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EXPEDITION REPORT

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Report published: July 2009

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Authors:
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Wildlife and Community Development Fund (WCDF)

Matthias Hammer (editor) & Peter Schuette
Biosphere Expeditions

Abstract

This study was part of an expedition to the Caprivi Delta in the Caprivi region of the Democratic Republic of Namibia, run jointly by Biosphere Expeditions and the Wildlife and Community Development Fund (WCDF) from 7 September to 21 November 2008. The aim was to conduct a preliminary investigation into human-predator conflict (HPC) within the study area by employing an array of interdisciplinary and cross-cutting research methodologies.

Using standardised sign transect methods and prey survey techniques, presence/absence surveys as well as relative abundance and relative health surveys were carried out for large carnivore populations (lion, leopard, hyaena, cheetah and wild dog) and prey populations (52 species in total) across the study area of approximately 250,000 hectares. Captures of large carnivore species took place throughout the study period in order to fit radio-tracking devices and these study individuals and/or social units were subsequently located and monitored on a daily basis. An early warning system was put in place to warn communities when study individuals and/or their social units approached villages and livestock kraals. The behavioural ecology of large carnivore species was documented along with their prey preferences, including domesticated species. Much of the study area was mapped using the Global Positioning System (GPS) and displayed on a regional Geographical Information System (GIS) map. Interviews with communities affected by HPC formed an important part of the research procedure. The expedition also compiled bird and medium to large-sized mammal inventories, as well as a soil and plant community review for the study area.

In 2008 the expedition found evidence of all five large carnivore species within the study area and a total of four animals were captured (two female leopards, one female lion and one male lion). There were five confirmed reports of hyaena killing community livestock and no reports of communities killing any predator in retaliation. Of the predators, our preliminary investigations suggest that hyaena are the biggest killers of livestock, contrary to widespread public perception in the rural communities living in the study site. The other big killer of livestock appears to be poisonous plants. Both causes need further investigation in 2009 and beyond, and the early warning system that has started to be put into place in 2008 need to be extended with an emphasis on hyaenas.

Other data collected suggest that prey species numbers and available habitat seem to be adequate to sustain viable populations of all five large carnivore species. Although human tolerance for predator species in the study area is very low, our interview data shows that younger generations in particular are better informed and more willing to find ways to coexist with potentially taxing large carnivore species if communities are to benefit from them through the broader sharing of benefits generated through tourism and hunting. Nevertheless, the Caprivi delta remains an important wildlife sanctuary for threatened and endangered carnivore species that require continued protection through Community Based Conservation (CBC).

We believe that this project design will, given time, allow for the sufficient transfer of skills and capacity-building that enables local wildlife managers and livestock owners to self-manage large-carnivores without having to depend on ‘outside sources’ in the future. This should be viewed as the bridge that crosses the divide between research and management and is crucial in addressing the conservation issues at hand.

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Matthias Hammer
Biosphere Expeditions

1.1. Background

Biosphere Expeditions runs wildlife conservation research expeditions to all corners of the Earth. 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. Expeditions are open to all and there are no special skills (biological or otherwise) required to join. Expedition team members are people from all walks of life and 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 the Caprivi area of Namibia from 7 September to 21 November 2008. The expedition conducted a preliminary investigation into human predator conflict (HPC) within the study area, surveying large carnivore populations (lion, leopard, hyaena, cheetah and wild dog) as well as prey populations (52 species in total). Research activities included community surveys, GIS mapping, large carnivore capture and monitoring.

1.2. Research Area

Flags and location of Namibia, Botswana, Zambia and study site.

An overview of Biosphere Expeditions' research sites, assembly points, base camp and office locations is at Google Maps.

The expedition assembled in Zambia right next to Victoria Falls. From there it travelled to Namibia and the heart of the Caprivi delta, where the bulk of the work was conducted.

The study area falls within a highly valued contiguous conservation area, the Kazangula heartland that encompasses five adjoining countries (Namibia, Angola, Zambia, Zimbabwe and Botswana) and extends over an area of approximately five million hectares.

The Caprivi delta is a wetland paradise: broad perennial rivers are fringed by papyrus and palm trees, and the land stretches out over lush floodplains and broadleaved woodlands. The research area covers an expanse of approximately 250,000 hectares comprising two Namibian national parks and a number of community-owned conservation areas known as conservancies. The Kwando river flows through the delta's western end and the Linyanti river flows from the east. These two rivers teem with hippo and crocodile and converge only to fan out and form the Caprivi delta. The area is very diverse in fauna and flora and there are reports of local feline species that have evolved hydrophilic habits and have adapted this to their hunting strategies.

Caprivi, one of Namibia's 13 provinces, is a geographically isolated corridor to the northeast of Namibia which borders Botswana, Zambia and Angola. The Caprivi Strip, about 20 km wide and 400 km long, was established in 1890 after a German land-exchange with the British to give the German colony of South West Africa access to the Zambezi river. The province and the strip are named after the German Chancellor Leo von Caprivi, who negotiated the exchange. Before German acquisition, this area was called Barotseland and centred around the central Zambezi valley including the southern parts of Zambia, Zimbabwe and northern parts of Botswana, as well as south-eastern parts of Angola. The Caprivi province is divided into western and eastern parts by the Kwando river, which also forms the border between Namibia and Botswana.

The Caprivi has long been an area of tribal conflict, stunted development, and increased pressures on its natural resources, making conservation work very difficult. For the first time in the Caprivi region's recent history, conservation initiatives are now starting to have an effect, providing an opportunity for government to expand conservation areas for biodiversity preservation and for conservationists to increase their knowledge of the status of large carnivore populations in marginalised areas.

Although HPC is well documented, little progress has been made in recent years to address this escalating conservation concern. Information collected by this expedition provided valuable data that can be used in the formulation of HPC management policies.

1.3. Dates

The expedition ran over a period of ten weeks from 7 September to 21 November 2008 and was composed of a team of international research assistants, guides, support personnel and an expedition leader (see below for team details).

Slot dates were 7 - 19 September | 21 September - 3 October | 12 - 24 October | 26 October - 7 November | 9 – 21 November with 4 – 11 October a rest and re-organisation period.

1.4. Local Conditions & Support

Expedition base

The expedition team was based in a rustic bush camp style research base. Team members stayed in rooms of reed and thatch with beds, mosquito nets and furniture. There were showers, toilets, a communal lounge, rest areas with hammocks and a kitchen. Expedition team members had their own rooms and double rooms were also available on prior arrangement. Water for showers was heated by fire, and breakfast and all meals were prepared by the expedition cooks, who could cater for vegetarians and some other special diets.

Field communications

There was no telephone at base, but mobile phones worked in much of the study site, including base.

No radio communication was available during the expedition due to the absence of a radio repeater system to boost the expedition's Motorola GP320 and GM340 radio sets. Instead the expedition used mobile phones as most of the research area had mobile phone coverage for most of the time.

Regular expedition diary updates were uploaded to www.biosphere-expeditions.org/diaries for friends & family to access.

Transport & vehicles

Team members made their own way to the Livingstone assembly point. From there onwards and back to the assembly point all transport and vehicles were provided for the expedition team, for expedition support and for emergency evacuations.

Courtesy of Land Rover, and with the support of their local dealer in Windhoek, Novel Motor Company, the expedition had the use of two Defender 110 Station Wagons and two Defender 130 Double Cabs. Team members wishing to drive the Land Rovers had to be older than 21, have a full clean driving license and a new style EU or equivalent credit card sized driving license document. Off-road driving and safety training was part of the expedition.

Medical support and insurance

The expedition leader was a trained first aider, and the expedition carried a comprehensive medical kit. Further medical support was provided by a district hospital in the town of Katima Mulilo (180 km from the research station) and a health centre in Sangwali some 35 km from the research station.

All team members were required to be in possession of adequate travel insurance covering emergency medical evacuation and repatriation. Emergency evacuation procedures were in place, but did not have to be invoked.

There were no major medical incidents. There was one incident that required eight stitches to a film crew member's foot and this procedure was performed at the station.

1.5. Local Scientists

The expedition's scientists are Francois de Wet and Julia Gaedke.

Francois was born in South Africa and his BSc in Ecology is from the University of Natal, South Africa. He has assisted in African conservation projects throughout his professional career, the latest of which dealt with the conservation of the African leopard. Francois now works as a conservation biologist for the Wildlife and Community Development Fund (WCDF).

Julia was born in Germany and her MA in communication science and economics is from the Free University in Berlin. She has worked for various organisations and agencies as a communications consultant and account manager, the most recent of which is the Friedrich Ebert Foundation (FES) in Johannesburg, South Africa. She developed a study for the UNESCO Institute for Education (UIE) (Germany) and gained her first insight into wildlife conservation as a volunteer in a carnivore management project in Northern Zululand. She has travelled in Europe, Mexico, Thailand, America and Africa. Julia is now a co-director of the Wildlife and Community Development Fund (WCDF) that works to assist conservancies in Namibia through the management of HPC.

1.6. Expedition Leader

This expedition was led by Peter Schütte. Peter was born in Germany. He studied geography and cartography at the University of Bremen (Germany) and Göteborg Universitet (Sweden) and geoinformatics in Salzburg (Austria). He has worked on several mapping and remote sensing projects all over the world. In 2004 and 2005 Peter was involved in wildlife conservation projects in Namibia, where he joined Biosphere Expeditions as a member of the team of local scientists and was promptly bitten by the wildlife expeditions bug. He has travelled in Scandinavia, Iceland, Southern Africa, North America and Central Asia. Peter holds First Aid and Off-Road driving certificates and has worked in Namibia, Altai and Oman for Biosphere Expeditions.

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 (with their countries of residence)

7 – 19 September

Inge Boersma (UK), Julia Collins (UK), Andrew Collins (UK), Karen Goepfert (UK), Monique Lindner (Germany), Eckart Lindner (Germany), Horst Paehlke (Germany), John Rawnsley (UK), Martyn Roberts (UK), Vivian Siderfin (UK), Francoise Stocker (Switzerland)

Also: Malika Fettak, Biosphere Expeditions intern (Germany) & Matthias Hammer, founder & managing director of Biosphere Expeditions (Germany).

21 September – 3 October

Andrea Baumgärtner (Germany), Reto Bühler (Switzerland), Herbert C Connor (USA), Flavia Di Giusto (Argentina), Anja Giles (Germany), Rick Myers (Canada), Andy Smith (UK), Sven Strohschein (Germany), Mechelle Sweeney (UK), Gustavo Szejnberg (Argentina), Catherine Thebault (France), Serge Thebault (France).

Also: journalist Amy Packer (UK).

5 – 17 October

Sigrid Aschenbrenner (Germany), Sue Dickson (UK), Alicia Dmytruk (Canada), Erik Dmytruk (Canada), Philipp Garber (Germany), Ingo Hary (Switzerland), Lysann Hasenohrl (Germany), Addi Hasenohrl (Germany), Irmgard Immig (Switzerland), Lynn Kimmel (USA), Ute Poppenheger (Germany).

26 October – 7 November

Houbart Benoit (France), Sebastien Darras (France), Barbara DeMatteis (USA), Helga Longin (Austria), Gerry Monaghan (UK), Johann Naglmayr (Austria), Luis Praxmarer (Germany), Karen Smith (UK), Annette Tillkes (Germany), Ulli Wolf (Austria), Hans-Peter Wolf (Austria).

Also: cameraman Laas Rosenbaum (Germany).

9 – 21 November

Sara Birkholz (Germany), Don Coleman (USA), Carol Collins (USA), Nicki Douglas (Switzerland), Espen Eriksen (Norway), Kurt Ersland (UK), Ellen Haas (USA), Barry Hardy (Switzerland), Ulrich Hoehner (Germany), James Ruskin (France), Ina Steiner (Switzerland), Annette Tillkes (Germany).

Also: camera team Susanne Grüter, Florian von Carlowitz and Sebastian (Germany).

Throughout the expedition

John, Makhando, Ernest, Richwell (Predator Monitoring Unit, guides and translators). Sarietty and Viola (camp helpers), Moses and Terron (camp cooks), Jimmy and Simon (camp supervisors), Ronel de Wet (camp manager and heart and soul of the kitchen).

1.8. Expedition Budget

Each team member paid towards expedition costs a contribution of £1390 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 these contributions were spent are given below.

Income	£
Expedition contributions	80,479
Expenditure	
Base camp and food includes all meals, base camp equipment	13,250
Transport includes fuel, shopping trips, vehicle tows, buses	9,940
Vehicle maintanance & repairs includes revovery, towing, spare parts, repairs	16,647
Equipment and hardware includes research materials, research gear	1,593
Biosphere Expeditions staff includes salaries, travel and expenses to Namibia	11,411
Local staff includes salaries, travel and expenses, Biosphere Expedition tips, gifts	2,630
Donations & loans to WCDF includes start-up funding for Hanyini Station	11,705
Administration includes bribes, registration fees, sundries, etc	1,034
Income – Expenditure	12,269
Total percentage spent directly on project	85%

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 and who 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. A special mention to Dick & Katy Sharpe of Sharpe Engineering & Tutwa Travel for their help in the field. A big thank-you to staff at Novel Motors, the "local" Land Rover dealer in Windhoek, especially Fritz Rossler and Tony Bassingthwaihte for their patient and tireless help in dealing with the vehicles. Herbert and Kennedy at African Wild Trails were superb in their logistical support. Freddy Rossouw at BP Katima was also a great help, as were Willie and Monica and all the staff at Lianshulu Lodge. Biosphere Expeditions would also like to thank Land Rover, Swarovski Optik, Motorola, Buff®, Cotswold Outdoor, Globetrotter Ausrüstung, Snowgum and Gerald Arnhold for their sponsorship.

WCDF would like to thank the Namibian Ministry of Environment and Tourism (MET) and Integrated Rural Development and Nature Conservation (IRDNC) for their unwavering support. The communities of Balyerwa Conservancy, Wuparo Conservancy, Dzoti Communal Area and Shikhaku Communal Area are thanked for their participation and support. WCDF would also like to thank Traffic Clothing cc, Groundcover cc, the University of South Africa (UNISA), the International University of Bremen, Dr. Edmore Masaire and Wilderness Safaris for their continuing support. Last but not least, WCDF would like to thank Biosphere Expeditions and every team member for the contribution that this expedition has made to large carnivore conservation and community development.

1.10. Further information and 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. Enquiries should be addressed to Biosphere Expeditions at the address given below.

2. Human-Predator Conflict

Francois de Wet
Wildlife and Community Development Fund (WCDF)

2.1. Introduction

The increase of pastoralist in proximity to conservation areas combined with the growing success of numerous community-based conservation programmes and therefore increased wildlife populations has resulted in a steady rise in incidents of human-predator conflict (HPC) throughout Africa. Case studies from countries all over Africa demonstrate the severity of the conflict and reflect the fact that large predators are destroyed at an alarming rate in areas where humans and predators compete for the same resources. Some are of the opinion that the retaliatory and pre-emptive killing of predators by rural people, particularly livestock owners, poses the single greatest threat to large carnivore populations today. HPC also undermines human welfare, health and safety and has economic and social costs, which include loss of human life, loss of livestock and pets, missed school and work, additional labour costs, loss of sleep, fear and restriction of travel (Hoare 1992). HPC therefore impedes the success of community-based conservation areas (conservancies) that are highly complementary to Africa's protected area network. In fact, it is estimated that across the African continent approximately 80% of the range available to megafauna lie outside of protected areas (Muruthi 2005); areas in which rural inhabitants coexist with wildlife and both suffer tangible consequences. Considering the current human population growth rate, increasing demand for resources and the growing demand for access to land, it is clear that HPC will not be eradicated in the near future and therefore, in order to break this cycle, there is a need to protect rural livelihoods, reduce their vulnerability, counterbalance losses with benefits and improve community-based conservation in areas of human-predator coexistence (Distefano 2005).

The conservancies that lie immediately adjacent to national protected areas or in strategic wildlife movement corridors bolster the protected area network system significantly. One of the goals of human-wildlife conflict alleviation is to create landscapes where people and wildlife can coexist and have as little negative impact on each other as possible. This has become increasingly important in the establishment of African transfrontier parks and conservation heartlands. If high levels of HPC continue in the future, with few or no management options to reduce the conflict, this may impact on the success of many conservation programmes currently underway across the continent.

It is important to note that most of the species concerned are carnivores and large home range species, which are important for conservation efforts because if such endangered and/or flagship species cannot be protected, then entire biodiversity conservation attempts may become undermined (Ogada et al. 2003). HPC ranks amongst the main threats to conservation in Africa alongside habitat destruction and the commercial bush meat trade (Muruthi 2005). With growing numbers of people and livestock throughout the continent, large carnivores may become entirely restricted to very large or well-managed protected areas if conflict prevention and mitigation cannot be implemented in areas of human-predator coexistence.

There have been significant recent changes in the methodologies and theoretical approaches of community development. Early work on natural resource management has focused on the lack of local knowledge and the need to improve this through education, training and outside expert advice. Through early community-based natural resource management arose a two-way approach of communication that acknowledges both the experience and knowledge of community members as 'insiders', as well as the efforts of 'outside' participants such as consultants, scientists and government. This gave the community and the most marginalised a voice in their own development priorities.

Annual quotas of trophy hunting permits are issued by CITES (Convention for the International Trade in Endangered Species of Flora and Fauna) to African countries for the legal termination of various large carnivore species. These quotas are under constant debate, as it is argued by scientists that for some species, population estimates are not accurate due to the uncertainty of carnivore populations on marginal lands. Hunting concessions are sold to outfitters on conservancy land and hunting quotas for large carnivores are based on population estimates established by conservancy resource monitors and game guards. Compounding the impact of legal trade (CITES quota) is the ever-increasing number of predators that are being killed by farmers, pastoralists and illegal hunters. Without a method for conservancy staff to accurately and reliably establish and monitor carnivore populations, this debate may prolong the unsustainable harvest of vulnerable predator species.

HPC compensation schemes that have relied in the past on constant external funds are evolving into self-insurance schemes through revenues generated from natural resources. For this reason it is becoming more urgent for conservancies to manage all resources responsibly and reduce risk through the diminution of HPC incidents.

20 September 2005 saw the creation of eleven new conservancies in Namibia bringing the number of conservancy members up to about 46,000 and perhaps even more dramatically, increasing the total land area under conservancy management to approximately 105,000 square km (MET 2005a). Today there are nearly nine million hectares of land and more than 120,000 people in Namibia's national conservancy programme, which constitutes 42% of Namibia's protected area network and supports 6.3% of the population (Wright 2003). Although a policy for managing HPC in Namibia is being formulated, one has not yet been tested or implemented. In 2001 the Ministry of Environment and Tourism (MET) recorded 196 livestock losses in a reduced area of the Caprivi region in Namibia. The event book system recorded 369 livestock equivalent losses with an average of more than two livestock units lost per incident. Community Game Guards (CGG) recorded seven human deaths due to wildlife (Murphy et al. 2003). In 2002 the MET recorded 508 livestock equivalent losses and three human deaths in the Caprivi (Wright 2003). Estimated economic costs due to livestock losses as a result of predation in a small sample area of east Caprivi between 1991 and 1994 totalled US$71,570 (O'Connell-Rodwell et al. 2000) and today the annual loss to the gross domestic product from predation on livestock in the Caprivi region is estimated to be US$35,000 (MET 2005b).

Recent statistics indicate that the border zones of Mudumu and Mamili National Parks in east Caprivi represent areas in which both people and wildlife suffer considerable losses due to HPC. Unofficial reports from the Dzoti communal area on the north-eastern border of Mamili National Park totalled 83 head of cattle killed in 2006 due to large free-roaming predators (Fidel 2006).

Over the past 18 years one of the project's local supporting organization, Integrated Rural Development and Nature Conservation (IRDNC), has paved the way for community-based natural resource management and community-based conservation in designated areas of Namibia. Now for the first time communities are prepared to find solutions to HPC without having to resort to killing the animals.

It is now more important than ever to have in place national HPC management policies, to understand the ecology of HPC, to verify the status of large carnivore populations on conservancy land and to put into practice strategies and measures that promote human-predator coexistence. Additionally, with the continuation of community-based natural resource management and community-based conservation in Namibia, a tested and inexpensive tool for indirectly establishing and monitoring large carnivore population densities is urgently required.

2.2. Research area and timing of survey

All research was conducted in the dry months of the year when spotting animals and conducting sign transects are easiest. During the rainy season the study area becomes flooded, by and large bringing research activities to a halt.

The study area falls within the Mudumu South Complex (MSC) that lies in the eastern Caprivi region of Namibia. The MSC is an area that is jointly managed by Mudumu National Park, Mamili National Park and a collaboration of adjacent conservancies. This area is excellent for the purpose of this study. Firstly because it experiences the highest number of HPC incidents in Namibia with livestock depredation causing significant economic losses. Secondly, this area is of high conservation priority to Namibia, conservancy members and additional local and international stakeholders, amongst other reasons because it represents the largest contiguous conservation area in Africa with the largest free-roaming and migratory elephant population in the world and one of the best frontiers for community-based conservation efforts in Africa.

The study provides an opportunity to assist conservancy members and local government with the implementation and monitoring of HPC prevention and mitigation measures.

Each of the project's study sites, one in Mamili National Park, one in Mudumu National Park, one in Balyerwa conservancy, one in Wuparo conservancy, one in Dzoti communal area and one in Shikhaku communal area is in part determined by the size of the sign transect and available prey survey area. Each study site harbours differing densities of available prey and is under different levels of human influence. Work with community members was conducted throughout Balyerwa, Wuparo, Dzoti and Shikhaku that extend from the northern border of Mamili National Park and form a corridor to Mudumu National Park. In total the project is required to manage predators over an area of roughly 250,000 hectare.

2.3. Methods

The most sensible approach to address HPC is by combining short-term mitigation tools with long-term preventative strategies (Treves & Karanth 2003). This reduces current incidents allowing time for the development and implementation of innovative approaches to prevent future conflicts that include improving the attitude of affected communities through education and the broader sharing of benefits associated with the presence of wildlife (Distefano 2005).

Following nine months of preparation through an integrated and participatory process involving local traditional authorities, communities, NGOs and local government, the project was designed as follows.

Short-term alleviation

Short-term alleviation of HPC is to be achieved by the monitoring of radio-collared large-carnivores that frequent communal areas. Monitoring of predators is to be performed by a newly appointed and trained Predator Monitoring Unit (PMU) that will cover the extent of the project area. Additional short-term PMU responsibilities include (1) informing communal pastoralists on a daily basis of areas that are to be avoided for grazing purposes given the whereabouts of radio-collared predators, (2) encouraging better animal husbandry such as kraaling livestock at night and herdboy vigilance, (3) conducting large carnivore sign transects and prey surveys via set routes on bicycles to assist in the development of a large carnivore monitoring methodology designed to complement the suit of responsibilities assigned to community game guards, (4) assisting in the collection of GPS data pertaining to community infrastructure that will assist in the development of a Geographical Information System (GIS) database for the project area, (5) responding to reports of HPC in the community in order to record important data, and (6) aiding research assistants to perform their duties within the project area.

Long-term preventative strategies

Long-term preventative strategies are to be achieved through community participation involving problem identification, solutions development and implementation. The role of the PMU in attaining these goals, in addition to short-term mitigation, includes (1) community awareness and education pertaining to large carnivore conservation, (2) participatory workshops with livestock owners and herdboys within the project area for problem identification and solutions development, and (3) assisting communities with the implementation of identified solutions.

We believe that this project design will, given time, allow for the sufficient transfer of skills and capacity-building that enables local wildlife managers and livestock owners to self-manage large carnivores without having to depend on ‘outside sources’ in the future. This should be viewed as the bridge that crosses the divide between research and management and is crucial in addressing the conservation issues at hand.

Ecological survey

The research activities that constitute the ecological data collection component of this expedition include large carnivore sign transects, foot prey counts, vehicle prey counts, telemetry, large carnivore behavioural ecology, large carnivore kill records, large carnivore capture, as well as bird and large-medium sized mammal inventories. The outcomes that are to be attained through long-term data collection include large carnivore density and distribution estimates, available prey density and distribution estimates, carrying capacity estimates for both large carnivore and prey species, special spatial and behavioural ecological parameters pertaining to large carnivores in marginal areas and a newly formulated method to count and monitor an array of large carnivores in the African setting. These outcomes and tools are desired by the MET and IRDNC in order for this governmental body and governmental parastatal (a parastatal is a fully or partially state-owned corporation or government agency) respectively to make clear decisions regarding the conservation of the species concerned and the wellbeing of the communities that are affected.

In 2008 Biosphere Expeditions, together with WCDF, ran the first expedition and collected substantial data. Research assistants (also known as expedition team members) underwent a two–day training period before deploying into the field. Datasheets were created to minimise human error and subjectivity and, where necessary, research teams were accompanied by trained local personnel to improve the accuracy of field interpretations or to provide a safe working environment. Research assistants transferred field records into the computer database daily. If this is effort is kept up by subsequent expeditions, there is every reason to believe that the project outcomes will be reached.

Soil and plant community review

A review of soil types and plant communities within the study area was done using all available published and unpublished data for the Caprivi region. This information was later used to explore the ecological status of the study area and by inference the status of its prey and predator populations.

Foot prey counts

Foot prey counts were conducted during the driest period of the year and in the early mornings so as to maximise the possibility of spotting prey species. Five measured effort fixed transect routes were selected to cover the study area, optimise the possibility of locating prey species and to represent the dominant plant communities within the area in approximate proportion to their true abundance. Observers counted sightings of prey species only within a 180 degrees arc ahead of them and only recorded sightings within a 150 m semi-circle (the average viewing distance on foot). Weather conditions, observer names (sampling effort) and sampling time were recorded also and the equipment used included one rangefinder, binoculars, clipboard, datasheet, pen and prescribed African mammal identification field guides.

Vehicle prey counts

Vehicle prey counts were conducted following the same principles as for foot prey counts, except that observers recorded sightings within a 250 m semi-circle (average viewing distance by vehicle). Vehicle speed was kept slow and relatively constant (20 – 30 km/h). Weather conditions, observer names (sampling effort) and sampling time were recorded also. Equipment used included one Land Rover Defender 130 Double Cab, one rangefinder, binoculars, clipboard, datasheet, pens and prescribed African mammal identification field guides.

Large carnivore sign transects

Set sign transects also followed the above principles and were conducted in the dry months of the year when carnivore signs remain evident for longer and the vegetation is sparse to improve the possibility of spotting animals. Observers recorded sightings within 10 m (average viewing distance on foot). Weather conditions, observer names (sampling effort) and sampling time were recorded also and the equipment used included a GPS, binoculars, clipboard, datasheet, pen and prescribed African mammal sign identification field guides.

Telemetry

Study animals were located daily between 15:00 - 06:00. Research teams set out in a Land Rover Defender 130 Double Cab to locate deployed VHF collars using a Telonics TR4 receiver and Yogi folding antennae. Other equipment used included binoculars, GPS, clipboard, datasheet, pen, spotlight and night vision goggles. Once a collared animal was located its location was recorded in the GPS and transferred to a GIS the following day.

Large carnivore behavioural ecology

When time and weather permitted, research teams stayed with located study animals in order to record behavioural, social, breeding, hunting, feeding and spatial ecology data whilst the animals were in their natural environment and whilst interacting with human settlements and domestic animals. Data collection was achieved through following social units and individuals of the study species for many hours at a time, which required resilience and a keen eye in the observers. Although much of the behavioural ecology of these species has been well documented, it is vital that we understand their specific behaviours in this environment. Research teams set out in a Land Rover Defender 130 Double Cab to locate deployed VHF collars using a Telonics TR4 receiver and Yogi folding antennae. Other equipment used included binoculars, GPS, clipboard, datasheet, pen, and spotlight and night vision goggles.

Large carnivore kill records

All research teams carried a kill record datasheet in case they located a kill made by one of the study species. Kills were recorded in order to gain an insight of species specific prey preferences within the study area.

Large carnivore capture logbook

Capture & subsequent radio collaring was done to determine home range size and habitat selection of various large carnivore species. Collaring also allows the project to monitor real-time movements of study animals and set up an early warning system to alert neighbouring communities of the whereabouts of free-roaming predators. At each capture, the physical condition, physical measurements, age and vital signs were recorded. All study animals were immobilised using a tiletamine-zolazepam (Zoletil/CI-744) combination at recommended doses delivered remotely with a dart rifle. Immobilising drugs were delivered in a 3.0 ml or 2.0 ml syringe-dart fitted with a 1.5 mm x 30 mm collared needle. Top-ups were administered as necessary and each study animal was vaccinated for rabies. Once sedated, the animal's vital signs were monitored. Eyes and ears were covered with a soft bandanna and noise levels and light intensity was kept to a minimum. The animal was then examined for signs of injury; thorns, sprains, fractures, location of dart impact and other signs of physical harm and each condition was treated in order of importance (TRIAGE management). A model 101 VHF radio collar from SirTrack (USA) was then fitted and activated, the animal was weighed and measured, and identification photographs were taken. All data were transcribed into a datasheet. Finally each animal was monitored closely until fully recovered. All radio-collared animals were subsequently re-located using a Telonics TR4 receiver and Yogi folding antennae.

Bird and large-medium sized mammal inventories

Recording the presence of additional bird and large-medium sized mammal species was carried out continuously throughout the expedition, utilising existing and acquired identification skills. Species were identified using field guides and recorded on an inventory list.

2.4. Results

Soil and plant community review

Table 2.4a. Summary of the vegetation units and subunits in the study area and the soil types, dominant grass species, dominant tree species and prey species found in each.

Vegetation unit	Soil types	Dominant grass species	Dominant tree species	Prey species
Open water	Hydromorphic	*Phragmites australis* *Cyperus papyrus* *Salvenia molesta* *Nymphia spp.* *Sedge spp.*	None	*Aonyx capensis* *Lutra maculicollis* *Loxodonta africana* *Hippopotamus amphibius*
Floodplains subunits	Clay-loams	*Hyparrhenia hirta*	*Combretum imberbe*	*Papio ursinus,* *Cercopithecus aethiops*
Dry Mamili grassland	Sandy loams	*Cymbopogon excavatus* *Andropogon schirensis* *Setaria sphachelata* *Cynodon dactylon*	*Terminalia sericea*	*Lepus saxatilis,* *Paraxerus cepapi* *Pedets capensis* *Hystrix africaeaustralis* *Thryonomys swinderianus* *Canis mesomelas* *Canis adustus* *Mellivora capensis*
Kwando-Linyanti grassland	Sandy clay-loams	*Miscanthus junceus* *Vitiveria nigritana* *Echinochloa stagnina* *Phragmites australis*	None	*Mungos mungo,* *Pparacynictis selousi* *Herpestes ichneumon* *Galerella sanguinea* *Atilax paludinosus,* *Cynictis penicillata* *Cynictis penicillata,* *Genetta genetta*
Liambezi-Linyanti grassland	Loamy clays	*Eragrostis cf. lapulla* *Imperata cylindrica* *Loudetia simplex* *Hemarthia altissima* *Cynodon dactylon*	None	*Genetta tigrina* *Civettictis civetta* *Felis lybica* *Felis serval* *Felis caracal* *Orycteropus afer* *Loxodonta africana,* *Equus burchellii* *Phacochoerus aethiopicus* *Potamochoerus porcus*

continued…

Table 2.4a. continued.

Vegetation unit	Soil types	Dominant grass species	Dominant tree species	Prey species
Wet Mamili grassland	Clay-loams	*Imperata cylindrica*	*Acacia nigresence*	*Hippopotamus amphibius*
		Hemarthia altissima	*Garcenia livingstonei*	*Syncerus caffer*
		Phragmites australis	*Lonchocarpus capassa*	*Tragelaphus strepsiceros*
		Sedge spp.	*Diospyros mespiliformis*	*Tragelaphus spekei*
		Eragrostis cf. lappula	*Uclea devinorum*	*Tragelaphus scriptus*
		Diditaria brazzai	*Diospyros lycioides*	*Redunca arundinum*
		Hyperrhenia rufa	*Combretum hereroense*	*Aepyceros melampus*
		Ludetia simplex		*Sylvicarpa grimmia*
		Tristachya superba		*Raphicerus campestris*
Mopane Woodland subunits	Sandy loams / clay-loams	*Stipagrostis uniplumis*	*Acacia erioloba*	*Papio ursinus* *Cercopithecus aethiops*
Linyanti woodland	Sands / clay-loams	*Digitaria eriantha*	*Lonchocarpus capassa*	*Lepus saxatilis*
		Eragrostis rigidior	*Combretum imberbe*	*Pedets capensis*
		Schmidtia pappophoroides	*Acacia nigresence*	*Otocyon megalotis*
		Panicum maximum	*Terminalia sericia*	*Mellivora capensis*
			Ziziphus mucronata	*Pparacynictis selousi*
			Combretum hereroense	*Herpestes ichneumon*
			Rhus tenuinervis	*Galerella sanguinea*
			Grewia flavescens	*Atilax paludinosus*
			Acacia fleckii	*Helogale parvula*
Mopane-Aristida woodland	Clay-loams	*Aristida adscensionis*	*Cholophosperum mopane*	*Ichneumia albicauda*
		Aristide rhiniochloa	*Acacia eriolobo*	*Genetta genetta*
		Chloris virgata	*Acacia nigrescens*	*Genetta tigrina*
		Urochloa brachyuran	*Albizia harveyi*	*Civettictis civetta*
		Eragrostis viscose	*Euclea devinorum*	*Proteles cristatus*
		Eragrostis rigidior	*Diosperos lycioides*	*Felis lybica*
		Digitaria eriantha	*Ximenia americana*	*Felis serval*
			Croton gratissimus	*Felis caracal*
			Terminalia *sericea*	*Orycteropus afer*
Mopane - Burkea woodland	Clay-loams	*Aristida adscensionis*	*Colophospermum mopane*	*Loxodonta africana*
		Aristida rhiniochloa	*Burkea africana*	*Equus burchellii*
		Aristida stipoides	*Erythrolphleum africanum*	*Phacochoerus aethiopicus*
		Chloris virgata	*Combretum collinum*	*Potamochoerus porcus*
		Melinis repens		*Hippopotamus amphibius*
		Eragrostis rigidior		*Syncerus caffer*
		Schmidtia pappophoroides		*Giraffa camelopardalis*
		Stipagrostis uniplumis		*Taurotragus oryx*

continued…

Table 2.4a. continued.

Vegetation unit	Soil types	Dominant grass species	Dominant tree species	Prey species
Mopane-Terminalia woodland	Sands / clay-loams	*Tricholaena monachne* *Aristida stipoides* *Aristida adscensionis*	*Terminalia sericea* *Erythrophleum africanum* *Burkea africana* *Combretum collinum* *Acacia fleckii* *Colophospermum mopane*	*Tragelaphus strepsiceros* *Tragelaphus scriptus* *Hippotragus equinus* *Hippotragus niger* *Kobus ellipsiprymnus* *Redunca arundinum*
Mudumu Mulapo woodland	Sands / clay-loams	*Eragristis pallens* *Aristida meridionalis* *Aristida stipitata* *Andropogon chinensis* *Manicum kalaharense* *Aristida spp.* *Chloris virgata* *Eragrostis viscose*	*Terminalia sericea* *Burkea africana* *Baphia massaiensis* *Bauhinia petersiana* *Combretum collinum* *Colophospermum mopane*	*Aepyceros melampus* *Sylvicarpa grimmia* *Raphicerus campestris* *Connochaetes taurinus* *Damaliscus lunatus* *Mungos mungo* *Canis adustus* *Hystrix africaeaustralis* *Paraxerus cepapi*

The Caprivi forms part of the Kalahari basin, a vast inland depression formed some 145 million years ago (Mendelson & Roberts 1997). The study area is covered in thick deposits of Kalahari sand with its valleys and river courses filled with heavier deposits from soils that have washed down from Angola and Zambia. The heavyweight class soils within the study area consist of hydromorphic and organic clay soils, the middleweight class soils of clay loams and sandy clays and the lightweight class soils of sandy loams and sand. Soil types reflect the plant communities in an area and although many of the soils present in the area may not be ideal for cultivating crops, every plant community favours specific species of wildlife and creates ideal niche habitats. Accordingly, each plant community reflects general and specific differences in mammal species composition and abundance. This will be an important factor to consider when evaluating both predator and prey species composition and abundance for the different study sites.

The vegetation units within the study area can be broken down into three broad categories, namely Open Water, Floodplains and Mopane woodlands.

Table 2.4b. Presence (P) / absence (A) of primary large prey units (PLPU), primary small prey units (PSPU), water dependent species (WD), non-water dependent species (NWD), grazers (G), browsers (B) and mixed feeders (M) for each vegetation unit (except Open Water) in 2008.

	PLPU		PSPU		WD		NWD		G		B		M	
	P	A	P	A	P	A	P	A	P	A	P	A	P	A
Mopane woodland	√		√		√		√		√		√		√	
Mixed woodland	√		√		√		√		√		√		√	
Grassland	√		√		√		√		√		√		√	

Table 2.4c. Relative abundance of primary large prey units (PLPU), primary small prey units (PSPU), water dependent species (WD), non-water dependent species (NWD), grazers (G), browsers (B) and mixed feeders (M) for each vegetation unit in 2008.

	PLPU	PSPU	WD	NWD	G	B	M
Mopane woodland	22	78	35	65	14	15	71
Mixed woodland	88	12	88	12	56	4	40
Grassland	79	21	99	1	34	1	65

From 7 September to 21 November 2008 a total of 47 foot prey counts were carried out. The average length of one measured effort fixed transect route was 3.7 km, and it took an average of 2.8 hours to complete each transect. Transect routes covered all three vegetation units within the study area.

From 7 September to 21 November a total of 45 vehicle prey counts were carried out. The average length of one measured effort fixed transect route was 10.2 km, and it took an average of 0.8 hours to complete each transect. Transect routes covered all three vegetation units within the study area.

As vegetation units (broadleaved woodland, mixed woodland and grassland) are antonymous with sample site (Shikhaku, Wuparo and Mudumu, Dzoti and Balyerwa, and Mamili respectively), pooled samples indicate the presence and absence of primary large carnivore species per vegetation unit simultaneously.

Samples for foot and vehicle prey counts were pooled as there was no significant difference between the two datasets ($t = 1.46 < 1.96$) with the only real advantage to vehicle game counts being an increased transect length and average viewing distance and ease of completing a transect. Nine transects per study site were used in the analysis (the amount of transects completed for the least surveyed site) to even out sampling effort.

Only primary prey species were included in the analysis (mostly bovid species) and primary large prey units (PLPU) were standardised at 650 kg (average mass of a buffalo) and primary small prey units were standardized at 180 kg (average mass of a kudu cow). PLPU is viewed as a measure of the quantity of available prey per predator species in each vegetation unit. For example, if one PSPU is standardised at 180 kg, then it would require ten duiker (average mass of 18 kg) to make up one PSPU. Primary prey species are divided into these two classes to comment further on the relative abundance of the large carnivore species in each study site and vegetation unit.

Presence / absence

Although all classes of prey species recorded here are present in all vegetation units, there are some apparent and obvious differences in their relative abundance and distribution. Large, water-dependent grazers are most commonly found in the mixed woodland and grassland vegetation units. This is because species such as buffalo and hippo, which make up the bulk of this class can be found in these palatable and abundant grassy vegetation units.

It requires more specialised habits to survive in the drier, more nutrient-deficient mopane vegetation units and thus the prey species that occur most commonly there are smaller, mixed-diet, non water-dependent species. Large prey species that do occur in the mopane woodland unit are also the more specialised non water-dependent species such as sable and roan antelope.

Relative abundance

There is good diversity and representation of both large and small prey species within the study area. The bulk of large prey units occur in the grassland and mixed woodland areas and the majority of small prey units occur in the mopane woodland areas. This will naturally reflect the distribution of predator species within the study area, with lion and hyaena capable of preying on both large and small prey units and leopard, wild dog and cheetah preying mostly on small prey units.

Large carnivore sign transects

Table 2.4d. Presence (P) / absence (A) of primary large carnivore species in each vegetation unit in 2008.

	Hyaena		Lion		Leopard		Cheetah		Wild dog	
	P	A	P	A	P	A	P	A	P	A
Mopane woodland	√			√	√		√		√	
Mixed woodland	√		√		√		√		√	
Grassland	√		√		√			√		√

Table 2.4e. Relative abundance of large carnivore species expressed as a percentage for each species per vegetation unit.

	Hyaena	Lion	Leopard	Cheetah	Wild dog
Mopane woodland	60	0	23	50	44
Mixed woodland	26	60	46	50	56
Grassland	14	40	31	0	0

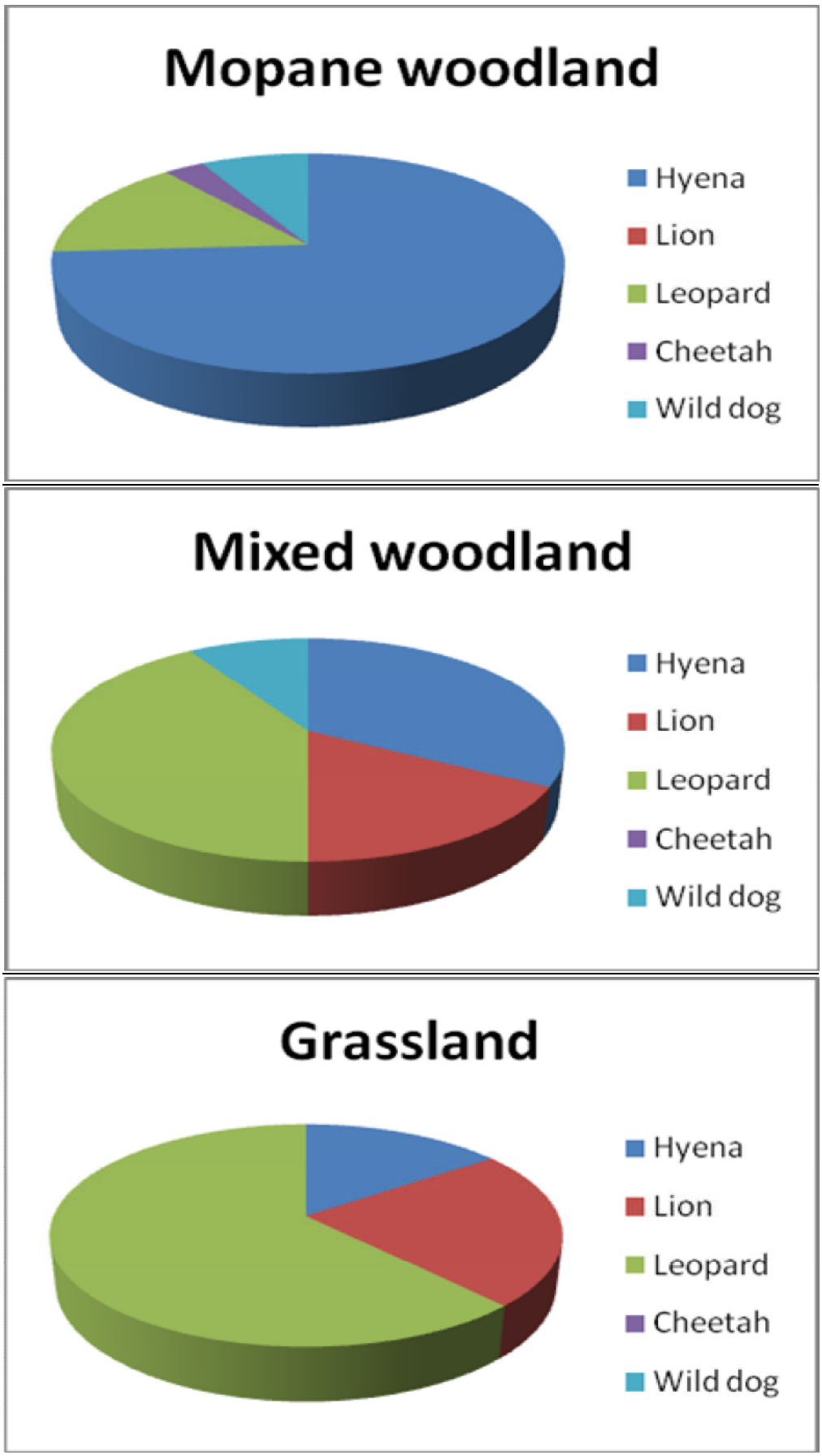

Figure 2.4a. Relative abundance expressed as a percentage for all large carnivore species within the study area and broken up per vegetation unit.

Table 2.4f. Relative population health expressed as a percentage and weighed up against proximity to nearest village.

	Relative health index	Proximity to nearest settlement (km)
Mopane woodland	92	3.7
Mixed woodland	85	2.2
Grassland	38	1.1

From 7 September to 21 November a total of 46 large carnivore sign transects were carried out. The average length of one measured effort fixed transect route was 3.7 km, and it took an average of 2.8 hours to complete each transect. Transect routes covered all three vegetation units within the study area.

Large carnivore sign searched for during this expedition included: spoor (tracks), direct sighting, and scat (faeces). Given the ubiquitous soft soil throughout the study area and absence of heavy and prolonged rainfall during the expedition, large carnivore signs were relatively well preserved and easy to identify. Both spoor and scat had a longevity of approximately 6-7 days dependent on the strength of the wind over the spoor and the intensity of detrivore activity in proximity to the scat. 92% of all signs recorded were spoors, 8% were scats and no direct sightings of large carnivores were recorded whilst conducting the sign transects.

Presence / absence

As plant community (broadleaved woodland, mixed woodland and grassland) are antonymous with sample site (Shikhaku and Wuparo, Dzoti and Balyerwa, and Mamili) respectively, pooled samples indicate the presence and absence of large carnivore species for each vegetation unit during the 2008 expedition.

Both leopard and hyaena are by nature extremely elusive and adaptable species and their ability to coexist with humans in altered environments is well documented (Balme & Hunter 2004). This is likely to be the main reason why these two carnivore populations were present in all areas and biomes within the study area in 2008.

Both cheetah and wild dog require large home ranges and there is evidence of their presence in the Balyerwa and Wuparo areas (see table 2.4d). There are known populations of these two large carnivore species in the adjoining Mudumu National Park and it is conceivable that the signs that we were seeing were remnants of their movements out of Mudumu National Park and that either their home ranges do not extend as far south-east as Dzoti and Shikhaku or that the human settlements that lie between these areas curb them from reaching the south-eastern region.

Lions, on the other hand, are bold and sometimes confrontational, often resulting in their demise. MET and community records from 2002 to 2007 show a clear decline of this species within the area (De Wet 2008) and it is inferred that as a result, the only viable populations of this species occur within the boundaries of Mudumu and Mamili National Parks, which they will periodically leave behind.

The absence of lions in the drier broadleaf woodland areas suggests that they have a preference for the water-rich mixed woodland and grassland areas that accommodate a higher concentration of available prey species, particularly during the drier months when this survey was carried out.

The presence or absence of species, such as lion, cheetah and wild dog, more sensitive to change are also a function of the degree of human disturbance within the study area, particularly in areas that exhibit rich prey species abundance. Lion, being most vulnerable (ecological factors included) can therefore be regarded as an indicator of large carnivore population health in a large, free-roaming homogenous multispecies environment.

Relative abundance

The current dataset on large carnivore sign transects allows an analysis of their relative abundance within the study area. Subsequent datasets and proportionate modelling will, in years to come, allow total population estimates using sign transect data alone.

Table 2.4e shows that hyaena are most frequent in the mopane woodland vegetation unit and that as a species they show a slight preference for broadleaf woodland. They are, however, well distributed throughout the region. When the relative abundance of the hyaena sample population is expressed as a percentage of each species within the sampled sites, they make up 51% of all large carnivores within the study area. Lions were not found in the mopane woodland vegetation unit and when the relative abundance of the lion sample population is expressed as a percentage of each species within the sampled sites, they make up 10% of all large carnivores within the study area. Leopards too are well represented within all the vegetation units and are most common in the mixed woodland and grassland areas. When the relative abundance of the leopard sample population is expressed as a percentage of each species within the sampled sites, they make up 30% of all large carnivores within the study area. There was only one record of cheetah sign during the expedition in the mopane woodland of the Wuparo area. According to the available data the cheetah population makes up only 1% of all large carnivores within the study area. Wild dogs are represented equally in the mixed woodland and mopane woodland units. When the relative abundance of the wild dog sample population is expressed as a percentage of each species within the sampled sites, they make up only 8% of all large carnivores within the study area.

Relative population health and proximity to settlements

The major threat to large carnivore populations within the study area are the direct (persecution) and indirect (human presence, veld disturbance, disease and prey species depletion) threats of human presence. Thus proximity to nearest settlement may play a role in predator population health. When large carnivore population health (k) is expressed as a function of relative abundance (n) and species richness (s) for each vegetation unit, an index of relative population health can be attained for each area expressed as $k = n/5 + s$.

Surprisingly, there is no positive correlation between relative population health and proximity to nearest settlement, which indicates that other environmental, ecological or anthropogenic factors may play a role in the relative population distribution, density and diversity of large carnivores within the area. This is an interesting and unexpected finding that will require more thorough investigation in 2009.

Telemetry

Home range sizes for both female leopards are normal for this species under such conditions as is that of a lion pride of this size (all other ecological parameters considered). An interesting observation is the spatial utilisation of home range as both lion and leopard appear to stake out islands surrounded by permanent deep water channels in the flooded southern region as territories.

Behavioural ecology

Female leopard 1 (Fle1) – An extremely shy animal with two cubs (approximately 15 months of age). Moves in the vicinity of a prominent livestock-owning family (including many goats), but has caused no depredation. Fle1 spends much of her time in open grassland habitat and frequently preys on baboon, bushbuck and reedbuck.

Female leopard 2 (Fle2) – An extremely aggressive animal with one cub (approximately 20 months of age). As a resident of Mparamure island she is never in contact with human habitation or related threats and is an ideal control subject for the study. Fle2 spends much of her time in wooded hummocks interspersing flooded areas and frequently preys on impala and warthog.

Female lion 1 (Fli1) – The largest female in a pride of three; one older though smaller female and one male of approximately three and a half years of age (Mli1). This pride is largely confined to Imparamure island, only periodically moving north towards Pita Kwenta in pursuit of buffalo and only for short periods. On most afternoons this pride is found lying up on tall grass stands adjacent to bodies of water and forages on wooded hummocks during the night, preying largely on kudu, impala and buffalo.

Male lion 1 (Mli1) – A large sub-adult of approximately three and a half years of age. This male will leave the pride permanently in due course and it will be valuable to record his dispersal and resettlement.

Kill records

Table 2.4g. Confirmed large carnivore kills over the expedition period in 2008.

	Wart-hog	Reed-buck	Bab-oon	Impala	Bush-buck	Kudu	Sitat-unga	Zebra	Buff-alo	Duiker
Fle1	2	0	0	2	0	0	0	0	0	1
Fle2	1	3	6	0	2	0	0	0	0	1
Fli1 & Mli1	1	0	0	2	0	2	1	2	6	0

Not a large number of kills were recorded over the study period, however, there does seem to be a clear indication that study animals are targeting the available prey species that are most abundant within their home ranges and are adapting their hunting strategies accordingly. This behaviour is normal.

Capture

Table 2.4h. Physical measurements of captured study animals.

	Total body length (cm)	Shoulder height (cm)	Chest circumference (cm)	Head length (cm)	Head circumference (cm)	Mass (kg)
Fle1	166	34	59	23	39	22
Fle2	186	54	62	25	45	34
Fli1	216	88	110	38	68	± 120
Mli1	256	98	120	40	71	± 140

All animals captured were in good health and blood sample tests revealed no presence of terminal disease in any of them. There were mild cases of mites (*Otodectes cynotis)* on the ear tips of all study animals, which is not unusual. Large carnivores proved to be exceedingly difficult to capture throughout the study period without the aid of bait. All captures and capture procedures ran smoothly and animals took an average of three hours and twelve minutes to become fully ambulatory.

Figure 2.4b. MLI 1 receiving collar.

Figure 2.4c. FLI 1 receiving collar.

Figure 2.4d. FLE 1 receiving collar.

Figure 2.4e. FLE 2 receiving collar.

Bird and large-medium sized mammal inventories

Bird and large to medium sized mammal inventories were compiled (see Appendices 1 and 2). These inventoried will be kept as a baseline survey from year to year and assessed for fluctuations in indicator species and species richness. In the 2008 expedition a total of 294 bird species were recorded belonging to 68 families and 18 orders. A total of 52 large to medium sized mammal species were identified belonging to 12 families and 5 orders.

2.5. Discussion & conclusions

Conducting wildlife research expeditions under truly wild African conditions is challenging indeed and not for the faint-hearted. Research activities must be well orchestrated and conducted under the supervision of experienced personnel for the safety of those involved. Data collated thus are exceedingly valuable.

The expedition has shown that populations of the five large carnivore species are present in the study area and natural prey species are sufficient to sustain these populations. Since the inception of the conservancy system in the Caprivi region it is clear that prey species numbers are on the increase (personal observation). In a natural system this would by inference result in an increase in natural predator species. There is, however, evidence that lion populations fluctuate dramatically from year to year as a result of direct human persecution and intolerance for large carnivores.

Our findings indicate that the peak in livestock depredation over the rainy season is due to lions and hyaenas following buffalo herds out of the national parks and into conservancy areas, as at this time these herbivores are able to disperse from the perennial water systems that abound in the parks. This places predator species in frequent contact and conflict with livestock and the community. During the drier periods of the year herds of cattle are drawn into the parks where there are perennial river systems that provide water and better grazing. We have discovered that at certain points along the northern boundary of Mamili National Park, cattle move far into the park during this time of the year on a daily basis and almost always unattended. This is one of the reasons that we believe there is also a peak in HPC incidents during the drier months. Interview evidence from communal pastoralists provides another plausible explanation. They believe that the winter peaks are due to livestock being left unattended in the fields at night following the maize and sorghum harvest. Both patterns provide significant opportunities to reduce HPC in the area.

Recommendations for action

- Capture, collar and monitor vulnerable predator species to protect them and reduce livestock losses.
- Implement the use of cellular collars to improve the early warning system.
- Explore the use of olfactory deterrents in reducing HPC.
- Build predator-proof kraals in areas most affected.

Outlook and future expedition work

Further research is needed to monitor large carnivore and prey population trends in the study area. Presence / absence and relative abundance surveys should be repeated in the following years. Capturing and collaring of further lion prides, cheetah and wild dog is a high priority in order to monitor these individuals and social units and to build on the efficiency of the early warning system.

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3. Anthropogenic Survey

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3.1. Introduction

> *Protected area management and biodiversity conservation is about managing change, which means managing the process of changing the attitude and behaviour of people.* (Hesselink et al. 2007).

Communication is essential to achieve participation and empowerment and development communication encompasses strategies that improve the likelihood for development projects to succeed. This approach strives for behaviour change and not only information dissemination, education or awareness creation. While the latter are necessary ingredients of communication, they are not sufficient for getting people to change long-established practices or behaviours. Thus, in order to affect behaviour, it is necessary to understand traditional and cultural backgrounds and social structures as, “it is not enough to raise awareness of the ‘benefits’, but it is critical to understand the ‘costs that people perceive such a change would entail” (The World Bank 2007). The identification of main threats, the definition of focal problems and the development of possible solutions are some of the early steps in the development process of this interdisciplinary project.

Cultural background

About 80,000 people live in the Caprivi province, about 4% of Namibia's population (Wikipedia 2007). The largest ethnic groups are the Mafwe, Masubiya, Mayeyi and Mbukushu and all have strong cultural and historical connections with ethnic groups in their former homelands Zambia and Botswana. About 17,000 are part of the Lozi ethnic group of western Zambia. The society of the Lozi people is highly stratified and the political organization of the Lozi has long centred around a monarchy, whose king or today’s chief is known as 'litunga', which translates as 'keeper of the earth'. The Lozi language is spoken as lingua franca by all east Caprivians.

Tensions over land and chiefdoms have persisted over the last 30 years between the Mayeyi, Mafwe and Masubiya tribal groups. The Masubiya view themselves as the dominant people of the Caprivi, which is not accepted by the Mafwe. The Namibian government views both groups historically as equals. The Mayeyi, the dominant cultural group in the study area, have accepted Mafwe leadership over the past 120 years but now strive for independence.

Political background

Tensions exist between the Lozi and the Ovambo, the majority ethnic group of northern Namibia. In 1994 this resulted in the formation of the Caprivi Liberation Front (CLF), which seeks self-rule and independence for the Lozi people from the rest of Namibia. Between 1998 and 1999 Caprivi was under attack from a secessionist group, the Caprivi Liberation Army (CLA). President Samuel promptly declared a state of emergency and over 300 people were detained on suspicion of participating in the attacks, sympathising with the secessionists or assisting them in planning or launching attacks. One of the political

leaders of the coup and as many as 2,500 other people fled to Botswana following a government crack-down on secessionists after discovering a military camp in Mudumu National Park. The political leader was later granted political asylum in Denmark. The armed uprising in the Caprivi region in August 1999 was the latest manifestation of a secessionist movement among members of the Lozi-speaking ethnic groups in Namibia, which dates back several decades.

Economic background

The people of the Caprivi are by and large subsistence agriculture and livestock farmers, fishermen and hunters. Poor crop and livestock yields are often a result of flooding, drought, disease and poor faming practices. Alternative income is sought in the form of handcraft sales, employment through tourism, hunting and development practice.

Conservancy system

In 1996 the MET introduced communal rights over wildlife to communities in communal areas that formed the management unit called a conservancy. Since then many local communities have embraced this opportunity to manage their own wildlife, natural resources and tourism activities, and communal area conservancies are now found in nearly all regions of Namibia. The conservancy approach has proved effective as a conservation strategy, as evidenced by the increase in wildlife in many areas. It has also proved effective as a rural development strategy, generating income for local communities, bringing new jobs and providing new skills and expertise. Since the introduction of the conservancy system, wildlife and economic benefits to local people have increased. For example, the total income from Namibian conservancies increased from about N$ 600,000 in 1998 to over N$ 26 million in 2006 (NACSO 2007).

Social background

Previously the Caprivi was divided into separate provinces. Each province was divided into districts and in each district centre a Lozi representative was appointed as a senior headman or district induna. His responsibilities included political order, collecting taxes and recruiting soldiers. The district induna was aided by several minor headmen or village indunas and the number depended on the size of the area for which he was responsible. The role of a minor induna was to resolve social and legal problems and to act as a direct intermediate between the people (who were often not Lozi) and the Lozi. The regional influence of each individual leader differed widely and depended largely on his personality and achievements.

Today the social system in the Caprivi remains largely unchanged. Indunas are elders and founding members of their villages and as such are responsible for the distribution of community land, law and order.

The tribal leader or chief together with his district indunas form a regional council that is known today as the Traditional Authoritiy (TA) or Khuta. Here decisions concerning land distribution or solving social and legal problems are made. The chief of any recognised tribe in the Caprivi holds a permanent position in Namibia’s judicial system. Decisions of the chief are binding and if traditional rules and regulations are not respected, implementing government policies and other action plans becomes extremely difficult.

The organigram below describes the ruling system in Caprivi.

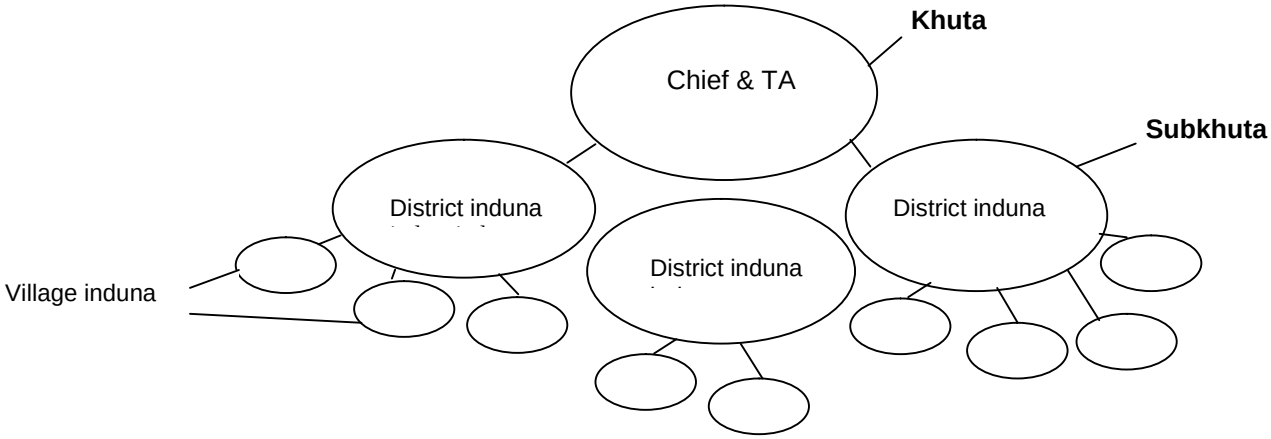


Figure 3.1a. Diagrammatic representation of traditional structures in the study area. See text for details.

From its inception, the conservancy system in the Caprivi has been integrated with the tribal ruling system. Each conservancy forms a conservancy committee in which an induna is a committee member. The area induna, depending on his ethnicity, either belongs to a Subkhuta or a Khuta. Conservancy areas are often shared amongst several tribes and as a result more than one induna may sit on the conservancy's committee. Indunas on the committee are responsible for reporting to their respective Khuta.

Each village has an induna who, together with his relatives and their families and companions, forms a village. If a young man gets married, his wife usually moves to the husband's village. Men are responsible for family livestock and animal husbandry. Gender equality is becoming more evident and the conservancy system supports the emancipation of women in Namibia.

3.2. Methods

The method used in this study is based on a two-way communication process and will be tested and evaluated for its application in this project. The overall communication strategy requires a combination of interpersonal and mass communication skills and approaches.

The overall project strategy is divided into phases, which are to achieve set communication objectives. These objectives are developed from the focal problems as identified in collaboration with the community. The process starts with problem analysis and then turns to problem-solving. Information from secondary sources, community needs, opportunities, problems and possible solutions, as well as the people's culture and perceptions of the relevant issues have to be identified and included in the overall strategy-building process (Mefalopulos & Kamlongera 2005).

Methods used during the expedition were

- community surveys through conducting interviews,
- observation during the interviews, at community events and meetings, and on a day-to-day basis,
- awareness-creation during interactions with the communities.

An important additional part of the study is the gathering of information through unstructured and informal interviews and research with and through different stakeholders in the area. Such interviews are conducted with MET members, other government officials, TAs, local and international NGO members.

Community survey

Community surveys captured demographic and statistical household data (e.g. livestock distribution, population density in the village) as well as attitudes, knowledge (e.g. animal husbandry methods and their consistency) and communication methods of the communities. This assisted in the participatory design of long-term strategies for awareness creation and development of better animal husbandry and other preventative methods in the subsequent phases of the project.

Interviews employed a semi-standardised questionnaire in a stratified random sampling method in order to obtain a representative sample of the whole population in the study area. In order to represent each conservancy within the study area fairly, an equal minimum number of questionnaires were randomly selected for each. The random sampling process was affected by availability of the sample population due to limited access to certain villages and a hit and miss chance of finding people at their homes.

The research area is divided into four communally managed areas, namely Balyerwa and Wuparo conservancies and Dzoti and Shikhaku communal areas, that form a corridor between Mudumu and Mamili National Parks. Taken together this constitutes the study area facing the highest number of HPC incidents in Namibia (MET 2005).

Interviews focused solely on livestock-owning families or individuals. Age and gender were selected randomly, provided they were above 18 and owned or cared for livestock. Where required a translator from the local community working for the project's PMU was chosen to assist with the interviews.

Observation

Additional field notes were taken to record the behaviour and activity of correspondents throughout the interview process. This was done to gauge assertiveness and general ability of correspondents to fully understand the questions and to answer them openly, as these factors affect the reliability of the data.

Secondary information

Additional information sources for the anthropogenic survey were considered. They include information on the history, religion, culture, activities and traditional aspects of the people living in the study area. Information was recorded through storytelling by the indunas, attendance at cultural events, community meetings and literature reviews.

Awareness creation

Awareness creation at this early stage was accomplished through the interview process itself and it is mentioned at this phase of the project as a positive “side effect” of set research activities. It will be conducted strategically and in detail in the subsequent phases of the project. Aspects of awareness transfer to the community throughout the expedition included basic information about resident predator species, research methods used in the project and information about alternative animal husbandry methods.

Results

Results for the anthropogenic survey are discussed in order of their introduction above. Much of the data collected here are qualitative in nature and thus frequently subjective as is common in the social sciences. Other data were suitably quantitative and are thus easier to analyse statistically. In addition, opinions, attitudes and knowledge are expressed from the point of view of individuals. However, the results shown below provide an idea of trends and future directions for the project.

Community survey

In total 140 interviews throughout the study area were completed, covering 92 villages. In addition 218 livestock kraals were recorded within the study area, where most cattle kraals are close to the villages and some are in peripheral areas. The collection of the GPS locations of villages and cattle kraals including the name of the owners in the study area combined with the GPS locations of the carnivores in the GIS database enables us to set up an early warning system to alert neighbouring communities about free roaming predators in their area.

3.3. Results

Geographical distribution

Interviews were conducted in all villages throughout the four community areas within the study area (Balyerwa and Wuparo conservancy and Dzoti and Shikhaku communal area).

Table 3.3a. Geographical distribution of the respondents (total).

Area	Balyerwa	Wuparo	Dzoti	Shikhaku
Total	65	36	19	20

Age distribution

Table 3.3b. Age distribution of the respondents (total).

Age group	18-30	31-45	46-60	> 61
Total	38	52	24	26

The biggest age group interviewed fell between 31-45 followed by 18-30 years of age. The life expectancy in this area is 45 (Mendelson & Roberts 1997) and may contribute to this result.

Gender distribution

Male: 110

Female: 30

The reason for the gender distribution is rooted in the traditional system of the Caprivi in that most often men are responsible for livestock. Men therefore automatically took to participating in the interviews and women mostly when their men were not at home. A minority of single women who owned livestock partook in the interviews.

Socio-economic distribution

Socio-economic distribution was divided into (1) subsistence farmer, (2) commercial farmer (where commercial farming was understood as selling the extra produce of their crop and/or livestock yields), (3) pensioner, (4) other employment and (5) induna. One respondent could give more than one answer, e.g. when a subsistence farmer was also a pensioner.

Table 3.3c. Occupational distribution of the respondents (total).

subsistence farmer	commercial farmer	pensioner	other employment	induna
99	23	8	26	23

Examples for other employment include manager at Lianshulu lodge, a cleaner/gardener at Lianshulu lodge, chair person of conservancy, school cook, predator monitor, driver for a road construction company, cook Hanyini Research Station, traditional tour guide, shop owner, fisherman, grass seller, teacher, artist and ministry staff.

Animal husbandry and livestock loss

Interviews captured data on domesticated species and their densities.

Table 3.3d. Approximate numbers of domesticated species recorded for the study area during the expedition (total).

Total	3518 cattle	839 goats	343 dogs	691 chickens	39 cats

Interviews captured data on the number of and the reasons for livestock losses over the past 12 months.

Table 3.3e. Reasons for cattle and goat losses over 12 months expressed in total and as a percentage.

Cattle				
Stock theft	Poisonous plants	Disease	Predators	Drought/ Flood/ Plastic
73	44	844	480	28
5%	3%	57%	33%	2%
Goats				
Stock theft	Poisonous plants	Disease	Predators	Drought/ Flood/ Plastic
85	12	162	159	0
20%	3%	39%	38%	0%

The two main reasons expressed for cattle losses are disease followed by livestock depredation with disease accounting for 57% and predators for 33% of losses. In domestic goats disease reportedly causes 39% of losses, predators 38% of losses and theft 20% of losses. These figures may well be exaggerated and will be compared with those officially reported and recorded by MET and CGGs.

In total, communities claim that they lose an average of 46% of their livestock per annum. This figure may be unrealistic as the livestock production increase in the Caprivi region is considered to be between 15-25% (DVS 2006) and livestock numbers have steadily increased since the foot and mouth outbreak in 2001.

Diseases expressed for being responsible for livestock losses in the area are shown in table 3.3f below. The accuracy of these assumptions will be compared with those of the MET veterinary department in Katima Mulilo.

Table 3.3f. Livestock losses due to disease in the study area expressed in total and as a percentage.

Foot & Mouth	Anthrax	Lung disease	Blackwater	Gowbladder	Others
55	17	13	5	6	15
50%	15%	12%	5%	5%	13%

The highest amount of livestock loss through disease is due to foot and mouth, followed by anthrax and lung disease. The Namibian government tries to prevent the outbreak of these diseases through their annual vaccination program.

Table 3.3g. Reported incidents for 2007-2008 of seasonal livestock depredation in the area.

	Lion	Hyaena
Dry season	20	41
Rainy season	24	23

The losses caused by predators are mostly due to hyaena and lion. Incidents with hyaenas occur mostly during the dry season. Incidents of livestock depredation occur mainly at night, far away from the cattle kraal and without anyone attending the livestock. This shows the low consistency in animal husbandry practices in the study area, which is a major contributor to the conflict experienced in the area. Indeed the project has to look at the reasons for this in the future to support better animal husbandry methods and the reduction of HPC.

Kraal construction naturally plays a further important part in the protection of livestock. Figure 3.3h below describes the current status of kraal construction in the study area.

Table 3.3h. Details of cattle kraal constructions in the study area (total).

Approximate kraal height	0-1.5m	1.5m+
	101	42
Material	Thorns & branches & sticks	Poles and/or wire
	131	7
Can a predator see through it	Yes	No
	110	19

Most cattle kraals are less than 1.5 m in height, transparent and poorly constructed allowing easy access to most predators.

Community perceptions

51% of the sampled population regard hyaena to be the biggest threat to them amongst the predators present followed closely by lion at 49%. Compared to the data from MET in which 71% of all cases of livestock depredation in the study area are due to hyaena, we can see that public opinion in this case does not correlate well with these records.

In total, only 24% of all respondents felt that predator numbers should increase whilst an alarming 59% of respondents expressed that predator numbers in the area should decrease.

When asked if they have ever physically seen any of these predator species in 140 questionnaires, cheetah had been spotted 13 times, leopards 27 times, wild dog 31 times, lion 76 times and spotted hyaenas 111 times. This sighting frequency, compared with the geographical area covered by the questionnaire, indicates low predator density.

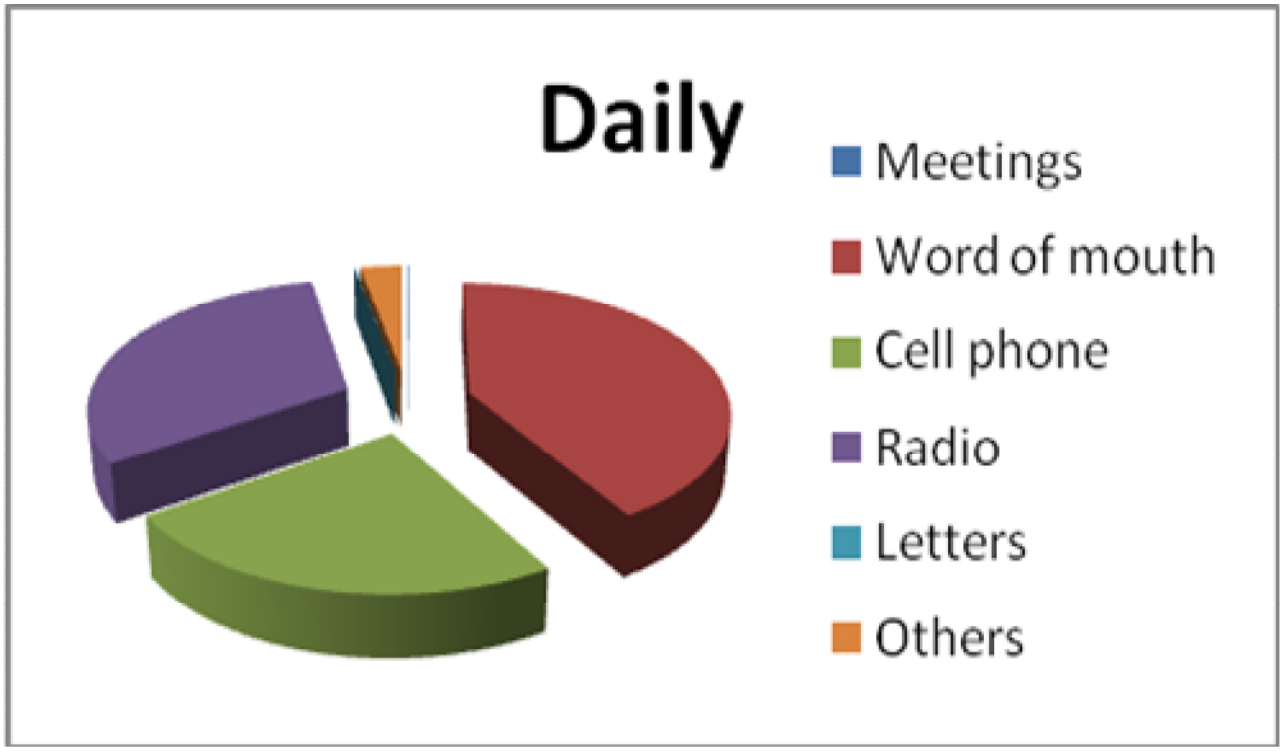
To make an assessment of the reliability of these sightings we asked respondents in what numbers these species are normally seen in. Responses were mostly correct indicating that they probably correctly identified the species. This is a good indication in the sense that it suggests that answers given are likely to be honest and accurate.

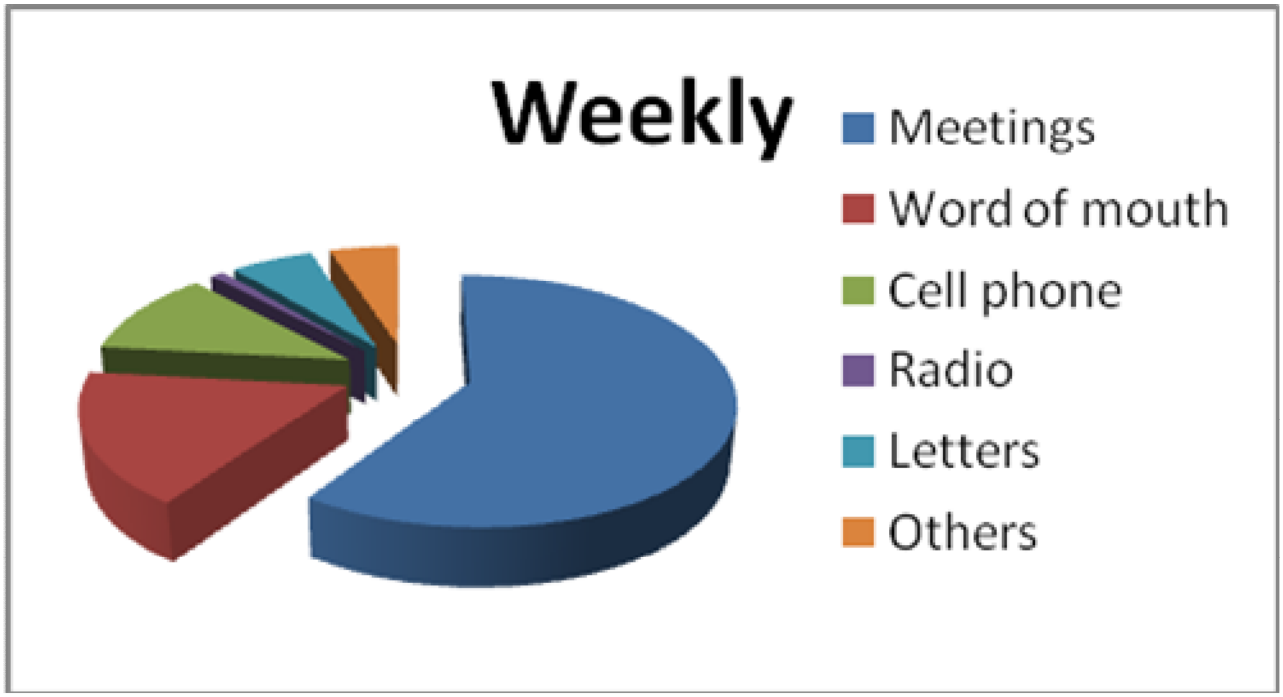
The need to conserve animal predators and human livelihoods at the same time makes the challenge of conservation in the MSC very complex. Compounding the problem are the attitudes of the rural community towards predators, a low skill set in animal husbandry, as well as prejudices against predators. Real results can only be achieved through behavioural change with awareness acceleration and better understanding of the reasons for the behaviour and perception of local communities. All this is a real challenge, but we strongly believe that, given time and a continuation of the efforts described here, predators can be conserved and managed properly within the MSC.

The most cited reasons to conserve predators within the MSC according to the respondents in order of popularity are that (1) overseas hunters pay them money for these animals, (2) tourism lodges (and their benefits) are here because of wildlife such as large predators and (3) they really couldn't care if these predators are there or not, as long as their livestock are not killed by them.

Communication & information

In the last section of the community survey the study looked at communication methods that respondents were using. On a monthly and weekly basis, predominantly community meetings were used to receive information. On a daily basis communities relied more strongly on word-of-mouth, radio and cell phone to receive current information.





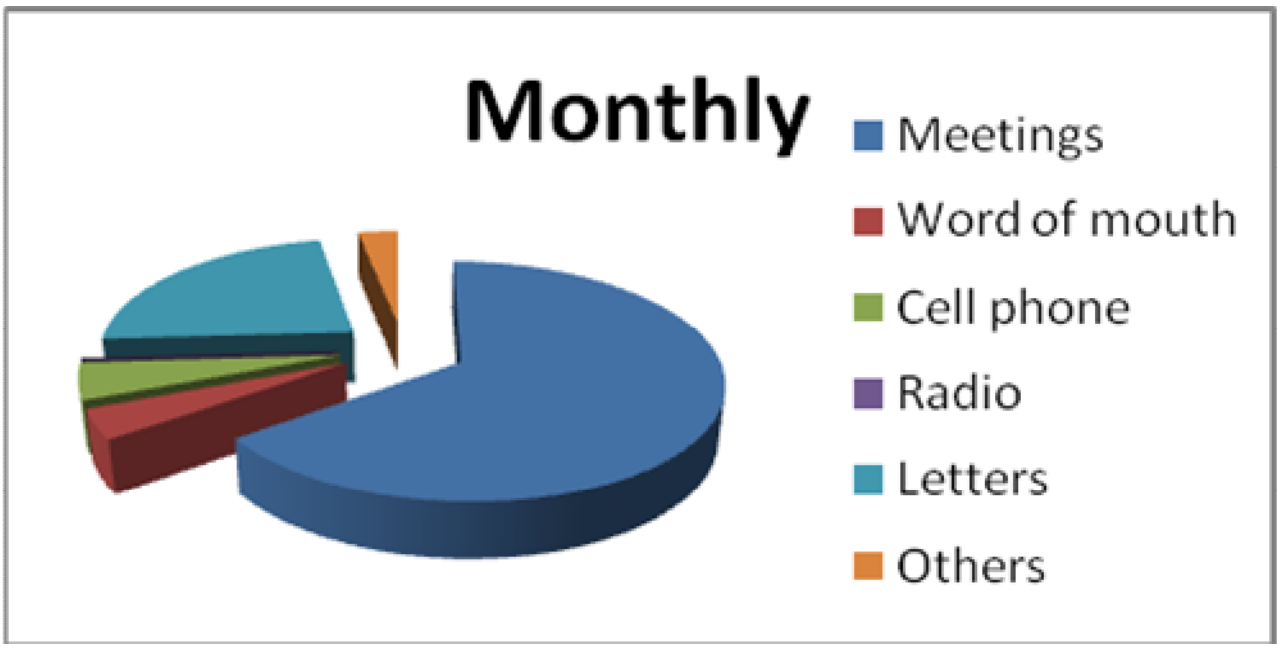


Figure 3.3a. Illustration of daily, weekly and monthly communication methods in the study area.

Observation

Cultural aspects

By observation we could see how the African tribal system predetermines social stratification within the area. Men are responsible for taking care of livestock within the family and thus answered most of the questionnaires.

Understanding

Respondents appeared to understand the questions. The questionnaire shows that disease is the most taxing element to community livestock in the area and that predation by large carnivore species is relatively low in comparison to the losses caused by poisonous plants. However, when we explained to respondents that we are in the area to study livestock predation by large carnivores, they often attempted to circumvent these facts in order to convince us that predators are in fact the largest cause of livestock loss in the area and that something must be done about this, preferably in the form of monetary compensation. This entirely human response for personal gain is of course very well known.

The questionnaire results also revealed that the community is well aware of good animal husbandry practices but in reality we see that very few members of the community are prepared to put these very simple practices to use.

Openness

Respondents, and the community in general were quite open to participate and to express their views. Preceding each interview a description of the project and the reason for and nature of the interview was given, which was designed to make respondents open and unafraid.

The use of visual materials during interviews with pictures of the relevant carnivore species supported further understanding of the questions and created an open atmosphere.

Awareness creation

The interview process also provided an opportunity to create awareness regarding HPC, predator species, animal husbandry practices and the role of the project within the study area. With a high percentage of the population and surface area covered by the expedition's survey work it is foreseeable that the majority of the community have now received good knowledge of these topics, paving the way for the next phase of the project.

Visual documentation

The following pictures illustrate the animal husbandry methods currently in use and problems the respondents have with them.

Figure 3.3b. Standard cattle kraal made of thorns and branches.

Figure 3.3c. Standard cattle kraal entrance.

Figure 3.3d. Interview in front of cattle kraal made of poles.

Figure 3.3e. Interview with livestock owner in front of courtyard.

3.4. Discussion & conclusions

Cattle are preyed on for the most part, with hyaenas responsible for 71% of all recorded losses. This, combined with the current poor animal husbandry practices, provides an opportunity to reduce HPC appreciably. In the time that the expedition conducted this preliminary investigation we found that animal husbandry within the study area was poor and in need of much improvement if local communities wish to protect their assets, both cattle and carnivore. Cattle are taken mostly at night irrespective of whether the animals are kraaled or not. This indicates that the existing and traditional construction of livestock kraals provide little guard from predation. Throughout the expedition period and on numerous other occasions we have found cattle wandering aimlessly and unattended, far from their kraals and on the park boundary during the night. Where livestock are kraaled at night, the kraals have been found to be insufficient to either keep hyaenas and lions out of the enclosure, or more frequently not strong enough to keep panic-stricken cattle confined.

We strongly believe, therefore, that through the construction of stronger kraals combined with actually placing cattle inside them at night, a very significant reduction in HPC incidents within the area from hyaenas alone can be achieved. This, in combination with the active monitoring of predators, can assist local communities to improve their livelihoods by supporting co-existence and the reduction of HPC within the area.

Even though communities have experienced decades of conflict with predators in the study area, our data show that most are willing to find solutions that reduce conflict and protect their assets. Predators are valued in the short term for the revenue generated by their consumptive and non-consumptive use through hunting and tourism respectively. Predators are seen as part of the lives the local people have always lived and are to be preserved for future generations. This essentially positive outlook and the willingness of local people to find solutions provides a very good and unique opportunity to improve livelihoods, and reduce HPC incidents whilst at the same time expanding conservation areas and the protection of biodiversity at large.

The goal of future expeditions is therefore to facilitate these broader objectives and through applied research to contribute to the information required by decision-makers for conservation and rural development. In addition a long-term presence will broaden the communities' knowledge of predators and how to prevent depredation incidents.

The increase in wildlife populations and concomitant increase in conflict incidents for local communities have resulted in averse attitudes toward wildlife. However, through constant awareness-creation efforts and behavioural adaptation by affected communities, the area can benefit significantly from wildlife and this provides the most realistic and tangible avenue for these marginalised people to overcome the poverty trap.

Recommendations for action

- Expand community awareness of the importance and benefits of conservation.
- Provide training workshops for herdboys in the area.
- Involve cattle owners in the building of predator proof kraals.
- Strengthen the capacity of the PMU to manage predators in conservancy areas.
- Extend and improve the efficiency of the early-warning system.

Outlook and future expedition work

Expeditions provide much training and capacity building for local people and personnel (PMU) and this will continue to be a very valuable contribution in years to come. Continued participatory interaction with community members and local job creation is very important in order to facilitate the associated benefits of large carnivores to the local community. This will aid understanding and awareness and create opportunities to better livelihoods and create income alternatives to lower conflict and improve natural resource management.

Crucially, important data collection activities, interviews and community involvement with volunteers should continue to widen and build on the current database and baseline surveys.

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4. Mapping the Study Site

Peter Schuette
Biosphere Expeditions

4.1. Introduction

Topographical maps in the scale of 1:250,000 and 1:50,000 are available for the Caprivi region. These were made in the 1990s after an aerial photography campaign to establish new Namibian infrastructure after independence in 1990.

Landscapes constantly change and this is especially true of the Mudumu South Complex (MSC), which is heavily influenced by rainfall and rising rivers after the rainy season. Those factors are essential for living and working in a landscape that is exposed to extreme heat in the dry season and extreme rainfall in the wet season. This dynamic landscape makes any map outdated because it will always show a picture of a landscape, which is exposed to changes after producing the map.

Commercially available topographic maps of the MSC are not suitable for the purpose of wildlife research as the scale is not detailed enough and the landscape differs from year to year and from season to season. For example, the shoreline of rivers and the number of islands are dependent on the water level caused by the amount of rain. Also the accessibility to certain areas and use of roads differ very often after just one downpour.

All of this makes creating a new map of the study site very useful. Thanks to the development of GPS (Global Positioning System) it is quite easy to map important locations and features. After initial mapping, an annual update can be done relatively quickly and easily.

During the expedition, roads, livestock kraals, villages and the broad infrastructure of the MSC were mapped. In addition, the locations for four study animals were recorded. All these data were input and managed into a GIS (Geographical Information System).

In its strictest sense, a GIS is a computer system capable of assembling, storing, manipulating and displaying geographically referenced information, i.e. data identified according to their locations. Practitioners also regard the total GIS as including operating personnel and the data that goes into the system.

A GIS is a powerful tool with several functions combined: a database for data entry and management, a graphical surface for drawing and displaying the map objects or satellite images, lots of tools for analysis, calculating or generating data and layout tools for generating a map.

4.2. Methods

The Global Positioning System consists of 24 satellites in orbit. Radio signals, containing time and positioning information are sent out from the satellites. With the help of these signals, a position can be pinpointed with an accuracy of < 10 metres (dependent on the GPS receiver).

For the mapping activity, expedition team members were taught how to use a GPS (Garmin GPS60) and how to save waypoints and tracks. With this set of skills, recording features of interest and roads or tracks becomes relatively easy.

All data thus recorded, tracks and waypoints, were downloaded from the GPS to the expedition computer daily to manage and save the current records. Once in the computer, GIS software can then display the data in many ways, for example tracks and waypoints recorded superimposed on a satellite image. All data and underlying maps can also be used to produce a map showing all features or to manage the whole dataset and extract only specific data needed for specific tasks.

4.3. Results and conclusion

During the expedition a total of 46 locations for four study animals, 329 km of roads, 218 livestock kraals, 92 villages and the broad infrastructure of the MSC were mapped. In addition survey routes for game counts or sign transects are components of the map that show the spatial distribution of research activities. The expedition team together spent about 40 days in the field to map all these data points.

All this information when combined with the real-time locations of carnivores in the area constitutes the workings of the early warning system. This will be very useful for the wildlife management of the national parks and the communal conservancies.

The GIS not only shows current locations of carnivores of interest. The spatial representation of accumulated data is also a very useful tool to predict areas where depredation is likely, to find corridors for large carnivore movements and for setting up the early warning system. With the use of more collars in the future, these GIS data will become an invaluable tool for the management of large carnivores within the MSC.

For this all to work, the map created requires an annual update, preferably after the rainy season when the Kwando river’s water level reaches its peak. Additionally the use of recent satellite images will be very useful. Accurate assessment of flooding or island access is only possible from space or air. And only with these data can locations of carnivores and trends be clearly identified. Of course satellite imagery is expensive, so much of this will depend on future funding that the project may be able to secure.

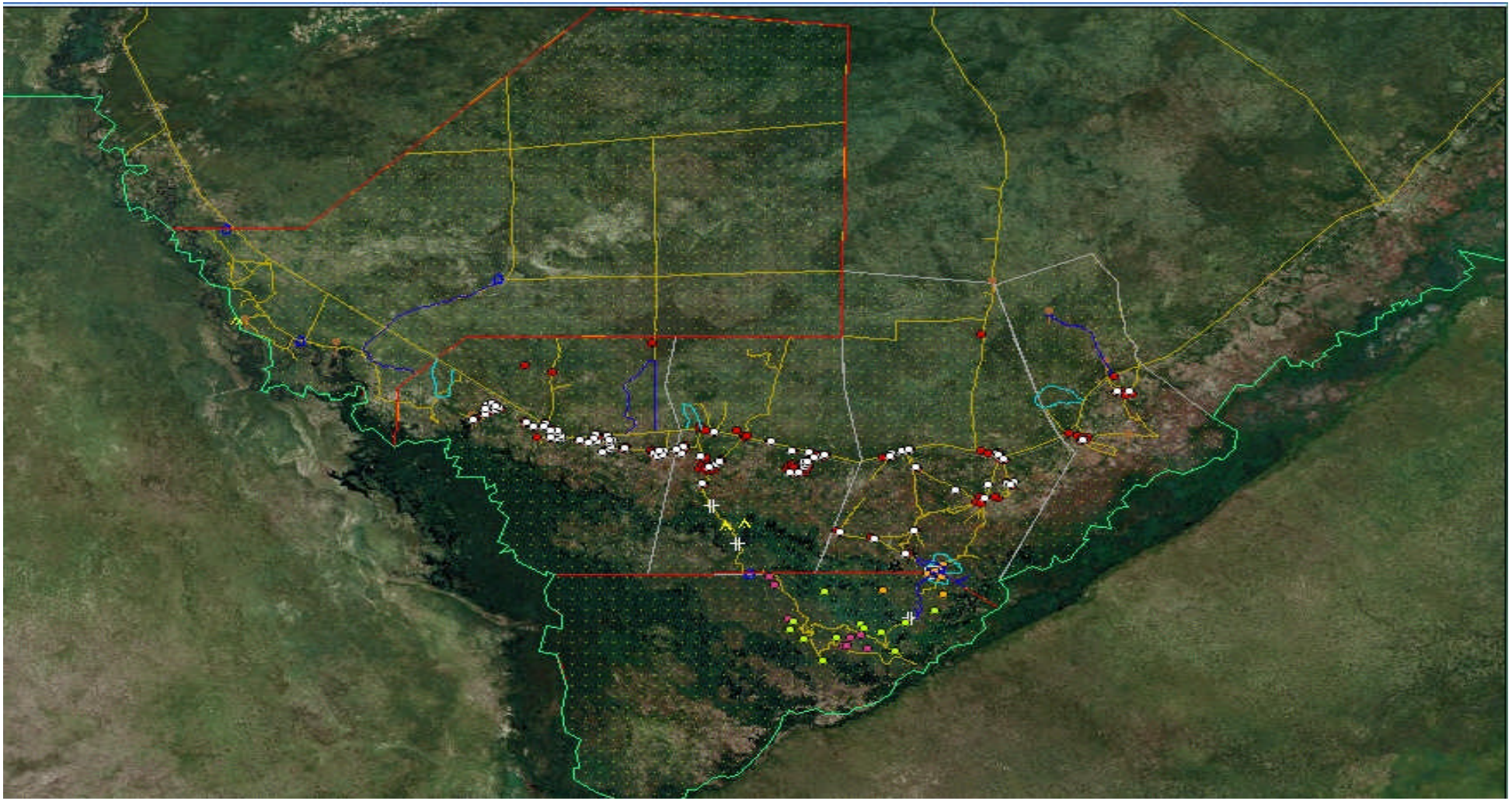

Figure 5a. Earth SAT (July 1999) image with GPS based map depicting country borders (green), National Park boundaries (red), conservancy boundaries (grey), road network (yellow), villages (white), cattle kraals (red), game count routes (dark blue), sign transect routes (blue) and carnivore locations (green, orange, pink). This is a schematic overview representation for the purpose of this report only; the actual GIS dataset is much more detailed and flexible. Mapping by Peter Schuette & Biosphere Expeditions 2008. Layout by Francois de Wet 2009.

Appendix 1: Large-medium mammal inventory 2008.

Recording the presence of large-medium sized mammal species was carried out continuously throughout the expedition, using the simple tick list below, which was kept at base, and utilising existing and acquired identification skills. Species were identified using field guides and recorded on an inventory list.

Chacma Baboon	√
Vervet Monkey	√
Lesser Bushbaby	√
Pangolin	√
Scrub Hare	√
Tree Squirrel	√
Springhare	√
Porcupine	√
Cane-Rat	√
Bat-Eared Fox	
Black-Backed Jackal	√
Side-Striped Jackal	√
African Wild Dog	√
Cape Clawless Otter	√
Spotted-Necked Otter	
Honey Badger	√
Striped Weasel	
Striped Polecat	√
Banded Mongoose	√
Selous's Mongoose	
Large Grey Mongoose	
Slender Mongoose	√
Water Mongoose	√
Dwarf Mongoose	
White-Tailed Mongoose	√
Yellow Mongoose	
Small-Spotted Genet	
Large-Spotted Genet	√
Civet	√
Spotted Hyaena	√
Brown Hyaena	
Aardwolf	√
African Wild Cat	√
Serval	√
Caracal	√
Cheetah	√
African Lion	√
African Leopard	√
Aardvark	√
African Elephant	√
Burchell's Zebra	√
Warthog	√
Bushpig	√
Hippopotamus	√

Southern Giraffe	√
Cape Buffalo	√
Eland	√
Kudu	√
Sitatunga	√
Bushbuck	√
Roan Antelope	√
Sable Antelope	√
Waterbuck	√
Red Lechwe	√
Puku	√
Reedbuck	√
Blue Wildebeest	√
Tsessebe	√
Impala	√
Steenbok	√
Common Duiker	√

Appendix 2: Bird inventory 2008.

Recording the presence of bird species was carried out continuously throughout the expedition, using the simple tick list below, which was kept at base, and utilising existing and acquired identification skills. Species were identified using field guides and recorded on an inventory list.

Great Crested Grebe	
Little Grebe	√
White-Breasted Cormorant	√
Reed Cormorant	√
African Darter	√
Great White Pelican	
Pink-Backed Pelican	√
Goliath Heron	√
Purple Heron	√
Grey Heron	√
Black-Headed Heron	√
Yellow-Billed Egret	√
Great-White Egret	√
Little Egret	V
Cattle Egret	√
Squacco Heron	√
Malagasy Pond Heron	
Black Egret	√
Slaty Egret	√
Rufous-Bellied Heron	√
White-Backed Night-Heron	√
Great Bittern	√
Black-Crowned Night-Heron	√
Green-Backed Heron	√
Dwarf Bittern	√
Little Bittern	
Black Stork	
Abdim's Stork	
White Stork	√
Yellow-Billed Stork	√
Marabou Stork	√
Saddle-Billed Stork	√
Openbilled Stork	√
Wooly-Necked Stork	
Greater Flamingo	
Lesser Flamingo	
African Spoonbill	√
Hamerkop	√
Hadeda Ibis	√
Glossy Ibis	√
Sacred Ibis	√
Spur-Winged Goose	√
Egyptian Goose	√
Knob-Billed Duck	√
White-Faced Duck	√
Fulvous Duck	

African Wood-Owl	
Marsh Owl	√
White-Faced Owl	√
African Barred Owlet	
Pearl-Spotted Owlet	√
African Scops-Owl	√
European Nightjar	√
Pennant-Winged Nightjar	
Freckled Nightjar	
Fiery-Necked Nightjar	√
Rufous-Cheeked Nightjar	
Square-Tailed Nightjar	√
Swamp Nightjar	
Alpine Swift	√
European Swift	
African Black Swift	√
Bohm's Spinetail	
Little Swift	√
Horus Swift	
White-Rumped Swift	√
African Palm-Swift	
Narina Trogon	
African Broadbill	
Red-Faced Mousebird	√
Giant Kingfisher	√
Pied Kingfisher	√
Half-Collared Kingfisher	√
Malachite Kingfisher	√
African Pygmy Kingfisher	√
Woodland Kingfisher	√
Brown-Hooded Kingfisher	√
Grey-Headed Kingfisher	√
Striped Kingfisher	√
European Bee-Eater	√
Blue-Cheeked Bee-Eater	√
White-Fronted Bee-Eater	√
Carmine Bee-Eater	√
Swallow-Tailed Bee-Eater	
Little Bee-Eater	√
Lilac-Breasted Roller	√
Racket-Tailed Roller	
European Roller	√
Purple Roller	√
Broad-Billed Roller	√
Ground Hornbill	√
Trumpeter Hornbill	√

White-Backed Duck	
African Pygmy Goose	√
Southern Pochard	
Maccoa Duck	
Yellow-Billed Duck	√
African Black Duck	
Cape Shoveler	
Cape Teal	
Red-Billed Teal	√
Hottentot Teal	√
Lappet-Faced Vulture	√
White-Headed Vulture	√
Cape Vulture	
White-Backed Vulture	√
Palm-Nut Vulture	
Egyptian Vulture	
Hooded Vulture	√
African Fish-Eagle	√
Osprey	√
Bateleur	√
Brown Snake-Eagle	√
Black-Breasted Snake-Eagle	√
Western Banded Snake-Eagle	
Steppe Eagle	√
Lesser Spotted Eagle	
Tawny Eagle	√
Verreaux's Eagle	
Martial Eagle	√
African Crowned Eagle	√
Long-Crested Eagle	√
African Hawk-Eagle	√
Ayres's Eagle	√
Booted Eagle	
European Honey-Buzzard	
Augur Buzzard	
Wahlberg's Eagle	√
Steppe Buzzard	√
Gymnogene	√
African Marsh-Harrier	√
Western Marsh-Harrier	
Pallid Harrier	
Montagu's Harrier	
Pale Chanting Goshawk	
Dark Chanting Goshawk	
Black Kite	
Yellow-Billed Kite	√
Black-Shouldered Kite	√
African Cuckoo Hawk	√
Lizard Buzzard	√
Pygmy Falcon	
Ovambo Sparrowhawk	√
Gabar Goshawk	

Bradfield's Hornbill	
Crowned Hornbill	√
African Grey Hornbill	√
Yellow-Billed Hornbill	√
Red-Billed Hornbill	√
Green Wood-Hoopoe	√
Common Scimitarbill	√
African Hoopoe	√
Greater Honeyguide	√
Lesser Honeyguide	√
Slenderbilled Honeyguide	
Sharpbilled Honeyguide	√
Black-Collared Barbet	√
Crested Barbet	√
Acacia Pied Barbet	√
Yellow-Fronted Tinkerbarbet	
Olive Woodpecker	
Cardinal Woodpecker	√
Golden-Tailed Woodpecker	√
Bennett's Woodpecker	
Bearded Woodpecker	√
Dusky Lark	
Flappet Lark	√
Eastern Clapper Lark	√
Monotonous Lark	√
Sabota Lark	√
Fawn-Coloured Lark	
Rufous-Naped Lark	√
Red-Capped Lark	√
Pink-Billed Lark	√
Chestnut-Backed Finchlark	√
Grey-Backed Finchlark	
Red-Breasted Swallow	√
Mosque Swallow	√
South African Cliff Swallow	
Greater Striped Swallow	√
Lesser Striped Swallow	√
Barn Swallow	√
Wire-Tailed Swallow	√
White-Throated Swallow	
Pearl-Breasted Swallow	
Common House-Martin	
Grey-Rumped Swallow	√
Banded Martin	√
Sand Martin	
Brown-Throated Martin	√
Rock Martin	
Fork-Tailed Drongo	√
Black Cuckooshrike	√
White-Breasted Cuckooshrike	
African Golden Oriole	
European Golden Oriole	

Shika	√
Little Sparrowhawk	√
Black Sparrowhawk	√
African Goshawk	√
Lanner Falcon	√
Peregrine Falcon	
Red-Necked Falcon	
Eleonora's Falcon	
Eurasian Hobby	
African Hobby	√
Bat Hawk	
Sooty Falcon	
Dickinson's Kestrel	
Amur Falcon	
Red-Footed Falcon	√
Lesser Kestrel	
Rock Kestrel	
Greater Kestrel	
Red-Billed Francolin	√
Swainson's Francolin	√
Natal Francolin	
Orange River Francolin	
Shelley's Francolin	√
Crested Francolin	
Coqui Francolin	√
Helmeted Guineafowl	√
Crested Guineafowl	
Common Ostrich	
Harlequin Quail	
Common Quail	√
Small Buttonquail	
African Finfoot	
Red-Knobbed Coot	√
Common Moorhen	√
Lesser Moorhen	
Purple Gallinule	
Lesser Gallinule	
Black Crake	√
African Jacana	√
Lesser Jacana	√
African Rail	√
Corn Crake	
Spotted Crake	
African Crake	√
Striped Crake	
Baillon's Crake	√
Red-Chested Flufftail	√
Crowned Crane	√
Wattled Crane	√
Blue Crane	√
Secretarybird	√
Kori Bustard	√

Black-Headed Oriole	√
Pied Crow	√
Black Crow	√
Ashy Tit	
Rufous-Bellied Tit	
Southern Black Tit	√
Spotted Creeper	
Arrow-Marked Babbler	√
Black-Faced Babbler	√
Hartlaub's Babbler	
Southern Pied Babbler	
Red-Eyed Bulbul	
Black-Eyed Bulbul	√
Terrestrial Brownbul	√
Yellow-Bellied Greenbul	√
Kurrichane Thrush	√
Groundscraper Thrush	√
Miombo Rock-Thrush	
Familiar Chat	√
Arnott's Chat	
Capped Wheatear	
European Wheatear	
Whinchat	
African Stonechat	√
Anteating Chat	
Red-Capped Robin-Chat	
White-Browed Robin-Chat	√
Bearded Scrub Robin	
White-Browed Scrub-Robin	√
Kalahari Scrub-Robin	
Thrush Nightingale	
Willow Warbler	√
Icterine Warbler	
Olive-Tree Warbler	√
Garden Warbler	
Common Whitethroat	
Burnt-Necked Eremomela	
Green-Capped Eremomela	√
Yellow-Billed Eremomela	√
Grey Penduline-Tit	
African Sedge-Warbler	√
Cape Reed-Warbler	√
River Warbler	
African Marsh-Warbler	
European Reed-Warbler	√
European Marsh-Warbler	
Greater Swamp-Warbler	
Greater Reed-Warbler	
European Sedge-Warbler	
Stierling's Barred Warbler	
Barred Warbler	
Grey-Backed Camaroptera	√

Stanley's Bustard	
Black-Bellied Bustard	√
Red-Crested Koraan	√
Northern Black Koraan	
Black-Winged Stilt	√
Avocet	
Common Ringed Plover	
Three-Banded Plover	√
Kitlitz's Plover	
Caspian Plover	
Chestnut-Banded Plover	
White-Fronted Plover	√
Crowned Lapwing	√
Long-Toed Lapwing	√
White-Crowned Lapwing	√
Spur-Winged Lapwing	
African Wattled Lapwing	√
Blacksmith Lapwing	√
Grey Plover	
Ruff	
Curlew Sandpiper	
Sanderling	√
Little Stint	
Common Sandpiper	√
Green Sandpiper	√
Wood Sandpiper	√
Terek Sandpiper	
Common Redshank	
Common Greenshank	√
Marsh Sandpiper	
Spotted Redshank	
Bar-Tailed Godwit	
Lack-Tailed Godwit	
Greater Painted-Snipe	√
African Snipe	√
Great Snipe	√
Ruddy Turnstone	
Collared Pratincole	
Black-Winged Pratincole	
Rock Pratincole	
Spotted Thick-Knee	√
Water Thick Knee	√
Temmnick's Courser	
Double-Banded Courser	
Three-Banded Courser	
Bronze-Winged Courser	√
Lesser Black-Backed Gull	
Caspian Tern	
African Skimmer	√
Grey-Headed Gull	
White-Winged Tern	
Whiskered Tern	

Chestnut-Vented Tit-Babbler	
Long-Billed Crombec	√
Yellow-Breasted Apalis	
Fantailed Cisticola	√
Desert Cisticola	
Neddicky	√
Tinkling Cisticola	
Rattling Cisticola	√
Luapula Cisticola	
Chirping Cisticola	
Red-Faced Cisticola	
Tawny-Flanked Prinia	√
Black-Chested Prinia	
Spotted Flycatcher	√
Ashy Flycatcher	
Fantailed Flycatcher	√
Southern Black Flycatcher	V
Chat Flycatcher	
Marico Flycatcher	
Pale Flycatcher	
African Paradise Flycatcher	√
Collared Flycatcher	
Yellow White-Eye	√
Chinspot Batis	√
Cape Wagtail	√
African Pied Wagtail	
Grey Wagtail	
Yellow Wagtail	√
Wood Pipit	
Grassveld Pipit	√
Plain-Backed Pipit	
Buffy Pipit	
Tree Pipit	√
Pinkthroated Longclaw	
Crimson-Breasted Shrike	√
Longtailed Shrike	√
Souza's Shrike	√
Red-Backed Shrike	√
Lesser Grey Shrike	
Fiscal Shrike	√
Tropical Boubou	√
Swamp Boubou	√
Black-Crowned Tchagra	√
Three-Streaked Tchagra	√
Grey-Headed Bush-Shrike	
Orange-Breasted Bush-Shrike	√
Redbilled Helmet-Shrike	
White Helmet-Shrike	√
Southern White-Crowned Shrike	
Brubru	√
Puffback Shrike	√
Greater Blue-Eared Starling	√

Double-Banded Sandgrouse	√
Yellow Throated Sandgrouse	
Namaqua Sandgrouse	
Burchell's Sandgrouse	√
Rock Pigeon	
Feral Pigeon	
African Mourning Dove	√
Red-Eyed Dove	√
Cape Turtle-Dove	√
Laughing Dove	√
African Green Pigeon	√
Emerald-Spotted Wood-Dove	√
Namaqua Dove	√
Grey-Headed Parrot	√
Meyer's Parrot	√
Black-Cheeked Lovebird	
Schalow's Turaco	√
Grey Lourie	√
European Cuckoo	
African Cuckoo	√
Red-Chested Cuckoo	√
Black Cuckoo	√
Striped Cuckoo	
Jackobin Cuckoo	√
Great Spotted Cuckoo	√
Diderick Cuckoo	√
Klaas's Cuckoo	√
Emerald Cuckoo	
Coppery-Tailed Coucal	√
White-Browed Coucal	
Senegal Coucal	√
Black Coucal	√
Giant Eagle-Owl	√
Pel's Fishing Owl	√
Spotted Eagle-Owl	√
Barn Owl	√
Cape Glossy Starling	√
Miombo Blue-Eared Starling	
Plumcoloured Starling	
Burchell's Starling	√
Longtailed Starling	√
Sharp-Tailed Starling	
Wattled Starling	√
Red-Billed Oxpecker	√
Yellow-Billed Oxpecker	√
Scarlet-Chested Sunbird	
African Black Sunbird	√
Copper Sunbird	
Collared Sunbird	√
White-Bellied Sunbird	√
Marico Sunbird	

Purple-Banded Sunbird	
Great Sparrow	
House Sparrow	√
Yellow-Throated Sparrow	√
Southern Grey-Headed Sparrow	√
Red-Billed Buffalo-Weaver	√
White-Browed Sparrow-Weaver	
Thick-Billed Weaver	√
Village Weaver	√
Southern Masked Weaver	
Spectacled Weaver	√
Lesser Masked Weaver	√
Red-Headed Weaver	
Southern Brown-Throated Weaver	
Golden Weaver	
Red-Billed Quelea	√
Red Bishop	√
Golden Bishop	
White-Winged Widow	√
Red-Shouldered Widow	√
Pin-Tailed Whydah	√
Shaft-Tailed Whydah	√
Long-Tailed Paradise-Whydah	√
Broad-Tailed Paradise-Whydah	
Steelblue Widowfinch	√
Jameson's Firefinch	√
Red-Billed Firefinch	√
Brown Firefinch	√
Violet-Backed Waxbill	
Black-Faced Waxbill	
Common Waxbill	√
Blue Waxbill	√
Bronze Mannikin	
Cut-Throat Finch	
Red-Headed Finch	
Scaly-Feathered Finch	
Melba Finch	√
African Quailfinch	√
Orange-Breasted Waxbill	√
Yellow Canary	
Yellow-Fronted Canary	√
Black-Throated Canary	
Cinnamon-Breasted Bunting	
Golden-Breasted Bunting	√
Lark-Like Bunting	

Appendix 3: Expedition diary by Peter Schuette.

12 August

Hello and welcome to the Caprivi diary for 2008. I am Peter Schuette, your expedition leader, and you will be hearing from me regularly over the next few months as I update you on what's happening.

Some admin first: my phone number in Namibia will be +264 (81) 3957863. Please note that this is for emergency purposes only, for example if you are about to miss assembly or something along those lines.

As I write this, we are packing up our equipment, ready to fly down to Africa to get things set up for you. There will be three of us initially. Malika Fettak, our star intern and general Biosphere slave, Dr. Matthias Hammer, our founder and Managing Director, and yours truly. Together well be arriving in Namibia over the next few days on different flights and making our way to the Caprivi delta. Well have all the setting up to do and we are very excited to see the research station in all its operational glory (we hope!) soon. Julia & Francois, our resident scientists, have worked very hard over the past few months to get the research station built and ready for you, and in fact much of your money has gone into building it. So before you even lift a finger with data collection, you can see where your money went! (Talking about money – if you have not yet returned your paperwork and paid your balance, then you are a day late now. Go on – make our job a bit easier by not having to chase you!)

Incidentally, this "building a research station from team member's dosh" is tried and tested model of Biosphere Expeditions - providing interest-free loans to our scientists to build research stations that we then use over the years with the scientists providing "free" accommodation until the loan is paid back. That way we generate capacity, local jobs and facilities and in the end our scientists have a research station that belongs to them to do their research & conservation work, generate income from and provide employment for local people. Everyone wins, everyone's happy – at least that's the general plan ;)

Anyway, I digress. So the three of us will be in Namibia over the next few weeks, setting up, playing film stars with a team from the ZDF (a very large German public broadcaster) before the first team arrives and generally trying to make sure that you have beds to sleep in and some food to keep you going. You hope ;))

Malika and Matthias will then be with us for a week of the first slot, before travelling the world again on other projects. Then you'll be all mine!

I hope you are all looking forward to coming out to help us in this beautiful part of Africa. Team 1 especially will be trailblazers where teething problems will probably abound until we get into the groove. So please all come with your best sense of humour, ready to muck in and be real expeditioners (not tourists!). For those of you who are coming to Africa for the first time, you are in for some amazing experiences. For those of you with experience of Africa, get ready to experience it differently and away from all the comfy lodge for the white man rubbish ;)

See you in a few weeks. Have fun packing and safe travels!

Peter Schuette
Expedition leader

P.S. You may not hear from me again until the expedition starts, so don't panic and assume that no news is good news ;) But then again you may well hear from me. This is Africa, you know!

22 August

Just a quick one from the field, where base is up for you (more or less) and we are frantically trying to get ready ;)

Showers are hot (one each for the boys & girls), toilets are flushing (also one each for the boys & girls) and your reed & bamboo huts are up in all their wonky glory. It's hot & dusty, but can get chilly at night, so make sure you bring at least one set of warm clothing. Amazing sunsets, pitch-black skies with millions of stars & the Milky Way, the sounds of lions, elephants, hippos & countless birds at night are naturally part of it all. There's also a leopard with her cub who's taken a fancy to camp, visiting at night.

Went for a short drive around the study site yesterday. The waters are still high after a record flood, so if you are not used to the water getting up to the bonnet when crossing "puddles", better get acquainted with the idea and the sound of water rushing through the gaps in the doors.

Saw elephants, hippos, kudus, baboon and countless birds on that short drive. No decent maps of the place, of course (you'll be creating them), and virtually nothing in terms of infrastructure. So its back to GPS & compass navigation and welcome to "Wild Africa Junction" - we didn't call the expedition that for nothing ;)

24 August

Yesterday was a fun day. We went for a reccee into the park, then for an afternoon swim in a hippo pool. So far, so good.

Then a tyre lost air & we had to change it, then I dropped my mobile into the water, then we drive back as the sun set to find a park ranger stuck in the mud. We tried to help with one of our two vehicles and got that stuck too. Three hours later we were totally covered in stinking bog water, cold, muddy, with leeches on our legs, bitten by mosquitoes and one car down, which after jacking countless times to get it out, we had to abandon for the night, because it refused to start once we almost got it out!

All fun & games, though, and we were laughing as we toiled. We managed to help the ranger out eventually & drove back in the dark with his car and the second Land Rover. Every pool (17) we passed had a crocodile in it and we saw civet and African wild cat scuttling around in the dark.

We've just recovered the lost vehicle & are back on track, literally.

Important lesson for everyone: off the tracks, you will get stuck. On the tracks you may get stuck. Don't take any risks otherwise you'll be jacking, digging and winching in the mud all day & night :)

I bet that with each diary entry, you are increasingly looking forward to joining us in the bush & mud, aren't you?

1 September

Not much to report other than elephants migrating past base, hippos grunting at night, a leopard in the bush & lots of shopping & still more preparation work going on.

It's still hot, it's still dusty & today the wind has whipped up so that we now have it in our eyes & teeth too :)

There's also a bit of a problem with termites, so some of you may be sleeping to the sound of gentle munching & crunching. That is if we don't decide to call in the chemical artillery first.

See the first lot of you soon!

16 September

What can I say other than it's been a hectic and eventful time since I last wrote. The main news is that we've caught & collared our first leopard yesterday. Other than that the last couple of weeks have been tales of getting ready, team 1 arriving, cars breaking down & getting stuck, plans changing constantly, attempts of tooth extraction in the field by a qualified dentist team member, team 1 being a model of flexibility & effort, herds of elephants walking past camp, wrecking the access road, holding up our work and generally making a nuisance out of themselves ;), some boiling hot days, lots of sand and dust, and things being as they tend to be with a brand-new expedition trailblazing its way into a groove. Suffice it to say that we're not quite there yet, so come prepared for some organised chaos!

Now some admin. Reading through the kit list, you do NOT need a "mess kit: non-breakable camping cutlery and crockery, and a non-breakable mug", as we are packing a dinner box for the capture team staying out at night that basically has everything in it you need. Instead you DO need a travel mosquito net that you can take out with you on the overnight capture activity, sling up under a tree and go to sleep under the stars. The smaller this net packs down, the better, as it will be used for your overnight fly camps and may need to be put up and taken down at short notice as you chase lions, leopards and other predators to capture them for collaring or follow their collar signals around the study site.

You also need N$300 (Namibian Dollar) in cash for me if you want to do the river cruise on the rest day on Saturday. There is little opportunity to change money into N$ in Livingstone, as Livingstone is in Zambia, so I recommend you change some money at home. You are very unlikely to get Namibian Dollars out of your bank – instead you can change your money into ZAR (South African Rand), which is accepted all over Namibia at a rate of 1:1 as the two currencies are linked.

So please make sure you bring at least 300 Rand with you in cash. We also run a bar service at camp for soft drinks, beer and wine, so if you bring 2000 Rand (approximately 200 Euros or 160 Pounds Sterling or 300 US Dollars), then this also gives you some cash for drinks from the bar, souvenirs, etc.

Confused? I am sure you're not – just bring 2000 Rand cash with you and you will be fine. And to make things even clearer, I am attaching the plans of what you'll be doing once you are out here.

20 September

After dropping the first team in Katima Mulilo yesterday, where the shuttle to Livingstone collected them, today we have some time to re-org. As I sit here in Katima on the Zambezi river, looking over to the other side to Zambia, I just wanted to give you a summary of what happened over the last few days.

Buffaloes are increasing in the vicinity around camp and with them are the lions. And, indeed, the capture group found some lion tracks and on Tuesday night they tracked four lions in the dense bush, but lost them again in an hour-long search.

But then on Wednesday Francois took Viv, Inge, Francoise and Ronel out for the night when they spotted three lions of yesterday's group of four. Quickly Francois darted one female with the dart gun, then lay her on the Land Rover pick-up to fit a collar. What a lifetime experience for the team – I am sure no one from this capture team will ever forget touching a wild lion in Mamili NP!

And for our project this is great news too; one collared leopard and one lion, so the monitoring of the predators can start from now on!

But on the back of all this excitement, the other activities are no less important for the project! We established vehicle game count routes and foot transects for counting spoors and game. During these activities we found tracks of leopard, hyaena, wild dog and spotted lots of game such as wildcat, serval, kudu, duiker, warthog, reedbuck, steenbok, bushbuck, elephant, hippo and lots of birdlife, such as eagle, heron, etc. It is a very special experience to go walking with a guide/ranger in the national park, where lions, hyaenas, leopards and elephants roam! And you get really close to some of them (ask our "girlie"-group, they had a very close encounter with about 80 elephants on the trot the other day!).

Community survey and GPS continue unabated and we completed 46 interviews with local farmers, mostly subsistence farmers, to get an idea of the main concerns. It seems that hyaenas are the biggest threat to livestock in the communal areas. Closer to the national park, lions also become a problem.

The study site's map is growing - all in all we have now mapped more than 280 km of roads and tracks, and many of these little villages along dusty and sandy track in the middle of the bush. In addition to our mapping work, we have also been busy with some road construction (removing trees and filling in holes), as elephants around camp are quite destructive. But we try to keep our access road to base camp clear!

I should mention that on Thursday, the last evening in camp, we had visitors around the campfire. Two "indunas" (induna: village elders) spoke about the history of Malengalenga, the area of our study site.

Now it is time to say a BIG THANK YOU to slot No1 of this year's Caprivi Expedition. So many things went a bit haywire, so much was achieved, and as you all know, this is an expedition after all ;) Thank you for your patience and efforts and always looking on the bright side of things.

Goodbye slot 1 and welcome slot 2.

23 September

The second team of this year's expedition arrived safely, some of them with their luggage delayed or (Rick) absent – all thanks to Jo'burg airport. If you can collect and check it in there manually, please do so as this will increase the chances of your luggage getting to Livingstone.

After two days of briefings and training on data collection techniques, completing datasheets, handling equipment and off road driving we started the research activities today. The GPS mapping team went out to continue searching for passable tracks. Today we covered more than 150 km, mainly in the thick mopane forest. Spending the day in the car looking for landmarks and infrastructure is quite a job, especially during the midday heat. But it's exciting to see the map getting more and more detailed!

Working on the spoor and game count transects last week, I created maps of the transects and uploaded them to the GPS. My idea was to make it easy for everybody to find the transects and staying on them whilst doing the research tasks. This works very well, but it needs somebody in the team to check the route in the GPS! If not, you will take a completely different route like our experts Amy, Mechelle and Andy! :-)

24 September

Temperatures are up to 40 centigrade now, so we went for a swim in the river to cool down during the lunch break. Hard expedition life!

Apart from repairing a broken water tower, we also managed to do some more research work today with two teams out to do more interviews in the villages and collect game data on foot and vehicle transects. Francois' night group managed to receive signals of our collared lion and leopard. And they got close to them, sighting a pride of three lions, they followed them for a while. This will be done more and more in the coming weeks to study the predators' ecology & behaviour. We want to find out what their movement patterns are, where they find prey, where they rest, etc. This can be done relatively easily with the telemetry equipment. After locating the animals' signal, we try to spot them in the bush and when they move, we follow. Sounds easy, doesn't it? But this can take up a few hours, because lions especially enjoy their lie-downs, which can last for hours…

27 September

It's our day off and I am using it to review all the GPS data we have collected in the last three weeks.

Also some clarifications: Firstly, during our day off we go to Lianshulu Lodge by the Kwando river. You'll drive there in the morning, spend some time at the pool or on the terrace and then join a boat ride along the Kwando river, which forms the border between Namibia and Botswana. You'll return in the evening for dinner at the research station. Secondly, you must bring with you a lunch box, because in the morning during breakfast you'll pack your lunch to take with you into the field. If you forget to bring a box, your lunch will be squashed inside your daypack.

But now back to letting you know what has been going on in the last few days. We spotted lots of game in the NP. Hippos, buffaloes, elephants, kudu, impala, wild cat and serval and, of course, our study animals. Francois and his groups have managed to spot them every day during this slot!

Julia was busy with interviews in the Wuparo conservancy. Sangwali is the biggest settlement there (you should be able to find Sangwali on a map) and it's remarkable how widely scattered over a large area this settlement is. Consisting of many small villages, this is a place of 25 x 25 km where perhaps between 4,000 and 6,000 people live.

Yesterday we all sat around the fire, having a braai (BBQ), watching the stars (explained by Serge) and went to bed quite late because of our day off today!

28 September

After yesterday's day off everybody is full of beans again and fit for new ventures, encouraged by our Biosphere Expeditions' presentation about all our projects yesterday evening. Today we went out to Chinchimane, a settlement about 60 km from base camp, to experiencing the festival of Chief Mamili's birthday celebration. Chief Mamili is the traditional chief of the area, the National Park is named after him, and thousands of people from all over the place were coming to join this event. After hours of dancing, singing, speeches about importance of history, culture and politics and a procession with the chief in leopard's coat, everybody was invited to His Majesty's lunch. What a rare experience of being in the middle of the crowd with traditional singing and dancing groups in traditional colourful costumes!

But after joining this event in the morning, we went back to research work in the afternoon. We tried to find a suitable route for the vehicle game count in the Wuparo conservancy, where no route has been set yet. But in the Mopane forest it's hard to finding a track, which does not end in one of the countless fields or cattle kraals. Finally we gave up shortly before sunset and made our way back to camp.

Good news from the carnivore team! Francois and his team found telemetry signals of the leopard very quickly. After spotting her, Francois realized a warthog kill is the reason for the leopard not moving. Also, the mother (not collared yet) showed up, but there was no possibility for a capture, because they disappeared into the bush too quickly.

29 September

Today I joined the Foot Sign Transect and Game Count group in the morning, which led us to the Shikhaku forest area. At 08:30 it was already very hot and took it out of us, but we managed to finish the 9 km transect. And it's incredible what you can find in the dense bush. Often you can't see more than 10 metres into the bush, and yet we found spoors of hyaena, genet, civet, jackal, kudu, duiker, aardvark, porcupine and wildcat. So there is a lot of wildlife around, most of the animals are nocturnal, so that makes it easy to identify the tracks in the morning.

In the afternoon I led the carnivore tracking team (Amy, Mechelle and Andy) together with our PMU guy John out into the Mamili NP. Our aim was firstly to cross a deep channel safely and successfully. We did and directly after that we tried out the telemetry equipment. Because of quite strong signals from both, the leopard and the collared lions we went into a hectic activity to complete triangulations of both animals. With the help of those triangulations we are able to locate the animals very accurately. After this was done (thanks to the team!) we wanted to spot the lions to continue studying their movements. Luckily, and thanks to eagle-eye John, we found them very quickly! Lying around very lazly and well fed their interest in a Land Rover approaching was very littel. Even when we got closer (only 5 m from them) the only reaction was a roll on the back to stretch their legs!

So we decided to have our dinner, not even 500 m away (anyone chickening out? J) to be close for another attempt to follow them. Unfortunately they decided that their spot was a perfect one to spend the whole night there. So we went for the leopard, but this elusive cat proved invisible to us.

2 October

Good to see that our research activities are developing well. The second week went smoothly, each team did its best, with the first week's experience a useful guideline. We finished mapping the small villages in the Sangwali area. Some of them are only a few huts with one family and you will not find them on any map except ours!

No news on the elephants. They are still around, this morning they again blocked our access road (we cleared it yesterday!). Perhaps 300 of them were sneaking around J.

News on the predators: A local fisherman discovered a hyaena den, which we checked out, only to find that the den had not been used for a week, but we'll keep an eye on that.

In the morning we completed the Wuparo Conservancy Foot Transect, after a 5 km walk, just right to avoid the heat, we drove back to camp when we realized that somebody (?) forgot to put the GPS (with all the important data!!!) into the car. So we turned around, searching for the precious thing and suddenly we spotted something yellow in the dust just in the middle of the road. Luckily the traffic density in this area is not comparable to European highways. So all our data were safe, and I am happy! Phew!

3 October

In the early morning we made our way back to Katima Mulilo. Its surprising again and again how fast two weeks of each slot can pass by! We did achieve a lot, more routine in our daily work, more transects for spoor tracking and game count, more than 25 new interviews, so what can I say other than: A job well done slot two! Thank you!

Maybe one more word for clarification for upcoming slots: In Livingstone at the assembly point you'll be picked up by a shuttle bus, which bring you directly to us. We'll be waiting for you at 11:00 a.m. at the Zambian/Namibian border. This worked very well for the first two slots, just don't be surprised when a bus is showing up instead of a Land Rover!

13 October

No new diary from Peter yet, but we thought you might like to see a blog entry about a leopard capture from one of our team members at http://blogs.warwick.ac.uk/johnrawnsley/entry/spotted_game/.

14 October

The team members set off this morning to begin data collection after a day of training and lectures yesterday.

I took the GPS mapping team to the Balyerwa conservancy close to Mudumu NP. With Makando's (one of our PMU's) support we set a transect for the Foot Sign and Game Count route in that area. After 6 km of walking it became really hot around 10:00 already and everybody was happy to reach the car again. On the way we could spot roan antelopes, zebra and a hyaena track. Because of the proximity to the National Park, this area will be particularly interesting to study where and how the animals move between the conservancy and the National Park.

The "real" Foot Transect team beat us today, they walked 9 km in Shikhakhu and spotted two hyaenas, possibly wild dog tracks and many, many tracks of wildcat.

We also tried to investigate lion tracks close to a village, which was reported by a local farmer. Despite walking around and searching intensively, we were not able to find them. Elephants are still around camp, which is quite unusual, as normally they move away after one or two days and come back after some more days. This time they remained here, which makes movements for game count or sign transects interesting or logistical support tricky sometimes and you need some patience. In the evening five big animals came very close to our fence. So we had our daily review with some audience.

In the night Francois and his team met another elephant, a massive bull, two metres from the car. But John obviously speaks the elephant language. He didn't tell what he said, but all of a sudden the bull took himself off into the bush. Eager to spot more in the bush all of them missed the leopard until
she was about couple metres from the car. The mother of our collared young female just wanted to have a look who is disturbing her again ☺

15 October

In the morning Julia's community survey went out to Balyerwa again. There are so many villages that this will keep us busy for a while. Main results of this week's investigation are: We found a disco, playing Snoop Dog, and the local craft market where all the ladies of the expedition bought hundreds of hand-made baskets of all sizes. At least the locals are happy to sell the products and I am already laughing seeing our team members packing their bags with baskets. I wonder what will stay here instead! :-)

At noon fisherman and rangers reported a dead elephant and because everybody was keen to have a look, we went there in the afternoon. On our way John spotted another one, obviously just passed away. Francois and the rangers tried to ascertain the cause of death, but no clear signs could be found. Two dead elephants in the area - that has to be reported to the Ministry and also to the conservancy for
further investigation. We'll see what comes out of this.

In the last days we saw some clouds in the sky – shock, horror! And especially over midday it is incredibly hot now. The locals say the rain will come soon, which means that there will be some drops first and maybe some more drops after a few days, sometime with thunder.

17 October

Yesterday it happened! On our way to map the area around Mudumu NP approximately 10 rain drops fell onto our windscreen. In the distance we could hear some thunder, so now the "rainy" season has started!

Francois decided it was worth putting some effort into observing the dead elephant as it is likely to attract some carnivores, which could give us a good chance to capture one. So we went out with a team yesterday and today for observation. Unluckily nothing the first night. After three hours of sitting still and staring into the night, we were just about moving home, a movement could be spotted around the carcass. Bright moonlight, nightvision and binoculars couldn't do the job of identifying what it was, so eventually I took the spotlight to spot a domestic dog! Disappointed we drove home, just in time to sing a birthday song for Lynn at midnight!

In the afternoon the telemetry team found a third dead elephant in the area. Samples of these animals will go to the state veterinary for further analysis.

18 October

So a lot of work was done during the last week. On our transects we spotted many tracks, mainly hyaena (and of course many others, but interestingly for our data collection, there were only the five big predators). Unusually we found a hippo and a crocodile track on the transects. Animals of this week:
lots of baboons and elephants, hippos, bushbucks, kudu, duikers, roan and sable antelopes, impala, serval, leopard, springhare, mice, spiders, puff adder with baby, a scorpion, thousands of bird (e.g. cranes, storks, eagles, pelicans…….) and many more.

Everyone is enjoying a day off from data collection today and we are all now focussing on the next few days to bring us what everyone is hoping to see - a lion or a leopard or hyaena close enough for sedation!

20 October

Sunday morning yesterday. On our way out to more interviews and mapping we stopped at a cattle kraal for some private investigation of our agricultural experts from Switzerland. Irma and Ingo conducted an interview with the farmer and found out that a cow only produces 1 litre of milk per day. After this and also the community survey was done, we checked a lion track in muddy terrain, which was reported by a farmer. And, sure enough, it was a female lion track, two days old, disappearing into the thick bush.

Francois took one reccee team into the Mudumu NP, meeting up with the rangers there to find out more about the lion population in that park. On their way with lots of game around, they found several lion tracks. So simply by having a closer look, we could solve the riddle of Mudumu. The three
lodges around assumed that in the whole area there is only one big male lion around. Well, there are more! We have started a relationship with the rangers there now and we will put more effort into working in that area from now on.

Midnight, Philipp's 18th birthday. Francois checked, secretly, a bait close to camp. What was feeding there? A nice female leopard, waiting for her sedation shot! Once she was completely unconscious, we brought her to camp where the examination took place on the back of the pick-up after we woke everybody up! Weighing in at 33 kilos, this was a fully grown adult animal, so we fitted a radio collar on. The health checks and measurements took us about 45 minutes and after a few flickers from her ears Francois decided we should put her on the ground to wake up. This process took a lot longer than we expected but once awake, she disappeared immediately into the bush! Our third collared study animal! Slowly we can start doing telemetry the whole day!

In the mornings the sky is now covered with clouds, which makes the temperature more comfortable until the sun burns all the clouds away by noon. But this also means more humidity, more flies and mosquitoes.

Later today we got results from the Ministry for Environment and Tourism. At least the third elephant's cause of death is anthrax. Some other scientists and vets also reported cases of anthrax in Botswana and Caprivi. This is not unusual, especially during this time of the year. Anthrax is always present here, which always makes us being very cautious when carcasses are spotted.

One of our groups was incredibly lucky today, robably because it was Phillip' birthday and Adi's and Lysann's wedding anniversary. They spotted in one single afternoon: the collared leopard, warthog, baboons with eight little babies, puku, lechwe, impala, kudu, buffalo, jackal, springhare, and of course elephant and hippo, vultures, ground hornbills, cranes and a pangolin! What a day, ending with a birthday cake made by Ronel and a private candlelit dinner for two of us ;)

23 October

The data collection in the second week of a group is always running smoothly. Everybody knows how things work. Francois has at last found a crossing through the deep channel to Liandura island in the southern part of Mamili NP. A lot of effort was put into this because we think this is a good island for us with lots of game and lions! Now we can start investigating there. And first results show there must be some groups of lions on this island, we already found their tracks there.

The telemetry team is now able to find the collared lion with her cubs each day. They are obviously enjoying their lives, as each time we see them they are really relaxed, rollinging on their back, etc. We also picked up signals of female leopard 2, collared on Sunday night (you remember?), very close to camp! But we couldn't spot her in the bush - she was hiding somewhere.

Of course, Francois' team got stuck in the mud somewhere again, but the reward for the hard work was spotting secretary birds, endangered, rare cranes, fish eagle, kingfisher, serval cats, a baby croc with its huge mum, a tortoise and all the others!

The GPS mapping team went into the Mudumu NP, where we discovered some more (new) roads that are not on the existing maps. One more reason why our mapping is important. It not only gives us all the data digitally, we can also correct the existing maps! This park is a completely different habitat compared to Mamili. Away from the river you'll find roan and sable antelopes and zebra. Also sightings of cheetahs have been reported to us in that area.

25 October

I am now in Livingstone where the amazing purple blooms of the jacaranda trees are still out in force. But there is almost no water at the Victoria Falls during
this time of the year.

The third slot has come to an end. It has been another great two weeks with the fantastic bonus of a leopard capture and collaring. A big thank you to everyone for all your committment and hard work with collecting data and for all the fun that went along with it. I hope you all take away some great memories.

So, tomorrow is the start of the fourth slot and I can't begin to imagine what surprises lie in store for us. Let's see!

27 October

After a long morning of training on the equipment and explaining the background of the project, we had closer look at the Land Rovers in the heat of the afternoon. Everybody learned how a winch works, how to use the high-lift jack and we made sure that the cars are ready for the next few days of fieldwork. Next I took the drivers out for a driving course to show them how to cross water and stuff. Francois organised some bait and placed it in two promising locations close to camp while Julia took the non-drivers out for a game drive. After a while Julia's emergency call came in! Stuck in the National Park! So the rescue team made their way to a shallow stream where the Land Rover was stuck in a sandy hole. So we put training into practice and everybody experienced how hard it can be to get a car out of the water. Of course it got dark, the mosquitoes came out and finally we had to call Francois to help with the rescue operation. With two cars and after three ours of digging, jacking, pushing, towing, we finally managed to get the car out. Call it training on the job!

30 October

On their second full day of on-site activities, slot four is in the swing of data collection work with promising results so far. Francois took out some of the team to check the baits and with the aid of telemetry they spotted "our" female leopard just lying and resting in a tree! They also received signals from the the pride of lions (female lion 1, FLI1), but they were far away. Unfortunately nothing to report on the baits, "only" vultures and jackals took an interest.

More carnivore spoors were discovered on the Wuparo Foot Transect such as a cheetah and a hyaena track. And the Vehicle Game Count team reported sightings of two single buffaloes outside the NP and a big herd of buffaloes inside. Elephants, of course, are always around and we counted hippos, warthogs, kudu, duiker, reedbuck and the big troop of baboons is very often on the same spot.

Today we tried to conduct two Foot Transects (in Dzoti Conservancy and Mamili NP) at the same time with two teams to get a better idea of animal movements. That worked well, we found two lion tracks, a leopard and a hyaena track and, again, elephants all around!

2 November

For quite a while now we have been very busy in the Balyerwa Conservancy. This seems to be an incredibly big place with lots of villages, some very small, just a few huts. So GPS mapping and the Community Survey also are still busy in that area.

Just to give to you an idea, altogether, we have now mapped more than 600 km of road network, over 60 villages and 600 other waypoints so far!

During the interviews we learned that some people are really interested in conservation and our project and want to support us whichever way they can. Others, often older ones, take a negative view of it. The variety of persons questioned goes from 17-year old girls to old men of more than 80. Especially now in the beginning of the rainy season, many people are out on the fields, so there are not many left in the villages during the day. Sometimes you'll come across tragic stories such as a house burnt down or somebody losing cattle and therefore their livelihoods through disease.

We are obviously not the only ones visiting the villages. In one village people were really hostile. The reason for that, we found out, was an approach by a sect in that village, a sect that is hostile to whites.

On Friday afternoon we completed the first four-day cycle of activities. We also conducted two Vehicle Game Counts at the same time this week in the neighbouring areas of Balyerwa and Mudumu. Not many animals around but that's the way of nature sometimes.

So while I am sitting here, raindrops are falling on my hut and I can hear thunder not too far away. Francois was heading out yesterday night with a team, because during yesterday's day off, Lianshulu Lodge staff was reporting lions close by, whiche we were keen to find. So we tried something new: Francois will stay in that area with a tent and the teams are shifting, supporting him during the night to search for these lions. We all hope this effort with be crowned by success.

One word about road construction. You'll remember that team 1 and 2 were quite busy with keeping the access road to base camp passable, because of our big grey friends. Some weeks ago this road was closed by some farmers who were ploughing their fields, so in the interest of good community relations we now have to use another road from the main road to Hanyini Research Station.

8 November

Due to some car breakdowns we had to improvise a little bit during the last week. More effort was put into activities on foot or we organized to drop the teams somewhere and collect them after finishing the work, which worked very well, I think.

On foot in the different areas (Conservancies and National Parks, different vegetation forms and habitats) we found six hyaena tracks and eight leopard tracks in total - amongst them FLE2, our second collared female leopard with the cub. Sometimes we took the telemetry equipment with us to get an idea where our study animals were roaming around.

The vehicle game count teams saw and counted quite a lot of game and I am already eager to see the analysis of these counts on one of my maps. Of course, this will take a while after the expedition, but we'll let you know ;-).

Our lions chase was unfortunately not successful. I think nobody knows the south-western part of the Mudumu National Park better than Francois now. I was really worried about him when I saw him sunburnt, walking the whole day in one direction following the lion's track. After four days we gave up! But we'll get them! Driving through the bush in the middle of the night was an experience for everybody. No cats, but chameleons in the tree, snakes, scorpions and spiders around the fire in the bush (always attacking Kristina). Not really our main study, but exciting!

Our community survey now reaches remote villages, altogether we did more than 20 interviews in this slot. Our mapping is almost finished, just one more day, then I have to work on the computer to put everything together. I look forward to seeing the result of our work from the last weeks printed on a poster.

Wednesday, our last night out, Francois took the whole group to find/spot FLE2. We found her signal quickly, but leopards are smart and excellent at hiding. Hans holding the spotlight could see her first, then racing away at incredible speed she disappeared into the bush and was not seen again! But at least some of the team could spot her moving like lighting.

And again - unbelievable how fast it goes - one more slot of the 2008 Caprivi expedition is over. Thanks for the enthusiasm and effort you put in, collecting data for the project, folks! And tomorrow the last team for this year will arrive. We're looking forward meeting all of you!

12 November

So, finally the last team of the expedition arrived safely on Sunday. Only one bag is still lost and on the way from Livingstone there was a two hours stop because of a flat tyre on the shuttle. As I told you, this is an expedition ;)

After the introductions late on Sunday we continued on Monday with talks about the science, training on the equipment and Land Rovers, as usual. All this and more is recorded by a film crew from German VOX TV, which is with us for a week.

Yesterday morning was the first time we let the team members out for real data collection :) One team went to Wuparo to walk the Sign Transect and Foot Game Count. The sky was heavily overcast, so not much was seen, probably the animals got wind of the coming rain and were hiding. Julia is still busy in Balyerwa doing interviews for the Community Survey.

Believe it or not, at around 12:00 we had a heavy downpour, probably (according to Francois and Julia) the heaviest ever in early November! Oh man, it was raining for two hours and we had a lot of work with waterproofing kitchen, huts, tents etc. We had to use all buckets and bowls in camp to keep the water out. The temperature dropped down below 20 C and the sky was dark! Luckily, the day before we had set up a big tent next to the kitchen, which is waterproof.

After that Francois and I decided to capture a lion today in the afternoon!

So Francois went out with team 1 and the film crew, equipped with telemetry and capture gear to find FLI1, the collared female lion mother (with the two male and female sub-adults). We wanted to collar the young male, because he's moving away now from time to time and at some stage the time will come from him to part from his family. After only an hour Francois informed me on the phone that they had found the lions. So everybody rushed into the car and we drove quickly after them! After half an hour's drive through the wet and muddy Mamili NP and two water crossings and one scary metal bridge later, we reached Francois and team waiting for us, just a couple hundred of metres away from the lions.

The darting procedure took a while. We could spot all three lions in the reeds at a kill of a sitatunga bull. The high grass next to water made it difficult to hit the target, but finally Francois did it! Then we had to chase away the other two with the Land Rovers, which worked very well. So we loaded MLI1 (Male Lion 1) on the trailer to move him away from the other lions around. Six people were needed to lift that guy and after we fitted the collar on, Francois started with the examination. He was taking body measurements and investigating physical condition and health of the animal. After a while he (the lion) moved his head and some rumbling came out of the depth of his throat, so we decided to leave him alone. It took more than three hours for him to wake up and then he just watched us not even thinking about moving away.

We, sitting in and on the cars had to watch him until he was fully awake to check if everything was fine with him. Obviously it was, so we headed back to camp in the late evening for a midnight dinner and some lion capture celebration.

What a day!

So today, everybody is back to normal work after a short night. The two Foot Transect groups just came back from Dzoti and Mamili. Not really much to report because of more rain in the morning (still chilly and no sun!), one group saw 16 buffaloes and a reedbuck, the other ones also spotted buffaloes and a night adder in the park!

In the afternoon we will go out to have a telemetry look, whether MLI1 is back to mummy and maybe we'll find one of the leopards…

14 November

Highlights from yesterday were different sightings of e.g. side-striped jackal, hippo outside the pool during the day and a big herd of buffaloes. In the morning the telemetry team spotted FLE1 close to the T-junction behind the deep water crossing! Cool, they were sooo close, Kurt took great pictures with his mega lens! Leopard sitting in the tree, watching us! Just incredible that we could spot her. And also the lions and some signals, moving somewhere in the bush, we couldn't spot them.

Day off is close (tomorrow), so Barry decided to teach us Irish dancing to honour his birthday today, of course after our daily work. So after a marvellous apple pie, baked by Ronel on the fire, he convinced a few to join the lesson. Very funny, watching people with head torches around the ankles trying to follow Irish dance steps. Julia topped the show with a nice reed skirt, bought in a village!

During the day we were busy with the film crew in Katima Mulilo, filming Sara in the big city. They're following Sara wherever she goes ;-) , to show on German TV what expedition life is like.

Camera man Florian stepped into something which cut the sole of his foot yesterday. Because there was not the right equipment in the Sangwali Health Centre, we took him back to the station, where Uli and Francois did a very good job at stitching that cut. Just to make sure, we went to see a doctor today. I tried to get some crutches for him so that he can move around. Imagine how difficult that can be in Katima. After two hours, talking to several doctors, chatting to a very bored physiotherapist at the state hospital from Cuba for half an hour, I got them! Yeah!

The remaining researchers tried to get more information about our collared lions and they spotted them after following the telemetry signals. Lazyly, as always, they hung around very close to the spot where we found them when we collared MLI1 on Tuesday night. Temperatures drop down to chilly when the sky is overcast, but as soon as the sun comes out, it's really hot and humid. But with cloud cover, the sunset is even more beautiful and stunning. During the day the cicadas make an incredible noise, sometimes you only realize it when they stop, because you can't hear any more.

17 November

After they have seen what the daily problems are here in this region, the group decided to collect some money for a "Florian needle and crutches fund" to support the Sangwali Health Centre for more medical equipment, isn't that great?

GPS mapping came to an end, Julia and her group went into the last unmapped villages. Now I only have to add some more locations of predator sightings, then the digital map, the beginning of an information system for this project is done.

During the morning Francois went out to check on the lions, and found them still in the same spot! On the way back, he saw three more lions and first he thought, they moved really fast. Back at base we were convinced that must have been a different group of lions. Very often the farmers of the villages close by report sightings, tracks and kills. And also very often we can hear lions roaring close to camp. Francois knows this group already, but every time he wanted to follow them, they disappear very very fast. So we went out to check on their location, but, guess what, we couldn't find them!

So Francois decided to try to find them in the afternoon and night. And, really, they could find their tracks. After darkness, the team had to drive in the marsh, very wet in the high gras where you can't see more than a metre. Sitting on the roof rack, shining with the 800,000 candles spotlight, James, Ina, Uli, Sara and Kurt tried to find them. Bumping with the front and rear wheel in two holes of an aardvark at the same time is already bad luck. But if you have a loaded dart gun in your hand to dart one of the lions you've searched for hours driving around like crazy, and you are only few metres away from them and then to get stuck, what do you call this? Francois, almost prepared to shoot, could have kicked himself!!! So the lions got away completely relaxed and our team watched them from the roof, stuck in the hole. It took two hours for them to get out! You can imagine what mood they returned in...

19 November

More luck on Tuesday! No immobilisation, but Francois took the Monitoring group and his parents out into the bush and, very close to camp they spotted FLE2 and her cub, just sitting in the grass! Quick decision to have a look where they are going after our dinner. So the group went back to the station and then another heavy downpour and thunder, which was quite something, stopped all late afternoon and evening activities. So we had to sit in the shelter of the big tent or in the kitchen playing cards or collecting water.

Today the last full day of data collection has come! So, all groups went out another time doing the different research activities. Nothing very exciting to report on the Wuparo Foot Transect, except the mopane forest gets green and lush after all the rain. Quite nice to see!

One other group walked into the National Park to have a look for the buffaloes which we could hear all night long. They have been really close to camp, some even touched the fence, ringing the bells! Lots of buffalo tracks around, but no sings of lions. Very often the big cats follow their favourite dish, but not today.

While I am busy with wrapping up the last 12 weeks of field work the team are out for the afternoon. Very importantly, as this is your legacy, the data entry went well. Francois told me the other day that he can't wait to get going on the expedition report. The analysis of all data you collected will keep Julia and Francois busy for a while. We will let you know when the report will be published.

The Vehicle Game Count team just came back, having spotted many buffaloes around camp. So some weeks ago, the elephants besieged the Hanyini Research Station, now it's the buffaloes! And no less important, that team also collected tomorrow's dinner from the fishermen at the river. One last time fresh river bream from Caprivi!

21 November

Incredibly, this is already the last entry of the 2008 Caprivi diary! I remember coming here in August and now it's almost the end of November. Time flew by and I met so many interesting people from all over the world and all of you did a great job contributing to this new project.

I remember that in the first days we had to fight with new activities and get everything into a groove. Then there were the elephants trapping us many times along the road, we had to work a lot on that road! Remember the collapsed water tower? Very interesting to see how we progressed doing interviews in all four conservancies. We met so many local people, meetings which are very special and, I am sure, many of you will never forget.

We chased lions and leopards all night long. Finally we now have four collared study animals. Many of you learned, how to get a car out of the water, mud, holes, reeds….etc!

We mapped a largely umapped site and we now have a road/track network of more than 400 km, more than 80 villages and 220 cattle kraals.

Whilst working in and around study site we spotted so much (remember the “ghost transect”?). I really look forward to seeing it all written up in Julia's and Francois' report. And I look forward to seeing the station next year again - imagine what it will look like with grass growing.

So what else can I say? Thanks to everybody for your contribution, patience, effort and flexibility. A special thanks goes to Julia, Francois and their staff.

Hope to see you again, maybe on next year’s Caprivi expedition or somewhere else!

So long - it's been great working with you.

Peter Schuette
Expedition leader

P.S.: And don't forget to upload and share your pictures via www.biosphere-expeditions.org/pictureshare.

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Addendum from Julia & Francois

This year marks the beginning of the Caprivi Human-Predator Conflict (HPC) Project and by your efforts and funds, what a start it has been! During this expedition each team has contributed to research activities that have been identified by the projects’ academic and field supervisors as being relevant to addressing HPC in the Caprivi, and elsewhere in Africa, for the mutual benefit of rural people and wildlife alike. As you will have realised, this applied-research project takes on a multidisciplinary and holistic approach to a pressing conservation issue by embodying numerous crosscutting activities. You will remember these activities well and in summary, this year’s expedition has collected the data necessary to complete a detailed Geographical Information System (GIS) map for the study site and the community survey for preliminary situation analysis.

As you know, all other activities are ongoing and the ones completed this year serve as stepping-stones to attain further goalposts in 2009. Please look out for the complete expedition report within six to twelve months, which will give a detailed scientific explanation of the data collected this year.

Our study animals, FLE1, FLE2, FLI1 and MLI1 are all doing well and have not found themselves in need of rescuing as yet. We have much to learn from these study individuals and look forward to what data they will produce. FLE1, the two cubs of FLE2 and MLI1 are all in the process of becoming independent and will disperse soon. It is these transient animals that will be keeping us on our toes.

The communities of the Mudumu South Complex (MSC) have had their first experience of integrating with and working together with team members at the grass roots level. Their responses of the expedition this year are in accordance with, “we ourselves did learn so much”, and “why can’t we work together the whole year?” They will miss you and are deeply grateful for your support.

Life at the station continues unabated and together with the MSC Predator Monitoring Unit (PMU) the project's scientists will usher in the new year with more research data, community work, capture and monitoring. The PMU themselves have grown noticeably this year in their fieldwork with you and they too look forward to the expedition in 2009.

Each research team has been so different and you will each remember the personalities of your fellow team members. We would like to thank each of you for your specific contributions and insights and we will certainly never forget the events that have transpired over the past ten weeks. Despite sunken vehicles, camera crews with home-done stitches, hundreds of tyre punctures, stuck countless times, broken windows and extremely long nights in tow, the 2008 expedition to this wild junction of Africa was without a doubt a huge success and by its very nature lived by its motto, ‘EXPECT THE UNEXPECTED!’

From your scientists in the field we extend a hearty thank you for this year and we hope to see you again soon. *Francois de Wet (B.Sc. Hons. Ecol.)& Julia Gaedke (M.A. Comm. Econ.)*