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## Annual Report 2004

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### Annual Report

#### 1. Brown hyena home range size

Home range sizes of brown hyenas along the coastal Namib Desert vary greatly (Table 1). This is not only a result of differences in habitat, food availability and distribution, but also a result of the use of different tracking techniques (VHF vs. GPS telemetry). Lhb210RC's home range of 134 km<sup>2</sup> (95% MCP) and 106 km<sup>2</sup> (95% ad. Kernel) combining VHF and GPS telemetry fixes is larger than the home range calculated only from VHF fixes (95% MCP: 36 km<sup>2</sup> and 95% ad. Kernel: 56 km<sup>2</sup>). Therefore we can assume that e.g. Lhb276RC's home range estimates, being an animal of the same brown hyena clan, are very conservative. Contrary brown hyenas Lhb10 and Lhb21f of the Peninsula clan show very similar home range estimates despite different tracking techniques. This discrepancy can be explained by differences in foraging behaviour of the brown hyenas belonging to the two different clans.

The Wolf Bay clans' home range includes a concentrated food source, a mainland seal breeding colony north of Wolf bay. Brown hyenas belonging to the Wolf Bay clan visit the colony regularly to search for food and usually rest close to the seal colony during day. Therefore VHF fixes obtained from a vehicle or plane during day, rather reflect the "resting" home range than the true home range. Brown hyenas of the Peninsula clan patrol many kilometres of coastline to search for food, as there is no mainland seal colony in their home range. Therefore they tend to rest in many different areas, depending on where they found food last, which is reflected in a less concentrated "resting" home range and reflects a better true home range.

Table 1: Home range sizes in km<sup>2</sup> of 12 brown hyenas along the coastal Namib Desert (-- sample size too low).

Hyena ID	Clan	Type of collar	N	Minimum Convex Polygon			Adaptive Kernel		
				50%	75%	95%	50%	75%	95%
LHb10	Peninsula	VHF collar	51	22	74	86	25	71	138
LHb21f	Peninsula	GPS collar	2039	24	91	132	9	32	128
LHb210RC	Wolf Bay	VHF & GPS collar	474	13	26	134	16	37	106
LHb276RC	Wolf Bay	VHF collar	31	5	12	19	14	30	59
LHb26m	Wolf Bay	GPS collar	702	177	325	625	121	291	595
3 E-Bay hyenas combined	E-Bay	VHF collar	13	10	25	58	11	23	49
BBHb9	Baker's Bay	GPS collar	5	--	--	--	--	--	--
LHb22f	Agate/Anigab	VHF collar	15	4	5	45	--	--	--
LHb23m	Agate/Anigab	VHF collar	11	4	53	96	10	17	42
LHb25m	Nomad	VHF collar	5	--	--	--	--	--	--

Therefore it is important to learn about the different habitats before discussing the results of the home range estimates and before making a decision in favour of VHF or GPS collars.

At present, four brown hyenas remain fitted with VHF collars (LHb10, LHb22f, LHb23m, LHb25m) and one with a GPS collar (BBHb9) that will drop off in March 2005. It is planned to fit three additional VHF collars on animals of the Wolf Bay or E-Bay clan in 2005.

## 2. Brown hyena population size

Brown hyena population size was determined in three study areas around mainland seal colonies (Table 2: Wolf Bay, Van Reenen Bay, Baker's Bay). The seal colonies differ in size and habitat. The Wolf Bay seal colony is a large colony on rocky ground with cliffs reaching into the sea. The other two seal colonies at Van Reenen Bay and Baker's Bay are small and situated on sandy beaches with few rocky areas at the edges of the colony. Three methods were used to identify brown hyenas: (1) artificial ear notches, where triangular shaped notches were cut into the edges of the ears; we identified three areas to cut notches per ear (upper inside, upper outside and lower outside), but a maximum of two notches were cut per ear; (2) visual collars, made out of machine belting and marked with a numbered plate, and radio collars with a unique VHF frequency; and (3) photographic identification. To obtain a definite identification of an unmarked animal (method 3), photographs of both ears and forelegs, from the front and side, had to be taken. In most cases large natural ear notches already provided a clear identification of the individual brown hyena, but as these can change over time, the combination of ear notches and stripe pattern on the forelegs was used. Once the photographic ID was made, identifications of individual brown hyenas could be made visually or from photographs.

For the population size estimates either only sightings from systematic monitoring of the seal colonies (high effort) or only incidental sightings (low effort) were analysed. A modified version of the Peterson estimate (Lincoln Index) was used for the calculation of  $N = ((n_1+1)*(n_2+1)/(m_2+1))-1$ . The parameter  $n_1$  was the number of individually identifiable brown hyenas on day 1,  $m_2$  the number of different individuals, identified during sightings and  $n_2$  the number of total sightings per total number of identified animals divided by  $m_2$ . The 95% confidence limits and the percentage of relative precision (PRP) were determined.

The population estimate was similar in all areas around mainland seal colonies and pup production at these colonies seems to have no influence on brown hyena population size.

Table 2: Population size estimate (N) of brown hyenas around three mainland seal colonies in different years and pup production at these seal colonies (\* = count from 2001; <sup>1</sup> = low effort)

Seal colony	Period	n1	n2	m2	95% min	95% max	N	PRP	Pup production at seal colony
Wolf Bay	Nov97-Oct98	4	10,00	4	8,89	11,43	10,00	12,70	36500
Wolf Bay <sup>1</sup>	Nov99-Oct00	6	9,33	4	8,87	33,13	13,46	90,11	30825
Wolf Bay <sup>1</sup>	Nov00-Oct01	5	13,00	4	10,80	32,80	15,80	69,61	21139
Van Reenen Bay	Nov01-Jan02	7	13,46	7	12,56	14,50	13,46	7,18	2953
Van Reenen Bay	Nov03-Feb04	6	12,00	6	11,08	13,09	12,00	8,39	2953*
Baker's Bay	Aug02-April04	9	12,00	9	11,37	12,71	12,00	5,57	6163*

The total population size of brown hyenas in the study area along the coast between Lüderitz and Chamais Bay (S 27°52'20" E 15° 39' 00") is estimated to be between 40 and 50 adult animals.

### 3. Brown hyena hunting and foraging behaviour

This study is part of my PhD thesis. The following results were presented at a colloquium organised by BIOTA and the Royal Society, Pretoria in Victoria West (RSA) in August 2004.

Brown hyenas inhabiting the coastal Namib Desert mainly scavenge and prey on Cape fur seal pups. These pups are either found on mainland Cape fur seal breeding colonies or washed up along the beaches. At these colonies, brown hyenas regularly kill seal pups. The majority of pups found at the colony are killed in surplus or are only partly and selectively consumed. Brown hyenas don't show prey choice regarding the condition of the pups, but consume the brain of larger pups and hence have an additive impact on seal pup mortality.

Brown hyenas are described as being scavengers. Along most parts of the Namib Desert coast they are the largest and apex predator foraging at mainland Cape fur seal colonies, such as the Wolf Bay seal colony. This colony is a localised, abundant food source with a year-round availability of seal pups. I investigated whether (1) brown hyenas show prey choice regarding the condition of pups and whether (2) seal pup predation, as a consequence of the previous question, has an additive impact on seal pup mortality.

Cumulative brown hyena predation was 9.4% in 1997-1998, 9.6% in 1999-2000 and 5.1% in 2000-2001 (Figure 1). Pup production at the Wolf Bay seal colony differed between years and was lowest in 2000-2001. This resulted in empty sample areas from the middle of February.

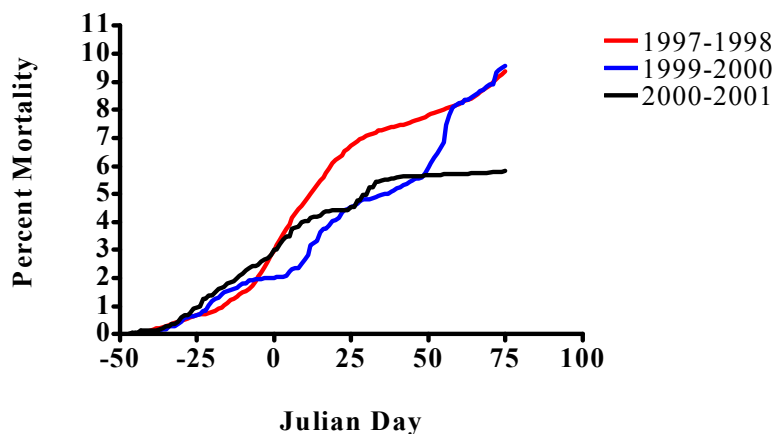


Figure 1: Percentage of seal pups predation at the Wolf Bay seal colony (Julian day 0 = 31 December)

Brown hyenas killed seal pups throughout the study period.

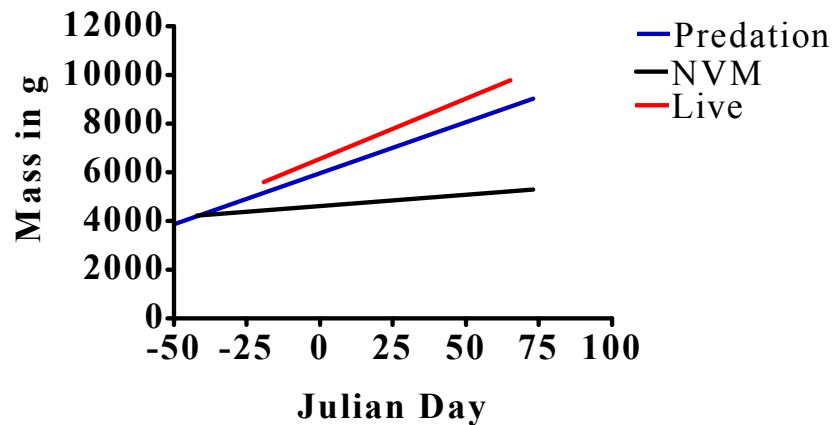


Figure 2: Mass of live and dead seal pups over time (Julian day 0 = 31 December)

The slopes of the linear regression curves of changes in pups mass of non violent mortality (NVM) pups differed significantly from those of hyena predations and live pups. Contrary, the slopes and elevations of live pups and hyena predations did not differ significantly. Therefore brown hyenas did not choose between large pups and small ones with a high probability of non violent mortality (Figure 2) and as a consequence have an additive impact on seal pup mortality.

Furthermore, brown hyenas killed significantly more pups per day in surplus (SK) than they consumed selectively (EK) or completely (CC) at the colony or cached (CE) (Figure 3).

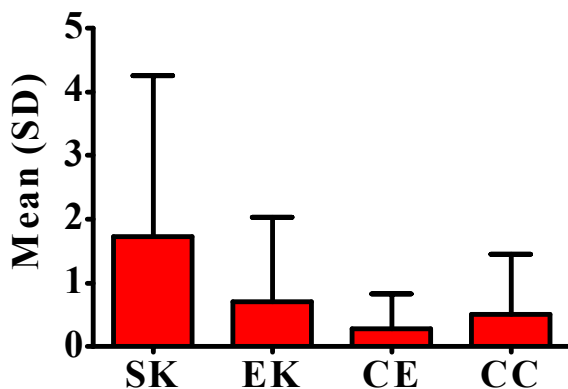


Figure 3: Average daily number of pups killed in surplus (SK), selectively consumed (EK), completely consumed (CC) and cached (CE).

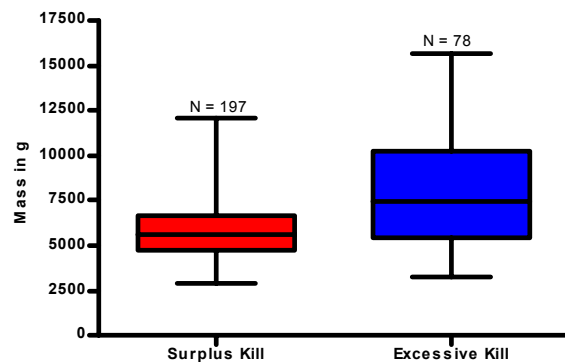


Figure 4: Mass of seal pups killed in surplus and selectively consumed.

Nevertheless brown hyenas selectively consumed larger seal pups, as the mass of pups, which were selectively consumed (EK), was significantly higher than the mass of pups killed in surplus (SK) (Figure 4).

#### 4. Mapping of study areas for brown hyena signs

All study areas are mapped for brown hyena signs such as dens, latrines, resting sites, feeding sites and paste marks. Up to now 60 den sites, 537 latrines, 409 resting sites and many feeding sites and paste marks were recorded. GPS positions of the locations are taken and we are working on a GIS database to display all recorded data. This includes the description of the sign, habitat information and photographs of the sites. The data will be used for habitat use analysis in connection with the information about brown hyena home ranges.

## 5. Baker's Bay/Pocket Beaches impact study

The project started as planned on the 1<sup>st</sup> of January 2004. We ordered one GPS collar (GPS Prosec 600UD) from Televilt in Sweden. The collar is equipped with an external drop off unit and the pre-programmed drop off time was set to 370 days, as the collars battery life expires after approximately 387 days. The VHF antenna is incorporated into the collar, which makes it less susceptible to damage. The VHF frequency of 149.100 MHz was registered with the Namibian Communications Commission for the duration of one year. We also chose the option of activity and mortality sensors.

The collar's schedule is as follows: VHF signals are sent on Saturdays, Sundays and Wednesdays between 7:00 and 14:00 h Namibian Time. GPS fixes are taken daily at 1:00, 3:00, 5:00, 7:00, 9:00, 12:00, 17:00, 19:00, 21:00 and 23:00 h.

We darted brown hyena's in the Baker's Bay area, with the help of Dr. Hartmut Winterbach from Swakopmund, between the 1<sup>st</sup> and 4<sup>th</sup> of March 2004.

The brown hyenas were attracted to our bait (goats and dead seal pups) through drags and novel lures. They were darted with a Pneu Dart using 220 and 250 mg of Zoletil respectively. After deploying the collar, taking of blood samples, measurements and clinical data, the brown hyenas were transferred into a wake-up cage and released as soon as they had fully recovered.

On the 2<sup>nd</sup> of March, we darted BBHb9, which had been seen for the first time at the Baker's Bay seal on the 28<sup>th</sup> of November 2002. BBHb9 was fitted with the GPS collar, as he is a resident brown hyena in an excellent condition and as we assumed, that his home range reaches the mining site at Ford Reef to the south of the seal colony.

On the same day, we darted another brown hyena, BBHb12, just north of the Baker's Bay seal colony and deployed a visual collar with a number tag. For details of the darted brown hyenas, please see Table 3 below.

Table 3: Measurements and details of darted brown hyenas at Baker's Bay.

	BBHb9	BBHb12
Gender	male	male
Age Class	III	III
Collar	GPS collar	Visual collar
Condition	excellent	excellent
Mass	39,3 kg	>50 kg
Total Body Length	132 cm	151 cm
Shoulder Height	70 cm	71 cm

In total we sighted six brown hyenas during our stay. Two of them were well known animals, visiting the seal colony on a regular basis (BBHb9 and BBHb10). BBHb12 had not been previously identified. The other three animals were seen during night and no ID's could be obtained.

The GPS collar will be retrieved in March 2005 and the analysis of the data will be included in the annual report for 2005.

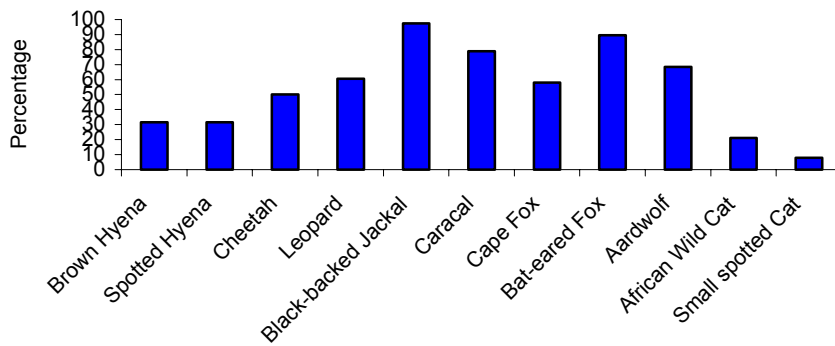
## 6. Farmer questionnaire and carnivore ATLAS

We have started analysing the data retrieved through the carnivore questionnaire, which was distributed to over 200 farms in the southern Karas Region (see Appendix 1). 38 farmers replied and below are some of our preliminary results. Appendix II shows the first ATLAS results for the southern Karas region.

PART B: Carnivores – general

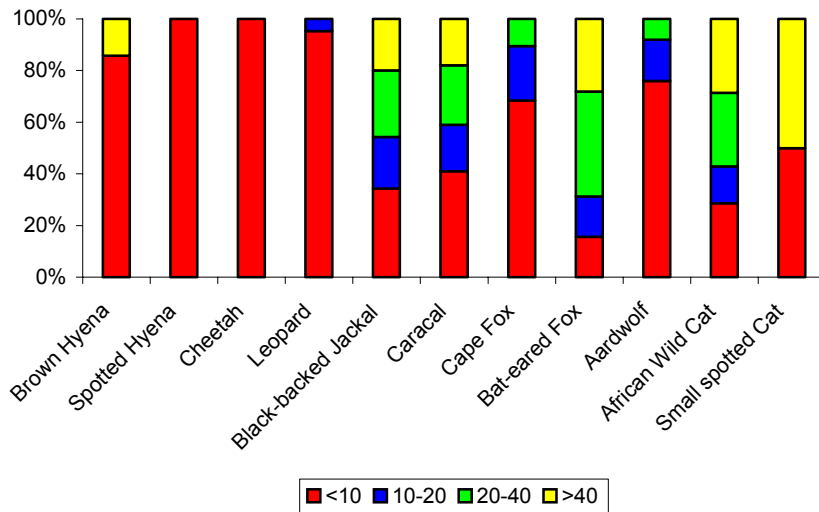
From this part of the questionnaire we try to establish carnivore occurrence and estimated numbers as well as population trends. We also collected information about the habitat type, where certain carnivores predominantly occur.

Figure 5: Carnivore occurrence



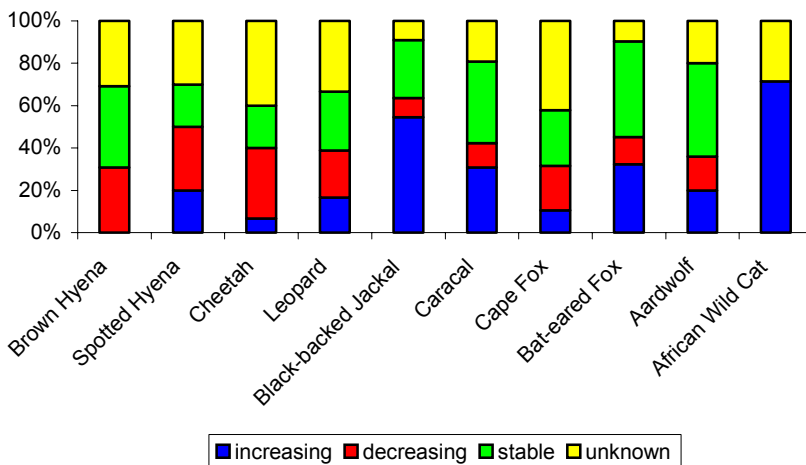
Large carnivores occurred on 30-60% of all farms, whereas small to medium-sized carnivores were found on most farms.

Figure 6: Estimated number of carnivores per farm



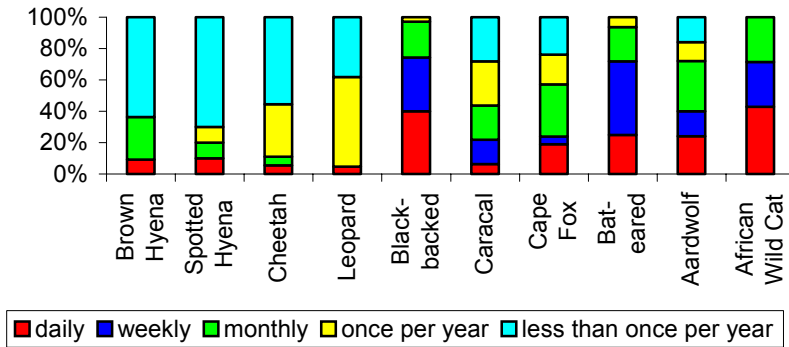
Estimated population sizes of large carnivores were below 10 per species on most farms. The exception is a large number of brown hyenas (estimated 100) on two farms, owned by the same person. We feel that this number is too high, but nevertheless included it in this analysis. Small to medium-sized carnivores occurred mostly in higher numbers.

Figure 7: Trends in carnivore numbers



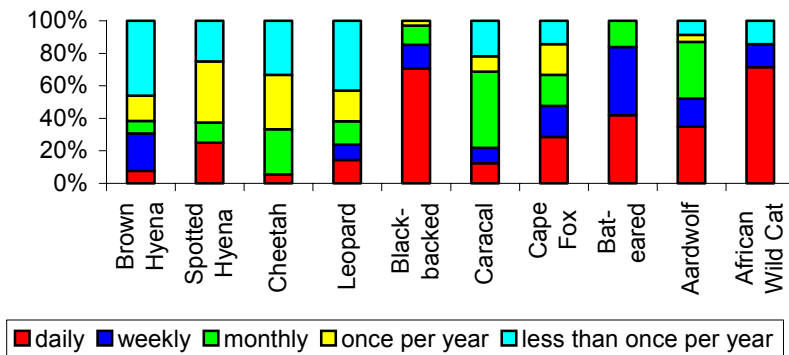
The population size trend for large carnivores was decreasing to stable, whereas the trend for small to medium-sized carnivores was increasing to stable.

**Figure 8: Frequency of carnivore sightings**



Most large carnivores were sighted less than once per year to about once per year. Small to medium-sized carnivores were seen more regularly - between daily and monthly sightings occurred.

**Figure 9: Frequency of carnivore sign sightings**



Carnivore signs were more frequently seen than actual sightings of the animal occurred, especially in the case of large carnivores.

This is only a preliminary account of the information we will obtain through analysing the questionnaire. The final report will be available in April 2005.

## 7. Environmental awareness and education

The Brown Hyena Research Project opened an Environmental Information Centre (EIC) at the Lüderitz Waterfront in February this year. Our aim is to educate the public in environmental awareness and to inform locals and tourists about the wildlife in our area. Schools from all over Namibia visit us to learn about carnivore ecology and behaviour and we also offer outdoor lectures on the Lüderitz Peninsula. The start-up money was provided by the Critical Ecosystem Partnership Fund via the Succulent Karoo Ecosystem Planning (SKEP) programme, an organisation based in the USA, and their contribution helped to run the Centre for the period of one year.

More than 250 visitors signed the guest book since the opening of the EIC. Most of our visitors (90%) were Namibians (89% locals). Other visitors were tourists from other African countries (5%) and from overseas (5%).

We have also started a long-term commitment with the Aus Multi Purpose Center to teach children about carnivores in general and brown hyenas in special. On their visits to Lüderitz, we take the children to an abandoned brown hyena den site and teach them about brown hyena behaviour and ecology in the field.

## 8. Collaborations

### a) University of Central Florida

New insights in the brown hyena feeding ecology can be gained through analysis of hair samples for the determination of the ratio of stable isotopes. With this method, we can draw conclusions about the food spectrum of brown hyenas in our study areas, which will give us further insight into habitat requirements and habitat use with respect to potential prey species and their occurrence. At present we concentrate on the question of the importance of the marine component in the brown hyena diet. The carbon (C) and nitrogen (N) ratios in brown hyena hair should show signatures, which resemble those of the most important food source, as illustrated in Figure 10, which shows the preliminary results from our previous studies.

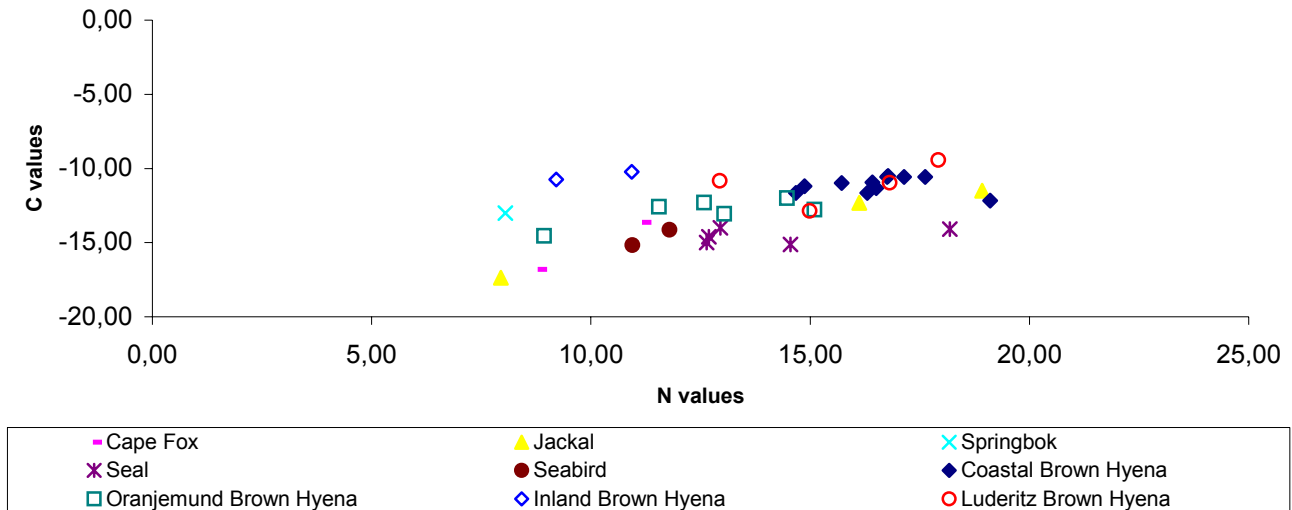


Figure 10: Carbon (C) and nitrogen (N) values of the stable isotope analysis of hair samples.

The coastal brown hyenas, which have access to mainland Cape fur seal breeding colonies show a similar signature to seals. Brown hyenas from the vicinity of Oranjemund show an intermediate position and obviously feed on marine and terrestrial food items in similar quantities. Inland brown hyenas show a similar signature to the springbok sample. The latter two brown hyena hair samples were only collected up to 40 km east of the coast, a distance, which brown hyenas can travel in one night. Nevertheless, these samples did not show a high marine influence in the diet and we can assume, that these animals don't forage along the coast.

### b) Predator Conservation Trust (PCT)

Our carnivore ATLAS data set is shared and analysed together with the Predator Conservation Trust in Windhoek. We have already provided the PCT with sighting data collected since 1995.

### c) Raleigh International

The Brown Hyena Research Project is one of Raleigh International's project partners. The venturers mainly participate in the mapping project but occasionally contribute to the Baker's Bay impact study.

### d) Save the Rhino Trust

We provided two radio collars to the Save the Rhino Trust to be fitted on brown hyenas around the Ugab camp. One collar was fitted on a brown hyena at the beginning of 2004 and Mr. Bernd Brell is radio tracking the animal on a regular basis.

### e) Wild Horse project

In collaboration with the Wild Horse project, based in Aus, we try to fit one to two spotted hyenas with radio collars to obtain a first estimate of their home range size.

## Planned Projects

### **1. Hottentotsbay**

#### Project Title

Brown hyena demography in the Hottentotsbay area.

#### Project Duration

February 2005 – 2008

#### Study Area

Coastal area between Kegelberg and Hottentotsbay

#### Project Description

The area around Hottentotsbay distinguishes itself from all other study sites, as there is no mainland Cape fur seal colony nearby and therefore brown hyena density and home ranges are expected to differ from other coastal study sites. In order to examine these expectations we will use camera traps to determine population size and GPS collars to determine home range size and habitat use.

### **2. Kaukasib & Klinghardt Mountains**

#### Project Title

Brown hyena demography in inland areas of the Sperrgebiet.

#### Project Duration

September 2004 – August 2005 (Kaukasib)

June 2005 – December 2006 (Klinghardt Mountains)

#### Study Area

Kaukasib and Klinghardt Mountains

#### Project Description

This project fills the gap to other research projects carried out by the Brown Hyena Research Project (BHRP) in the coastal areas of the Namib Desert. The aim of this study is to establish the population size of brown hyenas in inland areas of the Sperrgebiet through the use of camera traps and to survey home range/territory size, habitat use and movement/activity patterns through GPS telemetry.

Brown hyena density is expected to be lower, their home ranges are expected to be larger and they are expected to use a wider variety of food items than the coastal brown hyena population.

### **3. Bogenfels (extension of Baker's Bay/Pocket Beaches study)**

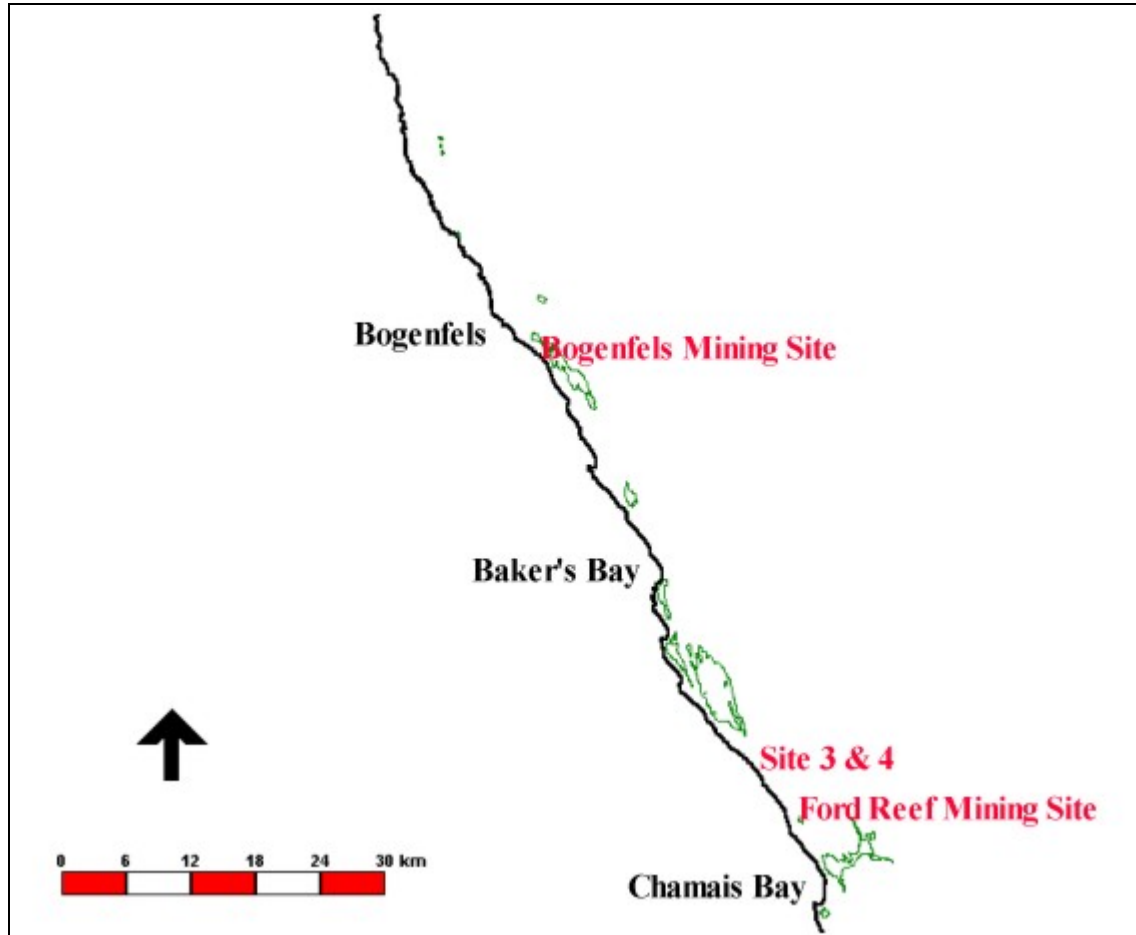
This project aims to investigate the effects of diamond mining activities on the brown hyena population in the southern coastal Namib Desert. The results will substantially increase the knowledge of the behavioural and population ecology of brown hyenas in an ecologically unique ecosystem, the Succulent Karoo Biome, and will be applicable to land use planning and decision-making as new areas of the coastal Namib Desert are developed (mining and tourism industry). The research outputs will ultimately contribute to management strategies for the conservation of the brown hyena and its unique habitat.

#### New project activities:

Mining started at the Ford Reef mining site (Site 2) as planned. One brown hyena was fitted with a GPS collar at Baker's Bay in March 2004 and the collar and data will be retrieved in March 2005. Small-scale mining will continue at Ford Reef and the southern part of Site 3&4 until the middle of 2006, but the major operation will be shifted to Site 11&12 just south of Bogenfels (Map 1). Namdeb's new mining plans are to

start with the construction at the Bogenfels Mining Site by the middle of 2005 and to mine the area until the middle of 2007 with a peak in mining activity in 2006.

Our original proposal's aim was to fit a second GPS collar on a brown hyena in 2006. As Namdeb's plans changed in the meantime, we are planning to fit an additional GPS collar on a brown hyena in the Bogenfels area at the beginning of 2005, as a different brown hyena clan is affected by the newly planned mining activities. Additionally we will place camera traps near a waterhole in the Bogenfels area in collaboration with Namdeb to establish general wildlife movement and occurrence in the affected area and to establish the brown hyena clans' population size.



Map 1: Namdeb's mining sites between Bogenfels and Chamais Bay.

#### 4. Road safety

The high number of brown hyena road kills on the tar road between Lüderitz and Haalenberg (~40 km inland) is alarming. In the past 12 months five brown hyenas that we know of were hit and killed by vehicles on that road. We also had to experience that many road kills disappear before we can collect them, which highlights the possibility that the real number of road kills is far higher. Namdeb offered to sponsor warning and information signs to be displayed next to the road and we will contact the Lüderitz town council for approval early in 2005.

**Appendix I: CARNIVORE QUESTIONNAIRE FOR SOUTHERN NAMIBIA  
(VRAE LYS OOR DIE ROOFDIERE VAN SUIDELIKE NAMIBIË)**

Please tick appropriate boxes or fill in requested information.

(Vul asseblief die inligting in vir die onderstaande vrae en merk die betrokke items in die tabelle. *Belangrik: "Lewende hawe" verwys na alle gedomestiseerde diere (vee, hoenders, konyne, ens.) waarmee op u plaas geboer word (kommersiële of vir self onderhoud).*)

**PART A: GENERAL INFORMATION** (if you want to stay anonymous, please give approximate position of farm area)

**AFDELING A: ALGEMENE INLIGTING** (as u anoniem wil bly, verskaf asseblief die posisie van die area waarin u plaas geleë is)

Your name (Naam): \_\_\_\_\_ Gender (Geslag): male/female (manlik/vroulik) Date (Datum): \_\_\_\_\_

The farm's name (Naam van u plaas): \_\_\_\_\_ Size of farm (Grootte van plaas): \_\_\_\_\_ ha/unknown (onbekend)

Owner/Farm Manager/Other (specify) (Eienaar/ Plaas voorman/Ander

(spesifiseer): \_\_\_\_\_

District (Distrik): \_\_\_\_\_

Postal address (Pos adres): \_\_\_\_\_ Telephone number (Telefoon nommer): \_\_\_\_\_

Fax number (Faks nommer): \_\_\_\_\_

e-mail address (e-pos adres): \_\_\_\_\_

Average number of people living on farm (Gemiddelde getal mense wat op die plaas bly): \_\_\_\_\_

Latitude (Breedtegraad): \_\_\_\_\_ Longitude (Lengthgraad): \_\_\_\_\_

Percentage of habitat types on farm (Persentasie van habitat tipes op die plaas):

Mountains (Berge)	Open plains (Oop vlaktes)	Gravel plains (Gruis vlaktes)	Hills (Heuwels)	Woods (Woude)	Desert (Woestyn)	Riverbeds (Rivierbeddings)	Others (Ander)

Number of waterholes/boreholes on farm (Getal watergate/boorgate op die plaas): \_\_\_\_\_

**PART B (AFDELING B): CARNIVORES – GENERAL (ROOFDIERE – ALGEMEEN)**

1. Which species of carnivore occur on the farm (Watter roofdier spesies word op u plaas aangetref)?

Brown Hyena (Bruin hiëna)	Spotted Hyena (Gevlekte hiëna)	Cheetah (Jagluiperd)	Leopard (Luiperd)	Black-backed Jackal (Rooi jakkals)	Caracal (Rooikat)	Cape Fox (Silwer jakkals)	Bat-eared Fox (Bakoorjakkals)	Aardwolf	Others (Ander) - Specify

2. Estimated number of carnivores on the farm (‘n Skatting van die getal roofdiere op u plaas)?

	<10	10-20	20-40	>40
Brown Hyena (Bruin hiëna)				
Spotted Hyena (Gevlekte hiëna)				
Cheetah (Jagluiperd)				
Leopard (Luiperd)				
Black-backed Jackal (Rooi jakkals)				
Caracal (Rooikat)				
Cape Fox (Silwer jakkals)				
Bat-eared Fox (Bakoorjakkals)				
Aardwolf				
Others (Ander) -specify				

3. Are carnivore numbers increasing, decreasing, stable or unknown (Neem die getal roofdiere toe, af, stabiel, onbekend)?

	Increasing (Neem toe)	Decreasing (Neem af)	Stable (stabiele)	Unknown (onbekend)
Brown Hyena (Bruin hiëna)				
Spotted Hyena (Gevlekte hiëna)				
Cheetah (Jagluiperd)				
Leopard (Luiperd)				
Black-backed Jackal (Rooi jakkals)				
Caracal (Rooikat)				
Cape Fox (Silwer jakkals)				
Bat-eared Fox (Bakoorjakkals)				
Aardwolf				
Others (Ander) -specify				

4. In which habitat type do the carnivore species occur on the farm (In watter habitat tipes kom die roofdiere voor op u plaas)?

	Mountains (Berge)	Open plains (Oop vlaktes)	Gravel plains (Gruis vlaktes)	Hills (Heuwels)	Woods (Woude)	Desert (Woestyn)	Riverbeds (Rivierbeddings)	Others (Ander)
Brown Hyena (Bruin hiëna)								
Spotted Hyena (Gevlekte hiëna)								
Cheetah (Jagluiperd)								
Leopard (Luiperd)								
Black-backed Jackal (Rooi jakkals)								
Caracal (Rooikat)								

	Mountains (Berge)	Open plains (Oop vlaktes)	Gravel plains (Gruis vlaktes)	Hills (Heuwels)	Woods (Woude)	Desert (Woestyn)	Riverbeds (Rivierbeddings)	Others (Ander)
Cape Fox (Silver jakkals)								
Bat-eared Fox (Bakoorjakkals)								
Aardwolf								
Others (Ander) - Specify								

5. How often are carnivores seen (Hoe gereeld word die roofdiere gesien)?

	daily elke dag	weekly weekliks	monthly maandeliks	once per year (een keer per jaar)	less than once per year (minder as een keer per jaar)
Brown Hyena (Bruin hiëna)					
Spotted Hyena (Gevlekte hiëna)					
Cheetah (Jagluiperd)					
Leopard (Luiperd)					
Black-backed Jackal (Rooi jakkals)					
Caracal (Rooikat)					
Cape Fox (Silver jakkals)					
Bat-eared Fox (Bakoorjakkals)					
Aardwolf					
Others (Ander) - specify					

6. How often are their spoor or other signs seen (Hoe gereeld word roofdiere spore of ander tekens van hulle aanwesigheid opgemerk)?

	daily elke dag	weekly weekliks	monthly maandeliks	once per year (een keer per jaar)	less than once per year (minder as een keer per jaar)
Brown Hyena (Bruin hiëna)					
Spotted Hyena (Gevlekte hiëna)					
Cheetah (Jagluiperd)					
Leopard (Luiperd)					
Black-backed Jackal (Rooi jakkals)					
Caracal (Rooikat)					
Cape Fox (Silver jakkals)					
Bat-eared Fox (Bakoorjakkals)					
Aardwolf					
Others (Ander) - specify					

### PART C (AFDELING C): WILDLIFE (NON CARNIVORES) AND LIVESTOCK (WILD (NIE-ROOFDIER) EN LEWENDE HAWE)

1. What wildlife (non carnivores) is in the farming area (Watter wild (nie- roofdiere) kom op u plaas voor)?

Kudu (Koedoe)	Gemsbok	Springbok	Ostrich (Volstruis)	Steenbok	Klipspringer	Common (Gewone) Duiker	Others (Ander)

2. What is their approximate number (Wat is die getalle na beraming)?

Kudu (Koedoe)	Gemsbok	Springbok	Ostrich (Volstruis)	Steenbok	Klipspringer	Common (Gewone) Duiker	Others (Ander)

3. How often are they seen (Hoe gereeld word hulle gesien)?

	daily daagliks	regularly gereeld	often dikwels	seldom skaars	never nooit
Kudu (Koedoe)					
Gemsbok					
Springbok					
Ostrich (Volstruis)					
Steenbok					
Klipspringer					
Duiker					
Others (Ander)					

4. What species are hunted on the farm and how many were killed last year (Watter spesies word gejag op die plaas en hoeveel is verlede jaar suksesvol gejag)?

	Number hunted (Getal gejag)	Method used (Methode)
Kudu (Koedoe)		
Gemsbok		
Springbok		
Ostrich (Volstruis)		
Steenbok		
Klipspringer		
Duiker		
Others (Ander)		

5. What livestock is on the farm (Watter lewende hawe kom voor op die plaas)?

Cattle (Beeste)	Calves (Kalwers)	Sheep (Skape)	Goats (Bokke)	Horses (Perde)	Donkeys (Donkies)	Chicken (Hoenders)	Rabbit (Konyne)	Others (Ander)

6. What is their approximate number (Hoeveel van hierdie lewende hawe is na beraming op u plaas)?

Cattle (Beeste)	Calves (Kalwers)	Sheep (Skape)	Goats (Bokke)	Horses (Perde)	Donkeys (Donkies)	Chicken (Hoenders)	Rabbit (Konyne)	Others (Ander)

7. What livestock loss causes do you experience on your farm (Indien u verlies aan lewende hawe het op u plaas, wat is die oorsake hiervan)?

	Cattle (Beeste)	Calves (Kalwers)	Sheep (Skape)	Goats (Bokke)	Horses (Perde)	Donkeys (Donkies)	Chicken (Hoenders)	Rabbit (Konyne)	Others (Ander)
Stock theft (Diefstal)									
Poison plants (Giftige plante)									
Disease (Siektes)									
Carnivores (Roofdier aanvalle)									
Domestic dogs (Rondloper honed)									
Veld injuries (Beserings in die veld)									
Calving problems (Probleme met goboorte)									

8. What are the estimated stock losses during the last 12 months (Hoeveel diere het u verloor gedurende die afgelope 12 maande)?

	Cattle (Beeste)	Calves (Kalwers)	Sheep (Skape)	Goats (Bokke)	Horses (Perde)	Donkeys (Donkies)	Chicken (Hoenders)	Rabbit (Konyne)	Others (Ander)
Stock theft (Diefstal)									
Poison plants (Giftige plante)									
Disease (Siektes)									
Carnivores (Roofdier aanvalle)									
Domestic dogs (Rondloper honed)									
Veld injuries (Beserings in die veld)									
Calving problems (Probleme met goboorte)									

9. What livestock management techniques are you currently practising? Please distinguish between during day (mark with D) and at night (mark with N) (Watter metodes gebruik u huidiglik om u lewende hawe te bestuur? Onderskei asb tussen dag bestuur (merk met 'n D) en nag bestuur (merk met 'n N)).

	Cattle (Beeste)	Calves (Kalwers)	Sheep (Skape)	Goats (Bokke)	Horses (Perde)	Donkeys (Donkies)	Chicken (Hoenders)	Rabbit (Konyne)	Others (Ander)
Calving season (Kalf/lammer seisoen)									
Kraaling young calves (Jong diere in krale)									
Stocking rate (Aankope van lewende hawe)									
Bringing livestock close to home (Vee bly naby huis)									
Grazing rotation (Roteer weiding)									
Shepherding* (Vee wagters)									
Wire kraals (Draad heining krale)									
Thorn kraals (Doringtak krale)									
Stick kraals (Houtlak/stok krale)									
Guarded by dogs (Beskerming deur honed)									
Free roaming (Diere beweeg vry)									
Others (Ander)									

\* guarded by people

**PART D (AFDELING D): CARNIVORES AND LIVESTOCK (ROOFDIERE EN LEWENDE HAWE)**

1. Which carnivore do you consider a low, medium or high threat to your livestock (Watter roofdiere beskou u as 'n bedreiging (laag, medium of hoog) vir u vee)?

	low laag	medium	high hoog
Brown Hyena (Bruin hiëna)			
Spotted Hyena (Gevlekte hiëna)			
Cheetah (Jagluiperd)			
Leopard (Luiperd)			
Black-backed Jackal (Rooi jakkals)			
Caracal (Rooikat)			
Cape Fox (Silwer jakkals)			
Bat-eared Fox (Bakoorjakkals)			
Aardwolf			
Others (Ander) -specify			

2. Would you like to see the population increase, decrease or remain stable (Sou u verkies dat die populasie roofdiere toeneem, afneem of konstant bly)?

	increase toeneem	decrease afneem	remain stable konstant
Brown Hyena (Bruin hiëna)			
Spotted Hyena (Gevlekte hiëna)			
Cheetah (Jagluiperd)			
Leopard (Luiperd)			
Black-backed Jackal (Rooi jakkals)			
Caracal (Rooikat)			
Cape Fox (Silwer jakkals)			
Bat-eared Fox (Bakoorjakkals)			
Aardwolf			
Others (Ander) -specify			

3. What species are hunted on your farm, which methods are used and how many were killed during the last 12 months (Watter spesies word gejaag op u plaas, watter jag metodes word gebruik en hoeveel is gedurende die afgelope 12 maande suksesvol gejaag)?

	hunted -yes/no gejaag – ja/née	Method Metode	Number killed Getal gedood
Brown Hyena (Bruin hiëna)			
Spotted Hyena (Gevlekte hiëna)			
Cheetah (Jagluiperd)			
Leopard (Luiperd)			
Black-backed Jackal (Rooi jakkals)			
Caracal (Rooikat)			
Cape Fox (Silwer jakkals)			
Bat-eared Fox (Bakoorjakkals)			
Aardwolf			
Others (Ander) -specify			

4. Does carnivore cause problems with domestic stock (Veroorsaak roofdiere probleme met u lewende hawe/vee)?

	yes ja	no nēe
Brown Hyena (Bruin hiëna)		
Spotted Hyena (Gevlekte hiëna)		
Cheetah (Jagluiperd)		
Leopard (Luiperd)		
Black-backed Jackal (Rooi jakkals)		
Caracal (Rooikat)		
Cape Fox (Silwer jakkals)		
Bat-eared Fox (Bakoorjakkals)		
Aardwolf		
Others (Ander) -specify		

5. Which species of domestic animal are killed (Watter van u lewende hawe of enige ander gedomestiseerde plaasdiere word gevang deur roofdiere)?

	Cattle (Beeste)	Calves (Kalwers)	Sheep (Skape)	Goats (Bokke)	Horses (Perde)	Donkeys (Donkies)	Chicken (Hoenders)	Rabbit (Konyne)	Others (Ander)
Brown Hyena (Bruin hiëna)									
Spotted Hyena (Gevlekte hiëna)									
Cheetah (Jagluiperd)									
Leopard (Luiperd)									
Black-backed Jackal (Rooi jakkals)									
Caracal (Rooikat)									
Cape Fox (Silwer jakkals)									
Bat-eared Fox (Bakoorjakkals)									
Aardwolf									
Others (Ander) -specify									

6. How many have been killed during the last 12 months (Hoeveel is deur roofdiere gevang gedurende die afgelope 12 maande)?

	Cattle (Beeste)	Calves (Kalwers)	Sheep (Skape)	Goats (Bokke)	Horses (Perde)	Donkeys (Donkies)	Chicken (Hoenders)	Rabbit (Konyne)	Others (Ander)
Brown Hyena (Bruin hiëna)									
Spotted Hyena (Gevlekte hiëna)									
Cheetah (Jagluiperd)									
Leopard (Luiperd)									
Black-backed Jackal (Rooi jakkals)									
Caracal (Rooikat)									
Cape Fox (Silwer jakkals)									
Bat-eared Fox (Bakoorjakkals)									
Aardwolf									
Others (Ander) -specify									

7. Which species of wildlife (non carnivore) are killed (Watter van u wild spesies (nie-roofdier) word deur roofdiere gevang)?

	Kudu (Koedoe)	Gemsbok	Springbok	Ostrich (Volstruis)	Steenbok	Klipspringer	Common (Gewone) Duiker	Others (Ander)
Brown Hyena (Bruin hiëna)								
Spotted Hyena (Gevlekte hiëna)								
Cheetah (Jagluiperd)								
Leopard (Luiperd)								
Black-backed Jackal (Rooi jakkals)								
Caracal (Rooikat)								
Cape Fox (Silwer jakkals)								
Bat-eared Fox (Bakoorjakkals)								
Aardwolf								
Others (Ander) -specify								

8. How many have been killed during the last 12 months (Hoeveel van u wild (nie-roofdier) is gedurende die afgelope 12 maande gevang)?

	Kudu (Koedoe)	Gemsbok	Springbok	Ostrich (Volstruis)	Steenbok	Klipspringer	Common (Gewone) Duiker	Others (Ander)
Brown Hyena (Bruin hiëna)								
Spotted Hyena (Gevlekte hiëna)								
Cheetah (Jagluiperd)								
Leopard (Luiperd)								
Black-backed Jackal (Rooi jakkals)								
Caracal (Rooikat)								
Cape Fox (Silwer jakkals)								
Bat-eared Fox (Bakoorjakkals)								
Aardwolf								
Others (Ander) -specify								

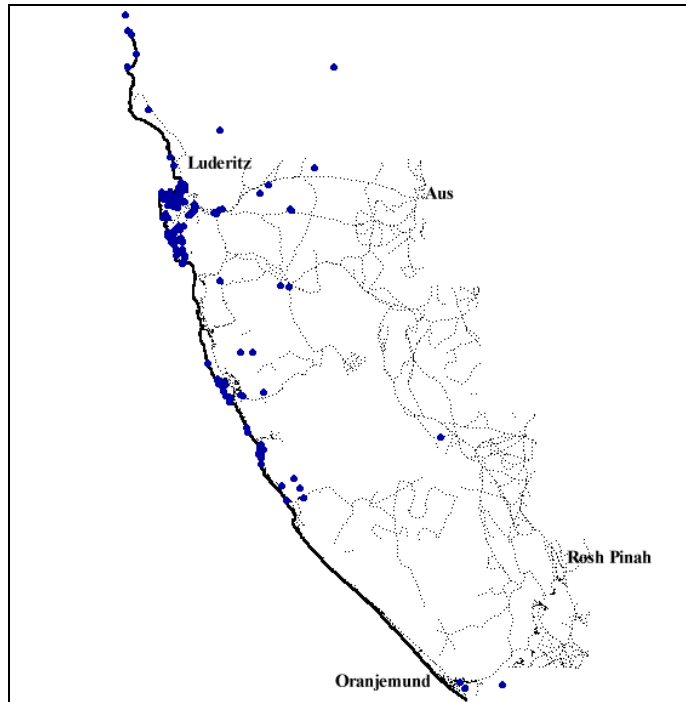
9. What is your attitude towards the carnivore (Wat is u houding teenoor roofdiere)?

	tolerated (verdra)	shot (skiet)	poisoned (gebruik gif)	trapped (vang)	non lethal predator removal* (verwydering sonder dood maak*)	threat to humans (Bedreiging vir mense)	hunted for food (gejag as voedsel bron)	given food (verskaf kos aan)	Others (Ander)
Brown Hyena (Bruin hiëna)									
Spotted Hyena (Gevlekte hiëna)									
Cheetah (Jagluiperd)									



## Appendix II

The Carnivore Monitoring Project was launched in February 2004 with financial support from the Critical Ecosystem Partnership fund. The Brown Hyena Research Project has already been collecting data about brown hyena sightings in southern Namibia since 1995 and that data set is included in this report.



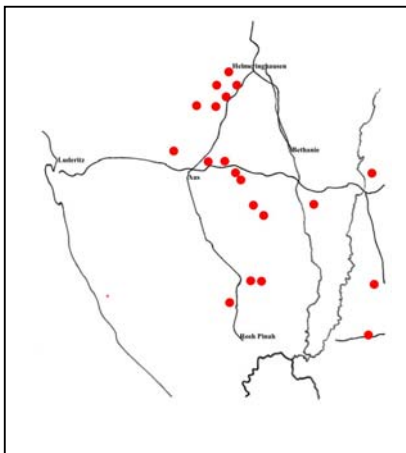
Location of reported brown hyena sightings since 1995

Species	No	male	female	Adult	Cubs
Brown Hyena	54	1	5	54	0
Spotted Hyena	1	/	/	1	0
Leopard	1	/	/	1	0
Cheetah	0	/	/	/	/
Aardwolf	3	/	/	3	0
Black backed Jackal	13	/	/	13	0
Caracal	1	/	/	1	0
Bat-eared Fox	0	/	/	/	/
Cape Fox	1	/	/	1	0
Afr. Wild Cat	2	1	/	2	0

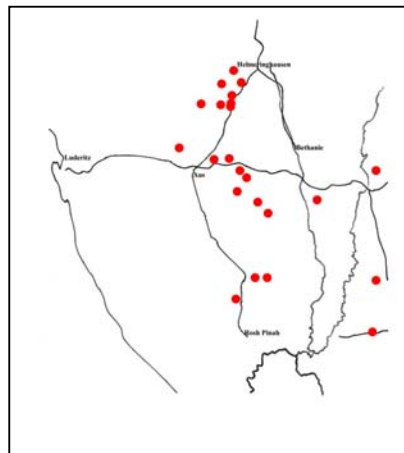
Number of sightings, sex ratio and age structure

### Maps of reported carnivore occurrence in the southern part of the Karas region

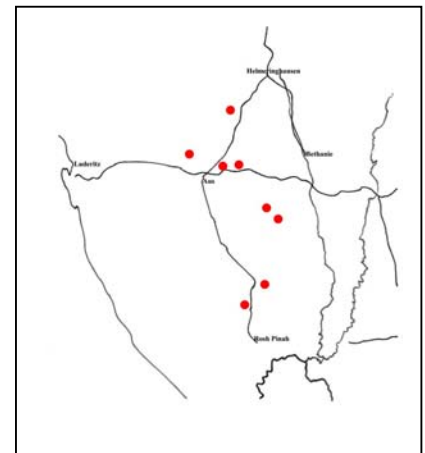
Aardwolf:



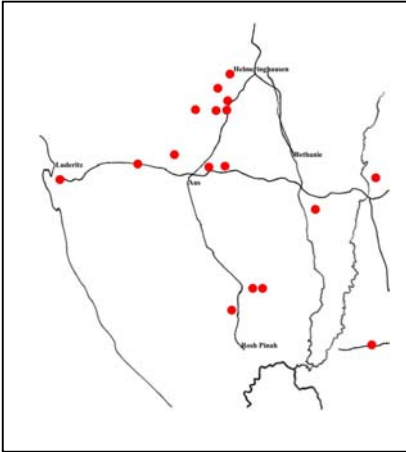
Bat-eared fox:



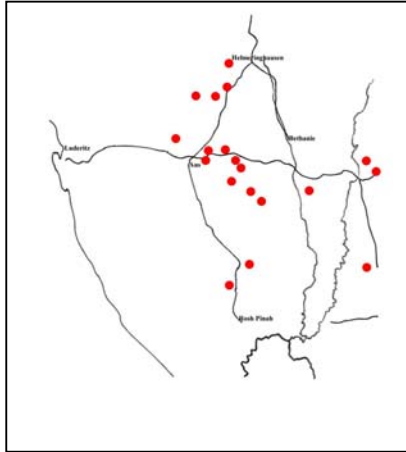
Brown hyena excl. Sperrgebiet:



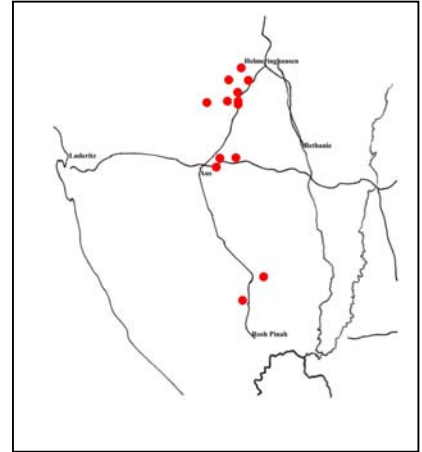
Cape fox:



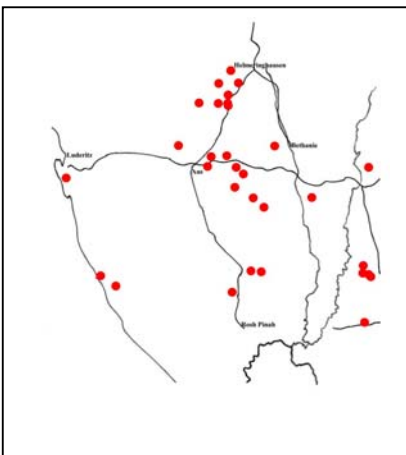
Caracal:



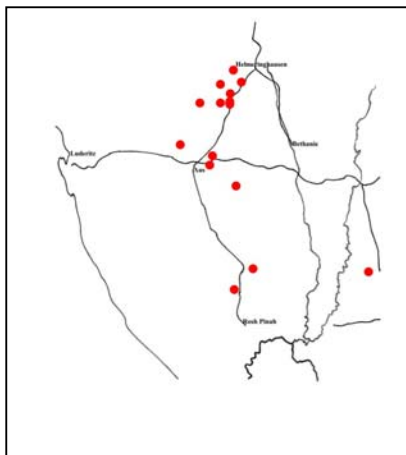
Cheetah:



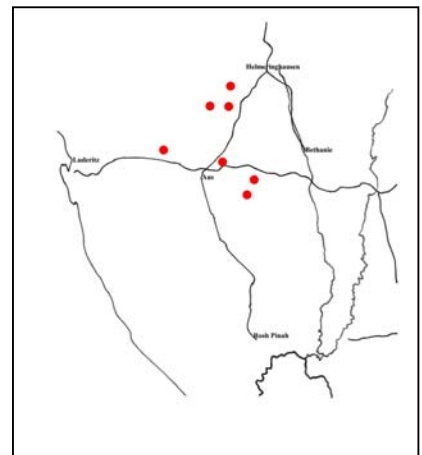
Black-backed jackal:



Leopard:



Spotted hyena:



African wild cat:

