

CHAPTER 7

Summary and conclusions

Expansion of the geographic range of wild dogs *Lycaon pictus* in South Africa is of key importance to reduce the risks of extinction associated with small populations. A proliferation of private nature reserves and game ranches in South Africa (van der Waal & Dekker 2000) has resulted in increasing scope for conserving wild dogs on private land. This chapter summarises a study which: a) assessed the potential for conserving wild dogs outside state protected areas on private land; b) identified conditions under which conservation efforts are most likely to succeed; and c) suggested appropriate conservation strategies.

7.1 Answers to questions addressed in this study

7.1.1 What is the present distribution and population status of wild dogs outside state protected areas in South Africa?

Wild dogs outside protected areas form a more significant component of the South African wild dog population than previously recognised (c.f. Fanshawe et al. 1997). The population of wild dogs occurring outside state protected areas in South Africa is estimated to have fluctuated between 42 and 106 animals during 1996 - 2002. The number of wild dogs resident outside protected areas during this period, ranged between 25 and 67 animals during 1996 - 2001, with an extent of occurrence of 43,310 km² and an

area of occupancy of 17,907 km². Sightings were most commonly reported from the western border of Kruger National Park (henceforth referred to as “Kruger”), along the Limpopo River, and from northern Kwa-Zulu Natal. The majority of sightings of resident wild dogs occurred on game ranches (77.2%), with unmodified land cover (91.2%), at low human densities (19.5 ± 4.77 people / km²; mean \pm S.E.) and close to source populations (86.6 km \pm 5.02). Dispersing wild dogs were sighted further from source populations (187 km \pm 16.1), in areas of higher human density (47.1 people / km² \pm 2.24), in more modified habitat (19.6% of sightings occurred in areas of degraded or unsuitable land cover), and in more varied land use (only 32.9% on game ranches).

An estimated 264,900 km² of potentially suitable habitat (unmodified natural land cover and <5 people / km²) for the conservation of wild dogs exists north of the southerly borders of the Free State and Kwa-Zulu Natal provinces. However, habitat fragmentation, the presence of high-speed roads and negative human attitudes are likely to substantially reduce the area available for range expansion. The best scope for range expansion probably exists in Limpopo (46,550 km² of potentially suitable habitat), and North West (39,725 km² of potentially suitable habitat) due to the prevalence of game ranching (van der Waal & Dekker 2000) and the proximity of source populations. Despite large areas of unmodified habitat with low human densities, the Free State (49,350 km² of potentially suitable habitat) and Northern Cape (115,650 km² of potentially suitable habitat north of the southern Free State border) provinces probably provide poor prospects for wild dog conservation. In both provinces, wild dogs would likely conflict with sheep farming, and the absence of resident wild dogs in the Kgalagadi Park in the Northern Cape (Fanshawe

et al. 1997) suggests that the habitat in the dry west of South Africa is likely sub-optimal for wild dogs.

7.1.2 What are the minimum area and prey requirements for a pack in the areas in which wild dogs occur in South Africa?

An estimated minimum area of 158.5 km² is required to support a pack of 12 wild dogs in northern South Africa, compared to 172.8 km² in eastern South Africa, and 354.2 km² in northeastern South Africa. A pack size of five is the threshold, below which reproductive failure is likely (Courchamp & Macdonald 2001). The area requirements of five wild dogs are estimated to be 65.4 km² in northern South Africa, 72.1 km² in eastern South Africa and 147.2 km² in northeastern South Africa. These results suggest that reserves smaller than those previously utilised might be considered for wild dog reintroductions. These estimates represent the theoretical minimum area necessary to support wild dogs, and observed home range areas under natural conditions are significantly larger (by 1.2 times in eastern South Africa, 2 times in northeastern South Africa, and 3.5 times in northern South Africa). Conservation of wild dogs at the theoretical maximum density would require intensive management of the factors known to limit wild dogs under natural conditions.

7.1.3 What are the attitudes of landowners towards wild dogs, and the reasons for these attitudes in the areas in which wild dogs occur on private land in South Africa?

Wild dogs are the least popular large carnivores among southern African ranchers.

Despite this, 52.3% of ranchers indicated that they would like to have wild dogs on their

property. Rancher's attitudes varied significantly between sample sites; the highest proportion of ranchers were positive in eastern South Africa (69.2%), followed by in Zimbabwe (66.6%), northeastern South Africa (58.5%) and finally, northern South Africa (24.1%). The proportion of land area occupied by ranchers positive towards wild dogs varies from 75.5% in eastern South Africa, to 68.9% in northeastern South Africa, and 39.4% in northern South Africa.

The most common reasons for negative attitudes towards wild dogs were "they affect my income" (13.5% of ranchers), "they kill a lot / too much game" (13%), "they kill livestock" (12%), and "they chase game and make it wild" (10.6%). The complaints of many ranchers (44.7% of ranchers) were related to economic costs associated with the presence of wild dogs. Conservation initiatives aimed at reducing the costs associated with the presence of wild dogs represent the most direct way in which to improve attitudes. The most common reasons for positive attitudes towards wild dogs were; 'their ecotourism value' (21.6%), 'their ecological role' (13.5%), and 'because wild dogs only pass through the property' (12.5%).

Attitudes are most positive where neighbouring ranchers have cooperated to remove internal fencing to form collaborative nature reserves, and where land use is dominated by ecotourism. Attitudes are likely to be negative where ranches are isolated from neighbours by perimeter game fencing, and where cattle ranching or the consumptive utilisation of wildlife dominate land use.

7.1.4 What are the costs and potential benefits associated with conserving wild dogs within a viable population, through reintroduction into a reserve, and in situ, on ranchland?

The costs (estimated present values) of conserving a pack of wild dogs in perpetuity under three scenarios are as follows: 1) \$1,850 within a viable population; 2) \$78,861 - \$856,928 for reintroduction into and maintenance within a private nature reserve utilised for commercial wildlife production (depending primarily upon the need for upgrading perimeter fencing, and the costs of predation by wild dogs post-release); 3) \$47,467 - \$460,136 on ranchland, depending upon the costs of predation.

The willingness of tourists to pay to go on a guided tour to see wild dogs at a den varied from a minimum of \$11 / person / trip, among visitors to a public reserve (Kruger), to \$53 / person / trip among visitors to a private nature reserve (Ngala Game Reserve). In the scenario of two trips to a den daily with a safari vehicle capable of carrying nine guests over a period of three months, and a 75% booking rate, potential annual income is \$11,110 under the Kruger estimate of willingness to pay, and \$63,499 under the Ngala estimate of willingness to pay. The net present value of conserving a pack of wild dogs in a viable population in perpetuity is estimated to be \$90,887. Potential annual tourism revenue from a single pack in Kruger (\$11,110) is sufficient to offset the mean annual costs of the conservation of the entire Kruger population (\$1,712). Given the high volumes of tourists and multiple wild dog packs in Kruger, it is realistic to argue that Kruger could potentially generate sufficient funds from wild dog-based ecotourism to subsidise wild dog conservation efforts elsewhere.

The potential for tourism revenue to offset the costs of the reintroduction and conservation of wild dogs in a private nature reserve is dependent upon predicted tourism benefits, the need for modifications to perimeter fencing, and the post release costs of predation by wild dogs. Tourism revenue is only likely to offset costs if tourist willingness to pay is high, and costs associated with post-release predation by wild dogs are negligible. Under these conditions, tourism revenues have the potential to act as an incentive for private nature reserve owners to reintroduce wild dogs at their own cost. On ranchland, tourism revenue is predicted to offset the costs of conserving wild dogs under most scenarios and has the potential to act as a real incentive for ranchers to conserve wild dogs on their properties.

7.1.5 To what extent has donor funding subsidised wild dog conservation in South Africa in recent years?

An estimated \$372,297 was spent on the conservation of wild dogs in South Africa between 1997 and 2001, at an average of \$74,459 per annum. Of this \$270,117 (72.6%) was spent specifically on the meta-population, \$57,863 (15.5%) on wild dogs in Kruger and \$33,942 (9.1%) on wild dogs on ranchland. NGOs provided the most funding for wild dog conservation in South Africa during 1997 - 2001 (39.9%), followed by South African state agencies (36.8%), private donors (20.8%) and universities (2.5%). The majority of expenditure on the Kruger population was provided by state agencies (65.8%), the remainder being provided by NGOs (34.2%). NGOs provided most of the money spent on the meta-population (44.5%), followed by private donors (27.9%), and

state agencies (26.8%). The majority of the money spent on wild dogs on ranchland was provided by state agencies (71.9%), followed by NGOs (24.4%).

The use of donor funding in wild dog conservation over the last five years has been effective within the limits of set targets (Mills et al. 1998). The target size of the meta-population (9 packs) has been exceeded in just over half the proposed time frame (Mills et al. 1998), and the Kruger population has been closely monitored (Davies 2000).

Beyond this, however, little has been achieved. Wild dogs occurring on ranchland remain heavily persecuted and remain few in number, with a limited distribution. Adequate protection of these animals is vital to increase the geographic range of wild dogs in South Africa and to protect the integrity of sub-populations occurring within protected areas.

7.1.6 What is the most cost efficient strategy for improving the status of wild dogs in South Africa?

When the cost efficiency of wild dog conservation is considered in terms of packs conserved per \$100,000 invested, then conserving wild dogs in large protected areas represents the most cost efficient strategy (449 packs / \$100,000). The establishment of the meta-population has been a far less cost efficient conservation strategy, yielding 23 packs / \$100,000. If wild dogs are reintroduced into private nature reserves to expand the meta-population, costs may be higher still. The costs of predation by wild dogs are potentially very high, and private nature reserves may not be willing to accept these losses in the absence of compensation. Such compensation, in addition to the high start-up and maintenance costs would reduce the cost efficiency of the reintroduction of wild

dogs to an estimated 3 - 11 packs / \$100,000 spent, depending upon the predicted costs of predation post-release. The conservation of wild dogs *in situ* on ranchland is predicted to be a more cost efficient strategy (14 - 27 packs / \$100,000) due to the absence of the high start up costs associated with wild dog reintroductions.

I suggest that donor funding should be used to reintroduce wild dogs to the proposed transfrontier parks as soon as they are established, to create additional viable populations in large protected areas at relatively low cost. In the meantime, it is suggested that donor funding be used to maintain the current meta-population, and to establish conservation programmes involving wild dogs on ranchland. Expansion of the meta-population should be limited to private nature reserves willing to carry the costs.

7.2 Final conclusions

South Africa has a total free ranging wild dog population of 279 - 307 individuals, occurring in three separate distributions: Kruger (57.7% of total population); outside protected areas (24.7% of total population), and the protected meta-population (17.6% of total population – based upon the 2002 pre-denning season population estimate). Kruger supports South Africa's sole viable population and forms the core of current conservation efforts. The meta-population represents an attempt to create a second viable population, and comprised an additional 54 adults and sub adults, in 10 packs, in five sub populations prior to the denning season in 2002. An additional reintroduction has since occurred during May 2003, at Marakele National Park (16 wild dogs released). Wild dogs outside

protected areas form a more significant portion of the population than had been realised. High levels of persecution, however, prevent this population from expanding to fill large areas of potentially suitable habitat. Assuming that the area of suitable habitat for wild dogs equals the area of unmodified land with fewer than five people / km² in Kwa-Zulu Natal, Limpopo, and North West (88,750 km², conservatively assuming that all habitat in the Northern Cape and Free State provinces is unsuitable), the potential population size of wild dogs occurring outside protected areas is 178 individuals (~ 18 packs) given a density equal to the lowest observed in a protected area (two dogs / 1000 km², Fuller et al. 1992), or 1,482 individuals (~ 148 packs) given a density equal to the minimum density observed in Kruger (16.7 dogs / 1000 km², Mills & Gorman 1997). The results of my study suggest that conservation efforts should be focused as discussed in the following paragraphs.

7.2.1 Large protected areas

The monitoring of the Kruger wild dog population should be continued, and donor funding should be used to establish wild dog populations in the proposed Limpopo / Shashi and Lubombo transfrontier conservation areas (www.peaceparks.org) as soon as they are established.

7.2.2 The meta-population

The expansion of the meta-population should be limited to state reserves, and private nature reserves willing to carry the costs. Potential revenue from wild dog-based ecotourism is substantial under certain conditions, and it is realistic to expect that the

expansion of the meta-population could be achieved in this manner, with minimal donor funding. Private nature reserve owners should be provided with assistance to establish, and market wild dog-based ecotourism enterprises. Reserves smaller than those utilised to date should be considered for wild dog reintroduction.

7.2.3 *On ranchland*

Donor funding should be directed towards the conservation of wild dogs on ranchland, and be used to assist ranchers to establish ecotourism operations involving wild dogs on their land, so as to offset the costs associated with their presence. Collaborative nature reserves, and areas dominated by ecotourism-based land uses represent ideal targets for conservation initiatives. In areas where wild dog-based ecotourism is not possible, or unlikely to exceed the costs, compensation schemes might be considered as a means of reimbursing landowners for losses caused by wild dogs. Prior to the onset of such a scheme, however, careful consideration should be given to potential difficulties and problems. Finally, all conservation efforts should be underpinned by education and community awareness schemes, aimed at improving ranchers' understanding of the endangered status of wild dogs, and potential ecological benefits conferred by their presence, so as to increase tolerance.

In conclusion, the key to improving the conservation status of wild dogs in South Africa lies in cooperating with landowners and local communities in developing strategies to encourage co-existence, using economic incentives.

7.3 The applicability of this study to the conservation of other carnivores

There is increasing awareness that a reliance upon parks and reserves is not sufficient to ensure adequate biodiversity conservation (Edwards & Abavardi 1998). The low densities, and large area requirements of large carnivores in particular, make it imperative that land occurring outside protected areas is included in conservation planning. By virtue of their life history characteristics however, large carnivores are difficult to conserve (Linnell et al. 2001), and these problems are magnified outside protected areas. The diet of many large carnivore species overlaps significantly with that of humans, predisposing them to conflict (Macdonald & Sillero-Zubiri 2002). Many large carnivore species range widely, and those occurring outside protected areas are likely to encounter a mosaic of land uses, covering areas in which they may conflict with humans in varying ways and to varying degrees, and areas in which their presence does not result in conflict. Consequently, effective conservation strategies for large carnivores outside protected areas are likely to be diverse and adaptive, and involve sociological and economic considerations, on top of ecological concerns. My study used a series of methods to identify the most appropriate, and most cost effective strategies for conserving wild dogs under varying conditions. A similar series of methods, moulded to specific circumstances, has general applicability in the design and implementation of conservation efforts involving large carnivore species, worldwide.

7.3.1 Ecological approaches

Determining the distribution and status of populations, and assessing the conditions under which populations are persisting represents an important first step towards conserving a species. Populations of carnivores occurring outside of protected areas are unlikely to receive the attention given to many species within parks and reserves in terms of monitoring, and numbers are likely to be little known, or potentially exaggerated where a species' presence causes conflict, and under estimated in the case of cryptic or nocturnal species. Consequently, population size and geographic distribution assessments are especially important for carnivore species occurring outside protected areas. The geographic area to be sampled, and the population size, spatial organisation, behaviour and life history of the species in question will dictate the most appropriate census technique (Wilson & Delahay 2001). The sighting data collection methods and analyses used in my study represent a cheap and effective way in which the distribution and status of large, rare, charismatic carnivores can be gauged over large areas, although the accuracy of the methods has not been tested. The methods have particular applicability to developing countries, with limited resources to respond to declines in carnivore populations. Obvious candidate species for the methods in the developing world include cheetahs *Acinonyx jubatus* in Africa (Gros 1998; Gros & Rejmanek 1999) and Asia, tigers *Panthera tigris* in Asia, and wolves *Canis lupus* in eastern Europe and Asia.

Designing conservation strategies requires that the area required for the conservation of a viable population, or of a minimum demographic unit of a species, is determined with allowance for natural or artificial dispersal of individuals (Smallwood 2001). Chapter 3 in

my study outlined simple methods for estimating the minimum area required for the minimum demographic unit, or a viable population of any large carnivore species. The methods employed in Chapter 3 are simple, and easily employed by scientists and managers, given adequate data on prey population sizes and likely predator diet, increasing the applicability of the methods for developing countries. The most obvious application of these methods is in the planning stages of carnivore reintroduction programmes, a conservation management tool now being employed worldwide (Fischer & Lindenmayer 2000; Breitenmoser et al. 2001).

7.3.2 Sociological approaches

An obvious step in implementing a conservation programme involving large carnivores outside protected areas is to identify the reasons behind the initial population decline. Conflict with humans represents the most common cause of conservation problems for many large carnivores (Woodroffe & Ginsberg 1998) and the survey techniques employed in this study were adequate to determine if conflict exists between local people and carnivores, and why. Such techniques enable the design of strategies that might be employed to reduce or remove conflict, and permit identification of the conditions under which conflict is likely to be least prevalent. These methods are widely applicable to conservation planning for large carnivore species, and have been intensively used - for example prior to and during the expansion of wolf populations in Europe and the USA through reintroduction and natural re-colonisation (Lohr et al. 1996; Pate et al. 1996; Ericsson & Herbelein 2003).

7.3.3 Economic approaches

Conflict between large carnivores and humans frequently occurs as a result of perceived or real economic costs resulting from the loss of livestock or game animals.

Consequently, conservation solutions based upon reversing or minimising economic losses due to the presence of large carnivores are likely to be effective in reducing the state of conflict. Ecotourism is a rapidly growing industry (Gossling 1999) and the derivation of economic benefits from wildlife and protected areas is a potentially important way in which conservation efforts can be justified (Norton-Griffiths 1995).

Carnivores are especially popular with tourists, and significant potential exists in terms of deriving economic benefits from ecotourism, particularly from charismatic, highly visible species such as tigers, lions *Panthera leo* and wolves (Sillero-Zubiri & Laurenson 2001).

The methods outlined in Chapter 5 permit rapid assessment of the potential tourism revenue from a carnivore species, relative to the costs of conservation programmes, and are easily applied to other species. These techniques are useful in identifying the conditions under which ecotourism benefits are likely to exceed the costs, and the conditions whereby ecotourism benefits are unlikely to match the costs and where conservation efforts are likely to depend upon donor funding.

In southern Africa, large areas of land are devoted to game ranching, with income based upon tourist hunting, or ecotourism (Earnshaw & Emerton 2000; van der Waal & Dekker 2000). This land tenure background is ideal for conservation planning based upon the exploitation of the ecotourism value of large carnivores such as cheetahs, leopards *Panthera pardus*, lions, and wild dogs. In Europe and the USA, tourists do not typically

visit private ranches, and resultantly, conservationists have largely ignored the potential for exploiting the tourist value of large carnivores outside of state protected areas. The results of my study suggest that tourists are willing to pay to view a large carnivore in its natural habitat, and that the revenue is potentially sufficient to offset the costs of predation in most scenarios on private land. Expanding populations of brown bears *Ursus arctos*, lynx *Lynx lynx*, and wolves in Europe, and cougars *Felis concolor* and wolves in North America are increasingly conflicting with private land owners as a result of increasing livestock depredations, and competition with humans for wild prey (Breitenmoser 1998; Mech 1998). I suggest that European and North American conservationists might consider establishing ecotourism operations on private land as a means of creating economic incentives for land owners to conserve large carnivores occurring on their properties. Similar schemes might be considered in the cattle ranching regions of the Pantanal in Brazil, to reduce persecution of jaguars *Panthera onca* and cougars (Johnson et al. 2001). Likewise, ecotourism schemes have the potential to promote coexistence between people and large carnivores such as cheetahs, lions, wild dogs in east Africa, and tigers in parts of Asia, where land tenure systems are based more upon communal ownership and subsistence farming (Cumming 1991; Damania et al. 2003).

Increasing numbers of threatened and endangered species are resulting in an increasing shortfall between the resources required to ensure effective conservation, and the resources that are actually available (Myers et al. 2000). Consequently, conservation programmes must deliver value for money. The estimation and comparison of costs of

proposed conservation strategies represents a key step in programme design. The cost efficiency indices developed in this study to compare the long term costs of competing conservation strategies provide a solid basis from which to decide between potentially competing conservation strategies for any threatened or endangered species, with particular applicability to species such as tigers and wolves which attract large sums of donor funding (Mech 1998; Christie 2001).

7.5 References

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