

CHAPTER 9.

GENERAL CONCLUSIONS AND MANAGEMENT IMPLICATIONS FOR LARGE CARNIVORE REINTRODUCTION.

The present study suggested that, contrary to most other efforts at large African carnivore translocation, reintroduction may be a viable method for re-population, at least in the short-term. From a behavioural and ecological perspective, reintroduced lions and cheetahs appeared well-disposed to translocation: they established home ranges, foraged successfully and produced offspring which they raised to independence. Methodological considerations contributed in part to the success of early establishment of reintroduced felids. Released lions and cheetahs at Phinda showed minimal evidence of homing behaviour compared with previous efforts to translocate large felids (Chapter 3) and subsequently established enduring home ranges at the release site (Chapter 4).

Quantifying the influence of these techniques is complicated by the difficulty of establishing control groups but a substantial pre-release captivity period combined with the presence of electrified fencing appears to be important in these processes. Since the use of these techniques at Phinda, many subsequent efforts at large carnivore reintroduction have adopted them with similar results and success (Van Dyk 1997; Hofmeyr & Van Dyk, 1998; Purchase, 1998). Although such techniques require considerable resources, it is highly recommended that projects attempting to reintroduce large felids in South Africa consider their use. In areas where fencing release sites is not practised or not feasible, such methods may have reduced applicability and is an area which would be productive for further study. Regardless of the techniques adopted by practitioners, projects involving large carnivore restoration are inevitably expensive and therefore, should not be undertaken without access to *at least* the capital required by the methods adopted during this study.

The availability of suitable habitat and resources is another factor which will significantly influence project success and should be an important aspect of a management plan for reintroduced lions and cheetahs. Some lions at Phinda showed extended periods of activity around small, isolated artificial dams and this may have contributed to increased predation pressure on herbivores. Although the understanding of this relationship is still in its infancy, careful consideration of the placement and distribution of artificial water sources is an important aspect of predator-prey management in small reserves. Similarly, the suitability of habitat for cheetahs in a reintroduction project requires careful consideration. The limited availability of open woodland and savannah at Phinda may have forced cheetahs to encounter conspecifics and other carnivores (particularly lions) at increased rates. Some of these incidents resulted in the deaths of healthy, adult cheetahs which may not have

occurred if more open habitat was available. In regions where the extirpation of large herbivores has resulted in bush encroachment, active manipulation of habitat types using techniques such as selective bush-clearing may be necessary to improve success.

Again, this requires considerable resources, but it can play a significant role in the creation of jobs and access to resources for local people on the boundaries of reserves, itself an important factor in the long-term success of carnivore restoration (Chapter 2; Peek *et al*, 1991; Reading & Clark, 1996). At Phinda, much of the bush-clearing project was conducted using locally employed labour which cleared encroached areas using hand tools. Further, the wood from these operations was made available to local communities for fuel and also formed the basis of a charcoal-producing cottage industry. Importantly, such methods take substantially longer than using heavy machinery and if they are to form part of an effort to improve habitat suitability for reintroduced cheetahs, must be planned and implemented far in advance of the release of cats.

This study illustrated the importance of human activity in post-release mortality of re-introduced cats, an area where intensive management could significantly improve results. Human activity is increasingly considered to be the single greatest factor likely to influence the success of reintroduction projects, particularly of large carnivores (Peek *et al*, 1991; Reading & Clark, 1996; Linnell *et al*, 1997; Woodruffe & Ginsberg, 1998). The pressure on reserves to provide an established tourism operation while felid reintroduction is ongoing may exacerbate the significant human-mediated mortality of cats, as seen in the present study. Where possible, the development of the extensive infrastructure required by wildlife tourism operations should be staggered to reduce competition for resources which might otherwise be allocated to felid reintroduction and management. In many cases, where the reserve is established and functional, the potential for conflict will be reduced. However in newly established reserves (which are presently the most common sites for release of large carnivores in South Africa), this may be a significant problem.

Carnivore reintroductions face considerable obstacles beyond the initial stages following release. In small, enclosed reserves, managers need to be aware that monitoring and management of reintroduced felids is an ongoing, long-term process. This cannot be neglected following the early stages of a project, which are typically marked by high levels of excitement and resource allocation but which inevitably decline once animals are considered "settled". At Phinda, the impact of growing populations of reintroduced cats led to the decline of some herbivore species (Chapter 7) and removals of both lions and cheetahs were implemented from 1995 onwards (Hunter, 1996b). In small, enclosed reserves with resident populations of herbivores, this kind of long-term population control will probably be necessary to avoid excessive impact on prey species. Although it remains to be seen whether

excessive levels of predation would result in the extinction of a species following reintroduction of cats, managers will be unable to make informed decisions if consistent monitoring of cats and their prey species is not maintained long after the early post-release period.

Other long-term issues may threaten project success. Most such projects are typically initiated with a small number of founders bringing genetic considerations into question. A small population with few founders may be subject to losses of genetic variability, reducing its ability to adapt to environmental changes and increasing chances of inbreeding and losses to disease episodes. The decline of lions in the Umfolozi-Hluhluwe Game Reserve apparently related to an immunodeficiency syndrome as a result of inbreeding (Meltzer *et al*, 1997) suggests that a management plan for reintroduced populations should specify how to avoid this problem in the early stages of a project. At the time of writing, Phinda already has an inbred generation of lions, a problem experienced by other reserves with small, reintroduced lion populations (Braack, *pers comm*)¹. Avoiding this outcome is most easily achieved in the early years following release when the relationships between founding animals and their offspring tend to be well monitored and understood. Further, the present study demonstrated that unrelated animals can be 'bonded' to form founder groups, a technique which has subsequently been refined elsewhere in South Africa (Van Dyk 1997) and which can be adopted to offset this problem.

Spatial characteristics of sites in such projects are also threats to long-term success. The persistence of populations will be affected by whether the area is large enough to sustain enough individuals required to maintain demographic and genetic heterogeneity in the long term, exceedingly so for small founder groups typical of carnivore reintroduction (Gilpin, 1987; Clark & Reading, 1996). Furthermore the degree of isolation from other potential release sites or established populations will influence the degree to which the exchange of individuals- whether natural or mediated by man- is possible. Minimum population sizes and the impact of these processes on restored populations are still largely unknown for large carnivores (Beier, 1993; Dinerstein *et al*, 1997). Increasingly, wildlife managers and conservation biologists are faced with the problem of fragmented and isolated wildlife populations where the normal processes of dispersal, immigration and emigration are impeded or impossible (Lacy, 1987). To ensure the long-term persistence of reintroduced populations in small, enclosed reserves such as Phinda, a metapopulation management approach- in which each population is treated as a sub-division of the entire population, and genetic and demographic exchange is mediated 'artificially' by human management- will

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probably be necessary (Gilpin, 1987). At the time of writing, Phinda management is involved in negotiations to consolidate 500km² of government and privately-owned land surrounding Phinda into a single conservation area, and exchanges and translocations of lions and cheetahs between Phinda and other developing reserves has been ongoing since 1995 (Hunter 1996b). Ultimately, such an approach will considerably enhance the conservation value of the Phinda lion and cheetah populations.

Clearly, considerable obstacles face efforts to re-establish large felids. Ongoing research and extensive, continued management of such 'restored' ecosystems will prove to be critical factors in the long-term survival of these expensive, high-profile conservation efforts. Nonetheless, the short-term benefits of these types of projects may be significant. From an 'eco-tourism' perspective, Phinda is widely considered to be one of the best reserves in which to view lions and cheetahs, and that kudos has encouraged other similar projects in southern Africa (Wells, 1996). The gradual consolidation of such efforts and exchange of information between them will substantially increase their contribution to conservation biology. This is the subject for on-going research within southern Africa (Hunter, 1998b) and will ultimately provide more answers to the long-term management issues surrounding large felid restoration.

...are without due consideration for various factors which adversely may affect the success of such a release. The present study attempted to address such issues including possible trauma and disorientation associated with capture and transportation, the presence of resident conspecifics, the availability of space for released individuals and the possibility of individuals leaving the release site and encountering conflicts with humans. All individuals in the present study were held in captivity following their capture for 6-8 weeks at the release site prior to being set free. Release events were staggered and took place from different locations within Phinda for two reasons. First, it was intended to allow individuals sufficient time and space to establish home ranges before the potentially disruptive effects of subsequent releases. Secondly, it was hoped newly released individuals would be less likely to encounter territorial conspecifics soon after release by having later release sites outside the home ranges of established individuals. The reserve lacked resident lions and cheetahs and was entirely surrounded by electrified fencing in an attempt to discourage reintroduced cats from leaving the site (Chapter 2).

All reintroduced lions and cheetahs remained at the reserve. Animals generally did not display the excessive "homing" behaviour characteristic of past carnivore translocations in other regions. Three groups of lions and cheetahs (largely young males) showed evidence of homing for two months following release, but all subsequently established home-ranges at the release site. The reserve's boundary fence was a critical factor in restricting post-release movements of felids. Unfamiliar and unacclimated animals socialised during the pre-