants

The fragmentation of landscapes and populations is of concern to conservation managers and scientists (Lande 1988; Burkey 1989; Cutler 1991; Robinson *et al.* 1992). Small fragmented populations are at greater risk of extinction from

demographic and environmental stochasticity and less likely to survive than larger populations that are less restricted spatially (see Terborgh & Winter 1980; Diamond 1984; Burkey 1989, 1999 and references therein).

The use of surrogate species in conservation biology may be a short cut to monitor or solve conservation problems (Caro & O' Doherty 1998), but Simberloff (1998) identified problems posed by a single species approach and proposed that we aim for ecosystem conservation. He acknowledged, however, that it is hard to define the ecosystem system and its function so perhaps the use of surrogates can be justified. The assumption underlying the use of surrogates is that if we protect the surrogate we can adequately conserve regional biota (Andelman & Fagan 2000). There is little evidence to support the use of umbrella or flagship species, and that, as a minimum, surrogate species must spatially co-occur with a large proportion of other species in the area of interest (Andelman & Fagan 2000).

The long-term population persistence of elephants is probably dependent on an initial population size exceeding 400 individuals (van Jaarsveld *et al*. 1999) and isolated populations smaller than this have experienced reduced genetic diversity (Whitehouse & Harley 2001). In South Africa only Kruger National Park and adjacent areas exceed a population size of 400 elephants (Hall-Martin 1992), although the founder population was probably much smaller and numbers increased due to immigration from Mozambique (Whyte 2001). The only elephant populations in South Africa/southern Mozambique that are not recently derived from the Kruger population are those of Maputaland and Addo Elephant National Park.

The Maputaland coastal plains are of importance as a biodiversity 'hotspot' (Myers *et al*. 2000) and many endemics/near endemics co-occur with the elephant populations (van Wyk 1994). We propose that the presence of elephants can afford

other species conservation that they might not otherwise have. Elephants fit the criteria of a flagship species because they can be used to "anchor a conservation campaign because it arouses public interest and sympathy" (Simberloff 1998) and are a species that stands for, or promotes, conservation in a general or regional sense (Mittermeier *et al*. 1998).

The presence of the African elephant as a flagship species might be a key factor in the conservation of the biodiversity of Maputaland. Early in the planning phase, the Peace Parks Foundation (PPF) identified the importance of elephants to the TFCA. It is significant in this case that the elephant was not used to determine the importance of Maputaland as a biodiversity 'hot spot' (Mittermeier *et al*. 1998), but used as a flagship species to attract funding, support and interest.

While ecosystem management is better than the conservation of flagships, in the case of Maputaland, perhaps, the flagship can enable ecosystem protection, especially by using elephant ranges to determine the ecosystem boundaries (Fairall & van Aarde 2004a). The elephant can be used as a flagship to draw attention or raise funds, but the status of elephants does not necessarily reflect the health of an ecosystem, as the removal of larger vertebrates can cause a wave of further extinction (Pimm 1991). For instance in South Africa the decline of elephants has resulted in forestation of large areas of savanna habitat, leading to localized extinction of several species of grazing antelope (Owen-Smith 1989).

Re-connecting fragmented elephant populations

If fragmentation has negative effects for elephant conservation then the ideal solution to the problem of fragmented elephant populations is to reunite, *i.e.* de-fragment, them. This may be facilitated through the establishment of TFCAs. In most countries

in the world, and in countries that were former colonies in particular, international borders are politically determined and not ecological or physical boundaries. This is especially evident in Africa where many international borders are straight lines.

In Southern Africa there are seven TFCAs in development between South Africa and its neighbours. Of these seven potential TFCAs two include the linking of conservation areas in South Africa and Mozambique; the Lubombo TFCA and the Limpopo (Gaza-Kruger-Gonarezhou) TFCA. The Lubombo Transfrontier Trilateral Protocol, between Mozambique, South Africa and Swaziland, and the Lubombo-Tembe-Futi TFCA Protocol between Mozambique and South Africa, both signed on 22nd June 2000 (Peace Parks Foundation 2004), are aimed at establishing a TFCA between the signatories including areas currently inhabited by the Maputaland elephant populations, and removing the fence which currently fragments the elephant population.

While the establishment of TFCAs is usually seen as beneficial to conservation activities it is possible that some attempts could be detrimental in the long term if communities are marginalised or displaced, or communal property rights are not established (Metcalfe 1999; Mayoral-Phillips 2000; Wynberg 2002). Elephants should not, therefore, be used as an excuse to establish TFCAs where it might not be beneficial for the ecosystem, or in response to an elephant problem on one side of an international boundary.