



**3<sup>rd</sup> Annual Diamond Route Research Conference**  
**30<sup>th</sup> & 31<sup>st</sup> October 2012**  
**Multipurpose Room, Cornerstone Building,**  
**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 30 <sup>th</sup> October
08h30	REGISTRATION and TEA / COFFEE
09h00	Rob Smart, Chair of the Diamond Route <b>Overview of Diamond Route properties</b>
09h20	Bob Scholes <b>Importance of Biodiversity Conservation</b>
<b>Species &amp; Community Adaptations</b> <b>CHAIR: Richard Satekge, Site Representative; Tswalu Kalahari</b>	
09h50	T. Keswick and M. Hofmeyr A tortoise for all seasons: Behaviour and thermoregulation in <i>Psammobates oculifer</i>
10h10	G.C. O'Brien The ecological state of the Diamond Route reserves rivers and what we should do about it?
10h30	G. Purchase Impacts of holistic management on depredation rates: A case study of Debshan Ranch, Zimbabwe
10h50	TEA / COFFEE and Poster Session
<b>Mammal Ecology</b> <b>CHAIR: Corne Anderson, DBCM Manager; Ecology and Biodiversity Management</b>	
11h20	M. Cromhout <sup>1</sup> , J. du P. Bothma <sup>2</sup> and M. W. Van Rooyen <sup>3</sup> The suitability of the arid, southeastern Kalahari region of South Africa for the African buffalo
11h40	B.J. Steinback <sup>1</sup> , M.E. Taylor <sup>2</sup> and M. Hazell <sup>3</sup> Woodland Caribou Movements in the James Bay Lowlands
12h00	S. M. Miller <sup>1</sup> , C. Harper <sup>2</sup> , P. Bloomer <sup>3</sup> and P. J. Funston <sup>4</sup> Genetic diversity of lions in South Africa
12h20	A. Sliwa <sup>1</sup> , B. Wilson <sup>2</sup> , and N. Lamberski <sup>3</sup> , J. Herrick <sup>4</sup> , A. Lawrenz <sup>5</sup> Long-term Black-footed Cat Research on Benfontein
12h40	E. Bussi�re <sup>1</sup> , L.G. Underhill <sup>2</sup> and I. Wiesel <sup>3</sup> The Tswalu Brown Hyena Project
13h00	LUNCH and Poster Session and Conference Photograph

Time	Tuesday 30 <sup>th</sup> October (continued)
<b>Avian Conservation</b> <b>CHAIR: Warwick Davies-Mostert, De Beers Biodiversity Coordinator</b>	
14h00	N. Chiweshe The impact of rapid land redistribution on avian diversity and abundance in Zimbabwe
14h20	R. L. Thomson Nests as a resource to other species: the case of sociable weavers in the Kalahari
14h40	<u>D. du Plessis</u> <sup>1,2,3</sup> , C. T. Symes <sup>1</sup> and H. A. Smit <sup>2</sup> Environmental factors influencing the occurrence of White-bellied Korhaan <i>Eupodotis senegalensis</i> on Telperion and Ezemvelo Nature Reserve
15h00	<u>S. L. Scott</u> <sup>1</sup> and C. T. Symes <sup>2</sup> Seasonal food limitation drives the foraging behaviour of birds in an Afromontane forest
15h20	TEA / COFFEE
<b>Invertebrate Conservation</b> <b>CHAIR: Malwande Dumeko, Site Representative: Brenthurst Garden</b>	
15h50	<u>C. Theron</u> <sup>1</sup> , C.W.W. Pirk <sup>1</sup> and F.Dalerum <sup>2,3</sup> Using nest mate recognition to determine colony extent of <i>Trinervitermes trinervoides</i>
16h10	I.A. Engelbrecht Trapdoor spider conservation in Gauteng Province with a survey at Ezemvelo Nature Reserve
16h30	<u>B.P. Tshikae</u> <sup>1</sup> , A. L.V. Davis <sup>1</sup> , N. Makate <sup>2</sup> and C.H. Scholtz <sup>1</sup> Mining Lease Areas as refugia for dung beetles along the Diamond Route in Botswana
16h50	<u>A.E.J. Leroy</u> and J-M. P. Leroy Survey of Arachnids at Brenthurst Garden - Some Surprises
17h10	J. Leeming Tswalu Kalahari Scorpion Survey, Education and Ecotourism
17h30	A. S. Dippenaar-Schoeman The diversity and adaptation of orb-web spiders (Araneae: Araneidae)
17h50	Close of Day 1
18h00	COCKTAIL FUNCTION & POSTER SESSION: DE BEERS CORNERSTONE
	Welcoming Address: Prof. Jonathan Jansen, Rector of Free State University "The school as an ecosystem".
	Photographic Slide Show: Erwin & Nicoleen Niemand

Time	Wednesday 31 <sup>st</sup> October
08h00	TEA / COFFEE
<b>Community Studies</b> <b>CHAIR: Elsabe Bosch, Site Representative: Telperion</b>	
08h30	Graham Williamson The Sperrgebiet – natures parched masterpiece
09h00	H. Bezuidenhout Vegetation classification for Rooipoort Nature Reserve
09h20	<u>T.G. O'Connor</u> <sup>1</sup> and B. Page <sup>2</sup> Impact of elephants on the woody vegetation of the Venetia-Limpopo Nature Reserve
09h40	<u>S. Woodborne</u> <sup>1</sup> , A. Patrut <sup>2</sup> , G. Hall <sup>1</sup> , I. Robertson <sup>3</sup> , N. Loader <sup>3</sup> and M. Hofmeyr <sup>4</sup> The baobab climate change record
10h00	B. Maritz <sup>1</sup> and <u>G. J. Alexander</u> <sup>2</sup> The energetic reward of going big: the advantage of consuming large meals in the Namaqua Dwarf Adder
10h20	<u>K. Hutchings</u> <sup>1</sup> , A. Pulfrich <sup>2</sup> and B. Clark <sup>1</sup> Monitoring the impacts of diamond mining on the southern Namibian sandy beaches - the use of <i>Tylos granulatus</i> as an indicator species
10h40	TEA / COFFEE and Poster Session
<b>Climate Change</b> <b>CHAIR: Charles Hall, Site Representative: Dronfield Nature Reserve</b>	
11h10	<u>A. E. McKechnie</u> <sup>1</sup> , B. Smit <sup>1</sup> , S. J. Cunningham <sup>2</sup> , R. O. Martin <sup>2</sup> and P. A. R. Hockey <sup>2</sup> Hot birds at Tswalu: a progress report
11h30	<u>A. Fuller</u> <sup>1</sup> , R.S. Hetem <sup>1</sup> , D. Mitchell <sup>1</sup> and S.K. Maloney <sup>1,2</sup> Biologging, homeothermy and climate change
11h50	<u>W.M. Strauss</u> <sup>1,2</sup> , R.S. Hetem <sup>1</sup> , S.K. Maloney <sup>1,3</sup> , D. Mitchell <sup>1</sup> , L. Meyer <sup>1</sup> and A. Fuller <sup>1</sup> Conserving body water: the challenge faced by arid-zone ungulates
12h10	<u>B. Rey</u> <sup>1</sup> , R.S. Hetem <sup>1</sup> , L. Meyer <sup>1</sup> , A. Haw <sup>1</sup> , D. Mitchell <sup>1</sup> and A. Fuller <sup>1</sup> Body temperature and activity patterns of free-living aardvark ( <i>Orycteropus afer</i> )
12h30	LUNCH and Poster Session
<b>Geology, Archaeology and Heritage</b> <b>CHAIR: Duncan MacFadyen, EOS Research and Conservation</b>	
13h30	B. Senut Sperrgebiet, Namibia : a key for understanding desertification in Africa
13h50	M. Pickford A suite of well-bedded "Freshwater" limestones of Palaeogene age overlie Proterozoic Gariiep Group rocks in the Sperrgebiet, Namibia
14h10	N. Alexander Kolmanskop: An industrial heritage resource or only a tourist attraction? The assessment of value with regard to Kolmanskop Ghost Town and the industrial landscape of the Sperrgebiet National Park, Namibia
14h20	<u>Y. Fernandez-Jalvo</u> <sup>1</sup> and L.Scott <sup>2</sup> Natural Parks: Their value in understand the past, present and future
14h40	T. Forssman Changing Hunter-Gatherer Lifeways on the Greater Mapungubwe Landscape: A Landscape Approach to an Archaeological Quandary
15h00	<u>T.N. Huffman</u> <sup>1</sup> , M. Elburg <sup>2</sup> and M. Watkeys <sup>2</sup> Vitrified cattle dung in the iron age of Southern Africa
15h20	Presentation Awards - Mrs Strilli Oppenheimer
15h40	Closing - Mark Berry
15h50	<b>CONFERENCE CLOSURE</b>

Posters	
Authors	Titles
<u>E.C.J. Seamark</u> , T.C. Kearney and M. Keith	Historical records, estimates of species richness, taxonomic diversity and distinctness for bats (Mammalia: Chiroptera) from the Diamond Route Reserves
<u>Nicci Wright</u> , Alex Sliwa, Duncan MacFadyen, Elsabe Bosch, Maroti Tau, Ewann Stroh and Daniel Shai	Rehabilitation and release of handreared black-footed cats ( <i>Felis nigripes</i> )
<u>N. Lamberski</u> , B. Wilson, A. Sliwa, J. Herrick, A. Lawrenz, K. Terio and E. Dubovi	Viral seroprevalence in black-footed cats and sympatric carnivores
<u>T. Hoffman</u> , L. Underhill and Bob Millar	The African Mammal Atlas Project: Updating African mammal distribution records for improved conservation efforts
B. Wilson	Camera trapping and monitoring of wing-tagged White-backed Vultures at the Dronfield vulture restaurant
<u>S. D. Hofmeyr</u> , C. Symes and L. G. Underhill	Investigating the decline of the Secretarybird ( <i>Sagittarius serpentarius</i> )
B. Wilson	Post-fledging dispersal monitoring of a Secretarybird chick on Dronfield Nature Reserve using a cellular device
H. Smit	BirdLife South Africa terrestrial bird conservation overview
<u>A. Berruti</u> and S.M. Berruti	The implications of the diet of Namaqua and Burchell's Sandgrouse at Tswalu
<u>R. Lyle</u> and A. S. Dippenaar-Schoeman	Baboon and Trapdoor Spiders on some of the De Beer Diamond Route Reserves
<u>A. S. Dippenaar-Schoeman</u> , S. Foord and R. Lyle	The spiders (Arachnida: Araneae) of Venetia Limpopo Nature Reserve
<u>J. A. Kelly</u> and CD. Eardley	South African Bee Biodiversity Survey
J. Leeming	Tswalu Kalahari Scorpion Survey
<u>E. Harris</u> , J. Van den Berg and S.J. Siebert	<i>Frithia humilis</i> and generalist pollinators: why asymmetry in plant-pollinator mutualistic networks is advantages for the translocation of edaphic specialists
<u>P. Grundling</u> and A.T. Grundling	Wetlands of the Mapungubwe National Park: The big, the bad and the beautiful
<u>W.J. Collinson</u> , C. Patterson-Abrolat and D. van der Merwe	Road Ecology – the way forwards to mitigating the threat to wildlife
<u>A. S. Böck</u> and S. Mungungu	Atlantic 1 Environmental sensitive sites
T. Forssman	The Later Stone Age of the Venetia Limpopo Nature Reserve and its surrounds
<u>D. Cram</u> , J. Blount and A. Young	Benefits of cooperative breeding: does oxidative stress play a role?
<u>S.A. Kohler</u> , I. Wiesel, J-P. Roux, J. Kemper and L.G. Underhill	Marine nutrients imports to the Namib desert through large terrestrial carnivores and wind-blown detritus on the southern Namibian coast
R. Cooper-Bohannon	The significance of protected areas for bats conservation in southern Africa

## ORAL ABSTRACTS

### Importance of Biodiversity Conservation

Bob Scholes

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The past two decades have seen a broadening of the view of what constitutes 'biodiversity', and thus what it means to conserve it. At the same time, we have gained a new perspective on why it is fundamentally important, rather than just desirable, to maintain biodiversity in our landscapes. The arguments for conservation have historically been based on either aesthetic or ethical considerations: biodiversity is beautiful and we have a moral obligation to protect it. Those arguments remain valid, but have been demonstrably insufficient to prevent massive and accelerating biodiversity loss worldwide. We now have a third, very compelling reason to maintain and even restore biodiversity: human self-interest. This so-called 'utilitarian' argument is that biodiversity - in its broad definition (which includes biological variability at the gene, species and ecosystem levels, and in terms of composition, structure and function) – is essential to human persistence and wellbeing. It turns out that both the productivity and robustness of the biosphere – of which we are inescapably a part – are related to its biodiversity, albeit in complex and as yet poorly understood ways. It is possible to quantify the contribution that biodiversity makes to our lives in terms of 'ecosystem services'. In some cases it is useful to monetarise this value, expressing it as 'natural capital', directly comparable to the 'financial capital' which currently drives almost all development decisions. In this way we can make wiser choices about how to use the land and how much effort we should invest in conservation and restoration.

### A tortoise for all seasons: Behaviour and thermoregulation in *Psammobates oculifer*

T. Keswick & M. Hofmeyr

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The Kalahari tent tortoise, *Psammobates oculifer*, experiences fluctuating and extreme seasonal temperatures. We monitored seasonal refuge orientation, behaviour patterns, and tortoises' inguinal temperatures to assess the role of behaviour in its thermoregulation. During winter, tortoises basked more and orientated themselves predominately north-northeast of refuge cover, thereby maximizing the solar radiation received while remaining in protective vegetation. In summer, tortoises mainly basked at sunrise and positioned themselves east of their refuge, receiving early morning sun. Tortoises were then active for a short period prior to the midday heat. Through thermoregulatory behaviour, *P. oculifer* is able to exploit resources in any season.

### The ecological state of the Diamond Route reserves rivers and what we should do about it?

G.C. O'Brien

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The excessive use of aquatic ecosystem services in southern Africa has resulted in a decline in ecosystem integrity and the loss of key ecosystem processes of systems including rivers. The Diamond Route sites are located within river catchments that are negatively impacted on by anthropogenic activities. Three reserves including Rooipoort, Venetia and Ezemvelo are closely associated with ecologically important river ecosystems including the Vaal River, Limpopo River and Wilge River a tributary of the Olifants River respectively. The ecological state of these systems ranges from slightly impacted to poor ecological integrity state. The Diamond Route reserves can contribute to the conservation and management of ecologically important aquatic biodiversity and ecosystem functions of these systems

## Impacts of holistic management on depredation rates: A case study of Debshan ranch, Zimbabwe

N. Purchase

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Livestock depredation and the resultant conflict present a major threat to the survival of cheetah and African wild dog in much of their current range. Retaliatory killings of these two predators, in some areas, account for a large percentage of mortality. Cheetah and African wild dog, given their ecology and wide ranging behaviour, depend on land that is often under livestock and there is a critical need to determine land management practices that allow coexistence. Holistic management of livestock is one such management technique, and early indications are that it can significantly reduce livestock depredation by predators. This paper presents the preliminary results of a before and after analysis of depredation on a large scale cattle ranch in Zimbabwe that has recently adopted the holistic management model. The paper also discusses the implications of these findings to the wider conservation of large predators such as cheetah and wild dogs.

## The suitability of the arid, south-eastern Kalahari region of South Africa for the African buffalo

M. Cromhout<sup>1</sup>, J. du P. Bothma<sup>2</sup> and M. W. Van Rooyen<sup>3</sup>

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The feeding ecology of the African buffalo *Syncerus caffer* was studied on Tswalu Kalahari Reserve in the south-eastern Kalahari region of the Northern Cape Province, South Africa. The study commenced in April 2003 and continued until July 2004. Direct observations were used to determine the feeding preferences of the buffalo, and plant material was collected and chemically analysed to determine their nutritional status. From a total of 426 feeding records made in the cold, dry season and 346 in the warm, wet season, it was concluded that the buffalo on Tswalu Kalahari Reserve entered a period of nutritional stress during the winter months. The observed deficiencies of the buffalo were in crude protein, copper, manganese, zinc, calcium and phosphorus, which could all result in reproductive problems. The buffalo on Tswalu Kalahari Reserve were resource limited, and could not ingest a sufficient quality of food needed for maintenance requirements.

## Woodland Caribou movements in the James Bay Lowlands

B.J. Steinback<sup>1</sup>, M.E. Taylor<sup>2</sup> and M. Hazel<sup>3</sup>

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<sup>3</sup> AMEC Environment & Infrastructure, Mississauga, ON

Radio-telemetry and survey data from boreal woodland caribou (*Rangifer tarandus*) have been collected since 2004. Three sets of animals collared near the Victor Mine 100 km inland from James Bay have transmitted data via the Argos satellite system, revealing previously unknown details of habitat use. Home ranges varied from 5,000 to 110,000 km<sup>2</sup>, extending from the shores of James Bay and Hudson Bay westwards into Manitoba. Caribou showed strong fidelity to calving grounds but similar site fidelity was not observed for over-wintering areas. This presentation will summarize these studies, including evidence of seasonal mixing of caribou from different regions.

## Genetic diversity of lions in South Africa

S M Miller<sup>1</sup>, C Harper<sup>2</sup>, P Bloomer<sup>3</sup> and P J Funston<sup>4</sup>

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<sup>4</sup> Tshwane University of Technology

Lions have roamed the De Beer's Venetia-Limpopo Nature Reserve (VLNR) since its inception in the late 1980s. Genetic diversity is a key component of conservation success for any species. Using 26 microsatellite markers, we are examining lion DNA from across South Africa to determine genetic diversity. Preliminary results show that the VLNR lions have six alleles in five microsatellite markers not found in other populations in South Africa and three found only in one other population. This highlights the contribution of VLNR's lion population to the overall genetic diversity of South Africa's lions.

## Long-term Black-footed Cat Research on Benfontein

A. Sliwa<sup>1</sup>, B. Wilson<sup>2</sup>, N. Lamberski<sup>3</sup>, J. Herrick<sup>4</sup>, and A. Lawrenz<sup>5</sup>

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<sup>2</sup> *McGregor Museum*

<sup>3</sup> *San Diego Zoo Safari Park*

<sup>4</sup> *National Foundation for Fertility Research*

<sup>5</sup> *Wuppertal Zoo*

A summary of 6-years of fieldwork on Benfontein NR is provided by members of the Black-footed Cat Working Group (BFCWG). 20 different cats (12 males, 8 females) were captured. 13 cats were radio-collared and locations collected by members of the BFCWG and field assistants. 7 had deciduous dentition or lower body mass, thus were sub-adults. 6 litters of small kittens were found. Two birth seasons from spring to autumn are apparent. An adult male of >7 years holds the current longevity record. Causes of mortality in collared black-footed cats are discussed.

## The Tswalu Brown Hyena Project

E. Bussière<sup>1</sup>, L.G. Underhill<sup>2</sup> and I. Wiesel<sup>3</sup>

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<sup>2</sup> *Animal Demography Unit, University of Cape Town, South Africa*

<sup>3</sup> *Brown Hyena Research Project, Lüderitz, Namibia*

A new study on brown hyenas will soon be launched at Tswalu Kalahari Reserve. The brown hyena population is believed to be in decline due to habitat fragmentation and human persecution. The project aims to develop statistical and managerial methods to improve the conservation of brown hyenas in Tswalu and surroundings where persecution is strong and distribution data are missing. We plan to promote human-wildlife coexistence, test and potentially improve indirect carnivore survey methods, collaborate with MammalMAP to build up the brown hyena 21st century distribution map and assess the role of Tswalu in the maintenance of a viable brown hyena population on extensive agricultural lands

## The impact of rapid land redistribution on avian diversity and abundance in Zimbabwe

N. Chiweshe<sup>1</sup>, P. Mundy<sup>3</sup> and M. Dallimer<sup>3</sup>

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<sup>3</sup> *Department of Resource Economics and Food Policy, and Center for Macroecology, Evolution and Climate, University of Copenhagen, Denmark.*

In Zimbabwe, recent land re-distribution has had profound socio-economic and land-use consequences, including impacts on biodiversity. Although two-thirds of the original Debshan Ranch in central Zimbabwe was acquired for the use of resettled farmers, some of the property remains under management as a game/cattle ranch. It therefore represents an ideal case study system to investigate how avian communities may have altered in response to land re-distribution. During winter 2012, we carried out bird survey transects on 45 sites distributed across resettled and ranch land, sampling three habitat types (Acacia, miombo, open grassland). 152 species were recorded. Initial findings suggest the number of species and the number of individuals was higher on resettled sites. However, game mammals, large-bodied birds and raptors were generally only seen on ranch sites. Further fieldwork in different seasons and across multiple years is required before any firm conclusions should be drawn.

## Nests as a resource to other species: the case of sociable weavers in the Kalahari

R. L. Thomson

Section of Ecology, Department of Biology, University of Turku, [robtho@utu.fi](mailto:robtho@utu.fi)

Harsh environments favour close between-species associations. In the Kalahari, a potential keystone species the Sociable Weaver *Philetairus socius* builds massive nests. This study investigates the use of these colonies by other species. I mapped nests in a 110km<sup>2</sup> area within Tswalu Kalahari. Pygmy Falcons *Polihierax semitorquatus* are obligate users of weaver colonies. Signs of falcon use were found in 35% of colonies mapped, including 25 active nests, showing a preference for large colonies. Three bird species regularly utilized chambers for roosting. Colonies appear a valuable resource that may increase in importance as the environment becomes more extreme under global change.

## Environmental factors influencing the occurrence of White-bellied Korhaan *Eupodotis senegalensis* on Telperion and Ezemvelo Nature Reserve

D. du Plessis<sup>1,2</sup>, C. T. Symes<sup>1</sup> and H. A. Smit<sup>2</sup>

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<sup>2</sup>BirdLife South Africa

Ongoing fieldwork to investigate the biology of the White-bellied Korhaan in relation to issues of conservation is being conducted mainly on Telperion and Ezemvelo Nature Reserve. The preference of the White-bellied Korhaan for certain habitat types, grass heights, and the presence of large grazers are compared to those of co-occurring bustard species. By understanding the environmental factors that influence the continued survival of this species in South Africa, informed decisions about the conservation of this threatened grassland species can be made.

## Seasonal food limitation drives the foraging behaviour of birds in an Afromontane forest

S. L. Scott and C. T. Symes

School of Animal, Plant and Environmental Sciences University of the Witwatersrand, Private Bag 3, Wits, 2050; [samalamanam@gmail.com](mailto:samalamanam@gmail.com)

This study assessed the coexistence of bird species within a dynamic forest bird community, in response to seasonal variation in food availability and vegetation structure. Nectarivores, omnivores and insectivores tracked food resources within vertical strata to where their food resource was most abundant. In winter, a greater number of resource pools lead to less overlap in ecological niche space between bird species and in summer greater food availability led to high intra-guild overlap in niches. Therefore, food limitation in a season is species-dependent where some species leave the forest to forage elsewhere whilst those that remain compensate for a reduction in availability through niche expansion in one or more dimensions.

## Using nest mate recognition to determine colony extent of *Trinervitermes trinervoides*

C. Theron<sup>1</sup>, C.W.W. Pirk<sup>1</sup> and F. Dalerum<sup>2,3</sup>

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University of Pretoria, Centre for Wildlife Management

Termites are eusocial insects that reproduce sexually. Although colonies of the harvester termite *Trinervitermes trinervoides* may consist of many mounds, the spatial extent of their colonies is unclear. We used aggression between soldiers to quantify colony extent among mounds spaced 10 to 350 meters apart. Aggression was higher between individuals from different mounds compared to from the same mound, but the distance between mounds had no effect on aggression. These results suggest that a colony occupies only a single mound in our study area, and that there appear to be no kinship structure among colonies within the measured spatial scale.



## **Trapdoor spider conservation in Gauteng Province with a survey at Ezemvelo Nature Reserve**

I.A. Engelbrecht

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Trapdoor spiders are enigmatic, elusive animals which makes conserving them difficult. Surveys are currently underway at several localities in Gauteng Province, including Ezemvelo Nature Reserve, to gather the data needed for species Red List status assessments and for developing conservation strategies. These surveys have revealed a surprising diversity of species as well as unexpected behaviour. This paper will focus on some of the highlights from these surveys and discuss future research needs.

## **Mining Lease Areas as refugia for dung beetles along the Diamond Route in Botswana**

B.P. Tshikae<sup>1</sup>, A. L.V. Davis<sup>1</sup>, N. Makate<sup>2</sup> and C.H. Scholtz<sup>1</sup>

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<sup>2</sup>*University of Botswana, Department of Biological Sciences*

Scarabaeinae dung beetles are reputable bio-indicators of ecological integrity. They provide ecosystems services through burying mammal dung. The research explores dung beetle assemblage structure within the Debswana mining lease area protecting a diversity of indigenous mammals and communal farming areas dominated by livestock. Since dung beetle assemblage structure is influenced by abiotic and biotic factors their diversity and composition can be expected to vary between study areas. This is valuable base-line information for assessing future changes in habitat structure and rehabilitation. The information will be useful for systematic conservation planning tools and highlighting the role of mining sector in conservation in Botswana.

## **Survey of Arachnids at Brenthurst Garden – some surprises**

A. E.J. Leroy and J-M. P. Leroy

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A survey of the arachnids at Brenthurst Garden began in February 2011 was proposed to run to end in March 2012 but more data particularly of night active and non-spider arachnids is needed. So far only spiders and no other arachnid orders have been found. The number of different spider species noted is surprisingly small although some were unexpected. The value of various data gathering methods are discussed and input from the garden guides noted.

## **Tswalu Kalahari scorpion survey, education and ecotourism**

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The Kalahari desert is a hotspot for scorpion diversity and with few records for the area resulting in a good likelihood of discovering new species of scorpion at Tswalu Kalahari. The objectives of the project at Tswalu Kalahari initially comprised of a survey the scorpion fauna. Scorpions are an iconic symbol in the Kalahari however many people hold negative perceptions and towards them. Educational elements were introduced into the project to educate the staff, family of staff, medical personnel, guests and visitors to the reserve as to the ecological value of scorpions and public health issues. An educational display was also developed at Motse. The third part of the project was to promote ecotourism activities with special emphasis on these creatures. In this presentation, methods employed during the survey, the various activities undertaken and lessons learnt along the way will be discussed.

## The diversity and adaptation of orb-web spiders (Araneae: Araneidae)

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The use of a web to capture prey is assumed to have developed long after spiders came into existence, and it took more than 200 million years for the first orb-web to appear. The great diversity in web types suggests that this strategy is very successful. The webs of spiders are highly specialized structures that might be considered an extension of the spider's tactile sense organs. Webs may seem a chaotic arrangement of silk threads but most threads serve a definite purpose consisting of mooring threads, pilot threads, signal threads and catch threads. Different types of webs are constructed by spiders, and orb-webs one of the best known webs and are usually built over open spaces. There are a variety of orb-webs ranging between typical orb-webs to adapted orb-webs or reduced orb-webs. A rich diversity of orb-web spider families has been sampled from the different Diamond Route Reserves. The behaviour of these spiders and the types of webs they built will be discussed.

## Sperrgebiet Nature's Parched Masterpiece

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Located in the southwest corner of Namibia and bordering the Atlantic Ocean, lies the Sperrgebiet, part of the Namib, one of the world's oldest deserts. This forbidden area has been closed since the early nineteenth hundreds resulting in possibly one of the most protected areas in the world. At first encounter, this harsh wilderness with bleak, lonely, sandblasted, distant mountains can induce an overwhelming wave of agoraphobia and a feeling of being cut off from the rest of the world. This initial superficial impression of an empty desert terrain belies the fact that the Sperrgebiet is very special and one of the most fascinating interesting places in the world. Over time evolution has bequeathed to us a rugged land with a spectacular coastline, a palaeontological picture of fossils from bygone eras, numbers of artifacts left by early man, a spectacular panorama of dune systems and most of all the suppository of gem quality diamonds. The flora has developed in specialised discrete niches with numerous endemic plants occurring. The lower Orange River valley comprises a subcentre of endemism within the larger area termed the Gariep Centre. In the book a chapter is included titled "The Heritage of Time" where the survival evolutionary characters of the various flora and faunal elements are discussed and illustrated. The text comprises about 134,500 words and the book lavishly illustrated with over 1400 files (scans) covering as many of the Sperrgebiet facets as possible.

## The classification, mapping and description of the vegetation of the Rooipoort Nature Reserve, Northern Cape, South Africa

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The need for a scientifically-based wildlife management plan and for more knowledge on vegetation led to an investigation into the plant ecology of the Rooipoort Nature Reserve. The main aim of this study was therefore to classify, describe and map the vegetation of the reserve. The floristic data were analyzed according to the Braun-Blanquet procedure using the BBPC suite. The data analysis resulted in the identification of 15 communities that can be grouped into ten major community types. This resulted in five ecology-based management units, which could assist with the compilation of an ecologically sound management plan for the reserve in order to achieve sustainable utilization of the natural resources. The Rooipoort Nature Reserve is one of the oldest and largest private nature reserves in South Africa and as such deserves to be conserved and protected. The riverine and pan vegetation communities are considered to be endangered and are in need of special conservation and protection.

## Impact of elephants on the woody vegetation of the Venetia-Limpopo Nature Reserve

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Monitoring of 12000 woody individuals was conducted on the VLNR from 1997 to 2010. Elephants were responsible for a trend toward local extirpation of three dryland shrub species, one dryland succulent shrub, one succulent climber, three riparian shrub species, ten of 22 dryland tree species, and three of 11 riparian tree species. Other agents affected the trend toward local extirpation of one tree-like *Aloe*, one shrub and one dryland tree species. The current density of elephants threatens the functional loss of a number of plant species; 'biodiversity carrying capacity' has been exceeded. Management options for maintaining plant diversity are discussed.

## The baobab climate change record

S. Woodborne<sup>1</sup>, A. Patrut<sup>2</sup>, G. Hall<sup>1</sup>, I. Robertson<sup>3</sup>, N. Loader<sup>3</sup> and M. Hofmeyr<sup>4</sup>

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Carbon isotopic values in baobab wood reflect the rainfall at the time of formation. Isotopic profiles from baobab core samples, and from the annual ring recovered from fallen trees, produce a near-continuous annually resolved climate record for the Limpopo River Valley covering the last 1000 years. The record is unparalleled in interpreting the archaeological record from the Late Iron Age sequence in the region, but it has profound implications for our understanding of the carbon cycle. The baobab climate change record shows a rapid climate change during the Little Ice Age that is also reflected in reduced rainfall in the winter rainfall regions. An implicit shift in the climate bands at this time helps to elucidate the global changes in the atmospheric CO<sub>2</sub> concentration at this time.

## The Energetic Reward of Going Big: The Advantage of Consuming Large Meals in the Namaqua Dwarf Adder

Bryan Maritz<sup>1</sup> and Graham J. Alexander<sup>2</sup>

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Many snakes that ambush prey are able to consume enormous meals. While the associated costs have been studied in several species, advantages have not been quantified. We measured the energetic advantage of being able to consume large meals for the Namaqua Dwarf Adder by quantifying the available prey community and relative abundance of prey types in the diet. Namaqua Dwarf Adders are generalist feeders, consuming prey proportionally to encounter rate. Although very large meals are rarely encountered, the ability to consume those meals increased energy intake by up to 25%. This advantage represents a strong selective force for the ability to consume large meals in this species.

## Monitoring the impacts of diamond mining on the southern Namibian sandy beaches - the use of *Tylos granulatus* as an indicator species

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*Tylos granulatus* has been used as an indicator species to assess the impacts of diamond mining at three paired control and impact monitoring sites located in the Bogenfels Mining Licence Area (MLA). Sampling was initiated in 1998 and undertaken annually over the period 2004-2011 (ongoing). Baited pit trap sampling is conducted during each survey to estimate *T. granulatus* abundance and collect population size structure data. These data are analysed using a Before-After-Control-Impact (BACI) experimental design. Results show a dramatic and statistically significant decline in abundance with the onset of mining at impact sites, with abundance estimates remaining low or zero for the duration of mining activity. Statistically significant evidence of recovery in abundance has been found at impact sites approximately four years after the cessation of mining. However, the age/size structure of *T. granulatus* populations at the impacted sites remains substantially different from the pre-mining size structure and/or from that at the control sites for up to four years, indicating that the species takes longer to fully recover from mining impacts.

## Hot birds at Tswalu Kalahari: a progress report

A. E. McKechnie<sup>1</sup>, B. Smit<sup>1</sup>, S. J. Cunningham<sup>2</sup>, R. O. Martin<sup>2</sup> and P. A. R. Hockey<sup>2</sup>

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Since 2009, we have been using Tswalu as a model system for predicting the impacts of global warming on desert birds. We have found that numerous avian physiological and behavioural variables vary with temperature. For example, the daily water requirements of White-browed Sparrow-Weavers increase with temperature, as does the frequency of transient hyperthermic bouts. Our data also reveal how high temperatures lead to behavioural changes in Common Fiscals that negatively affect chick growth rates. Research at Tswalu has been instrumental in our development of a conceptual framework for predicting climate change impacts on desert birds at a global scale.

## Biologging, homeothermy and climate change

A. Fuller<sup>1</sup>, R.S. Hetem<sup>1</sup>, D. Mitchell<sup>1</sup> and S.K. Maloney<sup>1,2</sup>

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Maintaining homeothermy requires energy and water. Using biologging to record body temperatures continuously in free-living mammals in their natural habitat, we have shown that restriction of food or water leads to a relaxation of thermal regulation, evident as exaggerated amplitude of 24h temperature rhythm. Homeothermy appears to be a luxury, evident only in mammals that are well nourished, hydrated and not energetically compromised. We propose that the daily amplitude of body temperature rhythm provides an index of stress that predicts the performance of an animal. Long-term biologging of body temperature will provide a tool for us to investigate which species are likely to be threatened with extinction, when confronting climate change.

## Conserving body water: the challenge faced by arid-zone ungulates

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Success in arid environments requires optimal management of body water, which all arid-zone mammals need to conserve to maintain body fluid status, but which mammals which use evaporative cooling need to lose, to stay cool. Achieving optimal management of body water will become more difficult in the face of on-going global climate change, during which Southern Africa will become increasingly hotter and have less predictable rainfall. Those climate changes also will result in reduced food availability for artiodactyls, so the animals will be less able to employ thermoregulatory strategies like seeking shade, which compromise foraging. Using gemsbok, red hartebeest and blue wildebeest as our arid region ungulates, we explore some of the “mechanisms” that ungulates use in order to conserve body water and maintain homeothermy.

## **Body temperature and activity patterns of aardvark (*Orycteropus afer*) in response to fluctuating environmental variables in the Kalahari**

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While aardvark play an important role as ecological engineers in semi-arid habitats, very little is known about the biology of these animals in their natural habitat. In July 2012, we initiated a study at Tswalu Kalahari to determine, at a very fine scale, the patterns of body temperature and activity of aardvark, and their relation to natural fluctuations of environmental variables. Seven aardvarks have been implanted with miniature temperature and activity recording loggers, allowing continuous data collection from free-living animals, and a VHF transmitter for estimation of home range, surveys of habitat selection, and behavioural observations. Physiological, behavioural and spatial observations will be compared to meteorological parameters. A quantitative (abundance) and qualitative (calorific value) description of the main prey (ants and termites) and its temporal fluctuation over the year will also be used to understand the responses of aardvark to environmental challenges.

## **Sperrgebiet, Namibia: a key for understanding desertification in Africa**

B. Senut

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Parts of Africa which are desert today were forested in the past. This change is evidenced by fossil plants and animals which occur in sediments in Namibia. The Sperrgebiet contains numerous fossil vertebrate sites which span a wide period of time. In Palaeogene strata (ca 44 Ma) north of Bogenfels, the fossil vertebrates indicate the presence of a well vegetated area with summer rainfall, subtropical climate. In the lower Miocene (ca 20-19 Ma) at Auchas Mine and in the palaeovalleys of the Northern Sperrgebiet, the fossil floras and faunas suggest a wooded environment under a sub-tropical climate with winter rainfall, which persisted until 17.6 Ma at Arrisdrift on the banks of the Oranje River where more than 10 000 fossils were excavated. Fossil aeolianites of the area confirm that the Namib is the oldest desert in the world dating from the lower Miocene. The fossils discovered in the deposits and adapted to the Southern African desert were found in younger deposits in other parts of Africa when these became drier and more arid. The Sperrgebiet happens to be a cradle of modern African faunas.

## **A suite of well-bedded "Freshwater" limestones of Palaeogene age overlies Proterozoic Gariiep Group rocks in the Sperrgebiet, Namibia.**

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Previously interpreted as lacustrine deposits that accumulated in para-kimberlitic craters, recent mapping indicates that they are more likely to represent airfall carbonatitic ashes which blanketed a rolling topography, molding the topography rather like snow, followed by erosion along topographic highs and redeposition into depressions. The limestones accumulated onto an early phase of the Namib Unconformity Surface when the Great Escarpment was well west of its current position. At Werfkopje, well-bedded dolomitic limestones are overlain by Olivine Melilitite lava which raises the possibility of obtaining radioisotopic age control for the enigmatic underlying deposits and the NUS.

## **The Assessment of Value with regard to Kolmanskop Ghost Town and the Industrial Landscape of the Sperrgebiet National Park, Namibia**

N. Alexander

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Kolmanskop Ghost Town is situated within the Sperrgebiet National Park on the South-West Coast of Namibia. The diamond-mining town was established in 1908 and abandoned in 1956. Kolmanskop's status as a tourist attraction has been readily established and it is regarded as an important economic resource by the nearby community of Lüderitz. The key question of this research project is whether the site is also able to fulfil the criteria of an industrial heritage resource? The principal method employed is that of values-based conservation. The study relies on the survey of a broad range of individuals and stakeholders in order to establish present values as they pertain to Kolmanskop. The results are substantiated by historical research and an assessment of the natural, socio-cultural and socio-political contexts. The case study serves as an example for the appropriate treatment and recognition of industrial heritage in

Namibia. It further addresses the underlying tensions between heritage and tourism; looking toward finding a sustainable development solution within the post-colonial context of Namibia.

### **Natural Parks: Their value in understanding the past, present and future**

Y. Fernandez-Jalvo<sup>1</sup> and L. Scott<sup>2</sup>

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Fossils are the key to the understanding of the dynamics of past climatic and biodiversity changes including the evolution of humans and other species. The interpretation of present day global change and evolutionary trends in ecosystems relies strongly on evidence of events from the distant past. To understand the meaning of fossils palaeontologists need to observe processes occurring today which are similar to what happen before fossilization. Based on our present observations which can best be done in natural parks we will be able to reconstruct patterns from the past. This can be applied to attempts to predict future conditions.

### **Changing Hunter-Gatherer Lifeways on the Greater Mapungubwe Landscape: A Landscape Approach to an Archaeological Quandary**

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The majority of archaeological research in the Later Stone Age period is done at rockshelters. Here, artefacts are plentiful, organic preservation is high and there is usually a continual occupation over many centuries. However, this approach cannot account for broad cultural changes that occur over the entire landscape, truly consider differential site utilisation patterns or incorporate the ethnographic record. This paper presents renewed focus in the field of landscape archaeology – studying sites in a broad range of contexts – and the method's ability to answer questions that have not yet properly been addressed on the Greater Mapungubwe Landscape such as the apparent local Bushmen extinction.

### **Vitrified cattle dung in the iron age of southern Africa**

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Archaeologists in southern Africa usually explain vitrified cattle kraals in terms of natural causes, such as internal combustion, lightning strikes and veld fires. Our present study in the Limpopo Valley, in conjunction with previous research, eliminates internal combustion because the greatest vitrification occurred in the open around the wooden fence. Higher levels of K<sub>2</sub>O in vitrified samples support this conclusion. Moreover, spatial locations eliminate lightning as a likely cause, and the uneven distribution of vitrified kraals through time makes veld fires equally unlikely. Ethnographic information, on the other hand, indicates that villagers intentionally set kraals alight for hygienic and ideological reasons when their animals died unexpectedly.

## POSTER ABSTRACTS

### Historical records, estimates of species richness, taxonomic diversity and distinctness for bats (Mammalia: Chiroptera) from the Diamond Route Reserves

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A preliminary investigation into the bats found within and surrounding the various Diamond Route reserves, was undertaken using museum voucher records. Circular neighbor analysis was used to estimate species richness for this reserve network and immediate surrounding areas, and indicated Venetia (LP) had the highest estimates for species richness (25-35 species), followed by Ezemvelo (GP) (13-24 species), and then the Northern Cape reserves (1-12 species). Bat fauna in reserves in Savanna and Grassland biomes were taxonomically diverse, but the taxonomic distinctness was not statistically significant, whereas the bat fauna in reserves in the Succulent-Karoo showed significant taxonomic distinctness, but was not taxonomically diverse.

### Rehabilitation and release of handreared black-footed cats (*Felis nigripes*)

Nicci Wright<sup>1</sup>, Alex Sliwa<sup>2</sup>, Duncan MacFadyen<sup>3</sup>, Elsabe Bosch<sup>5</sup>, Maroti Tau<sup>4</sup>, Ewann Stroh<sup>4</sup> and Daniel Shai<sup>5</sup>

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Guidelines on the successful release of handreared Black-footed Cats are not readily available. The objective of this project was to gain information and data relating to the soft –release process of two handreared Black-footed Cats. We recorded in detail the behaviour, movement and adaptation of the cats to their environment during all phases of the project. The insights gained can be used as a blueprint for future releases of this species and provides data on learned and inherited behaviours. This project shows that successful release of handreared Black-footed Cats is possible provided it is done following a well-planned release guideline.

### Viral seroprevalence in black-footed cats and sympatric carnivores

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The black-footed cat (*Felis nigripes*), CITES Appendix 1, is ranked as the most vulnerable of the Sub-Saharan cat species by the Cat Specialist Group of IUCN. The Black-footed Cat Working Group has captured numerous black-footed cats and small carnivores that share their territory in order to better understand the ecology, genetics, health, and reproductive biology of this species. Evidence of serologic exposure to common viral pathogens is low except for canine distemper virus, which was also identified in biological specimens using molecular diagnostic techniques. A novel carnivore species may play the role of maintenance host for this important viral disease.

## **The African Mammal Atlas Project: Updating African mammal distribution records for improved conservation efforts**

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Knowledge of African mammal distribution patterns is based largely on historical records. However, the last three centuries have seen extensive human-modification of African landscapes, and the effectiveness of mammal conservation efforts is thus reliant on updating the ecological records to accurately reflect current mammal distribution patterns. The goal of the African Mammal Atlas Project (MammalMAP) is – through collaboration with scientists, citizen scientists, conservation organisations, and wildlife authorities – to update the distribution records of mammal species (including marine and small mammals) across Africa.

### **Camera trapping and monitoring of wing-tagged White-backed Vultures at the Dronfield vulture restaurant**

B. Wilson

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The use of motion or heat-triggered camera traps to collect data has become an increasingly popular tool in conservation and ecological research. It offers an unobtrusive, unbiased and practical method of supplementing field observations, particularly in remote situations or when personal observation is not possible. A single camera trap, donated by the UK-based Hawk Conservancy and set at the Dronfield Nature Reserve vulture restaurant, significantly increased re-sighting data of wing-tagged Endangered White-backed Vultures individuals in 2012. It also captured important interspecific and intraspecific behavioural interactions, and recorded approximate abundance of target and non-target species at the feeding site.

### **Investigating the decline of the Secretarybird (*Sagittarius serpentarius*)**

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The Secretarybird has recently been classified as Vulnerable. This study aims to investigate the status of Secretarybirds in South Africa and the causes of its decline. GPS tracking devices will be fitted to Secretarybirds in Tswalu Kalahari. These devices provide data of high spatial and temporal resolution, and will enable detailed analysis of the birds' movements and habitat use. Pre-existing data will be analysed to supplement our understanding of the species' ecology and status. These include data from three citizen science projects: the first and second Southern African Bird Atlas Projects and the Coordinated Avifaunal Road counts project. As part of this analysis, a comparison of atlas reporting rates within Diamond Route properties to those outside these properties will be conducted. This will assist in determining whether conservation of the habitat types protected by these properties is beneficial to Secretarybirds.

### **Post-fledging dispersal monitoring of a Secretarybird chick on Dronfield Nature Reserve using a cellular device**

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Secretarybirds *Sagittarius serpentarius*, listed as Near Threatened in South Africa and Globally Vulnerable internationally, have declined significantly in numbers over the last decade. This is thought to be due to habitat loss or habitat degradation from overgrazing, bush encroachment and human disturbances. Very little is known about post-fledging dispersal or spatial use and the impact of land-use changes to the species. In December 2011, a 60-day old chick on Dronfield was the first individual of this species to be fitted with a special cellular device that tracked its daily movements and provided researchers with a brief glimpse of the life-history of the species for three months.



## BirdLife South Africa terrestrial bird conservation overview

H. Smit

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The Conservation Division of BirdLife South Africa has initiated many projects since 2010, including pro-active involvement in the renewable energy sector. The primary focus of the division concerns threatened species conservation utilising the outcomes of scientific research. One of the newer projects is the PhD study of the biology, taxonomy and conservation of the *Vulnerable* White-bellied Korhaan *Eupodotis senegalensis*. Another is the Secretarybird *Sagittarius serpentarius* in the Grassland Biome project. BirdLife South Africa has recently taken over the responsibility of research, and therefore the conservation of the *Critically Endangered* White-winged Flufftail *Sarothrura ayresii*. The Ingula study on the adaptive management of high altitude grasslands, in addition to the project concerning the monitoring of another grassland endemic, the *Vulnerable* Southern Bald Ibis *Geronticus calvus*, will be published as PhDs by the respective project managers. BirdLife South Africa registered the SA Taita Falcon Survey Team as the Guardians for Taita Falcon *Falco fasciinucha* monitoring and conservation in South Africa, with financial support provided for by the Palabora Mining Company (the Species Champion), under the BirdLife International Preventing Extinctions Programme. Notwithstanding the numerous challenges faced, we remain confident of helping to secure the future of our country's birds, through various conservation interventions.

### The implications of the diet of Namaqua and Burchell's Sandgrouse at Tswalu

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(Abstract to be submitted)

### Baboon and Trapdoor Spiders on some of the De Beer Diamond Route Reserves

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Baboon and trapdoor spiders (Araneae: Mygalomorphae) are regarded as primitive spiders with the oldest fossil records dating back to the Triassic Period. Currently, ten families are found in Southern Africa. Most of these spiders are terrestrial and live in silk-lined retreats or burrows of various shapes made in the soil or under rocks or on tree trunks. The use of a burrow to live in provide special protection to these large long lived spiders and the great diversity in burrow shapes and types of burrow trapdoors suggests that this strategy of burrow living is very successful for these large predators. Some of the mygalomorphs so far sampled on De Beers Diamond Route reserves will be discussed and potential future plans presented.

### The spiders (Arachnida: Araneae) of Venetia Limpopo Nature Reserve

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The South African National Survey of Arachnida (SANSA) is an umbrella project that was implemented at a national level in collaboration with researchers and institutions countrywide dedicated to document and unify information on arachnids. As part of SANSA, projects are underway to determine the diversity of the Arachnida fauna of South Africa in different floral biomes. One such a project is an inventory of the spider fauna of the Savanna Biome that form part of the newly proclaimed Vhembe Biosphere in South Africa. The Venetia Limpopo Nature Reserve, a 36 000 hectare reserve that has been identified as an important buffer zone around the Mapungubwe World Heritage Site, a core area of the Vhembe Biosphere, was sampled by one of the SANSA teams in 2008. During this preliminary SANSA survey, five different sampling techniques were used and a total of 484 specimens were sampled representing 95 species of spiders belonging to 24 families. Based on guild structures 66.6 % are wanderers and 33.3 % web dwellers. A total of 4.17% of the South African species are protected in this reserve.

## South African Bee Biodiversity Survey

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The South African Bee Biodiversity Survey (SABBS) is an initiative to assess bees in natural and agro-ecosystems, and to improve the taxonomy and systematics of the group. Bees are a diverse group of insects, with approximately 1200 species in South Africa. Bees are important pollinators in all ecosystems, and are therefore responsible for the production of seed and fruit, ensuring plant propagation. In addition, many of these seeds and fruits which result from pollination are an important food resource for humans, arthropods and animals. Africa has many unique pollination systems that must be conserved to protect its unique biodiversity.

## Tswalu Kalahari Scorpion Survey

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The Kalahari Desert is a global hotspot for scorpion diversity. During a project at Tswalu Kalahari, a survey was conducted with the aims of documenting the local scorpion fauna in terms of habitat preferences, venomosity, behaviour, shelter selection and ecotourism value. Educational elements were introduced as part of the environmental education component of the project aimed at employees, local communities and guests. This informative poster depicts the scorpion fauna collected and documented during this survey including photos, descriptions, venomosity and behaviour.

## ***Frithia humilis* and generalist pollinators: why asymmetry in plant-pollinator mutualistic networks is advantages for the translocation of edaphic specialists**

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A population of the succulent *Frithia humilis* in the Ezemvelo Nature Reserve has been included in a monitoring programme focusing on translocated populations of this endangered species. The monitoring effort not only focuses on population numbers, but also on entomological interactions. Literature on the reproductive ecology of the Mesembryanthemaceae suggests that generalist insect pollinators are the main component of the pollination systems of this family. It is hypothesised that a suite of generalist anthophilous insects pollinate *F. humilis* flowers. Furthermore, this suite is suspected to differ between populations, due to differences in vegetative communities and micro-climate of the habitats.

## **Wetlands of the Mapungubwe National Park: The big, the bad and the beautiful.**

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Mapungubwe National Park is located on the confluence of the Shashi and Limpopo Rivers with Venetia Limpopo Nature Reserve on its southern border. The objective of this project was to do an inventory of Mapungubwe's wetlands to inform management. The geological control on this landscape is remarkable as is evident in the distribution, extent and types of wetlands. Floodplains are the dominating wetland type in Mapungubwe. However, smaller wetlands such as pans, artesian springs and calcareous mires add to diversity. Mapungubwe's wetlands have been impacted upon by a long history of agriculture practices, including draining, damming, cultivation and grazing, resulting in degradation features such as erosion. Rehabilitation measures have been formulated to address these.

## Road Ecology – the way forwards to mitigating the threat to wildlife

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Despite recognition of roads being a threat to biodiversity, road-density continues to increase and huge budgets are devoted to construction and upgrading of roads with little or no allocation to mitigation measures to protect biodiversity. There is much data on human road casualties, but very little on animal road deaths and particularly not in southern Africa. Despite road traffic being a known cause of wildlife deaths, studies are poorly represented. Research on roads is fairly *ad hoc* and largely reflects the interests of individual researchers and not the worldwide adverse impacts on wildlife populations. In 2010, a joint venture between the Endangered Wildlife Trust, Rhodes University and Tshwane University of Technology initiated a project that formed the basis for the future development of the first national multi-species protocol for the monitoring of roadkill in South Africa. This protocol has since been implemented in the Greater Mapungubwe Transfrontier Conservation Area (GMTFCA) in the northern Limpopo Valley of South Africa, a World Heritage Site. This assessment identified the factors affecting roadkill rates, species composition and any other variables that may affect roadkill rates. Over a 120-day period that encompassed three ecological seasons (hot/dry, hot/wet and cold/dry), 1121 roadkill carcasses were identified from 166 different species. This did not account for animals that crawled off the road to die after being hit or were scavenged by predators. Of the 1121 roadkill detected, birds were the most commonly impacted species with 52% of the total sample. Mammals, reptiles and amphibians followed with 26%, 20% and 2% respectively. Medium-sized mammal species consisted of Honey Badger; Black backed Jackal and African Civet. Individuals of larger species included Brown Hyaena, Spotted Hyaena and Leopard. Mitigation of the impacts of roads on wildlife populations is long overdue and research is essential to implement a national strategy.

### Atlantic 1 Environmental sensitive sites

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The DBMN Benthic Program was established to determine the impacts of mining and the recovery rate of mined sites. The Before-After-Control-Impact design was implemented to answer the questions set out by the objectives. This design focuses on first determining the natural state of the environment before mining and once mining has taken place, what are the impacts after the disturbance. Once a site has been disturbed (through mining/sampling) it has to be monitored to determine the recovery rate. This is all done with control and impact site pairs.

### The Later Stone Age of the Venetia Limpopo Nature Reserve and its surrounds

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The Later Stone Age covers the last 20 000 years of prehistory. It encompasses Bushman material culture, beliefs, traditions, rituals and rock art. In northern South Africa this has largely been neglected over the last six decades of research. Since 2000 renewed focus tackled this important aspect of local prehistory. Much of these findings have been made on properties owned by De Beers Consolidated Mines and their surrounds. This poster presents these findings, along with more recent evidence challenging our preconceptions of local, but now extinct, Bushman communities.

### Benefits of Cooperative Breeding: Does Oxidative Stress Play a Role?

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While the evolution of cooperation has been the focus of considerable attention, our understanding of the physiological mechanisms underpinning its costs and benefits remains poorly developed. In cooperatively breeding societies,

subordinates can suffer survival costs associated with helping to rear dominants' young, while dominant breeders receiving help may enjoy lightened workloads and longer life-spans. However, the causality of such cooperative load-lightening and the mechanisms that mediate its costs and benefits are as-yet poorly understood. Oxidative stress represents a key candidate for mediating these costs and benefits. Damaging reactive oxygen species (ROS) are a by-product of aerobic respiration (hard work), and oxidative stress occurs when ROS generation overpowers the body's protective antioxidant system. Dominants receiving help may therefore enjoy 'oxidative load-lightening:' decreased work rate and oxidative stress, leading to increased fecundity and survival. We therefore used a helper-handicap manipulation to experimentally test (i) the causality of cooperative load-lightening and (ii) the link between load-lightening and oxidative stress, in the white-browed sparrow weaver *Plocepasser mahali*. When helper contributions were experimentally reduced, mothers did not increase their work-rate in a compensatory manner, and maternal measures of oxidative stress were not affected. Although there is correlative evidence that mothers work less hard in groups with helpers, our experimental evidence suggests mothers are not responsive to helper work-rate. It is possible mothers decrease their work-rates in response to the presence of helpers, without assessing actual helper contributions. Further work is required to investigate whether the benefits of cooperation are primarily gained by mothers or offspring.

### **Marine Nutrients Imports to the Namib Desert through Large Terrestrial Carnivores and Wind-blown Detritus on the southern Namibian Coast**

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The recently proclaimed Sperrgebiet National Park, set in the coastal Namib Desert (southern Namibia) constitutes one of the world's top twenty-five Biodiversity Hotspot. Brown Hyenas, Oryx and Cape Fur Seals have been listed as flagship species, while the plant diversity, specific to the Succulent Karoo Biome, is composed of a unique set of endemic desert-adapted species. Because of the very restricted access to "Diamond Area One" until recently, this desert ecosystem has been largely spared from human influence and but also few biological studies have been undertaken in the region. For instance there is currently very little understanding about the linkage between the Namib Desert and the bordering and highly productive Benguela Upwelling System. Marine nutrients could be carried from the coastal area inland by animals and winds and have a significant enhancing effect on desert plants. Our research project aims at characterizing the influence of latrines of hyenas and jackals hunting seals and windblown detritus on desert plants using stable isotope analyses, on the southern Namibian coast.

### **The significance of protected areas for bats conservation in southern Africa**

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In southern Africa, a subcontinent rich in bat fauna, limited distribution data hinders ecological, evolutionary and conservation research on bats. In a recent Bat Conservation International newsletter Professor Paul Racey, a member of IUCN Bat Specialist Group and renowned international bat champion, wrote: "*Roughly half the landmass of the world remains mostly a bat-conservation void... This includes almost all of Africa...*" This study will focus on determining the geographical distribution of focal threatened cave-dwelling bats. As a group cave-dwelling bats are considered to be at very high risk from human impacts, wherever they occur, due to their dependence and loyalty to particular caves. Climate change and extensive land use change are universally recognised as the most significant threats to bat conservation globally. Climate change is likely to have a significant impact on biodiversity on this subcontinent; which is considered to be environmentally vulnerable. We propose to use species distribution modelling as a conservation tool to predict suitable habitats and environmental conditions for focal species and to then validate these results in the field. Modelling techniques have the potential to target fieldwork in large areas with limited resources. The results of this study will be used to evaluate the significance of protected areas for conserving (current and future) bat populations; with a particular emphasis on the Northern Cape.