



# 7<sup>th</sup> Oppenheimer De Beers Group Research Conference 18<sup>th</sup> & 19<sup>th</sup> October 2016

Multipurpose Rooms, Cornerstone Building,  
De Beers Corporate Headquarters, Johannesburg

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

- Share the outcomes of a range of research projects that have taken place across the properties and other sites within E Oppenheimer & Son and the De Beers Group of Companies.
- Provide an opportunity for students and researchers to present their outcomes and findings to a diverse audience of academics, students and environmental managers as well as members of the media, guiding future research and post-graduate opportunities across Oppenheimer and De Beers Group sites.

Time	Tuesday 18 <sup>th</sup> October
08h30	REGISTRATION and TEA / COFFEE
09h00	Phillip Barton <b>Welcome and Introduction</b>
09h20	Prince Mangosuthu Buthelezi <b>Keynote Address:</b> A lifelong journey to protect tomorrow's inheritance
	<b>Session 1</b> <b>CHAIR: Duncan MacFadyen</b>
09h50	Chilled birds: evaporative cooling capacity in nightjars Ryan O'Connor, Mark Brigham, Blair Wolf and <u>Andrew McKechnie</u>
10h10	Fossils, Honey bee biodiversity and sustainable agricultural production <u>Robin Crewe</u> and Robin Moritz
10h30	Ecological corridors in urban landscapes - identifying and assessing an ecological corridor in Johannesburg <u>Tyrone McKendry</u> and Ute Schwaibold
10h50	TEA / COFFEE / POSTER VIEWING
	<b>Session 2</b> <b>CHAIR: Charles Hall</b>
11h20	Season, habitat and locality affect carrion-associated fly assemblages in Gauteng, South Africa <u>Nina Parry</u> , Elsje Pieterse and Chris Weldon
11h40	1H- NMR used to determine the factors contributing to the re-establishment and growth of <i>Burkea africana</i> (Wild Syringa) trees <u>Lufuno Nemadodzi</u> , Gerhard Prinsloo and Jacques Vervoort
12h00	Do camelthorn trees use sociable weavers to forage for nutrients? <u>Carla du Toit</u> , Kervin Prayag, Michael Cramer and Robert Thomson
12h20	Dung beetle assemblages of rehabilitated coal mines of eMalahleni (Mpumalanga) in South Africa. Gustav Venter
12h40	The state of our mammals: how far have we come and where are we going? <u>Matthew Child</u> , Lizanne Roxburgh, Domitilla Raimondo, Andrew Taylor and Harriet Davies-Mostert
13h00	LUNCH / CONFERENCE PHOTOGRAPH / POSTER VIEWING

Time	Tuesday 18 <sup>th</sup> October (continued)
<b>Session 3</b>	
<b>CHAIR: Warwick Mostert</b>	
14h00	Recovery of deepwater benthic macrofauna communities affected by offshore diamond mining operations <u>Bruce Mostert</u> , Barry Clark, Oliver Duna, Nina Steffani and Lesley Roos
14h20	Engraved art and acoustic resonance: exploring ritual and sound in north-western South Africa Riaan Rifkin
14h40	The importance of the Telperion Nature Reserve for the protection of the fishes of the upper Olifants River Catchment <u>Gordon O'Brien</u> and Garth Wellman
15h00	Do cheetahs prefer grassy plains to sandy deserts? Gus Mills
15h20	TEA / COFFEE / POSTER VIEWING
<b>Session 4</b>	
<b>CHAIR: Elsabe Bosch</b>	
15h50	Tracking Arctic Grayling ( <i>Thymallus arcticus</i> ) through acoustic telemetry and occupancy modeling downstream of the Gahcho Kué mine <u>Sarah McLean</u> , Lee Ann Baker, Kyle Artym, and Heidi Swanson
16h10	Reproductive capacity of female Southern white rhinoceros ( <i>Ceratotherium simum simum</i> ) in wild and captive environments <u>Martin van Rooyen</u> , Magdalena van Zijl, Natalie Aneck-Hahn and Robert Millar
16h30	The moth diversity of Waltham Place, Berkshire, England <u>Niki McCann</u> and David White
16h50	Effects of microhabitat temperature variations on Chacma baboon ( <i>Papio hamadryas ursinus</i> ) habitat utilisation and ranging patterns at Telperion Nature Reserve, Mpumalanga, South Africa. <u>Lesley Marisa</u> , Peter Henzi, Leslie Brown and Alan Barrett
17h10	Temporal and spatial effects on the population dynamics of eastern rock sengis ( <i>Elephantulus myurus</i> ) <u>Dina Fagir</u> , Sasha Hoffmann and Heike Lutermann
17h30	The Tswalu butterfly perspective: A need for a vast Kalahari wilderness to conserve small flying jewels and great natural phenomena Reinier Terblanche
17h50	Close of Day 1
18h00	FORMAL POSTER SESSION/ WINE TASTING (PAINTED WOLF WINES)
18h30	COCKTAIL FUNCTION: <b>Centre for Experiential Learning (CEL) De Beers West Campus</b>

Time	Wednesday 19 <sup>th</sup> October
08h00	TEA / COFFEE / POSTER VIEWING
08h30	Anthony Turton <b>Keynote Address:</b> Are we Seeing State Failure in the Water Sector?
	<b>Session 5</b> <b>CHAIR: Dylan Smith</b>
09h00	Projections of future climate change over Africa Francois Engelbrecht
09h20	Mesocarnivore species composition and activity patterns - Telperion Nature Reserve <u>Andrea Webster</u> , Lourens Swanepoel and Michael Somers
09h40	Evolution of the gut microbiome in wild versus captive mammals Frederic Delsuc, Se Jin Song, Jessica Metcalf, Jon Sanders, Nico Avenant, Duncan MacFadyen, Valerie McKenzie and Rob Knight
10h00	Habitat associations of small mammals in the foothills of the Drakensberg Mountains, South Africa <u>Felicity Simelane</u> , Themb'alilahlwah Mahlaba, Julie Shapiro, Duncan MacFadyen and Ara Monadjem
10h20	The ribbon-winged, spoon-winged and thread-winged lacewings: a unique South African biological heritage (Neuroptera; Nemopteridae) <u>Mervyn Mansell</u> , Jonathan Ball and Catherine Sole
10h40	The breeding system and demography of <i>Sesamothamnus lugardii</i> Alison Bijl
11h00	TEA / COFFEE / POSTER VIEWING
	<b>Session 6</b> <b>CHAIR: Colin Edwards</b>
11h30	Lessons on and insights into the Bankenveld. Results from a vegetation monitoring programme on Telperion and Ezemvelo <u>Danie Krynauw</u> and Dawid du Plessis
11h50	The effect of DDT on the haematocrit and white blood cell counts of House Sparrows from designated areas of South Africa <u>Lindi Steyn</u> , Henk Bouwman and John Maina
12h10	Pushing the boundaries of our knowledge on moths in South Africa Hermann Staude
12h30	Detection of birth and location of den sites in brown hyaenas ( <i>Parahyaena brunnea</i> ) based on GPS telemetry data Ingrid Wiesel and <u>Inga Jänecke</u>
12h50	LUNCH / POSTER VIEWING

Time	Wednesday 19 <sup>th</sup> October (continued)
<b>Session 7</b> <b>CHAIR: Patti Wickens</b>	
13h50	Effects of size-selective predation on prey population dynamics in modern ecosystems <u>Jacqui Codron</u> , Daryl Codron and Nico Avenant
14h10	Diet and prey abundance of aardvarks in a semi-desert environment <u>Nora Weyer</u> , Andrea Fuller, Robyn Hetem and Mike Picker
14h30	The Night Kraal in holistic cattle management – from the soil, trees to the elephants; the journey so far <u>Ranga Huruba</u> , Peter Mundy, Allan Sebata, Colin Edwards, Mupenyu Mberi and Steve Collins
14h50	Genetic diversity and interspecies hybridisation in <i>Cossypha</i> robin-chats <u>Naadhirah Munshi</u> , Craig Symes and Jean Mollett
15h10	The true bugs (Heteroptera) of Wakefield - a treasure trove of undescribed species Dawid Jacobs
15h30	Fresh-water nematodes of the Telperion Nature Reserve <u>Chantelle Girgan</u> , Mariette Marais, Antoinette Swart and Driekie Fourie
15h50	Climate Change in southern Africa over the last 1000 years Stephen Woodborne
16h10	Presentation of Awards – Nicky Oppenheimer
16h20	Closing – Nicky Oppenheimer (EOS)
16h30	<b>CONFERENCE CLOSURE</b>

## Posters

Authors	Titles
<u>Jabu Linden</u> and Peter Taylor	Land-use planning and development, securing critical biodiversity areas & enabling partnerships
<u>Meredith Palmer</u> and Craig Packer	“Snapshot South Africa”: Long-term biological monitoring
<u>Andrew Hankey</u> and Belinda Cooper	Making a stand to protect the Albertina Sisulu Orchid and the Verreux’s Eagles of Roodekrans
Magda Remisiewicz, <u>Zephné Bernitz</u> , Herman Bernitz, Kobie Rajmakers, Shonie Rajmakers, Ilona Krawczyk, Anna Płowucha and Les Underhill	Contrasting moult strategies of Common Whitethroat <i>Sylvia communis</i> in Central Europe and South Africa
<u>Rogan Fourie</u> and Dan Parker	The population dynamics and ecology of leopards ( <i>Panthera pardus</i> ) on Debshan Ranch, Shangani, Zimbabwe
<u>Devin Murray</u> , Paloma de Peña and Tim Forssman	A technological analysis of contact period stone scrapers from Little Muck Shelter, northern South Africa
<u>Daryl Codron</u> , Jacqui Codron and Marcus Clauss	Comparative stable isotope niche structure of mammalian carnivore and herbivore populations
<u>Kyle Finn</u> , Markus Zottl, Dan Parker and Nigel Bennett	Density related effects on philopatry in Damaraland mole-rats
<u>Wataru Tokura</u> , Sam Jack, Tania Anderson and Timm Hoffman	Understanding changes in plant productivity using EVI satellite data in Tswalu Kalahari Reserve
<u>Sarah McLean</u> , Tyler Jessen, Marco Mussiani and Robert Mulders	Estimation of grizzly bear and wolverine populations in the arctic using DNA analysis of hair
<u>Phumlile Simelane</u> , Themb’alilahlwa A.M. Mahlaba, Julie Teresa Shapiro and Ara Monadjem	The foraging ecology of free-roaming Nguni cattle and Brahman cattle in Kwa-Zulu Natal, South Africa
<u>Peter Webb</u> and Ansie Dippenaar-Schoeman	Rich spider diversity of native grassland in the Gauteng Province
Desiré Dalton, David Zimmermann, <u>Clearance Mnisi</u> , Megan Taplin, Peter Novellie, Halzka Hrabar, and Antoinette Kotzé	Hiding in plain sight: evidence of hybridization between Cape mountain and plains zebra
<u>Shannon Conradie</u> and Trevor McIntyre	Facilitation of nutrient transfer across the aquatic-terrestrial interface by semi-aquatic predators
Vida van der Walt and <u>Ansie Dippenaar-Schoeman</u>	Jumping spiders of the Diamond Route Reserves (Araneae; Salticidae)
<u>Motlalefi Mogashoa</u> , Stefan Kienzle, Leslie Brown and Alan Barrett	Wetland water level assessment and hydrophyte composition in Telperion Nature Reserve
<u>Alex Nepomuceno</u> , Christian Pirk, Werner Strümpher, Clarke Scholtz and Catherine Sole	Food relocation and burial behaviour in the dung beetle <i>Pachylomera femoralis</i> Kirby (Coleoptera: Scarabaeidae: Scarabaeinae)
<u>Anneke Schoeman</u> , Abdullahi Yusuf, Catherine Sole, Christian Pirk and Clarke Scholtz	The role of chemical ecology in the speciation of the dung beetle <i>Epirinus Reiche</i> (Coleoptera: Scarabaeidae: Scarabaeinae)
<u>Caitlyn Nauschutz</u> , Catherine Sole and Mervyn Mansell	Systematics of three pit-building antlion genera: <i>Hagenomyia</i> Banks, 1911, <i>Macroleon</i> Banks, 1909, and <i>Myrmeleon</i> Linnaeus, 1767 (Neuroptera: Myrmeleontidae)
<u>Liam Selby</u> , Christian Pirk and Fredrik Dalerum	Human and Carnivore Coexistence: Human-Carnivore Conflict in the Context of Sweden
<u>Charles Gumbi</u> , Themb’alilahlwa Mahlaba and Ara Monadjem	The effect of cattle versus wildlife grazing on diversity and community structure of terrestrial small mammals along the fenced boundary of Telperion Nature Reserve, Mpumalanga
Tim Forssman and <u>Christian Louw</u>	Telperion Shelter- A case study in method, theory, and the exploration of a multifaceted history

Authors	Titles
<u>Lynette McGinn</u> and Angela Hartman	Belgro - Ecological Landscaping – Conversion of a Highveld Garden
<u>Henrique Deliberato</u> , Francesca Parrini, Jason Marshall and Hannes Louw	Resource overlap and distribution of zebra ( <i>Equus quagga</i> ) and red hartebeest ( <i>Alcelaphus buselaphus</i> ) at Ezemvelo and Telperion nature reserves
<u>Jarryd Streicher</u> , Tharmalingam Ramesh and Colleen Downs	The effects of differing land use on the presence and habitat use of various mongoose species
<u>Kelsey Green</u> , Ingrid Wiesel and Jan Venter	Variables affecting mammal capture rate as evaluated by camera traps on Tswalu Kalahari Reserve
<u>Mfundo Maseko</u> , Manqoba Zungu, Riddhika Kalle, Tharmalingam Ramesh and Colleen Downs	The effects of habitat modifications and fragmentation on forest bird's occupancy and diversity within the eThekweni Municipality
Mupenyu Mberi	Strengthening resilience in the Zimbabwean livestock industry in a changing socio- political landscape – Debshan's holistic approach
Erika Verduciel and <u>Jessica Light</u>	Development of a rat dissection model utilizing computer tomography and additive manufacturing as an alternative to using animals
<u>Olabimpe Okosun</u> , Abdullahi Yusuf, Christian Pirk and Robin Crewe	Use of multiple glandular sources for pheromonal control by invasive social parasitic workers on host workers in honey bees
<u>Susannah Patrocínio</u> , Alan Barrett, Leslie Brown and Hanneline Smit-Robinson	The effect of <i>Seriphium plumosum</i> on the biodiversity of grasslands at Telperion, Mpumalanga, South Africa
Connal Eardley	Bees in citizen science
<u>Precious Shabalala</u> and Peta Thomas	The impact of volunteerism and communication towards an improved relationship between South African National Parks and local communities
<u>Adriaana Jacobs</u> , Lydia Mojela, Grace Kwinda, Brett Summerell and Eduard Venter	DNA Barcoding of Soil Fusarium in the National Collection of Fungi
<u>Manqoba Zungu</u> , Mfundo Maseko, Riddhika Kalle, Tharmalingam Ramesh, Mathieu Rouget and Colleen Downs	Effects of habitat fragmentation on forest mammal occupancy and ecological connectivity in eThekweni Municipality
<u>Rouxlyn Roux</u> , Maartin Strauss and Emmanuel Do Linh San	Resting site ecology of the rusty-spotted genet, <i>Genetta maculata</i> , in Telperion Nature Reserve (Mpumalanga, South Africa)
Sicelo Sebata	Spiders and Holistic Management Practices
<u>Kay Soopu</u> and Ompatile Galaletsang	Orapa, Letlhakane and Damtshaa Mines (OLDM) White Rhino Breeding Programme
<u>Simone Ackermann</u> , Nigel Bennett and Marietjie Oosthuizen	The effects of night lighting on the foraging behaviours of small rodent species
<u>Sarita Maree</u> , Samantha Mynhardt, Gary Bronner, Nigel Bennett, Carel Oosthuizen and Paulette Bloomer	Effective conservation requires a sound taxonomy: Lessons from recent advances in phylogenetics and phylogeography of Africa's endemic golden moles (family Chrysochloridae)
<u>Thato Bengu</u> , Jaco du Plessis, Lee-Ann Modley and Cobus van Dyk	Health effects in fish from the polluted Orlando Dam and Klipspruit wetland system in Soweto, South Africa
Mika Vermeulen	Towards restoration of ecosystem processes for conservation management in arid systems: Exploring feeding ecology, habitat utilisation and population responses of native ungulates in two contrasting arid ecosystems, Tswalu Kalahari Private Game Reserve and Karoo National Park
<u>Graeme Wilson</u> and Ann Wilson	Unisa as an Experiential Learning Provider on Telperion: where has all the experience gone
<u>Zander Venter</u> , Michael Cramer and Heidi Hawkins	Holistic Planned Grazing in South African grasslands: soil, vegetation and cattle responses

Authors	Titles
<u>Wendy Panaino</u> , Robyn Hetem, Francesca Parrini, Gus van Dyk, Dylan Smith, Mike Picker and Andrea Fuller	Body temperature patterns and behaviour of free-living ground pangolins ( <i>Smutsia temminckii</i> ) in a semi-arid environment
Nicola Wright	Pangolin research and conservation in South Africa: An overview of the African Pangolin Working Group's activities
<u>Nathan Baker</u> , John Maina and Richard Greenfield	Metal accumulation in House Sparrows ( <i>Passer domesticus</i> ) from Thohoyandou, Limpopo Province, South Africa
Heather Webster, Sasha Hoffmann, Heike Lutermann, Peter Teske and Bettine van Vuuren	Phylogeography of the eastern rock elephant shrew, <i>Elephantulus myurus</i>
<u>Samke Ngcobo</u> and Colleen Downs	Aspects of the ecology of Cape porcupines in KwaZulu-Natal, South Africa
Evelyn Mervine	Offsetting Carbon Footprints through Carbon Sequestration in Mine Tailings
<u>Kabelo Sebilane</u> , Bettine van Vuuren, Dineo Pilane, Oageng Modise, Ofentse Ntshudisane, Nathi Ntuli, Duncan MacFadyen and Jaco Visser	The spatial distribution and genetic variation of climbing mice occurring in South Africa
<u>Mark Turnbull</u> , Bettine Jansen van Vuuren and Chris Chimimba	Comparing genetic patterns in native and introduced species
<u>Phil Richardson</u> , Everhard Conradie, Phillip Olivier, Sieglinde Rode, Byron Loubser, Catherine Shutte, Robyn Khoury and Hayley Wittridge	Remotely operated virtual fences: a successful new approach to baboon management
<u>Maxie-Leigh Perrings</u> , Dina Fagir and Heike Lutermann	Habitat Preferences of Two Small Mammals
<u>Jake Mulvaney</u> , Jean Mollett and Craig Symes	Genetic divergence in the Short-toed Rock-thrush <i>Monticola brevipes</i>
<u>Ndamononghenda Hamunyela</u> , Francesca Parrini, Jason Marshal and Hannes Louw	Foraging behaviour of ruminant and non-ruminant grazers in previously cultivated and natural land in Telperion and Ezemvelo Nature Reserves (TENR)
<u>Kerushka Pillay</u> , Tharmalingam Ramesh and Colleen Downs	Aspects of the ecology of feral cats in urban Pietermaritzburg, South Africa
Yingisani Chabalala, Tendani Mashamba, <u>Elhadi Adam</u> , Zakariyya Oumar and Stefania Merlo	Estimating forage quality across different grass communities in Telperion Game Reserve using high resolution remote sensing data

## ORAL ABSTRACTS

### A lifelong journey to protect tomorrow's inheritance

Prince Mangosuthu Buthelezi

*Inkatha Freedom Party, 2 Durban Club Place, Durban, 4001, [lyndithw@ifp.co.za](mailto:lyndithw@ifp.co.za)*

Prince Mangosuthu Buthelezi has been a lifelong conservationist. Since the fifties when he became friends with Dr Ian Player, Mr Nick Steele and Mr Hugh Dent, he has used his various leadership positions to promote conservation. In 1982, as Chief Minister of the erstwhile KwaZulu Government, he established the KwaZulu Bureau of Natural Resources, which later became South Africa's first Department of Nature Conservation. He founded the Tembe Elephant Park, is a Trustee of the Wilderness Leadership School, and is patron of the Magqubu Ntombela Foundation, the Rhino and Elephant Foundation and the Wildlands Conservation Trust. Over the years he has received several international conservation awards, including the Bruno H. Schubert Stiftung Environmental Award, in Frankfurt, and the NatureLife International Environment Award for 2015. He will be speaking about his lifelong passion to protect our natural heritage, and his friendship with the Oppenheimer family.

### Chilled birds: evaporative cooling capacity in nightjars

Ryan O'Connor<sup>1</sup>, Mark Brigham<sup>2</sup>, Blair Wolf<sup>3</sup> and [Andrew McKechnie](mailto:aemckechnie@zoology.up.ac.za)<sup>1</sup>

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Birds living in hot environments rely heavily on evaporative cooling to avoid heat stress, particularly in sunlit microsites where operative temperatures for small species may approach 60°C. Nightjars often spend the day roosting in full sun, and represent an extreme example of avian heat tolerance. Over the last few years, we have measured evaporative cooling capacity in Freckled Nightjars at Telperion and a site in Namaqualand, and in Rufous-cheeked Nightjars at Dronfield. All three populations show remarkable evaporative cooling capacities, with the ratio of evaporative heat loss / metabolic heat production in Rufous-cheeked Nightjars the highest yet documented in birds.

### Fossils, Honey bee biodiversity and sustainable agricultural production

[Robin Crewe](mailto:Robin.Crewe@up.ac.za)<sup>1</sup> and Robin Moritz<sup>2</sup>

<sup>1</sup>*Social Insects Research Group, University of Pretoria, Pretoria, 0028, [Robin.Crewe@up.ac.za](mailto:Robin.Crewe@up.ac.za)*

<sup>2</sup>*Institute für Biologie, Molecular Ecology, Martin-Luther-Universität Halle-Wittenberg, Halle, Germany*

The current biodiversity and abundance of honey bee species will be explored through the lens provided by the evolution of bees and the information gleaned from the fossil record and from ancient climate changes. The implications of this for the provision of sustainable pollination services will be explored on the basis of evidence from the FAO database and an exploration of the current distribution of honey bee species worldwide. Honey bee vulnerability to over harvesting and climate change will be discussed and risks to scalability of agricultural production from limited availability of honey bee colonies highlighted.

### Ecological corridors in urban landscapes - identifying and assessing an ecological corridor in Johannesburg

[Tyrone Mckendry](mailto:tyrone.mckendry@gmail.com) and Ute Schwaibold

*University of Witwatersrand, Animal Plant and Environmental Sciences, Urban Ecology and Sustainability Lab, [tyrone.mckendry@gmail.com](mailto:tyrone.mckendry@gmail.com)*

Urbanisation is currently recognised as the greatest threat to biodiversity globally. The impacts associated with urbanisation include a loss of natural habitat through fragmentation and degradation. Ecological corridors connect fragments of natural habitat that support biodiversity and allow for species movement. This study assessed the condition of an ecological corridor in Johannesburg, South Africa. Land-use data were used to identify potential barriers along the corridor. The vegetation was assessed for differences in percentage vegetation cover, structure and species composition. Camera trapping and live trapping was used to record the small mammal species richness.

## Season, habitat and locality affect carrion-associated fly assemblages in Gauteng, South Africa

Nina Parry<sup>1</sup>, Elsje Pieterse<sup>2</sup> and Chris Weldon<sup>1</sup>

<sup>1</sup>Department of Zoology and Entomology, University of Pretoria, Hatfield, South Africa, 0002, [nina.jparry@gmail.com](mailto:nina.jparry@gmail.com)

<sup>2</sup>Department of Animal Sciences, Stellenbosch University, Private bag X1, Matieland 7602, South Africa

Seasonal variation, habitat associations and geographical distribution of carrion-associated species remain poorly studied in South Africa. Fly species assemblages were sampled using modified Red-Top® traps containing chicken liver and fish at three localities in grassland, savannah and human-disturbed habitats during March, June and October of 2014 and January 2015. Species assemblages differed temporally, with season being the largest determining factor of species diversity. Species richness, abundance and species diversity were highest in March and lowest in June. Abundance and species richness of Diptera was highest in human-disturbed habitats. However, the overall species assemblage present in human-disturbed habitats differed little from assemblages recorded in more natural habitats. These results suggest that urban areas act as refuges that provide food sources for carrion-associated fly species, especially those that are pests or invasive.

## 1H- NMR used to determine the factors contributing to the re-establishment and growth of *Burkea africana* (Wild Syringa) trees

Lufuno Nematodzi<sup>1</sup>, Gerhard Prinsloo<sup>1</sup> and Jacques Vervoort<sup>2</sup>

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*Burkea africana* is an abundant tree species, however factors which contribute to the re-establishment, growth and development of seedlings to reach reproductive stage has always been a mystery to farmers. The aim of his study was therefore to determine the factors which control the establishment of trees in the nursery. It has been suggested that soil microflora is responsible for the successful establishment in nature, and not present in the nursery environment. Soil samples were collected from three different sites where *B. africana* trees grow as well as other three different sites where *B. africana* do not grow. A total of 32 collected soil samples comprise of topsoil and subsoil from both sites were analysed for macro and micro elements. Two separate sets, each consisted of 45 soil samples collected from the sites where *B. africana* trees grow as well as where *B. africana* trees do not grow were analysed using NMR based metabolomics for the annotation of compounds present in the soil. Furthermore, leaves were harvested from randomly selected *B. africana* trees, were grounded to powder and analysed with NMR for the annotation of compounds. The results showed that there was no significant difference between pH; total nitrogen; phosphorus and boron from the soil analysis conducted on both soils. However, NMR analysis using OPLS-DA showed a significance difference in compounds present where *B. africana* trees grow as compared to where *B. africana* does not grow. A compound database, Chemomx was used for the annotation of trehalose, trimethylamine oxide found in the soils where *B. africana* trees grow and formate in the soil where *B. africana* trees do not grow.

## Do camelthorn trees use sociable weavers to forage for nutrients?

Carla du Toit<sup>1</sup>, Kervin Prayag<sup>1</sup>, Michael Cramer<sup>1</sup> and Robert Thomson<sup>2</sup>

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"Islands of fertility" form around savanna trees due to plant-foraging for water and nutrients. Plant-animal feedbacks may amplify islands through faunal nutrient deposition. We studied the relationship between Camelthorns and Sociable Weaver colonies in Tswalu Kalahari. Soil nutrient concentrations were strongly enriched below colonies compared to below non-nest trees. Despite this, there were no differences in foliar nutrients between trees. Trees with nests had 27% higher leafiness, suggesting trees use nutrients for growth, but do not accumulate foliar nutrient. Canopy volume was reduced in nest trees due to branch-fall and nests occupying foliar space. We suggest that initial positive feedbacks between nests and trees become negative in older trees.

## Dung beetle assemblages of rehabilitated coal mines of eMalahleni (Mpumalanga) in South Africa

Gustav Venter, Jackie Dabrowski, Wayne Truter and Clarke Scholtz

University of Pretoria: Department of Zoology and Entomology, [gustavv224@gmail.com](mailto:gustavv224@gmail.com)

To utilize the numerous ecosystem services that dung beetles provide such as bioturbation of soils, this project aims to determine their effectiveness in improving post-mining land use options on rehabilitated coal mines in the eMalahleni area. By determining the assemblage of beetles across the area we aim to determine if periodic application of beetles will be necessary and to identify indicator species suitable for breeding. Species richness and abundance were assessed by using pitfall trapping during the rainfall season on five rehabilitated sites and three reference areas, including Telperion. Both species richness and abundance were significantly higher on reference sites.

### The state of our mammals: how far have we come and where are we going?

Matthew Child<sup>1,2</sup>, Lizanne Roxburgh<sup>1</sup>, Domitilla Raimondo<sup>3</sup>, Andrew Taylor<sup>1</sup> and Harriet Davies-Mostert<sup>1,2</sup>

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The results of the 2016 Red List revision for mammals of South Africa, Swaziland and Lesotho reveal that 17% of our mammals are threatened with extinction, compared to 19% in the previous assessment (2004). However, of the ~30 genuine changes in conservation status recorded since 2004, 57% were uplistings (i.e. species have become more threatened). We present case studies on key species that have improved or deteriorated in status and outline suggested reasons why conservationists in South Africa have made no net progress in over a decade. Recommendations for improved conservation effectiveness are also presented.

### Recovery of deepwater benthic macrofauna communities affected by offshore diamond mining operations

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De Beers Marine South Africa (DBMSA) conducts prospecting and mining for diamonds in the South African Mining Licence Area MPT 25-2011, which is located within the borders of South Africa, and stretches from the Orange River to the Buffels River. A monitoring programme which included baseline geophysical (bathymetry, side scan sonar, and chirp sub-bottom profiling), sediment and macrofauna surveys was initiated in 2003 to assess impacts on and recovery of benthic macrofauna communities in this area. Mining was conducted in 2007 and follow-up surveys were undertaken in 2008, 2010, 2011, 2013 and 2015. Key findings from this study will be presented in this talk.

### Engraved art and acoustic resonance: exploring ritual and sound in north-western South Africa

Riaan Rifkin

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At a hill-top site in the Korrannaberg, where there is a water source and a sandy arena embraced by a rocky ridge, the author persuasively evokes a lively prehistoric ritual centre, with rock gongs, reverberating echoes, dancing and trance. There exists a vast corpus of literature dealing with the significance of the landscape in foraging societies and with studies concerning landscapes and rock art. In general terms, the landscape is perceived as a socially- and culturally-constructed phenomenon, a 'mindscape', which is as symbolic and conceptual in character as it is geomorphological. Topophilia, the feeling of a strong emotional attachment to familiar places is a widespread cultural phenomenon. Recent anthropological and geographical explorations of the interplay of the senses critique the exclusively vision-based epistemology, calling for the exploration of the roles of the other senses, of which there may be no fewer than 21, in the cultural patterning of perception. Writing explicitly about the realm of sound, Schafer (1985), building on the concept of 'acoustic space' as developed by Carpenter and McLuhan (1960), explores the soundscapes of living

environments. That enquiry aimed to illustrate that the concepts of landscape and topophilia do not stand in isolation, but are augmented by what may be termed a cosmologically-prominent 'soundscape'.

## **The importance of the Telperion Nature Reserve for the protection of the fishes of the upper Olifants River Catchment**

Gordon O'Brien<sup>1</sup> and Garth Wellman<sup>1</sup>

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The Department of Water and Sanitation is applying the Resource Directed Measures procedures to manage the highly utilised water resources of the Olifants River Catchment. This includes the Resource Quality Objectives that have resulted in a range of new laws to balance water use and protection. The Upper Olifants has been classified as a working river for use and the Wilge River catchment including the Telperion Nature Reserve (TNR) for protection. New laws require TNR be protected so that the fish amongst other aquatic animals may re-colonisation of the upper Olifants catchment in the future. What fish are important, who must protect them, and how can they be protected to meet these new legal requirements?

## **Do cheetahs prefer grassy plains to sandy deserts?**

Gus Mills

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The Serengeti Plains and southern Kalahari are at the extremes of the cheetah's habitat range in terms of annual rainfall and productivity. Superficially it might seem that the Serengeti Plains with its vast herds of gazelle and extremely open habitat is the ideal habitat for the fastest terrestrial animal in the world. However, the cheetah density on the Serengeti Plains is not that much higher than in the southern Kalahari, and, in fact, in some respects cheetahs performs better in the Kalahari than they do on the Serengeti Plains. They also, play a different ecological role.

## **Tracking Arctic Grayling (*Thymallus arcticus*) through acoustic telemetry and occupancy modeling downstream of the Gahcho Kué mine**

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Arctic Grayling are a sensitive salmonid species that spawns in clear, cold shallow streams throughout northern Canada. Construction of the Gahcho Kué diamond mine required de-watering most of a headwater lake normally used by Arctic Grayling as overwintering habitat. De Beers committed to maintaining flow in the watershed downstream of the mine at rates that would support continued Arctic Grayling occupancy. Research using both habitat occupancy models and acoustic telemetry has provided evidence for the ideal flow rates in the downstream and has indicated that Arctic Grayling continue to occupy the watershed post mine construction.

## **Reproductive capacity of female Southern white rhinoceros (*Ceratotherium simum simum*) in wild and captive environments**

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Captive breeding of rhinoceros has been flagged as a safety net for wild populations of rhinoceros threatened due to poaching. However, female Southern white rhinoceros (*Ceratotherium simum simum*) born and raised in captivity have

been observed to breed unsuccessfully, in contrast to wild bred females in captivity. It is hypothesised that the high phytoestrogen content of captive diets is the cause of this impaired reproductive ability. This study quantified the reproductive capacity of female Southern white rhinoceros in both wild and captive conditions. Subsequently, reporter gene bioassays were used to quantify the estrogenic activity of feed samples from both the captive and wild diets.

### **The moth diversity of Waltham Place, Berkshire, England**

Niki McCann<sup>1</sup> and David White<sup>2</sup>

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Moths play an important part in the ecosystem as both pollinators and a source of food to other species. They can be considered a key indicator species and in studying them we can gain insight into the effects of pollution, changes of land use and climate change. Over a 14 year period ongoing moth surveys at Waltham Place have recorded 476 species of moth to date. Our aim is to determine the quality and abundance of the moth fauna of Waltham Place and to raise public awareness of these fascinating invertebrates through participating in National Moth Night and sharing information with our visitors.

### **Effects of microhabitat temperature variations on Chacma baboon (*Papio hamadryas ursinus*) habitat utilisation and ranging patterns at Telperion Nature Reserve, Mpumalanga, South Africa.**

Lesley Marisa<sup>1</sup>, Peter Henzi<sup>1,2</sup>, Leslie Brown<sup>1</sup> and Alan Barrett<sup>1</sup>

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The effects that microhabitat spatiotemporal ambient temperature ( $T_a$ ) variations have on Chacma baboon habitat utilisation and ranging patterns are investigated in this study. The study assesses the influence of microhabitat temperature variations on habitat selection and utilisation. Twenty temperature-recording i-buttons were placed throughout the study troop's home range to collect temperature data at 15-minute intervals. Monthly thermomaps were created using the collected temperature data. A grid was superimposed over the maps to create monthly thermogrids. Baboon monthly ranging data were overlaid onto the thermomaps and grids to determine whether temperature has an effect on their habitat utilisation and ranging patterns. Preliminary findings indicate that there is a correlation between core area utilisation and microhabitat temperatures. The troop also utilised microhabitats with temperatures that are within their thermoneutral zone and shunned areas where temperatures dropped or increased to levels that induce thermal stress.

### **Temporal and spatial effects on the population dynamics of eastern rock sengis (*Elephantulus myurus*)**

Dina Fagir, Sasha Hoffmann and Heike Lutermann

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Understanding temporal and spatial dynamics of a species is an integral part of a species' biology but often poorly known for African mammals. Hence, in the present study we investigated the population dynamics of two eastern rock sengi populations from two localities with contrasting climatic conditions. The body mass differed by more than 25% between the two study populations (Ezemvelo/Telperion Nature Reserve, Gauteng Province; Goro Game Reserve, Limpopo Province) despite seasonal fluctuations. At the same time, we found evidence that the breeding season is longer in the northern population. Hence, species biology appears to be affected by locality.

## **The Tswalu butterfly perspective: A need for a vast Kalahari wilderness to conserve small flying jewels and great natural phenomena**

Reinier Terblanche

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The 76 butterfly species from the semi-arid Tswalu Kalahari Reserve include species such as *Aloeides simplex* (Dune Copper) that is found only at sand dune areas and *Argyraspodes argyraspis* (Warrior Silver-spotted Copper), a butterfly species of Karoo affinities that is confined to the Korannaberg mountain series. Territorial beacons such as hilltops are used for mate location by many butterfly species. Large source areas that contain keystone host plant species that support the great annual butterfly migration in southern Africa are found at Tswalu Kalahari Reserve. Small unique habitat pockets, territorial beacons and large source areas of butterfly migrations all together require a large wilderness area for effective conservation management of the natural Kalahari butterfly heritage.

### **Are we Seeing State Failure in the Water Sector?**

Anthony Turton

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For any economy to function we need sub-systems to synchronise and work in harmony. This is not evident in the water sector, where a number of fundamental disconnects occur. In terms of Integrated Water Use Licences (IWUL) for mining, the administrative burden on the state is such they are simply overwhelmed. The lack of co-ordination between different regulatory departments (DMR, DWS, DEA) regarding mining rights and associated IWULA's is a characteristic of the sector. Legal compliance is virtually impossible because of bureaucratic bottlenecks, high staff turnover and regulatory flip-flopping. An even greater disconnect is evident between the national department of water and sanitation and municipalities. This is a constitutional crisis, because of the way power has been evolved, but it is exacerbated by the blatant political manipulation taking place. With the startling reality that about 80% of all sewage return flows are non-compliant, the failure to prosecute demands greater scrutiny. Abuse of the constitutional aspect of cooperative governance, interpreted to mean that one cadre should not prosecute another, is driving systemic failure. Delay of Phase 2 of the Lesotho Highlands Project, allegedly on instruction by the Minister, to favour a specific tenderpreneur close to the centre of power, has placed the entire Gauteng economy at risk. This talk will deal with empirical evidence of the precarious state of our national water resource, making the case that we are seeing systemic failure if we do not do things differently in the near future.

### **Projections of future climate change over Africa**

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The summer of 2015/ 2016 was associated with record-breaking temperatures across the southern African region, and in some provinces of South Africa, with devastating drought. These regional extremes were the result of a very strong El Niño event in combination with the regional consequences of systematic global warming. In this presentation state-of-the-art global and regional climate models are used to investigate how future climate change may increasingly impact on the African continent by altering the frequency of occurrence and intensity of extreme weather events. Of particular interest are the changing attributes of El Niño and southern African droughts under climate change.

## Mesocarnivore species composition and activity patterns - Telperion Nature Reserve

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Mesocarnivores are varied and abundant, however our understanding of their competitive interactions, ecology and spatio-temporal use of the landscape at multi-species and community levels is limited. Through a camera trapping survey conducted in 2015 on Telperion Nature Reserve, we identified 14 different mesocarnivores and two large carnivore species. The data suggest that times of activity were influenced significantly by temperature and moon phase. The most commonly used avoidance strategies between guild members were spatial and temporal niche separation. Community composition appears to be an important driver of overall times of activity.

## Evolution of the gut microbiome in wild versus captive mammals

Fredric Delsuc<sup>1</sup>, Se Jin Song<sup>2</sup>, Jessica Metcalf<sup>2</sup>, Jon Sanders<sup>3</sup>, Nico Avenant<sup>4</sup>, Duncan MacFadyen<sup>5</sup>, Valerie McKenzie<sup>2</sup> and Rob Knight<sup>3</sup>

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Understanding how the gut microbiome has evolved in mammals is a question currently attracting a lot of interest in the context of human microbiome research. One current limitation of mammalian microbiome studies is that they are mostly based on zoo-kept animals in which captivity might have influenced the evolution of their gut microbes. In 2014, we conducted a field trip at Tswalu Kalahari reserve to sample fecal material from a large diversity of mammalian species. Analyses of the microbial diversity associated with these samples allowed us to compare the composition of the gut microbiome between wild and captive individuals in 16 mammalian species. Our work highlights the importance of sampling wild populations for gut microbiome characterization.

## Habitat associations of small mammals in the foothills of the Drakensberg Mountains, South Africa

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Habitat association of terrestrial small mammals was investigated at Wakefield farm in the foothills of the Drakensberg Mountains, South Africa from July 2015 to January 2016. Sherman live traps were used to capture small mammals on 35 grids in six habitats. A total of 473 individuals from 14 species was recorded comprising; 10 rodents, three shrews and one golden mole. Species richness and diversity differed across habitats and seasons. The riparian habitat harboured the highest species richness, diversity and abundance of small mammals. Species composition also differed across habitats with the indigenous forest and rocky outcrops supporting distinct assemblages.

## **The ribbon-winged, spoon-winged and thread-winged lacewings: a unique South African biological heritage (Neuroptera; Nemopteridae)**

Mervyn Mansell<sup>1</sup>, Jonathan Ball<sup>1</sup> and Catherine Sole<sup>1</sup>

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The insect family Nemopteridae (Neuroptera) is unique among insects owing to their highly adapted elongate hind wings, which distinguish them from all other winged insects. South Africa, and the Western and Northern Cape provinces in particular, has been a major evolutionary centre for these insects, where more than two thirds of the world's species occur. Their spectacular radiation in the last four and a half million years has closely paralleled that of the flowering plants in the same area. It is suggested that this evolutionary diversification has been facilitated by the burgeoning floral abundance as all adults are obligate pollinators, with mouthparts specially adapted for pollenophagy.

## **The breeding system and demography of *Sesamothamnus lugardii***

Alison Bijl

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Little is known about the conservation status of *Sesamothamnus lugardii* trees, which occur in Limpopo, South Africa. The absence of seedlings in a Mapungubwe National Park (MNP) population was concerning so we identified demographic bottlenecks and their determinants, to assess the extinction risk of this population. The absence of seedlings appeared to be due to bottlenecks in the breeding system. *S. lugardii* flowers are highly specialised: pollinated exclusively by *Agrius convolvuli* hawkmoths, and the flowers are self-incompatible so they depend entirely on their pollinators. The natural reproductive success in the population was found to be low, and intense florivory by beetles was observed. These traits make *S. lugardii* vulnerable to local extirpation, but in spite thereof, the longevity of the mature trees currently buffers the population against demographic stochasticity. However, should this change, *S. lugardii* trees in MNP may be pushed beyond their critical resilience threshold.

## **Lessons on and insights into the Bankenveld. Results from a vegetation monitoring programme on Telperion and Ezemvelo**

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Nine years of vegetation monitoring data recorded on Telperion and Ezemvelo resulted in important insights into the nature and vegetation dynamics of bankenveld. The data produced some interesting new insights, specifically relevant to the study site with its particular set of variables and characteristics. The methodologies used are well known basic vegetation survey applications, which potentially lend itself to easy replication. Great emphasis was placed on operator proficiency during surveys. A variety of data types with meaningful practical relevance were obtained. This presentation focuses on findings from monitoring of a variety of vegetation aspects. Relevant key aspects are presented in a visual way which persons from all backgrounds will be able to appreciate. The following general bankenveld aspects are covered: The role and impacts of fire; the rate of vegetation change; dynamics of the bankenveld woody plant component; Bankenveld resilience; the crucial role of soils in understanding vegetation dynamics; weed 'explosion' events and species richness. The following aspects that relate to the specific Telperion / Ezemvelo situation are also covered: Alien plant invasions; Browse line types and their effects; dynamics of indigenous problem plants (e.g. *Seripium*); legumes in grasslands and 'un-surveyable' vegetation aspects.

## **The effect of DDT on the haematocrit and white blood cell counts of House Sparrows from designated areas of South Africa**

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Dichlorodiphenyltrichloroethane (DDT) exposure is highly injurious to animal life. Haematological parameters are easily detectable and good indicators of pesticide exposure. Blood was collected from 52 adult house sparrows at 7 sites in two South African Provinces, namely Limpopo- and Free State. White blood cells (WBC) counts and haematocrits (Hcts) were determined. The WBCs and Hcts differed significantly between the blood from the birds sampled from the

Free State- and the Limpopo sites ( $P > 0.005$ ). As observed by others, pesticide exposure leads to an apparent decrease in Hct and lower WBC counts and dysfunction of organs such as the kidney and the spleen.

## Pushing the boundaries of our knowledge on moths in South Africa

Hermann Staude

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In South Africa the total vertebrate species diversity is less than 25% of the known moth (Lepidoptera other than butterflies) species diversity. Yet there has been for the last few decades only one full time paid professional researcher in the whole of Africa working on the fauna. As a result, there exists a huge taxonomic impediment and knowledge gap regarding moths in South Africa and even worse in the rest of Africa. In order to assist in addressing this impediment and closing this knowledge gap we (an informal group comprising interested individuals, the Lepidopterists Society of Africa and collaborators worldwide) have embarked on a number of projects including "the Moths of South Africa book project"; LepiAfrica data basing project; the Caterpillar Rearing Group (CRG); African Scopulini project; African Geometrinae project and the South African Lepidoptera Conservation Assessment (SALCA).

## Detection of birth and location of den sites in brown hyaenas (*Parahyaena brunnea*) based on GPS telemetry data

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Brown hyaenas give birth in natal dens before moving their cubs to larger communal dens. These are visited by all clan members to socialize and to provide solid food for older cubs. Within a clan's territory, several natal dens exist and several different communal dens are used during a single denning season. Communal dens in particular are used over generations and hence location and occupancy data are important to guide conservation measures in areas that are threatened by changing land use. GPS telemetry is a helpful tool to obtain exact activity data indicating parturition date in brown hyaenas and subsequent den use and den site location.

## Effects of size-selective predation on prey population dynamics in modern ecosystems

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This project investigates the effects of size-dependent predation on prey population dynamics: how different patterns of size selectivity affect prey populations with different life history strategies. We examine prey size selection patterns across three predator classes: opportunist, optimal and selective feeders, in contemporary ecosystems. We hypothesize that prey subjected to opportunistic predation will display higher reproductive rates to compensate for high mortalities amongst more numerous size classes (e.g. juveniles). Alternatively, prey populations exposed to selective predators will invest in behaviours that preserve offspring survivorship. Our data, combined with collected records of temporal changes in prey population size structures, will be used to develop and test ecological models of size-dependant predator-prey interactions.

## Diet and prey abundance of aardvarks in a semi-desert environment

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In the Kalahari, aardvarks endure extreme fluctuations in rainfall and temperature. We investigated seasonal changes in aardvark physiology and diet, as well as prey abundance and nutritional value at Tswalu Kalahari Reserve over a two-year period. The diet of aardvarks at Tswalu consisted primarily of Northern harvester termites (*Hodotermes mossambicus*), which depend indirectly on rainfall and whose colonies are known to collapse after droughts, potentially

jeopardising the aardvark's food supply. As conditions in the Kalahari become hotter and drier with climate change, the aardvark's survival may be seriously threatened by metabolic stress imposed by prey limitation and environmental extremes.

### **The Night Kraal in holistic cattle management – from the soil, trees to the elephants; the journey so far**

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When cattle are kraaled overnight for 7 days in Savory's holistic management, they deposit solid and liquid waste thus creating nutrient hot spots. What are the responses of soil, fauna and flora both in the short and in the long term? We explore all of this in the story of the night kraal; the lessons learnt, the lessons still being learnt, the challenges and opportunities.

### **Genetic diversity and interspecies hybridisation in *Cossypha* robin-chats**

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Global anthropogenic change has resulted in range changes where species that were once ecologically separated now overlap, leading to possible genetic introgression. Using mitochondrial and nuclear markers we established phylogenetic relationships in South Africa's five *Cossypha* robin-chat species (*C. dichroa*, *C. natalensis*, *C. humeralis*, *C. heuglini*, *C. caffra*). For the five species a Neighbour-joining tree provides a graphic representation of divergences, and genetic relationships are inferred via a Bayesian clustering analysis (using the statistical programme STRUCTURE). *C. dichroa* X *C. natalensis* hybridisation is recorded, although these two species are not each other's closest relatives.

### **The true bugs (Heteroptera) of Wakefield - a treasure trove of undescribed species**

Dawid Jacobs

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Two hundred and twelve heteropteran species have been recorded from the farm Wakefield and adjacent properties during a recent survey. At least 30 and probably as many as 50 of these species are undescribed. Several of the species are discussed and illustrated and likely reasons for the high number of undescribed species are forwarded.

### **Fresh-water nematodes of the Telperion Nature Reserve**

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Nematodes are the most abundant and possibly the most diverse Metazoa in aquatic environments, however little is known about fresh-water nematode diversity in South Africa. A systematic nematode survey of the Telperion Nature Reserve was conducted and will form part of the National Collection of Nematodes (NCN) housed and the Biosystematics Division of the ARC-PPR. Water substrate samples were collected from various sites within the Telperion Nature Reserve to compile a biodiversity checklist of the nematode fauna present in water sources on the reserve. Results indicated high diversity with the possibility of some new records for South Africa.

## Climate Change in southern Africa over the last 1000 years

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Isotopic analysis of tree growth increments has yielded a 1000-year proxy record of rainfall variability in southern Africa. Isotope dendro-climatology reconstructions from baobab trees (*Adansonia digitata*) provide evidence for rainfall variability in a transect from the arid Namib Desert through to Madagascar. A yellowwood tree (*Afrocarpus falcatus*) museum specimen yields another record from the southwestern part of the subcontinent, and exploratory analyses of camelthorn (*Acacia erioloba*) and black monkey thorn (*Acacia burkei*) trees indicate that the approach can also be used on dryland species. Combined with the limited classic denro-climatologies available in the region these records yield palaeo-rainfall variability over southern Africa over the last 1000 years. Shifts in rainfall distribution have had a profound effect on human settlement on the subcontinent, as well as ecological parameters controlling mammalian distributions. The record provides a good scenario to test climate models. A first order (wetter versus drier) comparison between each of the tree records and a 1000-year palaeoclimate model yields a generally good correspondence.

## POSTER ABSTRACTS

### Land-use planning and development, securing critical biodiversity areas & Enabling partnerships

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The Vhembe Biosphere Reserve, with unique biodiversity and a largely rural population directly reliant on natural resources, is an ideal landscape for sustainable development models integrating conservation, development and logistical support as stipulated by the biosphere programme. Current protected areas preserve little of the most biodiverse habitats, not meeting national conservation targets. Given serious threats to the integrity of the biosphere reserve from potential large scale mining and a growing population developmentally constrained by Apartheid settlement patterns, there is an urgent need to use existing biodiversity distribution and process data to identify future conservation areas in terms of biosphere zonation.

### “Snapshot South Africa”: Long-term biological monitoring

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Although camera-traps are revolutionizing the fields of ecology and conservation, many current studies are short-term and focus on only a single target species. We are implementing standardized, long-term camera-trapping projects throughout southern Africa which will enable ecological comparisons on dozens of species across habitat types, community compositions, and management strategies. This project will produce an unparalleled dataset that will be made available to scientists, managers, and educators. The monitoring design will follow the paradigm of *Snapshot Serengeti*, our previous citizen science initiative. We discuss opportunities for collaborating with this project and report on camera-trapping efforts at Debshan Ranch and Telperion Nature Reserve.

### Making a Stand to protect the Albertina Sisulu Orchid and the Verreaux’s Eagles of Roodekrans

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The Albertina Sisulu orchid is probably the most threatened plant in Gauteng, and approved plans for high density housing development threaten the long term survival of this species at what is currently the last known viable population, located in Krugersdorp on the West Rand of Gauteng. The Proteadal Conservation Association (PCA) is a community group established with the objective of protecting the remaining natural ridges on the West Rand for their intrinsic conservation value. The Albertina Sisulu orchid and the Black Eagles of Roodekrans have been identified by the PCA and WOSA (Wild Orchids of Southern Africa) as flagship species to further this conservation goal.

### Contrasting moult strategies of Common Whitethroat *Sylvia communis* in Central Europe and South Africa

Magda Remisiewicz,<sup>1,7</sup> Zephné Bernitz<sup>2</sup>, Herman Bernitz<sup>3</sup>, Kobie Raijmakers<sup>4</sup>, Shonie Raijmakers<sup>5</sup>, Ilona Krawczyk<sup>1</sup>, Anna Płowucha<sup>6</sup> and Les Underhill<sup>7</sup>

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Breeding, moult and migration are energy-expensive and birds fit these within the annual cycle in different ways depending on migration distance. We compared timing of moult of flight feathers between two populations of Common Whitethroats: medium-distance migrants and long-distance migrants. We analysed moult of adults ringed in Poland and in South Africa, including Telperion. The medium-distance migrants rapidly moulted their wing in Poland before departure; long-distance migrants moulted their wing slowly in South Africa. This strategy is possibly the best for the long-distance migrants which require large fuel deposits and good-quality feathers. We show the extent of flexibility in moult of flight feathers within a species. Flexible moult in migrants can buffer variation in timing of breeding and migration, which have to stay adjusted to seasons in a changing climate.

## **The population dynamics and ecology of leopards (*Panthera pardus*) on Debshan Ranch, Shangani, Zimbabwe**

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Leopard (*Panthera pardus*) populations across the world, are threatened by habitat loss, over-utilisation, illegal poaching and human – wildlife conflict due to livestock depredation. Understanding the population dynamics and ecology of leopard populations is therefore essential for understanding how effective conservation measures can be implemented. I will investigate the population dynamics and ecology of leopards on Debshan Ranch, a commercial cattle ranch, and assess the associated threats which may impact their conservation status.

## **A technological analysis of contact period stone scrapers from Little Muck Shelter, northern South Africa**

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The Later Stone Age sequence in the middle Limpopo Valley, southern Africa, changed considerably when its producers, indigenous foraging communities, came into contact with incoming farmer groups. As part of this change was the introduction of new technologies from trade arrangements and a shift in forager activities because of new exchange demands. At Little Muck Shelter, northern South Africa, this is seen in an emphasis on stone scraper production. The objective of this study is to understand how the foragers produced their stone scrapers by analysing the diagnostic characteristics of each mode of production.

## **Comparative stable isotope niche structure of mammalian carnivore and herbivore populations**

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Stable isotope profiles of incremental tissues document dietary histories of individuals over extended time periods. These records allow investigation of persistent individual-level niche differences within populations. Here, we contrast the within-population (i.e. between-individual) isotopic niche structures of populations of large-bodied mammal carnivores with herbivores. These data are used to test a model, based on optimal foraging rules, that predicts low likelihood, and no ecological benefits, of individual dietary specialization evolving amongst herbivores. Our comparative analysis of syntopic groups following fundamentally different foraging “rules” will enable an understanding of the ecological constraints and consequences of different types of population niche structures.

## Density related effects on philopatry in Damaraland mole-rats

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We compare two distinct populations of Damaraland mole-rats to test the effects of density on group level and individual attributes. The study will monitor the relative differences in original colony size, recapture colony size, colony composition, birthing rate, body size and mass, as well as growth rates between the two study sites. Additionally it will investigate the presence of size- and sex-bias dispersal in either population and compare the frequency of colony displacement between locations to assess if it is affected by population density. These data will provide a clearer understanding of the relationship between population density and dispersal patterns.

## Understanding changes in plant productivity using EVI satellite data in Tswalu Kalahari Reserve

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The long term trend and variability in plant productivity from 2000-2015 was studied in Tswalu Kalahari Reserve, using satellite-derived MODIS Enhanced Vegetation Index (EVI). The results showed a highly variable pattern of plant productivity over time and space, which was strongly influenced by rainfall, soil and vegetation structure. A residual trend analysis identified significant positive trends in plant productivity in some shrub-dominated vegetation types, providing evidence for bush encroachment in these areas. Locations with negative trends in plant productivity (e.g. around some watering points) were also identified. This monitoring approach has value for reserve management decisions.

## Estimation of grizzly bear and wolverine populations in the arctic using DNA analysis of hair

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Canada's arctic is home to several large mammal species including grizzly bear (*Ursus arctos horribilis*) and wolverine (*Gulo gulo*). Estimation of wildlife population sizes is made difficult by an extreme climate and vast landscape. DNA analysis of hair samples collected passively near the Gahcho Kué and Snap Lake mines has enabled estimation of grizzly and wolverine populations. In 2013, 35 bears (13M:22F), and in 2014, 46 (22M:24F) bears were identified from hair collected within the 30,000 km<sup>2</sup> study area. In 2013, 28 wolverines (10M:18F), and in 2014, 27 wolverines (16M:11F) were identified in the 3,000 km<sup>2</sup> study area.

## The foraging ecology of free-roaming Nguni cattle and Brahman cattle in Kwa-Zulu Natal, South Africa

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Cattle production is important for communal livelihoods and the national economy in South Africa however, different breeds and management systems may affect their foraging ecology. Thus, we compared the behaviour of Nguni and Brahman on a holistic and a free range farm, KwaZulu-Natal, South Africa. Nguni cattle foraged on plants proportional to their availability in the dry season but preferred highly nutritious grasses in the wet season while Brahmans showed selectivity during the dry season but ate grasses in proportion to their availability during the wet season. Activity budgets were similar between the two breeds. These results shed light on how livestock breed and management strategy affects cattle foraging ecology and behaviour.

### **Rich spider diversity of native grassland in the Gauteng Province**

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Interest in the invertebrate faunas of urban and suburban areas has increased in the last few years. These areas can be potential corridors for dispersal of wildlife through urban areas, promoting connectivity between species' meta-populations both within and outside towns and cities. This study report on a six-year arachnid survey undertaken in and around the Irene village in an adjacent native grassland in the Gauteng Province, South Africa. Forty-two spider families represented by 150 genera and 257 species have so far been collected with the Salticidae (43 spp.), Araneidae (33 spp.) and Thomisidae (33 spp.) the most species rich. The diversity and general behaviour of the more abundant species will be discussed.

### **Hiding in plain sight: evidence of hybridization between Cape mountain and plains zebra**

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Cape mountain zebra (CMZ) were previously distributed along the mountain ranges of the Cape Province. Due to excessive hunting and habitat loss the number of CMZ reduced drastically. Between 1998 and 1999, plains zebra was re-introduced in sympatry with CMZ into four formally protected areas. In this study, a total of 16 microsatellite markers were used to identify possible hybrids, two individuals were identified as hybrids, Genetic diversity ( $H_e = 0.335$ ) was observed to be low in the CMZ populations. We recommend that all areas where CMZ and plains zebra are sympatric to be assessed for the extent of hybridization

### **Facilitation of nutrient transfer across the aquatic-terrestrial interface by semi-aquatic predators**

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Animal mediated nutrient transfer facilitates nutrient cycling in marine, freshwater and terrestrial ecosystems via the deposition of aquatically derived nutrients such as nitrogen (N) and carbon (C). We aimed to quantify the nutrient deposition associated with defecation, urination, and scent-marking behaviour of semi-aquatic predators. We provide a comparison of stable nitrogen and carbon isotopes ( $\delta^{15}N$ ,  $\delta^{13}C$ ), measured in soil and vegetation, between latrines and paired non-latrines sites used by African clawless otter, spotted-necked otter and/or marsh mongoose. Preliminary results indicate localised soil  $\delta^{15}N$  increases in latrines, while difference in surrounding soil and vegetation were less consistent.

## Jumping spiders of the Diamond Route Reserves (Araneae; Salticidae)

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As part of the South African National Survey of Arachnida (SANSa) surveys have been undertaken in most of the Diamond Route reserves. Different sampling techniques were used to sample both the plant and ground dwellers. So far a total of 67 salticid species from 31 genera have been sampled and photographed. A photo gallery to illustrate the rich diversity of some of the jumping spiders (Salticidae) from six reserves are provided with information on their occurrence and guild.

## Wetland water level assessment and hydrophyte composition in Telperion Nature Reserve

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Wetlands and people have a unique relationship in different parts of the world. This relationship varies between developing countries, developed countries, and conservation areas. Awareness of human and intricate biophysical dynamics is important when managing wetlands. South Africa has recently experienced dry conditions which coincides with the water assessment component of this study. Wetland sites were established using sophisticated GIS terrain analysis tools allowing for a purposeful representation of water bodies across the site. This study shows which wetland sites have sustained relative water prevalence through lateral water monitoring.

## Food relocation and burial behaviour in the dung beetle *Pachylomera femoralis* Kirby (Coleoptera: Scarabaeidae: Scarabaeinae)

[Alex Nepomuceno](#)<sup>1</sup>, Christian Pirk<sup>2</sup>, Werner Strümpher<sup>1</sup>, Clarke Scholtz<sup>1</sup> and Catherine Sole<sup>1</sup>

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*Pachylomera femoralis* is one of a few dung beetle species that can alternate between food relocation and burial behaviours, namely rolling and tunneling. The factors that drive this behaviour are unknown. Dung is a patchy and ephemeral resource so competition between beetles can be intense. The objective of this study is to determine whether competition plays a role in *P. femoralis* alternating between the two behaviours. Field observations and laboratory experiments indicate that at higher levels of competition *P. femoralis* will exhibit rolling behaviour, while tunneling behaviour is exhibited more often at low levels of competition.

## The role of chemical ecology in the speciation of the dung beetle *Epirinus* Reiche (Coleoptera: Scarabaeidae: Scarabaeinae)

[Anneke Schoeman](#)<sup>1</sup>, Abdullahi Yusuf<sup>2</sup>, Catherine Sole<sup>1</sup>, Christian Pirk<sup>2</sup> and Clarke Scholtz<sup>1</sup>

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Reproduction and speciation in animals are inextricably linked. Therefore, traits influencing the fine-tuned exchange between the sexes form the platform for divergence in sexual species. This study examined the role of the chemical aspect of intraspecific communication in speciation by examining both the species-specific cuticular hydrocarbons and glandular morphology of five *Epirinus* dung beetle species in comparison to a close relative, *Sisyphus muricatus*. Multi-species comparisons revealed close correlation between chemical profiles, glandular morphology and phylogeny in *Epirinus*, suggesting that intraspecific communication channels play a crucial role in the speciation of this dung beetle genus and probably dung beetles in general.

## **Systematics of three pit-building antlion genera: *Hagenomyia* Banks, 1911, *Macroleon* Banks, 1909, and *Myrmeleon* Linnaeus, 1767 (Neuroptera: Myrmeleontidae)**

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Myrmeleontidae, comprising the antlions, is the largest Neuropteran family in terms of described species, the minority of which build characteristic pits to trap arthropod prey. While research focusing on their systematics has been conducted, more studies are still required. This study aimed to test the validity of three pit-building genera, namely [i]Hagenomyia[/i], [i]Macroleon[/i], and [i]Myrmeleon[/i], through the use of molecular techniques. The three ingroup genera and the outgroup, [i]Cueta[/i], were represented by 19 specimens collected from 8 localities in South Africa. Nucleotide sequences were obtained from the 16S, 18S, and COI gene regions, and phylogenetic relationships were inferred from constructed trees.

## **Human and Carnivore Coexistence: Human-Carnivore Conflict in the Context of Sweden**

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Major political debates in Sweden still occur over what management plans need to be implemented to reduce large carnivore populations in order to reduce, or prevent, livestock damages by the carnivores. The main objective of this paper was to determine if carnivore population sizes had a significant effect on the number of damages to livestock, which livestock species were actually damaged by each carnivore species and to compare these effects between each of the carnivore species. Significant positive correlations have been found between carnivore density and damages to livestock. The results from these data may provide valuable insight into improving wildlife management in South Africa.

## **The effect of cattle versus wildlife grazing on diversity and community structure of terrestrial small mammals along the fenced boundary of Telperion Nature Reserve, Mpumalanga**

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The terrestrial small mammal community in Bankenveld grassland at Telperion was sampled on either side of the boundary fence, in order to investigate the impact of cattle versus wildlife grazing on this assemblage. Paired sampling grids were placed on either side of the fence, 100 m apart. A total of 123 animals were captured comprising seven rodents, one shrew and one elephant-shrew species. Eight species were recorded on the reserve side and seven on the farming side, with trapping success of 56% and 46%, respectively. This suggests little difference between wildlife and cattle grazing impact on small mammals.

## **Telperion Shelter- A case study in method, theory, and the exploration of a multifaceted history**

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Telperion Shelter has been the focus of several archaeological investigations over the past two years. Its complexly stratified past has seen the unique life stories of Bushman, Khoekhoe, Sotho-Tswana, and the South African War weave the thread of time into a single space. Decrypting the codex of its past required technical archaeological recording through the use of QR codes, delicately coupled with philosophical anthropological perspectives. We illustrate the partnership between such methodological and theoretical approaches as well as consider our own role in imploring future strategies for the exploration, conservation and sharing of Telperion Shelter's magnificent heritage.

## “Belgro - Ecological Landscaping – Conversion of a Highveld Garden”

Lynette McGinn and Angela Hartman

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The gardens at this site, whilst being aesthetically pleasing, were essentially sterile and provided limited support for a functioning ecosystem. Belgro’s objective was to provide a vegetation base, albeit on a micro scale, comprising plant species sourced from habitat types formerly existing in the Parktown Ridge area to enable a progressive colonization of a range of plant and animal species which have been systematically excluded from the metropolitan area. The end result is a garden that is now an indigenous microhabitat in the centre of town attracting birds and insects.

### **Resource overlap and distribution of zebra (*Equus quagga*) and red hartebeest (*Alcelaphus buselaphus*) at Ezemvelo and Telperion nature reserves**

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Different grazers species have specific feeding requirements, and so the availability and abundance of resources is directly related with their distribution, what causes coexistence of species in some area and can generate interactions such as resources partitioning and interspecific competition. To assess overlap in zebra and red hartebeest population, we will compare the distribution of this species over the last 7 years within the Ezemvelo and Telperion nature reserves. Zebra (i.e. generalist feeders) should show a distribution increase coinciding with a decrease in red hartebeest’s (i.e. specialist feeders). The outcome of this analysis may provide information about the factors influencing these populations dynamics within the reserves, in order to enhance management decisions.

### **The effects of differing land use on the presence and habitat use of various mongoose species**

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Small carnivore species like mongoose provide models of how mesocarnivores cope with land use change. However minimal ecological work in KwaZulu-Natal, South Africa, has been conducted since Rowe-Rowe, Maddock and Perrin in the late 1980’s. Mongoose are often regarded as vermin by farmers because of their negative impacts on livestock (especially chickens), leading to human wildlife conflict issues. We are investigating how land use change affects aspects of the ecology, especially spatial use and movements, of various mongoose species with differing land use using GPS collar transmitters in the midlands as well as documenting their human wildlife conflict.

### **Variables affecting mammal capture rate as evaluated by camera traps on Tswalu Kalahari Reserve**

Kelsey Green<sup>1</sup>, Ingrid Wiesel and Jan Venter<sup>1</sup>

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Tswalu Kalahari Reserve provides a unique study area in that the two sections of the reserve contain different predators - the lion and wild dog. The aim of the study was to investigate the effect of different predator guilds on prey species. This was done using a total of 21 camera traps which were deployed on Tswalu in June 2015. A collective total of 3 673 camera days and 12 880 individual captures were obtained between 20 camera traps. This data was analysed to compare capture rates of prey species between the two reserve sections.

## **The effects of habitat modifications and fragmentation on forest bird's occupancy and diversity within the eThekweni Municipality**

Mfundo Maseko<sup>1</sup>, Manqoba Zungu<sup>1</sup>, Riddhika Kalle<sup>1</sup>, Tharmalingam Ramesh<sup>1</sup> and Colleen Downs<sup>1</sup>

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Nowadays fragmentation and loss of natural habitats are said to be the biggest threats to the survival of many terrestrial wildlife species. In recent decades, natural environments are mainly converted for agriculture, livestock farming and human settlements. In most cases, these have been observed to have negative effects on the occupancy and richness of avifauna. The project investigates the influence of habitat conversion and habitat characteristics on the presence/absence of forest dependent ground-dwelling birds. Moreover, it investigates the change in bird's diversity across different forests in the Greater Durban area.

## **Strengthening resilience in the Zimbabwean livestock industry in a changing socio- political landscape – Debshan's holistic approach**

Mupenyu Mberi

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Transforming Debshan cattle and wildlife ranch into a ranch run according to holistic principles has affected the operations and resource base of the 45 000-hectare property. Debshan also influences the surrounding catchment and this development will ultimately impact the livestock industry in Zimbabwe. Social and political factors in Zimbabwe are ever changing and beyond the control of management. Constant innovation in managing and strengthening the resource base will determine the survival and success of the entity. According to Alan Savory, 'The process of decision making and planning that gives people the insights and management tools needed to understand nature: resulting in better, more informed decisions that balance key social, environmental and financial considerations' is called holistic management. How applying this process will impact Debshan and ultimately, Zimbabwe's livestock industry will be assessed. Strengthening resilience in the Zimbabwean livestock industry in a changing socio- political landscape – Debshan's holistic approach. How applying this process will impact Debshan and ultimately, Zimbabwe's livestock industry will be assessed.

## **Development of a rat dissection model utilizing computer tomography and additive manufacturing as an alternative to using animals**

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Rats are commonly dissected to teach basic anatomy at primary and secondary school level as well as University level. This necessitates a large number of animals, in particular rats, to be euthanized each year. This practice is considered unnecessary by the National Council of SPCA's and an alternative teaching aid needed to be found. A Computer Tomography (CT) scan of a rat was used to design and later print 3 dimensionally, a teaching aid that includes major anatomical landmarks. This model is available to schools and Universities to replace or partially replace the use of rats for teaching and educational purposes.

## **Use of multiple glandular sources for pheromonal control by invasive social parasitic workers on host workers in honey bees**

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Social parasites such as *Apis mellifera capensis* clonal workers ("Capensis") can become invasive in colonies of *A. m. scutellata* ("Scutellata") because they escape the host queen's control. Queens use a diversity of glandular sources for pheromonal control, but the use of multiple glandular secretions by workers for the same purpose is not known. To determine whether Capensis workers use pheromones from multiple glands for dominance, we reared groups of workers of the two subspecies together and evaluated different glandular secretions and ovarian activation status of each worker after 21 days. Capensis workers used mandibular and tergal gland secretions to achieve reproductive dominance through inhibition of ovarian activation in subordinate Scutellata workers.

## **The effect of *Seriphium plumosum* on the biodiversity of grasslands at Telperion, Mpumalanga, South Africa**

Susannah Patrocino<sup>1</sup>, Alan Barrett<sup>1</sup>, Leslie Brown<sup>1</sup> and Hanneline Smit-Robinson<sup>2</sup>

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Development within the Bankenveld area of South Africa has resulted in the degradation of the natural vegetation. As a result, large proportions of the grassland sections of this area have become encroached by the dwarf shrub *Seriphium plumosum* (Bankrupt bush, Slangbos). Encroachment of *Seriphium plumosum* has serious consequences for biodiversity as it results in a loss of biodiversity. If not properly managed, this species has the ability to alter large areas of grasslands into less productive shrublands. The decrease in biodiversity also results in a change and even loss of other grassland associated wildlife. The Grassland Biome is home to a wide variety of bird and small mammal species, most of which are specifically adapted to living in grasslands. A study will be undertaken to compare the biodiversity of selected grasslands with various levels of *Seriphium plumosum* encroachment on Telperion. The study will evaluate the influence that this encroacher has on plant species composition, abundance and diversity and also small mammals and birds. The results of the study may provide land owners and management with threshold values in terms of *Seriphium plumosum* densities that would negatively affect biodiversity. The expected results may also provide guidelines for conservation efforts in natural grasslands of the Bankenveld.

### **Bees in Citizen Science**

Connal Eardley

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Interest in social bees has been pursued for millennia. First, for honey, later for pollination. Keeping solitary bees is more recent and has mostly been with trap nests; holes in wood or other materials in which bee's nest - known as bee hotels. They have been used for research, pollination and hobby. In South Africa, popular interest in solitary bees has largely been by photographers. Towards this end, bee hotels have been added to their repertoire. They have huge potential for citizen scientists to contribute to the nesting biology of bees, pollination biology, bee biogeography and crop production.

### **The impact of volunteerism and communication towards an improved relationship between South African National Parks and local communities**

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The idealisation of Batho Pele "people first", is seen as a key in gaining the buy-in for the continued survival of national and provincial parks, through encouraging the participation of many communities who may see the South African national and provincial public wildlife/wild area parks as historically - 'not for them'. The aim of the study was to understand and identify the potential value of volunteerism for the Kruger National Park through Honorary Rangers, and to identify ways in which a diverse ranger group can work with National Parks, contributing to building a broad constituency for conservation in a citizen – centred way. A key finding is the multiple roles of types of communication required to talk to South Africans about conservation. The findings also strongly support the role of Honorary Rangers to bridge and influence stronger community alliances, through improved communication channels, between communities and state organisations via ecotourism and eco-education. Overall, the findings make recommendations for a more holistic approach, to conservation beginning from government departments such as the Department of Education through communities and parks, to community youngsters. Lastly, these initiative may result on these communities see the South African national and provincial public wildlife/wild area parks as for them as well not only for a certain group of people.

## DNA Barcoding of Soil Fusarium in the National Collection of Fungi

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Species in the genus *Fusarium* are characterised by significant variation in morphological characters enabling the use of these characters for species identification. However, some species proved very difficult to identify based on morphology alone and therefore extensive phylogenetic protocols were developed to aid in species identifications and descriptions. During the current *Fusarium* soil survey, an integrated approach is used to demarcate species obtained from undisturbed soils and dominant grass species in the grassland biome of South Africa. To date ca. 2 000 isolates have been obtained from seven nature reserves and DNA barcode sequence data are being generated. The isolates and associated data, including DNA barcodes, have been incorporated into the National Collection of Fungi. This ensures the availability of the data to decision makers and the research community, both national and internationally. The NCF's database also serves as a portal for the reporting of new species and new distribution data for known species. This knowledge will in future be invaluable to predicting the development of new pathogens on subsistence and commercial crops and quarantine related to trade of agricultural commodities with South Africa.

### Effects of habitat fragmentation on forest mammal occupancy and ecological connectivity in eThekweni Municipality

Mangoba Zungu<sup>1</sup>, Mfundo Maseko<sup>1</sup>, Riddhika Kalle<sup>1</sup>, Tharmalingam Ramesh<sup>1</sup>, Mathieu Rouget<sup>1</sup> and Colleen Downs<sup>1</sup>

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Very few studies have documented the occurrence of forest mammals in forest fragments in urban areas. Metropolitan areas are ideal for studying the effect of habitat fragmentation because they represent areas with the largest human population and harbour small areas with suitable habitat able to sustain wildlife with a high degree of isolation. In this type of landscape, most of (or all) the animal dispersal occurs within-fragment because the surrounding landscape is less suitable to cross. Hence, assessing the biodiversity patterns in urban forests is essential for managing these areas.

### Resting site ecology of the rusty-spotted genet, *Genetta maculata*, in Telperion Nature Reserve (Mpumalanga, South Africa)

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We studied the resting site ecology of rusty-spotted genets by radio-tracking nine males and six females for 15 days per season throughout the year. Males used more resting sites than females. Inter-resting site distances on consecutive days were significantly higher for males than females. This was also true for both sexes during autumn relative to any other season. We hypothesize that greater inter-resting site distances, and therefore greater home range coverage, increase males' mating opportunities. During autumn the greater home range coverage might be because animals want to gain fat-reserves before colder winter months during which they spend more time inside their resting sites.

## Response of spider fauna to holistic grazing and trampling at Debshan Ranch, Shangani, Zimbabwe

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The multiple benefits of holistic grazing are attracting considerable attention. These, among others, include increased soil organic matter, weed control and grass health. However, its impact on the arthropod fauna has not been studied yet. We will use a matched pair design (grazing vs. no grazing) in three areas of the Debshan Ranch in western Zimbabwe to assess the response of spider diversity to grazing at six time intervals (surveys): before, during, 1, 3, 6 and 10 months after cattle introduction. At each of the six sites, sampling points will be positioned 50, 100, 200 and 400 m along four perpendicular transects leading away from the cattle kraal (shelter) for a total of 16 sampling points. Spiders will be sampled using pitfall traps and sweep netting at each of the sampling points. Spider diversity is expected to be more diverse with distance from the kraal.

## Orapa, Letlhakane and Damtshaa Mines (OLDM) White Rhino Breeding Programme

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According to WWF, uncontrolled hunting in the colonial era was historically the major factor in decline of white rhinos the world over, Botswana inclusive. However, current poaching for the illegal trade in their horns is the key contributing factor to the species decline. In 2011, Debswana, OLDM through its policy for environmental conservation and protection initiated a programme to breed White rhino for future release into the wild and or donation to other conservation areas once the population has increased to the environment's maximum carrying capacity. The programme encompasses partnerships with other conservation stakeholders, nationally and regionally for concerted effort in restoration of the White rhino species today and into the future.

## The effects of night lighting on the foraging behaviours of small rodent species

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Artificial light generated from a variety of human sources is becoming increasingly common in a modern world. Research has shown that light has significant influences on the physiology as well as behaviour of organisms, from plants to mammals. The proposed project will provide some insight into the potential effects artificial light at night may have on the foraging behaviour of rodents, using the most widespread contributor to light pollution, namely street lights. We will be conducting trials using three of the most common types of street lights at Tswalu Nature Reserve during the summer. We will be using a Giving Up Density index to elucidate the effect of light on foraging behaviour. We will investigate the effects of both the presence of light and the spectral composition of the light on the foraging behaviour of rodents that may lead to possible community structure changes in areas of concentrated light pollution.

## Effective conservation requires a sound taxonomy: Lessons from recent advances in phylogenetics and phylogeography of Africa's endemic golden moles (family Chrysochloridae)

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Golden moles are elusive subterranean insectivores within the Afrotheria and count among Africa's most endangered but poorly studied mammals. Ten of 21 species are threatened (IUCN 2016), yet taxonomic uncertainties and unresolved evolutionary relationships jeopardize conservation efforts. Within this context we present a revised classification for chrysochlorids based on a fully resolved total evidence phylogeny that revealed divergent lineages within several genera and species. Further analyses of intraspecific relationships and gene flow at two spatial scales in the widespread Hottentot golden mole and the highly threatened, range-restricted Juliana's golden mole provided novel molecular frameworks to inform conservation planning that should conserve the integrity of each genetically unique lineage. Our analysis emphasize accurate taxonomic delineation and comprehensive geographic sampling across entire species ranges as essential for effective conservation of threatened chrysochlorids and species in general.

## Health effects in fish from the polluted Orlando Dam and Klipspruit wetland system in Soweto, South Africa

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Exposure to aquatic pollutants can cause physiological and histo-morphological alterations in fish. This study aimed to investigate the health of *Clarias gariepinus* from two sites in the polluted Klipspruit River system flowing through Soweto, south west of Johannesburg. Standard necropsy and histological procedures were used to assess selected target organs. High levels of faecal coliform bacteria, metal concentrations and potential endocrine disrupting chemicals were detected in water and sediment samples. Abnormalities identified in fish were mainly associated with the reproductive organs and included abnormally-shaped urogenital papillae, macroscopic gonadal alterations, and the microscopic analysis confirmed intersex in 13.6% and 50% of fish from the respective sampling sites.

## Towards restoration of ecosystem processes for conservation management in arid systems: Exploring feeding ecology, habitat utilisation and population responses of native ungulates in two contrasting arid ecosystems, Tswalu Kalahari Private Game Reserve and Karoo National Park

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Historically, the arid regions of southern Africa had large migratory herds of indigenous ungulates, having a profound influence on the ecological functioning of these systems. These migratory habits having been largely disrupted. The objectives of the project are; 1: To characterize the forage selection of ungulates across different seasons, 2: To relate ungulate distribution to water distribution, predator density and vegetation type in space, 3: To relate changes in ungulate population growth rates to water availability, predator numbers and rainfall in time. The findings should contribute towards determining suitable ungulate assemblages so as to allow for informed sustainable management and use within fenced areas.

## Unisa as an Experiential Learning Provider on Telperion: where has all the experience gone?

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Over the past nine years, Unisa and Ernest Oppenheimer and Son (EOS) have been providing Work-integrated Learning (WIL) experiences on Telperion. The basic aim of this partnership is to provide a platform which improves the students' possibilities of academic success. In 2015 the number of National Diploma in Nature Conservation graduates who gained experience on Telperion passed the 50% mark of all graduations achieved in that academic year, for the first time. As a result of this sustained success, this presentation focuses particularly on looking into where the Telperion Unisa Conservation Mentoring Project alumni have gone in terms of their conservation careers. The objective of this exercise was to select a number of students from each year and to make use of the Unisa Alumni Office to provide generic information about the students' whereabouts and their current employment status. In addition to this information, their further academic progression was also requested. The results, though of not of any academic value, do provide some answers to interest shown towards the continual and life-long development of the students who came through the Telperion Unisa Conservation Mentorship Project.

## Holistic Planned Grazing in South African grasslands: soil, vegetation and cattle responses

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Holistic Planned Grazing (HPG) is an adaptive livestock management tool said to mimic wild herds of ungulates by using high-intensity rotational grazing. HPG is claimed to restore grasslands in the face of desertification and climate change by promoting ecosystem processes. The claims regarding the effects of HPG have been both supported and contradicted by the literature, with few studies considering the multiple abiotic and management factors that may confound the effects of HPG. This PhD aims to adopt a systems approach to assess the efficacy of HPG in South African grasslands by analysing multiple management variables and their soil, vegetation and cattle responses.

## Body temperature patterns and behaviour of free-living ground pangolins (*Smutsia temminckii*) in a semi-arid environment

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The ground pangolin (*Smutsia temminckii*) is an elusive, primarily nocturnal mammal that occurs in areas of southern and eastern Africa, many of which are predicted to become hotter and drier with climate change. In order to investigate how pangolins may respond to the direct and indirect effects of a changing climate, we are measuring core body temperature, behavioural responses and the diet of free-living pangolins at Tswalu Kalahari Reserve. Here, I describe preliminary data on the core body temperature patterns and behavioural responses of the pangolins, and the potential significance of our findings for the conservation of pangolins in the face of climate change.

## **Pangolin research and conservation in South Africa: An overview of the African Pangolin Working Group's activities**

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Pangolins (Pholidota: Manidae) are the only group of mammals that have a covering of scales rather than fur, as is more typical for mammals. These secretive, predominantly nocturnal mammals occur at low population densities, are rarely seen, and even more rarely studied. Pangolins have the dubious honour of being the most heavily traded group of wild mammals at present and it is estimated that more than a million individuals have been traded in the past decade, although a recent estimate suggests that the actual trade may be double this. The African Pangolin Working Group was established in 2011 with the goal of identifying gaps in our present knowledge of African pangolins, implementing research to address these gaps, and also implementing and supporting pangolin conservation initiatives across Africa. Since its inception the African Pangolin Working Group has been involved in various research projects including studies on the ecology of pangolins, the threats that they face, the uses of pangolin derivatives in Traditional African Medicine and cultural rituals, and providing health screens for rescued pangolins prior to their release. Our poster gives a broad overview of the activities that we have been involved in thus far, as well as some specific examples.

## **Metal accumulation in House Sparrows (*Passer domesticus*) from Thohoyandou, Limpopo Province, South Africa**

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House Sparrows from the unindustrialised Thohoyando region were used to evaluate the use of feathers as non-lethal bio indicator tissue and generate baseline data. Plume feathers, flight feathers and muscle tissue were analysed using ICP-OES techniques, with the following trends in metal concentrations observed: plume feather > flight feather > muscle tissue. Magondi showed a degree of metal pollution, whilst Makonde may be an important reference site for future comparative studies. It was concluded that House Sparrows can be used as a bio-indicator organism and plume feathers are best for determining metal pollution levels.

## **Phylogeography of the eastern rock elephant shrew, *Elephantulus myurus***

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Phylogeography relates species' phylogenies to their geography. The resulting structure can be shaped by various factors including landscape, species biology, as well as life histories. We investigated the genetic structure of *Elephantulus myurus*, a rocky outcrop specialist. Using a mitochondrial gene and microsatellites, we found an isolation by distance genetic structure. With a few exceptions, each locality had its own unique mitochondrial haplotype and we suspect shared haplotypes may reflect ancestral diversity. Microsatellite data showed that genetic similarities occurred between individuals that were sampled at localities that were in close proximity to the Great Escarpment, a possible landscape corridor.

## Aspects of the ecology of Cape porcupines in KwaZulu-Natal, South Africa

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Cape porcupines, *Hystrix africaeaustralis*, appear to be one of the South African mammalian species that are increasing their range and abundance with changing land use and climate change. We are investigating aspects of the ecology of porcupines from 3 study sites along a land-use gradient. The study sites include farmlands (Nottingham Road), a natural protected area (KwaWula Residential Game Estate, Howick), and an urban area (Simbithi Eco-estate, Ballito). Habitat use, home range sizes and movements obtained using GPS collar transmitters are being compared. We are also using camera-trapping to assess temporal activity patterns and population sizes of porcupines.

## Offsetting Carbon Footprints through Carbon Sequestration in Mine Tailings

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Some mining operations, including most diamond mines, have the potential to substantially offset their carbon footprints (up to ~10x their annual greenhouse gas emissions) through the formation of carbonate alteration minerals in mine tailings. These carbonates occur naturally and store carbon captured from the atmosphere in safe (non-toxic), solid mineral form. At many mine sites, these carbonates can already be found in tailings. In addition, there are ways to accelerate their formation through “mineral carbonation” technologies. This talk will discuss mineral carbonation research on mine sites globally, including recent research at the De Beers operations at Victor and Voorspoed Mine.

## The spatial distribution and genetic variation of climbing mice occurring in South Africa

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An increasing number of species are threatened by anthropogenic and natural pressures and protected areas (including those managed under the Diamond Route Properties) play an important role in protecting biodiversity. We used climbing mice as a model to investigate spatial genetic structure across its range. Our DNA results were compared to those previously published, and indicate that animals collected from Sandveld Nature Reserve, Rooipoort and Tswalu group together while animals collected from Richards Bay grouped separately; a taxonomic revision might be required for *D. melanotis* as it might comprise a species-complex. The population health of animals collected from Telperion is assessed.

## Comparing genetic patterns in native and introduced species

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Most animals have genetic structure across their native range. When this is a result of geographical features it is known as phylogeography. Phylogeography occurs due to barriers restricting gene flow between populations. Mitochondrial DNA was used to determine the phylogeographic patterns within a generalist species (*Saccostomus campestris*) and a rock-dwelling species (*Elephantulus myurus*) in order to determine the effect of habitat specificity. These patterns will be compared to an invasive species (*Rattus rattus*) within two countries, South Africa (Bastos et al., 2011), and the DRC (Kaleme et al., 2011), to determine whether similar barriers influence both invasive and native species

## Remotely operated virtual fences: a successful new approach to baboon management

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Virtual Fencing (VF) is a cost effective strategy, for deterring baboons from entering prohibited spaces. It is based on the principal of creating a "landscape of fear", which is achieved by remotely activating camouflaged action stations loaded with pyrotechnics and audio bio-mimicry. Temporal unpredictability adds to the fear. GPS radio-collared animals are tracked in real-time, thereby providing an early warning system. During the first three months after activation of a Gordon's Bay VF, the local authority saved 3500 man hours from not needing to manage baboons. This system can be modified for other animals and has great potential for research.

## Habitat Preferences of Two Small Mammals

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Animals tend to prefer certain habitat features resulting in disproportionate use of their environment, which affects their survival and fitness. Despite this significance, habitat preferences are poorly known for many endemic small mammals. In the current study, data on the occurrence of two sympatric mammal species with different life-history traits within Ezemvelo/Telperion Nature Reserve, coinciding with various landscape features and ant abundance, was determined over several seasons. High capture rates occurred on the rocks, while ant abundances seemed not to affect the distribution of either species, perhaps indicating that despite their differences these species have very similar habitat preferences.

## Genetic divergence in the Short-toed Rock-thrush *Monticola brevipes*

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Recent phylogenetic evidence supports the elevation of the subspecies of Short-toed Rock-Thrush, *Monticola brevipes brevipes* and *M. b. pretoriae*, to full-species status. This interpretation is based on a small sample size of birds from few sites within the species range. The analysis of mitochondrial *cytochrome b* and *NADH dehydrogenase subunit 2* genes from 50 samples across the species distribution assesses this split further.

## Foraging behaviour of ruminant and non-ruminant grazers in previously cultivated and natural land in Telperion and Ezemvelo Nature Reserves (TENR)

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Feeding behaviour of large herbivores affects their management inside nature reserves. This study compared foraging behaviour of zebra, hartebeest and black wildebeest in previously cultivated land (PCL) and natural area (NL). We measured bite rate, step rate, feeding time, and vegetation greenness and height. On PCL, hartebeest and zebra were rare or absent; wildebeest grazed on very short grass. On the NL, zebra grazed on tall and short grass, wildebeest grazed on very short grass, and hartebeest grazed selectively on very tall green grass. Differences in forage selection and forage availability likely determine the observed patterns.

## Aspects of the ecology of feral cats in urban Pietermaritzburg, South Africa

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Feral cats (*Felis catus*) are alien invasives with expanding populations globally, particularly in urban areas. They are negatively implicated in preying on native wildlife, harbouring and spreading infectious zoonotic diseases and being a public nuisance. We investigated aspects of the ecology of feral cats in urban Pietermaritzburg, South Africa including their home ranges and habitat use in an urban mosaic, and disease prevalence to assist in making management recommendations.

## Estimating forage quality across different grass communities in Telperion Game Reserve using high resolution remote sensing data

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Grass quality, as determined by the concentration of nitrogen, phosphorus, potassium, calcium, and sodium is an important factor influencing the distribution of grazing mammals. Mapping grass quality is important to understand ecosystem dynamics, functions, wildlife and livestock feeding as well as distribution patterns. Understanding the spatial distribution of grass quality provides essential information for sustainable planning and management by identifying crucial areas for conservation and restoration. A number of studies have shown that grass quality at a large scale is influenced by climatic and environmental variables and grass diversity. Techniques that can estimate grass quality on such scale are therefore critical in understanding and explaining wildlife and livestock foraging and migration patterns. In this study, we aimed at examining the use of new generation's multispectral sensor such as Sentinel-2 and WorldView-2 in mapping grass communities and estimating canopy nitrogen (N), phosphorus (P) and sodium (Na) across different common grass communities in Telperion. A machine learning-based approach was used on this study for classification and regression. The study demonstrated the possibility to accurately map the common grass communities and grass quality at a large scale using multispectral sensors with the red edge waveband with a high spatial resolution.