

Heterogeneity in the density of Spotted Hyaenas in Hluhluwe iMfolozi Park

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Aims

- Update estimate of average hyaena density & population size of HiP
- Map hyaena density across the surface of HiP
- Consider results in light off:
 - earlier hyaena population estimates for HiP
 - co-existence of subordinate intraguild carnivores with hyaenas
 - relevance of scale when evaluating competitive, interspecific spatial relationships involving hyaenas
 - conservation status of hyaenas in KZN and RSA

Methods

- Hyaenas counted at stations spread across HiP using audiotape broadcasts, “playbacks”, as developed by Mills *et al.* (2001).
- Independent calibration experiment indicated
 - maximum response distance: 2.8 km
 - response probability: 0.6
- Stations located at least 5.6 km apart
- Two series conducted: sampled 20 stations in 2003 & 24 in 2004
- observed # of hyaenas at each station adjusted with response probability to derive expected # of hyaenas
- Means & CI for both series calculated using bootstraps based on 10000 replications with replacement following Ogutu *et al.* (2005) for:
 - expected # hyaenas per station
 - density of hyaenas per station
- Spatial interpolation (Inverse distance weighted method) performed on station densities to produce hyaena density maps for 2003 & 2004

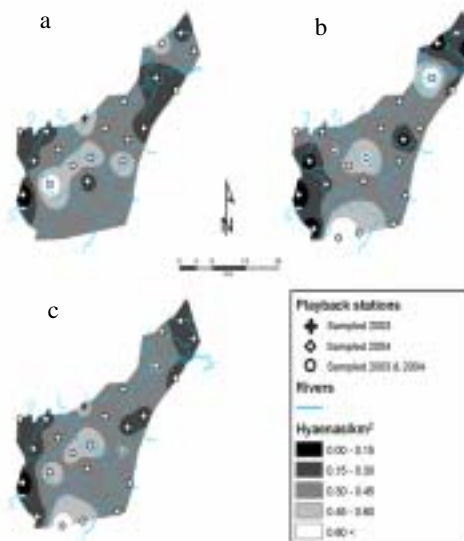
Table 1. The total number of hyenas responding (*n*), estimates of the mean and the associated 95% bootstrap confidence limits (lower, upper) for, the expected number of individuals within the response range of a station, the population density (numbers/km²), and population size (number) for the 2003 and 2004 playback series in HiP.

Year	Playback stations	Area (km ²)	<i>n</i>	Expected number			Density			Size		
				Mean	Lower	Upper	Mean	Lower	Upper	Mean	Lower	Upper
2003	20	417.3	92	7.670	5.750	7.670	0.350	0.268	0.438	315.0	241.2	394.2
2004	24	480.4	107	7.421	5.347	9.583	0.363	0.259	0.481	326.7	233.1	432.9

Results

- Hyaenas responded at 19/20 & 22/24 stations for 2003&4 respectively
- Four hyaenas with snares around neck or head recorded
- Observed # of hyaenas per station ranged from 0 – 12 individuals for both series
- Two series produced very similar results indicating consistency of technique (Table 1)
- No significant difference between # of observed hyaenas per station for 2003 & 2004 ($F=0.02$, $p=0.88$), & thus estimates were combined:
 - mean density of 0.357 hyaenas/km² (lower: 0.259 & upper: 0.481)
 - mean adult & sub-adult population of 321 hyaenas (lower: 233, upper: 433)
- Spatial interpolation produced representative hyaena density maps for 2003 & 2004 (Fig. 1a, b)
- Averaged hyaena density map can be seen in Fig 1c

Figure 1. Density (hyaenas/km²) maps of hyaenas in HiP illustrating spatial heterogeneity in hyaena density across the park for (a) 2003, (b) 2004, and (c) average of 2003 and 2004



Discussion

- HiP hyaena population has potentially remained constant since 1st estimate in 1970's (Whateley & Brooks 1985)
- However, this interpretation should be treated with caution, as hyaena clan size has significantly increased in north eastern HiP
- Relative to other southern African areas hyaena density in HiP is high, but intermediate compared to East African areas
- Over short periods spatial heterogeneity in density was marked at small and large spatial scales, but decreased over longer periods
- This heterogeneity may create “competition refuges” in space and time
- Competitively subordinate carnivores with high mobility, such as wild dogs & cheetahs, should be able to exploit these “competition refuges”
- Heterogeneity in density at small spatial scale indicates that testing for avoidance of hyaenas by subordinate carnivores at small scale may be important
- Emigration to other local hyaena populations (Mkhuze, Opathe, Ithala & Greater St. Lucia GR) may occur via long distance dispersal as noted in HiP
- HiP population probably contiguous with these populations in a natural meta-population sense
- Hyaena population ca. 50% larger, than last estimate of 200 (Hofer & Mills 1998)
- Second largest protected population in RSA following Kruger NP

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