



Diamond Route Research Conference 9-10 November 2010 PROGRAMME

Auditorium, De Beers Johannesburg campus

The objectives of this conference are to provide a platform for researchers to:

- Share the outcomes of the range of research projects that have taken place across the Diamond Route properties and other sites within the De Beers Family of Companies and E Oppenheimer & Son.
- Provide a networking opportunity for the site managers and researchers working across these sites.
- Guide future research and post-graduate opportunities across the properties.

Time	Tuesday 9 November
08h30	REGISTRATION and TEA / COFFEE
09h00	Welcome Manne Dipico, Chairman of Ponahalo Holdings / Deputy Chairman of DBCM
09h10	Guest speaker The Honorable Minister of Water and Environmental Affairs, Buyelwa Sonjica
09h20	Overview of Diamond Route properties Rob Smart, Chair of the Diamond Route
09h30	Key note speaker: A Brief Historical Review of Research on De Beers Properties Dr Mark Berry, De Beers Board and ECOHS Committee member
Day 1	
Species & Population Ecology CHAIR: Gus van Dyk, Site Manager - Tswalu	
09h50	Jo Shaw Adaptive resource use by black rhino (<i>Diceros bicornis bicornis</i>) at Tswalu Kalahari Reserve
10h10	Beryl Wilson Black-footed Cat (<i>Felis nigripes</i>) research: Benfontein and beyond
10h30	Bryan Maritz Treasures in the sand: conservation of the Namaqua Dwarf Adder
10h50	TEA / COFFEE and Poster Session
Monitoring & Management CHAIR: Corne Anderson, Site Manager - Dronfield	
11h20	Eric Herrmann Distance sampling for estimating Cape hare and springhare densities on Benfontein Nature reserve
11h40	Hannes Louw Predator-prey relationships in smaller game reserves in Southern Africa: a review of current models and management principles
12h00	Dr Andrea Pulfrich Monitoring the Impacts of Diamond Mining on Marine Communities in Namdeb's Mining License Areas
12h20	Prof Mark J. Gibbons Use of the submersible, <i>Jago</i> to assess the impact of offshore diamond mining
12h50	LUNCH and Poster Session and Conference Photograph

Time	Tuesday 9 November
Avian Conservation CHAIR: Andrew Stainthorpe, Site Manager - Rooipoort	
14h00	Ernst Retief Analysis of Bird Species at the properties of the De Beers/Oppenheimer Diamond Route
14h20	Dr Aldo Berruti Sustainable Utilisation of Burchell's and Namaqua Sandgrouse at Tswalu
14h40	Mark D. Anderson White-backed Vulture research at Dronfield Game Farm
15h00	Prof. Andrew McKechnie Taking the heat – predicting the responses of Kalahari Desert birds to climate change
15h30	TEA / COFFEE and Poster Session
Invertebrate Conservation CHAIR: Maroti Tau, Site Manager - Ezemvelo	
16h00	Hannelie Human Honeybees of South Africa: Healthy or need for conservation?
16h20	Peter Roos & Graham Henning Lepidoptera Research and Distributions within Various Diamond Route Reserves.
16h40	Dr Mervyn W. Mansell Demons of the sand - the antlions and lacewings of Tswalu
17h00	Close of Day 1
19h00	CONFERENCE DINNER AT MOYOS
	Speaker: Strilli Oppenheimer

Time	Wednesday 10 November
08h00	REGISTRATION and TEA / COFFEE
	Day 2
	Species & Population Ecology CHAIR: Dr Patti Wickens – Environmental Principal, De Beers Group
08h30	Low de Vries Are aardwolves seasonally influenced optimal foragers? Data from scat analysis and an extension of aardwolf diet
08h50	Dina Fagir The role of parasites in the population ecology of southern African small mammals
09h10	Prof. Nigel Bennett Physiological suppression in non-reproductive female Damaraland mole-rats eases in colonies when ecological constraints on dispersal are relaxed
09h30	Gordon O' Brien Can Tigerfish (<i>Hydrocynis vittatus</i>) from Schroda Dam (Venetia Limpopo Nature Reserve) control alien invasive fish in the Letsibogo Dam, Botswana
09h50	Dr Justin Boyles Heterothermy in small mammals in response to thermal challenges
10h10	TEA / COFFEE and Poster Session
	Plant Community Studies CHAIR: Duncan MacFadyen – Manager : Research and Conservation
10h50	Danie Krynauw The nature and dynamics of key plant communities on Ezemvelo/ Telperion - Initial findings of a vegetation monitoring project
11h10	Dr Timothy O'Connor A synopsis of 29 years of ecosystem change of the Venetia-Limpopo Nature Reserve
11h30	Priscilla Burgoyne Understanding the <i>Frithia</i> ecology on Ezemvelo Nature Reserve
11h50	Prof. George Bredenkamp & Ansie Swanepoel The vegetation ecology of Ezemvelo and Telperion, Bronkhorstspuit, South Africa
12h10	LUNCH and Poster Session
	Archaeological Findings CHAIR: Warwick Davies-Mostert, Ecology Division - Conservation Coordinator
13h10	Dr Thomas Huffman Archaeology of the Mpungubwe landscape
13h30	David Morris Roopoot – its rock art and archaeology in context
13h50	DISCUSSION SESSION - Future Research Opportunities Dr Patti Wickens/ Duncan MacFadyen
14h40	Presentation Awards Mrs Strilli Oppenheimer
14h50	Closing Duncan MacFadyen
15h00	CONFERENCE CLOSURE

Posters	
Author	Titles
Nadine Lamberski et al.	Conservation of Black-footed Cats and Prevalence of Infectious Diseases in Sympatric Carnivores in the Northern Cape Province, South Africa
Dr Justine Braby	The Damara Tern <i>Sterna balaenarum</i> in the Sperrgebiet
Dr Ingrid Wiesel	The influence of land development on brown hyena (<i>Parahyaena brunnea</i>) behaviour and habitat use
Ruth Muller	Darkling beetles (family Tenebrionidae) in the Tswalu Reserve, Kalahari
Samantha Scott & Craig Symes	Resource partitioning in forest birds
Dr Yolanda Fernández-Jalvo	Hyena scats: A key to understanding past ecosystems
Dr D.H. Jacobs	A Heteroptera survey in the Telperion & Ezemvelo Nature Reserve
Dr Adrian Davis	Dung beetle fauna of Tswalu Kalahari Reserve (Coleoptera: Scarabaeidae: Scarabaeinae)
Julie Kern	Space use in relation to season in an elephant breeding herd in De Beers Venetia Limpopo Nature Reserve.
Dippenaar-Schoeman et al.	The spiders of the Kalahari
Harriet T. Davies-Mostert et al.	Can Predators pay their way? The benefits of wild dog based ecotourism in Limpopo Province, South Africa
Janet M Edwards et al.	Conservation genetics of African wild dogs <i>Lycaon pictus</i> in South Africa
Wendy Collinson et al.	Diamond Route BIKE4BEASTS Mountain Bike Challenge
L Roos & P Wickens	Marine diamond mining... Opportunities for marine research and student development
Duncan MacFadyen	The dynamics of small mammal populations in Rocky Highveld Grassland, Telperion, Mpumalanga, South Africa
Dr Patti Wickens & Duncan MacFadyen	Diamond Route Partnerships ...creating mutual value

A brief historical review of research on De Beers properties

Mark Berry

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The paper reviews research on De Beers' properties spanning more than 5 decades. The research has covered a broad spectrum of ecological and environmental issues and numerous floral and faunal studies at both undergraduate and post-graduate level. Institutions involved in this research include universities, technical colleges and museums. Some projects have been on-going for almost 30 years and others were pioneering and have set industry standards. De Beers' properties have made, and continue to make, a significant contribution to scientific knowledge and understanding.

Adaptive resource use by black rhino (*Diceros bicornis bicornis*) at Tswalu Kalahari Reserve

J. A. Shaw, N. Owen-Smith and S. F. Helary

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Black rhino were re-introduced to Tswalu Kalahari Reserve in 1995 and have shown a high population growth rate. Analyses of seasonal diet content and chemical composition of key woody plant species showed that adaptive resource use, specifically consumption of semi-evergreen *Acacia haematoxylon*, averted a decline in diet quality during the critical dry period. Seasonal variation in resource availability was incorporated in a metaphysiological model to estimate habitat capacity for black rhino at Tswalu. Outputs from the model could provide guidance for management of rhino at Tswalu and emphasise the need to consider seasonal variation when assessing black rhino habitat elsewhere.

Black-footed Cat (*Felis nigripes*) research: Benfontein and beyond.

Beryl Wilson¹, Alex Sliwa², Nadine Lamberski³, Jason Herrick⁴, Arne Lawrenz⁵

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The black-footed cat is a small, vulnerable felid restricted to southern Africa. It is listed on Appendix 1 of CITES, and ranked as the most vulnerable of the Sub-Saharan cat species by the IUCN/Species Survival Commission Cat Specialist Group. The species has received little attention from the conservation community.

From 1992-1998 the only ecological study of the species was conducted by Dr Sliwa on Benfontein Game Farm. In 2004 the third field study began on Benfontein. An international collaboration, this multifaceted investigation is focusing on the ecology, reproductive biology, health and conservations of the species. Some findings are presented here.

Treasures in the sand: conservation of the Namaqua Dwarf Adder

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Namaqua Dwarf Adders are small, threatened snakes that occur along the southern African west coast. Little is known of the biology of the species, limiting conservation management. We collected genetic material from populations of Namaqua Dwarf Adders from across their geographic range to assess biogeographic history. Additionally, we investigated the population density, spatial ecology, and foraging ecology of a population of Namaqua Dwarf Adders from Namaqualand Mines property, Northern Cape. Our data suggest strong phylogenetic structuring within the species. We demonstrate that Namaqua Dwarf Adders occur at high abundances, show strong spatial fidelity, and are generalist ambush predators. Our data suggest that continued protection of appropriate habitats would aid in protecting these irreplaceable treasures.

Distance sampling for estimating Cape hare and springhare densities on Benfontein Nature reserve

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Distance sampling using line transects has become a well-known method for estimating densities of both large and small mammals in relatively open habitats. In 2007 and 2008 distance sampling was used to estimate numbers of Cape hares (*Lepus capensis*) and springhares (*Pedetes capensis*) on Benfontein Nature Reserve, Kimberley. Density estimates with relatively low 95% confidence intervals and coefficients of variation for both species were obtained with moderate investment in sampling effort. The results suggest that distance sampling using line transects is a very useful and efficient technique for estimating densities of Cape hare and springhare populations in relatively open habitats.

Predator-prey relationships in smaller game reserves in southern Africa: A review of current models and management principles

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The direct impact of lion (*Panthera leo*) predation on herbivore populations in smaller game reserves was investigated. Kill and census data were used to derive preference indices for prey species and compared with findings from earlier studies. Results suggested that lions are risk-sensitive predators, and largely ignore larger and more risky species such as giraffe (*Giraffa camelopardalis*) and buffalo (*Cyncerus caffer*) in smaller game reserves. The degree to which these species are avoided, however, does vary and adds an element of unpredictability to trends in prey populations. Wildebeest (*Connochaetes taurinus*) and eland (*Tragelaphus oryx*) populations, however, were the two species most sensitive to predation throughout all study areas. Current models, based on prey and lion biomass correlations, were tested against trends in prey populations and generally performed poorly in smaller game reserves. Unaccounted juvenile mortality, through predation by lions and other predators, could be primarily responsible for this.

Monitoring the Impacts of Diamond Mining on Marine Communities in Namdeb's Mining Licence Areas

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Namdeb Diamond Corporation holds seven diamond-mining licences covering both land and sea areas on and adjacent to the southern coast of Namibia. The first biological monitoring programme was launched in 1993 to investigate the effects of fine tailings disposal at Elizabeth Bay on marine communities, particularly on the commercially important rock lobster. Since then Namdeb have commissioned a wide variety of baseline and monitoring surveys to assess the magnitude and duration of mining impacts on marine communities inhabiting sandy beaches, rocky intertidal and subtidal habitats and deep-water unconsolidated sediments. These programmes are presented and the findings briefly discussed.

Use of the submersible, *Jago* to assess the impact of offshore diamond mining

Mark J. Gibbons

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The impacts of offshore diamond mining on the seabed environment and associated biota were examined from archived videotape recorded by the submersible *Jago* from surveys commissioned by De Beers Marine off southern Namibia at the end of the 1990s. The offshore benthic fauna in the region is poor in species, which reflects the nature of the physical environment. While mining activities obviously change the habitat mix on the seafloor, and while most species of nekton are negatively affected by mining, some species appear to benefit. The negative impacts of mining on the sessile benthic fauna appear to be spatially restricted.

Analysis of Bird Species at the properties of the De Beers/Oppenheimer Diamond Route

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This study provides an analysis of the bird species that occur on the properties of the De Beers/Oppenheimer Diamond Route in order to indicate the value of these properties to the conservation of birds in South Africa. The analysis was based on data collected during a number of citizen science driven projects in South Africa for example SABAP 1 and 2, Co-ordinated Waterbird Counts Project and the Birds in Reserve Project. Using the data sets for these projects, with the use of GIS tools, it was possible to provide a detailed analysis of the species that occur at the above-mentioned properties.

Sustainable Utilisation of Burchell's and Namaqua Sandgrouse at Tswalu

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The sustainability of utilisation of Burchell's and Namaqua sandgrouse through shooting at Tswalu is investigated, based on census and published recruitment estimates. Shooting is sustainable in the long-term in terms of current understanding. The implications are discussed and future direction for research are proposed.

White-backed Vulture research at Dronfield Game Farm

Mark D. Anderson¹, Angus Anthony, Tania Anderson, Corne Anderson, Beryl Wilson, Eddie McFarlane, Andy Hinton, Campbell Murn, Bill Bowerman, & co-workers

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White-backed Vultures have been studied at De Beers' Dronfield Game Farm for the past 16 years. The main aim of the project is to monitor the annual breeding demographics of a population of c. 80 pairs of tree-nesting vultures. The research essentially involves two annual trips to Dronfield. The first, in May-June, is to determine which vultures are breeding (by visiting c. 350 known *Acacia erioloba* nest sites). The second visit, in October, is to check which pairs bred successfully, to ring the nestlings, collect mensural data, take a blood sample, and in some birds fit tracking devices. This study provides an indication of annual breeding success, useful as an early-warning system to determine the health of the population, especially in light of vulture crises elsewhere in the world (especially in South Asia). Additional research has included an aerial survey of the breeding vultures in the greater Kimberley area, a study of blood parasites, movement studies (including using satellite transmitters), lead studies, and an investigation into predicted climate change effects on the vultures. This paper will be an overview of this ongoing research.

Taking the heat – predicting the responses of Kalahari Desert birds to climate change

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Rising temperatures and more frequent heat waves associated with climate change are predicted to severely impact birds inhabiting hot desert habitats. We are examining the temperature-dependence of various avian behavioural and physiological traits at Tswalu, with the goal of modeling the impacts of future climate regimes on bird communities and ecosystem functioning. Our data reveal considerable interspecific variation in drinking behaviour, time-activity budgets and patterns of microsite selection. Behavioural data provide the basis for indices of vulnerability to heat stress, which may predict species losses under hotter conditions. Upcoming work will focus on water turnover, thermoregulation and characterising thermal landscapes.

Honeybees of South Africa: Healthy or need for conservation?

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Honeybees are crucial for pollination of crops and their pollination services account for 35% of the human diet and the benefit of pollination is estimated at €153 billion. The loss of honeybees would reduce agricultural production by ±8%.

The total number of managed colonies worldwide is estimated at 72.6 million with only <18 million in Africa. The situation in Africa is unique, having the only remaining large and diverse wild population, with an estimated 310 million colonies and in South Africa around 10 million wild colonies. Although African honeybees appear to be more resistant to major diseases, the situation of honeybee populations worldwide suggests that the conservation of our bees is a necessity.

Lepidoptera Research and Distributions within Various Diamond Route Reserves.

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The results of surveys of butterflies of the Tswalu Kalahari Reserve, Rooipoort, Ezemvelo, and Venetia Limpopo Diamond Route Nature Reserves will be presented. The primary aim and objective was to survey and document a species list of butterflies of the various Nature Reserve, their life histories and larval foodplants. Many life histories and foodplants are still unknown as are predators, ant associations, mating habits etc. Notes were compiled of the distribution, habitats, foodplants, nectar plants and habits specifically relating to each Reserve. This paper will be an overview of this ongoing butterfly research.

Demons of the sand - the antlions and lacewings of Tswalu

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Tswalu Kalahari Reserve is a unique ecosystem that harbours a rich fauna of antlions and other lacewings, which all belong to the insect order Neuroptera. The intrusion of the Korannaberg hills into a typical Kalahari dune-field system provides many habitats in addition to those of the characteristic Kalahari psammophiles (sand-dwellers). Of the 13 families of Neuroptera that occur in South Africa, five have already been recorded from Tswalu, and a further five families could be expected with more intensive exploration, making Tswalu a major hotspot for Neuroptera. The dominant family Myrmeleontidae – antlions – is well represented, with over 20 species already known from the reserve. These insects are major predators, ambushing their prey from beneath the sand surface – hence the epithet “sand demons”. This presentation reviews the ecological role played by lacewings, their predation strategies, and highlights some of the species that are conserved within Tswalu.

Are aardwolves seasonally influenced optimal foragers? Data from scat analysis and an extension of aardwolf diet

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The aardwolf (*Proteles cristatus*) is a highly specialised myrmecophagous mammal, and probably the most specialised mammal on the African continent. Aardwolves feed almost exclusively on the *Trinervitermes* genus of termites, which comprises as much as 90% of their diet. However, during the course of our study, we found that aardwolves fed on solifugids on at least nine occasions and consumed one scorpion. We discuss possible implications of these findings on the foraging behaviour of the aardwolf and suggest further research directions to determine if aardwolves are optimal foragers or not.

The role of parasites in the population ecology of southern African small mammals

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Several small mammals are considered health and economic hazards according to the damage they cause directly or indirectly to human beings, for instance: destroying the infrastructure, costing billions of dollars in lost crops each year (WHO, 1987). Their associated parasites are important vectors of micro-organisms, e.g. fleas have played a vital role in transmitting plague and murine typhus, while ticks can transmit many diseases such as the relapsing fever and spotted fever. And also they serve as hosts of numerous intestinal parasites some of which also infect man, e.g. the tapeworms, *Hymenolepis* sp. and *Trichinella* sp. Accordingly, the knowledge of host biology, behaviour and parasites is of great importance. However, our knowledge of these relationships is particularly scarce for regions where these issues are most prevalent such as in tropic and sub-tropic countries. The host-parasite relationship has been a central topic in the study of the wildlife diseases. In the past, many researchers consider parasites as predators which live in balance with their hosts and outbreaks of diseases which cause the mortality of the host are cases where environmental factors have disturbed this balance. But more recently Anderson and May (1978) proposed that parasites have a regulatory role in their host population dynamics. Therefore, parasites may have a negative effect on their host fitness and therefore parasites may be considered as a potential pest control agent (Elton, 1942). I aim to evaluate the potential of parasites as control agent for host population dynamics of small African mammal population

Physiological suppression in non-reproductive female Damaraland mole-rats eases in colonies when ecological constraints on dispersal are relaxed.

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In field captured social Damaraland mole-rats from Tswalu Kalahari Nature Reserve, physiological suppression amongst subordinate non-reproductive females eases markedly during the annual rains, despite the presence of the dominant female and in colonies containing no new immigrant males. Non-reproductive females show substantially higher pituitary sensitivities to GnRH challenges during the wet period than compared to the dry while in the confines of the colony. These changes cannot be attributed to between female differences, variation in body mass or concomitant reductions in physiological stress. We suggest the findings reflect selection for reproductive readiness among subordinate females during periods of rainfall when ecological constraints on dispersal are relaxed.

Can Tigerfish (*Hydrocynis vittatus*) from Schroda Dam (Venetia Limpopo Nature Reserve) control alien invasive fish in the Letsibogo Dam, Botswana?

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² Ecology Unit, Digby Wells and Associates, Johannesburg, RSA

Biological control has widely been used to control the impact of alien invasive species throughout the world with positive and unfortunately negative consequences. In this study the advantages and disadvantages of using the Tigerfish (*Hydrocynus vittatus*) to control the risk posed by large populations of alien fishes within the Letsibogo Dam, Selebi Phikwe, Botswana were undertaken. Biomonitoring experiments of the resident Schroda Dam and relocated populations of Tigerfish were carried out. The findings of the study show that Tigerfish would be a safe and suitable biological control agent for the Letsibogo Dam and other large reservoirs the Limpopo Catchment.

Heterothermy in small mammals in response to thermal challenges

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Many endothermic organisms (i.e., mammals and birds) allow body temperature to fluctuate to conserve energy during energetic bottlenecks. We measured body temperatures of eastern rock elephant shrews and Namaqua rock mice on Ezemvelo nature reserve. Elephant shrews are known to be heterothermic (i.e., they allow body temperature to fluctuate widely) while rock mice are thought to be homeothermic (i.e., they are thought to maintain a high and constant body temperature). We tested the prediction that both species would in fact show similar patterns in body temperature when thermally challenged, but elephant shrews would show larger overall fluctuations in body temperature.

The nature and dynamics of key plant communities on Ezemvelo / Telperion - initial findings of a vegetation monitoring project

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Without monitoring data collection it is difficult for wildlife managers to assess the dynamics and changes of natural ecosystems. During 2007, a vegetation monitoring project was initiated on Ezemvelo / Telperion to describe the functional nature of the main plant communities, and to record vegetation changes in these vegetation types over time. Methods applied were standardized, with marked survey sites and appropriate techniques, to try and ensure long term viable data collection. Using a recent vegetation classification as basis, the functional nature and dynamics of the main plant communities were recorded. The data of the first year of surveys (2007) is used as baseline data, and the data of each year is compared with the baseline data, as well as with each previous year. The project has run for 4 years now, and some remarkable findings have been made. Some plant communities show remarkable resilience. Problem plant invasions have been recorded. Vegetation changes of varying nature have taken place.

A synopsis of 29 years of ecosystem change of the Venetia-Limpopo Nature Reserve

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The VLNR grew from two farms in 1980 to a >350 km² wildlife reserve today. Based on 29 years of monitoring, the main ecosystem changes which have occurred since 1980 are in response to (a) relaxation of grazing pressure (removal of livestock, low wildlife stocking rates), and (b) introduction of elephants. The initial highly degraded landscape (sheet and gully erosion, sward composition, patch dieback, bush encroachment) appears to be recovering slowly, constrained by climatic variability. Highly selective feeding habits of elephants have resulted in reversal of *Acacia* encroachment of hydromorphic grasslands, but many slow-reproducing woody species are trending toward local extirpation.

Understanding the *Frithia* ecology on Ezemvelo Nature Reserve

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Frithia is a summer rainfall mesemb genus comprising two species. In 2000 a complete study of both species of *Frithia* was undertaken, which led to a relatively comprehensive understanding of their habitat requirements and ecology. More recently after a mining licence had been granted to a large coal mine near Witbank (eMalahleni), a population of the eastern species, *Frithia humilis*, was discovered by the Mpumalanga Tourism and Parks Agency (MTPA) while removing medicinal plants before mining could take place. Current legislation dictates that after a licence has been granted, the mine is under no obligation to undertake a translocation. However, the mine considered it a priority to translocate the entire population of this Red Listed species. *Frithia humilis* is now Red Listed as Endangered and a translocation would at least preserve the genetic diversity as the loss of a single population is undesirable. Suitable habitat to which the population could be translocated to was found. Known sites from the previous study were also visited to check on their progress. As a result of the translocation new data concerning the threats to this taxon and its habitat have thus come into play. These will be discussed and the importance of constant monitoring of Red Listed taxa is highlighted.

The Vegetation Ecology of Ezemvelo and Telperion, Bronkhorstspuit, South Africa

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A vegetation survey was conducted on the Ezemvelo and Telperion Nature Reserves. The aim of the study was to identify, describe and classify the plant communities of the study site as vegetation based ecosystems. The information derived from this study may be useful when compiling a management plan for the Reserves. The results obtained are based on floristic composition and habitat information from 210 sample plots. The data was captured in the TURBOVEG database and classified using the TWINSPLAN numerical classification algorithm. The resulting phytosociological tables were compiled and organized using the MEGATAB computerized table management programme according to Braun-Blaunquet procedures. Twenty-two major plant communities and 4 sub-communities were identified, described, and ecologically interpreted. The localities of the plant communities are indicated on map, compiled by using GIS. The plant communities on the Reserve are distributed in a mosaic of woodlands, grasslands and wetlands, related to the heterogeneous habitats created by the variations in topography, which is typical of Bankenveld vegetation. Photographs of these will be shown in the presentation.

Archaeology of the Mapungubwe landscape

Tim Huffman

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Since the 1990s, Wits archaeologists have investigated the last 2000 years in the Mapungubwe landscape. Various graduate students have investigated ethnic stratification (Calabrese PhD 2005), climate change and herding strategies (Smith PhD 2005), glass beads and international trade (Wood MA 2005), the ethno-archaeology (Murimbika PhD 2006) and archaeology (Schoeman PhD 2006) of rainmaking, the relationship of settlements to the landscape (du Piesanie MSc 2008), faunal remains (Fatherley MSc 2009), agricultural production (Chandler Honours 2009) and spherulites in cattle dung (Mashimbye MSc in prep). Current research includes settlements during the Khami Period (du Piesanie PhD) and herding strategies (Hanisch PhD). In addition, we are collaborating with visiting scientists for a DNA study of cattle bones (Otago, New Zealand), paleo-magnetism (KZN and Rochester) and OSL dating (Arizona).

Rooipoort – its rock art and archaeology in context

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Rooipoort Nature Reserve, near Kimberley, is rich in archaeological traces spanning long periods of time. The best known, if not the most noteworthy, of the sites on Rooipoort is the rock engraving locale at Klipfontein, known as Bushman's Fountain. The more than 4500 engravings there have attracted attention from researchers for over a century. The paper focuses primarily on this site and the research and conservation problems associated with rock engravings in the area. It reviews a century of engagement and changing perceptions of rock art in the Northern Cape and considers the interpretation of what is one of South Africa's most spectacular pre-colonial sites.

POSTER ABSTRACTS

Conservation of Black-footed Cats and Prevalence of Infectious Diseases in Sympatric Carnivores in the Northern Cape Province, South Africa.

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Black-footed cats share their territory, prey base, and infectious disease susceptibility with many other small carnivores which provides numerous opportunities for disease transmission. Preliminary data from Benfontein suggests the black-footed cats have been exposed to infectious diseases common in wild and domestic carnivores and results indicate a high seroprevalence of canine distemper in small carnivores in the area. The significance of this finding and its impact on the health of black-footed cat populations needs to be elucidated. A better understanding of the current disease dynamics of the species will assist in accurately assessing the species' conservation status and action plans.

The Damara Tern *Sterna balaenarum* in the Sperrgebiet

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The Damara Tern (*Sterna balaenarum*) breeds on the desert mainland of Namibia during the austral summer and migrates to West Africa during winter. The species is Near-Threatened on IUCN's Red Data List of Species. It is Specially Protected under the Draft Parks and Wildlife Management Bill of 2002 and has recently become a flagship species of the Namibian coastline. Very little was previously known about Damara Terns within the restricted diamond area known as the Sperrgebiet. This study lists all the breeding colonies in the Sperrgebiet and describes the breeding success at each one and suggests management approaches to each colony to assure the survival of the breeding Damara Terns in the Sperrgebiet.

The influence of land development on brown hyena (*Parahyaena brunnea*) behaviour and habitat use

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Brown hyenas occur at medium to high densities along the southern Namibian coast. Their home ranges are large and they travel 20 to 30 km per night. Food is found along beaches and at mainland Cape fur seal (*Arctocephalus pusillus pusillus*) colonies. This study's aim was to establish the importance of the coastal area and to assess the impact of development on brown hyena behaviour and habitat use. GPS telemetry revealed that use of the coastal area was high and that land development influenced hyena behaviour. Environmental Management Programmes are therefore adjusted regularly to review disturbance and conflict related issues.

Darkling beetles (family Tenebrionidae) in the Tswalu Reserve, Kalahari

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The family Tenebrionidae is one of the largest and most diverse within the insect order Coleoptera, not only morphologically but they also have different ecological adaptations. They are mainly responsible for assisting the decay of vegetation and animal matter; some are fungi feeders.

Most species are nocturnal and during the day they hide under stones, rotten plants and in sandy areas some even underground. Those that are active during the day are very fast runners. Worldwide, the family Tenebrionidae contains nearly 20,000 species, divided over 10 subfamilies, 96 tribes and 61 subtribes. The species identification of tenebrionids is easy in some groups, but in other groups difficult or even impossible due to different reasons. For example, the status of several described subspecies is doubtful and probably those taxa represent often just infraspecific variations. Additionally, several tenebrionid genera urgently need a modern revision, which will lead to new species descriptions but also new synonyms. Finally, the distribution of most species is only insufficiently known. Darkling Beetles of the Kalahari have never been systematically inventoried. During our fieldwork in Tswalu Nature Reserve we found 42 different species. It is only a very rough estimate but indicates a high diversity in that group and most probably the Tenebrionidae are the most dominant beetle group in the Kalahari. The species were identified by Dr. Wolfgang Schawaller and photographed by Johannes Reibnitz from the Staatliches Museum für Naturkunde in Stuttgart, Germany.

Resource partitioning in forest birds

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Resource availability and vegetation structure are strong determinants of bird community assemblages, and define the number of available niches in an environment. Birds utilise resources in several ways that reduce intra- and inter-species competition, particularly during periods of low food availability. This project describes and quantifies the utilisation of available food resources by birds in a KwaZulu-Natal afro-montane forest patch. Two methods were used, including field observations and carbon and nitrogen stable light isotope analysis. Preliminary data on resource partitioning by birds during winter are presented.

Hyena scats: a key to understanding past ecosystems

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Coprolites (fossil dung) are important pollen traps in palaeontological sites, and provide valuable insights into past ecosystems. In our research project in Tswalu Natural Park we view hyaena scats

as precursors of coprolites. We collect them during different seasons, together with aerial pollen traps and soil pollen from the same area. These samples allow us to compare seasonal changes in pollen abundance and composition to establish how well pollen content in dung represents the environment. When applied to coprolites in fossil sites the results will provide a more accurate interpretation of past environments or climatic fluctuations over time.

A Heteroptera survey in the Telperion/Ezemvelo Nature Reserve

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The Heteroptera (true bugs) are a large and diverse group of insects with 57 families and about 2200 species recorded from southern Africa. During 2005/6 a survey of the Heteroptera of the Telperion/Ezemvelo Nature Reserve was done. During the survey 217 species belonging to 39 families were recorded and subsequently a further 16 species were collected. It is estimated that they represent about 66% of the species occurring in the reserve. At least 5 of the species are undescribed and 3 represent new records for South Africa. The host plants of many species (several unknown before) and other biological data were also recorded.

Dung beetle fauna of Tswalu Kalahari Reserve (Coleoptera: Scarabaeidae: Scarabaeinae).

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Several surveys have been conducted to inventory the dung beetle fauna of Tswalu Kalahari Reserve (Coleoptera: Scarabaeidae: Scarabaeinae). These surveys also determined dominant spatial patterns in the west of the reserve and examined food type associations. In terms of abundance, the fauna of the Korannaberg was dominated by Nama Karoo elements whereas the plains and dunes were dominated by Kalahari and Savanna elements with the north of the reserve showing different structure to the south, although this may have been primarily influenced by a single species. Five different patterns of food type association were demonstrated for the dung beetle fauna.

Space use in relation to season in an elephant breeding herd in De Beers Venetia Limpopo Nature Reserve.

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We detail a study conducted on a breeding herd of elephants in De Beers Venetia Limpopo Nature Reserve (VLNR). Home range size, daily movements and vegetation preference were examined in relation to season. No seasonal variation in home range size or daily distance travelled was observed. Habitat use was non-random; however, it was not a function of time of year. Large home range overlaps were observed across seasons. We propose these results to be related to the high density of artificial water sources on the reserve.

The spiders of the Kalahari

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This is an exciting time in the study of spiders in South Africa. Biologists are starting to recognize the importance of the invertebrate component in the functioning of healthy ecosystems and with the initiation of the South African National Survey of Arachnida (SANSA), an umbrella project dedicated to unify and strengthen research on the Arachnida, research on spiders has escalated in South Africa.

Spiders are unique animals mainly because of their ability to produce silk. Silk enabled them to live in a variety of habitats and it plays an important part in their survival. They inhabit almost all terrestrial and some aquatic habitats, and many species have developed quite extraordinary methods to live in extreme environments. They are very important predators in all terrestrial ecosystems. They comprise one of the largest groups of land animals that are common and abundant in gardens and wilderness areas. They rank seventh among terrestrial animals in global diversity and 6% of the world fauna are known from South Africa.

This study provides information on the spiders of the Kalahari. The area covered by Kalahari sands extends over 2.5 million km² of the interior of central southern Africa. These wind-blown sands are the largest continuous stretch of sand in the world. It is regarded as one of Africa's last wilderness areas where minimal human impact has contributed to its preservation.

Presently 342 species from 41 families are known from the region. Desert spiders have developed their own means of coping with the high temperatures, long hours of sunlight, long periods without rain and water and the large amounts of salt present in this unique environment. The poster provides some information on the spiders of the Kalahari.

Can Predators pay their way? The benefits of wild dog based ecotourism in Limpopo Province, South Africa

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African wild dogs (*Lycaon pictus*) are endangered, and in South Africa as elsewhere, they inhabit a fraction of their former range. Recent efforts to establish a viable wild dog metapopulation outside of the Kruger National Park have met with considerable success: there are currently in excess of 150 free-ranging wild dogs in seven medium-sized (50 – 900 km²) protected areas across the country. It has been argued that wild dogs contribute to the ecological fitness of ecosystems. However many medium-sized reserves are managed within tight economic constraints such that wild dogs, among other large carnivores, are perceived to reduce revenue derived from the consumptive use of wild herbivore populations, including hunting and live game sales. In addition, perceived reduction in prey from high levels of predation raises fears that non-consumptive uses such as ecotourism are also impacted. The perception that wild dogs are “costly” has even led to the managed reduction of wild dog populations in some metapopulation reserves. Wild dog packs within the metapopulation are often closely monitored and this provides an excellent opportunity to generate revenue from tourism. They provide a highly rewarding game viewing experience, particularly during the denning season when packs are largely sedentary and the likelihood of seeing pups is close to 100%. This study reports on the development of a specialist wild dog ecotourism venture on the De Beers Venetia Limpopo Nature Reserve (Limpopo Province) between 2002 and 2005. More than 1200 people visited the project during this period, and benefits derived from wild dogs made a meaningful contribution to the operating budget of the reserve. The marketing potential of the wild dogs also added value to other tourism operations in the area.

Conservation genetics of African wild dogs *Lycaon pictus* in South Africa

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The African wild dog, *Lycaon pictus*, is South Africa's most endangered carnivore. In 1997 it was decided to manage South African wild dogs following a metapopulation approach which involves managing at least nine separate wild dog subpopulations on several small geographically isolated reserves as a single population. This requires intensive management including periodic movement of animals between reserves to mimic natural dispersal and maintain gene flow. Until now, all translocations have been done on a case-by-case situation considering available demographic information. Informed conservation management planning should involve both demographic history and an understanding of the genetic variation within the concerned taxonomic group. Conservation genetics consider genetic factors that affect extinction risks and genetic management systems needed to reduce these risks. The more phylogenetically distinct an endangered species is, the higher its conservation value. Wild dogs have been shown to be genetically distinct from canids (e.g. wolves and jackals) and are classified in their own genus. This project proposes to obtain baseline genetic data on the South African wild dog metapopulation in order to provide a basis for sound population management to reduce inbreeding and maintain levels of genetic heterozygosity similar to those found in large free-ranging populations, such as in Kruger National Park (KNP) which is the only place in South Africa which has a self-sustaining and viable population of wild dogs. Thirty two individuals from KNP and over 180 individuals from the metapopulation reserves were sampled. Microsatellite genotyping was performed to obtain baseline genetic data for both KNP's wild dog population and the metapopulation, and consequently used in analyses for the investigation of parentage and relatedness amongst the South African wild dog packs.

Diamond Route BIKE4BEASTS Mountain Bike Challenge

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Conservation is about our responsibility towards maintaining a healthy planet. The way in which we implement this is to focus on the resources and tools. BIKE4BEASTS is one such resource, and is a series of mountain bike challenges held in support of the Endangered Wildlife Trust (EWT). It combines the excitement and adrenaline of participating in an extreme sport with an opportunity to showcase how private conservation areas, such as the Diamond Route properties, can indirectly support conservation activities. BIKE4BEASTS was launched in 2007 as a fundraising initiative to support the EWT on two of the Diamond Route properties: the De Beers Venetia Limpopo Nature Reserve, and then, later, the Ezemvelo Nature Reserve in Gauteng. The Diamond Route undertakes to "make a lasting contribution to conservation and enhance environmental awareness in communities in the areas in which we operate". BIKE4BEASTS draws upon this mission and as an event has promoted developing riders, assisted the community, local businesses, landowners and tour operators alike. Some 686 riders have competed in BIKE4BEASTS over the last four years, with 316 at Ezemvelo and 370 at Venetia giving local accommodation suppliers and tour operators in the areas a boost in their tourism bed-nights and associated activities. The EWT has also benefited from the raised profile of their conservation activities with a 1,000-strong BIKE4BEASTS rider database each receiving regular conservation updates. BIKE4BEASTS has raised more than R250,000 for the EWT, proving it is a successful fundraising initiative. Exposure of the event has been wide, through both

national and international media with 16 magazine publications (including Ride and Bicycling SA), 5 newspapers with additional coverage in a Canadian newspaper, 3 guide books, 10 websites, 2 radio station reviews and 2 television interviews on 2 channels. Plans are underway to expand the scope of the event to include further Diamond Route properties in different biomes around South Africa, thus broadening exposure to both the route and the conservation activities of the EWT.

Marine diamond mining... Opportunities for marine research and student development

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Mining diamonds in water depths of around 120 metres is both technologically and environmentally challenging. On completion of an extensive Environmental Impact Assessment (EIA) for deepwater mining in 1996, ongoing research was initiated to monitor and demonstrate natural recovery of the mined environment. In conducting this research, opportunities were sought to partner with marine research institutions in order to

- share scientific expertise to ensure development of scientifically rigorous research techniques,
- ensure independence in research results, and
- provide educational opportunities to train marine researchers.

More than eighteen students have been associated with De Beers Marine since 1994, with involvement ranging from undergraduate projects to three PhD degrees.

The dynamics of small mammal populations in rocky highveld grassland, Telperion, Mpumalanga, South Africa

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The study attempts to answer the question of habitat selection of small mammals to vegetation type and structure in the Rocky Highveld Grasslands of Telperion in Mpumalanga. The project focuses on the influence of different broad habitats (pioneer grasslands, disturbed grasslands, *Burkea* dominated veld, *Protea* dominated veld) on small mammal diversity and the differences and similarities of ecological patterns displayed. This study also focuses on the effect of different management influences (virgin bush, moderate to severely altered areas) on diversity and abundance. These interactions should give an insight into the effect of different management practices in this grassland region. Habitat fragmentation is a major threat to biodiversity worldwide. It may result in the isolation of populations resulting in unviable population sizes due to low recolonization rates and can thus cause a decrease in population numbers of many species, both directly and indirectly. However, fragmentation is not all negative as a patchwork of habitats of different sizes can lead to high faunal diversity if these areas are of a sufficient size. Many studies have focused on larger vertebrates; however, significantly fewer have considered the importance of small mammals, rodents in particular, and their interaction with vegetation.

Diamond Route Partnerships ... creating mutual value

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Across the Diamond Route, a range of partnerships and collaborations exist broadly aimed at driving positive change in biodiversity management and conservation as a common goal for both parties. Partnerships may take the form of financial support, logistic support, access to property, data/information sharing or strategy development and review. Successful partnerships tend to create a greater impact through working together rather than individually and providing mutual benefit for both the partner organisations. Some of the partners that have worked, or still work, with the Diamond Route and within the broader De Beers Family of companies are SANParks, Peace Parks Foundation, Endangered Wildlife Trust, Wildlife and Environmental Society of South Africa, Conservation International, South African National Biodiversity Institute, Worldwide Fund for Nature, Namibian Ministry of Fisheries and Marine Resources, Millennium Seedbank Project, McGregor Museum, Ditsong Museum of Natural History, National Cultural History Museum, Angolan Biodiversity Assessment and Capacity Building Programme, AGRED, BirdLife South Africa, Cheetah Conservation Botswana, Brown Hyaena Project and a range of universities (Western Cape, Stellenbosch, Oxford, Exeter, Rhodes, Kwa-Zulu Natal, Cape Town, Wits, Pretoria, Wupperthal and Namibia). Some examples of projects and their benefits to both parties are presented.
