8th Oppenheimer De Beers Group Research Conference
17th & 18th October 2017

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 supported by E Oppenheimer & Son and the De Beers Group of Companies.
- Provide an opportunity for students and researchers to present their 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 with the Oppenheimer family and the De Beers Group.

Time	Tuesday 17th October
08h30	REGISTRATION and TEA / COFFEE
09h00	Mpumi Zikalala: Senior Vice President De Beers Sightholder Sales, South Africa **Welcome and Introduction**
09h20	Jane Carruthers **Keynote Address:** Conservation Science: A Century of Research in South Africa
	Session 1 **CHAIR: Duncan MacFadyen**
09h50	The Theory and Application of Virtual Fencing in Wildlife Management Phil Richardson, Phillip Olivier, Everhard Conradie, Sieglinde Rode, Byron Loubser, Catherine Shutte, Elana Kellerman and Hayley Wittridge
10h10	Spiders and Holistic Management Practices: Response of spider fauna to holistic planned grazing at a landscape scale at Debshan Ranch, Shangani, Zimbabwe Sicelo Sebata, Charles Haddad, Stefan Foord and Moira Fitzpatrick
10h30	Insights into the life of ground pangolins at Tswalu Kalahari Reserve Wendy Panaino, Robyn Hetem, Francesca Parrini, Gus van Dyk, Dylan Smith, Mike Picker and Andrea Fuller
10h50	TEA / COFFEE / POSTER VIEWING
	Session 2 **CHAIR: Corne Anderson**
11h20	Ancient human and pathogen DNA persists in South African Pleistocene archaeological sediments Riaan Rifkin, Jean-Baptiste Ramond, Guillaume Porraz, Aurore Val and Anders Hansen
11h40	The Phenology of the Enkangala Grasslands Mthokozisi Moyo
12h00	Diversity of breeding groups in the African Pygmy Falcon Robert Thomson, Diana Bolopo and Anthony Lowney
12h20	Are Debshan headwater streams refugia against invasive fish species? Amanda Adlam, Chris Chimimba, Marco Alexandre and Stephan Woodborne
12h40	Seasonal Chiropteran diversity and abundance across habitat types on Wakefield farm, Natal Midlands, Kwa-Zulu Natal Province, South Africa Alexandra Howard, Chris Chimimba, Ara Monadjem and Duncan MacFadyen
13h00	LUNCH / CONFERENCE PHOTOGRAPH / POSTER VIEWING

Time	Tuesday 17th October (continued)
	Session 3 **CHAIR: Warwick Mostert**
14h00	Aspects of the water quality of the Wilge River within the Telperion Nature Reserve Sharri Cannell, Lee-Ann Modley, Gregg van Rensburg and Cobus van Dyk
14h20	The Ticks of Debshan Arthur Spickett and Rangarirai Huruba
14h40	Investigation of the home ranges and movement patterns of Cape porcupines along a land-use gradient in KwaZulu-Natal Samke Ngcobo
15h00	How birds have been affected by some of the first wind farms in South Africa Samantha Ralston-Paton, Jon Smallie, Andrew Pearson, Ricardo Ramalho and Hanneline Smit-Robinson
15h20	TEA / COFFEE / POSTER VIEWING
	Session 4 **CHAIR: Maroti Tau**
15h50	Predicting the phylogeny of Scarabaeini (Coleoptera: Scarabaeidae) using cuticular hydrocarbon profiles and gland morphology. Alex Nepomuceno, Catherine Sole, Clarke Scholtz and Christian Pirk
16h10	The enemy of my enemy is my friend: Kalahari Tree Skinks use Sociable Weavers presence to manage predation risk Anthony Lowney, Tom Flower and Robert Thomson
16h30	Understanding the temporal scale of rainfall effects in white-browed sparrow weaver reproduction Pablo Capilla-Lasheras, Xavier Harrison, Alastair Wilson and Andrew Young
16h50	How *Apis mellifera scutellata* queens control reproductive parasitism in *A. m. capensis* clones Fiona Mumoki, Abdullahi Yusuf, Christian Pirk and Robin Crewe
17h10	Get to the Point: Spatially Explicit Resources Offer Opportunities to Study Snake Competition in the Kalahari Desert Bryan Maritz and Graham Alexander
17h30	The future of spiders and ants on an ancient mountain: substituting space for time and replicating space in time Stefan Foord, Evans Mauda, Ansie Dippenaar-Schoeman and Caswell Munyai
17h50	Close of Day 1
18h00	FORMAL POSTER SESSION/ WINE TASTING (PAINTED WOLF WINES)
18h30	COCKTAIL FUNCTION: **Gold Reef City Theme Park Hotel – Barney's Bar Area**

Time	Wednesday 18th October
08h00	TEA / COFFEE / POSTER VIEWING
08h30	Norman Owen-Smith **Keynote Address:** Contributions of GPS telemetry to Ecology and Conservation
	Session 5 **CHAIR: Dylan Smith**
09h00	The challenging life of a Helmeted Guineafowl *Numida meleagris* at Rooipoort: laid to 'grave' Tim Crowe
09h20	The population dynamics and ecology of leopards (*Panthera pardus*) on Debshan Ranch, Shangani, Zimbabwe Rogan Fourie and Dan Parker
09h40	Understanding of complex spatial-structuring of Arctic Grayling populations in the Northwest Territories, Canada Leanne Baker, Kyle Artym, Sarah Lord and Heidi Swanson
10h00	Assessing fine-scale impacts of cattle versus wildlife grazing on small mammal assemblages along a fenced boundary of Telperion Nature Reserve Charles Gumbi, Ara Monadjem and Themb'alilahlwa Mahlaba
10h20	Debshan Frog Survey: Species richness, seasonal activity and habitat utilization, based on passive acoustic monitoring and visual encounter surveys Louis Du Preez, Willie Landman and Ferdi de Lange
10h40	The use of acoustic detectors for assessing bat species richness and functional activity Dan Parker and Ric Bernard
11h00	TEA / COFFEE / POSTER VIEWING
	Session 6 **CHAIR: Colin Edwards**
11h30	Seasonal dynamics in C_4 and C_3 plant consumption of ungulates in contrasting arid biomes Mika Vermeulen, Tineke Kraaij and Jan Venter
11h50	Debshan Ranch-A new nesting haven for White-backed Vultures Josphine Mundava, Ngoni Chiweshe, Nobuhle Mabhikwa, Fadzai Matsvimbo and Peter Mundy
12h10	Divergent responses to fire in South African and North American grassland communities Kevin Kirkman, Scott Collins, Melinda Smith, Alan Knapp, Deron Burkepile, Catherine Burns, Richard Fynn, Nicole Hagenah, Sally Koerner, Katherine Matchett, Dave Thompson, Kevin Wilcox and Peter Wragg
12h30	Biodiversity of invertebrates in ephemeral waterbodies across a disturbance gradient of inundation at Tswalu Kalahari Reserve Jackie Dabrowski
12h50	LUNCH / POSTER VIEWING

Time	Wednesday 18th October (continued)
	Session 7 **CHAIR: Patti Wickens**
13h50	Modelling and mapping of land protection and rehabilitation scenarios to support water security in the uMngeni Catherine Hughes
14h10	The effects of differing land use on the home range and habitat use of three mongoose species Jarryd Streicher, Tharmalingam Ramesh and Colleen Downs
14h30	Porcine zona pellucida immunocontraception of African elephant cows in South Africa Henk Bertschinger, Audrey Delsink and Martin Schulman
14h50	Microsatellite variation in a population-level study of the endangered Bearded Vulture *Gypaetus barbatus* Melanie Burke, Sonja Krűger and Sandi Willow-Munro
15h10	Geology and Hydrogeology of Tswalu Game Reserve Kym Morton
15h30	Where have all the garnets gone? – Lena West paleoclimate Raymond Davies, Toby Strauss and Alan Davies
15h50	Spatio-temporal ecology of the rusty-spotted genet, *Genetta maculata*, in Telperion Nature Reserve (Mpumalanga, South Africa) Rouxlyn Roux, Roxanne Collins, Maartin Strauss and Emmanuel Do Linh San
16h10	Presentation of Awards – Nicky Oppenheimer
16h20	Closing – Nicky Oppenheimer (E Oppenheimer and Son)
16h30	**CONFERENCE CLOSURE**

Posters	
Authors	**Titles**
Susannah Patrocinio, Hanneline Smit-Robinson, Alan Barrett and Leslie Brown	The influence of *Seriphium plumosum* encroachment on small mammals at Telperion, Mpumalanga, South Africa
Daniela Monsanto, Shilpa Parbhu, Devon Main, Ofentse Ntshudisane, Candice Jooste, Siphiwe Madiba, Tshegofatso Fakude, Duncan MacFadyen and Bettine van Vuuren	Cryptic diversity of rodents in the Tswalu Kalahari Reserve
Sellina Nkosi, Leslie Brown, Alan Barrett and Elhadi Adam	Modelling the impact of African elephant (*Loxodonta africana*) on woody vegetation in Venetia-Limpopo Nature Reserve using remote sensing techniques
Jason Marshal, Hannah Hoffmann, Francesca Parrini and Cornelius Louw	Photographic sampling of large herbivores at Telperion and Ezemvelo Nature Reserves
Ingrid Wiesel, Sabrina Karthun-Strijbos, Inga Jaenecke, Dylan Smith and Gus van Dyk	Three years of camera trapping - spatial distribution of herbivores and carnivores at Tswalu Kalahari Reserve
Heather Webster, Sasha Hoffmann, Keith Dube, Erin Oberem, Nico Avenant, Peter Teske, Heike Lutermann and Bettine van Vuuren	A spatial genetic comparison of two endemic Southern African small mammals
Elena Mariotti, Francesca Parrini, Jason Marshal and Cornelius Louw	Spatial and temporal variation in ungulate landscape use in relation to resources and constraints at Telperion and Ezemvelo Nature Reserves
Chantel Henning, Paul Grobler, Malan Davey and Bettine van Vuuren	The impact of selection and limited geneflow on genetic diversity: the impala (*Aepyceros melampus*) as a model
Deon de Jager, Cindy Harper, Bettine Jansen van Vuuren and Paulette Bloomer	Investigating sub-specific hybridisation across the southern range of common eland (*Tragelaphus oryx*)
Faith Ngute, Allan Sebata and Ranga Huruba	Effect of herbivory on above ground grass biomass on rangeland patches previously used as overnight cattle kraals at Debshan Ranch, central Zimbabwe
Chantelle Girgan, Mariette Marais, Antoinette Swart and Driekie Fourie	Nematode diversity of the Telperion Nature Reserve, South Africa
Theresa Sethusa, Ansie Dippenaar-Schoeman, Robin Lyle and Domitila Raimondo	Making the case for conservation of spiders
Mosihla Frederick Mokumo, Ali Halajian, Katlego Kunutu and Wilmien J Luus-Powell	Preliminary study on the health and parasites of tigerfish *Hydrocynus vittatus* (Actinopterygii: Alestidae) from Schroda dam, Limpopo Province, South Africa
Jacqui Codron, Nico Avenant and Daryl Codron	Population demographics of herbivores in Tswalu Kalahari Reserve
Margaret Nolan, Henk Bertschinger and Martin Schulman	Contraception of wildlife and domestic populations
Mark Turnbull, Bettine Jansen van Vuuren and Chris Chimimba	Comparing genetic patterns in native and introduced species
Naadhirah Munshi, Craig Symes and Jean Mollett	Genetic diversity and interspecies hybridization in *Cossypha* robin-chats
Josie Everatt, Craig Symes, Mike Butler and Jean Mollett	The taxonomic status of Terpsiphone viridis granti and Terpsiphone viridis plumbeiceps
Eleanor Weideman, Robert Thomson, Jasper Slingsby and Bernard Coetzee	The effect of land use change on the phylogenetic diversity of bird communities in Phalaborwa, Kruger National Park

Authors	Titles
Billi Krochuk, Robert Thomson, Diana Bolopo and Claire Spottiswoode	Investigating the unique defecation behaviour of African Pygmy Falcons
Elize Lundall-Magnuson	Is beekeeping in South Africa viable?
Grace Kwinda, Adriaana Jacobs, Nthati Seema, Maria Tladi, Madira Manganyi and Eduard Venter	Fungal diversity in soil and grass on the Telperion Nature Reserve
Shannon Mitchell, Catherine Sole, Ian Engelbrecht and Robin Lyle	The genetic structure and phylogeography of trapdoor spiders, Stasimopus Simon, 1892 (Araneae: Mygalomorphae: Ctenizidae)
Reinier Terblanche	*Anoplolepis steingroeveri* (Forel 1894), a new associated ant species record for myrmecophilous butterflies in Africa, new host-plant records for *Crudaria* (Wallengren 1875) (Lycaenidae: Aphnaeinae) including a geoxylic suffrutex at sand ramp
Ansie Dippenaar-Schoeman, Peter Webb and Robin Lyle	Some amazing termite feeding spiders (Araneae: Ammoxenidae)
Elmé Brand, Catherine Sole and Ian Engelbrecht	Understanding the monotypic rinkhals, *Hemachatus haemachatus* (Elapidae)
Fay Robertson	*The Times They Are A-Changin'* - on Shangani Ranch not so much
Evelyn Mervine, Patti Wickens, Siobhan Wilson, Ian Power, Sterling Vanderzee, Connor Turvey, Jessica Hamilton, Gregory Dipple, Gordon Southam, Zandile Miya, and Alexandrina Fulop	Carbon Storage Potential of Kimberlite Mine Tailings
Rachid Koual, Marie-Ka Tilak, Nora Weyer, Wendy Panaino, Andrea Fuller, Nico Avenant, and Frédéric Delsuc	A metagenomic approach for assessing the diet of ant-eating mammals
Roxanne Collins	Assessing the Response of Mesopredators to Different Apex Predator Regimes in the Tswalu Kalahari Reserve
Peter Taylor, Macy Madden, Cathy Vise, Murunwa Nelufule, Vusani Mphethe, Tigga Kingston and Sarah Venter	Surviving in a harsh environment: bats, water & baobabs in the semi-arid Limpopo Valley
Trevor McIntyre	Now you see me, now you don't: using camera trap data to model densities of riparian zone predators
Simone Ackermann, Nigel Bennett and Maria Oosthuizen	The Effect of Light Pollution on the Foraging Behaviour of Rodents
Manqoba Zungu, Mfundo Maseko, Riddhika Kalle, Tharmalingam Ramesh and Colleen Downs	Habitat fragmentation and the impacts on mammal occupancy and abundance
Lesley Marisa, Peter Henzi, Alan Barrett and Leslie Brown	The influence of seasonality and commensurate physiological responses by Chacma baboon (*Papio hamadryas ursinus*) to Daily Travel Distance and Home Range Size at Telperion Nature Reserve, Mpumalanga, South Africa
Cornelius Louw and Sam Ferreira	Predation risk: Does spatial scale matter?
Sein Heighton, Darren Pietersen, Grant Hall and Armanda Bastos	Investigating geographic traceability as a conservation tool against the scaly trade in pangolins
Jacqui Codron, Nico Avenant, Corli Wigley-Coetsee and Daryl Codron	Carnivore stable carbon isotope niches reflect predator-prey size relationships in African savannas
Nathan Baker and Richard Greenfield	Using macro-invertebrate community assemblages to determine water quality within drought conditions
James Dabrowski and Jackie Dabrowski	The Importance of the Wilge River in Maintaining Water Quality and Aquatic Ecosystem Health in the Olifants River
Tyrone McKendry	Conserving Kyalami's African Grass-Owls
Lara Jordan, Kevin Kirkman, Tracy Rehse and Colleen Downs	Can key extinction risk factors be identified in the order gruiformes?
Carla du Toit, Susan Cunningham and Anusuya Chinsamy-Turan	Mechanosensory structures in the beaks of waders (Family: Threskiornithidae) in relation to their foraging ecology

Authors	Titles
Mfundo Maseko, Manqoba Zungu, David Ehlers Smith and Colleen Downs	An investigation into the effects of forest fragmentation via measures of patch size and isolation on the taxonomic and functional diversity of forest bird community
Devin Murray	An economic and behavioural study of Oakhurst end-scrapers at Bushman Rock Shelter (Limpopo South Africa): insights from use-wear analysis
Anika Steynberg, Christian Pirk and Laura Bester	The effect of pesticides on the lethal limit of honeybee
Gerhard Nortjé	Soil science research needs in Southern African protected areas
Mudzuli Mavhunga, Adriaana Jacobs, Eduard Venter and Brett Summerell	The Gauteng grassland biome, a treasure house of Fusarium species
Lufuno Nemadodzi, Jacques Vervoort and Gerhard Prinsloo	Investigation and identification of microbial diversity that play a role in discrimination between *Burkea* soils and non-*Burkea* soils and the effects they have on the growth of *Burkea africana* trees
Gretel van Rooyen and Noel van Rooyen	Updated vegetation map and assessment for Tswalu Kalahari Reserve
Craig Peter, Karsten Wodrich, Bill Mincher, Andrew Hankey and Nic Venter	Last chance to see? The race to save the spectacular Albertina Sisulu Orchid, *Brachycorythis conica* subsp. *transvaalensis*, a critically endangered South African terrestrial orchid
Mupenyu Mberi and Colin Edwards	Analysing breakthrough innovations used to leverage results of integrating holistic management on Debshan Ranch
Wendy Collinson, Lizanne Roxburgh, Innocent Buthelezi and Claire Patterson-Abrolat	Using citizen science to survey roadkill at wide spatio-temporal scales: the example of South Africa
Philip Weller	Integrated Pest Management - A Sustainable Future for Global Agriculture
Meshack Sahomba, Ranga Huruba and Mlamuleli Mhlanga	Effect of mobile kraaling on wildlife distribution and patch utilization at Debshan Ranch, Zimbabwe. Implication for holistic grazing

ORAL ABSTRACTS

Conservation Science: A Century of Research in South Africa

Jane Carruthers

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South Africa is renowned for its wildlife conservation in iconic national parks such as the Kruger, and also for innovative management in other protected areas both privately and state-owned. However, little is known about the history of the interesting and often exciting, conservation science research that has been accomplished and scientists and ecological managers themselves are often ignorant of the contexts within which they operate. This paper, based on a recently published book, provides an overview of the rich tapestry involving the international milieu, government, institutions of learning, and the public, that has shaped the present conservation arena.

The Theory and Application of Virtual Fencing in Wildlife Management

Phil Richardson[1,2], Phillip Olivier[1], Everhard Conradie[1], Sieglinde Rode[1], Byron Loubser[1], Catherine Shutte[1], Elana Kellerman[3] and Hayley Wittridge[3]

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A virtual fence (VF) is a non-physical structure serving as a psychological boundary, like a territorial boundary, which is designed to keep intruders out through fear of retribution, if caught. The mechanism by which a VF or territorial boundary is maintained, is embedded in the 'landscape of fear' theory, which predicts that prey animals (competitors) adjust their behaviour to reduce predation risks, even at the cost of losing feeding opportunities. The key element to prevent VF habituation, is that retribution must be temporarily and spatially unpredictable. A baboon troop VF outside Gordon's Bay has been 100% successful since January 2016.

Spiders and Holistic Management Practices: Response of spider fauna to holistic planned grazing at a landscape scale at Debshan Ranch, Shangani, Zimbabwe

Sicelo Sebata[1,2], Charles Haddad[2], Stefan Foord[3] and Moira Fitzpatrick[4]

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The multiple benefits of holistic planned 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 used 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) after cattle introduction. Sampling points were positioned 50, 100, 200 and 400 m along four perpendicular transects away from the cattle kraal (shelter). Spiders were sampled using pitfall traps and sweep netting at each of the sampling points. A total of 3773 spiders in 121 genera belonging to 35 families. Spider abundance, but not richness increased away from the kraal for both pitfall and sweep net data. Distance from the kraal and grazing had a small but significant effect on assemblage structure. Species associated with these changes are discussed.

Insights into the life of ground pangolins at Tswalu Kalahari Reserve

Wendy Panaino[1,2], Robyn Hetem[2,3], Francesca Parrini[1], Gus van Dyk[4], Dylan Smith[4], Mike Picker[5] and Andrea Fuller[2]

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Observations at Tswalu Kalahari Reserve over a two-year period revealed that free-living ground pangolins have a highly-specialized diet, which includes mainly *Crematogaster* and *Anoplolepis* ants, and *Trinervitermes* termites. Pangolins emerged from burrows earlier during the day in winter compared to in summer (16h00 in winter vs 21h00 in summer, on average), however the duration of above-ground activity did not change across seasons (about 6 – 8 hours). Ultimately, through a detailed investigation of pangolin ecology, we hope that our work will contribute to the conservation effort of the species.

Ancient human and pathogen DNA persists in South African Pleistocene archaeological sediments

Riaan Rifkin[1], Jean-Baptiste Ramond[1], Guillaume Porraz[2], Aurore Val[3] and Anders Hansen[4]

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Diseases had a profound influence on human evolutionary history, and many ancient pathogens are still implicated in the deaths of millions of people annually. It is known that our species evolved in sub-Saharan Africa, but exactly which pathogens were brought from Africa to the rest of the world, following the departure of *Homo sapiens* from the continent, remains unclear. The recent recovery of human and pathogenic DNA from South African archaeological sediments represents a first step towards reconstructing a global human 'disease baseline'. The ability to detect microbial DNA in African sediments opens a vast range of analytical possibilities.

The Phenology of the Enkangala Grasslands

Mthokozisi Moyo

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Phenology is the study of the timing within the year of life history events in plants and animals. The aim of this study is to gain a predictive understanding of the phenology of the Enkangala moist, high altitude grassland. Remote sensing techniques are used to quantify the grassland phenology at landscape scale. A long-term daily climate data record is then used to establish the climatic determinants and detect change over the past century. We found that there has been a change in the growing season in this region. The growing season will only start if the soil moisture is above 10mm and the temperature is 15°C.

Diversity of breeding groups in the African Pygmy Falcon

Robert Thomson[1], Diana Bolopo[1,2] and Anthony Lowney[1,3]

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Diurnal raptors show a high occurrence of cooperative breeding. We present a study of the breeding organization of African pygmy falcon *Polihierax semitorquatus* in the southern Kalahari. Breeding ecology data now exists for 6 breeding seasons and over 150 nests. We found cooperative breeding at about 20% of nests, including multi-male, multi-female and multi-male-female groups, with unrelated adults, delayed offspring or both types of individuals. Pygmy falcons are facultative cooperative breeders whose mating system varies as monogamous, polyandrous and traditional cooperation within a single population. We discuss the possible reasons for the evolution of this interesting mating system.

Are Debshan headwater streams refugia against invasive fish species?

Amanda Adlam[1], Chris Chimimba[1], Marco Alexandre[2] and Stephen Woodborne[3]

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Genetic integrity of fish such as Kariba (*O. mortimeri*) and Mozambique (*O. mossambicus*) tilapia is threatened by invasive Nile Tilapia (*O. niloticus*), and headwater streams of the Shangani River at Debshan may offer genetic refugia. High diversity (14 spp.) suggests a healthy aquatic community structure, although epizootic ulcerative syndrome occurred in some catfish. Comparing species dietary niche and habitat preferences with the invaded Zambezi River highlights predation potential, but also greater predator avoidance environments in determining community structure. The results suggest that low nutrient status and strong seasonal cycles mitigate against the naturalization of invasive species in headwater streams at Debshan.

Seasonal Chiropteran diversity and abundance across habitat types on Wakefield farm, Natal Midlands, Kwa-Zulu Natal Province, South Africa

Alexandra Howard[1], Chris Chimimba[1], Ara Monadjem[2] and Duncan MacFadyen[3]

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Multidisciplinary morphological, molecular and echolocation data were used to assess seasonality in Chiropteran diversity and abundance across different habitats at Wakefield Farm (Natal Midlands, KwaZulu Natal Province, South Africa) – an area characterized by a matrix of anthropogenic structures, forest, grassland and plantations. Morphological and molecular identification of mist-netted individuals recorded 54 microchiropteran bats representing nine species, seven genera and four families. The highest species richness and abundance were recorded during summer with many individuals being adult females with a high ecto-parasite load comprising of mites and fleas. On-going analyses are investigating Chiropteran diversity and abundance based on echolocation data.

Aspects of the water quality of the Wilge River within the Telperion Nature Reserve

Sharri Cannell[1], Lee-Ann Modley[2], Gregg van Rensburg[3] and Cobus van Dyk[4]

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The aim of this study was to assess aspects of the water quality (physical, chemical and biological parameters) at selected sites in the Wilge River and five of its perennial tributaries located within the Telperion Nature Reserve. The Saalboomspruit was found to be most impacted compared to the other tributaries. Most noticeable was a higher concentration of certain metals, chloride and sulphate levels, elevated electrical conductivity, total dissolved solids and hardness as well as higher *Escherichia coli* concentrations. The SASS5 results corresponded with the water quality results, with ecological categories associated with critically modified conditions observed at sites with poorer water quality.

The Ticks of Debshan

Arthur Spickett[1] and Rangarirai Huruba[2]

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Quantitative assessments were executed to determine tick dynamics on Shangani and Headquarters (HQ), Debshan (Pvt.) Ltd. in Zimbabwe during 2016. Results confirm that Shangani supports a greater species richness than HQ, indicative of a higher habitat and host diversity on Shangani. Overall mean tick abundance on vegetation was distinctly higher on Shangani than on HQ whereas the overall mean abundance of ticks on cattle was notably higher at HQ than at Shangani. Variance in tick species dynamics between the two properties are contingent on vegetation diversity and contrasts in climate, hosts and management interventions.

Investigation of the home ranges and movement patterns of Cape porcupines along a land-use gradient in KwaZulu-Natal

Samke Ngcobo

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Cape porcupines, *Hystrix africaeaustralis*, are one of the South African mammalian species that are increasing their range and abundance with changing land use. Knowledge of the spatial movement of this species can provide important ecological information and provide possible reasons why this species is capable of adapting and surviving in a range of environments. We investigated the home ranges and movement patterns of 15 radio tagged Cape porcupines along a land-use gradient in KwaZulu-Natal from June 2016- July 2017. We selected three study areas representing differing land use types, namely a natural protected area, farmlands, and an urban area.

How birds have been affected by some of the first wind farms in South Africa

Samantha Ralston-Paton[1], Jon Smallie[2], Andrew Pearson[3], Ricardo Ramalho[4] and Hanneline Smit-Robinson[5]

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We reviewed avifaunal monitoring reports for the first eight wind farms of the Renewable Energy Independent Power Producer Programme in South Africa to help contextualise, improve predictions, and ultimately minimise negative effects of wind energy on birds. The average estimated fatality rate was 4.1 birds per turbine per year (285 turbines), and falls within the range of estimated fatality rates reported in for the United States of America and Europe. All wind farms in the review reported at least one fatality of a threatened species. Raptors accounted for 37% of carcasses found. The study reinforces the value of post-construction monitoring and information sharing, particularly where wind energy is developed in new environments.

Predicting the phylogeny of Scarabaeini (Coleoptera: Scarabaeidae) using cuticular hydrocarbon profiles and gland morphology

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As cuticular hydrocarbons (CHC) and glands are involved with reproduction and due to their high species specificity, variations in gland morphology and CHC profiles can represent characteristics that are consistent within a species. We will determine the evolutionary relationship between members of the Scarabaeini tribe by comparing their chemical profiles and glandular morphology using phylogenetic tools. Preliminary multi-species comparisons revealed variation in small details of CHC profiles and gland morphology between species of Scarabaeini. Therefore, small differences in gland morphology and CHC profiles are useful character states that can be used to reconstruct the evolutionary history of closely related species.

The enemy of my enemy is my friend: Kalahari Tree Skinks use Sociable Weavers presence to manage predation risk

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In southern Africa, the African Pygmy Falcon (*Polihierax semitorquatus*) depends entirely on Sociable Weaver (*Philetarius socius*) colonies for nesting and roosting. Kalahari tree (*Trachylepis spilogaster*) skinks also significantly associate with weaver colonies. The presence of pygmy falcons, which prey mainly on small reptiles, does not impact this association. We tested the prediction that tree skinks use sociable weaver cues to evaluate predation risk. When weavers were present at a colony, skinks were more visible and more likely to forage away from the tree. Skinks also used visual and acoustic cues to run for cover when a potential predator is approaching.

Understanding the temporal scale of rainfall effects in white-browed sparrow weaver reproduction

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In arid environments, rainfall is often associated with reproductive bouts in many species. However, this relationship is commonly not well quantified, being only based on anecdotal observations. Using life-history data from our continuous decade-long field study of >40 white-browed sparrow weaver groups in the Tswalu Kalahari Reserve, we present a framework to quantitatively determine the effects of rainfall on sparrow weaver breeding decisions. Our analyses indicate that white-browed sparrow weavers lay eggs 4 to 22 days after rainfall occurs. We further discuss the possible interactions between rainfall and cooperation affecting reproduction in this social species.

How *Apis mellifera scutellata* queens control reproductive parasitism in *A. m. capensis* clones

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We investigated whether honey bee queens can avert reproductive competition from the intraspecific social parasite *Apis mellifera capensis* ("clones"), infesting host colonies in the presence and absence of a queen. Our results show that queens employ a strategy that involves suppression of ovarian activation and a caste-specific step-wise inhibition in production of "queen-like" pheromone signals, achieved by differential expression of enzymes involved in the biosynthesis of these pheromones. This is the first report showing that honey bee queens can regulate reproductive dominance by clones and contributes to our understanding of how context governs behaviour in social insects.

Get to the Point: Spatially Explicit Resources Offer Opportunities to Study Snake Competition in the Kalahari Desert

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Sociable weavers (*Philetairus socius*) are ecosystem engineers that build communal colonies. These colonies act as spatially-explicit resources that attract large numbers of cape cobras *(Naja nivea*) and boomslang (*Dispholidus typus*) that prey on chicks and eggs. We summarise studies of the diets of these snakes and show that the two species consume a similar diversity of prey types, but differ in that boomslang favour arboreal prey types. We show that cobras consume many snakes, including conspecifics. Limited prey availability may drive increased niche overlap and stronger competition around spatially-explicit resources. Observations reveal frequent occupancy of colonies by snakes, suggesting high potential for intra- and interspecific interactions.

The future of spiders and ants on an ancient mountain: substituting space for time and replicating space in time

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Long-term monitoring of assemblages across mountains provides tests of the mechanisms that drive diversity but also predict changes in response to climate change. Here we report on the results of an eight-year study of spiders and ants across the Soutpansberg mountain. The taxonomic diversity of thermophilic ants decrease with elevation, is mainly driven by temperature, while that of spider increases with elevation is mainly affected by neutral processes. Ant diversity on this mountain is predicted to increase with increases in global climates and effect local extinctions of spider species, particularly on top of the mountain.

Contributions from GPS telemetry to ecology and conservation

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The advent of Global Positioning System (GPS) telemetry has opened new opportunities for documenting how animals relate to their environments in space and through time. Individuals representing several species can be monitored continuously day and night for periods covering a year or longer. Our team has used this technology to address three conservation problems: (1) why sable antelope numbers have declined in Kruger National Park, (2) why wildebeest are numerically sparse in Kruger Park, and (3) how gemsbok and wildebeest cope with extremes of temperature and aridity in the Kalahari. Some findings from these three studies will be presented.

The challenging life of a Helmeted Guineafowl *Numida meleagris* at Rooipoort: laid to 'grave'

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The first challenge is to get laid. During droughts, hens may not nest. Chicks must hatch from the (for size) thickest bird egg on Earth. If the father fails to brood/feed chicks, the hen lets them die. Without care from parents, chicks/juveniles die from hypothermia or predation. Juveniles, especially males, must fight for a place in the flock. Males should establish relative dominance and court hens – who 'date' up to five 'boy friends' before having sex. Males lose fitness while guarding 'dates'/mates. Once eggs are laid, males abandon hens and rape unguarded ones. Hens lose fitness while incubating due to starvation/worm-parasitism. All suffer if arthropod food fails due to poor post-hatching rainfall. Floater troops may displace resident ones. Troops shot once only are helped, not harmed.

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

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Leopard (Panthera pardus) populations across Africa face several threats, including habitat fragmentation, persecution by humans and prey depletion. In order to implement successful conservation measures, it is crucial to know baseline population data, such as population size and density. In this study we determine the population size and density of Leopards on Debshan Ranch, Shangani, Zimbabwe, by carrying out an extensive camera trap survey.

Understanding of complex spatial-structuring of Arctic Grayling populations in the Northwest Territories, Canada

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In the Northwest Territories, Canada, development of De Beers' Gahcho Kué mine required dewatering of a headwater lake containing a population of Arctic Grayling (*Thymallus arcticus*). Adult fish reside in the lake but spawn in nearby streams, in which the year-0 fry will spend the summer. Adult Grayling were monitored via acoustic tagging, and year-0 Grayling via stream surveys. Adult Grayling showed altered habitat use, and declining spawning population size after dewatering. Year-0 Grayling also declined despite their natal streams maintaining suitable habitat characteristics. Understanding of complex spatial-structuring of Arctic Grayling populations in the developed area could guide future habitat compensation efforts.

Assessing fine-scale impacts of cattle versus wildlife grazing on small mammal assemblages along a fenced boundary of Telperion Nature Reserve

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Grazing by ungulates has direct and indirect impacts on small mammals. This study compared the effects of wildlife and cattle grazing on small mammal assemblages at Telperion Nature Reserve during the dry and wet seasons in 2016. Small mammals were captured on 15 paired grids established 50 m on either side of the boundary. A total of 187 individuals comprising 14 small mammal species were captured, with *Micaelamys namaquensis* being numerically dominant. Species richness and diversity did not differ between the two land uses, however abundance of small mammals did. Generalized Linear Models indicated a positive association between the abundance of small mammals and rock cover, and a negative association with grass cover. Grazing by wild and domestic ungulates has similar impacts on small mammal communities.

Debshan Frog Survey: Species richness, seasonal activity and habitat utilization, based on passive acoustic monitoring and visual encounter surveys

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Amphibians were the first vertebrate animals to colonize land some 350 million years ago but today the Amphibia globally comprise the most threatened vertebrate Class, with a third of known species regarded as threatened. They play a vital role in providing stable ecosystem services and frogs are regarded as some of the best environmental indicators. Based on a desktop study as many as 34 species of frogs may occur in the Debshan area. The objectives of the Debshan frog survey are to document frog diversity, determine frog chorus strength, document seasonal patterns in frog activity based on automated call recordings, and to get an indication of wetland health based on frog diversity.

The use of acoustic detectors for assessing bat species richness and functional activity

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Bats are a notoriously difficult group of mammals to survey. However, bats should not be neglected because they are important bio-indicators. We used acoustic detectors to sample bats within Mapungubwe National Park, South Africa during 2013. At least 11 species from six families were recorded, with clutter-edge and open-air foraging bats, dominating. Bat activity was higher in summer than winter due to higher prey availability and reduced thermoregulatory costs in summer. Our data compares favourably with historical records and we provide evidence of the presence of an undescribed species. We advocate the use of acoustic detectors for future bat surveys.

Seasonal dynamics in C_4 and C_3 plant consumption of ungulates in contrasting arid biomes

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We explored the feeding ecology of 18 ungulate species in two contrasting arid ecosystems in South Africa, i.e. arid savanna of the Kalahari, and arid dwarf shrublands of the Nama Karoo. Isotope analysis was used to determine relative proportions of C_3 and C_4 plant forms in the ungulates' diet on a seasonal basis. Provisional results indicate that the contribution of C_4 to the diets of species in Arid Savanna was generally higher than in Nama Karoo, in line with greater relative abundance of C_4 grasses in the former. During winter C_3 intake was higher in Nama Karoo than in Arid Savanna.

Debshan Ranch-A new nesting haven for White-backed Vultures

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The study aim is to understand the use of private ranches for breeding by southern African vultures, particularly the White-backed Vulture – the most abundant vulture in southern Africa. Measured parameters include preferred nesting niche and nesting productivity on the Debshan Ranch. Results over three years show that Debshan Ranch supports more than 20 nesting pairs of White-backed Vulture in successive breeding seasons, pointing to the importance of the ranch in the ecology of the species. Prior to 2014, vultures were not known to nest on the Ranch, though three species (Cape Griffon, White-backed and Lappet-faced Vultures) were commonly sighted there.

Divergent responses to fire in South African and North American grassland communities

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Functional responses of natural grasslands to disturbances influence grassland community structure, composition, biodiversity and supply of ecosystem services. Apparently divergent responses between hemispheres and continents prompted study of two long-term grassland experiments, one in North America and one in Southern Africa based on similar fire frequency treatments and using identical methodology. Nutrients were added to the fire treatments as a means of investigating response mechanisms. Despite inherent differences in species richness, with Southern African grasslands containing more species than North American grasslands, there was overall convergence in that both communities responded strongly to fire frequency and to nutrient addition

Biodiversity of invertebrates in ephemeral waterbodies across a disturbance gradient of inundation at Tswalu Kalahari Reserve

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Ephemeral pans are ubiquitous in arid landscapes of southern Africa. Unpredictable and infrequent rainfall has selected for a unique assemblage of invertebrates able to survive as desiccated propagules in the dry sediments of temporary waterbodies. The greatest threat to their survival is habitat destruction in the form of permanent inundation. This study aims to describe the diversity of invertebrates of temporary and permanent waterbodies using direct sampling and hatching studies. Results indicate a rich and highly mobile species assemblage in permanently inundated pans, while temporary waterbodies are less diverse but host a distinct assemblage of invertebrates adapted to ephemeral conditions.

Modelling and mapping of land protection and rehabilitation scenarios to support water security in the uMngeni

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South Africa is facing its worst drought in decades, and the question of whether the delivery of sufficient, high quality water can be sustained through investment in ecological infrastructure, i.e. through the securing or rehabilitation of natural vegetation and landforms, is highly pertinent. Priority areas for delivery of water-related ecosystem services were mapped and identified in the uMngeni catchment using recent high resolution land cover data and a daily-timestep hydrological model. The wider project aimed ultimately to inform decision makers as to whether such investment would be worthwhile, and where to invest in catchment rehabilitation or land protection.

The effects of differing land use on the home range and habitat use of three 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. We are investigating how land use change affects aspects of the ecology, especially spatial use and movements, of three mongoose species (water: *Atilax paludinosus*, large grey: *Herpestes ichneumon* and white-tailed: *Ichneumia albicauda*) with differing land use in the KZN Midlands using GPS collar transmitters. Thus far, we have determined the home range size and habitat preference of our study species.

Porcine zona pellucida immunocontraception of African elephant cows in South Africa

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In 1996 the first elephant cows were treated with the porcine zona pellucida (pZP) vaccine in the Kruger National Park. Following proof of concept, Makalali was the first game reserve to use pZP vaccine for population control of elephants. The program commenced in 2000 and is ongoing. It demonstrated that pZP was 100% effective when applied to individual cows, safe to use during pregnancy and had no effect on social behaviour of breeding herds. Over the year's additional reserves have joined the program and currently approximately 750 cows are being treated in 25 reserves. In 2015, 65 cows were treated on Venetia Limpopo Nature Reserve.

Microsatellite variation in a population-level study of the endangered Bearded Vulture *Gypaetus barbatus*

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Vultures provide ecological, economic, and cultural services. Despite this six of Africa's 11 vulture species are now threatened by extinction. The Bearded Vulture *Gypaetus barbatus* occurs at low frequencies across mountainous regions of Africa, Europe and Asia. This study will focus on the isolated population found in the Drakensberg. Previous work based on mitochondrial DNA found little differentiation between populations in Ethiopia and Southern Africa, as compared to Northern populations. This study uses 14 microsatellite markers to confirm the lack of genetic diversity in South African populations. The genetic diversity will be compared to that of other vulture species.

Geology and Hydrogeology of Tswalu Game Reserve

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The foundation and skeleton of the reserve is its geology. The surface geology is a contributing factor to the location of different types of soils and locations of pans. This in turn contributes to the distribution of flora and fauna. The bulk of Tswalu is covered by Kalahari sand and it is difficult to plot the underlying geology however where there is exposure (outcrop) the underlying geology can be mapped and the dips and strikes determined. The map presented is a preliminary drift map based on the field mapping done by the Council for Geosciences in the 1970's. The hydrogeology can be plotted as three interconnected aquifers. The first is the upper sand and weathered zone (to about 12m) which is recharged from immediate rainfall. The second is fractured and faulted horizons in the metasediments (quartzite) to about 230m. This is being used for domestic supply from boreholes. The third is a dolomite aquifer which requires further exploration.

Where have all the garnets gone? – Lena West paleoclimate

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De Beers has explored the Lena West region of Canada's NWT since 1975. Kimberlite indicator minerals (KIMs) are widely spread but their source appears to lie on the flank of the Melville Hills where oxide KIM numbers peak. Numbers of pyrope garnets drop sharply and those found show diagenetic alteration. There is evidence that tropical weathering destroyed pyrope and the weathering, on and adjacent to the unglaciated Melville Hills, was not removed by glaciation. The well-defined negative pyrope anomaly supports evidence of early Eocene warming and suggests that other weathering effects related to this warming could be preserved in kimberlite pipes that may be found in the Melville Hills.

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

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Genetta maculata on Telperion was tracked to describe their activity patterns, resting site and home range ecology. Genets were nocturnal with activity becoming less during winter due to food and temperature restrictions. Due to reproductive actions males were more active and had higher inter-resting site distances than females. Inter-resting site distances also increased during autumn due to food availability. The home range sizes and the number of different resting sites did not differ between sexes or seasons. Core areas were small due to consistent food availability and home ranges were located on denser bushveld vegetation rather than grassland.

POSTER ABSTRACTS

The influence of *Seriphium plumosum* encroachment on small mammals at Telperion, Mpumalanga, South Africa

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Seriphium plumosum encroachment is threatening the biodiversity of Mesic Highveld Grasslands, altering small mammal species habitat by changing food sources, nesting and predator evasion. This study looks at the seasonal effects of *S. plumosum* on small mammals at Telperion Nature Reserve. Initial findings suggest that high densities of *S. plumosum* negatively affects species diversity, compared to areas that are not infested. Of interest are ecotones with intermediate levels of infestation, where the diversity is highest. Species such as *Dendromus melanotis* utilize *S. plumosum* during the dry season, presumably for the cover it provides, while *Gerbilliscus leucogaster* avoid encroached areas.

Cryptic diversity of rodents in the Tswalu Kalahari Reserve

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The diversity of rodents is evident in the fact that they comprise the most speciose mammalian order and new species are being described every year. They have successfully inhabited all continents north of Antarctica and occupy a plethora of terrestrial habitats. Their short life histories and propensity for rapid eco-morphological adaptation in response to changing environmental conditions have resulted in significant morphological homoplasy and consequently much taxonomic confusion within the order. Here, using the mitochondrial marker cytochrome B and barcoding techniques we attempt to uncover cryptic diversity within rodents in the Tswalu Kalahari Reserve.

Modelling the impact of African elephant (*Loxodonta africana*) on woody vegetation in Venetia-Limpopo Nature Reserve using remote sensing techniques

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African elephants are ‘ecosystem engineers’ capable of changing habitats and ecosystem processes as consequence of their feeding habits. These activities lead to changes in vegetation structure (tree height and density) and composition. If elephant foraging activities are excessive due to high number of elephants, plants, animals and soil get affected, especially in small-protected areas. This study aims to quantify and model the impact of elephants on woody vegetation in Venetia Nature Reserve and to determine seasonal home range of elephants. These will be achieved by integrating field-based approaches and different Remote Sensing (RS) and Geographic Information System (GIS) data and techniques.

Photographic sampling of large herbivores at Telperion and Ezemvelo nature reserves

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Photographic sampling is a convenient method to collect spatially explicit information about wildlife populations. We surveyed plains zebra (*Equus quagga*), blue wildebeest (*Connochaetes taurinus*), red hartebeest (*Alcelaphus buselaphus*) and common eland (*Taurotragus oryx*) by driving a fixed route daily for 10 consecutive days. For all four species, photographic sampling provided information on spatial distribution and herd composition. For zebra and wildebeest, individually recognizable markings also provided a way to identify and keep track of individuals and to estimate abundance and demographic rates (e.g. survival and reproduction). We provide a summary of dry-season data collected for these four species.

Three years of camera trapping - spatial distribution of herbivores and carnivores at Tswalu Kalahari Reserve

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The understanding of interactions among herbivores and carnivores is important to assess ecological processes and structures in multi-species communities and camera traps are a useful tool to obtain such long-term data. At Tswalu Kalahari Reserve, we assessed the spatiotemporal distribution of mammals through camera trap images taken over a period of three years. Occupancy, species associations and coexistence will form a major part of the final analysis. Here, we are presenting a first summary of results highlighting spatial distributions of the most common herbivore and carnivore species.

A spatial genetic comparison of two endemic Southern African small mammals

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Various biotic and abiotic factors shape spatial genetic patterns. We compared the eastern rock sengi, *Elephantulus myurus*, to the western rock sengi, *Elephantulus rupestris* using microsatellites and mitochondrial DNA. Eastern rock and western rock sengis occur in similar habitats but they are separated geographically across South Africa. Our results for the eastern rock sengi show ancestral colonization along the escarpment, with a shared mitochondrial haplotype detected in geographically distant localities. We suspect a similar pattern in our western rock sengis due to the continuation of the escarpment through their range. The comparative phylogeography of the two species will be discussed.

Spatial and temporal variation in ungulate landscape use in relation to resources and constraints at Telperion and Ezemvelo Nature Reserves

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Telperion and Ezemvelo nature reserves host a rich variety of ungulates. Among them, plains zebra (*Equus quagga*) and blue and black wildebeest (*Connochaetes taurinus, C. gnou*) are increasing in number, while red hartebeest (*Alcelaphus buselaphus*) shows a decline, especially on the more heterogeneous eastern section of the reserves. To understand reasons for this trend, we aim to identify factors driving ungulate landscape use at landscape and feeding patch level, and to analyse how their relative importance is affected by season and landscape heterogeneity. Early findings suggest heterogeneous vegetation favour blue wildebeest and zebra; homogeneous vegetation favour hartebeest and black wildebeest.

The impact of selection and limited geneflow on genetic diversity: the impala (*Aepyceros melampus*) as a model

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The aim of this study is to investigate the impact of (a) limited migration and (b) selection on genetic diversity, using the common impala (*Aepyceros melampus*) as a model. A wild population will be used for baseline data. A population of impala that experience no immigration or emigration (closed population) on Telperion Nature Reserve and another population consisting of only black colored impala on Romaco Ranch will be the study populations. Summary statistics will be calculated for each of these populations using a suite of published microsatellite markers. The project's main objective is to provide important insights into the genetic diversity of closed populations of wildlife in South Africa.

Investigating sub-specific hybridisation across the southern range of common eland (*Tragelaphus oryx*)

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Common eland is an important antelope species in a variety of ecosystems. Two subspecies, namely Cape (*T. o. oryx*) and Livingstone's (*T. o. livingstonii*) eland, occur in southern Africa, with potentially overlapping ranges in northern South Africa/southern Zimbabwe. Hybridisation of these two subspecies could have detrimental fitness effects on hybrids. Furthermore, extra-limital breeding of Livingstone's eland in South Africa may threaten the Cape eland lineage. Through collection of genetic samples from five Oppenheimer and De Beers properties, private reserves and national parks, we aim to investigate the extent of natural and human-mediated hybridisation and potential management implications.

Effect of herbivory on above ground grass biomass on rangeland patches previously used as overnight cattle kraals (corrals) at Debshan Ranch, central Zimbabwe

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Debshan ranch in central Zimbabwe is using a system of short duration overnight cattle kraaling in natural rangelands to improve grass production. These sites are however attractive to grazers after use resulting in their heavy grazing. This study assessed the effect of herbivory on grass production in these sites. Herbivore exclosures were set up after kraal use and grass biomass and height inside and outside exclosures measured. Grass biomass and height were higher inside than outside exclosures, although the differences were not statistically significant. We conclude that herbivory reduces grass production in previously kraaled sites.

Nematode diversity of the Telperion Nature Reserve, South Africa

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The Nematology Unit of the ARC-PPRI Biosystematics Division founded the South African Plant-Parasitic Nematode Survey (SAPPNS) in 1987 to do a comprehensive assessment of the nematode biodiversity resources of South Africa. Various surveys have been undertaken in protected areas to record nematode biodiversity. The Telperion Nature Reserve, Mpumalanga is one of these areas. Various samples were collected over four consecutive seasons. Nematode diversity found during this survey was remarkable. A total of six nematode species were found from various grass seed samples. Thirty-six genera were found at water sites. Ninety-nine genera were found in the soil and root samples (27 plant-parasitic and 72 free-living nematodes).

Making the case for conservation of spiders

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In the growing South African economy, biodiversity is constantly in competition for attention and limited resources. Within and among conservationists, more charismatic animals are always prioritises and invertebrates are often neglected and not advocated for. The neglect is often attributed to the lack of knowledge for the group and the many unresolved taxonomic issues. Through the project The Red List of South African spiders, several consultation workshops were held to shed light on the very issues and the current knowledge is being packaged to help conservationist make the case for spiders. Lessons learned from previous similar projects e.g. Conservation Assessment of Butterflies, indicates that despite the continued strive for balance between conserving a species and subsistence projects envisioned to create jobs and alleviate poverty, the wellbeing of species is considered in decision making processes. For example, data and knowledge generated through the Conservation Assessment of Butterflies project, is used in making the case for the expansion of protected areas and in Strategic Environmental Assessments (SEA) for Strategic Infrastructure projects (SIPS). We therefore have a challenge and responsibility to upgrade the status or importance of spiders, identify areas and processes through which data and knowledge generated from The Red List of South African spiders will help advocate for the protection and/ or conservation of spiders.

Preliminary study on the health and parasites of tigerfish *Hydrocynus vittatus* (Actinopterygii: Alestidae) from Schroda dam, Limpopo Province, South Africa

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Tigerfish is a freshwater fish, family Alestidae. According to the IUCN red data list (2017), tigerfish populations are declining. As a pilot study during winter 2017 ten fish were collected from Schroda Dam (Mapungubwe National Park) and examined for parasites. Health Assessment Index was also measured. Parasites found were Monogenean parasites *Annulotrema* sp. (prevalence=80%) on gills and the digenean *Diplostomum* sp. (prevalence=10%) from eyes. Water quality was good but high conductivity was recorded. For better understanding of this fish health and ecology of parasites, additional samples are needed in different seasons. This may assist with future management of this fish.

Population demographics of herbivores on Tswalu Kalahari Reserve

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This project investigates the role of size-specific predation in regulating large mammal herbivore (LMH) populations. We present preliminary data on changes in demographic structure of LMH populations exposed to varying levels of predation. Amongst the most preyed-upon LMH species in Tswalu Kalahari Reserve, populations in the Lekgaba area (containing free-ranging lion) comprise lower proportions of sub-adults and juveniles compared to the Korannaberg area (where cheetah and, previously, wild dog are active). Populations of these species on Rooipoort (large mammal carnivores absent) comprise the highest proportion of younger age classes. Results suggest predator pressure is unevenly distributed across herbivore demographic groups.

Contraception of wildlife and domestic populations

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The Veterinary Population Management Laboratory, Onderstepoort investigates non-lethal, research-based methodologies to improve veterinary management of domestic and wildlife populations. Ongoing research includes: a census of elephant cows undergoing porcine zona pellucida (pZP) immunocontraception in South Africa, investigation of contraceptive efficacy of novel immunocontraceptive vaccine protocols in equids, evaluation of alternative adjuvants for immunocontraceptive vaccination, the development of a recombinant zona pellucida vaccine and the measurement of Anti-Müllerian Hormone concentrations as an indicator of follicular reserves in African elephant cows subsequent to treatment with pZP vaccine.

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 generlist species (*Saccostomus campestris*) and a rock-dwelling species (*Elephantulus myurus*) in order to determine the affect of habitat specificity. These patterns will be compared to an invaisve 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.

Genetic diversity and interspecies hybridization in *Cossypha* robin-chats

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Southern Africa boasts a wide diversity of avian species with five *Cossypha* species distributed at varying levels of sympatry and allopatry. Due to the effects of climate change and land use patterns, species which were once ecologically segregated may now overlap leading to possible genetic introgression and hybridization. This study investigates the genetic diversity and relatedness between the five *Cossypha* species. Mitochondrial and nuclear markers were analyzed using Bayesian and Likelihood methods to determine speciation patterns and phylogenetic relationships of these species. The data suggest that the five species have recently speciated. Despite the hybridization events recorded between *C. dichroa* and *C. natalensis* these two species do not appear to be each other's closest relatives. The hybridization events indicate their ability to overcome reproductive isolation mechanisms such as vocalisations.

The taxonomic status of Terpsiphone viridis granti and Terpsiphone viridis plumbeiceps

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African Paradise-Flycatcher Terpsiphone viridis, an intra-African migrant in eastern South Africa, was recognised as two separate subspecies, T. v. plumbeiceps and T. v. granti, until the 1950s. We investigated the taxonomic status of these two units using mitochondrial (cytb, COI, ND2) and nuclear (G3PDH) sequence data, and stable isotope analysis (δ2H, δ13C, δ15N) of feathers from birds (n=18) sampled across the South African range. The findings of this study present an understanding of the taxonomic status of these two taxa, and their likely broad-scale origins during their over-wintering period further north.

The effect of land use change on the phylogenetic diversity of bird communities in Phalaborwa, Kruger National Park

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The conversion of natural habitats to agricultural and urban land has the potential to change the phylogenetic structure and diversity of communities. Using a dataset of 106 bird species collected over two years, this study compares bird communities inside Kruger National Park and outside in three areas of different anthropogenic land use. It aims to assess which lineages are more vulnerable to land use change, the effect of land use change on evolutionarily distinct species and the consequent changes to the phylogenetic structure and diversity of communities. Such studies are important as changes in phylogenetic diversity have been shown to affect ecosystem functioning and stability.

Investigating the unique defecation behaviour of African Pygmy Falcons

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African Pygmy Falcons (*Polihierax semitorquatus*) occupy Sociable Weaver (*Philetairus socius*) colonies in southern Africa. Chambers occupied by falcons are easily identified by the conspicuous faecal mat at the entrance. It is not known whether this serves a purpose. Here we investigated two possibilities for why the falcons exhibit this behaviour: (1) an antimicrobial function, and (2) a thermoregulatory function. Additionally, weaver responses to faecal markings was experimentally tested. Results suggest that the faecal mat does not provide antimicrobial resistance nor does it appear to provide thermal buffering in autumn or winter months. Weavers did not respond to manipulated chambers.

Is beekeeping in South Africa viable?

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Beekeeping is an ancient agricultural enterprise that provides the essential environmental service of pollination of dozens of our food crops, as well as providing a source of income for the beekeeper in the form of pollination services, honey and other hive products. Although beekeeping is a popular agricultural activity, it is becoming increasingly difficult for beekeepers to profitably keep bees in South Africa. The input costs of commercial beekeeping have increased dramatically, while the income generated from honey sales (the main income generator for most) have not increased proportionally. Beekeepers have problems securing access to land for their hives on farms that do not belong to them and there are massive losses of hives through veld fires, wanton vandalism and the theft of entire apiary sites. Other factors that influence the viability of beekeeping is the loss of sites for beekeeping due to land use changes and loss of forage sites, while the high use of agricultural pesticides and other environmental stresses on the bees is putting the entire future of our bees at risk. The poster will discuss the constraints influencing the continued viability of beekeeping in South Africa.

Fungal diversity in soil and grass on the Telperion Nature Reserve

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A survey of the fungal diversity in soil and grass samples; were conducted in four geographical different sites in the Telperion Nature Reserve. Isolates were identified based on DNA barcodes for, two different gene regions, namely the internal transcribed spacer and translation elongation factor-α regions. The fungal genera identified based on nBLAST analyses to date includes, eleven *Fusarium* species and species belonging to another fourteen genera including, *Trichoderma, Penicillium, Cladosporium, Alternaria, Aspergillus and Neocosmospora.* The survey showed that the isolates obtained from soil and grasses in the Telperion Nature Reserve represent several fungal species and novel lineages.

The genetic structure and phylogeography of trapdoor spiders, *Stasimopus* Simon, 1892 (Araneae: Mygalomorphae: Ctenizidae)

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The genetic structure and phylogeography of trapdoor spiders, *Stasimopus* Simon, 1892 (Araneae: Mygalomorphae: Ctenizidae) in the Karoo is currently unresolved. This research performs a preliminary assessment of the molecular phylogenetic relationships between *Stasimopus* populations within the Karoo BioGaps region. The phylogeny is used to analyse the distribution patterns of the genus in relation to the topography of the region - assisting in the identification of historical drivers of population structure. This information serves as a genetic biodiversity index for the *Stasimopus* of the Karoo and feeds into the Karoo BioGaps project being run by SANBI.

Anoplolepis steingroeveri (Forel 1894), a new associated ant species record for myrmecophilous butterflies in Africa, new host-plant records for *Crudaria* (Wallengren 1875) (Lycaenidae: Aphnaeinae) including a geoxylic suffrutex at sand ramp

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Small Pugnacious Ant, *Anoplolepis steingroeveri* is the associated ant species of a unique *Crudaria* butterfly population that occurs at elevated sands against a rocky hill at Tswalu Kalahari Reserve. For the first time *Anoplolepis steingroeveri* is recorded as associated ant species of a myrmecophilous ("ant loving") butterfly species in Africa. Two more host-plant species records for butterfly genus *Crudaria* (Greys) are added, the geoxylic suffrutex *Elephantorrhiza elephantina* (Eland's Bean) for unique *Crudaria* population and tree *Vachellia hebeclada* (Candlepod Thorn) for "normal" *Crudaria leroma* at plains north of Dedeben. These results indicate that microhabitat diversity for butterflies in the southern Kalahari is underestimated.

Some amazing termite feeding spiders (Araneae: Ammoxenidae)

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Most spiders are generalist, feeding on a variety of prey. Members of the endemic southern African genus *Ammoxenus*, are unique as they prey only on termites. *Ammoxenus* species are free-running, ground living spiders, commonly found in areas infested with harvester termites. They are active on the soil surface only during periods when harvester termites are foraging. They have the ability to dive head first into the sand. They prey only on termites. Six *Ammoxenus* species are known from southern Africa and three have been recorded from five De Beers reserves: Tswalu, Benfontein, Rooipoort, Venetian and Ezemvelo.

Understanding the monotypic rinkhals, *Hemachatus haemachatus* (Elapidae)

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The rinkhals, *Hemachatus haemachatus*, is a monotypic species of Elapid snake that is endemic to southern Africa. This species varies greatly in size and colouration across its distributional range. It is thought to possess predominantly cytotoxic venom, but suspicions have been raised that some populations possess more neurotoxic venom compared to others. As rinkhals occur across different ecotypes, we aim to determine whether there are distinct genetic differences between the populations from different provinces. This project will provide baseline knowledge necessary for future venom studies relating to possible differences in venom composition across the different populations.

The Times They Are A-Changin' - on Shangani Ranch not so much

Fay Robertson

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Vegetation monitoring sites on Shangani Ranch were established during 2013 and reassessed annually. During 2017, both herbaceous cover and grass length were, on average, unchanged since 2013, although last season's rainfall was 56% above the long-term mean. Ecological condition was unchanged or had improved slightly in most vegetation types, but it deteriorated in *Terminalia* bushland on sands. The greatest changes since 2013 were an increase in the abundance of bushes in *Combretum* wooded grassland, in riverine and on a vlei site. In *Julbernardia* woodland, some trees had been pushed over by elephant. But the ranch's grass layer had changed little.

Carbon Storage Potential of Kimberlite 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 emissions) through the formation of carbonate alteration minerals in mine tailings. These carbonates occur naturally and store carbon captured from the atmosphere in a 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 presentation will discuss mineral carbonation research at mine sites globally, with emphasis on recent research at the De Beers mines Venetia and Gahcho Kué.

A metagenomic approach for assessing the diet of ant-eating mammals

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Recent progress in sequencing technologies has made molecular barcoding approaches more affordable. Metabarcoding techniques based on a short PCR-amplified barcode fragment are increasingly used for diet assessment in diverse taxa. We present a metagenomic approach based on low coverage genome shotgun sequencing approach to characterize the diet of aardvark (*Orycteropus afer*), ground pangolin (*Smutsia temminckii*), and aardwolf (*Proteles cristatus*). First, we reconstructed complete mitochondrial genomes of ants and termites collected at Tswalu Kalahari and Tussen Die Riviere Nature Reserves. Second, we used these mitogenomes as a reference database to map shotgun reads obtained from field-collected fecal samples of the three ant-eating mammal species. Preliminary data show that this approach has the potential to provide a fine-scale characterization of the diet of these elusive mammals.

Assessing the Response of Mesopredators to Different Apex Predator Regimes in the Tswalu Kalahari Reserve

Roxanne Collins

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Decline in apex predator populations have cascading effects on community dynamics. This manifests as changes in community composition and population dynamics. One such effect is mesopredator release - the loss of an apex predator or an alteration of the top predator guild is thought to cause a boom of mesopredator populations, and consequent changes in structure and density of mesopredators' prey populations. Tswalu Kalahari reserve provides a unique opportunity to test this in the South African context as it is comprised of two separate areas within broadly similar habitats, Lekgaba where lions remain as apex predators and Korannaberg that contains wild dog and cheetah as top level predators. We used camera trapping techniques to assess mesopredator populations, mark-recapture techniques to determine small mammal populations, and bird count transects to assess game bird populations.

Surviving in a harsh environment: bats, water & baobabs in the semi-arid Limpopo Valley

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Work is being carried out at Venetia and Mapungubwe to understand the importance of nature and artificial, temporary and perennial water sources as well as baobab trees, for bat communities in the semi-arid Limpopo Valley. Acoustic data for insectivorous bat activity at Venetia in the dry and wet seasons revealed the critical importance of both natural pans and man-made reservoirs. Baobabs are important to bats both as potential roosts as well as suppliers of nectar. In East and West Africa, fruit bats are known to pollinate Baobabs but no data are yet available for southern Africa. A "Baobab Blitz" citizen science project carried out in November 2016 monitored 18 flowering Baobab trees in Limpopo between dusk at 12:00. Insects and bushbabies but no fruit bats were observed to visit flowers. However several flower visitations were observed by Epomophorus fruit bats at a Baobab tree at Chilo Lodge on the northern border of Gonarezhoe Reserve in Zimbabwe.

Now you see me, now you don't: using camera trap data to model densities of riparian zone predators

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Data from camera traps are increasingly used to estimate densities and record behaviours of animals that are difficult to observe directly. Here I report on trials completed on 42 camera traps which quantified the influence of camera height, distance from the camera, animal speed and ambient temperature on camera detection probabilities. By applying random encounter models to simulated datasets I illustrate the need for accurate detection probability estimates for estimating animal abundance. I also report preliminary density estimates for three riparian zone predators (African clawless otters, marsh mongoose and Nile monitor lizards) recorded at Telperion Nature Reserve.

The Effect of Light Pollution on the Foraging Behaviour of Rodents

Simone Ackermann, Nigel Bennett and Maria Oosthuizen

Department of Zoology and Entomology,

Light pollution has far reaching effects on physiology and ecology of organisms. In this pilot study, we aimed to obtain an initial impression of whether artificial light at night affects the foraging behaviour of nocturnal rodents, and whether the type of light has an influence. Three types of commonly used suburban street lights were used to illuminate a naturally dark area during the night, rendering some unexpected results. Data suggest that rodents prefer to forage under higher wavelengths and broader spectra of light while avoiding lower wavelength, narrow spectrum light. General observations suggest that short term and long-term effects of light may be different.

Habitat fragmentation and the impacts on mammal occupancy and abundance

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Knowledge of the effect of habitat fragmentation on mammal occupancy and abundance is crucial for species conservation. We estimated occupancy of forest mammals in response to habitat fragmentation in eThekwini Municipality. Occupancy estimates for cape porcupine (*Hystrix africaeaustralis*), blue duiker (*Philantomba monticola*), bushbuck (*Tragelaphus sylvaticus*) and bushpig (*Potamochoerus larvatus*) increased with the amount of forest coverage and declined with urban development. On the other hand, occupancy estimates for large-spotted genet (*Genetta tigrina*) and vervet monkey (*Chlorocebus pygerythrus*) were unaffected by the level of development. Feasible management implications for conserving diverse mammalian assemblages in forest-urban mosaics are highlighted

The influence of seasonality and commensurate physiological responses by Chacma baboon (*Papio hamadryas ursinus*) to Daily Travel Distance and Home Range Size at Telperion Nature Reserve, Mpumalanga, South Africa

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Seasonality affects habitat utilization by Baboons and associated, measurable fluctuations in stress levels. For this study, we collected co-ordinates of a baboon troop's seasonal movement patterns. Fecal material was collected on an *ad libitum* basis and samples were assayed for Cortisol. Seasonal Daily Travel Distances (DTD), Home Range Sizes (HRS) and Cortisol levels were significantly different. DTD and HRS were positively correlated. There was a weak significant negative correlation between Cortisol and season. Wet season Cortisol levels were elevated, attributed to the close spatial proximity of troop members when resources are clumped and visibility is restricted in the dense microhabitats they frequent.

Predation risk: Does spatial scale matter?

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Current findings from Telperion suggest increased biomass of dominant species like wildebeest and zebra promotes intra-guild competition through a habitat modification mechanism, outcompeting species, in particular tall grass feeders, from achieving similar densities. Correspondingly, top-down processes seemingly often regulate these same species. We demonstrate contrasting performances between numerically dominant species and numerically rarer species when exposed to apex predators. For comparative purposes, we compare sites devoid of large predators and those containing large predators. Our results suggest anti-predator strategies of species like hartebeest and eland are less efficient than those of primary prey like wildebeest and zebra.

Investigating geographic traceability as a conservation tool against the scaly trade in pangolins

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The international wildlife trade is a growing, multinational business worth ~316 billion US$/year. Whilst regulation of trade has in some instances ensured species survival and recovery, it fails when the benefits of illegal trade outweigh consequences. Complementary approaches such as wildlife forensics, not only assist with ensuring compliance, but can have direct conservation benefits if sufficiently high levels of resolution are achieved to allow for rapid identification of poaching hot-spots. Using molecular and stable isotope approaches, this study aims to obtain enhanced levels of geographic traceability for Temminck's Ground Pangolins across SADC countries to reduce trade of this threatened species.

Carnivore stable carbon isotope niches reflect predator-prey size relationships in African savannas

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Predator-prey size relationships are important drivers underlying the structure and function of ecological communities. We proposed that stable carbon isotope analysis can be used to reconstruct predator-prey size relationships in mammalian savanna systems. In these systems, ^{13}C-enriched prey are limited primarily to large body size classes, a trend that should result in positive δ^{13}C-body mass relationships amongst carnivores, if prey and predator body sizes are correlated. Analysis of extant and Plio-Pleistocene assemblages support our hypothesis. Our study presents a new approach to understanding predator-prey size relationships and for tracing how various behavioural, ecological and environmental factors influence prey size selection.

Using macro-invertebrate community assemblages to determine water quality within drought conditions

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The Nyl & Mogalakwena rivers are under pressure from increased urbanisation, industrial development, mining and agriculture. Results from low flow sampling showed that the Modimolle STW is severely affecting the water quality, nutrient loads and the macroinvertebrate taxa present within these systems. Fifteen families were present at STW, while JASP, 8km downstream, had 28 families present. Water nutrient data at JASP was worse than that of STW, perhaps due to a lower pH. Macroinvertebrate families at each of the site correlate with that of water nutrient data, identifying STW as having significant impacts on water quality and other downstream sites.

The Importance of the Wilge River in Maintaining Water Quality and Aquatic Ecosystem Health in the Olifants River.

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The Klipspruit River is heavily impacted by acid mine drainage and causes significant increases in salinity and dissolved metal concentrations in the Olifants River, coupled with a clear deterioration in macroinvertebrate diversity. The Wilge River provides an important regulating ecosystem service and significantly improves water quality and macroinvertebrate diversity further downstream in the Olifants River. Challenges facing the Wilge catchment and the ecosystem services it provides are discussed considering recent fish kills observed in the Bronkhorstspruit River, an important tributary of the Wilge River.

Conserving Kyalami's African Grass-Owls

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The African Grass-Owl *Tyto capensis* is a habitat specialist that is listed as 'vulnerable' in South Africa. Urbanisation has resulted in the degradation of the habitats that these birds depend on. The Greater Kyalami Conservancy and the Endangered Wildlife Trust are currently monitoring the grass-owl populations in Kyalami, Johannesburg. The aim of this research is determine the success of this species in an urban landscape. The objectives are to identify nesting sites; to assess population changes; to monitor movement and dispersal patterns; and to implement conservation measures. How long will these owls be able to survive in an ever-changing environment?

Can key extinction risk factors be identified in the order gruiformes?

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Determining extinction risk of a species enables conservationists and wildlife professionals to prioritise conservation goals for *in situ* as well as *ex situ* populations. We focussed our analysis on the Order Gruiformes specifically Gruidae and Rallidae to identify trends in extrinsic and intrinsic factors affecting their extinction risk. Global databases were used to collate information on perceived and current threats, risks, stressors, biological factors, world economic incomes, habitats utilised, region of range and endemism, all of which have been identified as contributing to extinction risk to *in situ* populations of the various threatened Gruidae and Rallidae. We then used multivariate analysis to identify the key factors affecting extinction risk for the respective species. In addition, we made a comparison of the 52 species of Gruidae and Rallidae kept in captivity using the same technique and assessed the sustainability of the captive populations with emphasis on the species classed as Vulnerable, Endangered and Critically Endangered.

Mechanosensory structures in the beaks of waders (Family: Threskiornithidae) in relation to their foraging ecology

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Many probe-foraging bird species, possess a unique sensory system known as remote-touch. This refers to their ability to sense and locate submerged prey objects by detecting vibrations in the substrate. This is facilitated by the bill-tip organ, which is made up of receptors embedded in pits in the bone at the tip of the bill. Though the general structure of the bill-tip organ is conserved across all that possess it, there is a lot of interspecific variation in its structure. We hypothesize that there is a relationship between the morphology and histology of the bill-tip organ and the foraging ecology of ibises. To test the hypothesis, three ibis species are being studied: hadeda, sacred, and glossy. These each have distinctive feeding habits in different substrate environments ranging from terrestrial to aquatic. We expect to find differences between the three species, in accordance with the preliminary work suggesting an increase in the extent of pitting over the length of the beak with increased aquatic habitat use. If a pattern is found, the results could potentially be used to make inferences about the feeding ecology of extinct bird species.

An investigation into the effects of forest fragmentation via measures of patch size and isolation on the taxonomic and functional diversity of forest bird community

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The increase in human population in urban areas has put direct pressure on the natural environments as these areas are rapidly converted for human activities. Our main aim was to investigate the effects of forest fragmentation via measures of patch size and isolation on the taxonomic and functional diversity of forest bird community in five Protected Areas within an urban mosaic. We conducted a total of 137 fixed radius point counts. Species richness and functional diversity of birds in patches of different sizes and different levels of urban development in the landscape were then compared.

An economic and behavioural study of Oakhurst end-scrapers at Bushman Rock Shelter (Limpopo South Africa): insights from use-wear analysis

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This project aims to apply a use-wear methodology to better understand the economic and behavioural aspects of Bushman Rock Shelter (BRS) by analysing the Oakhurst end-scrapers. Through the creation of a comparative experimental collection used to work similar raw materials as was used at BRS in the past, such as wood and hide, it will be possible to positively identify what the archaeological end-scrapers were used to work. This identification will be made possible with the use of macro and microscopic analysis of the tools. This project also aims to expand the field of use-wear analysis in South Africa as very little work has been done in this regard so far.

The effect of pesticides on the lethal limit of honeybee

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The growing population together with changing climatic conditions add more pressure on farmers to produce more successful agricultural yields. Ensuring more successful agricultural yields normally goes hand in hand with an increased use of pesticides. These pesticides pose a great threat to pollinators, like honeybees, which in turn jeopardizes food production, hence food security. The World Economic Forum listed food security as the biggest global challenge in 2016. This study looks at the combined effect of pesticides and temperature on honeybees, and will broaden our understanding of the key pollinator which is vital in preventing a global food crisis.

Soil science research needs in Southern African protected areas

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Soil research should form an integral part in any conservation efforts in wildlife-protected areas. Research has shown that large areas in protected areas are affected by severe soil erosion, soil crusting and sub-soil compaction (Nortjé, 2014). Some causes have been proven and partially addressed. However, little is known and/or applied concerning rehabilitation and prevention. My hypothesis is that when the soil is degraded, the vegetation dies. This leads to no herbivores, no predators and eventually no tourists. This degradation cannot be alleviated naturally due to a lack of soil resilience of a large part of Southern African soils.

The Gauteng grassland biome, a treasure house of Fusarium species

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Fungi play a pivotal role in soil health by decomposing the above and belowground litter. However, the distribution of soil fungi in ecosystems with no anthropogenic activity is poorly documented. In South Africa, the grassland biome is among the world's most endangered biomes, with only about 2% protected in nature reserves. Furthermore, grassland biome research focuses on macrobiota, eschewing information on biodiversity, in a primary niche. This study aims to determine the diversity of fungi in grassland soils, with special reference to the genus *Fusarium*. Current results demonstrate that the Gauteng grassland biome houses a diverse range of *Fusarium* species complexes, including plant pathogenic groups.

Investigation and identification of microbial diversity that play a role in discrimination between *Burkea* soils and non-*Burkea* soils and the effects they have on the growth of *Burkea africana* trees

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Burkea africana proved to be difficult to propagate outside its natural environment due to internal regulation mechanisms. No information is available to grow *B. africana* to maturity and it had been proposed that the soil microflora plays an important role. No information is however available on the microbial composition or communities in the soil where it grows effectively (*Burkea* soils) and how it differs from soils where they do not grow (non-*Burkea* soils). In this work, we analyzed microbial biodiversity of the *Burke*a soils versus the non-*Burkea* soils ecosystem to determine its relatedness and differences, and determine whether the microbial diversity influences the growth of *B. africana* trees. High throughput sequence (BLAST) was used to analyze the soil microbial diversity (bacterial and fungal) and composition found in both soils, using 16S rRNA gene sequencing for a comprehensive understanding of the soil DNA. The results revealed that, the main differences were the presence of *Chloroflexi* bacterial phylum, as well as the *Ascomycota* fungal phylum, which was found in the non-*Burkea* soils and *Burkea* soils. *Tracheophyta* was identified as the dominant fungal phylum in *Burkea* soils. The difference in fungal and bacterial composition of the soils suggests that *Tracheophyta* has a role as an endophyte for propagation and development of *Burkea africana* trees. The effect of the soil microbial diversity on the soil composition and the effect on survival of the trees are discussed in this paper.

Updated vegetation map and assessment for Tswalu Kalahari Reserve

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Surveys were conducted in late summer 2017 to compile a vegetation map for the entire Tswalu Desert Reserve. At the same time surveys were conducted to determine the veld condition. Twelve plant communities were distinguished ranging from drainage lines, pans, plains, dune valleys, dune crests to mountainous communities. The results are compared to a previous map and veld condition assessment done in 1999.

Last chance to see? The race to save the spectacular Albertina Sisulu Orchid, *Brachycorythis conica* subsp. *transvaalensis*, a critically endangered South African terrestrial orchid

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Brachycorythis conica subsp. *transvaalensis* was first described in 1918, but had not been seen in Gauteng in over 50-years, before the rediscovery of a large population in 2007, now known to number more than 100 individuals. Alarmingly, the land has been approved for development in a decision upheld by provincial officials. This decision is currently being challenged in the high court as it allegedly contravenes environmental regulations. Subsequent searches at all historical sites has found an additional three small populations of 8, 10, and 4 individuals. Based on these and other surveys, the IUCN status of this subspecies was recently (2015) revised from endangered to critically endangered. The plight of this orchid has been popularized by introducing a “common” name and widespread use of social and traditional media.

Analysing breakthrough innovations used to leverage results of integrating holistic management on Debshan Ranch

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Agricultural enterprises and specifically cattle production businesses are located in most of the land not densely inhabited by humans, and therefore share the same space with other species of flora and fauna. ‘Both productivity and stability are important in any grassland system, and indeed in any agricultural system. Tainton N. M (Veld Management in South Africa), University of Natal press, 1999. Breakthrough innovations used through integrating holistic management into Debshan’s operations is analysed on this large scale, cattle and wildlife ranch. The interaction of the social, economic and ecological factors will be determined to show how applying incremental but continuous innovation can build leverage for the entity in the face of an ever changing landscape.

Using citizen science to survey roadkill at wide spatio-temporal scales: the example of South Africa

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The work of the Endangered Wildlife Trust (EWT) has improved our understanding of the impacts of road infrastructure on wildlife in South Africa. Repeated road surveys conducted by trained personnel are the ideal way to monitor the impacts of roadkill on wildlife populations but are impractical to conduct over large areas. However, the development of public participation for data collection (often dubbed “citizen science”) has facilitated monitoring at broad spatial and temporal scales, far beyond the limit of traditional field studies. In January 2014, we launched a national public awareness campaign to report roadkill sightings through various social media platforms and a smartphone app. To date, we have collected almost 16,000 roadkill data points, with the assistance of over 150 volunteers from across the country. From these data, we can identify problem species and sites, and develop and implement targeted measures to reduce roadkill.

Integrated Pest Management - A Sustainable Future for Global Agriculture

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Integrated pest management (IPM) is a system of pest and disease management in agriculture that incorporates preventative measures, cultural, biological and chemical controls. IPM promotes lower use of pesticides and increasing use of biologicals. Aims of IPM are economic viability, social acceptability and minimal risk to human health and environment. Dudutech contributes to long term sustainability by producing quality biological products. Over several decades’ ticks on cattle have mainly been controlled using synthetic chemicals. At Shangani Ranch a more holistic approach is being pursued with a biological tick trial in progress.

Effect of mobile kraaling on wildlife distribution and patch utilization at Debshan Ranch, Zimbabwe. Implication for holistic grazing

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Use of kraals at Debshan Ranch has been practised since late 2012 and this has had an attractive effect on herbivorous wildlife species. Cameras were setup in twelve abandoned kraals and controls during the wet and dry seasons. Kraaling had no significant impact on species diversity during the wet season but significantly affected species diversity in dry season. In addition, kraaling showed an impact on species temporal use and interaction during the dry season as compared to the wet season. Holistic grazing and mobile kraals can be a tool in improving wildlife species diversity and temporal habitat use of herbivores.