African Wildlife Conservation Fund

Carnivore Densities in Gonarezhou National Park

Results of the May/June 2009 Spoor Survey

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Introduction

An understanding of the density of carnivore populations in protected areas helps to guide management decisions (Stander 1998), provides useful data for ecological research, and contributes to knowledge of population trends. Carnivore density information can offer early warnings about conservation needs, and provide information regarding prospects for successful future photographic tourism, as well as offer input for decisions regarding hunting quotas or possible culling requirements. Moreover, carnivore density trends are a reflection of prey densities and therefore may serve as a useful indicator of ecological health.

The African Wildlife Conservation Fund's Lowveld Wild Dog Project (LWDP) carried out a carnivore spoor survey in the Gonarezhou National Park (GNP) in May/June 2009 using a standardised methodology to allow for consistency through time and to ensure comparability with other studies. In areas of suitable substrate, spoor surveys have been shown to be an effective and efficient means to assess wildlife densities (Stander 1998; Funston et al. 2001; Davidson & Romaňach 2007) as there is a strong correlation between spoor density and true density.

This report presents the results of the May/June 2009 carnivore spoor survey for the Gonarezhou.

Methods

We employed the methods used in Hwange and the Savé Valley Conservancy (SVC) by Davidson and Romanach (2007) and Groom (2008), based on those used by Stander (1998) in Namibia. Given the low road penetration in the park, almost all suitable roads were used as transects. In total 490.4km of roads were driven which represents a penetration ratio of 1:7.7 (total number of kilometres driven to total sample area). This is reasonably consistent with the penetration ratio in the SVC which was between 1:6 and 1:7

The total area of the Gonarezhou National Park (GNP) is 4963km^2. However, 1177km^2 of the area is north of the Runde River and was excluded from the survey because of the unsuitability of the substrate for seeing spoor (very rocky granite terrain). South of the Runde River however, the ground substrate consists of alluvial sands and Cretaceous sands which are ideal for spoor surveys. The total area of the park south of the river was 3786km^2, which represents the total sample area. This in turn was divided into 2 sections, representing the different management sections of the park. The southern section (the Mabalauta subregion, comprising the Mabalauta tourist area and the Guluweni-Chefu Wilderness Area) comprised

2121km^2. The northern section (the Save-Runde subregion comprising the Chipinda Pools and southern Runde tourist areas) totaled 1665km^2.

In the northern section, a total of 233.8km were driven as transects (penetration ratio 1:7.1) whilst in the southern section, a total of 256.6km were scanned for spoor (penetration ratio 1:8.2).

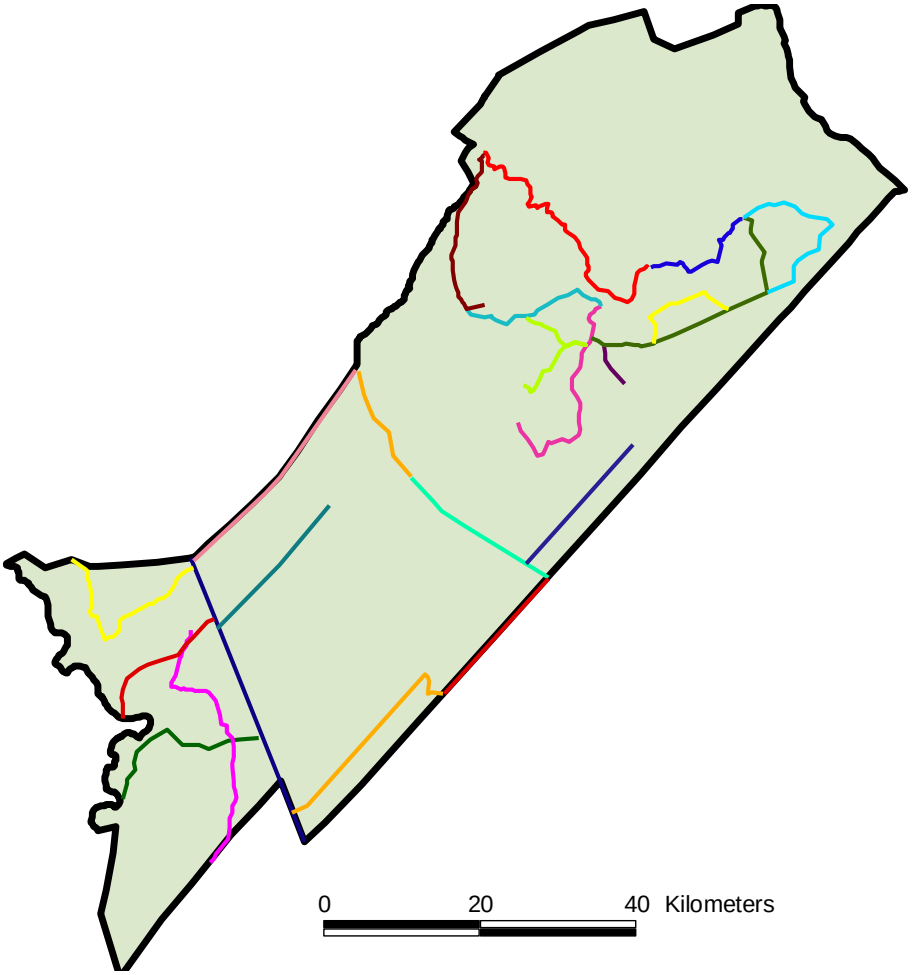
Each transect was driven at a speed of between 10 and 20 km/hr with one observer sitting on the front of the car scanning the road. The driver did the data recording and verified the track identifications. Transects ranged from 12km to 38km in length with a mean length of 21.3km.

Each transect survey started as close to sunrise as possible, and wherever feasible was driven from west to east to ensure the best possible tracking conditions. A break was taken in the middle of the day, and transects were continued in the late afternoons (in an east-west direction where possible), until the sun went down. Spoor was recorded for all mammalian carnivores equal in size to or larger than a genet. This included genet, African wild cat, bat-eared fox, jackal, porcupine, honey badger, civet, aardwolf, serval, wild dog, cheetah, leopard, spotted hyena and lion.

Only tracks less than 24 hours old were counted. Road conditions were generally sandy, such that spoor was relatively easy to see. Where possible, spoor of individual animals was followed to reduce the likelihood of that individual being counted twice on a given transect.

The survey took 14 days to complete, and was done in two sessions.

Figure 1: Map of the transects driven in Gonarezhou National Park– May/June 2009



Results

Table 1: Results summary for the four main large carnivores (density equations derived from graphs in Stander 1998)

Parameter	Northern GNP	Southern GNP	Total GNP
Area (km^2)	1665	2121	3786
Combined transect length (km)	233.8	256.6	490.4
Penetration ratio	1:7.1	1:8.2	1:7.7
Results – Lions			
Number of individual lion spoor seen	2	8	10
Lion spoor frequency (km/spoor)	116.9	32.1	49.0
Spoor density (spoor/100km)	0.9	3.1	2.0
Density of lions per $100km^2$ (Y=0.3049X)	0.3	1.0	0.6
Estimated number of lions	**4**	**20**	**23**
Results - Spotted Hyenas			
Number of individual hyena spoor seen	76	56	132
Hyena spoor frequency (km/spoor)	3.1	4.6	3.7
Spoor density (spoor/100km)	32.5	21.8	26.9
Density of hyenas per $100km^2$ (Y=0.3049X)	9.9	6.7	8.2
Estimated number of spotted hyenas	**165**	**141**	**310**
Results – Leopards			
Number of individual leopard spoor seen	18	18	36
Leopard spoor frequency (km/spoor)	13.0	14.2	13.6
Spoor density (spoor/100km)	7.7	7.0	7.3
Density of leopards per $100km^2$ (Y=0.6993X)	5.4	4.9	5.1
Estimated number of leopards	**89**	**104**	**194**
Results – Wild Dogs			
Number of individual wild dog spoor seen	4	6	10
Wild dog spoor frequency (km/spoor)	58.5	42.8	49.0
Spoor density (spoor/100km)	1.7	2.3	2.0
Density of wild dogs per $100km^2$ (Y=0.3049X)	0.5	0.7	0.6
Estimated number of wild dogs	**8**	**15**	**23**

These results are an estimate and must be treated with caution (as should the results for all species given in the tables at the end). The sample size for most of the large carnivores, excluding spotted hyenas was too small to give good confidence in the estimates obtained. For example, it has been calculated that for lion, a sample size of 25 encounters is required to achieve a 95% confidence level in the estimation of lion density from spoor in the Zimbabwean bushveld (Davidson & Loveridge 2005). It is likely that a similar encounter rate would be necessary to more accurately estimate other large carnivores and this criteria was

not met. To achieve this, the transects would be repeated until the required number of tracks were encountered. However, it is likely that the estimates are accurate enough to be able to pick up on trends over time, which is what we hope to achieve from such a survey. A similar survey in the SVC in October 2008 gave very accurate results for lions, leopards and wild dogs, all species for which we had a very good idea of the population size before the survey. Spotted hyenas may be over-estimated due to their propensity to walk along roads for very long distances, often moving away and re-joining the road several kilometers further down. Such an error in estimates would however be consistent across years and thus would still be useful for picking up trends in the hyena population.

Detailed results for all species counted are included at the end of this report. The leopard equation was used to derive a population estimate from spoor density for all of the smaller carnivores given their largely solitary nature and habits of using the roads as access routes (see tables at end).

Comparison with Savé Valley Conservancy

Having recently completed a spoor survey in the SVC as well, several differences between the two areas were apparent. These are however simply informal observations.

- We picked up a good number of aardwolf spoor in the GNP, whereas we encountered only one track in the conservancy. Aardwolf used to be abundant in the conservancy until the 1991/92 drought, but are now extremely rare. From the spoor, it seems like the GNP has a decent population, although it would be good to have visual sightings to confirm this.

- There seems to be a much lower density of lions in the GNP, as compared with SVC. This is likely to due to a combination of factors, including the smaller prey base in the park, the impact of snaring, the hunting concessions surrounding the park, and the strong hyena population in the park. While the hyena population in SVC is also quite good, the majority of spoor encounters there were of single hyenas or pairs at most, whilst lions were present in prides. By contrast in GNP, it was evident from the spoor that hyenas were present in clans whilst lions were usually solitary or in pairs. It may be that the hyenas are partially out-competing the lions in the park, given their group sizes. I would suggest it is likely however that lion numbers will pick up over time.

- We did not encounter any spoor of brown hyena in the GNP. This contrasts with the SVC where we picked up a good number of brown hyena tracks and know there to be a good population of brown hyenas from their presence at most baits (recorded on camera traps). It would be interesting to see if brown hyenas are present in the park by doing a baiting survey with camera traps.

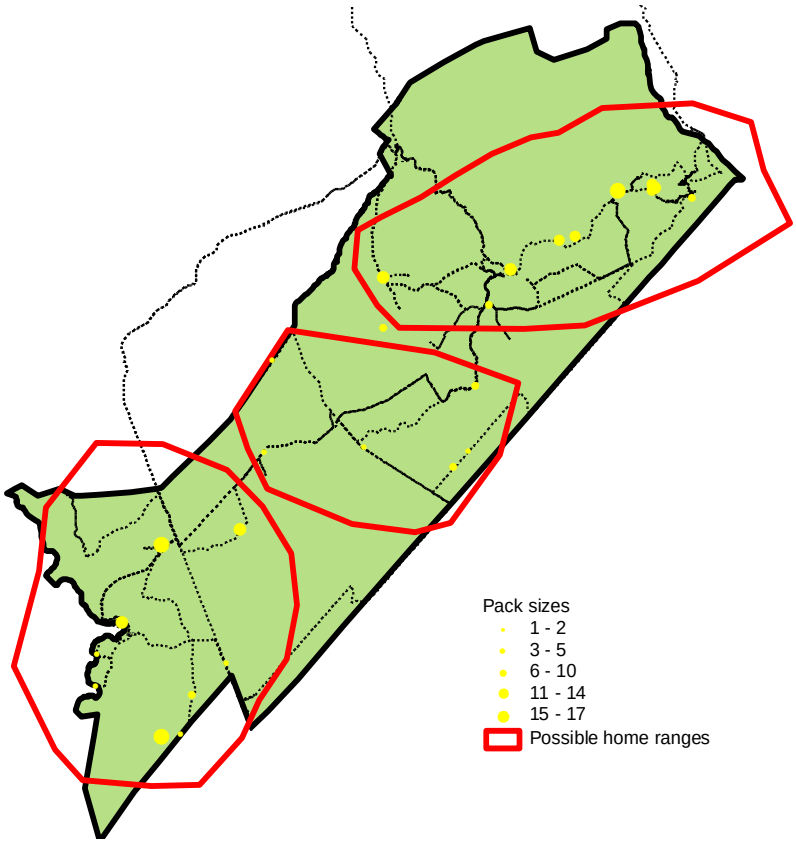
- As in the SVC, population densities of civets and porcupines seem to be especially high, and genets and wild cats seem to be fairly abundant in both areas as well. We picked up relatively few signs of jackals as compared with the conservancy.

Wild Dogs in Gonarezhou National Park

Whilst the spoor survey alone was not sufficient to give an accurate estimate of the wild dog population in the park, that, combined with tourist and ranger reports and sightings, and an understanding of wild dog behavior and home range sizes, allows us to make a very informal estimate of the wild dogs in the GNP. The map below includes all records of wild dogs in the GNP since November 2008, including spoor recorded on our survey. It is probable that there are at least 2 packs of wild dogs in the park: one in the Mabalauta area of about 14 individuals and one along the Runde River (about 10 individuals). Interestingly, this tallies

reasonably well with the results from the spoor survey which estimated 15 dogs in the southern section and 8 in the northern section. It is however possible there is another small pack in the centre of the park, as illustrated in the map below. As drawn on the map, home range sizes are around 1,600km^2, which is a realistic size given the low prey density and habitat in the park.

Possible wild dog packs in the Gonarezhou National Park – June 2009



Recommendations for Future

In terms of wild dogs, a comprehensive effort is needed to find the den sites during the denning season (June to September). Once these have been located, satellite collars can be fitted to the packs to monitor their movements. Finding the dens in the first place will however require a full time presence by the wild dog team in the park, and the co-operation of scouts and rangers. This may only be possible in the 2010 denning season. In the meantime, we will continue to collate all sightings information to build up more of an idea of the dogs in the park.

In order to assess the carnivore populations north of the Runde River, a technique other than spoor surveys needs to be employed. For the smaller carnivores; bait stations with camera traps and sand traps would be best. For lions and hyenas, call-up stations at regular intervals throughout the area would probably give the best estimate. Camera traps at baits could also be useful to estimate lion and hyena numbers.

Repeating the spoor survey annually, using the same methods and the same transects, will give a good idea of carnivore population trends in the park.

Conclusion

Given the excellent substrate south of the Runde River, a spoor survey would seem to be a useful method for estimating carnivore numbers in the park and for assessing trends. There are sufficient roads to give a fairly good penetration ratio, but there remain vast areas without any roads, whilst other areas are well covered, which may bias the results. Nonetheless, repeating this survey on an annual basis will give a good indication of carnivore population trends and should be considered as a useful management tool.

Acknowledgements

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NORTH GNP	Survey Area North GNP	Est. population	Equation Used	Est. density	Distance covered (km)	No. of spoor counted	Spoor frequency (km/spoor)	Transect length (km)	Penetration	Spoor density
Species	(Km^2)	(Total area)	Stander1998	(Animals/100km^2) Y=0.3049X Y=0.6993X	Sum of transects			Sum of routes	(Area/length)	(Spoor/100km)
Aardwolf	1665	69.7	Leopard (Y=0.6993X)	4.2	233.8	14	16.70	233.8	7.12	5.99
Bat-eared fox	1665	0.0	Leopard (Y=0.6993X)	0.0	233.8	0		233.8	7.12	0.00
Cheetah	1665	4.3	Lion (Y=0.3049X)	0.3	233.8	2	116.90	233.8	7.12	0.86
Civet	1665	259.0	Leopard (Y=0.6993X)	15.6	233.8	52	4.50	233.8	7.12	22.24
Genet	1665	69.7	Leopard (Y=0.6993X)	4.2	233.8	14	16.70	233.8	7.12	5.99
Honey Badger	1665	5.0	Leopard (Y=0.6993X)	0.3	233.8	1	233.80	233.8	7.12	0.43
Jackal	1665	79.7	Leopard (Y=0.6993X)	4.8	233.8	16	14.61	233.8	7.12	6.84
Leopard	1665	89.6	Leopard (Y=0.6993X)	5.4	233.8	18	12.99	233.8	7.12	7.70
Lion	1665	4.3	Lion (Y=0.3049X)	0.3	233.8	2	116.90	233.8	7.12	0.86
Porcupine	1665	244.0	Leopard (Y=0.6993X)	14.7	233.8	49	4.77	233.8	7.12	20.96
Serval	1665	0.0	Leopard (Y=0.6993X)	0.0	233.8	0		233.8	7.12	0.00
Spotted hyaena	1665	165.0	Lion (Y=0.3049X)	9.9	233.8	76	3.08	233.8	7.12	32.51
Wild cat	1665	44.8	Leopard (Y=0.6993X)	2.7	233.8	9	25.98	233.8	7.12	3.85
Wild dog	1665	8.7	Lion (Y=0.3049X)	0.5	233.8	4	58.45	233.8	7.12	1.71

SOUTH GNP	Survey Area South GNP	Est. population	Equation Used	Est. density	Distance covered (km)	No. of spoor counted	Spoor frequency (km/spoor)	Transect length (km)	Penetration	Spoor density
Species	(Km^2)	(Total area)	Stander1998	(Animals/100km^2) Y=0.3049X Y=0.6993X	Sum of transects			Sum of routes	(Area/length)	(Spoor/100km)
Aardwolf	2121	75.1	Leopard (Y=0.6993X)	3.5	256.6	13	19.74	256.6	8.27	5.07
Bat-eared fox	2121	5.8	Leopard (Y=0.6993X)	0.3	256.6	1	256.60	256.6	8.27	0.39
Cheetah	2121	12.6	Lion (Y=0.3049X)	0.6	256.6	5	51.32	256.6	8.27	1.95
Civet	2121	439.3	Leopard (Y=0.6993X)	20.7	256.6	76	3.38	256.6	8.27	29.62
Genet	2121	179.2	Leopard (Y=0.6993X)	8.4	256.6	31	8.28	256.6	8.27	12.08
Honey Badger	2121	0.0	Leopard (Y=0.6993X)	0.0	256.6	0		256.6	8.27	0.00
Jackal	2121	75.1	Leopard (Y=0.6993X)	3.5	256.6	13	19.74	256.6	8.27	5.07
Leopard	2121	104.0	Leopard (Y=0.6993X)	4.9	256.6	18	14.26	256.6	8.27	7.01
Lion	2121	20.2	Lion (Y=0.3049X)	1.0	256.6	8	32.08	256.6	8.27	3.12
Porcupine	2121	364.2	Leopard (Y=0.6993X)	17.2	256.6	63	4.07	256.6	8.27	24.55
Serval	2121	5.8	Leopard (Y=0.6993X)	0.3	256.6	1	256.60	256.6	8.27	0.39
Spotted hyaena	2121	141.1	Lion (Y=0.3049X)	6.7	256.6	56	4.58	256.6	8.27	21.82
Wild cat	2121	57.8	Leopard (Y=0.6993X)	2.7	256.6	10	25.66	256.6	8.27	3.90
Wild dog	2121	15.1	Lion (Y=0.3049X)	0.7	256.6	6	42.77	256.6	8.27	2.34

TOTAL GNP	Survey Area Total GNP	Est. population (Total area)	Equation Used Stander1998	Est. density (Animals/100km^2)	Distance covered (km)	No. of spoor counted	Spoor frequency (km/spoor)	Transect length (km)	Penetration (Area/length)	Spoor density (Spoor/100km)
Species	(Km^2)			Y=0.3049X Y=0.6993X	Sum of transects			Sum of routes		
Aardwolf	3786	145.8	Leopard (Y=0.6993X)	3.9	490.4	27	18.16	490.4	7.72	5.51
Bat-eared fox	3786	5.4	Leopard (Y=0.6993X)	0.1	490.4	1	490.40	490.4	7.72	0.20
Cheetah	3786	16.5	Lion (Y=0.3049X)	0.4	490.4	7	70.06	490.4	7.72	1.43
Civet	3786	691.0	Leopard (Y=0.6993X)	18.3	490.4	128	3.83	490.4	7.72	26.10
Genet	3786	242.9	Leopard (Y=0.6993X)	6.4	490.4	45	10.90	490.4	7.72	9.18
Honey Badger	3786	5.4	Leopard (Y=0.6993X)	0.1	490.4	1	490.40	490.4	7.72	0.20
Jackal	3786	156.6	Leopard (Y=0.6993X)	4.1	490.4	29	16.91	490.4	7.72	5.91
Leopard	3786	194.4	Leopard (Y=0.6993X)	5.1	490.4	36	13.62	490.4	7.72	7.34
Lion	3786	23.5	Lion (Y=0.3049X)	0.6	490.4	10	49.04	490.4	7.72	2.04
Porcupine	3786	604.7	Leopard (Y=0.6993X)	16.0	490.4	112	4.38	490.4	7.72	22.84
Serval	3786	5.4	Leopard (Y=0.6993X)	0.1	490.4	1	490.40	490.4	7.72	0.20
Spotted hyaena	3786	310.7	Lion (Y=0.3049X)	8.2	490.4	132	3.72	490.4	7.72	26.92
Wild cat	3786	102.6	Leopard (Y=0.6993X)	2.7	490.4	19	25.81	490.4	7.72	3.87
Wild dog	3786	23.5	Lion (Y=0.3049X)	0.6	490.4	10	49.04	490.4	7.72	2.04