CHAPTER 2

The distribution and population status of wild dogs *Lycaon pictus* outside protected areas in South Africa

2.1 Introduction

A variety of anthropogenic factors have resulted in a reduction in the numbers and geographic range of many carnivore species across the world (Gese 2001). The design and implementation of recovery programmes for these species is partially dependent upon rapid and accurate assessment of their abundance and distribution. Many carnivore species are nocturnal, secretive, rare and wide-ranging, making such assessment problematic (Gese 2001), despite a proliferation of methods to estimate carnivore range and abundance (Wilson & Delahay 2001). Members of the diverse large-carnivore guild in Africa have been a focus for the development of a variety of such techniques (e.g. lions *Panthera leo*, Pennycuik & Rudnai 1970, Smuts et al 1977; spotted hyaenas *Crocuta crocuta*, Mills 1985, Mills et al. 2001; and cheetahs *Acinonyx jubatus*, Gros et al. 1996).

Wild dogs are endangered and their conservation status has received particular attention as a result. During the last 30 years there has been a dramatic decline in the number and distribution of wild dogs across Africa, and at present, it is believed that viable populations occur in only six of the 34 countries in which they once occurred (Fanshawe et al. 1991; Woodroffe & Ginsberg 1999). Efforts have been made to document conservation status and population trends on various scales: continental, national, and by

individual protected areas. Fanshawe et al. (1991) conducted a pan-African survey of wild dog status and distribution, and then Fanshawe et al. (1997) updated this with an intensification of methodology. Several studies have surveyed the status of wild dogs on a national level: Zimbabwe (Childes 1988); Botswana (Bulger 1990); Namibia (Hines 1990); Kenya (Jennings 1992); Zambia (Buk 1994); Ethiopia (Malcolm 1995); and Senegal (Sillero-Zubiri 1995). In South Africa, accurate assessment of wild dog populations was pioneered through the collection of photographic records of each individual in the Kruger National Park (henceforth referred to as "Kruger") population (Maddock & Mills 1994). Fanshawe et al. (1997) and Friedmann et al. (2002) estimated the distribution and status of wild dogs on a national level in South Africa, based upon a survey of field workers, and expert opinion combined with museum data, respectively. To date, however, no in depth attempt has been made to assess the number of wild dogs occurring specifically outside state protected areas in South Africa.

In South Africa, wild dogs were historically recorded from the southern coast, throughout the interior of the country to the northern borders (Skinner & Smithers 1990). Increasing human populations and commercial agriculture resulted in eradication from most of the historic range, and at present wild dogs are limited to a single viable population in Kruger (Stuart et al. 1985; Fanshawe et al. 1997).

There are no suitable protected areas of sufficient size for a second viable population in South Africa, and recent conservation efforts have concentrated upon establishing a meta-population, consisting of a number of sub-populations within a network of small reserves

(Mills et al. 1998). By 2002, sub-populations had been established in five protected areas, with a combined area of ~ 2,750 km^2 and a population size of approximately 54 adults and sub adults in 10 packs.

A shortage of suitable, large protected areas in South Africa suggests that land outside protected areas may need to be utilised to expand the geographic distribution of wild dogs. Land-use trends on private land in northern South Africa have seen a dramatic shift to game ranching from cattle ranching, resulting in increases in the distribution and numbers of many prey species (van der Waal & Dekker 2000), and a corresponding increase in the potential for conserving wild dogs. Determining the numbers and distribution of wild dogs currently occurring outside state protected areas represents a vital pre-requisite for conservation planning involving private ranchland.

2.2 Methods

The large spatial scale of the study, restricted access over large areas, and secretive behaviour of the dogs outside state protected areas precluded implementation of the census techniques used in Kruger (Maddock & Mills 1994). The collection of sighting records is a method widely implemented to survey the status of large carnivores (Gese 2001) and was used to estimate the numbers and distribution of wild dogs outside state protected areas (excluding privately owned land incorporated into national parks). Sighting records recorded between January 1996 and August 2002 were included, from the following sources:

a) Representatives from provincial conservation authorities (hereafter referred to as nature conservation). Landowners frequently report the presence of large carnivores to nature conservation authorities, and detailed records of wild dog sightings were obtained from officers in charge of 'problem animal' control in each province (except for the Eastern and Western Cape, where sightings are extremely unlikely). Where possible, contact numbers of informants were obtained and follow up calls made to obtain detailed sighting-information.

b) Appeals for sightings published in the English and Afrikaans media, including: three national agricultural / wildlife magazines; two wildlife newsletters; and 14 local newspapers with a wide coverage (Appendix A). In each article, a photograph of a wild dog was included to help prevent misidentification.

c) Interviews with ranchers from three focal areas where published records mention recent wild dog activity outside protected areas: i) ranching areas along the Limpopo River (Skinner & Smithers 1990); ii) ranching areas west of Kruger (Fanshawe et al. 1997); and iii) ranching areas north of Hluhluwe-Umfolozi Park (Maddock 1999). Focal areas of activity were demarcated on a 1 / 250,000 map with the assistance of nature conservation representatives, yielding approximate central coordinates as follows; i) 22° 20' S, 29° 40' E; ii) 24° 10' S, 30° 55' E; iii) 27° 30' S, 31° 45' E, respectively. Ranch names were obtained from 1 / 250,000 maps, and corresponding telephone numbers derived from telephone directories. In each area, as many ranchers as possible were personally interviewed with a set

questionnaire (Appendix B), in a two-week period. A total of 166 ranchers was interviewed in all three areas.

d) Interviews with local communities in communal land in which nature conservation authorities reported wild dog presence. The head ecologist (Chris Roche) of a large safari operator (CCAfrica) asked managers and staff working in safari camps within Timbavati Game Reserve on the western border of Kruger (Ngala Lodge), and Mtethomusha Game Reserve (Bongani Lodge), on the southwestern border of Kruger, to provide information on any sightings they heard of from the neighbouring communal lands where they live. This provided coverage of large areas of communal land neighbouring Kruger, with approximate central coordinates of 24° 40' S, 31° 10' E, and 25° 20' S, 30° 10' E.

e) Networking with field workers. Field researchers and wildlife capture teams working in the northern half of the country were contacted and asked to provide information on any sightings they heard of. Additional appeals for information were made at Wild Dog Advisory Group-South Africa meetings.

Respondents were asked to provide as many details as possible for each sighting, including: 1) date; 2) location; 3) land use at location of sighting; 4) number of individuals; 5) sexes; 6) ages (juvenile, sub adult, adult), and 7) frequency of sightings. When wild dogs were reported away from areas of high sighting frequency, respondents were asked for a description of the animal(s) seen to determine whether they had

correctly identified the species sighted. If wild dogs were seen on a given property for less than one month, a single sighting was recorded irrespective of the actual number of sightings made. If wild dogs utilised a property over several months, a single sighting was recorded for each month that they were present. Sightings were digitized using ArcInfo (version 3.2).

2.2.1 Total number of wild dogs outside protected areas

The largest home range recorded in Kruger is 1,110 km^2 (Reich 1981) and this area was used as a basis for distinguishing between sightings of different groups. The diameter of 1,110 km^2 is 37.5 km, assuming the home range approximates a circle. Sightings were ordered by date and the distance between sequential sightings was measured. Sightings that fell within 37.5 km of the previous sighting were assumed to constitute the same group. A repeat of these methods based upon the mean Kruger home range size (537 km^2, Mills & Gorman 1997) yielded a very similar estimate of the number of groups, suggesting that within reasonable limits the method is insensitive to the home range area used.

2.2.2 Resident versus dispersing wild dogs – upper and lower limits

Summing the mean size of each group yielded an upper limit for the estimated number of wild dogs. Counting the mean pack size of wild dogs resident outside state protected areas (successful colonists), and excluding dispersing groups (potential colonists) yielded a lower limit of the estimated number of dogs. Wild dogs of 1 - 2 years old disperse in single sex groups, up to 250 km from natal home ranges (Fuller et al. 1992a). Most

respondents, although able to distinguish between adults and pups, were unable to distinguish between adults and sub adults, and most failed to provide details of the sexes of dogs seen. Consequently, group size was used as the basis for distinguishing between resident and dispersing dogs. The average recorded size of dispersing groups is 2.3 – 3.4 individuals for females, and 3.9 – 5.3 individuals for males (McNutt 1996; Creel & Creel 2002). Wild dogs were assumed to comprise dispersing groups if sightings of ≤ 5 individuals were received, or resident packs if sightings of ≥ 6 individuals were received, or if the presence of puppies or den sites were reported. An exception was made if a group of <6 wild dogs was sighted within a home range area (as defined above) in which a 'resident pack' was seen in the previous year. Mean group size was calculated by averaging the modal group size reported for each pack. Variation in the number of sightings of each pack prevented the use of an overall mean, and necessitated the calculation of the modal number of dogs in each pack, which was then averaged. Wild dogs sighted within 20 km of the Kruger boundary were arbitrarily assumed to be part of the Kruger population, irrespective of group size, unless >3 sightings were reported.

2.2.3 Geographic distribution

ArcInfo was used to create two measures of geographic distribution, extent of occurrence, and area of occupancy (IUCN 2001). Extent of occurrence was calculated using a minimum convex polygon comprising the area contained within the shortest continuous boundary encompassing all sightings of resident wild dogs (Appendix C). Area of occupancy was calculated by drawing a polygon around the outer most sightings of resident wild dogs (Appendix D). A pack of resident dogs sighted only once, in the North West province, was assumed to occupy an area equal to the largest home area observed in

Kruger (1,110 km^2, Mills & Gorman 1997) and this figure was added to both the extent of occurrence and area of occupancy estimates. To prevent exaggerated estimates of geographic distribution, sightings of dispersing wild dogs were excluded.

2.2.4 Wild dog distribution relative to environmental variables

A map of South Africa, north of the most southerly recorded sighting (approx. 30° 30' S) was converted to a grid cell format, (5 km^2 cells), and each cell denoted a code: 0 for no sightings ('absent cells'); 1 for dispersing wild dogs sighted ('dispersing cells'); and 2 for resident wild dogs sighted ('resident cells'). The relationship between wild dog distribution, land cover (degree of habitat modification) and human density was investigated by superimposing the grid cell map upon the CSIR National Land Cover Database (Thompson 1999), and 2002 human population census data (South African Municipal Demarcation Board 2002). When analysing wild dog occurrence relative to land cover, it was assumed that all habitat unmodified by human activity represented potentially suitable habitat. The original 31 land cover categories in the CSIR land cover database were categorised as; 'suitable', 'degraded', or 'unsuitable' based upon the degree of transformation (Appendix E).

The relationship between wild dog distribution and the distance from source populations was investigated by determining the shortest distance from the centre of each grid square to the nearest boundary of one of three potential source populations (Kruger, Hluhluwe-Umfolozi Park and Central Kalahari Game Reserve in Botswana).

For each grid cell, these methods provided an estimate of wild dog status (absent, dispersing, resident), land cover, human density, and distance from a source population. The relationship between these variables and wild dog status was investigated using ordinal logistical regression. Given the wide habitat tolerance of wild dogs (Skinner & Smithers 1990), natural vegetation type was not included as a variable in this analysis.

Data describing the distribution of land use on a fine scale (e.g. cattle ranching versus game ranching) on a national level was unavailable, and this factor could not be analysed with the other variables. However, the land use at each sighting was recorded, and the relationship between sightings of resident versus dispersing wild dogs and land use was analysed using ordinal logistical regression. For the analysis, land use at the location of each sighting was categorised as: communal land; livestock ranching (cattle or sheep); mixed cattle / game ranching; or game ranching (including private nature reserves). A note was made for each sighting as to whether the location of the sighting was part of a collaborative nature reserve, where neighbouring ranchers had cooperated to remove internal fencing.

2.2.5 Available habitat for expansion of the wild dog population outside protected areas

The area of remaining unmodified natural habitat, with a human population density of ≤ 5 people / km^2 (the modal population density of cells with sightings of resident dogs) north of the most southerly sighting was calculated using ArcInfo to provide an estimate of the area of suitable habitat for wild dog conservation in northern South Africa (excluding

private land which has been incorporated in to the greater Kruger, state reserves, and private nature reserves into which wild dogs have been reintroduced).

2.3 Results

A total of 516 sightings were reported from provincial nature conservation representatives (38.3% of sightings), field workers (28.6%), interviews with ranchers (23.2%), responses to publications (5.6%) and community interviews (4.3%).

2.3.1 Total number of wild dogs outside state protected areas

The upper limit of the wild dog population estimate was 84.9 ± 7.97 (mean ± S.E.) individuals between 1996 - 2002, varying from a low of 42 in 1996 to a high of 106 in 2000 (Table 2.1). The lower limit averaged 54.7 ± 5.54 individuals between 1996 - 2002, and varied from a minimum of 25 in 1996 to a maximum of 67 in 1997. The large estimated number in 1997 relative to 1996 was due in part to the appearance of a large pack in northwestern Limpopo that year. The number of wild dog groups (resident packs plus dispersing groups) varied from a minimum of 10 in 1996 and 1997 to a maximum of 21 in 2000 (Table 2.2). The estimated number of resident packs ranged from a minimum of four in 1996 to a maximum of 10 in 2000 and 2001. Twenty-nine den sites were reported between 1996 and 2002.

Table 2.1 The number of resident and dispersing wild dogs occurring outside protected areas during 1996 - 2002 (number of sightings in parentheses)

	1996 (47)		1997 (31)		1998 (40)		1999 (55)		2000 (93)		2001 (160)		2002 (90)	
	[a] Res	[b] All	Res	All	Res	All	Res	All	Res	All	Res	All	Res	All
Kwa-Zulu Natal	5	7	5	5	8	8	5	6	8	9	3	4	0	1
Mpumalanga														
Kruger border	0	6	0	1	5	11	5	16	4	16	0	9	0	0
Highveld	2	2	7	7	7	7	7	7	5	5	4	4	6	10
Limpopo														
Kruger border	11	18	21	34	25	32	12	22	11	22	14	22	12	12
Limpopo River	7	7	12	12	4	4	26	26	31	33	23	29	15	15
Northwest Limpopo	0	0	22	27	10	18	0	12	1	14	10	14	9	13
North West	0	2	0	0	0	7	0	5	0	7	10	16	6	22
Northern Cape	0	0	0	5	0	0	0	0	0	0	0	0	0	3
TOTAL	25	42	67	90	59	87	55	95	65	106	64	98	48	76

[a] Resident.
[b] Resident and dispersing.

Table 2.2 The number of resident packs and dispersing groups occurring outside protected areas during 1996 - 2002 (number of sightings in parentheses)

	1996 (47)		1997 (31)		1998 (40)		1999 (55)		2000 (93)		2001 (160)		2002 (90)	
	[a] Res	[b] All	Res	All	Res	All	Res	All	Res	All	Res	All	Res	All
Kwa-Zulu Natal	1	2	1	1	1	1	1	2	1	2	1	2	0	1
Mpumalanga														
Kruger border	0	2	0	0	1	3	1	3	1	3	0	2	0	0
Highveld	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Limpopo														
Kruger border	1	2	2	3	2	3	2	3	2	3	2	3	2	3
Limpopo River	1	1	2	2	1	1	2	2	4	5	3	5	2	2
Northwest Limpopo	0	0	1	2	1	3	1	3	1	5	2	3	1	3
North West	0	2	0	0	0	2	0	1	0	2	1	4	1	5
Northern Cape	0	0	0	1	0	0	0	0	0	0	0	0	0	1
TOTAL	4	10	6	10	7	14	8	15	10	21	10	20	7	17

[a] Resident.
[b] Resident and dispersing.

2.3.2 Group sizes

Mean group size (± S.E.) across all sightings was 6.9 ± 0.64 dogs and was very similar to the average pack size recorded in Kruger in the latest census (7.1 dogs, Davies 2000). The mean size of groups containing only adults and sub adults was 5.0 ± 0.34 S.E. dogs.

2.3.3 Wild dog distribution

Sightings of resident wild dogs during 1996 and 2002 had an area of occupancy of 17,907 km^2, and an extent of occurrence of 43,310 km^2. Most sightings (Figure 2.1) came from the ranching area on the western border of Kruger in Limpopo (n = 244). Wild dogs persisted in the area despite frequent persecution - five and seven individuals were reported shot in 1997 and 1998 respectively, and a pack was captured and removed in 1999. During 1996 - 2000 one to two packs were resident in the area, comprising 11 to 25 individuals (Tables 2.1, 2.2), with an area of occupancy of 4,247 km^2, and an extent of occurrence of 8,850 km^2. The majority of sightings (Table 2.3) occurred on game ranches (89.8% of sightings), with few sightings in communal land (8.6%). Almost 50% of sightings (48.7% of sightings) were made on collaborative nature reserves. One pack normally resident in Kruger had a den site in communal land neighbouring Kruger during the winter months of 1996 - 2001.

Sightings were also frequently reported from along the Limpopo River, close to the border with Zimbabwe (n = 136). The source of these dogs was probably northern

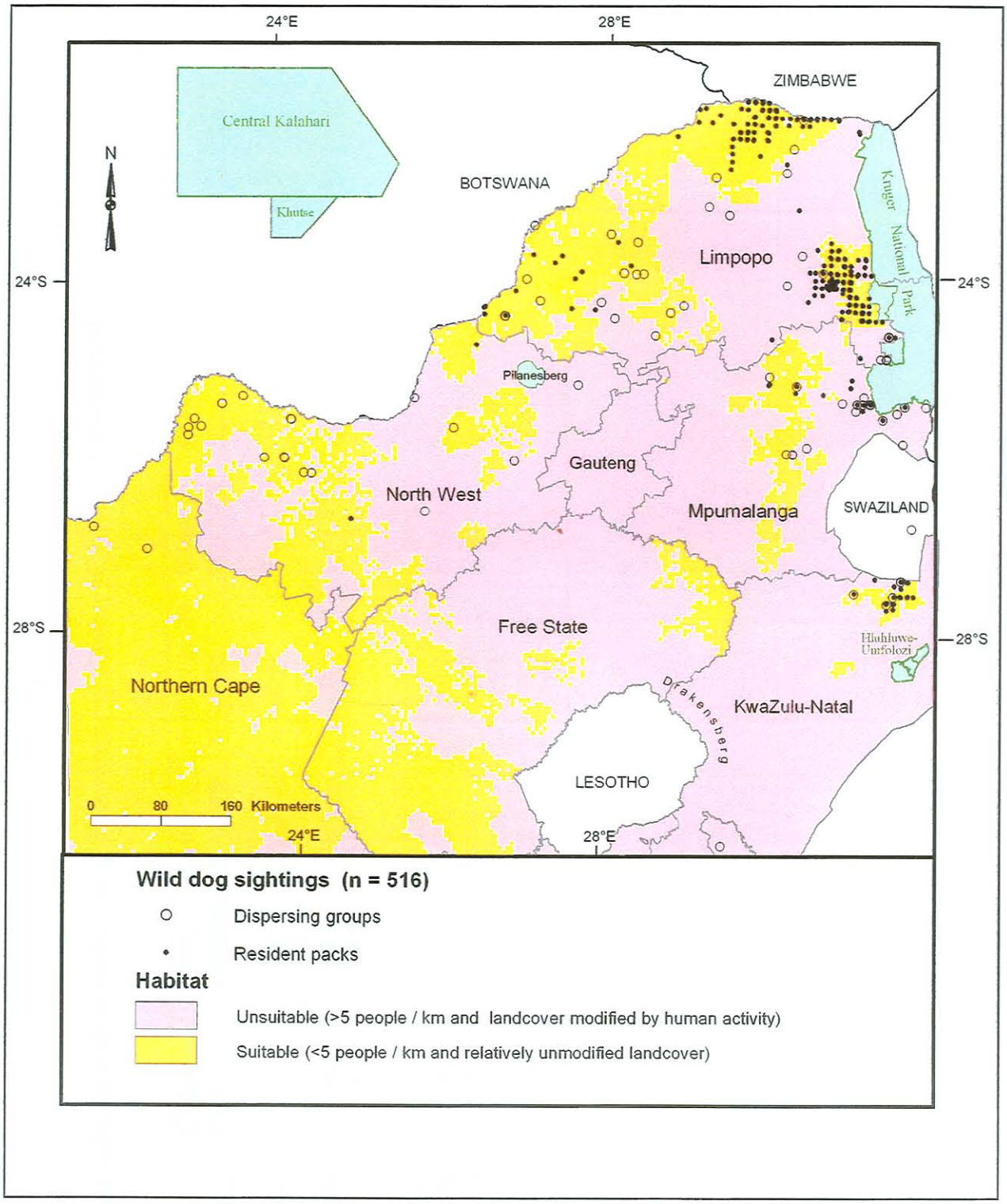

Figure 2.1 Relationship between the distribution of wild dogs outside protected areas and suitable habitat

Table 2.3 The percentage of sightings made in each of six land use categories (number of sightings in parentheses)

		Communal land	Sheep farming	Cattle ranching	Cattle / game ranching	Game ranching	Other
Kwa-Zulu Natal	(32)	0	0	3.1	25.0	53.1	18.8
Mpumalanga							
Kruger border	(28)	34.8	0	13.1	0	47.8	4.3
Highveld	(18)	0	83.3	11.1	0	5.6	0
Limpopo							
Kruger border	(244)	8.6	0	1.6	0	89.8	0
Limpopo River	(136)	0	0	3.8	9.7	84.9	1.6
Northwest Limpopo	(35)	0	0	58.8	5.9	32.4	2.9
North West	(18)	0	15.4	23.1	15.3	46.2	0
Others	(5)	20.0	0	20.0	0	40.0	20.0
OVERALL	(516)	6.0	4.0	5.8	7.5	69.5	7.2

Kruger, or the nearby Gona-re-zhou National Park in Zimbabwe. During 1996 - 2002 one to four resident packs were sighted in this area, comprising 4 - 31 individuals (Tables 2.1, 2.2), with an area of occupancy of 4,900 km^2 and an extent of occurrence of 11,525 km^2. In addition, one to two dispersing groups were infrequently sighted each year. Most sightings (Table 2.3) occurred on game ranches (84.9% of sightings), followed by mixed cattle / game ranches (9.74%) and cattle ranches (3.8%). A quarter of sightings (25.1% of sightings) were made on collaborative nature reserves. Several attempts have been made by nature conservation authorities to remove wild dogs from the area over the last five years. Two sets of puppies were removed from dens in 1997, in 1999 four adults were captured and removed, and in 2001, five adults were removed. In addition, part or all of a pack of was illegally captured and sold by ranchers in 2001. Although no proven cases of persecution were reported, ~ 4% of ranchers interviewed indicated without prompting that they would shoot wild dogs on their properties (Chapter 4).

Sightings were recorded in Mpumalanga (46 sightings), with resident dogs occurring in an area of occupancy of 2,650 km^2, with an extent of occurrence of 7,775 km^2. There was an aggregation of sightings along the southern and southwestern border of Kruger (28 sightings), most of which were probably groups dispersing from the park, or packs ranging beyond the park periphery. However, one resident pack occurred in this area between 1998 and 2000 (Table 2.2). Most sightings (Table 2.3) occurred on game ranches (47.8% of sightings), and communal land (34.8%). Thirty four percent of sightings were made on collaborative nature reserves. On two occasions (1998, 1999) small groups were captured outside Kruger in Mpumalanga and returned to the park.

Eighteen sightings were reported from the Mpumalanga Highveld, approximately 80 km west of the park. A single resident pack occurred in the area between 1996 and 2002 and was mostly seen on sheep farms (83.3% of sightings) and cattle ranches (11.1%, Table 2.3).

Thirty-two sightings were reported from northern Kwa-Zulu Natal, of wild dogs likely originating from Hluhluwe-Umfolozi Park (Fanshawe et al. 1997), which lies ~ 75 km to the south. In this area, most sightings occurred on game ranches (53.1% of sightings, Table 2.3), all of which belonged to collaborative nature reserves, and mixed cattle / game ranches (25.0%). Sightings consisted of one resident pack between 1996 - 2001, with an area of occupancy of 975 km^2 and an extent of occurrence of 1,825 km^2, as well as dispersing groups or individuals in 1996, 1999, 2000 and 2001. A singe male was sighted in 2002, which has since died. Further sightings have not been reported, and wild dogs are probably locally extinct.

Additional sightings were reported from northwestern Limpopo, North West and the Northern Cape. Sightings in these areas were infrequent, widely dispersed, and consisted primarily of dispersing groups. One resident pack was reported from northwestern Limpopo in 1997, 1998, 1999, 2000 and 2002, with two resident packs being reported in 2001. Most of these sightings (Table 2.3) occurred on cattle ranches (58.8% of sightings) and game ranches (32.4%). Only 7.8% of sightings occurred on collaborative nature reserves. In North West, a resident pack was sighted in 2001 and 2002. Although most sightings occurred on game ranches (46.2% of sightings), several sightings occurred on

cattle ranches (23.1%) and mixed cattle / game ranches (15.3%). No sightings occurred on collaborative nature reserves. A pack of five wild dogs sighted in the Northern Cape in 1997 was shot soon after by a rancher in the same province, while two individuals from a group of four were reported shot in North West in 2002.

2.3.4 Relationship between wild dog sightings and environmental variables

Using ordinal logistical regression, a relationship was found between land cover, human density, distance from a source population, and the presence of resident versus absent cells ($\chi^2 = 578.34$, df = 8, $p<0.0001$), the presence of dispersing versus absent cells ($\chi^2 = 73.17$, df = 7, $p<0.0001$), and the presence of resident versus dispersing cells ($\chi^2 = 76.82$, df = 5, $p<0.0001$, Table 2.4). A greater proportion of resident cells occurred in suitable land cover than absent cells ($p = 0.020$), or dispersing cells ($p = 0.038$). A greater proportion of dispersing cells occurred in suitable land cover than absent cells ($p = 0.0045$). Over 91% of resident cells occurred in suitable land cover, with 4.7% in degraded, and 4.1% in unsuitable land cover. Of dispersing cells, 80.4% occurred in suitable land cover, 5.3% in degraded, and 14.3% in unsuitable land cover. For absent cells, these figures were 74.8%, 5.8% and 19.4% respectively.

Human density was lower in resident than absent cells ($p<0.0001$), or dispersing cells ($p = 0.604$), and lower in absent than dispersing cells ($p = 0.760$). In resident cells, mean

Table 2.4 The relationship between the occurrence of wild dogs, human density, land cover and distance from source populations

	Absent cells	Dispersing cells	Resident cells
Percentage land cover			
Suitable	74.8	80.4	91.2
Degraded	5.8	5.3	4.7
Unsuitable	19.4	14.3	4.1
Human density (people / km^2)			
Mean ± S.E.	47.1 ± 2.2	77.5 ± 44.5	19.5 ± 4.8
Maximum	2390	2428	700
Distance from a source population (km)			
Mean ± S.E.	340 ± 1.2	187 ± 16.1	86.6 ± 5.0
Maximum	795	416	298

human density was 19.5 ± 4.77 (S.E.) people / km^2, compared to 47.1 ± 2.24 people / km^2 in absent cells and 77.5 ± 44.5 people / km^2 in dispersing cells (Table 2.4). There was an interaction between human density and land cover in the 'resident versus absent' model ($p<0.0001$), by virtue of the fact that 10.1% of resident cells occurred in unsuitable habitat, in which mean human density was 73.8 ± 40.1 people / km^2, compared to 13.3 ± 2.31 people / km^2 for the 89.9% of resident cells occurring in suitable habitat. There was an interaction between human density and distance from a source population in the 'resident versus absent' ($p = 0.0005$), and 'dispersing versus absent' ($p = 0.0030$) models as a result of higher human densities in cells closer to source populations.

Resident cells were generally closer to source populations than dispersing ($p = 0.001$) or absent cells ($p<0.0001$), and dispersing cells were typically closer than absent cells ($p<0.0001$). The mean distance of resident cells from a source population was 86.6 km^2 ± 5.02 (S.E.), compared to 187 km^2 ± 16.1 for dispersing cells, and 340 km^2 ± 1.17 for absent cells.

A relationship also existed between the presence of resident versus absent wild dogs, and land use ($\chi^2 = 63.7$, $df = 2$, $p<0.0001$). The large majority of sightings of resident wild dogs occurred on game ranches (77.2% of sightings, Figure 2.2), whereas sightings of dispersing wild dogs were spread more evenly across game ranches (32.9%), livestock ranches (sheep and cattle, 26.3%), and communal land (20.0%).

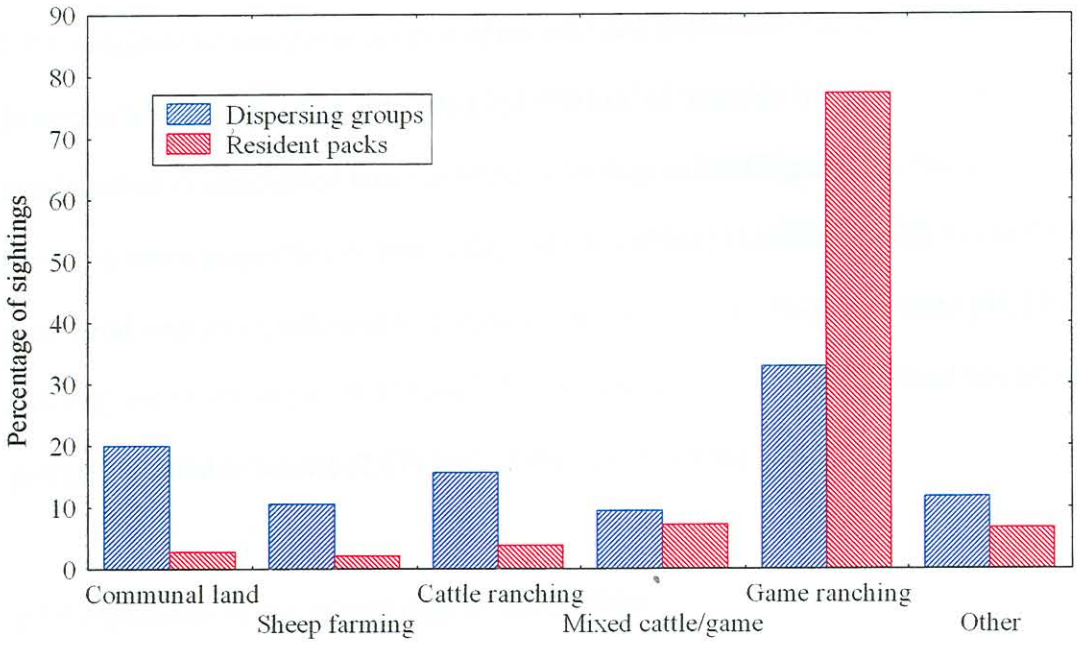

Figure 2.2 The percentage of sightings of resident and dispersing groups of wild dogs made in each of six land use categories

2.3.5 Available habitat for expansion of the wild dog population outside protected areas

In northern South Africa, an estimated 264,900 km^2 of 'suitable habitat' (<5 people / km^2 and (relatively) unmodified land cover) for wild dogs exists (Figure 2.1). Northern Cape has the greatest proportion of potentially suitable habitat (115,650 km^2 - 90.5% of the provincial land area), followed by Limpopo (46,550 km^2 - 46.3%), Free State (49,350 km^2 - 38.5%) and North West (39,725 km^2 - 34.4%). In contrast, Kwa-Zulu Natal has little potentially suitable habitat (2,475 km^2 - 3.4%), and Gauteng none.

2.3.6 Population status of wild dogs in South Africa

Latest census figures indicate that 177 wild dogs occur in Kruger in 21 packs (Davies 2000), down from 434 in 32 packs 1995 (Wilkinson 1995) probably due to a natural fluctuation. Prior to the denning season in 2002, an additional 54 wild dogs in 10 packs occurred in the meta-population, spread over five reserves (Hluhluwe-Umfolozi Park, 15 individuals; Karongwe Game Reserve, four; Madikwe Game Reserve, 16; Pilanesberg National Park, 11; Venetia Limpopo Nature Reserve, eight). Based upon these estimates, in 2002 279 - 307 free ranging wild dogs occurred in 37 - 47 packs in South Africa, with 57.7% of individuals occurring in Kruger (44.6% of packs), 24.7% outside protected areas (34.0% of packs), and 17.6% in the meta-population (21.3% of packs).

2.4 Discussion

The collection of sighting data seems to be a useful technique for estimating the distribution and status of wild dogs outside state protected areas in South Africa. Wild

dogs are well suited to the collection of sighting data for census purposes, as they are gregarious, diurnal, and charismatic enough to make sightings memorable (Gros 1998). It was noted in the latest census of the Kruger population, that the average pack size calculated from tourist sighting reports was very similar to that calculated from photographic evidence (differing by 0.67 dogs, Davies 2000), suggesting that sighting records yield accurate group size estimates. However, it is important to note the limitations of this method. There is no way of measuring the associated error, and the assumptions made may affect the validity of the results. Population size estimates were based upon the assumption that all sightings within a distance equal to the diameter of maximum Kruger home range area from the previous sighting constituted a single pack. It is possible that the presence of fences between ranches limits movement, and that the high stocking rates typical of game ranches results in small home ranges. If this is the case, the number of packs was underestimated. However, several factors suggest that the use of large home range areas as a basis for distinguishing between packs is likely to be valid. First, high quality electric fencing is required to hold wild dogs, and movements are unlikely to be significantly affected by the fencing typically found on cattle and game ranches (Hofmeyr 2000). Second, home ranges are largest where there are few other wild dogs to impede movement (Fuller et al. 1992b) and consequently home ranges outside state protected areas are likely to be large. Third, the degree of overlap between home ranges of neighbouring packs is likely to be less given discontinuous natural habitat. Finally, cheetahs utilise larger areas in areas where they are persecuted (Marker et al. in prep.) and the same is likely to be true for wild dogs.

It is possible that the use of group size to distinguish between resident packs and dispersing groups underestimated the number of resident packs, as the mean size of female dispersing groups (2.3 - 3.4, McNutt 1996; Creel & Creel 2002) is smaller than the cut off figure of five used to distinguish between dispersing groups and resident packs. However, sightings of resident packs were reported 8.2 ± 0.48 (mean ± S.E.) times on average, compared to 1.6 ± 0.14 times for dispersing groups, suggesting that dispersing groups were correctly identified as being non resident.

Distribution and population size projections are minimum estimates, and blank areas on the distribution map do not necessarily mean that no wild dogs occur, simply that no sighting reports were received. For example, it is likely that wild dogs occur more frequently than reported in the Madimbo corridor on the extreme northwestern boundary of Kruger. This area is managed by the South African Defence Force, and due to the low density of people, sightings are less likely to be reported than from other areas. However, wild dogs are highly visible, and although dispersing groups undoubtedly pass through blank areas on the distribution map, resident packs probably do not occur far beyond the limits of the distribution presented. When wild dogs were sighted in an area, their presence was often corroborated by sighting reports from multiple sources. Furthermore, by virtue of their being highly visible, wild dog sighting data may be less affected by biases related to varying sightability between habitat types than studies of more secretive species such as cheetah (Gros et al. 1996) or cougar *Felis concolor* (Pike et al. 1999). Nonetheless, although distribution and population size estimates are probably

conservative, the validity of these methods has not been tested for wild dogs, and the results obtained must be treated with caution.

The geographic distribution of wild dogs outside state protected areas in South Africa is greater than that suggested by Fanshawe et al. (1997) and Friedmann et al. (2002). Friedmann et al. (2002) estimated an extent of occurrence of 20,000 km^2, and an area of occupancy of >2,001 km^2, compared to my estimates of 43,310 km^2 and 17,907 km^2, respectively. The presence of vagrants in the Northern Cape and resident wild dogs on ranchland north of Hluhluwe-Umfolozi Park is confirmed (Fanshawe et al 1997; Maddock 1999), but the distribution and numbers occurring on ranchland along the Limpopo River and on the western border of Kruger is greater than previously suggested (Fanshawe et al. 1997). Sighting reports were received from several areas not mentioned by Fanshawe et al. (1997), including the southern and southwestern periphery of Kruger, Mpumalanga Highveld, northwestern Limpopo and North West.

Nonetheless, despite relatively widespread sightings of dispersing groups, the occurrence of resident wild dogs is limited primarily to areas close to source populations, with low human densities and unmodified habitat, dominated by game ranching. The three areas in which resident wild dogs are most commonly sighted (along the Limpopo River, the western border of Kruger, and northern Kwa-Zulu Natal) are all within 90 km of a source population. Kruger is a much larger source population than Hluhluwe-Umfolozi, and this is borne out by the greater number of sightings around Kruger. Dispersal greatly increases mortality risk in wild dogs (Creel & Creel 2002), and survival rates are likely to

decrease with distance from a source population due to exposure to unsuitable blocks of habitat, tarred roads, disease-risk through contact with domestic dogs *Canis familiaris*, and persecution. High human densities surround much of northern and southern Kruger and Hluhluwe-Umfolozi Park and provide an immediate barrier to dispersal. Correspondingly, dispersing cells had higher average human densities than absent cells, and had varied land cover (several sightings even occurred within town limits) and varied land use, due to the necessity of crossing inhospitable terrain to reach suitable habitat. This coupled with an Allee effect operating at low pack sizes (Courchamp & Macdonald 2001), and a paucity of source populations may explain why large areas of apparently suitable habitat (such as northwestern Limpopo) have not been successfully re-colonised. Wolves *Canis lupus* in North America, by contrast, have been observed to successfully disperse up to 600 km over agricultural land (Mech 1995). Given landowner cooperation, the translocation of wild dogs to areas of suitable habitat would greatly assist range expansion.

Wild dogs resident outside protected areas occur primarily on private land used for game ranching. Under these conditions, natural vegetation is typically intact and prey populations are actively protected. In contrast, few sightings were reported on communally owned property, likely as a result of depleted prey populations (Bigalke 2000). In some areas, notably the ranching area on the western border of Kruger, and in Kwa-Zulu Natal, a large portion of sightings (48.7% of sightings, and 53.1% respectively) was made on collaborative nature reserves. Most ranchers within collaborative nature reserves are positive towards wild dogs (Chapter 4) and this form of

land use provides conditions highly conducive to their conservation. An estimated 13% of South Africa is devoted to game ranching (Falkena 2000), suggesting that significant potential for wild dog conservation exists outside protected areas. However, this potential is reduced by habitat fragmentation - few large blocks of unmodified habitat exist outside protected areas. Ranging behaviour predisposes wild dogs to edge effects and increased mortality risk (Woodroffe & Ginsberg 1998) and approximately 9% of sightings of resident wild dogs occurred in conditions conducive to conflict with people: unsuitable habitat with high human densities and livestock based land uses.

Wild dogs outside state protected areas are limited largely to areas with low human population densities, in keeping with other carnivore species (e.g. cougars, Pike et al. 1999). By virtue of their cooperative breeding strategy, wild dogs are highly sensitive to adult mortality, and intolerant of persecution (Courchamp & Macdonald 2001). However, in some areas, resident packs persist despite high levels of human-related mortality, suggesting that wild dogs may be more tolerant of persecution than previously believed. Furthermore, resident packs persist at higher human densities (mode, 5.0 people / km^2; mean, 20 people / km^2; range, 1.5 - 150 people / km^2) than the critical density, above which extinction is predicted (0.7 people / km^2), and within the range of mean densities at which other large carnivores have gone extinct (e.g. wolves, 13.5 people / km^2; lions, 26.0 people / km^2, Woodroffe 2000). Nonetheless, persecution by humans probably limits the expansion of the distribution of wild dogs outside state protected areas, and reducing human-related mortality must be a focus of conservation efforts. Recent recoveries in large carnivore populations in Europe and North America suggest that successful

conservation is possible at high human densities given adequate law enforcement (Linnell et al. 2001).

2.4.1 Potential for range expansion

The best prospects for range expansion outside protected areas are probably in northern and northwestern Limpopo, and in northeastern North West province, where large areas of contiguous suitable habitat persist, with low human densities, largely unmodified land cover, and large prey populations due to a prevalence of game ranching (van der Waal & Dekker 2000). Significantly, cheetahs, lions, leopards *Panthera pardus*, and spotted hyaenas occur in these areas, suggesting that the prevailing conditions are conducive to large carnivore conservation (Friedmann et al. 2002). Given landowner tolerance, increasing wild ungulate populations in northern South Africa have the potential to support increases in wild dog numbers in these areas. However, ranchers in northern Limpopo are largely negative towards wild dogs, and in the absence of education programmes, and schemes aimed at reducing the costs and increasing the economic benefits associated with conserving the species, range expansion is unlikely to occur (Chapter 4).

There is some potential for range expansion in the Eastern Cape through translocation of wild dogs into Addo Elephant Park, or one or several of the growing number of private nature reserves in the region. Large areas of unmodified habitat with low human densities also occur in the Northern Cape. However, wild dogs are only vagrant in the Kgalagadi Transfrontier Park and the habitat in the remainder of the Northern Cape is probably

marginal or unsuitable for wild dogs (Fanshawe et al. 1997). In the western North West province and Northern Cape, wild dogs were often sighted on livestock ranches, where one would expect prey densities to be low. Reduced prey availability is associated with increased transience in carnivore populations (Fuller & Sievert 2001), and a shortage of suitable prey may explain the lack of resident packs in these areas.

If one conservatively assumes that all habitat in the Northern Cape and Free State provinces is unsuitable for wild dogs, and that suitable habitat is equal to the area of unmodified land with fewer than 5 people / km^2 in Kwa-Zulu Natal, Limpopo, and North West, then an area of 88,750 km^2 is potentially available for wild dog conservation outside state protected areas. The population size of wild dogs that could be conserved in this area is 178 individuals (or ~ 18 packs) given a density equal to the lowest density recorded in a protected area (two dogs / 1000 km^2, Fuller et al. 1992b), or 1,482 individuals (or ~ 148 packs) given a density equal to the minimum density observed in Kruger (16.7 dogs / 1000 km^2, Maddock & Mills 1994). Although in reality, some of habitat classified as 'suitable' in this study is likely to be unsuitable due to low prey populations and incompatible land uses, there is nonetheless significant scope for expansion of the distribution of wild dogs outside state protected areas.

2.4.2 Total South African wild dog population

Despite being frequently cited as one of six countries with a large and stable wild dog population (Fanshawe et al. 1997; Creel & Creel 2002), numbers in South Africa are precariously low, with a geographic distribution covering as little as 3.54% - 5.69% of

the country, based upon the area of occupancy and extent of occurrence, respectively. The 2002 population estimate of 279 - 307 wild dogs is markedly lower than that for other large carnivores in South Africa; cheetah (650 individuals), lions (2,519 individuals) and spotted hyaenas (2,970 individuals, Friedmann et al. 2002). The recent decline in wild dog numbers in Kruger probably represents a natural fluctuation likely related to high rainfall and low hunting success (Davies 2000), and numbers are believed to be recovering (G. Mills pers. comm.). Nonetheless, a population size of 177 leaves a demographically effective population size of as low as 140 (due to unbalanced sex ratios, and deviation from a stable age distribution), and the Kruger population is susceptible to environmental and demographic stochasticity (Caughley 1994; Creel & Creel 2002). The attempt to create a second viable population through the establishment of the meta-population had yielded an additional 54 individuals in 10 packs by 2002. Wild dogs outside state protected areas form a more significant sector of the national population than previously realised (Fanshawe et al. 1997; Friedmann et al. 2002). Conservationists and donors have neglected wild dogs occurring outside state protected areas, and they are highly persecuted, remain low in numbers and are limited in distribution. This neglect likely affects populations within protected areas by creating a 'vacuum effect' (Rasmussen 1999) whereby wild dogs leave the safety of protected areas to fill empty home ranges vacated by persecution. The channelling of donor funding and conservation efforts into wild dog conservation outside protected areas is vital to facilitate range expansion, and to create buffers for populations occurring within protected areas.

The collection of sighting data should be continued to document population trends and to gauge the efficacy of conservation efforts. It is recommended that these methods be employed in other range states to permit more accurate estimation of national population sizes. Reliable estimates of the distribution and status of large carnivores represent a vital prerequisite for conservation efforts, but are frequently lacking due to the costs associated with sampling over large areas (Smallwood & Fitzhugh 1995). Sightings collection represents an inexpensive and effective way in which the status of a highly visible large predator species can be assessed over large areas (Gros et al. 1996), and has been used to assess the status of several species (e.g. ocelots *Leopardus pardalis*, Tewes & Everett 1986; cougars, Pike et al. 1999; and wolves, Lariviere et al. 2000). The methods have particular applicability to developing countries with limited resources to respond to declines in carnivore populations. Future research should focus upon testing the validity of the methods.

In conclusion, a small population of wild dogs occurs outside state protected areas in South Africa, primarily in the game ranching areas of the extreme north and northeast. Although wild dogs persist at higher human densities and inhabit a wider geographic distribution than previously believed, they remain few in number and inhabit a fraction of the potentially suitable available habitat. Conservation efforts are required to increase the numbers and geographic range of wild dogs in South Africa, and in so doing protect the integrity of populations occurring inside protected areas.

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