

Chapter 8. General Discussion

In this chapter, I begin by recapping some of the key findings of my research, and then discuss the history of wildlife conservation and management in the Kunene Region where the work was carried out. This provides the background needed to discuss current issues in wildlife management and sustainable use, before suggestions are made for future research.

8.1. Major findings of the thesis

The desert-dwelling giraffe of the northern Namib Desert survive at the edge of the species range. They are genetically distinct and behaviourally and ecologically different from other giraffe throughout Africa.

Genetic evidence indicates that Namibian giraffe are distinct and that they differ, in particular, from Cape giraffe *Giraffa camelopardalis giraffa* Lydekker 1904,; their taxonomic classification for the last century. The five unique haplotypes observed in the desert-dwelling and Etosha NP populations of giraffe indicate that the Namibian taxon has not interbred with other giraffe subspecies for an extended period. The genetic differences, coupled with geographical isolation of the population, warrant further investigation into the appropriate taxonomic classification of Namibia's giraffe. Unfortunately, the recent extinction of Angola's giraffe population limits genetic comparisons. However, there is evidence that the populations of Namibia and Angola overlapped historically. Upon further genetic investigation, appropriate morphological and ecological research, the Namibian giraffe may be formally reclassified as *G. c. angolensis*. The weight of evidence for this reclassification is strong, and Namibian giraffe have been considered to be *G. c. angolensis* in this chapter.

In Namibia, limited gene flow was evident between giraffe in the desert and those in Etosha NP, despite their close geographical proximity. Indeed, the only gene flow appeared to have resulted from recent translocations of giraffe from Etosha into the northern Namib Desert. Large-scale movements of giraffe in the northern Namib Desert suggest that inter-mixing occurs between populations within the study region. However,

increasing growth of human populations in this marginal farming environment may limit giraffe movements in future if access to forage areas is restricted or if direct conflicts arise.

The arid conditions of the northern Namib Desert shape aspects of the population dynamics of giraffe, such as the very low population density. However, aridity is not the only factor, as historical poaching pressures, low fecundity, limited food and low, spatially variable rainfall combine to reduce the rate of population growth. Individual associations and population structure also varied greatly within the subpopulations of the study region. For example, more associations were observed among bulls in the Hoarusib River study area, where bulls predominated; while cows preferred the areas away from the Hoarusib River. Limited food in the tributaries restricts the year-round presence of giraffe so that cows move to the broader riparian woodlands to forage in the hot-dry season, and risk the closer proximity to the communal farmers. In the small, cow-biased population of giraffe in the Khumib River, by contrast, cows associated more strongly and a matrilineal social structure was observed. In general, my observations showed that giraffe in the northern Namib Desert depend critically on the riparian woodlands of the ephemeral rivers for year-round forage and shade resources.

Direct observations and tracking showed that giraffe in the study region have large home ranges, with some individual bulls showing the largest home ranges of any giraffe yet recorded. The large home ranges were associated with low population density, but also with sparse food resources and increased searching for receptive cows. This study confirmed the occurrence of extensive movements between study areas.

The activity budgets of the desert-dwelling giraffe are strongly biphasic. Energy consuming activities such as feeding and walking were reduced at midday and during early afternoon when ambient temperatures were greatest, whilst energy conserving activities such as resting increased during the same period. Dispersal of surplus metabolic heat when temperatures are lower, evaporative cooling and adaptations for water conservation contribute to the biphasic pattern of diurnal activity. Behavioural responses such as the selection of microclimates (shade, wind and body orientation), also help to conserve energy and water.

The activity budgets of Namibia's desert-dwelling giraffe differed markedly between sexes, as observed in other giraffe populations (Leuthold & Leuthold, 1972; Pellew, 1984a; van der Jeugd & Prins, 2000), but the time spent in different activities differed between this and other studies. All giraffe in the study region spent most of the day feeding. Cows spent more time feeding and resting, while bulls walked and ruminated more often, and juveniles mostly fed and rested. Feeding, combined with walking, resting and ruminating, occupied more than 95% of the activity time of giraffe.

Giraffe cows exhibited an energy 'maximizer' strategy characterised by increased feeding during the cold-dry season; this would increase fat deposition and reduce energy consumptive activities for better survival during the long hot-dry season. In contrast, bulls exhibited an energy 'minimizer' strategy; here, feeding increased in the hot-dry season as available forage in the canopies became limited. Similar strategies have been reported in other giraffe populations in Africa, but are not as marked as in the study region. Social interactions observed during this study provided valuable insight into the bonds and hierarchy of giraffe society, although longer-term research would help to better understand such dynamics.

Selection of food plants by giraffe was driven by a combination of factors, such as chemical content, seasonal abundance and phenology. Giraffe seasonally selected forage with increased levels of moisture and crude protein, which in turn was influenced by rain and fog precipitation. Although the study area is arid and has a limited diversity and richness of plant species, selection of forage by giraffe did not always correlate with plant abundance, but did correlate with phenological changes and the seasonal availability of fresh leaves.

Giraffe foraged predominantly in the riparian woodlands, but also moved seasonally into other habitats to exploit alternative sources of food; the mountains were used mostly in the cold-dry season. I hypothesised originally that, in the Hoanib River, the moisture content of food would influence seasonal small-scale movement. However, giraffe were shown not to need free-water, and evidence suggests instead that seasonal nutrient quality and abundance of forage most influence giraffe movements.

Giraffe have caused distinct structural changes in plant species in the study region, in particular *Faidherbia albida*. Approximately 80% of *F. albida* trees in the Hoanib River have browse heights in excess of 3 m—a direct impact of giraffe. Aside from structural changes to individual trees, 20 years of assessment of the *F. albida* population indicates a marked shift in size class distribution, indicative of a non-equilibrium population (Nott, 1987; Viljoen & Bothma, 1990b; Jacobson & Jacobson, 1998). Increased residence periods by elephant away from the Hoanib River has probably reduced the pressure on forage in the riparian woodland since the 1980s and contributed to the observed shift in dynamics of *F. albida*. However, hydrological and climatic events, as opposed to wildlife impacts, have been the major influences on the population dynamics of *F. albida* in the Hoanib River.

In summary, there is a small but persistent population of desert-dwelling giraffe in north-western Namibia that has, until now, not been studied in detail. Limited historical evidence suggests that it may be vulnerable to disturbance in the riparian refugia of the Hoanib, Hoarusib and Khumib catchments and throughout the broader Kunene Region. In the next section, I discuss the conservation history of this region and evaluate some potential threats to giraffe and other wildlife as the region becomes more developed.

8.2. Conservation history, management and future of giraffe in Namibia's northwest

North-western Namibia has undergone significant political, economic, social and ecological changes over the past century (e.g. Schoeman, 1984; Dreyer, 1994; Kreike *et al.*, 2004). From the first European settlements through the turbulent times of apartheid, poaching and drought, and more recently, the resurgence of wildlife, a progression of conservation methods and management techniques has affected the environment and its inhabitants.

At the turn of the 20th century, the German colonial administration of the former South West Africa (Namibia) exercised no control in the Kaokoveld (Owen-Smith, 1986). In 1915 the South African forces overran the German administration and the country was proclaimed under their rule. The barren and wild land of north-west Namibia was

proclaimed by the new administration as a reserved area for the traditional Ova-Himba and Otji-Herero tribes. Although stark, it was reported that the Kaokoveld abounded with big game (Owen-Smith, 1986). In 1928 the Kaokoveld was proclaimed by the South African administration as a protected game conservation area and, together with the Etosha NP, became known as Game Reserve No. 2 (Owen-Smith, 1970). This was then the largest conservation area in Africa, approximately five million hectares in size, and 2.5 times the area of the Kruger NP (Owen-Smith, 1970 & 1986; Gibson, 2001). At the time, and throughout the decades to follow, the wildlife of the Kaokoveld was abundant and widespread throughout the region (Viljoen, 1982).

The Kaokoveld was declared a separate magisterial district in 1939. This encompassed the majority of Game Reserve No. 2 and the existing boundaries remained similar until the Odendaal Plan was implemented in the 1960s (Owen-Smith, 1970 & 1986). In 1962, the South African Prime Minister established a commission enquiring into the welfare and future development of Namibia and its inhabitants. As a result large tracts of the Kaokoveld were de-proclaimed as part of Game Reserve No.2 to create 'ethnic homelands' for the indigenous peoples (Owen-Smith, 1970 & 1986; Reardon, 1986). Approximately 1.5 million ha of the western section of the reserve were redistributed to form the newly established homelands of Kaokoland and Damaraland. Conservationists across the region deplored this decision (Owen-Smith, 1970; Reardon, 1986; Hall-Martin *et al.*, 1988). Once declared, these tribal homelands became inaccessible to the general public without a valid permit. This law did not change until 1977 when another redistribution of land was implemented under the Odendaal Plan (Owen-Smith, 1986; Reardon, 1986; Hall-Martin *et al.*, 1988). However, fuelled by the construction of artificial water points and the introduction of veterinary services and other major development infrastructure, increased human populations and large numbers of domestic stock competed with wildlife for natural resources, resulting in large declines in game numbers (Viljoen, 1981; Owen-Smith, 1986; DEA, 1996; Gibson, 2001).

During the mid-1970s, poaching became a substantial problem in the Kaokoveld, with Angolan and Portuguese poachers and soldiers venturing south into Namibia. This period coincided with the beginning of the people's struggle for Independence of Namibia. Before the end of the decade, illegal hunting became a popular distraction for high-ranking

members of the South African Defence Force and the former South African government (Viljoen, 1982; Owen-Smith, 1986; Hall-Martin *et al.*, 1988; Lindeque, 1991).

Also in the mid-1970s a double fence was erected from east to west across Namibia, separating the northern domestic stock-diseased area from the disease-free south. The veterinary cordon fence, or 'red line', was erected as part of the Odendaal Plan to comply with European Economic Community requirements for the export of cattle from Namibia (Owen-Smith, 1986; Loutit & Lindeque, 1988). The fence limited the seasonal movement of wildlife, which resulted in high numbers of wildlife deaths in the fragile environment of the arid north-west.

In 1977, concerned nature conservators from the adjacent Skeleton Coast Park began to undertake anti-poaching patrols inland into Kaokoland and Damaraland, which continued until the late 1980s (Owen-Smith, 1970). Prior to the mid to late 1970s, the Directorate of Nature Conservation had little infrastructure to stop poaching activities, while jurisdiction in the area was unclear. It was not until 1981 that the first nature conservator was officially stationed in the Kaokoveld. Based in Damaraland the responsible officer initially patrolled an area of approximately 95 000 km² (Owen-Smith, 1986).

Devastating droughts in the early 1980s further accelerated a decline in wildlife numbers, with an estimated 60% of the large mammals and some 90% of the region's domestic stock dying off (D. Gilchrist & R. Loutit, personal communication). With such impacts, local farmers turned to hunting for survival, using weapons and ammunition supplied during the independence struggle. Wildlife numbers were now markedly reduced over Namibia's north-west and few animals remained, concentrating in isolated and remote pockets, such as the arid areas south of the Hoanib River. At this time, bans on hunting, increased scientific research and conservation of the area's rare and endangered wildlife were proposed, but to no avail (Hall-Martin *et al.*, 1988).

In 1982, a group of concerned conservationists and like-minded business people established the Namibia Wildlife Trust (NWT) to help fight poaching (Owen-Smith, 1986). The NWT, in conjunction with the appointed local conservator, worked closely with local tribal authorities through appropriate programs of conservation education, and extension

work. Over time the relationship yielded the respect and authority of the traditional elders, who placed their own local hunting embargo on the area's wildlife (Owen-Smith, 1986). This was a large step forward and one that would lead to the eventual creation of the current Community-based Natural Resource Management (CBNRM) program. During 1983 the NWT established the 'auxiliary game guard' system, again in close collaboration with the traditional elders, continuing the efforts to reduce poaching. This success saw the way forward for the local people to take ownership over the region's wildlife for their future. A localised resurgence in poaching occurred briefly in the late 1980s, but the combined efforts of NGOs, government, safari operators and communal authorities limited the impact (Reardon, 1986).

Prior to Namibia's Independence in 1990, communal residents were subjected to an array of dis-empowering processes and legislation (apartheid). These affected almost every facet of life, including education, health, agriculture and natural resource management practices. Wildlife belonged to the State and there was no incentive for people to manage local wildlife resources. Following Namibia's Independence in 1990, the newly-formed Ministry of Environment and Tourism (MET), in collaboration with the existing work of NGOs, embarked upon a process of changing the environmental legislation. This used a consultative approach, drawing on the ideals, wishes and needs of communal residents. The Namibian Government subsequently developed and introduced modern legislation in 1996, paving the way for the establishment of communal area conservancies (Jones & Murphree, 2001; NACSO, 2003). This legislation makes provision for communal area residents to obtain legal rights and responsibilities over the natural resources and tourism in their region. Furthermore, it provides legal and social mechanisms through which communal area residents can engage in natural resource management.

In a communally-owned and managed area, rural people have pooled their resources in order to manage, utilise and benefit from wildlife and other natural resources. Communal area conservancies allow people to diversify their livelihoods beyond normal farming practices and provide a greater incentive for sound natural resource management (Barrow & Murphree, 2001; Jones, 2001). However, conflicts and inter-communal conservancy disagreements between the conservancy boundaries and tribal groupings have hampered this process significantly (NACSO, 2003). In addition, support from the government,

although one of the initial driving forces behind the CBNRM program and associated legislation changes, was perceived to be indifferent at times (Jones, 1997; NACSO, 2003).

In addition to CBNRM, numerous conservation and management plans have been proposed since the mid-1990s, from the extension of the Etosha NP into the communal Kunene Region, to a Tourism Master Plan for the Region (e.g. Urban Dynamics Africa, 1999). Although all efforts were considered commendable and attempted to increase conservation and natural resource management, most did not leave the initial planning as legislation or general consent.

8.3. CBNRM and conservation in the Kunene Region

Almost a century of expansion and reduction of protected land in the Kunene Region, coupled with a range of management approaches, has set the framework for CBNRM in Namibia's north-west. The CBNRM program is a government initiative, actively promoting the sustainable utilisation of communal land that is economically viable and ecologically sustainable, while also being a sound mechanism driving local development, sustainable livelihoods and wildlife conservation (Long, 2004). The program is a collaborative approach that benefits communal conservancy members (predominantly subsistence farmers), and is supported by NGOs, donors and various government sectors.

The success of the Namibian CBNRM program has been largely wildlife- and tourism-based, but the depth of the program is far greater and the concept far broader. CBNRM is providing rural communities with the skills and tools to be involved in a wide range of social, economic and environment-empowering processes. From improving livelihoods, personal enrichment, capacity building, communication and management to preserving their country's natural endowments, the program has established a range of methodologies and lessons learnt in order to formulate a progressive legislative framework as a backbone for the success of the program. Importantly, the CBNRM program is not a silver bullet or panacea for any particular economic, social or ecological issue, but is part of a broader objective with a triple-bottom line approach.

CBNRM was initiated in Namibia in the 1980s and today more than five million hectares of communal land are under protective management by registered and emerging conservancies (NACSO, 2003). An increasing number of conservancies are becoming self-funded from locally-generated revenues, while direct benefits to the conservancy members include the building of local schools, distribution of cash revenue and creation of jobs. However, it would be ignorant to assume that the CBNRM program has been all things to all people. Inevitably, some components of the program are stronger than others, much of which has been dependent on NGO and donor support, the skill base and resources available (NACSO, 2003). On the whole, the program is moving in the right direction, although it is important to note that its continued success will require ongoing support. In the sections below I briefly outline and discuss some aspects of the CBNRM program with relation to long-term wildlife conservation and management in the Kunene Region.

8.3.1. Wildlife management and sustainable use

The Namibian government actively promotes sustainable use of wildlife as a management approach, and as an economically viable and ecologically sustainable tool on communal land such as in the Kunene Region. Benefits from wildlife use (consumptive and non-consumptive) on communal land are increasing annually since its recognition as an operational management tool within the CBNRM program. Economic benefits exceed N\$10 million a year, while the social benefits are considerable (Ashley & Barnes, 1996). Studies indicate that sustainable use of wildlife on commercial land is currently greater than five times that on communal land, although evidence suggests that the CBNRM program will allow for far greater revenue on communal land in the long-term than currently observed for the commercial sector (Ashley & Barnes, 1996).

Community-based wildlife management in the Kunene Region has facilitated many positive offshoots, such as increased wildlife populations, financial gains, and distribution of trophy meat, but also negatives, such as human-wildlife and domestic stock-wildlife conflict. Some of the questions that are now arising from the successful conservation and

management undertaken over the past 20 years which has seen the numbers of wildlife increase in the region are:

- how sustainable is the use of wildlife in an arid environment?
- Will conservancies have the skill, resources or capital to self-administer wildlife management or seek expert advice on these issues?

Although these are critical questions, what I perceive to be most important is finding the correct methods and tools that will help understand wildlife management in the future. An important tool for sustainable use of wildlife and conservation is long-term wildlife monitoring by the conservancy. Local-level wildlife monitoring offers a broad range of benefits, such as increased wildlife populations, local empowerment, skills and job creation (e.g. conservancy game guard system). The quality and continuity of monitoring are keys for obtaining long-term, standardised data for appropriate conservation and management (e.g. Taylor, 2001). However, community lethargy has found its way into local level monitoring (personal observation) and as a result monitoring has been substandard and not continuous in some conservancies. Partly, this is due to a lack of vehicles or unclear division of responsibilities in the CBNRM program (e.g. Sullivan, 2002; Sullivan & Homewood, 2004; personal observation). This has the potential to have marked short- and long-term impacts on wildlife management, as well as a knock-on effect for the economic and ecological sustainability issues facing conservancies.

With respect to giraffe, community-based wildlife management may need to take only a guardian approach in which conservancies undertake long-term monitoring of numbers and distribution, limit poaching and, if possible, restrict consumptive use of giraffe until long-term population data have been obtained. Within the conservancies of the study region, my recommendations would include that giraffe hunting should not be undertaken as the population is too low and giraffe move regularly between two or more conservancies. Until further monitoring and research are undertaken, conflict may arise over assigning ownership and benefits (financial, meat or material) to conservancies due to the large-scale movement of giraffe. However, in proposing this, budgetary constraints within individual conservancies and the CBNRM program, coupled with the assumption that biological management of giraffe is sustainable, it appears likely that trophy hunting of giraffe in the northern Namib Desert may occur.

As outlined by Long (2004), it is important that any government revenue derived from sustainable use should go towards promoting the conservation objectives of the country, which would include diverting revenue directly back to conservancies. Recommendations for establishing guiding principles and criteria for hunting black rhinoceros were recently proposed (Leader-Williams *et al.*, 2004). Many of these principles could be transferable for hunting of giraffe in the Kunene Region and support the community-based wildlife management approach (Leader-Williams *et al.*, 2004):

- ensuring that any offtake is biologically sustainable and based on good monitoring;
- ensuring that incentives from hunting opportunities are maximised, without discriminating between state agencies, private and communal sector;
- rewarding good biological management and long-term commitment to wildlife conservation; and,
- ensuring that appropriate internal and external controls are in place.

In advocating these principles, it is important that rural communities understand sustainable wildlife use and show awareness that economic benefits from wildlife outweigh land use options that exclude wildlife (du Toit, 2002). In an arid environment this includes establishing population estimates and setting carrying limits on consumptive use, while taking into account stochastic abiotic factors (Mentis, 1971; Bell, 1986; du Toit, 2002). One of the problems of sustainable consumptive use in an arid environment is that offtake may vary annually, and therefore lower offtake would result in a reduction in benefits. Importantly, education is the key to conservancies understanding this process, and this would in turn support their own survival as well as that of wildlife over the longer-term in the region (e.g. Hachileka & Kokwe, 2000; Shackleton & Campbell, 2000).

Further emphasis needs to be placed on highlighting the desert-dwelling giraffe as an ecologically distinct species, as has been done for the desert-dwelling elephant and rhinoceros. Preliminary studies indicate that non-consumptive wildlife-tourism is a valuable revenue earner for conservancies in the Kunene Region provided that appropriate management, training and guidelines are provided (M. Sibalatani & M. Hearn, unpublished data). For long-term success, wildlife management needs to extend across sectors, including tourism, as well as provide support for legislative changes to devolve more responsibility and control to the conservancies.

8.3.2. Tourism

Tourism in the northern Namib Desert has been emphasised as an industry that may be able to provide socio-economic and ecological development for people in the Kunene Region (Urban Dynamics Africa, 1999). Tourist numbers and facilities are mushrooming, but largely without control or formalisation, while the benefits of tourism to conservancies in the region are increasing. Some conservancies are fortunate to have a greater abundance of charismatic megafauna than others, thus enticing tourists and joint-venture operators, and in turn revenue and job creation, into their areas. Uncontrolled tourism in the Kunene Region impacts on wildlife behaviour, causes damage to the environment, and spoils the tourism experience. (Urban Dynamics Africa, 1999; SRT & NACOBTA, unpublished data; personal observation). Similar social and environmental impacts have been reported elsewhere (e.g. Chenje & Johnson, 1994; Reid, 2000; Terkenli, 2001)

Some of the key components of a formalised wildlife-tourism market are control, safety, socio-economic benefits and sustainability. In the Kunene Region, tourist numbers have increased markedly since the mid-1990s (Urban Dynamics Africa, 1999; NACOBTA, unpublished data). These trends indicate a greater demand and potential for sustainable tourism in the region. However, some consequences of increased tourism have included photographers harassing wildlife, motorbikes circling elephant, elephant charging vehicles and injuring or trampling tourists (Urban Dynamics Africa, 1999; SRT & NACOBTA, unpublished data; D. van Smeerdijk, personal communication; personal observation). With escalating and uncontrolled tourism, the impact on wildlife and the environment becomes difficult to predict.

A key strategy for long-term wildlife-tourism and its sustainability is low-impact community-based tourism. This would be beneficial for the environment, conservancies and their members, and potentially the private sector, which establishes joint-venture tourism agreements. Importantly, and particularly in light of increased tourist numbers and the unknown impacts of tourism on giraffe and other wildlife populations, an integrated tourist control or monitoring program is required for long-term conservation and tourist management in the study region.

Two methods proposed specifically for the Kunene Region include setting limits for the maximum use of an area, essentially estimating an area's carrying capacity, and establishing Limits of Acceptable Change (LAC) (Urban Dynamics Africa, 1999). The latter is more quantifiable and is an appropriate measure of the impacts of tourism in the study region. LAC defines management actions that would be triggered in response to defined signs of tourist pressure, established by local CBNRM planning and monitoring. Wildlife is the focus for tourism in the region and appropriate monitoring of the population behaviour should be a priority. However, other factors which should be assessed are road condition, vegetation or soil condition, litter and other pollution, the impact of visitors on local communities and visitor satisfaction levels (Urban Dynamics Africa, 1999). This would require regular and consistent, qualitative and quantitative data being obtained for the factors mentioned, and it is critical that long-term monitoring is undertaken so that guidelines for conservation and management of the resources can be established.

In addition to wildlife-tourism and control, one of the most effective measures to support wildlife conservation in the Kunene Region is to proclaim certain areas within and across conservancies as protected land. This would then afford increased protection to wildlife and the environment, as well as help control tourism. However, this may be legally difficult due to the proclamation of the communal area at Independence that allows free access to all people. Long-term planning and collaboration between all parties involved in the CBNRM program may lead to greater protection of land in communal areas.

8.3.3. Water development programs

It has been well documented that wildlife abundance in Africa has a negative relationship with human density (e.g. Eltringham, 1990; Happold, 1995). Human settlements tend to develop around water sources, both permanent and seasonal. The increase in use of these areas, particularly in arid environments, often results in irreversible environmental damage such as severe degradation, erosion and overgrazing. Furthermore, human settlements restrict access and increase competition for wildlife that use these water sources. In the arid Kalahari of Botswana, throughout the Sahel and elsewhere, permanent settlements have had a marked impact on wildlife movements (development), wildlife numbers

(hunting) and habitat use (competition for forage with domestic stock) (e.g. Parris & Child, 1973; Leisinger & Schmitt, 1995; Ngana, 2002; Biswas, 2004). Similar processes are currently operating and have occurred historically in the study region, to the detriment of the wildlife.

Increased numbers of water points in the study region have already had an affect on wildlife (K. Leggett, personal communication; personal observation.). For example, the foraging range of elephant has increased along the Hoanib River, and so too have predator numbers. This development has put severe stress on giraffe in the study region and resulted in the first known giraffe mortalities by predators in the Hoanib River in the past decade (personal observation). Permanent water also encourages communal farmers and their domestic stock to use areas for extended periods that have historically been only seasonally accessible. While this has not yet been observed for the new water point installations in the Hoanib River, historical knowledge indicates that communal farmers have used these areas seasonally in the past, and this may encourage their use in the future to the potential detriment of wildlife (J. Patterson, personal communication; observation). As the long-term impacts of water installations in the study region are unknown, it is important to undertake ecological monitoring to assess any resulting changes, whether they be human or wildlife-induced.

8.3.4. Poaching

Poaching of wildlife in the Kunene Region has been markedly reduced since the onslaughts of the 1960s to the 1980s. There was no evidence of giraffe poaching during this study, but small-scale poaching of smaller wildlife does occur (Katjiua *et al.*, 2002; K. Vaughan personal communication). This low intensity poaching may be sustainable in the sense that it is subsistence hunting for the family pot, although the localised impacts on wildlife is unknown.

A real concern is the potential for an increased demand of wildlife products, as this could result in large-scale losses of wildlife (e.g. Viljoen, 1989; Leader-Williams *et al.*, 1990; Milliken *et al.*, 1993; Caughley & Sinclair, 1994). Poaching of giraffe has never been an

issue that has drawn significant conservation or management attention, but recent reports indicate that giraffe poaching has risen markedly in Tanzania where local authorities believe that giraffe meat is a potential cure for HIV/Aids (Anon, 2004a). The HIV/Aids pandemic has caused many deaths and debilitation to families and economies across Africa. Appropriate education is necessary to dispel such irrational myths as soon as possible before widescale deaths of wildlife ensue.

8.4. Future research

No long-term monitoring of giraffe has ever been undertaken in Africa. This study provides useful baseline research that could form a solid grounding for long-term research and monitoring. I believe that without long-term research our understanding of giraffe will remain too limited to achieve effective conservation, and our attempts at management will continue to provide only short-term solutions.

The benefits afforded by long-term research enable one to assess the past, and present processes which impact on giraffe and giraffe habitat, and provide a means to predict the effects of management. Our current knowledge of giraffe ecology represents primarily a ‘snap shot’ in time; long-term studies should hopefully provide greater insight into many aspects of ecology, including population dynamics, social structure, movements, habitat use, resource competition and the impact of seasonal and periodic climatic conditions. Furthermore, long-term research can be augmented by in-depth analysis of individuals and their associations in the population. By using emerging microsatellite screening methods, it should also be possible to ascertain paternal and maternal associations to explore the importance of apparent matrilineal structures. Such information could provide the basis for sound conservation and management of giraffe.

There is currently an assumption that numbers of giraffe are stable and the taxon is not threatened, and this seems to have allowed some lethargy to creep into the management of giraffe in Africa. Is little conservation really required? No one has yet established the true extent of change in historical and current numbers and range of giraffe, nor the effects of habitat loss, fragmentation and human development. Furthermore, if such beliefs as giraffe

meat being a panacea for HIV/Aids persist, the species may become seriously threatened. As observed for many wild species throughout the continent, giraffe have suffered marked reductions in range and available habitat (e.g. Skinner & Smithers, 1990; East, 1999). Future research should set to develop a model for giraffe conservation and management in Africa using one country, such as Namibia, as an example population. Similar models have been proposed or developed for other wild species (e.g. MacDonald, 1997; Anon, 2004b). By establishing a baseline of past, present and future range, genetic relationships and diversity, population dynamics and structure, a range of conservation and management objectives could be formulated and a model established. This model could be adapted and applied to populations throughout their extant range. Since Namibia has small but potentially stable populations of giraffe that reside both in and out of protected areas, as well as a good legislative and management base in rural areas (CBNRM), using it as a model seems practical.

The desert-dwelling giraffe of the northern Namib Desert have survived a multitude of recent impacts including war, habitat fragmentation and loss, predation, development, disease, drought, tourism and poaching events. The population is unique, not only in its ability to survive, but also to adapt in such a harsh and arid environment. The ecological importance of such a unique 'ecotype' should be enough to support its protected status, even before the added knowledge that the giraffe is one of Africa's most recognised yet little understood and charismatic megafauna.