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Expedition report

Population ecology and long-term monitoring of the Namibian cheetah

Expedition dates: **4 October – 27 November 2004**

Report published: **May 2005**

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Abstract

This expedition to Namibia, run by Biosphere Expeditions and Okatumba Wildlife Research, from 04 October to 27 November 2004, was conducted to provide important baseline data on the world's largest free-ranging cheetah population. The expedition team consisted of three groups of 7-12 expedition team members each plus staff, each group working for two weeks, and was divided daily into 3-4 research teams to conduct various research activities concurrently. Each team of 2-3 team members was led by one local scientist or student. Additionally, two groups were joined by local trackers. This expedition design led to a very large amount of data being collected.

The difficulty of observation in the wild, especially in bushy areas, and the timidity of Namibian cheetahs necessitate the use of indirect sampling methods, rather than relying on direct observations. Therefore radio telemetry was used to locate study animals in order to determine space use (home range sizes, territories, habitat preferences, etc.) and activity rhythms.

Eight box traps were set in the study area and capture activities took place on 36 days (288 trap nights). One cheetah, which was already radio-collared, was caught and released. In addition 5 porcupines, 2 guinea fowls, 2 warthogs, 1 pangolin, 1 hare, 1 aardvark and 1 baboon were captured.

Aside from capture-recapture and radio telemetry, counting of cheetah tracks can be used to compute indices that reflect cheetah density. During the expedition spoor tracking took place daily. 19 cheetah tracks were detected around traps, 25 cheetah tracks and 10 leopard tracks were found on transects, and 18 cheetah tracks were detected elsewhere in the field.

Game counts using a line transect method and observations at waterholes were also conducted to obtain information on the cheetah's prey base.

Diese Expedition wurde von Biosphere Expeditions und Okatumba Wildlife Research durchgeführt und fand in der Zeit vom 04. Oktober bis zum 27. November 2004 in zentralen Landesteilen Namibias statt. Sie diente dazu, wichtige Basisdaten über den größten wild lebenden Gepardenbestand der Welt zu liefern. Das Expeditionsteam bestand aus drei Gruppen mit je 7-12 Teilnehmern plus Mitarbeitern, die jeweils für zwei Wochen vor Ort waren, und wurde jeden Tag in 3-4 verschiedene Arbeitsteams unterteilt. Dadurch konnten verschiedene Forschungsaktivitäten parallel nebeneinander durchgeführt und eine große Menge an Daten gesammelt werden. Jedes Arbeitsteam von je 2-3 Teilnehmern wurde von einem Wissenschaftler oder Studenten geleitet. Außerdem wurden zwei Arbeitsteams von einheimischen Fährtenlesern begleitet.

Zum einen ist es schwierig, Beobachtungen in freier Natur, insbesondere in verbuschten Gebieten, durchzuführen, zum anderen sind Geparden auf Farmland in Namibia sehr scheu. Dies macht die Anwendung indirekter Beobachtungsmethoden erforderlich. Mit Hilfe der Radiotelemetrie können Tiere zu bestimmten Zeiten lokalisiert, ihre Raumnutzung (Größe der Streifgebiete, Territorien, Habitatpräferenzen, etc.) bestimmt und ihre Aktivitätsrhythmen ermittelt werden.

Das Studiengebiet war mit acht Lebendfallen ausgerüstet, die an 36 Tagen scharf gestellt wurden (288 Fallennächte). Es wurde ein Gepard gefangen und am selben Tag wieder frei gelassen, da er bereits besendert war. Neben diesem Studientier gingen 5 Stachelschweine, 2 Perlhühner, 2 Warzenschweine, 1 Schuppentier, 1 Hase, 1 Erdferkel und 1 Pavian in die Fallen.

Außer Fang- und Wiederfang sowie Radiotelemetrie kann das Zählen von Spuren genutzt werden, um Indikatoren für die Gepardendichte zu ermitteln. Deshalb wurden täglich Spuren gesucht. Während der Expedition wurden 19 Gepardenspuren um die Fallen herum sowie 25 Gepardenspuren und 10 Leopardenspuren auf Transekten gefunden. 18 Gepardenspuren wurden anderswo im Feld entdeckt.

Wildzählungen nach dem Line-Transekt-Verfahren und Beobachtungen an Wasserstellen wurden durchgeführt, um Informationen über das verfügbare Beutespektrum der Geparden zu erhalten.

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1. Expedition Review

M. Hammer (editor) & David Moore
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. Our projects are not tours, photographic safaris or excursions, but genuine research expeditions placing ordinary people with no research experience alongside scientists who are at the forefront of conservation work. Our expeditions are open to all and there are no special skills (biological or otherwise) required to join. Our expedition team members are people from all walks of life, of all ages, looking for an adventure with a conscience and a sense of purpose. More information about Biosphere Expeditions and its research expeditions can be found at www.biosphere-expeditions.org.

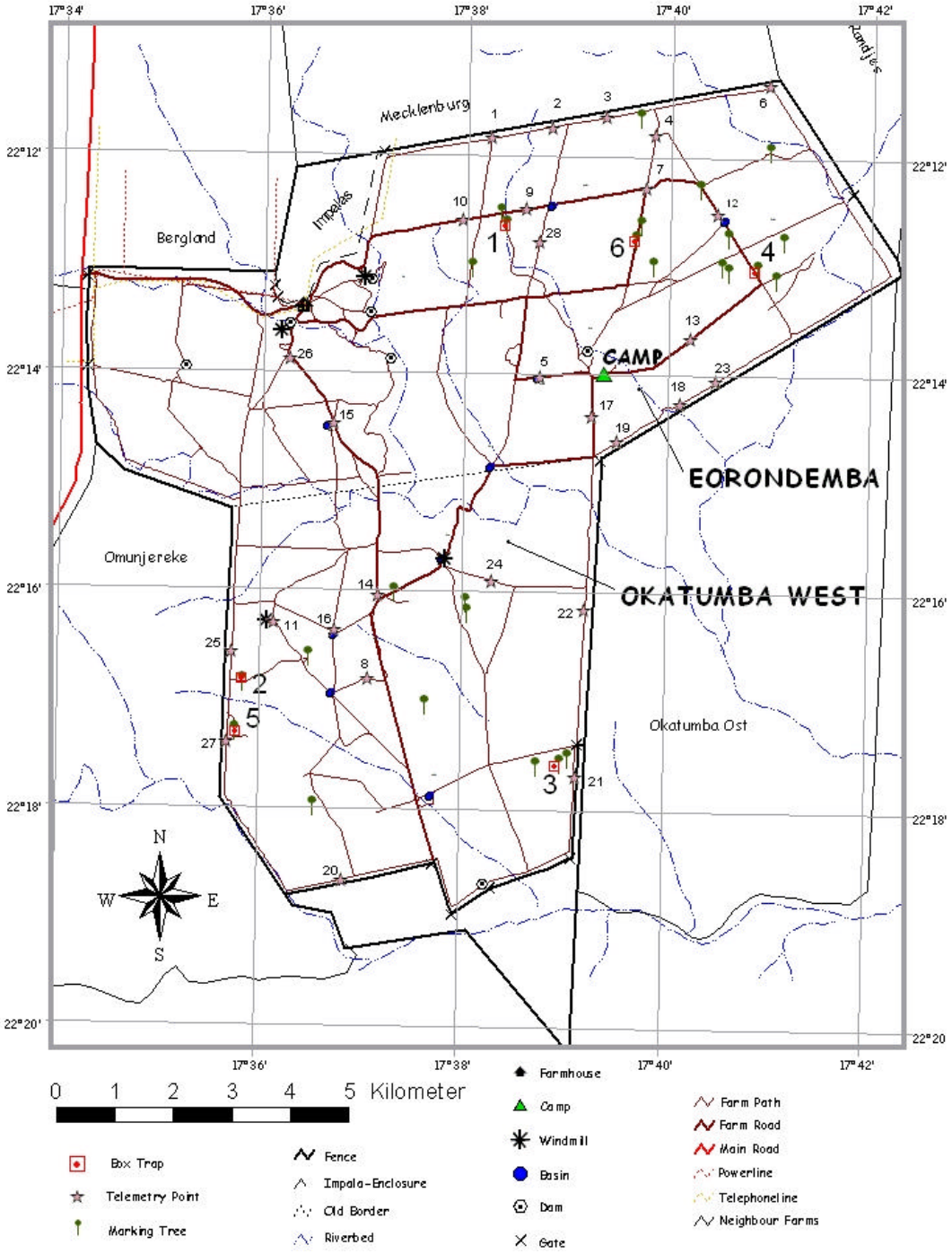
This expedition report deals with an expedition to Namibia that ran from 4 October to 27 November 2004. The expedition was part of a long-term research project on the Namibian cheetah with an emphasis on locating cheetah marking trees, capture activities, radio-tracking, counting cheetah track frequencies and on recording cheetah prey animals.

Namibia harbours the world's largest population of cheetahs and is one of a few African countries that support six species of large carnivores. Lions, spotted hyaenas and wild dogs are mainly restricted to protected areas, but cheetahs, leopards and brown hyaenas still occur on areas with intensive livestock and/or game farming. Today, about 40% of Namibia is used for commercial livestock breeding and it is estimated that this land provides the habitat for 90% of the current Namibian cheetah population. Ensuing conflict with humans has resulted in large numbers of cheetahs being captured and/or shot. Cheetahs do kill livestock, but the extent of losses and financial damage to the farmers has to date not been properly quantified.

Although the Namibian cheetah is a fascinating flagship species, its ecology is poorly understood and this makes conservation of the species difficult. Hunting quotas are set without scientific basis, removal through human conflict is poorly monitored and no reliable population density estimates exist. (The frequently used and well-published figure of 2,000-3,000 individuals has been quoted for the past 15 years, but is very likely inaccurate as it is based on unscientific guesswork). Due to this lack of scientific data, the effectiveness of present conservation efforts are in doubt. New baseline data on population density, demography and ecology are thus urgently required. Data gathered during this expedition will be an essential ingredient to a new and effective conservation strategy for the Namibian cheetah.

1.2. Research Area

With a small human population spread over a large area, Namibia is in better environmental shape than most African countries. Because Namibia lies mostly within an arid zone, much of the flora is typical African dryland vegetation. The research area covers about 40,000 hectares (400 km^2) on conservancy farmland savannah, as it is this farmland, not the national parks, which harbours 90% of the Namibian cheetah population. Conservancies are created by neighbouring farmers who agree to manage their land and livestock in a sustainable way and in return are granted ownership of the game on their land by the state. Within the research area was a core zone of 10,000 ha (outlined below by solid black lines) where counting of tracks, marking trees, prey density and cheetah capture took place, and a perimeter zone for radio-tracking.



Map showing the research area and expedition base ("camp"). See also appendix 1 (page 32) for slightly larger version

1.3. Dates

The expedition ran over a period of six weeks and was divided into four two-week slots, each composed of a team of international research assistants, guides, support personnel, local scientists and an expedition leader. Slot dates were:

4 - 16 October 2004
18 - 30 October 2004
15 - 27 November 2004

Dates were chosen at the beginning of the rainy season when vegetation is still sparse (and animal visibility therefore high).

1.4. Local Conditions & Support

On this expedition, Biosphere Expeditions was assisting Okatumba Wildlife Research (OWR) in its endeavours to provide important baseline data for a better understanding of the Namibian cheetah ecology. Three study sites in three different types of habitat were established, and the expedition camp with all essential supplies and equipment was situated in the western study site.

The climate is semi-arid with summer rainfalls, which peak from February to April. The dominating vegetation type is highland savannah in which various *Grewia* species occur. Large parts of the area also consist of camelthorn savannah on deep sandy soils. The characteristic plant species is camelthorn (*Acacia erioloba*), as well as some other types of acacia. Thickbush areas, which are mainly found on small hills, are dominated by *Acacia mellifera*.

Expedition base

The expedition team was based at a tented camp near Okatumba Wildlife Research, about 80 km East of Windhoek in a remote region of savannah farmland. Transport to and from base camp, and around the study site was by Land Rover Defenders.

The expedition base consisted of several safari tents for the expedition team, each with a shower, toilet and washing facilities. Team members were in pairs inside these tents. All meals were prepared for the team and served either outside or in an additional tent, which was also used as an office. Vegetarians could be accommodated. There was limited electricity at base camp.

Field communications

There was no telephone/fax/internet line at base. Two-way Motorola hand-held radios and vehicle-mounted portable radios were used for communication between teams around the study site. There was also irregular mobile phone coverage at base and around the study site.

Transport & vehicles

Team members made their own way to the Windhoek assembly point. For the expedition, the team had the use of two Land Rover Defender 110 Station Wagon, two Land Rover Defender 130 Double Cab, and various other vehicles. The vehicles were provided by Land Rover as part of its Fragile Earth policy, which is the company's commitment to the environment through the sponsorship of leading environmental organisations such Biosphere Expeditions, the development of sustainable practices and technologies and the company's 'Off-Road Code'.

Medical support & insurance

The expedition leader was trained first aider, and the expedition carried a comprehensive medical kit. Namibia's healthcare system is of an excellent standard and the nearest doctor and hospital were in Windhoek. Emergency medical support was provided by SOS International. All team members were required to carry an adequate travel insurance covering emergency medical evacuation and repatriation. The only medical incidents were a minor case of stomach upset and minor cuts from thorn bushes.

1.5. Local Scientists

Birgit & Harald Förster, originally from Germany, now live and work in Namibia. Birgit Förster trained as a veterinary assistant and studied Biology. Harald Förster is a trained horticulturist and after his apprenticeship studied Forestry, specialising in tropical forestry and wildlife biology. The Försters founded Okatumba Wildlife Research (OWR) together with local farmers and a veterinarian in an effort, amongst other aims, to conduct fundamental and applied research on the farmland habitat, especially regarding complex ecological patterns and human influence on wildlife populations. Their main research interest is in developing strategies for the sustainable use of natural resources and all their projects are conducted in close co-operation with the Namibian Ministry of Environment and Tourism (MET). Various MET scientists provide the Försters with logistical support as well as scientific advice. OWR is also working with various universities and research institutes in Europe.

1.6. Expedition Leader

David Moore was born and educated in England and now lives in the UK and France. He graduated in French and German and studied Japanese while working for two years in Tokyo. His expedition/group leading experience began with Japanese educational trips in Australia and he has since worked in the Caribbean and throughout Europe for companies such as P&O, Explorica and Alyson Adventures. David joined Biosphere Expeditions in 2003 and has led expeditions to the Azores and Namibia.

1.7. Expedition Team

The expedition team was recruited by Biosphere Expeditions and consisted of a mixture of all ages, nationalities and backgrounds. They were:

4 - 16 October 2004

Cathy Howieson (UK), Chris Laverick (UK), Catrina MacKenzie (Canada), Ester & Paul Nederlof (Netherlands), Judy Olsen (Australia), Isabelle Vandrot (France). Also: Matthias Hammer (Biosphere Expeditions).

18 - 30 October 2004

Jude Aldrige (UK), Sophie Bennett (UK), Johann Jobst (Austria), Cordelia Kelly (UK), Gareth Owen (UK), Allister Parkinson (UK), Martin Short (UK), Hubert Tudzisch (Germany).

15 - 27 November 2004

Matthias Basler (Germany), Jerry Baston (UK), Jenna Buckner (USA), Fiona & Chris Clark (UK), Loretta & Robin Glegg (UK), Rose Kaufmann (USA), Renate Liertz (Germany), Zosia Mace (UK), Anne-Marie Soulsby (UK), Brigitte Zerbst (Switzerland).

Staff (throughout the above period):

Anthony Lamacraft (assistant expedition leader), Imke Pape (scientific assistant) Peter Schuette (scientific assistant), Irene van den Heuvel (scientific assistant), Wienke Ellerbeck (au pair and helper).

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1250 per person per two week slot. The contribution covered accommodation and meals, supervision and induction, a permit to access and work in the area, all maps and special non-personal equipment, all transport from and to the team assembly point. It did not cover excess luggage charges, travel insurance, personal expenses like telephone bills, souvenirs etc., as well as visa and other travel expenses to and from the assembly point (e.g. international flights). Details on how this contribution was spent are given below.

Income	£
Expedition contributions	43,971
Expenditure	
Base camp and food includes all meals, base camp equipment, gas, wood	9,758
Transport includes fuel, car maintenance	1,881
Equipment and hardware includes research materials & gear etc purchased in UK & Namibia	266
Biosphere Expeditions staff includes salaries, travel and expenses to Namibia	4,682
Local staff includes salaries, travel and expenses, gifts	3,721
Administration includes bribes, registration fees, sundries etc	895
Scientific services & logistics organisation Payment to Okatumba Wildlife	7,472
Team recruitment Namibia as estimated % of PR costs for Biosphere Expeditions	3,900
Income – Expenditure	11,396
Total percentage spent directly on project	74%

1.9. Acknowledgements

This study was conducted by Biosphere Expeditions which runs wildlife conservation expeditions all over the globe. Without our expedition team members, who are listed above, provided an expedition contribution and gave up their spare time to work as research assistants, none of this research would have been possible. The support team and staff, also mentioned above, were central to making it all work on the ground. Thank you to all of you, and the ones we have not managed to mention by name (you know who you are) for making it all come true. Biosphere Expeditions would also like to thank Land Rover, Motorola, Silva, Field & Trek, Globetrotter Ausrüstung and Gerald Arnhold for their sponsorship and/or in-kind support.

1.10. Further Information & Enquiries

More background information on Biosphere Expeditions in general and on this expedition in particular including pictures, diary excerpts and a copy of this report can be found on the Biosphere Expeditions website www.biosphere-expeditions.org.

Copies of this and other expedition reports can be accessed via at www.biosphere-expeditions.org/reports.

Enquires should be addressed to Biosphere Expeditions at the address given below.

2. Cheetah study

Birgit & Harald Förster
Okatumba Wildlife Research (OWR)

2.1. Introduction

This expedition report deals with an expedition to commercial farmland in central Namibia, which hosts the largest cheetah population in the world. The expedition assisted Okatumba Wildlife Research (OWR) in their endeavours to increase knowledge about the Namibian cheetah and to contribute to a successful co-existence of this endangered species with Namibian people.

2.1.1. Aims and objectives

A large number of studies on free-ranging cheetahs have been published (for an overview see Caro 1994), but most of them were conducted in protected areas, mainly in East African countries. By contrast, only a handful of articles on Namibian cheetahs are published in the literature (Bartmann 1981, Gaerdes 1974, Joubert, 1984, Joubert & Mostert 1975, Kraus & Marker-Kraus 1991, Marker et al. 1996, Mc Vittie 1979, Morsbach 1987). The current project on cheetahs living on farmland in Namibia aims to provide important baseline data on population density, demography, behavioural ecology, genetics and diseases.

The habitat "protected areas" differs from the habitat "commercial farmland" in various aspects (see table 2.1.1.a) and as a result it would seem obvious that Namibian cheetah ecology must differ accordingly. For example, in comparison with East African cheetahs, cheetahs on Namibian farmland exhibit unusually large group sizes (Gaerdes 1974, Joubert 1984, McVittie 1979), as well as increased prey and litter sizes (McVittie 1979, Morsbach 1987). Durant (1998), Joubert and Mostert (1975) and McVittie (1979) have argued that lack of inter-specific competition might be one of the main factors in the success of the cheetah on farmland.

Table 2.1.1.a Differences between protected areas and commercial farmland.

Protected areas	Commercial farmland
- no inhabitants	- presence of people (farmers)
- no livestock	- presence of livestock
- no hunting pressure	- persecution by man
- high inter-specific competition: lion, spotted hyena, leopard, wild dog	- low inter-specific competition: Leopard, caracal, brown hyena
- migratory prey base	- permanent availability of prey
- low cheetah density	- high cheetah density

2.1.2. Namibia and commercial farmland

Today about 40% of the total area in Namibia is used for commercial livestock farming, 40% are communal areas and 20% are national parks and restricted areas (Berry 1990). It is estimated that commercial farmland provides the habitat for 95% of Namibia's cheetah population (Morsbach 1987) and about 80% of the commercially useable larger game species (Brown 1992). Thus Namibian farmland has a crucial role to play in the sustainable management and conservation of the country's wildlife.

The average farm size (commercial unit) in Namibia depends on the average annual rainfall and is about 5,000 ha in the North up to 30,000 ha in the South (Brown 1992). For reasons of efficient livestock management, farmers divide one farm into smaller units, so-called camps. In central parts of Namibia, where the study sites are situated, one camp is about 200 to 400 ha (own results, unpublished), and four to six camps are supplied by one watering place, usually of water pumped from the ground through wind power. One herd of livestock is rotated from camp to camp, dependent on season and quality of grass.

Commercial farmland in Namibia is fenced in, either with stock-proof fences on cattle farms, or with game-proof fences on game farms. Many farmers substitute their decreasing revenues from livestock breeding by consumptive and non-consumptive use of wildlife (Barnes & de Jager 1996). These farmers have a mixture of both types of fencing on their properties. Stock-proof fences are 1.40 m in height and consist of five wires that are stretched between wooden poles. These fences are no barrier for local wildlife and only serve to confine cattle. Game-proof fences are either 1.40 m in height and consist of eight to eleven wires, or 2.20 m in height and consist of 18 to more than 20 wires. The first type is game-proof for "crawling" game like hartebeest or oryx (who crawl under fences), but it can be crossed by "jumping" game like kudu or eland. The second fence type prevents movement of jumping species too. However, warthogs dig holes under all types of fences. Warthog holes are also used by some other species like steenbok, duiker and several carnivores, including the cheetah (personal observation).

2.1.3. Carnivores and population density

Namibia is one of the few African countries, which hosts six species of large carnivores. While lions, spotted hyenas and wild dogs are mainly restricted to protected areas, cheetahs, leopards and brown hyenas still occur on areas with intensive livestock and/or game farming (Berry et al. 1997). Kraus & Marker-Kraus (1991) and Morsbach (1987) have estimated that Namibia hosts the largest population of cheetahs in the world, but to date no reliable population density estimates exist and Namibian cheetah ecology is poorly understood. This lack of scientific data makes management and conservation of the species difficult. The frequently used and well published figure of 2,000 to 3,000 cheetahs for Namibia (Marker et al. 1996, Morsbach 1987) has been quoted for the past 15 years, but is probably inaccurate. More recent data from the *Large Carnivore Atlas Programme* indicate that cheetah numbers might be double or even more than this (Stander 2001).

Direct assessments of population density depend on recognition of individuals and groups, and as such they are very expensive and time-consuming (Stander 1998). Indirect sampling methods (Becker et al. 1998, Martin & de Meulenaer 1988, Mills et al. 2001, Panwar 1979, Smallwood & Fitzhugh 1995) are cost-effective, objective and repeatable, but are questioned by some (Norton 1990). Stander (1998) criticises a general lack of understanding the results of indirect sampling, because only a few studies have combined both, direct and indirect measurements. In his study on lions, leopards and wild dogs he found a strong linear correlation between spoor density and true population density. The current cheetah project aims to provide reliable data on cheetah density in three different habitats.

2.1.4. Predation and conflict with farmers

Conflict between farmers and predators has resulted in large numbers of cheetahs being captured and sold, or shot (Marker et al. 1996, Morsbach 1987). Because of this, national and international conservationists tend to see farmers as a serious threat to the Namibian cheetah population (Marker 2000, Nowell et al. 1997), but the farmers' impact on the population will remain speculative until it is rigorously investigated.

Cheetahs do kill livestock, but the extent of losses and financial damage to farmers has to date not been quantified. One aim of the study is to provide reliable information on the cheetah's diet and to quantify stock losses.

2.1.5. The phenomenon of marking trees

Some authors (Hanström 1949, Joubert 1984, McVittie 1979), as well as many Namibian farmers (personal communication) report on so-called play trees that are frequently used by cheetahs. Play trees appear to be a poorly understood, but very important means of communication, especially through scent-marking (Hanström 1949, McVittie 1979). Because of their importance as marking, rather than playing sites, the current study renamed 'play trees' into 'marking trees'.

Capture data indicate that marking trees are used more frequently by males than by females (McVittie 1979). Usually two thirds of cheetahs caught at marking trees are males. Females appear to visit marking trees in each reproductive status. In the current study they have already been caught in oestrus - either alone or with a male, whilst being pregnant or whilst being accompanied by juveniles of different ages.

2.2. Methodology

2.2.1. Study area

OWR established three study sites that differ in landscape types, geology and soils, annual rainfalls, composition of plant species, population densities of various game species as well as the presence of other carnivores (see table 2.2.1.a). Hunting pressure on prey base is similar in all study sites, and persecution of predators by humans is relatively low.

Table 2.2.1.a Study sites and habitat differences.

	Hochberg	**SEEIS** *	**Omitara**
Climate	semi-arid	semi-arid	semi-arid
Annual rainfalls	400 - 450 mm	300 - 350 mm	350 - 400 mm
Landscape	very flat	hills and mountains	flat with hills
Geology and soils	sandstone, limestone	granite, quartzite, slate	sand, schist, quartzite
Vegetation	thornbush savannah (dense vegetation)	highland savannah (open habitat)	camelthorn savannah (open - dense)
Prey base	high density	medium density	medium density
Dominant species	hartebeest, kudu, springbok	oryx, springbok, hartebeest	kudu, hartebeest, oryx
Additional species	oryx, warthog, steenbok, duiker, hares, birds	warthog, kudu, zebra, hares, birds	warthog, steenbok, duiker, springbok, hares, birds
Competitors	low leopard density, few brown hyenas	high leopard density, low hyena density	medium leopard density, few brown hyenas

* In 2004 Biosphere Expeditions assisted OWR at the Seeis study site (see page 4).

Each study site has a core area of about 100 km² where most research activities like capture, mark and release, sample collection, telemetry, spoor tracking, investigation of marking trees and counting prey animals take place. The surrounding area where interviews with farmers, aerial radio tracking, post mortems etc. are conducted is much larger.

2.2.2. Sampling Methods

Because they are heavily persecuted by humans, cheetahs on Namibian farmland live very secretive lives (Gaerdes 1974, McVittie 1979, personal observations). The difficulty of observation in the wild, especially bushy areas, and the wariness of Namibian cheetahs require employment of indirect sampling methods, rather than depending on direct observations.

Study animals are live-trapped using capture cages with trap release doors at each end and a trigger plate in the middle. The cheetahs are radio-collared (adults only), marked with ear tags and transponders (all animals), investigated, sampled and released at or near the place of capture. Radio collars are fitted with activity sensors, and radio

telemetry is used to locate study animals at will, to determine their space use (home range sizes, territories, dispersal of young adults) and activity rhythms.

Reliable data on population density can then be gleaned through a combination of mark-recapture (Caughley 1977, Cormack 1968, Otis 1978), radio telemetry (MacDonald & Amlaner 1980, Sargeant 1980) and counting spoor frequencies (Stander 1998). All these techniques were employed by the expedition.

Information on prey species was obtained by game counts using the line transect method (Buckland et al. 1993, Burnham et al., 1980). Continuous data collection by the expedition team led to large amounts of information on the cheetah's prey base, which will help to answer questions on prey availability and prey utilisation. In addition to this, the third expedition group conducted observations at water places.

The first two expedition groups consisted of 8 team members and were divided into three research activity teams, the third group consisted of 12 team members and was divided into four research groups as below. Each team consisted of 2-3 team members and one local scientist or member of staff. Each team had the use of a Land Rover Defender 110 Station Wagon, or a Land Rover Defender 130 Double Cab (a pick-up model). Team members rotated through the various activities daily.

Table 2.2.2.a Research activities and vehicles.

Team 1	Team 2	Team 3	Team 4
Checking box traps	Spoor tracking along farm boundaries (vehicle)	Radio telemetry	Spoor tracking on transect lines (walking)
Data entry	Follow-up	Game count	Waterhole observation
Land Rover Defender 110 Station Wagon	Land Rover Defender 130 Double Cab	Land Rover Defender 130 Double Cab	Land Rover Defender 110 Station Wagon

Every morning the **box trap team** drove a predetermined route to check box traps and to search for cheetah tracks around the traps. Box traps were either found open, or closed without animal, or closed with an animal inside. Captured animals others than cheetahs were released by the box trap team immediately. One cheetah that was already radio-collared was released later with all expedition team members present. In the afternoon the box trap team **entered all data** collected by the expedition from the previous afternoon and from the morning into a laptop at camp. Data were entered into a customized Excel database. Later data was exported from that database to other programs for further processing.

The **spoor tracking team** (vehicle) was joined by a local tracker (Kxoe Bushman). During the morning hours the vehicle was driven at low speed (<20 km/h) along the eastern parts of the farm boundary. The tracker and one expedition team member placed themselves on the bonnet of the Land Rover to detect spoors more easily. Expedition team members took turns in sitting in front. Usually, animal tracks either run

along the path or cross the path before/after passing under a fence. If a cheetah or leopard track was found, the GPS position was recorded using a Silva Multi-Navigator. Other spoor parameters such as species, number of animals, sex, age class, description of spoor, etc. were also collected. In some cases tracks were followed, either backwards or forwards, on foot. In the afternoon this team worked on **follow-ups**. Signals of study animals, which were located by the telemetry group during the morning, were picked up again, and the animals were followed either by vehicle or on foot.

During the morning hours the **telemetry team** drove along a predetermined route of about 30 km, covering central parts of the study area. To locate collared animals, the team would stop at vantage points and attempt to detect signals emanating from the surrounding area with the radio telemetry antenna. If a signal was detected, the GPS position was recorded using a Silva Multi-Navigator, as well as signal bearings using a Silva compass. These records had to be taken in three different locations (the more the better) to get reliable information on cheetah position and movements. In the afternoon this team conducted **game counts** by using the road strip method. With this method the predetermined counting route should be as random as possible, covering all types of habitat of the study site without going along farm boundaries. For data analysis it is important to cover various habitats and to record total km. Per 5,000 ha, 20 kilometres should be driven. The game count Land Rover was manned by one driver in the cab, and three observers and a tracker on the pick-up platform on the back. The driver operated the Land Rover at very low speed (walking pace to about 20 km/h) and observers on the back counted all animals they detected on both sides of the road. Observers also had to ensure that every single animal occurring on the transect line (angle = 0) was seen. When animals were detected, the observers signalled the driver who stopped the vehicle immediately. Observers then identified and counted all animals detected and recorded their distance to the Land Rover, their angle from the midline of the Land Rover, number of animals and, if possible, their sex and group composition. Every day the same route was covered.

The **transect team** was joined by a local tracker and followed the same protocol as the spoor tracking team. Instead of using a vehicle to search for spoors, the transect team walked along a predetermined transect line of about 5-8 km. If a cheetah or leopard track was found, the GPS position was recorded using a Silva Multi-Navigator. Other spoor parameters such as species, number of animals, sex, age class, description of spoor, etc. were also collected. In the afternoon this team **observed animal movements at water places** to obtain additional information on the cheetah's prey species. Two different water places were covered by two observers each. For successful data sampling it was important that observers placed themselves against the wind, wore clothes that blended in with their natural surroundings, remained totally quiet and moved as little as possible.

2.3. Results

As part of this cheetah project 62 cheetahs and four leopards were caught between July 2002 and September 2004 (17 single male cheetahs, 18 male cheetahs in coalitions of 2-3 animals, 9 adult females, 7 male subadults, 6 female subadults, 2 male cubs and 3 female cubs). In addition 10 cubs (sex unknown) were detected during aerial radio tracking surveys. With a total of about 8320 trap nights an average of 134 trap nights were required per captured cheetah. 41 of the captured cheetahs were fitted with radio-collars, 18 of these study animals are still alive, and six range within the Seeis study site.

Capture activities in the Seeis study site started in April 2003. Since then, ten cheetahs and two leopards (1 male and 1 female with two cubs) have been captured, sampled, marked and released. Among the captured cheetahs were two coalitions of two males (probably brothers) each, one single male, one female with two juveniles, one female that was in oestrus, and one female that was in the early stages of pregnancy. Aerial radio tracking later showed that the former gave birth to four cubs and the latter to three cubs. The single male cheetah was shot by a farmer. One male of a coalition was found dead in the field (for reasons unkown), but his brother is still alive and roaming within the core area of the Seeis study site.

2.3.1. Capture activities

During the expedition eight box traps were set throughout the study site. Each trap, which is set active, is counted as one trap night, so one night with eight active box traps is counted as eight trap nights. During the expedition, box traps were active on 36 days with a total of 288 trap nights.

Over a period of six weeks of expedition work only one cheetah was caught, and this one was already collared. It was one of the two brothers, with the other brother nearby the trap. As these two study animals had already been caught twice before, they did not need to be immobilised and sampled again, so the cheetah was released with all expedition team members present. In addition to the single cheetah, 5 porcupines, 2 guinea fowls, 2 warthogs, 1 pangolin, 1 hare, 1 aardvark and 1 baboon were captured.

Table 2.3.1.a Trapping effort and success during the expedition

	Group 1	**Group 2**	**Group 3**	**Total**
Number of trap nights	96	96	96	**288**
- open traps	83	77	77	**237**
- closed but empty traps	11	16	10	**37**
- captures	2	3	9	**14**

Sadly the single hare was seriously injured by the trap door and had to be killed.

2.3.2. Spoor tracking

On 27 days spoor tracking was conducted in an effort to throw some light on cheetah density within the Seeis study site.

During the expedition 19 cheetah tracks were detected around traps. In addition to this 25 cheetah tracks and 10 leopard tracks were found along farm boundaries and on transects. 18 cheetah tracks were detected by chance elsewhere in the filed. On the basis of these tracks and in connection with radio telemetry data, at least nine individual cheetahs and four individual leopards were identified.

Table 2.3.2.a Number of individuals identified on the basis of tracks found during the expedition.

	Males	Females	Juveniles	Sex unknown	Total
Cheetah	4	2	2	1	**9**
Leopard	2	2	0	0	**4**

These data correspond with expedition data sampled in 2003, and they indicate that cheetah density on the farms Eorondemba and Okatumba West (the core area within the Seeis study site) is much lower than within the Omitara study site, where more than 20 individual cheetahs were identified during an expedition in 2002. The reasons for this difference in density are as yet unknown.

2.3.3. Radio telemetry

Standard telemetry, which means location of study animals by use of triangulation, was conducted on 27 days, and radio-collared cheetahs and leopards were located on 16 days. In total team members drove more than 1,000 km and spent about 115 hours on this research activity.

Table 2.3.3.a Radio telemetry: effort and success during the expedition

	Group 1	Group 2	Group 3	Total
No. of tracking days	9	9	9	**27**
No. of days with signals	9	2	5	**16**

Most frequently (on seven days) signals from the single male, the brother of whom was found dead in the field, as well as from the female with four cubs (on six days) were received. The pair of two brothers and the female leopard could be located on four days, the female with two youngsters was found on three days and signals of the male leopard were received on one day only. The female with three cubs was known to range about 40 km east of the Seeis study site since she gave birth to her litter. Thus, it was not expected to receive signals from this animal.

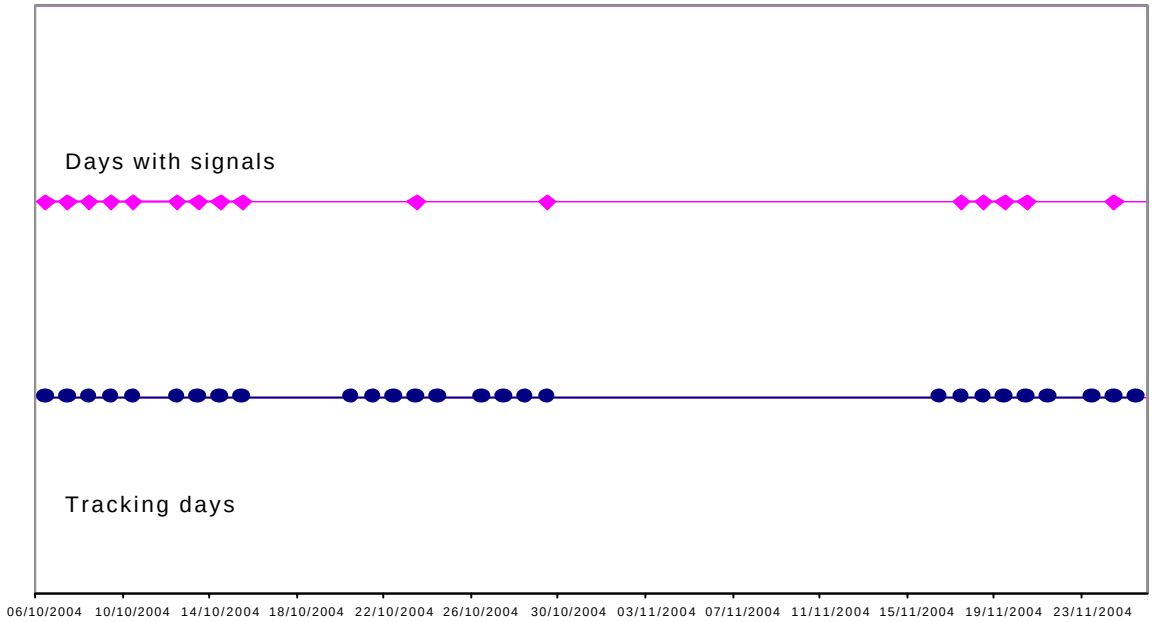


Figure 2.3.3.b Radio telemetry: total tracking days (diamonds) and days with signals (squares).

Table 2.3.3.c Radio telemetry: No. of days with signals of certain study animals during the expedition

	Group 1	**Group 2**	**Group 3**	Total
single male cheetah	4	-	3	7
two brothers	2	1	1	4
female cheetah with 2 cubs	3	-	-	3
female cheetah with 3 cubs	-	-	-	-
female cheetah with 4 cubs	5	-	1	6
female leopard with 2 cubs	4	-	-	4
male leopard	-	1	-	1

The first expedition group detected signals of more than one study animal every day, while group two was less successful, and group three was somewhere in between.

In addition to standard telemetry, so-called “ground-follows” were conducted on 12 days. The aim of this research activity is to follow a certain study animal by vehicle and/or by foot, to spot the animal and to observe as much as possible of its current situation (e.g. type of habitat, behaviour, other cheetahs or prey animals around, etc.). Data collection often takes researcher to within several hundred metres of the animal without actually seeing it.

Several cheetah sightings took place during the expedition (see 2.3.5), but in most cases the animals were seen for some seconds only.

2.3.4. Game counts

On 22 days game counts using the line transect method were conducted to assess availability of the cheetah's prey base. The transect route covered different vegetation types over a distance of approx. 20 km. Usually it took the teams up to three hours to conduct the survey. In total 392 km were driven and almost 60 hours were spent on this research activity, and 4566 animals were detected. Expedition group three had the highest average of 273 animals detected per counting day.

Table 2.3.4.a Effort in game counting during the expedition.

	Group 1	Group 2	Group 3	TOTAL
Number of counting days	8	7	7	**22**
Number of hours spent on this activity	18	19,5	20	**57,5**
Total km driven	121	129	142	**392**
Total number of animals sighted	1108	1544	1914	**4566**
Average number of animals per day	139	221	273	**208**

The most numerous species were hartebeest (1720 animals) and oryx (1077 animals), followed by springbok (741 animals), kudu (328 animals) and warthog (274 animals).

Table 2.3.4.b Animals per species sighted by the three different expedition groups.

	Kudu	Oryx	Harteb.	Warthog	Springb	Steenb.	Waterb	Eland	Zebra	Giraffe	Baboon	Cheetah	Jackal	TOTAL
Group 1	84	211	392	84	199	22	18	23	49	13	0	8	5	**1108**
Group 2	102	414	492	121	283	39	54	0	28	6	5	0	0	**1544**
Group 3	142	452	836	69	259	20	61	19	39	8	8	0	1	**1914**
TOTAL	**328**	**1077**	**1720**	**274**	**741**	**81**	**133**	**42**	**116**	**27**	**13**	**8**	**6**	**4566**

Game densities (number of animals per unit area) were estimated using the Distance Sampling Programme (Buckland et al. 1993). One of the major advantages of distance sampling is that it its model allows for some, or even many, of the objects to go undetected, which is reflected in reality. Central to the concept of this method is the detection function. Generally, detectability decreases with increasing distance from the transect line.

Distance sampling theory considers certain variables like average group size, spatial distribution, etc. of the animals. These factors are different between species. This is the reason why for example springbok density is higher than the densities of hartebeest and oryx, although fewer springbok were detected during the expedition.

Table 2.3.4.c Estimated game densities (no. of animals per 10 km²) for the dominant prey species.

	Group 1	Group 2	Group 3	**Entire expedition**
Kudu	44	34	39	**39**
Oryx	44	112	49	**65**
Hartebeest	153	4	66	**74**
Warthog	47	58	25	**43**
Springbok	74	132	39	**82**

Game densities were estimated for each expedition group, as well as for the entire expedition. There were large fluctuations from group to group in all species, except for kudu. It is thought that these fluctuations are mainly due to rainfalls and migratory patterns within the study site.

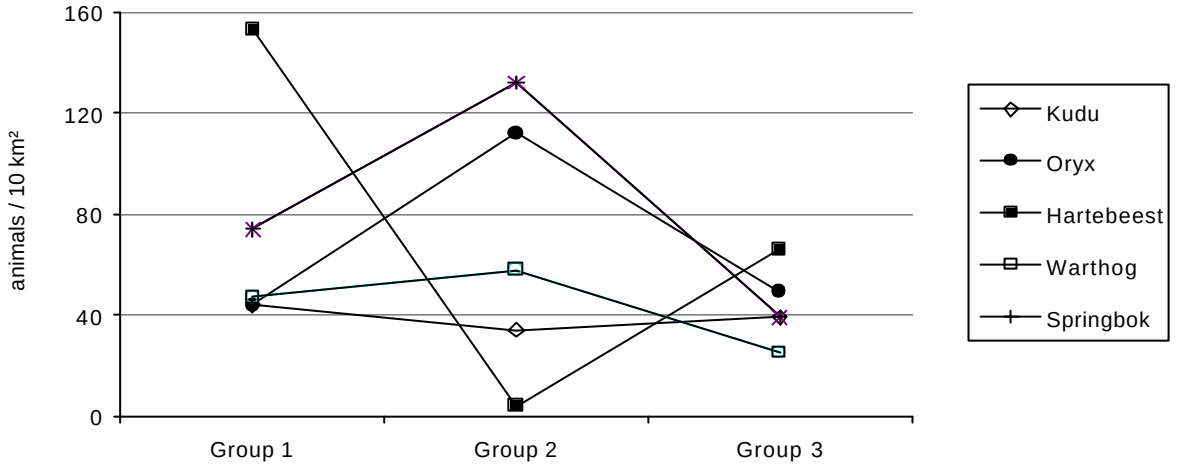


Figure 2.3.4.d. Estimated population densities (number of animals per 10 km²) of kudu, hartebeest, warthog and springbok per expedition group.

On the basis of population densities (number of animals per 10 km²) total numbers of the dominant species were calculated for the farms Eorondemba and Okatumba West, which cover an area of 98 km². The resulting numbers are 380 kudu, 640 oryx, 725 hartebeest, 420 warthog and 800 springbok on the two farms.

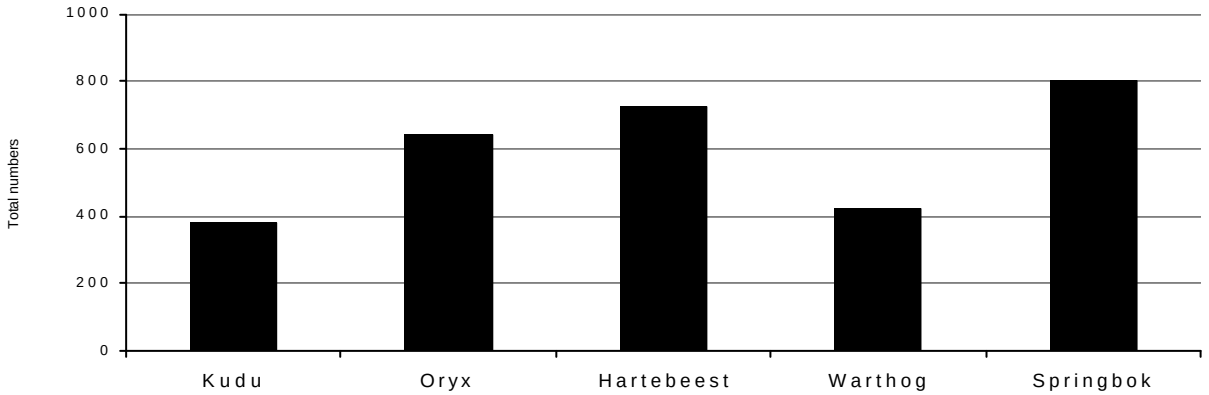


Figure 2.3.4.e. Total numbers of kudu, oryx, hartebeest, warthog and springbok on 98 km² (farms Eorondemba and Okatumba West). Numbers are calculated on the basis of estimated population densities during the expedition (22 counting days in six weeks).

Compared with the results that were obtained from the 2003 expedition, game count data reflect quite well what happened last year, i.e. natural incidents, as well as game management activities.

Table 2.3.4.f Changes in total numbers of dominant prey species.

No. of animals	2003	2004	Changes
Kudu	300	380	+ 27%
Oryx	1200	640	- 47%
Hartebeest	550	725	+ 32%
Warthog	430	420	- 2,4%
Springbok	620	800	+ 29%

Although kudu, hartebeest and springbok were used as trophy animals, as well as shot for food, these populations show an average growth rate of 29%.

These figures indicate that factors like diseases or predation have no significant effect on the hartebeest, kudu or springbok population within the study site.

By contrast, the warthog population shows a small decline of 2.4%. As this species was not utilised by the resident farmer, except for a few individuals shot as trophy animals, it appears that warthogs are much more vulnerable to natural influences like predation and diseases. In addition to this, warthogs suffer from poaching activities and they often die in snares.

The oryx population declined from 1200 animals in 2003 to 640 animals in 2004, which is mainly due to capture activities that took place in August 2004. Additionally, this species was used for trophy hunting, own use and sale of meat. Reduction of oryx numbers has been a management aim of the farmer and this is reflected well in the numbers above.

2.3.5. Cheetah sightings

During the expedition six cheetah encounters took place. On 6 October the box trap team caught one of the two brothers in trap no. 3. Tracks of the other brother were found on the farm path and around the tree. The telemetry team was called on the radio to come to the trap and to check for signals, and they located the brother near the trap. The two cheetahs were caught the first time on 20 July 2004, and they were recaptured on 20 September 2004. In both cases they were thoroughly examined and both cheetahs were found to be in an excellent condition. Thus, there was no need to immobilise and sample them again. All expedition team members then had the opportunity to observe the cheetah being released from the trap and running to freedom.

On 12 October the game counting group was fortunate to detect a group of five cheetahs that were thought to be a radio-collared female with four cubs. The animals were detected in the morning near the border basin - lying under a bush at a distance of about 100 metres. They soon ran away as they became aware of the vehicle. On the same day, half an hour later, the game counting group came upon another group of three cheetahs that were about 80 metres from the vehicle. These cheetahs did not react to the presence of people, and it appeared to the team members that the cheetahs were busy hassling a group of kudu.

Three cheetah sightings took place during ground-follow activities. On 9 October the telemetry team located the single male, as well as the female with four cubs. The male sighting occurred on a neighbouring farm, but signals of the female were received on Eorondemba. As this female had been ranging out of the core area of the study site for several weeks, the follow-up team aimed to ascertain whether the mother was still accompanied by all four of her youngsters. After the team members picked up the signal of the radio collar, they approached the supposed location of the cheetahs by vehicle. When the signal became strong, the group left the car and followed the cheetah on foot. The signal became very strong, indicating that the collared female was resting very close by. Unfortunately, the area was very bushy, but after reaching the top of a hill one of the team members became aware of some movement. At the same time the signal changed to activity, and the entire follow-up group was fortunate to see five cheetahs running across a little valley and up to the top of the opposite hill, confirming that the entire family was still alive and well.

On 12 October the follow-up team tried to approach another female, which was located by the telemetry team in the northern part of Eorondemba. This female was thought to be accompanied by two youngsters. After leaving the vehicle the group found tracks of two cheetahs, and they managed to get very close to the radio-collared animal. As the area was very bushy just one person saw a cheetah running away - starting from a distance of about 30 metres.

On 28 October signals of the single male cheetah, as well as of the above female were received during the morning hours. Both animals stayed on the neighbouring farm to the west, and it was decided to ask the farmer for permission to work on his property during the afternoon. The entire expedition team went to the neighbouring farm, and signals of the male were picked up at the supposed position. After the group followed this cheetah for a while, without getting really close to the animal, a decision was made to concentrate on the female cheetah. The new focus animal was located soon, and the team was fortunate to observe the mother with her two youngsters walking along the fence line.

2.4. Discussion

2.4.1. Expedition concept

Starting in 1998 Okatumba Wildlife Research was accustomed to work with students who have some specialised, scientific skills and already know how to conduct scientific work. The co-operation with Biosphere Expeditions is our very first experience with paying and largely untrained people from all walks of life and of all ages. Before the start of the first expedition in 2002 we were sceptical, but now after our third year we consider the expedition concept to be an excellent one. Expeditions run by Biosphere Expeditions are a real asset for all concerned: local scientists gain important assistance for their conservation work, team members increase their knowledge about habitats and/or species and gain some real hands-on research experience.

Usually we do not have the manpower, time and money to conduct game counts, radio telemetry or spoor tracking on a daily basis, and we are really thankful for the additional data gained from six weeks of intensive research. Besides that we receive financial and in-kind support such as, for example, the Land Rovers and this allows us to work with certain types of equipment or to employ specific sampling methods, which would not be possible without Biosphere Expeditions.

2.4.2. Data quality

The expedition team consisted of highly motivated people who came in their holiday time to work with us on a research project. The work they put in and their expedition contribution helped us to gather large amounts of data, which would not have been collected without this expedition.

As regards data quality, one must be aware that data sampling was conducted by people with little or no training apart from that given during the expedition introduction period. Although all groups were assisted by a local scientist, student and/or tracker, it is difficult to achieve uniform data quality. The kind of standardisation whereby one person always samples the same data is impossible during an expedition, because all team members understandably want to take part in all research activities.

Some field techniques like checking box traps or searching for marking trees are easy to learn, whilst others like game counts, spoor tracking or radio telemetry require the acquisition of some specialised skills. For this reason some data are more vulnerable to errors and quality problems than others and each expedition data set needs to be assessed on a case-by-case basis.

In general, however, this is not a significant problem, as the cheetah project is a long-term study, and most of the key questions require continuous data collection over a time period of several month or even years. Data gathered during the expedition(s) will be included in long-term data analyses, rather than being analysed as single data sets in this report. For example, it is not possible within the scope of this expedition report to determine home range sizes or territories out of six weeks of data collection.

Having said that, all data gathered during the expedition are important and useful. For example, telemetry data gathered during the expedition are very important, because they make a major contribution to interpretation of aerial radio tracking data and additional ground tracking conducted throughout the year. Game count data sampled during the expedition will, over time, give us additional information on spatial distribution of various prey species, which is important for interpretation of the space use patterns of our study animals. Population densities estimated from data collected during the expedition correspond well with results obtained from quarterly game counts conducted on Eorondemba and Okatumba West since November 1998.

2.4.3. Conclusions and outlook

As stated above working with Biosphere Expeditions is an asset to the cheetah project, which we would like to retain for future carnivore research. During the first expedition in 2002 we learnt a great deal, which helped us to improve data sheets, methodology, sampling effort, etc. Since then we want to make sure that:

- ✓ introduction to the project and research activities is conducted comprehensively,
- ✓ sampling methods are transparent and understandable for everybody,
- ✓ activities are not boring (or if so, it has to be very clear why they are as important as the more exciting ones),
- ✓ team members are kept highly motivated and thus continuously concentrate on the task in hand,
- ✓ data sampling is correct and continuous,
- ✓ data quality is as high as possible,
- ✓ data entry is transparent, intuitive and easy to understand and therefore works well.

The post expedition questionnaires gave the impression that most of these goals could be reached, but some of them (like making clear why certain activities are as important as other ones) still need to be better improved for future expeditions.

Although everybody was informed that the probability to see or even to capture a cheetah during two weeks is very low most of the expedition members understandably hoped to get somehow in contact with one of our study animals. We are thinking about how to increase capture rate during future expeditions, but again we cannot promise anything...

Team members worked successfully, and field data collected during expeditions run by Biosphere Expeditions and Okatumba Wildlife Research in 2002, 2003 and 2004 increased our knowledge about

a) cheetah density in two different study sites

b) availability of cheetah prey animals

c) space use of study animals

As regards cheetah density we are still busy with data analyses of spoor tracking data in connection with telemetry data. But we can already state that cheetah density within the Seeis study site is lower than within the Omitara study site. More accurate figures, as well as possible reasons for this will be provided in the post spring 2005 expedition report.

In both study sites a large amount of natural prey like springbok, steenbok, warthog, (juvenile) kudu and hartebeest are available, and as such study animals are not forced to prey on livestock. Scat samples, which were collected to determine cheetah prey species frequency, are awaiting analysis and results on cheetah diet are expected for the end of 2005.

As cheetahs need large areas for subsistence and distribution, aerial radio tracking is indispensable to determine space use patterns and home range sizes. Location rate is high (about 85%) for airborne telemetry, but low (less than 20%) for ground-based telemetry. Nevertheless, telemetry activities by car or on foot are important to obtain additional information.

Home range sizes of our study animals vary from 60 km² to 1580 km² (as obtained by the MCP method). Male coalitions of two or three cheetahs (who are considered to be brothers) use small home ranges and appear to hold territories, while single males roam over large areas. Home range sizes of females are somewhere in between. It appears that space use patterns of female cheetahs depend on and vary with their reproductive status: when in oestrus, they use larger areas, but when they have cubs they range in small areas. The bigger the cubs grow, the larger the home range becomes.

According to the above "rules of space use" expedition team members working in the Omitara study site often received signals from male coalitions, but location of single males was difficult. In the Seeis study site (2003) the male coalition ("Max and Moritz") were the one located most often. In 2004 all females were accompanied by cubs of different ages and used home ranges of different sizes. The female with the youngest cubs (5-6 months) could not be located, because she was known to stay about 40 km east of the core area. Team members managed to locate a mother of older cubs (7-8 months) on six days and a female with juveniles (almost one year) on three days. During ground-follows team members received information on where the animals were staying, what they were doing and how many cubs were still alive. Even when cheetahs could not be seen, their tracks still provided valuable information.

2.4.4. Acknowledgements

We thank all expedition team members, as well as staff members for their amazing effort. This expediton made a major contribution to the cheetah project and really assisted us in increasing our knowledge about Namibian cheetah ecology.

We are grateful to Land Rover for making the vehicles that are used during expeditions available. We also thank Motorola for providing the radios, as well as Silva for providing binoculars, GPS instruments and compasses.

Last, but not least our thanks goes to the farmers in and around our study area for giving us the permission to run the expedition on their properties and for their cooperation.

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3. Expedition leaders' diary: Namibia 2004 (kept by David Moore)

2 October

Since our arrival earlier in the week we have been busy getting things organized here at the base camp in Eorondemba, ready for the beginning of the 2004 Cheetah Surveying Expedition. Three of us flew out: Matthias our founder and Field Operations Director, Anthony on secondment from our partner organization 'Woodsmoke', and myself, David, the expedition leader. Harald, our local scientist met us at Windhoek airport and drove us straight out to the farm from which he coordinates his research together with his wife Birgit.

Over the last few days we have been setting up the base camp where we'll all be staying, sorting out the land rovers and organizing the rota ready for slot 1. Other local staff members are also hard at work getting the safari tents ready, stocking the kitchen and repainting the toilet blocks!

Yesterday we took the hour drive in to Windhoek to pick up some final supplies. It was a great ride back up to camp at dusk as the sun was setting and the local animals (oryx, kudu, steenbock, hartebeest, warthog.) were active, going about their early-evening business. Each morning we've also been out with Harald on his regular research work, checking the cheetah box-traps (there was a domestic calf waiting to be released this morning).
During the course of the expedition I'll be keeping you up-dated as to how each slot is getting to grips with the different tasks and will keep you informed of our progess.

Looking forward to meeting the first team members on Monday!

6 October

Time has passed quickly since Monday, getting in to the swing of life in the Namibian bush, familiarizing everyone with the expedition equipment and bringing four wheel drive skills up to date. We also covered a lot of background information on Namibian wildlife, the project aims and were trained up on the various activities which are carried out within the survey area.

Today began with tales of the various jackal howls, bird calls and beating of hooves that were heard close to our tents during the night, but I don't think any of us were quite prepared for the full extent of all that had been going on around us while we were sleeping. When explaining his long-term project aim of developing a method by which to calculate the cheetah population, Harold had been clear about the statistically low probability of actually capturing a cheetah - so we were excited by the early-morning report coming in across the radio of cheetah spoors 700 metres from the camp. This was followed by reports of other cheetah spoors entering the farm overnight at two different locations. By 9:30 the box trap checkers discovered that we had in fact captured a cheetah in box trap no.3, a collared male already twice captured on the site and known to travel with his brother. The telemetry soundings soon showed evidence of his brother as well a third collared cheetah, a female with cubs.

Although not an opportunity to collar a new individual, over time this kind of data is useful for building up a wider picture of the animals' movements (and also meant that all the team members were all able to gather together on site to witness the release of their chosen study species - see www.biosphere-expeditions.org/expeditions/namibia+.htm#clip for a short video clip of the release). We then followed this up later in the day with telemetry soundings of the pair working their way down one of the river beds, still on the farm.

I've now just left everyone around the camp fire where the day's events are being recounted: as well as the cheetah moment, it seems we also witnessed a horse masquerading as a zebra, detected spoors from a hook-legged porcupine, surprised a hearing-impaired baboon, and Chris was 'dive-bombed' by a weaver bird. I wonder what tomorrow holds...

10 October

The last few days have seen a considerable amount of activity on the study area with telemetry soundings from two cheetahs, which are already collared as well as a collared leopard from a neighbouring farm.

On Thursday we linked together fresh cheetah tracks seen over our morning Land Rover tire marks with soundings picked up by the telemetry team and were able to establish that several cheetahs were moving across the farm. With the help of our two bushmen trackers, Piet and Josef, we established their direction of travel and homed in on their location. The same situation arose on Friday when the linking together of spoors and soundings meant we were able to narrow down the cheetah's location to the nearest small hill just beyond the river bed. It wasn't until yesterday that Birgit's team were lucky enough to follow-up the data to the point of actually seeing collared cheetah no. 6 (still with all four of her cubs). Our scientists are encouraged by these results: it seems the cheetahs are returning to the area after being previously scared away due to extensive hunting by farmers.

Yesterday the entire team helped with the relocation of one of the box traps: Harald and Birgit had identified a 'marking tree' frequented by the cheetahs with fresh spoors and scat, so we moved one of our box traps to this spot from a unpromising location which had not seen any activity for over a year. Although it was empty this morning, we identified fresh spoors outside. There were no telemetry soundings of cheetahs in the area (the only excitement for the telemetry team came from digging the Land Rover out of a rut), so it looks like these spoors could be from a new individual. We'll keep you updated…

As I write, everyone is having a go at creating tranquilizing blow-darts and testing their aim on our dummy model cheetah which has been tactically placed by the camp fire. We're winding down from the activities of the week with plans to visit a neighbouring guest farm on our day-off tomorrow.

14 October

Temperatures were up to 39 degrees centigrade today, but it's cooled down now, so I'm able to sit outside in front of the tents to write the diary - quite a change from last week when temperatures went down surprisingly low to the zero mark in the early mornings and we were all crowding round the camp fire. Even the bush is starting to look a little less barren with the green of spring arriving.

Familiar now with the different activities, the team members have been getting along well with the data collection. Tuesday afternoon's Game Count team had an exciting diversion from the task of following a fixed route around the farm to count and judge distances from the vehicle of the numerous oryx, kudu, hartebeest, zebra and spring bock (as well as the elusive giraffe family): only 5 km from the camp, 100 metres from the track, Chris spotted a family of cheetahs lounging under a bush. Although they departed fairly hastily, telemetry readings form the morning enabled us to identify them as a collared female with her four cubs. Given that such random sightings are unusual, we were even more surprised when we came upon another family of three cheetahs about 3 km further down the road by the donkey bore hole, causing a disturbance as they hassled some kudu. On the same day, the follow-up team also glimpsed a third family group making a hasty get-away up at the northern end of the study site.

Although the box traps have been quiet this week (barring the give-away spoors by the entrances), the telemetry soundings to detect and track those cheetahs already wearing collars show that there are cheetahs moving on and off the farm every day. Today's follow-up team zoned in closely on one female cheetah with cubs heading west across the farm, and they were able to plot her movements and follow her fresh tracks right over to her exit point.
As is often the case, the process of collecting the data took us to within several hundred metres of the animal without actually seeing it.

Alongside the survey work, the team members are enjoying their time...Judy has shared her Black Jack knowledge with us during an evening of Bush Casino, Wienke and Anthony are extending their guitar repertoire and Paul is keeping our list of new animal sightings up to date!

20 October

Having kept their location secret through most of the first slot, the giraffes put in a goodbye appearance for the departing group of team members, and then greeted us with a repeat encounter for the new team who did their first box trap check yesterday morning. The mother and calf seemed unperturbed by our presence.

Along with the changing of the groups, there has been a dramatic change in the weather, with thunder and lightning now order of the day. Although it stayed fine enough for most of yesterday, the storms could be seen further off at all angles in the distance. By evening time we were forced to take refuge in the communal tent as the rains arrived and then seemed to stay directly above us for most of last night. The tents seem fairly waterproof, but sometimes required a tactical positioning of the bed to avoid any drips!

Trapped together at close quarters in the middle of the African bush with no electricity, slot 2 have been bearing up very well, and have certainly made a dent in the camp's beer supplies. Hope it doesn't run out before the next trip to Windhoek.

I guess the animals weren't moving much in the night as the spoors team from this morning had very slim pickings, though they did come back with a very good photo of an aardwolf track. The box trap team also spotted the unusual African wild cat, a close cousin to the common tabby though much more vicious. No sight or sound of the cheetahs today though. When reactivating the traps on Monday evening, however, we discovered fresh scat on one of the trapped marking trees, indicating that a cheetah had been visiting while the trap was unarmed over the weekend. Clever!

During the course of this morning the skies cleared and for the moment we are back to clear blue skies and sunshine. After the lunch break the follow-up team will head down to the southern end of the study-site to test some of the telemetry points there and see what can be found.

26 October

Following yesterday's break and trip to Windhoek, D?sternbrook and Joe's Beerhouse, slot 2 are back in to the swing of the research activities today.

Last week did not throw up any fresh sightings, at least not of cheetahs – the only temporary residents of the box traps were a baboon, an agitated aardvark and a rabbit. On their rounds, the game count team also came across a pair of aardwolves as well as a black mamba stretched across the farm tracks (fortunately it slithered away). The telemetry team picked up soundings from the brother coalition of cheetahs number 15 and 16 to the east on the neighbouring farm, whilst the other collars are absent for the moment. There has been no shortage of spoor tracks, however, with several fresh tracks picked up in the southern part of the study site, presumably from uncollared animals. The follow-up teams have spent time checking out the marking trees in this area hoping to find a promising spot for positioning one of the box-traps where the cheetahs are likely to visit. As a result of the investigations we moved one of the box traps from the north of the site on Friday.

Yesterday we were contacted by a farmer who had captured a collared cheetah (not one directly from this project) on his land 120 km away. In many cases cheetah capture by a farmer results in the animal being shot or placed into captivity, thereby removing the main game predator from their commercial farmland. Relocating the animal to a new territory is not an option, as it would simply return to its former home. In this case Harald has been able to negotiate with the farmer who has agreed to release the animal – given the pressures on the animal, its future survival is far from secure, though it's the best result we could expect.

I don't know if it's the rains of last week encouraging the insects out in to the open, but evenings around the camp fire have certainly seen their fair share of wildlife activity, with our friendly ever-present 'skunk-back' beetle and a large brown solifuge spider (it looks mean, but is pretty harmless like all the spiders round here). With a full moon due in a couple of days, I'm sure there's more activity on the way…….

29 October

Yesterday's fortnightly aerial telemetry fly-over gave us readings of all of the collared cheetahs in the surrounding area, letting us know their approximate position. As a result we decided to venture out on to the neighbouring farm in the afternoon where cheetah no. 14 had been detected together with her two cubs. Male no. 2 was also picked up by the telemetry equipment and led everybody round in circles for a while before the team was eventually able to locate the female with her cubs and get great views of them working their way along the fence line towards our study site. Their spoors have again been picked up this morning and should provide some interesting clues for the follow-up team this afternoon.

This morning's spoor team radioed earlier with news of very fresh spoor from a large male leopard, heading west across the farm which were picked up again in a dry river bed just by the newly positioned box-trap. They have now just returned to camp with news of a fresh kill - an oryx - which had been dragged through the bush and across the external fence before being deposited in its half eaten state on the other side. There were no big cats in the box traps however - only one large and frightened porcupine which darted to its burrow upon release.

Some good friendships have been developing over the past two weeks and there are plans underway for a grand 'last night' send-off tonight. Hopefully Jude will have finished fashioning her disco mirror ball so that it'll be in place for tonight's fire-side rendition of Bohemian Rhapsody.

18 November

On their second full day of on-site activities, slot three are in the swing of the data collection work with quite promising results so far. All this despite the temperamental weather with passing storms and strong winds causing the camp on occasion to turn in to a minor flood zone.

It seems we only have to leave the camp these days in order to find fresh spoors, with the first spoor reports coming in on day one as we drove round to re-set the box traps. Yesterday's spoor tracking team found more cheetah tracks entering and exiting the farm (as well as spotting a bat-eared fox with cubs), while this morning's box trap team found more outside one of the traps as well as next to an old marking tree. Then this morning's transect and spoor teams found leopard spoor in two different locations along a river bed - the follow-up team have just left this afternoon to see if they can establish if or where the animal left the study site.

From the telemetry teams we've had signals from the male coalition of cheetah's no. 15 and 16 who are still lurking on the neighbouring farm, while this morning's team picked up signals from female no. 6 and her four cubs. We even had our first cheetah sighting when we followed up the telemetry yesterday afternoon with Chris getting a fleeting glimpse of an unknown cheetah disappearing in to the bush. With nobody to confirm his sighting, he's having to deal with the scepticism of his fellow team members (and rumours that it was actually an oryx). I was out with the game count team getting close to the giraffes and crashing the vultures' water hole party, so I'm remaining neutral on this particular issue.

With more certainty we can say that there was a hysterical guinea fowl in one of the box traps this morning as well as a pangolin on Tuesday. This pangolin (a shy nocturnal aardvark-like creature with scales) rolled up in to a ball when we approached, but we were able to lift it out and place it down in the bush for it to scurry back to its burrow once we had left.

Needless to say, the team members are having fun settling in here at the camp - the only screams so far have come from Jenna who mistook a millipede for her hairbrush, though there are fresh reports coming in of a large, but benevolent mouse who makes a tour of the tents late at night. Robin has hatched a plan to tether a honey badger outside his tent to ward away any unwelcome visitors, though with even distant sightings of this ferocious animal being rare, we suspect he may have to revise his plans.

The data entry team have finished early and are leaving now to check out some new marking tree locations, so I'm going to get a lift up to the farm with them to send this!

23 November

Last Thursday presented an exciting follow-up when two teams went out to track the leopard spoors found in the morning. These spoors led them along a river bed before disappearing down in to an aardvark burrow. Even our tracker, Josef, was nervous for a moment as we wondered if the leopard (not an animal we would want to corner) was still down there. Everybody held back at a cautious distance until Josef was able to identify the exiting spoor and establish that it had already left and continued its way up the river bed.

We've also put in a great deal of effort in pursuit of the adult male cheetah no. 2 who managed to escape our tracking attempts: adult male cheetah spoors were picked up leaving the farm on Friday morning and then entering again on Saturday. Although the telemetry teams were able to link these in with signals from cheetah no. 2, the afternoon follow-up teams failed to locate him - not for want of trying!

Harald knows that he has quite a large territory, often simply crossing the study-site on route to more distant hunting grounds, so I guess he was just too fast for us this time.

In addition we have found spoors from a young female cheetah, which we presume to be un-collared.

We are back now to the clear starry night skies that we experienced last month (with a full moon due on Friday, so I'm told), and the team members are also enjoying their evenings at the camp. After the first few days spent enjoying the unusual sounds of the bush, we've now moved on to the treasures of Jerry's CD collection and Robin's 'ipod' (not to mention Anthony on the guitar), and have created a few night sounds of our own to rival those of the jackals.

This morning's teams have just returned to camp for lunch and shelter from the sun. The spoors team found leopard spoors (about 8 hours old), the box-trappers had a porcupine, and although the telemetry team heard nothing from a cheetah, they do have tales of fighting rival factions of baboons.

Sunday 28 November

Cheetah no. 2 has definitely gained himself a reputation during the last slot of the 2004 cheetah surveying expedition. After relatively scarce signals during the routine telemetry rounds, his collar signal was picked up late on Wednesday evening when some keen team members were squeezing in a little extra telemetry work up at the look-out. We then received a very faint signal from him from the telemetry team on Thursday.

Our big chance of a closer encounter came on Friday when the aerial telemetry flight picked him up on the neighbouring farm and the entire team headed over for their last afternoon to see if they could locate him. Alas it was not to be - the dramatic electric storms accompanied by torrential rain and hail meant it was impossible to do telemetry and everybody was forced to return and enjoy sundown at the camp. Cheetah no.2 had not had his last word, however, and the box trap checkers found trace of him on their Saturday morning check - he had actually hopped over the central plate of one of the box traps to gain access to the marking tree, left spoors and scat as evidence of his visit, and then safely exited to continue on his way (this is only the fourth time in six years that Harald and Birgit have come across this kind of cunning behaviour).

Even if cheetah sightings are limited to a couple of unconfirmed fleeting glimpses, there has been plenty to ensure a satisfied slot 3: The wallowing warthogs on the water hole observation are high on the list, as well as the newly born kudu still wrapped in its placenta along with a chance observation of an aardvark on one of the night drives. It is also clear that several cheetahs have been on the farm over the last couple of weeks: Friday's spoors team found evidence of a female cheetah with cubs and were able to follow the tracks to the bush which the animals had used as a resting place.

Gottfried the farm worker also sighted two cheetahs (one with a collar) by the dam on Wednesday morning and the telemetry team detected that it was cheetah no.14 which has since moved to the neighbouring farm.

As we finish for 2004 (we'll be back in March 2005 to follow-up on cheetah no.2!), let me thank everyone for their excellent contribution over the past two months. All teams have thrown themselves into the activities with enthusiasm both for the less glamorous activities - making the meeley-pop, doing the car checks - as well as the more obvious highlights. Your great attitude has been vital to making the expedition a success! I'll be forwarding the last day group photos by email shortly, and of course we'll also be sending out the post-expedition report within six months.

Appendix 1 – Map of study site