



Presentation Abstracts

(follows the same sequence as in the programme)

INVITED THEME PRESENTATION

The state of global research on biodiversity in human-modified landscapes and a case study on herpetofauna over a land-use gradient in coastal forest

Morgan J. Trimble¹ & Rudi J. Van Aarde¹

¹*Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Pretoria, South Africa*

Presenter: Morgan Trimble, Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Private Bag X20, Hatfield 0028
(012) 420 4522 / (072) 631 2828; morgantrimble@gmail.com

Studying biodiversity in human-modified landscapes can support sensible land-use management. Yet, research should cover relevant regions, and biases in study topics should not lead to gaps in the evidence base. Based on a review of the literature, this is not currently the case. There is clear geographical bias among biomes and geopolitical regions and taxonomic bias among species groups. Furthermore, distribution of published papers does not generally reflect threats of low protected area coverage, high land conversion, and high human population density. For example, forests are the subject of 87% of papers, and 75% focus on the Americas and Europe, while Africa and Asia are critically understudied. Understudied regions and species groups deserve further research to elucidate what, where, and how biodiversity persists alongside humans to enhance conservation efficacy.

We discuss an illustrative case study investigating herpetofauna, a little studied group, over a land-use gradient (forest, degraded forest, acacia woodland, eucalyptus plantation, and sugar cane cultivation) in South Africa's coastal forest, a biodiversity hotspot of high endemism and richness. We compared standard community metrics, and functional responses along the gradient. While the responses of richness, abundance and diversity were idiosyncratic, functional group richness decreased monotonically along the gradient, a pattern driven by sensitivity of fossorial frogs and reptiles and vegetation-dwelling frogs.

Our results highlight the importance of conserving forest and preventing degradation. Restoration, which allows acacia woodland development, and plantations have conservation value, while cultivation is the least amenable to the forest herpetofaunal community.

Birds and wind energy: challenges, conflict and opportunities in southern Africa

S. Ralston¹ & Hanneline A. Smit-Robinson¹

¹*BirdLife South Africa, Randburg, South Africa*

Presenter: Hanneline Smit-Robinson, BirdLife South Africa, P.O. Box 515, Randburg 2125
(011) 789 1122 / (082) 453 4714; conservation@birdlife.org.za

Poorly located wind energy facilities can have significant negative impacts on birds. These include disturbance, loss of habitat and mortality through collisions with the turbine blades. BirdLife South Africa supports the responsible development of the renewable energy industry in South Africa and is therefore proactively working to help minimise the impacts of renewable energy on birds. We have developed a number of resources, including Best Practice Guidelines for Avian Monitoring at Proposed Wind Energy Sites, and an Avian Wind Farm Sensitivity Map (both were developed in partnership with the Endangered Wildlife Trust).

Construction of the first projects approved in the Renewable Energy Independent Power Producer Programme in South Africa is set to commence in 2013. This provides us with the opportunity to learn from these pioneering South African projects and will allow us to address the inevitable future challenges and conflicts that may arise. Until now we have been drawing from experiences elsewhere in the world, including the United States, Europe and the United Kingdom. One such example is the high collision rates with turbines that have been observed in Griffon Vultures in southern Spain.

Wind farms are also proposed for the Lesotho Highlands, critical habitat for already-declining populations of Bearded Vulture (*Gypaetus barbetus*) and Cape Vulture (*Gyps coprotheres*). International conservationists are concerned that the proposed wind farms in the Lesotho Highlands could destabilize the populations and lead to the local extinction of these species. Careful planning will be required to ensure that wind energy in Lesotho is developed in places where the threat to these birds can be minimized.

Fragmentation induces idiosyncrasies in forest millipede assemblages

Robert A.R. Guldemond¹ & Rudi J. Van Aarde¹

¹*Conservation Ecology Research Unit, Department of Zoology & Entomology,
University of Pretoria, South Africa*

Presenter: Robert Guldemond, Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Private Bag X20, Hatfield 0028
(012) 420 3231 / (083) 770 9694; rguldemond@zoology.up.ac.za

Traditional conservation measures induce isolation, as does the degeneration of landscape matrices that surround protected areas. Such isolation distorts regional processes, which under natural conditions and in concert with local processes would dictate the composition, structure and function of local communities. Reduced connectedness inhibits dispersal and hence should reduce alpha diversity and increase beta-diversity. Imbalances in regional and local processes would then drive differences in the species composition, richness, evenness and rank-abundance of local communities. Isolated old growth forest patches along the north-eastern coastline of KwaZulu-Natal shared millipede species, but millipede

assemblages were structurally dissimilar. Differences in the steepness of rank-abundance slopes resulted from species-specific differences in absolute abundances, possibly due to the overriding effects of local conditions, and/or crowding driven by the impairment of dispersal in response to degenerated habitat conditions in matrices that surrounded these patches. Structural variables for protected and unprotected old growth forest fragments were similar, but differed from those of regenerating and degenerating fragments.

We conclude that fragmentation and the resulting isolation impairs regional processes, increases beta-diversity and detracts from community stability, which could reduce ecological integrity. Restoring functional linkages between isolated habitat patches may provide for both regional and local ecological processes to stabilize communities and hence benefit conservation in integrated landscapes.

A balancing act: Cheetah conservation objectives and reserve management expectations

Vincent C. van der Merwe¹ & Kelly Marnewick¹

¹*Endangered Wildlife Trust, Carnivore Conservation Programme, Modderfontein, Johannesburg*

Presenter: Vincent van der Merwe, Endangered Wildlife Trust, Carnivore Conservation Programme,
Private Bag X11, Modderfontein, Johannesburg 1645
(074) 166 0410; vincentv@ewt.org.za

Cheetah *Acinonyx jubatus* reintroductions into South African reserves began in 1965 by sourcing 'problem' cheetahs from commercial farmland in South Africa and Namibia. A total of 495 cheetahs have been introduced into 48 small fenced reserves to establish a current population of 264 animals which is declining at a rate of 5.7% per annum. This decline is largely due to: the movement of predator-naïve cheetahs to reserves with high predator densities (44.8% of mortalities); the sale of cheetahs from reserves to captive centres (30% of cheetahs moved off reserves); and a lack of breeding due single sex introductions (42% of reserves) or contraception (6% of reserves).

These management interventions are used to meet reserve-scale objectives which are generally driven by financial objectives. A cheetah typically consumes R130 000 worth of prey species per annum and many reserves need to either limit or recover the costs of predation. While this makes sense at the reserve level, at a national level it is possible that the cheetah population in fenced reserves may not be sustainable without supplementation. Supplementation from the free-roaming population is no longer viable and the challenge now is to balance reserve level management objectives with national level conservation objectives to ensure that the cheetah population in fenced reserves is sustainable in the long-term and contributes to cheetah conservation.

Here we present some case studies and suggest solutions that will contribute to the long-term genetic and demographic viability of the cheetah population in fenced reserves.

Maintaining biodiversity in the critically endangered lowland renosterveld vegetation of the Western Cape: The challenges of fire, herbivore grazing pressure and fragmentation

Frans G.T. Radloff¹, Laco Mucina² & Dirk Snyman³

¹ *Dept Biodiversity & Conservation, Cape Peninsula University of Technology, Cape Town*

² *School of Plant Biology, University of Western Australia, Perth, Australia*

³ *C4 EcoSolutions, Tokai, Cape Town, South Africa*

Presenter: Frans G.T. Radloff, Dept Biodiversity & Conservation, Faculty of Applied Sciences
Cape Peninsula University of Technology, P. O. Box 652, Cape Town 8000
(021) 460 3195; radloff@cput.ac.za

Cape lowland renosterveld is critically endangered with > 80% transformed to agriculture and < 1% statutorily protected. Conservation efforts are complicated by severe fragmentation and the multiple vegetation states recognised in renosterveld. Historical accounts aggravate the situation with notions that the area was formerly grassland rather than the unpalatable shrubland characterising it today.

The mechanisms driving the multiple states were explored by subjecting three renosterveld states (shrubland, tussock grassland and grazing lawn) to combinations of experimental treatments comprising fire (burnt/unburnt) and herbivore grazing pressure (utilized/unutilized by ostrich, bontebok and eland). Plant biomass was recorded in the experimental plots both before treatments were applied and again six years later.

Results reveal that herbivore grazing pressure but not fire significantly affects lawn and tussock grassland vegetation composition. Unpalatable shrub invaded grazed lawn areas while ungrazed tussock grassland was encroached by palatable shrub. The shrubland state was affected by fire, herbivore grazing pressure and the interaction between the two. Burnt and grazed shrubland reverted back to its dense unpalatable state while ungrazed plots became open grassland. Unburnt and ungrazed shrubland plots were encroached by palatable shrub species.

More insight on the ecosystem processes driving renosterveld vegetation state dynamics was gained but it does not inform to which state conservation efforts should aspire. A heterogeneous landscape representing all states is unrealistic given that the majority of remaining patches are < 1 ha. A shrubland protected from fire and herbivore grazing pressure appears to be the most species rich but is neither sustainable nor acceptable to farmers using the remaining renosterveld patches as grazing.

INVITED THEME PRESENTATION

The state of South Africa's Important Bird and Biodiversity Areas: A review of the threats, status and conservation responses in a network of protected and unprotected sites

Daniel Marnewick¹, Ernst F. Retief¹, Nicholas T. Theron¹,*Charmaine J. Uys¹ & Dale R. Wright¹

¹*BirdLife South Africa, Important Bird Areas Programme, Johannesburg, South Africa*

Presenter: Daniel Marnewick, Manager: Important Bird Areas, BirdLife South Africa, Lewis House, 239
Barkston Dr, Blairgowrie, South Africa 2125
(011) 789 1122 / (082) 772 4432; daniel.marnewick@birdlife.org.za

Important Bird and Biodiversity Areas (IBAs) are sites of global or regional conservation importance identified using birds. There are approximately 12 000 IBAs worldwide. IBAs are identified using standard internationally agreed criteria, which are; objective, quantitative and scientifically defensible.

As the country partner to BirdLife International, BirdLife South Africa is responsible for managing the IBAs in South Africa. Its objectives are to assess, monitor and conserve IBAs, which span over 14 million hectares, of which ca. 60% is not formally protected and mostly includes privately owned land.

In order to monitor the state of IBAs, an IBA assessment is completed every two to four years for each IBA. IBA assessments interrogate the state of the habitat and bird populations, the threats to the IBA and its birds, and the conservation response through protection, management and mitigation. IBA assessments are then used to prioritise IBAs for conservation and to instigate conservation action at a policy and site level.

The first IBA Status Report for South Africa is being published. This status report uses the IBA assessments completed between the period 2009 to 2013 for ca. 40% of South Africa's 122 IBAs, as well as the 1998 site accounts from the original IBA directory (Barnes 1998) for comparative purposes. This analysis includes both fully protected (26%) and unprotected (74%) IBAs. Many of the IBAs used in this analysis are partially protected (n=15), so for ease of analysis, IBAs with less than 70% of their surface area formally protected were categorised as unprotected, while those with more than 70% protected were categorised as fully protected.

Preliminary analyses of the IBA assessment data show that the severity and number of different types of threats are higher in unprotected IBAs versus fully protected IBAs. The types and levels of threats differ between regions. The state of the habitats in unprotected IBAs has deteriorated, mostly due to pollution or land use change, resulting in a decline or absence of the associated bird populations (IBA trigger species), and resulting in the de-listing of certain IBAs. The conservation responses, especially in many unprotected IBAs, have however improved. This is due to national and provincial conservation prioritisation, the associated expanded protected area network strategies, an increased involvement by conservation NGOs and civil society at site level conservation and the revival of the IBA Programme in 2009 by BirdLife South Africa. Due to a reduction of state resources aimed at protected area management, the conservation actions at protected IBAs have at best remained stable, but at many IBAs this has deteriorated.

Exploring the mesofilter as a novel operational scale in conservation planning

Casparus J. Crous¹, Michael J. Samways¹ & James S. Pryke¹

¹*Department of Conservation Ecology and Entomology, Stellenbosch University*

Presenter: Casper J. Crous, Stellenbosch University, Private Bag X1, Matieland 7602, South Africa
(021) 808 4231; casperc@sun.ac.za

Increased emphasis is being placed on developing effective biodiversity conservation tools for practical conservation planning. The mesofilter is such a biodiversity planning tool, but has yet to be fully explored to appreciate its effectiveness. The key premise of the mesofilter is that ecosystems contain certain features which are specifically associated with a diversity of species. Identifying such mesofilters could therefore complement existing conservation planning tools such as coarse- and fine-filters.

To explore the value of the mesofilter as an operational scale in conservation planning, we studied remnant patches of endangered montane grassland in KwaZulu-Natal, using the landscape feature of patch rockiness as a surrogate for biodiversity. The objective was to determine whether the mesofilter of rockiness can predict variation in species richness and composition for three dominant grassland taxa (plants, butterflies and grasshoppers) at the landscape scale.

Variable levels of rockiness had significant interactions with all three focal taxa. Higher species richness of all taxa was closely associated with higher levels of rockiness in a patch. The rocky mesofilter only predicted significant differences in species composition for butterflies. Elevation was also important, possibly another mesofilter for plants and grasshoppers in this landscape.

The results indicate that the use of an abiotic surrogate such as rockiness can predict biodiversity value across multiple taxa. The mesofilter is therefore a valuable surrogacy and congruency tool for practical biodiversity conservation across this landscape, and would likely have similar value if explored elsewhere. It also has value in the design and management of protected areas.

Population genetic structure of the Southern Ground-Hornbill (*Bucorvus leadbeateri*)

Antoinette Kotze^{1,2}, Desire Dalton^{1,2}, Nick Theron^{1,3}, Ray Jansen⁴ & J. Paul Grobler¹

¹*Department of Genetics, University of the Free State, Bloemfontein, S.A.*

²*National Zoological Gardens of South Africa, Pretoria, S.A.*

³*The Mabula Ground Hornbill Research and Conservation Project, Bela-Bela, S.A.*

⁴*Dept of Environmental, Water and Earth Sciences, Tshwane University of Technology, Pretoria, S.A.*

Presenter: Paul Grobler, Dept of Genetics, University of the Free State, PO Box 339, Bloemfontein 9300
(051) 401 3844; groblerjp@ufs.ac.za

Southern Ground-Hornbills (*Bucorvus leadbeateri*) are co-operative breeders that occur in groups of 2–9 individuals. Long life spans, large territory sizes and low reproductive rates render these birds vulnerable to loss of habitat and persecution.

In this paper, we investigate two aspects of population genetic structure. (1) In the Limpopo Valley of South Africa, the species is currently re-establishing after a serious decline in numbers. We determined the

effective population size, levels of genetic diversity, relatedness and parentage using molecular techniques. The re-colonisation of the Limpopo Valley was shown to have occurred by a number of unrelated individuals. This was demonstrable by the very low levels of average relatedness of the population, as well as the favourable levels of heterozygosity across age and sex categories. Within-group relatedness was as expected, with juveniles related to at least one parent from their natal group. Inferences on breeding behaviour based on genetic testing results provides the first evidence that Southern Ground Hornbills are not as monogamous as previously thought, with two instances recorded of extra pair copulations. (2) Augmentation of natural populations will require thorough knowledge on the genetic status of source and recipient populations.

We present preliminary results on the phylogeography of the species in East- and Southern Africa. Current results support a stepwise model of gene-flow across the distribution range.

Can we predict extinctions before they happen? A case study in coastal forests

Pieter I. Olivier¹ & Rudi J. van Aarde¹

¹Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Pretoria, South Africa

Presenter: Pieter Olivier, Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Private Bag X20, Hatfield 0028
(012) 420 4523 / (084) 612 7724; polivier@zoology.up.ac.za

Habitat loss apparently drives the current extinction crisis. The processes through which it affects biodiversity, however, are complex and poorly understood. This is especially true for spatially complex regions that comprise a mosaic of land-use types, which often range from protected areas to dense human settlements. In such places community characteristics such as species richness and evenness may be decoupled from prevailing landscape conditions and be reflected as an extinction debt. Predicting extinction debts has important implications for conservation, as the associated time delay provides the opportunity to apply conservation measures to mitigate future species losses.

Our analyses of coastal forests in KwaZulu-Natal suggest that the extensive loss in forests (82%) incurred an extinction debt, modelled to match the 11 bird species now listed as threatened locally. However, species interactions with the gradient of habitat conditions that now surround forest fragments may have forestalled the realisation of predicted extinctions. The prevention of future extinctions may therefore depend on conserving forest fragments, maintaining natural matrix habitats that surround fragments, as well as targeting landscape level restoration that improves connectedness and link remaining forest fragments.

Our study implies that forest loss drives local extinctions. Consequently we provide a novel approach to identify unpaid extinction debts. This approach should empower conservation incentives directed at reducing the impact of habitat loss on biodiversity.

Spatial responses to landscape heterogeneity: A case study of the elephants in the Kruger National Park

Andrew Purdon¹ and Rudi J. Van Aarde¹

¹*Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, S.A.*

Presenter: Andrew Purdon, Conservation Ecology Research Unit, Department of Zoology and Entomology,
University of Pretoria, Private Bag X20, Hatfield 0028
(012) 420 4522 / (083) 864 3726; andrew.purdon@zoology.up.ac.za

Recent measures that facilitate the naturalisation of elephant movements to ameliorate their apparent impact on other species in Kruger National Park include the reduction of watering points and improving the connectedness of the park with surrounding protected areas. These measures theoretically should instate functional connectivity which reflects on the permeability of matrix landscapes to allow for the dispersal of individuals. The matrix is usually considered as so-called 'non-habitat', but could contain low quality resources that provide stepping stones to facilitate dispersal between patches of suitable favoured habitat.

For elephants in Kruger, watering points interspersed between the six major river systems may provide such stepping stones and facilitate use and movement through relatively unfavourable habitat further away from water courses, especially during the dry season. This may enhance functional connectivity between patches of favoured habitat, e.g. those along major rivers and drainage lines. Utilisation distributions local in both space and time were calculated using time local convex hull for 26 breeding herds that roamed across most of the park. We then used resource utilisation functions to test if the spatio-temporal variations in utilisation distributions were attributable to heterogeneity in resource availability. Elephants structured themselves along six major river systems, using water points between the systems briefly as they moved to the next.

We hence conclude that enhancing the hostility of matrices between rivers and drainage lines may provide for the heterogeneity of spatial use as a desired outcome of landscape based conservation incentives.

The diet of black-backed jackals inside and outside protected areas in the Eastern Cape, South Africa

Dan M. Parker¹ & Ross W. Forbes¹

¹*Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, Grahamstown, South Africa*

Presenter: Dan Parker, Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, PO Box 94, Grahamstown 6140
(046) 603 8530; d.parker@ru.ac.za

As generalist, mesopredators, black-backed jackals (*Canis mesomelas*) are widely distributed canids and are regularly the protagonists in human-predator conflict. The recent proliferation of game farms and wildlife reserves in South Africa has resulted in the reintroduction of apex predators, often to properties which share a common boundary with livestock farms. Although the reintroduction of apex predators may facilitate increased foraging opportunities for jackals by providing carcasses for scavenging, top-down forcing is also possible, and this may result in jackals crossing onto neighbouring livestock farms to hunt. In this study, we investigated the diet of black-backed jackals using scat analysis on two protected areas and two adjacent livestock farms in the

Eastern Cape, South Africa. Jackal scats from the protected areas (n = 453) and livestock farms (n = 89) had similar proportions (~5%) of rodents and wild ungulates (~14%). However, significantly more livestock (12%) was recorded in the jackal scats from the farms than those from the protected areas (0.2%). In addition, significantly more mammal hair and vegetation were recorded on the farms than the protected areas. By contrast, significantly more invertebrates and fruit and seeds were consumed on the protected areas than the farms.

We suggest that the presence of apex predators may cause changes in jackal activity patterns and/or the spatial avoidance of the larger predators. Thus, without adequate mitigation measures in place (e.g. regular fence patrols and maintenance) apex predator reintroductions may exacerbate conflict between mesopredators and livestock farmers.

Mapping natural distribution ranges of herbivores

Daan Buijs¹ & Coral Birss²

¹*NW Department of Economic Development, Environment, Conservation & Tourism*

²*CapeNature Scientific Services, Stellenbosch*

Presenter: Daan Buijs, NW Department of Economic, Environment Conservation and Tourism, P.O. Box 510, Zeerust 2865
(083) 320 2727; dbuijs@nwpg.gov.za

The National Department of Environmental Affairs (DEA) was tasked to develop norms and standards for the translocation of herbivores. The purpose of these norms and standards are to enable the translocation of herbivore species within their natural distributional range to approved properties without the burden of issuing permits for each translocation, while setting obligatory requirements when relocating species to properties outside their natural distributional range. In this process the provincial conservation departments were represented in a DEA task team that plotted the natural distribution maps. The maps were based on historical data, and models derived from these data to include suitable vegetation types for which there are confirmed records. Determining factors including climate and topography were also considered. This method resulted in scale-related (1:10 000 vegetation type), scientifically-justifiable GIS maps of natural distributional ranges. This presentation describes the method used, and provides examples of generally-accepted natural distributional ranges that were incorrect.

Evaluating the mapping of natural distributional ranges for eco-typical species for the National Norms and Standards

Coral Birss¹ & Daan Buijs²

¹*CapeNature Scientific Services, Stellenbosch*

²*NW Department of Economic Development, Environment, Conservation & Tourism*

Presenter: Coral Birss, CapeNature Scientific Services, P. Bag X5014, Stellenbosch 7599
(021) 866 8015; CBirss@capenature.co.za

This presentation refers the mapping of natural distributional ranges of herbivore species with respect to the development of National Norms and Standards for their translocation. Various iterations and maps have been compiled. Several species, collectively called 'ecotypes' (populations of smaller or less mobile

species that are isolated by geographic barriers) were processed in a particular way. We provide an overview of the previous maps, and the criteria for evaluating these based on scientific data and recommendations made without scientific data. The application of scientific principles related to the conservation of evolutionary processes (with respect to speciation and environmental diversity) warrants an investigation. The investigation will consider scale and common denominators when applying regulatory measures for translocation of a suite of species, which generally persist in the landscape.

The approval of regulations to allow for the 'free' movement of eco-typical species between properties (habitats) without evaluation of their population characteristics with reference to potential gene flow range is not supported. The development of safe translocation distances based on genotypic rather than phenotypic variation is supported.

Can I function without my skirt?

Anton Schmidt¹, Laurence Watson¹ and Graham Kerley²

¹*School of Natural Resource Management, Nelson Mandela Metropolitan University, Saasveld Campus, George*

²*Centre for African Ecology, Nelson Mandela Metropolitan University*

Presenter: Anton Schmidt, Private Bag X6531, George 6530
(044) 801 5043; anton.schmidt@nmmu.ac.za

We investigated the relationship between changes in biodiversity and ecosystem functioning at both the landscape and patch scale in Arid Mosaic Thicket. At the landscape scale, we identified four herbivore induced transformation gradients in close proximity to one another. We then recorded data on the structure and composition of bushclumps and the biogeochemical functioning of the landscape along these gradients.

Using nonmetric multidimensional scaling and logistic regression plots we found significant non-linear correlations between distance from water and various indicators of landscape function and bushclump structure. At the patch scale we regressed the structural indicators of transformation (independent variables) against the functional indicators of transformation (dependant variables) to determine how herbivore induced changes to vegetation structure effect ecosystem functioning.

Initial analyses indicate significant correlations between structural indicators of transformation such as bushclump area, the intactness of the bushclump skirt and species richness and functional indicators of transformation, including various indices of soil stability, water infiltration and nutrient cycling. Some of these correlations are non-linear and appear to indicate threshold type changes to ecosystem functioning. Based on the results, we propose a multivariate model that land users can use to assess the functionality of their landscapes.

Cheetah activity patterns on two enclosed reserves in the Eastern Cape Province

Charlene Bissett¹ & Ric T.F. Bernard¹

Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, Grahamstown

Presenter: Charlene Bissett, Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, PO Box 94, Grahamstown 6140
(046) 603 8530; c.bissett@ru.ac.za

Habitat loss and population declines have resulted in the restriction of many large carnivores, including cheetahs, to fenced conservation areas. Recent studies have shown that animal movement is a bridge between behaviour, landscape ecology and population dynamics. Understanding cheetah activity patterns on enclosed reserves has important implications for the survival of this threatened species.

We collected data on cheetah activity patterns on two enclosed reserves in the Eastern Cape, one reserve with lions (Kwandwe PGR) and one without lions (Mountain Zebra NP). Continuous follows of four focal animals at Kwandwe PGR and four focal animals at MZNP were used to investigate the degree to which physical and biological factors influenced cheetah activity patterns. A model building approach identified sex, time of day and reserve as the most important predictors of cheetah activity. Cheetahs at Kwandwe PGR had peaks of activity in the morning (04h00-08h00) and in the late afternoon (16h00-20h00) and were significantly more active in the morning compared to cheetahs at MZNP. Cheetahs at MZNP were active for longer periods of time but covered shorter distances compared to Kwandwe PGR. Female cheetahs on Kwandwe PGR travelled significantly less distance compared to the males and compared to male and female cheetahs at MZNP.

Our results suggest that the presence of lions on Kwandwe PGR may influence the cheetahs' movement and that the female cheetahs move less to avoid contact with these larger predators. Furthermore the absence of lions at MZNP allows the cheetahs to be active for longer periods during the day.

The response of bird, tree and millipede communities to a coastal dune forest habitat peninsula

Natasha Visser¹, Pieter I. Olivier¹ & Rudi J. van Aarde¹

¹Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Pretoria, South Africa

Presenter: Natasha Visser, Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Private Bag X20, Hatfield 0028
(012) 420 4574 / (071) 365 8545; natasha.visser@zoology.up.ac.za

Understanding the biogeographic realities that shape biodiversity patterns in spatially complex landscapes may contribute to conservation efforts. One of the biogeographic forces that may affect regional scale biodiversity patterns is the peninsula effect, which predicts a decline in the number of species from a peninsula's base to its tip. In this study we investigated the peninsula effect as a potential driver of the community structure of trees, millipedes and birds in a subtropical coastal dune forest, which forms a habitat peninsula along the South African east coast. In agreement with the predictions of the peninsula effect the number of tree, millipede and bird species decreased significantly with distance from the

peninsula base. For birds this trend was only apparent for forest dependent species, suggesting that forest specialist species were more strongly affected by this biogeographic force than species that were merely associated with forests. It therefore follows that the peninsula effect might aid in explaining diversity patterns in peninsula shaped conservation areas which are embedded in a matrix of contrasting land-uses. Secondly, multiple protected areas might occur within a habitat peninsula, where the peninsula effect will determine the number of species within individual reserves. Lastly, new protected areas may preferably be established at the base of a peninsula to maximize the number of species that will benefit from conservation incentives.

Patterns of elephant impact within a fenced South African game reserve – A management perspective

Orla K. McEvoy¹, Tom Avent¹, A. Gonzalez Del Campo² & S. Waldren²

¹*Wildlife and Ecological Investments, Western Cape, South Africa*

²*School of Natural Sciences, Trinity College Dublin, Dublin, Ireland*

Presenter: Orla McEvoy, Trinity College Dublin, Ireland
(00353) 861075890; mcevoyor@tcd.ie

High population densities of African elephant *Loxodonta africana* can lead to habitat modification and destruction within fenced reserves. The number of elephant that an area can sustainably support is difficult to estimate, especially in reserves with high habitat heterogeneity where elephant impact is likely to be unevenly spread across the landscape. Welgevonden Game Reserve is a 37,500ha conservation area in the UNESCO Waterberg Biosphere with a current population of 119 elephants.

Detailed habitat assessments were conducted at forty 1ha sites covering all major landforms and vegetation communities. All trees and other woody vegetation over one metre high were identified in each block and assessed for elephant impact using a graduated Walker scale. Habitat maps were created to incorporate both vegetation communities and landform types. These maps were overlaid with the habitat assessment impact data and population distribution data from GPS collars on the matriarchs of two of the Reserve's elephant herds.

There was a significant difference in impact between habitats, with damage levels displaying an aggregated spatial distribution concentrated around a central river valley. Grassland habitats showed little or no tree damage whilst slopes and plateau landforms had intermediate damage levels recorded. This impact correlated closely with the habitat preferences and distribution patterns from the collar data. Further analysis identified the woody vegetation species most affected by elephant and vegetation structures and height categories most susceptible to impact. These results can be used to highlight areas and vegetation communities most in need monitoring for future elephant impact.

Morphological characterization and growth variability of *Barbus altianalis* (Boulenger, 1904) populations in Lake Victoria drainage basin, Kenya

Emily J. Chemoiwa¹ & Romulus Abila²

¹*Department of Biological Sciences, University of Eldoret, Eldoret – Kenya*

²*Department of Fisheries Management and Aquaculture Technology
South Eastern Kenya University, Kitui, Kenya*

Presenter Emily Jepyegon Chemoiwa Department of Biological Sciences, University of Eldoret, P.O. Box 1125, Eldoret – Kenya
+254 722 931 952; emilychemoiwa@yahoo.com

Barbs (genus *Barbus*) form a complex polyphyletic group of Old World, freshwater Cyprinidae. Their morphological plasticity makes them ideal models for studying evolutionary phenomenon. This cyprinid taxon requires a complete taxonomic reorganization of its status.

Morphological characterization of *Barbus altianalis* based on 21 measurements was carried out on the rivers Nzoia, Nyando, Yala and Sondu-Miriu from the Lake Victoria catchment, Kenya. Principal component analysis (PCA) showed separation of the River Yala population from Nzoia, Nyando, and Sondu-Miriu populations. Factor loadings established that 11 characters were morphologically informative. PCA1 accounted for 43% of the difference while PCA2 accounted for 19% of the difference. Mann-Whitney U Tests ($P=0.05$) indicated no significant difference in morphological characteristics between the Sondu-Miriu and Nyando populations, but significant intra-specific morphological difference between the other pairs of rivers. Growth variability analysis based on 15 characters indicated isometric growth of *Barbus altianalis* in the four populations.

Our results suggest the presence of intra-specific morphometric variation between the four populations.

Using occupancy models to assess biodiversity: a case study of lions *Panthera leo* in Kafue National Park, Zambia

Neil Midlane¹, Guy A. Balme^{1,2}, Luke T.B. Hunter² & M.J. O’Riain¹

¹*Department of Biological Sciences, University of Cape Town, Cape Town, South Africa*

²*Panthera, New York, United States of America*

Presenter: Neil Midlane, Department of Biological Sciences, University of Cape Town, Private Bag, Rondebosch 7701
(082) 652 4352; neilmidlane@yahoo.co.uk

Understanding the distribution of vulnerable species and the factors driving that distribution, both within and outside protected areas, are the first steps towards effective biodiversity management. Such understanding is particularly important for species playing key ecological and economic roles including the African lion *Panthera leo*, a species which has lost more than 75% of its historic range.

In recent years, traditional presence-absence approaches to establishing species distribution have been superseded by occupancy models which explicitly account for the issue of false absences i.e. a species is present during a survey but not detected. We used a single-season occupancy model based on detection of lion tracks to estimate the proportion of area used, and derived a spatially explicit probability of lion use

in northern Kafue National Park, Zambia, a protected area for which no previous empirical lion data exist. The occupancy model predicted a 23.3% larger area used than would have been estimated under a simple presence-absence approach. We expected prey biomass and anthropogenic edge effects to be the most important drivers of lion distribution in the study area, but these factors had poor AIC_c rankings amongst candidate models, and habitat class emerged as the best predictor of lion distribution.

Our findings provide management with focal areas for further lion research in Kafue NP and, more broadly, we demonstrate the utility of track-based occupancy models in establishing the distribution of large carnivores within previously un-surveyed African protected areas.

Beginning and the end of game meat in relation to food security: Opportunities and challenges

Leon L. Bekker¹, Louw C. Hoffman² & Piet J. Jooste³

¹*Department of Environmental Health, Tshwane University of Technology, South Africa*

²*Department of Animal Sciences, University of Stellenbosch, South Africa*

³*Department of Biomedical Sciences, Tshwane University of Technology, South Africa*

Presenter: Leon Bekker, Department of Environmental Health, Tshwane University of Technology, Private bag X680, Pretoria 0001
(012) 382 5280/1 / (082) 908 2596; bekkerjl@tut.ac.za

In South Africa, conservation of wild game and game farm management have contributed greatly to a growth in the numbers of game animals that its meat can make a valuable contribution to food security. In order to tackle the current world food security problem in a practical manner it is vital to explore meat sources which have the potential for sustainable use.

The game farm and other conservation areas are the first link in the game meat supply chain and therefore the management, and hunting practices followed, may impact on game meat quality and safety. The saying “garbage in, garbage out” becomes relevant, especially at the beginning of the supply chain.

At the end of the supply chain is the consumer. The eagerness of consumers to (1) eat game meat as an African experience and (2) to seek healthy alternatives to other red meat should be embraced. Reports on meat scandals however raise public awareness with regard to animal origin, welfare, meat quality and safety. Overall food quality significantly affects customer satisfaction and behavior. Research carried out amongst generation Y consumers, game farmers and hunters showed that (1) consumers are willing to purchase game meat under specific conditions, and (2) that certain farm management practices regarding game sourcing, identification and traceability, feed and water control, animal health control, and hunting and slaughter facilities will have to altered in order to provide for the expectations of consumers and the requirements of food law and standards.

Comparison of the numbers of free macrophages in the lungs of *Passer domesticus* and *Lamprotornis nitens* from different habitats

Lindi Steyn¹ and John N. Maina¹

¹*Department of Zoology, University of Johannesburg, Johannesburg, South Africa*

Presenter: Lindi Steyn, Department of Zoology, University of Johannesburg, P.O. Box 524, Auckland Park
2006, Johannesburg, South Africa
(011) 559 4963 / 072 129 3759; lindisteyn@live.com

There are ~9,920 species of birds on earth, with ~1,253 of them facing imminent extinction. Over the last three decades, global decline in numbers and species of birds, particularly those of the House Sparrow and European? Starlings have been well-documented. In Great Britain, the numbers of House Sparrows have declined by as much as 60% and the Starlings by 41%. In South Africa, very little is known about the numbers of the House Sparrow and Cape Glossy Starling populations. One of the speculations as to why the numbers of birds might be declining is environmental pollution and particularly the deterioration of air quality.

To evaluate this, birds from two study sites (an urban and a rural one) were caught and the numbers of free (surface) pulmonary macrophages (FMs) counted, after lavage, using a hemocytometer. In both the Cape Glossy Starling and the House Sparrow, the body mass normalized numbers of FMs of the birds from the two sites were statistically significantly different ($P < 0.001$). The numbers of FMs in the respiratory system of the urban birds were substantially more than those of the rural ones. FMs appear to be bio-indicators of air pollution. Beyond a critical level, pollutants may cause death or compel birds to move away from a habitat.

Analysing conservation practice with a view to provide guidelines for site managers

Peter J. Mills¹

¹ *Cradle of Humankind World Heritage Site Management Authority, Johannesburg, Gauteng, South Africa*

Presenter: Peter Mills, Cradle of Humankind World Heritage Site Management Authority, Johannesburg, Gauteng, South Africa
(012) 660 1029 / (082) 555 7972; peterjm@mweb.co.za

The updating of the existing management plan for the Cradle of Humankind site, a protected area by definition, followed closely on the completion of a short dissertation on management effectiveness of protected areas in Gauteng. The management effectiveness study gave an insight in to where conservation actions, at various levels of implementation, seem to be falling short. It was suggested that current management practices are currently ineffective and not meeting national, regional or local targets.

The results of the assessment showed that conservation initiatives were weakest at the implementation level. In other words - the setting of specific biodiversity targets and the implementation of specific activities to achieve targets scored the weakest. In addition, no direct monitoring appears to be taking place to show that there is, indeed, a measure of success. On the contrary, monitoring did not seem to consider conservation targets at all but highlighted the gap between conservation science and wildlife management activities at the local level.

The assessment could not link the management plan with monitoring activities, nor could they show how these influenced the day to day activities of the reserve manager.

Patterns of spatial and temporal genetic differentiation in the Mopane moth *Imbrasia belina*

Hesmari van der Westhuizen¹ & J. Paul Grobler¹

¹*Department of Genetics, University of the Free State Bloemfontein, South Africa*

Presenter: Hesmari van der Westhuizen, Department of Genetics, University of the Free State, P.O. Box 339, Bloemfontein 9300
(051) 401 7067 / (084) 438 4463; vdwesthm@ufs.ac.za

The close relationship between the mopane moth (*Imbrasia belina*) and the mopane tree (*Colophospermum mopane*) offers a valuable opportunity to create a single model describing aspects of spatial and temporal genetic connectivity, co-evolution and adaptation. Connectivity in species may be determined by a range of biotic and abiotic factors, but may also be affected by co-evolution resulting from a strong dependence of one species on a second.

We thus aim to sample extensively from natural populations of both mopane moths and trees, to construct a layered and holistic view that will portray patterns of inter-specific differentiation but also show the interrelationship between patterns of population genetic structure observed in each species.

Furthermore, we aim to investigate the influence of specific aspects of the life-cycle and biology of *I. belina* on current patterns of diversity. Genetic markers were used for the early detection of anthropogenic influences, specifically a genetic signature of potential overexploitation. Mopane caterpillar samples were collected from two locations in the Limpopo Province. The mitochondrial gene regions cytochrome c oxidase I and NADH dehydrogenase 1 and 5 were analyzed to determine the degree of genetic variation within and between populations. We were able to amplify a 548 bp portion of the CO1 gene whereas ND1 and ND5 could not be optimized successfully. Haplotypes for CO1 proved to be monomorphic across all individuals studied. Current attempts are therefore focused on the amplification of cytochrome b oxidase, in an attempt to detect polymorphisms to describe patterns of gene flow.

Contributions by a rural community to biodiversity conservation in South West KwaZulu-Natal

William R. Bainbridge¹, Z. Baleni² & M. Jacana³

¹*Advisor Umgano Project, KwaZulu-Natal*

²*Assistant Manager, Umgano Forestry*

³*Chairman, Umgano Community Trust*

Presenter: Drummond Densham, 5 Davidson Str., HOWICK 3290
(033) 330 4039; densham@sai.co.za

The Umgano Project is an initiative of the Mabandla Traditional Council, under the leadership of iNkosi Baleni. The community is resident in the Umzimkhulu District of SW KZN. The project is being implemented in an area of circa 6 500 ha in extent. This lies within an internationally-recognised

biodiversity hotspot, the Maputoland-Pondoland-Albany Hotspot, characterised by high levels of species-richness and endemism, which are under threat.

This community is implementing an innovative project, intended to both address the urgent need for the creation of business opportunities and employment, as well as to alleviate local poverty, while at the same time, to conserve the important biodiversity within the area.

It has made a promising start to achieve this, through the introduction of a range of environmentally-sustainable development initiatives, which enable it to both generate income and provide employment locally, but to also conserve the biodiversity.

This paper describes the biodiversity of the project area, the land-uses being introduced, some of the business opportunities that have been created, an indication of the number of jobs that have been provided to date, as well as the measures that are being put in place to conserve the biodiversity, which include the formal designation of a community-managed nature reserve, to be proclaimed under national legislation.

Functional connectivity within conservation networks: delineating corridors for African elephants

Rudi J. Van Aarde¹ & Carrie L. Roever¹

¹*Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, South Africa*

Presenter: Rudi van Aarde, Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Private Bag X20, Hatfield, 0028
(012) 420 2535. rjvaarde@zoology.up.ac.za

The development of conservation networks is a recent, yet growing trend. But for these networks to be ecologically viable, the functional connectivity of the landscape must be ensured. We assessed the connectivity between savanna elephant populations in southern Africa to test whether existing conservation networks were functioning and to identify other areas that could benefit from being managed as conservation networks. We used resource selection function models to create an index of habitat selection by males and female elephants. We employed this habitat use index as a resistance surface, and applied circuit theory to assess connectivity between adjacent populations within six clusters of protected areas across southern Africa. Circuit theory current flow maps predicted a high likelihood of connectivity in the central portion of our study area (i.e. between the Chobe, Kafue, Luangwa, and Zambezi cluster). High human density in the east and a lack of surface water in the west limited connectivity across the study area and effectively isolate elephants in the Etosha cluster in Namibia and Niassa clusters in Mozambique from the central region. We further identified northern Zambia and Malawi and northern Mozambique as distinct clusters where elephants might benefit from being managed as part of a conservation network. Habitat selection and circuit theory models are useful to identify conservation priorities and can be applied to other focal species to identify and conserve functional connectivity.

Based on Roever C.L., van Aarde R.J. & Legett K. 2013. *Conservation Biology* 157: 128 – 135.

SOME REFLECTIONS FROM A MEMORABLE MEMBER:

Cheetah conundrums: cubs and coalitions.

Gus and Margie Mills

Lewis Foundation, South Africa

WildCRU, Oxford University

Cheetah cub mortality is generally held to be exorbitantly high, predominantly due to lion predation, to the extent that on the IUCN/SSC Cat Specialist Group Website it states “Intraguild competition from more aggressive predators decrease cheetah survivability in protected game reserves, causing larger numbers of cheetahs to live outside protected areas and therefore coming into conflict with humans. Addressing this conflict may become the most important factor in their conservation.” Furthermore, cheetahs are the only cats, besides lions, where the males form long-lasting coalitions. It is commonly held that coalition formation in cheetahs has evolved to enhance their reproductive success. We discuss these two pieces of cheetah dogma using data from our 6 year intensive cheetah study in the Kgalagadi Transfrontier Park.

How efficient is invasive alien plant management in protected areas?

Wynand J. Loftus¹, Christo Fabricius² & Llewellyn C. Foxcroft³

¹*Nature Conservation at NMMU, Sustainability Research Unit, Saasveld, George*

²*NMMU Sustainability Research Unit, Saasveld, George*

³*Centre for Invasion Biology and Conservation Services, South African National Park, Skukuza*

Presenter: Wynand Loftus, NMMU Sustainability Research Unit, Saasveld, P/Bag X 6531, George 6530
(072) 354 2607; s208026672@live.nmmu.ac.za

The long-term sustainable management of invasive alien plants (IAPs) requires a management approach that monitors and measures the outcomes of current management practices, and considers it in future decision making. South African National Parks (SANParks) has adopted a Strategic Adaptive Management (SAM) approach for managing complex environments and making decisions in uncertain times. This comprises a ‘learning-by-doing’ approach, where lessons learned from purposefully tested management practices are used to inform future management decision making. It has, however, been questioned whether SAM is effectively applied to IAP management. Clearing of IAPs within the borders of SANParks is carried out by Working for Water, under the SANParks Biodiversity Social Projects programme. Clearing is done on a contract basis and contract data are stored in the Water Information Management System (WIMS) database. Although IAP clearing techniques are well implemented, the efficiency of overall clearing operations within the parks, and whether strategic adaptive management is being implemented, needs to be examined. We use data extracted from WIMS for five national parks (Addo Elephant, Agulhas, Garden Route, Kruger and Table Mountain) and investigated the effectiveness of IAP clearing in these parks. We use various indicators from WIMS to illustrate trends in efficiency between 2002 – 2012, by assessing person day (work load) estimates and densities of IAPs, amongst others.

We discuss why this inefficiency occurs and the main factors that are responsible. Further, we explore ways to improve the implementation of SAM with the aim of supporting continuous learning and improvement of IAP management.

Potential for protected areas to contribute to human well-being through the provision of biodiversity related ecosystems services

Rina C. C. Grant¹, Reinette (Oonsie) Biggs², Stefanie Freitag- Ronaldson¹, Louise Swemmer¹, Luthando Dziba³

¹*Scientific Services, SANParks, Kruger National Park*

²*Reinette (Oonsie) Biggs, Stockholm Resilience Centre, Sweden*

³*Luthando Dziba, Ecosystem Services, CSIR*

Presenter: Rina Grant, P. Bag X402, Skukuza 1350
(013) 735 4415 / (079) 519 5650; rina.grant@sanparks.org

We are living in a new era, the Anthropocene, where humans are a dominant force shaping ecosystems at local to global scales. It is expected that this era will be associated with the 6th mass extinction, thus emphasizing the role of protected areas in the conservation of biodiversity. However, protected areas also contribute to a wide range of ecosystem services such as pollination, climate regulation, aesthetics and recreation, the outcomes of which manifest at global, national, regional and local scales. The services at these different scales are very different and vary from protecting endangered species globally to providing resources in the form of mopane worms at a local scale.

Improving our knowledge of the contribution of protected areas to human well-being through the wide range of ecosystem services at different scales will help to define the role of protected areas in the Anthropocene. In an increasingly populated and resource scarce world, this may be central to motivating the case for protected areas and ensuring their future.

MammalMAP:

A mammal monitoring initiative for improved wildlife conservation in Africa that bridges ecosystem, disciplinary, and political divides

Tali S. Hoffman^{1,2}, Robert Millar¹ & Les Underhill²

¹*Mammal Research Institute, University of Pretoria*

²*Animal Demography Unit, University of Cape Town*

Presenter: Tali S Hoffman, Mammal Research Institute, University of Pretoria, Pretoria 0001
(083) 461 9678; Tali.S.Hoffman@gmail.com

Limited knowledge of the 21st Century distribution of African mammals strongly inhibits our ability to manage and conserve them. Launched in 2012 by two South African universities, MammalMAP aims to fill this knowledge gap by updating the distribution records of all African mammal species both within and beyond protected areas.

Through extensive collaboration with mammal experts and citizen scientists we consolidate reliable evidence of current (post 2010) mammal occurrence into an online, open-access digital database, in an exercise with four primary conservation benefits. Firstly, comparisons of current distribution records with historical and future records, and analyses of distributions shifts in relation to changes in habitat and climate, will yield both explanatory and predictive results that can inform species- and continent-level conservation policies. Secondly, these data will provide crucial guidance to the IUCN Red Data Lists. Thirdly, these data will direct landscape conservation regulations for maximum biodiversity protection, and

guide the effective spending of scarce conservation resources. Finally, MammalMAP provides a platform for involving Africa's citizens in, and educating them about, wildlife conservation. In short, MammalMAP represents a comprehensive, multi-species conservation initiative that bridges ecosystem, political, and disciplinary divides.

Here we summarise MammalMAP's progress over the last 2 years, and measure it's relative success in amassing mammal distribution records within and beyond protected areas. We also examine the extent to which citizen scientists have contributed to the geographic and taxonomic spread of the data and use this to determine the value of involving non-specialists in biodiversity conservation efforts.

Prey preferences of Africa's large predators: what we know and what the future holds

Matt Hayward¹²³, Graham Kerley², Michael Somers³, Lourens Swanepoel³ & Craig Tambling²

¹ *School of Environment, Natural Resources and Geography & School of Biological Science, Bangor University, U.K.*

² *Centre for African Conservation Ecology, Nelson Mandela Metropolitan University, Port Elizabeth*

³ *Centre for Wildlife Management, University of Pretoria, Pretoria*

Presenter: Matt Hayward. School of Environment, Natural Resources and Geography & School of Biological Science, Bangor University, U.K. & Centre for African Conservation Ecology, Nelson Mandela Metropolitan University, Port Elizabeth
+44(0) 1248 383642; m.hayward@bangor.ac.uk

A question by the manager of Addo Elephant National Park has led to a series of papers that originally aimed to determine what the park's reintroduced lions would feed on.

Via a series of meta-analytical studies that obtained data on relative abundance of prey, and predator diet, from the published literature, we have identified the species Africa's large predators optimally forage upon (preferred prey species assessed via Jacob's electivity index), which led to an ability to predict their diet and carrying capacity. We have extended this work to predators on other continents and so far the results highlight the tight evolutionary relationship between preferred prey and their predators. For example, tigers evolved soon after the cervids and today still show preference for the largest of these within their range (red deer or sambar). Despite the Holarctic distribution of wolves and the separation of populations since the last glacial maximum, they only significantly prefer red deer/elk. Snow leopard inhabit one of the most resource scarce environment and optimal foraging theory predicts they would be less likely to exhibit prey preferences, however they significantly prefer blue sheep and Siberian ibex.

We conclude by highlighting what these studies can tell us about optimal foraging among Africa's large predators.

Benefit sharing through human capital development in the Kruger National Park: The Skukuza Science Leadership Initiative

Karen J. Vickers^{1,2}, L.M. Kruger^{1,2} & N. King¹

¹*The Nsasani Trust, PO Box 33, Skukuza, South Africa*

²*The Organization for Tropical Studies, PO Box 33, Skukuza, South Africa*

Presenter: Karen Vickers, Nsasani Trust, PO Box 33, Skukuza 1350, South Africa
(079) 311 4778; vickerskaren@hotmail.com

Increasingly, the value of biodiversity is understood as the relationship between the provision of ecosystem services and human well-being. While previously, protected areas (PAs) were perceived as islands of pristine nature in a sea of human impact, current paradigms recognise that benefits of PAs can and must stretch beyond their borders and be shared across many stakeholders. This calls for an increasingly diverse portfolio of management and land-use strategies both within and alongside PAs.

While benefit sharing of environmental and cultural services like tourism are popular strategies, less tangible are the benefits PAs can provide through knowledge services - both the scientific and educational services gained through the study of ecosystems. These are imperative for our ability to adequately conserve ecosystem functions, not just for scientists, but for the broader public who's buy-in to various conservation strategies are critical to conservation success. The Kruger National Park (KNP) currently has some 300 registered scientific projects largely linked to tertiary institutions, as well as numerous higher-level education programmes that visit the Park. However, to date the benefits of experiential learning in nature have not been adequately shared with the communities beyond KNP's borders. In recognition, the Nsasani Trust,

SANParks and the Organization for Tropical Studies are embarking on a new science leadership and education initiative in the KNP. The initiative, discussed in this presentation, aims to link neighboring communities, the broader South African public, scientists and PA managers to ensure the transfer of knowledge, and environmental management skills amongst all stakeholders.

Can citizen science photographic surveys be effective in monitoring large carnivores outside protected areas? A case study from the Waterberg Biosphere, Limpopo

Kelly Marnewick^{1,2} & Michelle Thorn^{1,2}

¹*Carnivore Conservation Programme, Endangered Wildlife Trust, Modderfontein, Johannesburg, Gauteng*

²*Centre for Wildlife Management, University of Pretoria, Pretoria*

Presenter: Kelly Marnewick, Carnivore Conservation Programme, Endangered Wildlife Trust, P/Bag X11,
Modderfontein, Johannesburg 1645
(082) 477 4470; kellym@ewt.org.za / kellymarnewick@gmail.com

The Waterberg Biosphere Reserve in Limpopo, although not formally protected, is home to all members of South Africa's large carnivore guild, which roam freely on privately owned cattle and wildlife ranches where human-carnivore conflict frequently occurs. Little is known about the status of this carnivore assemblage because the large size of the area and the private ownership of land make carnivore surveys difficult to conduct.

Here we investigate the possibility of using a citizen science photographic contest to survey large carnivores. The contest ran from 30 May 2012-30 April 2013 and was advertised extensively using posters, electronic mailers and social media. Entries were received electronically and drop boxes were provided in large grocery stores for CD entries. The response rate was lower than expected with 46 entries received. Entries included photographs and video clips taken using handheld cameras and camera traps. The main species represented included: leopard *Panthera pardus* (37% of entries), African wild dog *Lycaon pictus* (24%), brown hyaena *Hyaena brunnea* (13%) and cheetah *Acinonyx jubatus* (9%). The confirmation of breeding in spotted hyaenas was unexpected and added to our knowledge of this species in the study area. This survey was cheap to run (<ZAR 5000) and not labour intensive, but methods to increase the response rates need to be found.

The data will be examined to determine applicability for various statistical methodologies including occupancy modelling. To our knowledge, this is the first attempt to run a citizen science photographic survey outside of a protected area in South Africa.

Quantifying the internet pet trade in indigenous reptiles

Zwelakhe Zondi & Michèle F. Pfab

South African National Biodiversity Institute, SANBI, Pretoria, South Africa

Presenter: Zwelakhe Zondi, South African National Biodiversity Institute, 2 Cussonia Ave, Brummeria, Pretoria 0001

(012) 843 5025 / 0810476669; z.zondi@sanbi.org.za

Wildlife trade is estimated to be a multi-million Rand industry, with both live specimens, and plant and animal products traded. The growth and success of the industry is enhanced by the growing interest in internet marketing, where both legal and illegal trade operates with ease. Wild populations of reptiles worldwide are threatened due to commercial exploitation in the pet trade. A growing number of internet-based vendors offer competing price ranges for their products; therefore pet keepers are now able to purchase a variety of reptile species through internet suppliers. While a proportion of these reptiles are captive-bred, some may be collected from the wild.

In this study we investigate the internet pet trade in indigenous reptile species, with particular emphasis on retail price, specimen origin and life stage, as well as species legislative status and conservation status based on the IUCN Red List system. The participating countries and ease of trade within these countries will also be investigated. A comparative quantitative study between legally harvested and exported CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) and TOPS (listed as threatened or protected in terms of the Environmental Management: Biodiversity Act) species and those traded on the internet will also be conducted. The presentation will summarize results of analyses undertaken to date.

INVITED THEME PRESENTATION

Integrating biodiversity planning, management and protected area benefits through bioregional approaches in the K2C biosphere

Marisa Coetzee¹, Freek Venter², Harry Biggs² & Peter Novellie³

¹*Association for Water and Rural Development, Hoedspruit, South Africa*

²*SANParks, Conservation Services, Skukuza, South Africa*

³*SANParks, Park Planning and Management, Pretoria, South Africa*

Presenter: Marisa Coetzee, Association for Water and Rural Development, PO Box 1919, Hoedspruit 1380
(013) 793 0503 / (082) 739 3650; marisa@award.org.za

Initiatives such as the UNESCO Kruger to Canyons Biosphere, and other bioregional programs and including the central Kruger National Park, have laid a solid foundation towards a more sustainable regional land use mosaic. The Man and Biosphere Program serves as mechanism to improve the synergy between people and their environment, particularly by promoting integrated bioregional planning and appropriate governance. Functions of the K2C BR include developing and maintaining effective governance and operational structures within the scope of the UNESCO's MaB program, and to implement and support projects demonstrating the reconciliation of biodiversity conservation and land-use, especially at bioregional level.

The K2C BR has provided the platform for increased stakeholder cohesion and willingness to collaborate around an integrative framework. Existing initiatives within this framework have helped form a solid basis for major multi-sectoral bioregional programs such as the Global Environmental Facility Protected Area and Mainstreaming Programs, GEF Small Grants Program, and USAID Programs. These bioregional programs integrate various activity levels, emphasise protected and buffer area enhancement, mainstream biodiversity-friendly land use, and promote resilience in catchment management, in this way providing a major opportunity to integrate land use management, improved livelihoods and resilient local economic development.

This talk will report on how such a bioregional framework provides the mechanism for integrated planning, management, and governance feedback loops at different levels. This includes reference to participation in the Comprehensive Rural Development Program, and informing relevant Strategies and institutional processes. Central to this bundle of concepts is a social-ecological approach.

Using social network analysis to disrupt trans-boundary wildlife trafficking criminal networks

Timothy C. Haas¹ & Sam M. Ferreira²

¹ *Lubar School of Business, University of Wisconsin-Milwaukee*

² *Scientific Services, SANParks, Skukuza*

Presenter: Timothy C. Haas, Lubar School of Business, University of Wisconsin-Milwaukee, P. O. Box 742, Milwaukee, WI 53201, United States
(414) 229-4360; haas@uwm.edu

A key threat to the survival of many species is poaching within protected areas. Traditional anti-poaching symptomatic responses have limited successes, partly because of organized crime. Middlemen in such criminal networks typically hire poachers residing in areas that abut reserves, while tradesmen to end-users are far removed from protected areas. As part of integrated approaches, criminal networks need to be disrupted through cooperative efforts both within and beyond protected areas.

Similar to terrorist networks, criminals pursuing illegal trade in wildlife form social networks. These networks are composed of *players*. Each player belongs to a group and some, called *key players*, are either in positions of influence or control the flow of information in the network. Loss of key players compromises network resilience and function. A typical rhino horn trafficking network comprises poachers, first-tier and second-tier middlemen. Social network analysis allows disruption by reconstructing the network from data on messages passed between players followed by the identification of key players based on *network centrality measures*. These key players are subsequently detained by law enforcement personnel.

We illustrate the application to a rhino horn trafficking network identified from a censored limited set of communication events between players. Maximum likelihood is used to reconstruct the actual network from this data.

We use our results to recommend complimentary approaches to existing approaches directed at collapsing rhino horn trafficking criminal networks and illustrate that social network analyses could be key elements in dealing with human threats to conservation values within and beyond protected areas.

Knowing and learning together: informal, local and traditional knowledge and adaptive co-management of protected areas

Christo Fabricius¹, B. Currie¹ & A. Vlok¹

¹ *NMMU Sustainability Research Unit, Saasveld, P/Bag X 6531, George 6530*

Presenter: NMMU Sustainability Research Unit, Saasveld, P/Bag X 6531, George, 6530
(044) 801 5111; christo.fabricius@nmmu.ac.za

Protected areas can be conceptualized as complex adaptive systems, with feedbacks between social and ecological processes inside and outside their boundaries. Understanding and managing these feedbacks requires as much information and knowledge as possible. Protected area managers on their own are seldom able to collect and process the full array of information required to adaptively manage protected areas, especially in the context of the broader social-ecological landscape. In that sense informal, local and

traditional knowledge can be valuable in providing supplemental or even core information required to make complex management decisions. Involvement of local knowledge holders may also assist in building bridges between protected area managers and local stakeholders, and ignoring local knowledge often leads to conflict with subsequent demands on precious human and financial resources.

In this presentation we provide a conceptual framework for the role of knowledge, learning and co-innovation in adaptive co-management. We provide examples of informal, local and traditional knowledge and its relevance for biodiversity conservation and protected area management, and of the lost opportunities and conflicts that come to the fore when such knowledge is ignored. We also discuss some of the pitfalls and share ideas of processes and methods that may promote the better use of informal, local and traditional knowledge in adaptive co-management of protected areas.

Legal tools for promoting Connectivity Conservation: as seen through the lens of the Baviaanskloof Mega-Reserve

Nick J. Fordyce¹

¹Institute of Marine and Environmental Law, University of Cape Town, Rondebosch, Cape Town, S.A.

Presenter: Nicholas Fordyce, 22 Clifton Road, Little Mowbray, Cape Town 7700
072) 261 2551; nick.fordyce@gmail.com

South Africa's incredibly rich biological diversity is increasingly being lost or threatened as a consequence of development induced habitat degradation and urban sprawl, fragmentation of natural landscapes and the influence of global climate change.

For the past four decades scientists have called for the creation of broad 'ecological networks' in which natural areas, which have varying degrees of legal protection, are functionally linked through a range of corridors, sustainable use zones and buffer zones. More recently, governments across the world have embraced the notion of 'connectivity conservation' and have given the concept significant recognition through various international agreements such as the Convention on Biological Diversity (CBD), the World Parks Congresses (IUCN WPC), the Convention on Migratory Species (CMS), Ramsar and the World Heritage Convention (WHC). Whilst South African environmental law does not call for the implementation of connectivity initiatives directly, it does, nonetheless, have a number of indirect tools within its environmental legal framework which can be used to promote connectivity conservation.

This report analyses which tools (for implementing connectivity initiatives) are available and used, which are available and unused and which are missing. This will be achieved by assessing how the National Biodiversity Strategy and Action Plan, the National Biodiversity Framework and the National Spatial Biodiversity Assessment, as well as the relevant sustainable use, conservation, biodiversity, land-use and coastal management legislation is applied in the case of the Baviaanskloof Mega-Reserve, a connectivity initiative within the Eastern Cape Province of South Africa.

Ecosystem services, conservation and perceptions of the Wakkerstroom Wetland, South Africa

Laura Danga¹, Jane Olwoch²

¹ *Centre for Environmental Studies, University of Pretoria, South Africa*

² *South African National Space Agency- Earth Observation, Pretoria, South Africa*

Presenter: Laura Danga Centre for Environmental Studies University of Pretoria P.Bag X20, Hatfield 0028, Pretoria
dangalaura@gmail.com

Ecosystem services derived from wetlands provide productive natural assets. Their conservation is regarded as a way of promoting wise-use, by providing prolonged and additional services to wetland communities. However, wetland ecosystems are rapidly declining due to human encroachment from resource harvesting and agricultural activities. The situation is no exception to the Wakkerstroom wetland of South Africa.

This study aims to assess the wetland ecosystem services that directly benefit the local community, determine the current management practices on wetland and understand the perception of wetland resource use and conservation strategies by the local community. The study primarily utilized Water Research Council Water Education Tools (WET-Ecoservices and WET-Health) to identify beneficial ecosystem services and current conservation status of the wetland. A secondary and local area study through a questionnaire survey was carried out on 50 individuals to validate the WET analyses.

Perceptions of benefits derived from the wetland, causes of degradation, and ways to improve the situation were assessed. WET-Ecoservices showed that the wetland provided reeds for harvesting, arable land in the wetland favourable for the cultivation of foods, pastures for cattle grazing and a birdlife refuge by the wetland; it also provided tourism opportunities. However, WET-Health showed deterioration in the hydrology, geomorphology and vegetation health status of the wetland mainly due to poor cropping methods and uncontrolled cattle grazing within the wetland. Sixty four percent of the respondents mentioned that ecosystem services were beneficial. While 75% of the respondents perceived the ecosystem to be degrading. Poor cropping methods, uncontrolled grazing of cattle within the wetland reserve and unplanned burning of the wetland to improve grazing destroyed the ecosystem, were identified as the main causes of such degradation.

In order to arrest the continued degradation resulting from flaws by local conservation practices, adaptive co-management is recommended to conserve this ecosystem in a more sustainable way.

Epidemiology of dog rabies at a wildlife interface in the South African lowveld: Assessing the risk to wildlife through spatial analysis

Michael R. Grover¹, Jacques van Rooyen² & D. Knobel²

¹*Sabi Sand Wildtuin, Skukuza, Mpumalanga, South Africa*

²*Department of Veterinary Tropical Diseases, Faculty of Veterinary Science, University of Pretoria,
Onderstepoort, South Africa*

Presenter: Michael Grover, Ecological Officer Sabi Sand Wildtuin
(013) 735 5102 / (078) 804 0347; gis@sabisand.co.za

Rabies is a disease of mammals, caused by lethal neurotropic infection with members of the *Lyssavirus* genus. Species affected by the disease are broad, but rabies cycles in Africa are sustained particularly by canine species (family *Canidae*). Canine rabies entered the study area in 2008, with phylogenetic analysis indicating that the virus originated from Swaziland.

The study site, a private reserve on the western boundary of the Greater Limpopo Transfrontier Park has a high density of human settlements on its boundary. Fences are continuously maintained and patrolled yet to date 203 stray dogs (63% of which tested positive for rabies) have been destroyed inside the reserve. Dogs are not limited to the reserve edges and have been documented up to 23 km inside the reserve. Known contacts with predators have taken place and there is a concern of possible rabies outbreaks in wildlife.

Spatial data were collated from previous samples. Additional data such as fence entry points, distances travelled by dogs inside and outside the reserves and time spent inside the reserve before being destroyed are also recorded. Data capture is done using mobile phone apps, creating spatial patterns of dog behaviour inside reserves that can be correlated with rabies infection status. Contact with wildlife is documented and home ranges of known predators, using sightings-based interactive maps, allows for contact hot spots to be identified. Management decisions of intervention can then be made to reduce the risk of contact, and to apply vaccination of high risk species and individuals.

Societal expectations of protected area management and effectiveness in Western Cape provincial nature reserves

Lee Saul¹ & Coral Birss¹

¹*CapeNature, Scientific Services, Stellenbosch*

Presenter: Natalie Hayward, CapeNature Scientific Services, Private Bag X5014, Stellenbosch 7599
(021) 866 8037; nhayward@capenature.co.za

The achievement of specific biodiversity conservation objectives of Protected Areas is aligned with national commitments in terms of the Convention on Biodiversity and is guided by legislation (Regulations for the Proper Administration of Nature Reserve, the Norms and Standards for Management of Protected Areas, Protected Area in term of the National Environmental Management: Protected Areas Act etc.) This framework provides for the establishment and enablement of various processes, reporting and accounting obligations specifically the reporting of Management Effectiveness of South Africa's Protected Areas. These legislative and accounting frameworks are intended to develop and integrate perceptions to promote effective protected area management.

The alignment of the legislative framework and an understanding of the role of each protected area, the network of protected areas, and the provincial conservation mandates require thorough consideration of how these different mechanisms influence and are intended to guide the formulation, implementation and measurement of effectiveness at protected area level.

This presentation will provide an outline of the statutory and legislative requirement and their integration into the formulation of protected area planning products, formulated for presentation and engagement with different societal spheres in relation to protected area management.

The use of social media platforms to monitor African wild dog movements and population patterns in the greater Kruger National Park

Grant Beverley¹, Kelly Marnewick^{1,2} & Harriet T. Davies-Mostert¹

¹ *Endangered Wildlife Trust, Private Bag x11, Modderfontein, Gauteng*

² *Centre for Wildlife Management, University of Pretoria, Pretoria*

Presenter: Grant Beverley, Endangered Wildlife Trust, Private Bag x11, Modderfontein 1645,
Johannesburg
(071) 470 7112; grantb@ewt.og.za

Citizen science projects are becoming increasingly popular and valuable for monitoring wildlife populations. Photographic surveys are particularly useful in areas with high tourist volumes and for species that can be uniquely identified by individuals, either through pelage patterns, or other physical characteristics. African wild dogs in the Kruger National Park, South Africa, have been monitored in this way since 1989, with five-yearly photographic competitions promoting participation.

With the development of smart phones and affordable, portable internet access, social media platforms that encourage members of the public to submit sighting information, are becoming popular safari accessories for many tourists. As part of the monitoring programme for wild dogs in the Kruger National Park a Twitter account with the handle @KNPwilddogs was set up to gather data on wild dog sightings from tourists and tour operators. Sightings from the Twitter account were collated, geo-referenced and the reported pack structure recorded in a database.

These data were compared to results from conventional focal monitoring techniques, conducted by field biologists, to determine if social media feeds can be effective in monitoring wild dog range size and broad-scale changes in population dynamics. Social media platforms offer the opportunity to obtain a large amount of data at relatively low cost and effort but their accuracy needs to be evaluated and the Kruger system provides an ideal opportunity to do so.

Mistbelt plant communities of the Soutpansberg Centre of Endemism as a basis for ecosystem conservation and management

Theodorus H.C. Mostert¹ & Rachel E. Mostert¹

¹*Botany Department, University of Zululand, KwaDlangezwa, KwaZulu-Natal, South Africa*

Presenter: Theo Mostert, Botany Department, University of Zululand, KwaDlangezwa, KwaZulu-Natal
(035) 902 6114 / 082 783 9801; MostertT@unizulu.ac.za

Effective conservation of biodiversity is becoming more urgent as human pressures on natural resources and the remaining natural ecosystems escalate. By focussing our conservation efforts on biodiversity hotspots and centres of endemism, we increase the number of species protected, while limiting the amount of land needed to do so. The Soutpansberg Centre of Endemism and Centre of Biodiversity fulfil these criteria exceptionally well. Due to the high suitability of vegetation to act as surrogate for underlying ecosystems, the plant communities of the Soutpansberg Conservancy and Blouberg Nature Reserve were identified and described.

This presentation focuses on the mistbelt plant communities with high numbers of species, many of which are endemic and near-endemic to the region. Vegetation data were collected in the form of 99 Braun-Blanquet floristic-sociological sample plots, accompanied by qualitative environmental data for each plot. Two major vegetation types, containing eight plant communities were identified and described using the Modified Twinspan numerical classification algorithm, namely *Rhus rigida* var. *rigida*–*Rhus magalismontanum* subsp. *coddii* cool mistbelt major vegetation type, *Vitex rehmannii*–*Syzygium legatti* low thickets and bush clumps, *Heteropyxis natalensis*–*Combretum molle* low thickets and bush clumps, *Protea caffra*–*Setaria sphacelata* var. *torta* low closed grassland, *Cyperus albostratus*–*Pennisetum glaucocladum* wetlands and peatlands, *Ocotea kenyensis*–*Xymalos monospora* forest major vegetation type, *Acacia ataxacantha*–*Rhus chirindensis* early regrowth forest, *Rapanea melanophloeos*–*Rhus chirindensis* advanced regrowth forest, *Ocotea kenyensis*–*Xymalos monospora* mature forest, *Diospyros whyteana*–*Widdringtonia nudiflora* quartzite cliff forest.

Primary environmental factors driving the floristic composition and structure of the various plant communities were identified by conducting an indirect gradient analysis using a correspondence analysis ordination. Each plant community was further evaluated in terms of its suitability as preferred habitat for plant species of high conservation value. Some conservation concerns associated with the various ecosystems underlying the identified plant communities are discussed.

Applicability of age-based hunting regulations for African leopards

Guy A. Balme^{1,2}, Luke T. B. Hunter¹ & Alex R. Braczkowski³

¹*Panthera, New York, United States of America*

²*Department of Biological Sciences, University of Cape Town, Cape Town, South Africa*

³*Department of Zoology, University of Oxford, Oxford, United Kingdom*

Presenter: Guy Balme, Panthera, 13 Orchard Ave, Lakeside, Cape Town, 7945
082 694 3083; gbalme@panthera.org

Trophy hunting can generate substantial financial returns, which may foster tolerance towards large carnivores and enhance their conservation outside protected areas. However, in species in which juvenile

survival depends strongly on male tenure, excessive trophy hunting can artificially elevate infanticide, potentially to unsustainable levels. Simulation models show that safe harvests can be assured by restricting offtakes to males old enough to have successfully reared their first cohort of offspring; in the case of leopards, ≥ 7 years old.

Here we explore the applicability of an age-based approach for regulating trophy hunting of leopards. We conducted a structured survey comprising photographs of known-age leopards to assess the ability of wildlife practitioners to sex and age leopards. We also evaluated the utility of four phenotypic traits that could be used to age male leopards in the field. Our logistic regression models showed that male leopard age affected the sexing ability of survey respondents; notably, males < 2 years were typically misidentified as females, while mature males (≥ 4 years) were sexed correctly. Mature male leopards were also more likely to be aged correctly, as were portrait photographs. A discriminant model including dewlap size, the condition of the ears, and the extent of facial scarring accurately discriminated among male leopard age classes. Model classification rates were considerably higher than the respective scores attained by survey respondents, implying that the aging ability of hunters could theoretically improve with appropriate training.

Our study demonstrated that an age-based hunting approach is practically applicable for leopards, though it would require major reform within the regulatory framework and hunting industry.

Financing biodiversity conservation beyond protected areas - *The Game Reserve* wine brand, an innovative approach towards sustainability

Mossie J.C. Basson

Conservation Manager, Graham Beck Wines, Robertson

Presenter: Mossie Basson, PO Box724, Robertson

(082) 885 1670; mossie@grahambeckwines.co.za www.grahambeckwines.com

Sustainable environmental practices are an integral part of responsible environmental management. Funding conservation projects is challenging. *The Game Reserve* by Graham Beck Wines serves as an example of creating sustainable revenue streams to fund conservation, whilst at the same time creating a brand asset contributing to the Net Asset Value of the business.

The Game Reserve by Graham Beck is an innovative selection of ecologically inspired wines, sold globally in approximately 35 countries, that honours the environmental conservation practices introduced at Graham Beck Wines. Each cultivar features one of the many indigenous animals and plants found in the Graham Beck Private Nature Reserve on the winery's Robertson Estate. These wines tell a unique and compelling story of farming in harmony with nature, celebrating the splendid natural diversity of this remarkable, yet fragile region. The business model features a contribution to conservation for every bottle sold; ensuring that wine lovers across the globe can share in the pioneering environmental success story. The conservation initiatives and healthy farm practices are thus financed fully through sales.

The message is clear, buy this wine and be part of the drive to conserve biodiversity, for the next generation. This project embodies conservation dividends - the ability to generate funds on a sustainable basis to invest in projects that will result in long term environmental survival benefits.

Using social network analysis to increase the scale and efficiency of a National Red Listing project

Matt F. Child¹ & Harriet Davies-Mostert¹

¹*Endangered Wildlife Trust, Conservation Science Programme, Johannesburg, South Africa*

Presenter: Matt Child, Endangered Wildlife Trust, Building K2, Pinelands Office Block, Ardeer Road,
Modderfontein 1645

(011) 372 3600 / (072) 199 2454; matthewc@ewt.org.za

Red Listing relies on the recruitment of expert networks to pool information and to apply the Red List criteria to each subject species. Red Listing is a process that collates existing data, generates new data, catalyses research and increases inter-institutional collaboration. However, most Red Listing projects rely on top-down, *a priori* expert groups to drive the assessments. In this paper, we describe the use of a chain-referral technique to sample the full spectrum of mammal researchers in South Africa, that produced a map of expert skill set (assessor or reviewer), and dataset distribution for each mammal species. The results of the social network analysis will enable us to stage strategic network interventions to increase information flow between organisations, and to translate research into action by linking practitioners to relevant academic nodes and vice versa.

We suggest that a social network approach to National Red Listing improves conservation science by 1) increasing the efficiency of recruitment and participation rate of experts; 2) improving the transparency of work allocation by assigning roles based on willingness and number of recommendations; 3) providing early-career researchers opportunities to contribute to a major conservation project; and 4) identifying data deficiencies and research gaps on a national scale. We suggest that social network analysis should be applied to more conservation frameworks to enhance the on-ground effectiveness of information flow.

Determining the presence, levels, and distribution of pollutants in the Swartkops estuary, South Africa

Larize Nel¹, Henk Bouwman¹ & Nadine A. Strydom²

¹*School of Biological Science, North-West University, Potchefstroom, South Africa*

²*Department of Zoology, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa*

Presenter: Larize Nel, Dwarsstaat 31, Potchefstroom
(018) 299 2512 / (082) 554 3189; 21250642@nwu.ac.za

Estuaries are among the most productive and diverse of aquatic habitats supporting a rich variety of plants and animals. They are nursery areas for many species of fish harvested by recreational and subsistence anglers. A detailed toxicological study is underway in the urban Swartkops Estuary situated on the temperate southeast coast of South Africa. The aim of this study is to determine and interpret the presence, levels, and distribution of selected priority pollutants in the food web of the Swartkops Estuary.

Pollutant levels in various matrixes such as sediment, invertebrates, fish, and marine bird eggs will be assessed. The samples will be analysed for heavy metals, persistent organic pollutants (POPs, such as DDT and PCBs), and polycyclic aromatic hydrocarbons (PAHs). Samples will be collected in early spring from the Swartkops Estuary following standard methods. This period coincides with the peak fish abundance and bird breeding within the system

Because of continual exposure from direct discharges, pollutant concentrations are expected to be higher in those matrixes located in the lower and middle reaches of the estuary. Heavy metal analyses shows that the cadmium and lead levels for the collected fish samples were much higher than the quality guidelines set by the Canadian Quality Guidelines. Sediment levels are also much higher than that of previous studies. Further analyses on PAHs still await and the Laboratory of Environmental Toxicology at the Norwegian School of Veterinary Science, Oslo, Norway will be used for detailed analysis of pollutants.

The levels will be compared with literature and threats assessed (including impact on the reproduction of the animals concerned, or human dietary intake), based on exceedances of norms, if any are detected.

INVITED THEME PRESENTATION

Effective conservation of large herbivore biodiversity in Africa: the need for a general framework of functional seasonal resources

Richard W.S. Fynn¹ and Norman Owen-Smith²

¹*Okavango Research Institute, University of Botswana, Maun, Botswana*

²*Centre for African Ecology, School of Animal, Plant and Environmental Sciences, University of Witwatersrand, South Africa*

Presenter: Richard Fynn, Okavango Research Institute, University of Botswana, Private Bag 285, Maun, Botswana
rfynn@ori.ub.bw

Effective conservation of large herbivore biodiversity requires an understanding of the functional heterogeneity/diversity of seasonal habitats and resources needed to enable various large herbivore species to adapt spatially to large temporal variation in resource availability (energy, nutrients and water), and to variation in their own resource demands, while minimizing the risk of predation. Adaptation to high demands for energy and nutrients during the period of pregnancy and lactation requires acquisition of high-quality resources. High-quality resources consist of easily digestible forage with high concentrations of energy, protein and minerals particularly Ca, Na and P. For grazers with wide mouths relative to their body size, short grasses with high leaf to stem ratios and high leaf density, which facilitate high bite size of digestible green leaf, are typical high-quality resources, whereas for grazers with relatively narrow mouths individual green leaves on taller grasses are typical high-quality resources.

For browsers certain leafy leguminous forb species often provide the highest quality forage. Owing to their preferred nature and location in less productive habitats, high-quality resources are quickly depleted and maintenance of a consistent intake of energy and nutrients over most of the annual cycle is generally achieved by access to appropriate staple resources, while adaptation to reduced resource quantity and quality over the dry season is achieved by access to reserve and bridging resources. During drought years the lowest quality components of the forage base, generally left uneaten in most years, provides a buffer or key resource that stabilizes population dynamics.

In general, reserve, bridging and buffer resources occur in more productive habitats and are, therefore, coarser in nature but more reliable in forage production than high-quality resources with staple resources being intermediate between these classes. For grazers, bridging resources are created by dry-season fires in various wetland types and floodplains, which stimulate a bridge of green regrowth over the dry season, while less preferred deciduous trees that sprout new leaves (only palatable when newly emerged) over the

dry season provide a bridge of green forage for browsers. These resource types are generic in that they are functionally relevant to all grazing and browsing herbivores and, therefore, provide a general framework for organizing our understanding and modeling of herbivore adaptive foraging strategies over the annual cycle. For a specific application of this generic resource framework to the conservation of a wide variety of African herbivore species, the framework must be linked to our understanding of how mouth part, digestive anatomy and body size influence herbivore perceptions of these generic resources and of predation risk. This knowledge can then be used to assess and conserve appropriate functional heterogeneity of habitats in conservation areas.

Moreover, this framework enables us to understand how to apply ecosystem engineering inputs (e.g. through livestock management) that manipulate and enhance functional heterogeneity, especially in regions where wildlife numbers and their associated impacts have declined or where certain rare species are being specifically targeted by management.

Microsatellite analysis provides insights into the genetic structuring of the Cape Parrot (*Poicephalus robustus*)

W.G. (Riël) Coetzer¹, Mike R. Perrin¹, Colleen T. Downs¹ and Sandi Willows-Munro¹

¹ *School of Life Sciences, University of KwaZulu-Natal, Pietermaritzburg*

Presenter: W.G. (Riël) Coetzer, School of Life Sciences, University of KwaZulu-Natal, Rabie Saunders Bldg, Scottsville, Pietermaritzburg 3209
coetzerwg@outlook.com

The Cape Parrot (*Poicephalus robustus*) is rare and endemic to South Africa. There are 1600 Cape Parrots in the wild. The loss of habitat is a major factor influencing its abundance. Habitat fragmentation and population isolation lead to diminished levels of gene flow between subpopulations. Reduced genetic variation and inbreeding within subpopulations can result from insufficient gene flow among disjunct populations. Inbreeding leads to decreased individual and population fitness, which can have severe negative effects on breeding success. The phylogenetic analysis of the subpopulations provides insights into the genetic structuring within the population, and the presence of low genetic variation / inbreeding.

The genetic structure of the population was evaluated using nuclear microsatellite data. Samples were sourced from wild caught, captive and museum specimens covering their natural distribution. The genetic variation within the subpopulations were estimated by calculating the allele frequencies, the number of alleles per locus, observed heterozygosity (H_O) and expected heterozygosity (H_E) for each subpopulation. Obtained F_{ST} values indicated the level of genetic variation between the different subpopulations.

An Analysis of Molecular Variance (AMOVA) was used to estimate 'among' and 'within' population variation and the level of gene flow between the various subpopulations were investigated using the Coalescence-based methods. Elevated levels of genetic variation were detected within the natural Cape Parrot population. The results aid conservation management authorities in establishing protocols to conserve the Cape Parrot.

Conservation status, distribution and species richness of small carnivores in Africa

Emmanuel Do Linh San¹, A.W. Ferguson², J.L. Belant³, J. Schipper^{4,5}, M. Hoffmann^{4,6}, P. Gaubert⁷, F.M. Angelici⁸ & M.J. Somers^{9,10}

¹*Department of Zoology and Entomology, University of Fort Hare, Alice, South Africa*

²*Department of Biological Sciences, Texas Tech University, Lubbock, USA*

³*Carnivore Ecology Laboratory, Forest and Wildlife Research Centre, Mississippi State University, Mississippi State, USA.*

⁴*IUCN Species Programme, IUCN, Gland, Switzerland*

⁵*IUCN/SSC-CI/CABS Biodiversity Assessment Unit, c/o Centre for Applied Biodiversity Science, Conservation International, Arlington, USA*

⁶*IUCN Species Survival Commission, c/o United Nations Environment Programme - World Conservation Monitoring Centre, Cambridge, UK*

⁷*Muséum National d'Histoire Naturelle, UMR BOREA IRD 207, Paris, France*

⁸*Via Cleonia 30, Rome, Italy*

⁹*Centre for Wildlife Management, University of Pretoria, Pretoria, South Africa*

¹⁰*Centre for Invasion Biology, University of Pretoria, Pretoria, South Africa*

Presenter: Emmanuel Do Linh San, Department of Zoology and Entomology, University of Fort Hare, Private Bag X1314, Alice 5700

(040) 6022601 / (073) 0658717; emmanuel.dolinhсан@gmail.com

We assessed the global conservation status of small carnivores in continental Africa based on the *IUCN Red List of Threatened Species*. African small carnivores represent about 31–34% of the extant small carnivores worldwide. Familial diversity is intermediate, with four of the world's nine families represented (Herpestidae: 47% of mainland African species; Mustelidae: 20%; Nandiniidae: 2%; and Viverridae: 31%).

Greatest species richness is in equatorial Africa, although most sub-Saharan countries host at least 15 species (out of a maximum of 27). Of the 55 small carnivore species found in mainland Africa, 52 (95%) are predominantly distributed in Africa and 48 (87%) are endemic. In terms of conservation status, 44 species are Least Concern (LC), three are Near Threatened (NT), four are Vulnerable (VU) and five are Data Deficient (DD).

For data-sufficient small carnivore species, 8% were considered threatened (all VU), primarily a result of population declines and small distribution ranges. The exact percentage of threatened species is unknown, but is between 7% (if no DD species are threatened) and 16% (if all are). Population trends are adjudged unknown for 46% of the species, while 27% are stable and 27% are decreasing.

Compared with mammals worldwide, the overall conservation status of small carnivores in Africa is relatively favourable. However, declining populations of many species and existing and new threats hint that additional small carnivore species may become threatened unless effective conservation strategies are implemented. This is of prime importance considering the high percentage of endemic small carnivore species in mainland Africa.

Demographic responses to the restoration of landscape heterogeneity: a case study for the elephants in the Kruger National Park

Ashley S. Robson¹ & Rudi J. Van Aarde¹

¹*Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, S.A.*

Presenter: Ashley Robson, Conservation Ecology Research Unit, Department of Zoology and Entomology,
University of Pretoria, Private Bag X20, Hatfield 0028
(012) 420 5422 / (084) 870 6026; asrobson@zoology.up.ac.za

Management approaches that focus on landscapes rather than species aim to restore structural heterogeneity. The resulting variability in habitat and resource availability can structure populations into sub-units with different demographic characteristics. Collectively the sub-units may provide for regional stability.

The Kruger National Park's present management strategy provides its savannah elephant population opportunity to respond to prevailing ecological conditions. The cessation of culling in 1995, the closure of nearly two thirds of artificial water points and the removal of some fences include management measures that could restructure the elephant population and alter population growth, fecundity, survival and dispersal rates.

Analysis of spatially explicit census and demographic data suggest that elephant population dynamics varied across the districts and habitats of the park, as well as between years. Reproductive and age specific survival rates differed locally, possibly in response to spatio-temporal variability in resources and density. Density-dependent dispersal resulted in the increased utilisation of inferior habitats, which may have demographic consequences. Furthermore, apparent density-dependent regulation at a regional level suggests that the population may be stabilising as a result of local processes. Our findings suggest that landscape-based management may be effective in limiting Kruger's elephant population.

Genetic diversity and population structure of the endangered Ripon Barbel, *Barbus altianalis* (Boulenger, 1900) in the Lake Victoria catchment, Kenya based on mitochondrial DNA sequences

Romulus Abila¹, E.J. Chemoiwa^{2,3}, A. Macdonald³, J. Lamb³, E. Njenga², J.E. Barasa⁴

¹*Department of Fisheries Management and Aquaculture Technology, South Eastern Kenya University, P.O. Box 170 – 90200 Kitui, Kenya*

² *Department of Biological Sciences, University of Eldoret. P.O. Box 1125-30100, Eldoret – Kenya*

³*School of Life Sciences, University of Kwa-Zulu Natal, University Road, Westville, KwaZulu Natal 3630,*

⁴*Dept of Fisheries and Aquatic Sciences, University of Eldoret, P.O. Box 1125-30100 Eldoret, Kenya*

Presenter: Romulus Abila, Department of Fisheries Management and Aquaculture Technology, South Eastern Kenya University, P.O. Box 170 – 90200 Kitui, Kenya
+254 720944 099; abilaowino@gmail.com / romulus.abila@seku.ac.ke

The ichthyofauna of the Lake Victoria ecosystem contains some of the most globally threatened biodiversity as a result of anthropogenic and other ecological impacts. 850bp of the mitochondrial DNA (mtDNA) D-Loop was used to assess genetic diversity, population structure and demographic expansion of

the endangered cyprinid *Barbus altianalis*, a species known to be potamodromous in Lake Victoria drainage.

From 196 samples from the rivers Nzoia, Yala, Nyando and Sondu – Miriu, the four main rivers draining the Lake Victoria catchment 49 mitochondrial DNA haplotypes were found in the barbel. Of the mitochondrial diversity 83.7% was restricted to these respective rivers. Overall mean haplotype diversity was high (0.937 ± 0.008) and ranged between 0.566 in Sondu – Miriu to 0.944 in Nzoia while overall mean nucleotide diversity was low (0.013 ± 0.001) ranging between 0.0342 in Sondu – Miriu and 0.0267 in Nzoia. Population differentiation tests of the mtDNA were highly significant ($P \leq 0.001$) and revealed strong segregation of the four populations according to river basins. F_{ST} values for comparison of mtDNA among the four populations ranged from 0.052 to 0.443.

Neutral evolution and mismatch distribution analysis suggest that *B. altianalis* may have experienced a population expansion. The population differentiation as revealed by mtDNA and the high number of river specific haplotypes is too strong to be explained by recent anthropogenic impacts and suggests that the species has probably existed in the Lake Victoria catchment as two populations; the now 'extinct' migratory population and the extant river restricted non-migratory population. The decline of migratory populations created opportunities for population expansion. We suggest basin specific conservation and management to protect the existing populations.

A case study using Conservation Detection Dogs to survey for cheetahs in Liuwa Plains

Rox Brummer¹, M. Parker² and M. Becker³

¹Green Dogs Conservation, PO Box 215, Alldays, South Africa

²Working Dogs for Conservation, 52 Eustis Road, Three Forks, Montana 59752, USA

³Zambian Carnivore Programme, PO Box 80, Mfuwe, Eastern Province, Zambia

Presenter: Rox Brummer, Green Dogs Conservation, PO Box 215, Alldays, South Africa.
(072) 640 9388; rox@greendogsconservation.com

Cryptic carnivores living at very low densities are extremely difficult to survey using conventional survey techniques such as camera trapping and photographic identification. The Liuwa Plains area has very low tourist traffic (<400 visitors per year) and so cheetahs are very rarely seen and photographed there. We took two cheetah scat detection dogs in to survey the area and found 40 cheetah scats in a time period of 3 weeks when not a single cheetah was sighted. Quadrat transects of 1000m x 500m were searched at 90 degrees to the prevalent wind, with three quadrats randomly placed per 8m² grid squares.

Scats located enable the extraction of DNA and so mark-recapture can be carried out, among other analyses. Further to this, the detection of scats in a particular location gives evidence of a species using an area, as either residents or transients through areas. Scats were located in areas surveyed where there are no visual records of cheetahs occurring, which suggests that olfactory surveys can record species presence in areas where visual and camera surveys would record them as absent. The highest detection distance was 514m, which is far higher than a visual survey could hope to achieve. There was very high dung beetle activity at the time and we think that a cooler time of year would yield more data for the same effort.

Nutritional limitations for meeting economic objectives from buffalo in the Dry Highveld Grassland: a case study on Molemane Eye Nature Reserve, North West Province

Peter E Leitner¹ & Francesca Parrini²

¹ *Protected Area Management, North West Parks & Tourism Board, Province of the North West, South Africa*

² *Centre for African Ecology, School of Animal, Plant and Environmental Sciences, Faculty of Science, University of Witwatersrand, Johannesburg, South Africa*

Presenter: Peter Leitner, PO Box 21399, Protea Park, Rustenburg 0305
(082) 7815708; pleitner@nwptb.co.za

In 2004, Molemane Eye Nature Reserve was stocked with 46 disease-free buffalo with the intention of generating future revenues. The buffalo population however did not achieve the growth rate to sustain the projected income. The very poor body condition of the buffalo during the dry seasons pointed to the potential nutritional limitations of the forage available during the dry season and to the importance of key resource areas.

In this study, we analysed nitrogen (N) and phosphorus (P) content in faecal samples as proxy for buffalo nutritional status. In addition we determined the dry season vegetation type selection and identified key resource areas. We also assessed the availability of buffalo preferred vegetation types in an adjacent property to explore the possibility of reserve expansion.

We found N and P to be already below the buffalo minimum nutritional requirements during the early part of the dry seasons and to last up to five months (April to August). The buffalo narrowed their selection of vegetation types to those containing woody elements as the dry season progressed. The incorporation of the adjacent property is expected to have limited benefit to the buffalo as it will contribute < 5% to the buffalo key resource areas. Supplementary feeding is advised and future studies should investigate the potential competition between buffalo and some of the other herbivores in the reserve, in particular zebra.

INVITED THEME PRESENTATION

Herbivore assemblage changes in semi-arid savannas under future scenarios of increased woody cover

Izak P.J. Smit¹ & H.H.T. Prins²

¹ *Scientific Services, South African National Parks, Skukuza, South Africa*

² *Resource Ecology Group, Wageningen University, Wageningen, Netherlands*

Presenter: Izak Smit, Scientific Services, SANParks, Private Bag X402, Skukuza 1350
(013) 735 4257; izak.smit@sanparks.org

The wide range of tree:grass ratios characterizing savannas create conditions suitable for a wide range of biodiversity. Directional changes in this ratio will influence various patterns and processes. Based on projected climate change scenarios and rising CO₂ levels, it is predicted that woody cover may increase in future in semi-arid savannas, a pattern that has already been observed in some areas. However, currently little empirical evidence exists on how such changes in woody cover may affect the large mammal assemblage, herbaceous biomass and fire frequency and whether these changes would be linear or

threshold controlled. Using a “space-for-change” approach, we explored how the herbaceous biomass, fire frequency and densities of 13 large herbivore species change along an existing woody cover gradient in the Kruger National Park (KNP).

We will discuss how the large herbivore assemblage in KNP and similar semi-arid savannas are likely to change under predicted scenarios of woody densification, before exploring trends in historical data to determine whether such patterns may already be emergent in KNP. Understanding and predicting these changes have both biodiversity and socio-economic implications for protected areas and commercial game farms, and should be used to inform monitoring programmes and management approaches.

From Global to Regional Red Lists: Science-based frameworks for integrated conservation planning and action

Harriet T. Davies-Mostert¹ & Matt F. Child¹

¹Endangered Wildlife Trust's Conservation Science Unit, Johannesburg, South Africa

Presenter: Harriet Davies-Mostert, Endangered Wildlife Trust, Building K2, Pinelands Office Block, Ardeer Road, Modderfontein 1645
(011) 372 3600; harrieted@ewt.org.za

The IUCN's Global Red List of Threatened Species is widely recognised as the most comprehensive and objective tool for evaluating the conservation status of plants and animals around the globe. Trends in species status and threats inform and catalyse conservation action.

National and Regional Red Lists provide an opportunity to collect finer-scale population data, identify potentially important but localised threats to species, lay the foundation for regionally-specific prioritisation (for example, in South Africa, the list of Threatened or Protected Species), and measure national progress towards legislated and agreed-upon goals. They therefore form the backbone of national conservation policy, and in southern Africa this is particularly critical for land-use planning conducive to biodiversity conservation, including the development of wildlife-based economies. However, the Red List process is relatively resource-intensive, and requires detailed, current information on populations, distribution ranges and threats, as well as the necessary skills to apply the Red List criteria.

In this presentation, we discuss the importance of Red Listing for the region, and present a framework (proposed under the auspices of the IUCN Species Survival Commission's National Red List Working Group) for increasing the application of National Red Lists throughout Africa, through a process of capacity building and improved regional collaboration to collate the necessary data and conduct assessments. This will contribute to regionally-integrated monitoring of species' status and threats, more effective conservation action, and the measurement of regional conservation progress.

LandCare Areawide Planning conserving biodiversity beyond the boundaries of protected areas

Francis J. Steyn¹

¹*Western Cape Department of Agriculture, Elsenburg*

Presenter: Francis Steyn, Western Cape Department of Agriculture, Private Bag X1, Elsenburg 7607, S.A.
(021) 808 5090 / (082) 907 2813; franciss@elsenburg.com

The Department of Agriculture: Western Cape is committed to helping people conserve, improve, and sustain natural resources and the environment. LandCare Areawide planning is one of the modern methods used to conduct this assistance to farmers.

LandCare Areawide Planning is a comprehensive problem solving process that integrates social, economic and ecological concerns over defined geographical areas. This process strives to sustain and improve environmental health through a natural resource management approach that integrates locally driven initiatives.

Locally led conservation is a concept whereby local people lead the planning process based on locally identified needs. Local people determine the resource issues (i.e. problems and opportunities), define the geographic area that affects these issues, and implement a planning process that will help achieve the desired conditions. Agencies, programs, and others provide technical and financial resources to help solve those needs and implement solutions.

Elephant distribution in a transfrontier conservation landscape: Trade-offs between resource availability and human disturbance

S.A. Jeanetta Selier¹, **Bruce R. Page**¹, **Rob Slotow**¹ & **E. Di Minin**²

¹ *Amarula Elephant Research Programme, School of Life Sciences, University of KwaZulu-Natal, Durban*

² *Finnish Centre of Excellence in Metapopulation Biology, Department of Biosciences, University of Helsinki FI-00014, Finland*

Presenter: Jeanetta Selier, South African National Biodiversity Institute, P/Bag X101, Pretoria 0001
(012) 843 5000 / (083) 458 8063; tuli.elephants@gmail.com

Understanding factors that affect the persistence of charismatic megafauna in human-dominated landscapes is strategic to inform conservation decision-making and reduce conflict.

We assessed the effect of environmental and anthropogenic factors on the distribution of elephants (*Loxodonta africana*) in the Greater Mapungubwe Trans Frontier Conservation Area in southern Africa. We combined aerial counts over a 12 year period with 10 variables on food availability and landscape and anthropogenic variables in a logistic regression. Models were run for the entire landscape, as well as smaller management units with different land-use practices, including ecotourism, trophy hunting, and a combination of hunting and photographic tourism.

The results of all models showed that human activities, such as human population density, the use of electric fences, and hunting, negatively affected the distribution of elephants. The provisioning of water was also found to be an important variable affecting elephant distribution. When planning transboundary

conservation areas and corridors in human-dominated landscapes it is important to take anthropogenic factors and their effect on the movements and distribution of megafauna into consideration - in particular, where countries with diverging management strategies are involved.

Through a locally led effort, participants become knowledgeable about the logic used to identify problems and opportunities, the science behind the planning and the rationale for proposed solutions.

I will present case studies illustrating the success of this management method for the Nuwejaars River Special Management Area, The Koup, Simonsberg, Moutonshoek, Breede and Berg Rivers and the newest combination of farming and conservation communities in the approved formation of Sustainable Resource Management Committees that will govern, enlighten through environmental awareness, do forward planning and manage biodiversity beyond the boundaries of protected areas in the Western Cape.

Reconciling intensive use and genetic conservation of African catfish, *Clarias gariepinus* (Burchell 1822) from Lakes Victoria and Kanyaboli, Kenya

James E. Barasa¹, Romulus Abila², J. Paul Grobler³, G.O. Dangasuk⁴, M.N. Njehira⁵ and B. Kaunda-Arara¹

¹Department of Fisheries and Aquatic Sciences, University of Eldoret, Eldoret, Kenya

²Department of Fisheries Management and Aquaculture Technology, South Eastern Kenya University, Kitui, Kenya

³Department of Genetics, University of the Free State, Bloemfontein, South Africa

⁴Department of Biological Sciences, University of Eldoret, Eldoret, Kenya

⁵Biosciences eastern and central Africa, International Livestock Research Institute, Nairobi, Kenya

Presenter: James E. Barasa, Department of Fisheries and Aquatic Sciences, University of Eldoret, P.O. Box 1125-30100, Eldoret, Kenya
+254-725842098; Jbarasa2002@yahoo.com

The African catfish (*Clarias gariepinus*) is an important fish species in the rapidly expanding aquaculture industry in East Africa. Most catfish farmers use stocks of unknown genetic characteristics, and uncertified seeds and inter basin transfer of brood stock threaten genetic distinctness of wild populations.

Using 346 base pairs of mitochondrial D-loop sequence variation, we explored genetic diversity and gene flow between two populations of *C. gariepinus* from Lake Victoria (LVG) and Lake Kanyaboli (LKG). LVG and LKG clustered interchangeably under one clade, separate from the outgroup, *C. liocephalus*. LVG had a higher genetic diversity compared to the LKG population, as measured by the number of haplotypes, singletons, polymorphic sites, haplotype diversity and nucleotide diversity. Higher genetic diversity of LVG was probably boosted by the refugium provided by exotic water hyacinth mats and substantial changes in the ecology of the lake, with anoxic conditions suitable for *C. gariepinus* but restrictive to predatory Nile Perch *Lates niloticus*. Both populations shared four haplotypes. The populations showed low differentiation, with an F_{ST} value of 0.026, which was not indicative of significant differentiation ($P \geq 0.05$).

We propose that human-mediated inter-basin transfers of *Clarias* baits or brood stock be controlled, to avoid a mixture of populations that could destroy extant genetic diversity. Also, the ecological integrity of Lake Kanyaboli should be maintained by avoiding land use changes that reduce the papyrus vegetation on the lake. Conservation of the resources of the lake should however be community centered, because local communities derive livelihoods from the lake.

Genetic support for spatial structuring in elephants: a case study in the Kavango-Zambezi Transfrontier Conservation Area

Alida de Flamingh¹, Catherine Sole² & Rudi J. Van Aarde¹

¹*Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Pretoria, S.A.*

²*Scarab Research Group, Department of Zoology and Entomology, University of Pretoria, Pretoria, S.A.*

Presenter: Alida de Flamingh, Conservation Ecology Research Unit, Department of Zoology and Entomology, University of Pretoria, Private Bag X20, Hatfield 0028
(012) 420 4522 / (082) 793 2555; adeflamingh@gmail.com

Transfrontier Conservation Areas (TFCAs) strive to increase connectivity between isolated protected areas to create larger ecological networks. TFCAs may therefore benefit spatially fragmented populations by maintaining or restoring linkages that increase the chance of persistence, enlarge gene pools, and increase genetic diversity. However, the ability of TFCAs to maintain or restore spatial population structure and linkages is rarely evaluated.

We used molecular techniques to investigate the spatial genetic structure and gene flow of the elephant population in the Kavango-Zambesi Transfronteir Conservation Area (KAZA-TFCA). We suggests that this population is structured into genetically distinct mtDNA (female inherited) sub-populations. Nuclear DNA (male and female inherited) gene flow, however, was high across the entire region. These results are the first to show genetic structuring in an elephant population that occurs in a continuous landscape where anthropogenic forces and extrinsic natural forces (e.g. geographic barriers) do not influence large-scale space use. This genetic structure may rather be driven by intrinsic natural forces (e.g. resource dependencies and social behaviour).

We identified a functional landscape linkage between elephants in the Chobe and Kafue National Parks, an observation that, despite concerted efforts, has not previously been recorded using telemetry data. We conclude that conservation initiatives should strive to maintain landscape linkages that extend beyond the borders of protected areas. This is especially important for the KAZA-TFCA where 80% of the elephant range extends beyond protected areas.

Thinking out of the “Pox”: A one health approach to wildlife diseases

Helene Brettschneider¹, Emily P. Lane¹, Desire L. Dalton^{1,2} & Antoinette Kotze^{1,2}

¹*Research and Scientific Services, National Zoological Gardens of South Africa, Pretoria, RSA*

²*Genetics Department, University of the Free State, Bloemfontein, South Africa*

Presenter: Helene Brettschneider, Research Department, Molecular Genetics, National Zoological Gardens of Pretoria, P.O.Box 754, Pretoria 0001, South Africa
(012) 339 2825; helene@nzg.ac.za

The one health initiative is an interdisciplinary field that studies the relationship between human and animal health and environmental conditions. With increasing human populations, and fragmented natural environments, there is increased contact between humans and animals. This increased contact facilitates disease interaction, and understanding these interactions helps to improve human and animal health

management systems. Zoos are ideal sentinels for emerging disease surveillance due the wide range of animals they host, the close proximity of humans, wild and domestic animals, as well as the presence of veterinarians trained to monitor disease. To build our understanding of wildlife and zoonotic diseases, the National Zoological Gardens of South Africa (NZG) maintains a wildlife disease database and is steadily expanding its diagnostic capacity. We report on the identification of three poxvirus strains, facilitating zoonotic disease surveillance and assisting in effective management of in and ex-situ wildlife populations.

Yaba Monkey Tumor Virus (YMTV) was identified as the causative agent of cutaneous pox lesions in a free-ranging vervet monkey (*Chlorocebus pygerythrus*), through molecular sequencing of a fragment of the DNA polymerase gene region. Correct identification of the disease allowed the lifting of quarantine by DAFF, which needed to rule out the exotic disease Monkeypox. Although human disease caused by YMTV is normally mild, persons in contact with non-human primates in the area of Umkomaas who develop cutaneous lesions should inform their doctors of the possibility of this infection.

Pox-like lesions were received from a Scimitar oryx (*Oryx dammah*), and from a Nile crocodile (*Crocodylus niloticus*). Poxvirus was also confirmed in both cases by amplification and sequencing of a fragment of the DNA polymerase gene region. Phylogenetic analyses of the Scimitar Oryx samples identified a Goatpox virus strain, while analyses of the crocodile sample recognized a Nile Crocodilepox virus. Molecular detection and characterization of these viruses enabled fast pathogen identification and resultant action by veterinarians and managers of these animal populations. The significance of these cases is discussed and members of the wildlife community are encouraged to contribute suspected cases to the NZG Wildlife Disease Database.

Who let the dogs out: mesopredator release in the Eastern Cape, South Africa

Jon M. Taylor¹, Dan M. Parker¹ & Armand D. Kok¹

¹*Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, Grahamstown*

Presenter: Jon Taylor, Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, PO Box 94, Grahamstown 6140
(046) 603 8530; jonny2702@gmail.com

The mesopredator release hypothesis states that the removal of apex predators can result in an ‘explosion’ of smaller mesopredators. Mesopredator release has been demonstrated in many marine systems but remains relatively understudied in terrestrial systems. Understanding such effects is critical when trying to maintain healthy ecosystems, particularly when species are being introduced or removed from enclosed reserves. This study used randomly distributed, remotely triggered camera traps, to estimate black-backed jackal (*Canis mesomelas*) and caracal (*Caracal caracal*) relative abundance at sites with and without apex predators in the Eastern Cape, South Africa. Cameras were deployed for 3296 trap nights, resulting in 5411 photographic events. Caracal encounter rate did not differ between sites. However, black-backed jackal encounter rate was significantly higher in the absence of apex predators.

Our results suggest that black-backed jackals may be released when the top-down forcing of apex predators is removed. Long term effects of black-backed jackal release and any associated trophic cascades are discussed, along with the potential of apex predator reintroductions to suppress mesopredator abundance and maintain biodiversity.

Famine weed within and beyond the protected areas of northern KwaZulu-Natal in early 2013

Ian A. W. Macdonald¹ & Jan Lee²

¹*International Environmental Consultant, Hluhluwe, South Africa*

²*Independent Research Assistant, Warner Beach, South Africa*

Presenter: Ian Macdonald, PO Box 29, Hluhluwe 3960
VOIP (011) 217 2289/ (082) 534 9588; macdonfam@kingsley.co.za

Results are presented from two road transect surveys of the invasive alien famine weed *Parthenium hysterophorus* carried out (a) in March 2013 in and around nine savanna/forest protected areas managed by Ezemvelo KZN Wildlife in northern KwaZulu-Natal (KZN), South Africa; and (b) in April 2013 along roads throughout KZN north of Richards Bay and east of Melmoth-Vryheid-Piet Retief.

Based on these results a strategic framework is proposed for the short-, medium- and long-term management of this extremely invasive, poisonous and allelopathic alien plant species within protected areas and throughout KwaZulu-Natal.

Implications of this alien plant invasion for biodiversity conservation, tourism, agriculture and human health in South Africa are presented for three scenarios (1) national and provincial decision-makers decide that the situation is hopeless and decline to attempt the control of famine weed in South Africa (= "The Swaziland Scenario"); (2) these decision makers decide to continue with the level of control effort that is currently being expended on this species (= "The Business-as-usual Scenario"), (3) these decision makers decide that the threat posed to South Africa by this species is so high that appropriate strategies, budgets and manpower are rapidly brought to bear on the problem (= "The Australian Scenario").

The reproductive success of black rhinoceros (*Diceros bicornis*) in Hluhluwe-iMfolozi Park, KwaZulu-Natal, South Africa

Zoliswa N. Nhleko¹, Dan M. Parker¹, Dave Druce^{2,3} & Geoff Clinning²

¹*Wildlife and Reserve Management Reserve Group, Department of Zoology and Entomology, Rhodes University, Grahamstown, South Africa*

²*Ezemvelo KZN Wildlife (EKZNW), Cascades, Pietermaritzburg, South Africa*

³*School of Biological and Conservation Sciences, University of KwaZulu-Natal, Westville Campus, Durban, South Africa*

Presenter: Zoliswa Nhleko, Wildlife and Reserve Management Reserve Group, Department of Zoology & Entomology, Rhodes University, P.O. Box 94, Grahamstown 6140
(078) 679 3318; nhlekozn@gmail.com

A biological management strategy for black rhinoceros (*Diceros bicornis*) was developed and adopted by Ezemvelo KZN Wildlife in order to have an average 0.25 black rhino births per female per annum, an annual growth rate of 5% per population and a provincial *in situ* population of 750 individuals. In 2002, the KZN Rhino Management Group determined that the Hluhluwe-iMfolozi Park (HiP) black rhino population was not achieving these desired targets.

Our study was initiated to determine the historical reproductive life histories of the HiP black rhino population. Using monitoring data from January 1998 to December 2012, seven reproductive parameters were calculated: age at sexual maturity (ASM), gestation length, inter-calving interval (ICI), the proportion of adult females giving birth per year, reproductive lifespan, mortality rate and annual population growth rate. Mean ASM was 150.6 ± 11.5 months which is almost double the ASM for black rhinos elsewhere. In addition, ICI was twice as long in the HiP population. However, average gestation length and reproductive lifespan were similar to other black rhino populations in Africa. We believe that a combination of high black rhino density, poor overall body condition and unfavourable climatic conditions may be responsible for the depressed reproductive capacity of the HiP population.

Is there any link between body score condition and the feeding and nutrition program in zoological gardens?

Ulrich Mwimbi¹ & Rebecca Khanyisile²

¹*Departement of Animal Sciences, Tshwane University of Technology South Africa*

²*Animal Nutrition Unit, Research and Scientific Services, National Zoological Gardens of South Africa*

Ulrich Mwimbi, Department of Animal Sciences Private bag X680, Pretoria, South Africa
(012) 382 5323 / (078) 112 6318; mwimbiku@tut.ac.za

The physical condition of wild animals, either in zoological communities or in protected areas, gives an indication of the quantity and quality of its food, its digestibility, and general health of the animal. Ecological techniques adopted successfully with humans or domestic animals have not been applied to wild animals due to the high cost, limited availability and portability of instruments, and logistic difficulties in moving wild animals into specialized laboratories.

Nutritional status assessment of carnivores (tiger and lions) and herbivores (sitatunga, zebra and waterbuck) was initiated in the zoological garden of Lubumbashi, Republic Democratic of Congo. Photographic techniques were adopted for body condition scoring compared to a published body condition index. Since some changes in fat reserves may not alter the external appearance, diet sheets were evaluated using the Zootrition™ program and the diet adequacy of energy supplied was calculated.

Sitatunga (male & female), zebra, and waterbuck scored respectively four (m) and three (f), four and three. The variation in response from species is related to difference in their nutrient requirements and choice of feedstuffs irrespective of the unique and same diet sheet at the energy level of 0.6044 Kcal/kg DM, which is lower than the suggested recommendation. Bengali tigers showed reasonable physical condition (body condition score 5). The energy level of the diet for male (82.65 kcal/kg DM) and for female (68.14 Kcal/kg DM) was in the accepted recommended range. However, this energy content of the diet was high for lions (male and female) based on their body weight or metabolic weight, although the same diet was used for tigers. These shortcomings show that an animal's physical condition needs to be monitored together with its diet.

Genetic differentiation between two African catfish populations separated by distance and the Bloemhof Dam in the Orange River System in South Africa

Sinebongo Mdyogolo¹, Hesmari van der Westhuizen¹, James E. Barasa², Romilus Abila³ & J. Paul Grobler¹

¹*Department of Genetics, University of the Free State Bloemfontein, South Africa*

²*Department of Fisheries and Aquatic Sciences, University of Eldoret, Kenya*

³*Department of Fisheries Management and Aquaculture Technology, South Eastern Kenya University, Kitui, Kenya*

Presenter: Sinebongo Mdyogolo, Department of Genetics, University of the Free State, P.O. Box 339, Bloemfontein 9300
(051) 401 7067 / (078) 155 9909; sinebongomdyogolo@rocketmail.com

The sharptooth catfish (*Clarias gariepinus*) occurs naturally in Africa and the Middle-East and has also been introduced to other continents through aquaculture activities. Anthropogenic activities can impact on natural patterns of genetic diversity in several ways. The presence of dams leads to fragmentation, with possible drift in the long term. Aquaculture ventures can also affect the patterns of genetic diversity in wild populations when individuals that are descendent from selection programs escape into natural systems and interbreed with resident populations. Furthermore, successful aquaculture ventures are dependent on use of optimal genetic resources, and such use necessitates the screening of possible source populations.

We report on patterns of genetic diversity within and between two populations of *C. gariepinus* from the East-flowing Orange River system in South Africa. We sampled catfish from Bloemhof Dam and from the Orange River flowing through Upington. Eight microsatellite loci and the sequence of one mitochondrial gene region were analyzed in order to determine the degree of genetic variation between and within populations.

Results show support for the hypothesis of significant differentiation among populations of *C. gariepinus* separated by the dam wall. Levels of genetic diversity within individual populations did not differ significantly. This project is part of a bigger collaborative project between South African and Kenyan researchers, to elucidate the population genetic structure of *C. gariepinus* in both countries.

The vegetation status of Makapan's Valley World Heritage Site in the Limpopo Province.

Sejabaledi A, Rankoana

University of Limpopo, Department of Sociology & Anthropology

Presenter: Sejabaledi A, Rankoana, University of Limpopo, Department of Sociology & Anthropology, Private Bag X1106, Sovenga, 0727, South Africa
(015) 268 2179; Sejabaledi.rankoana@ul.ac.za

Makapans Valley World Heritage Site in the Limpopo Province of South Africa is teeming with life as a rich tropical paradise of biodiversity. Biodiversity is composed of a variety of primates, including troops of baboons, vervet monkeys and abundant flora (Hopley et al, 2006). An ethnobotanical study was designed to examine the present status of the vegetation in the heritage site. The study results show that although a variety of plant species are exploited by the local community for household consumption as sources of fuel,

brooms, medicine and fruits, the vegetation of Makapan's Valley World Heritage Site is still intact. Access to the site is granted by the heritage site management. There are management plans to protect and sustain the vegetation, and as a result the harvesting of plant species is monitored. Most impressive, the local community applies its culturally developed mechanisms of harvesting and protecting plant species of cultural value. The study recommends that the management team of the heritage site should identify the mostly exploited indigenous plants of cultural value, evaluate the value of the local community's harvesting methods and integrate them into their management plan to sustain the vegetation status of the heritage site.

The feasibility of reintroducing African wild dogs (*Lycaon pictus*) to the Great Fish River Nature Reserve, Eastern Cape, South Africa

Samantha K. Page¹, Dan M. Parker¹, Dean M. Peinke², Harriet T. Davies-Mostert³ & Brendan Whittington-Jones³

¹*Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, Grahamstown*

²*Eastern Cape Parks & Tourism Agency, East London, South Africa*

³*Endangered Wildlife Trust, Johannesburg, South Africa*

Presenter: Samantha K. Page, Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, Grahamstown
(072) 304 6829; g09p0270@campus.ru.ac.za

Endangered African wild dog (*Lycaon pictus*) populations are declining and there are only ~450 individuals remaining in the wild in South Africa. Consequently, there is a need to expand the existing managed metapopulation of wild dogs (i.e. populations other than the Kruger National Park). The Great Fish River Nature Reserve (GFRNR; 429 km²), in the Eastern Cape, is being considered as a potential reintroduction site for wild dogs. This study aimed to determine the feasibility of such a reintroduction, using a population viability assessment approach.

Preliminary findings suggest that wild dog carrying capacity is 11 individuals and that kudu (*Tragelaphus strepsiceros*), bushbuck (*Tragelaphus scriptus*), warthog (*Phacochoerus africanus*) and red hartebeest (*Alcelaphus caama*) are predicted to be the most important prey species. While the size of the reserve is adequate for wild dogs, it is not large enough to allow for sustained wild dog predation on the warthog and bushbuck populations. While impacts from predation on native bushbuck are of concern, predation of warthogs by wild dogs may be desirable, given that warthogs are extralimital to the Eastern Cape. Densities of potential prey species are highest in the north-eastern sector, which may mean that this area will be preferred by reintroduced wild dogs.

Thus, our preliminary assessment suggests that the GFRNR would be able to support a small wild dog population. However, further work is required to investigate the potential long-term impact on the bushbuck population, in particular.

A leopard's favourite spots: leopard habitat selection in the Little Karoo

Gareth K.H. Mann¹, Dan M. Parker¹ & M. Justin O'Riain²

¹*Wildlife and Reserve Management Group, Department of Zoology and Entomology, Rhodes University, Grahamstown, South Africa*

²*Department of Biology, University of Cape Town, Cape Town, South Africa*

Presenter: Gareth Mann, Wildlife and Reserve Management Group, Department of Zoology and Entomology, Rhodes University, PO Box 94, Grahamstown 6140, South Africa
(079) 530 9897; gmann9@gmail.com

Large carnivores are vulnerable to anthropogenic land-use change and habitat fragmentation. Leopards are the only large predator to still occur naturally throughout the Western Cape, South Africa. We used the programme Maxent to map potential leopard habitat in the Little Karoo based on two independent data sources; leopard presence using camera traps and scat location data, and GPS tracking data from three collared leopards. Leopard habitat was modelled using seven variables that encompass landscape, vegetation and human disturbance categories. Models based upon camera trap and scat location data performed better than those using GPS collar data, despite the former having a smaller dataset. Distance to rivers was the most important predictor variable of leopard presence, as leopards showed a strong preference for drainage lines and riverine areas. Leopards were also strongly associated with mountainous terrain of intermediate elevation and high slope angle. The best-performing model classified 26.33% or 46.85% of the study area as suitable leopard habitat, depending on the threshold used to convert the continuous model output to a binary presence/absence map.

We suggest that tracking collars may be inappropriate sources of data for Maxent modelling, and that better results can be obtained from non-invasive techniques such as camera-trapping. Leopard habitat in the Little Karoo is largely restricted to mountainous areas, which are near-contiguous in the study area. Future conservation management should focus on maintaining the lowland corridor areas identified in this study, as these form potential links between core mountain habitat.

21st century mammal distributions in the North West Province, South Africa

R. John Power¹, A. van Straaten¹, T. Boshoff¹ & R. Schaller¹

¹*Directorate: Environmental Planning & Co-ordination, Department of Economic Development, Environment, Conservation & Tourism, North West Provincial Government, Mahikeng, South Africa*

Presenter: John Power, North West Provincial Government, AgriCentre building, Cnr. James Moroka & Stadium rd., Mahikeng 2735, South Africa
(018) 389 5343 / (076) 1982 502; JPower@nwpg.gov.za

The North West Province experiences an annual turnover of 1 % of its land area to non-natural vegetation, and considering that 60 % of the province is natural, then conceivably it would take half a century for complete biodiversity loss. Mapping biodiversity features has thus been prioritised, with mammals being a focal taxon for conservation planning. Standard mammal survey equipment (e.g. Willan-type small mammal traps, mole traps, mist-nets and camera traps) were deployed throughout the province, both within and outside protected areas between the September's of 2010 and 2013. A total of 118 mammal species have been recorded, while an additional 23 species could still occur and were known previously (i.e. museum collections). One species was newly recorded, the Marsh Rat *Dasymys incomtus*.

Aside from reintroductions, 15 free-ranging, smaller mammals (< c. 50 kg), have shown range expansions when compared to the last mammal mapping exercise in the then Transvaal section of the North West during the 1970's (e.g. Rautenbach 1978). These species belong to the following families, with numbers in parenthesis: Soricidae (1), Muridae (4), Thryonomyidae (1), Cercopithecidae (1), Viverridae (1), Mustellidae (2), Felidae (3) and Suidae (2). Removing three overlooked species, it is hypothesised that a combination of the following parameters explain these range expansions, e.g. a) climate change (i.e. increased rainfall from 2000 onwards), b) farm subdivisions (i.e. increased farmstead wood-lot density, vlei conditions at dams) and c) farm abandonment (i.e. fallow lands) could be the reasons for this. The implications are changed threat status for several species.

The prevalence of free-ranging predators on two land use types in the Fish-Kowie Corridor, Eastern Cape, South Africa

Armand D. Kok¹, Dan M. Parker¹ & Travis W. Perry²

¹*Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, Grahamstown*

²*Department of Biology, Furman University, Greenville, United States of America*

Presenter: Armand Kok, Wildlife and Reserve Management Research Group, Department of Zoology and Entomology, Rhodes University, PO Box 94, Grahamstown 6140
(046) 603 8530; armandkok@gmail.com

Conflict between humans and medium to large carnivores is widespread in the Fish-Kowie corridor (a priority conservation area) in the Eastern Cape, South Africa. Within the corridor, livestock pastoralism and game farming are the two dominant land use types.

We used six, spatially explicit (3 x 3) trail camera grids (3600ha) to assess the relative abundance indices (RAI) of four free-ranging predators, two mesopredators; black-backed jackal (*Canis mesomelas*) and caracal (*Caracal caracal*) and two large predators; brown hyaena (*Parahyaena brunnea*) and leopard (*Panthera pardus*). Camera grids were equally distributed on the two land use types. Over 13609 trap nights, 336 photographs of the target species were recorded. The relative abundance of the two mesopredators (black-backed jackal and caracal) was similar on the two land use types. In contrast, brown hyaenas and almost all leopards were recorded at only one game farm. Interestingly, jackals were recorded from far fewer camera stations at this site, when compared to the other sites.

We suggest that generalist mesopredators may be less sensitive to the effects of predator control than larger predators. However, mesopredators seem to be suppressed by larger predators, suggesting that top-down forcing may be occurring.

Listing of species as threatened or protected. Targeting legislation where it matters most

Michèle F. Pfab¹

¹*Biodiversity Research, Information & Monitoring Division; South African National Biodiversity Institute*

Presenter: Michèle Pfab, South African National Biodiversity Institute, 2 Cussonia Avenue, Brummeria,
Pretoria
(012) 843 5025; M.Pfab@sanbi.org.za

The National Environmental Management: Biodiversity Act (NEMBA) of 2004 provides protection for species listed as threatened or protected in terms of sections 56 and 57 of the Act (TOPS lists). Restricted activities involving the direct use of specimens of these species may not be carried out without a permit and may also be prohibited by the Minister of the Department of Environmental Affairs (DEA).

At the request of the DEA, the South African National Biodiversity Institute initiated an expert process in 2011 to revise the published TOPS lists. After establishing fundamental principles for listing considerations in a resource-limited conservation sector, objective science-based criteria were adopted to guide species listing. Species threatened by habitat loss and regulation of common game species were issues that attracted intense deliberations, and were resolved with input from the Scientific Authority in its NEMBA-mandated advisory role to the Minister.

An analysis of the species proposed for listing as threatened or protected revealed that conservation interventions should be prioritized for plants and the traditional medicine trade. The persecution of birds, fish angling, the hunting and persecution of mammals, the collection of plants for horticultural purposes, the collector invertebrate trade and the reptile pet trade should also be addressed by conservation authorities. The revised TOPS lists should inform research priorities, particularly where knowledge gaps relating to the sustainable use of listed species are identified.

Comparison between faecal nitrogen of giraffes that fed on deciduous or evergreen plants

Beanélri B. Janecke¹ & G. Nico Smit¹

¹*Animal-, Wildlife & Grassland Sciences, University of the Free State, South Africa*

Presenter: Beanélri Janecke, Animal-, Wildlife- & Grassland Sciences, University of the Free State, PO
Box 339, Bloemfontein 9300
(051) 401 9030; janeckbb@ufs.ac.za

Faecal nitrogen concentration (N_f) is a non-destructive, inexpensive indicator to assess diet quality of game animals. Objectives were to i) compare N_f of giraffe, especially during winter, from two different localities in the central Free State; and ii) use N_f as indicator of giraffe's nutritional status compared to known critical levels. Fresh droppings were dried and N_f determined with a Leco nitrogen analyser. Both study areas are classified as *Acacia karroo* Riparian Thicket with similar deciduous species present. In Wag-'n-Bietjie Private Nature Reserve, only deciduous species are present, therefore lucerne based feed and game pellets were supplied during winter. In Woodlands Hills Wildlife Estate, giraffe relied on evergreen species during winter and no feed was provided.

No significant differences ($p = 0.6$, $n = 34$) were found between these two localities. Faecal nitrogen from Wag-'n-Bietjie ranged from 18.9 – 36.8 g N/kg DM from winter to summer and in Woodland Hills from 19.6 – 36.0 g N/kg DM (15 g/kg reported as critical level for browsers). Where only deciduous species are available and no feed supplied, the decline in N_f will be more pronounced and may reach critical levels. At the applied stocking rate, 50 ha/giraffe is available in Wag-'n-Bietjie and 28 ha/giraffe in Woodland Hills. Minimum area recommended for this vegetation type is 80 ha/giraffe. Where evergreen plants are available and giraffes stocked at browsing capacity, N_f might be higher during winter, since more food are available per giraffe. N_f was a useful indicator of nutritional status during the browse limited dry season.

The feeding ecology of extralimital nyala (*Tragelaphus angasii*) in the arid mosaic thicket of the Southern Cape

Ryno C. Pienaar¹, Laurence H. Watson¹ & Anton G. Schmidt¹

¹*School of Natural Resource Management, George Campus Nelson Mandela Metropolitan University*

Presenter: Ryno Pienaar, Private Bag x6531, George 6530
(076) 777 8773; S210016736@live.nmmu.ac.za

We investigated the diet composition, diet preference and habitat use of nyala in Buffelsdrift Private Game Reserve. The vegetation is a combination of subtropical thicket and succulent Karoo. Browse contributed 87.4 % and graze 12.6 % to the annual diet. For browse, shrubs contributed 54.4 %, dwarf shrubs 26.8 %, forbs 4.0 %, succulents 0.2 % and other (creepers, climbers and hemiparasites) 2.0 %. Forbs (12 %) and grasses (24.2 %) were important during the early wet season, but significantly less in the late wet and dry seasons. *Acacia karroo* (22.2 %) was the principal food eaten in the late wet season. *Portulacaria afra* (14.6 %) and *Grewia robusta* (11.8 %) were the principal foods eaten during the dry season.

Preferences for different plant species were calculated using acceptability indices. Preferred food species included the aforementioned principal foods as well as palatable dwarf shrubs including *Felicia muricata* and *Lemeum aethiopicum*. Some species were proportionately less available in the environment than their representation in the diet, indicating browsing pressure. Two of the available habitat types are classified as priority areas. Olifants River and floodplain is listed as vulnerable and contains various principal food species. Grootkop Apronveld is listed as critically endangered and contains palatable dwarf shrubs and endangered succulents.

Results indicate a preference for the former in the early wet and dry seasons and for the latter in the late wet and dry seasons. Results suggest the need for monitoring in the priority areas.

Return of the fence: Risks of reactive conservation

Sam M. Ferreira¹

¹*Scientific Services, SANParks, Skukuza*

Presenter: Sam Ferreira, Scientific Services, SANParks, P.O. Box 202, Skukuza 1350
(013) 735 4237; sam.ferreira@sanparks.org

Conservation is evolving and now has societal responsibility directed at improving livelihoods. Central is connectivity of different land-uses within and beyond protected areas where various biodiversity benefits enhance human quality of living. Integrating human and wildlife landscapes, however, carry risks illustrated by declines of mammals noted across several African landscapes. Threats traditionally associated with human retribution in response to damages caused by wildlife have been recorded. Recently, however, intensified illegal wildlife trafficking has posed new challenges to the persistence of charismatic mammals in African landscapes within and beyond protected areas.

In response to these threats, conservation authorities in some instances have returned to re-active issues-based responses. I highlight two fence construction proposals. The first seeks to protect African lions by fencing the four highest priority lion populations in Africa in an attempt to mitigate human-lion conflict as a driver of the decline of lion abundances. The second proposes to curb rhino poaching by fencing people out from the Greater Limpopo Transfrontier Area. Treating rhino horn serves as a third case of re-active conservation within protected areas. I use spatially explicit lion and rhino poaching data as well as risk analyses to illustrate that such reactive responses are symptomatic and likely to fail.

I conclude that symptomatic reactive conservation responses are likely to disrupt socio-economic-ecological processes spanning different land-uses and degrade the societal benefits of biodiversity conservation. Focusing on the causes of concerns and addressing those directly provides better opportunities for lasting outcomes of biodiversity associated benefits within and beyond protected areas.