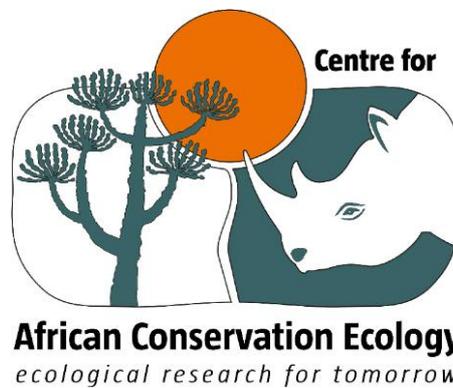


CENTRE FOR AFRICAN CONSERVATION ECOLOGY

ANNUAL REPORT 2008

Nelson Mandela Metropolitan University



Nelson Mandela Metropolitan University
P O Box 77000, Port Elizabeth 6031, South Africa
Tel: (041) 504 2308 Fax: (041) 504 2946;
E-mail: graham.kerley@nmmu.ac.za; URL: www.nmmu.ac.za/ace

INTRODUCTION

The formation of the Terrestrial Ecology Research Unit (TERU) was approved by the Council of the University of Port Elizabeth in 1991, in response to a need for terrestrial ecology training opportunities for postgraduate students and for terrestrial ecological research by conservation and environmental management agencies. TERU began operating in 1992, within the Zoology Department, and in 1997 it received Council recognition as a research unit within the Faculty of Science. In 2005, TERU was registered as a Centre within the Faculty of Science of the Nelson Mandela Metropolitan University. Following an internal debate, it was agreed upon that changing the name of TERU would be an opportunity to reflect its new status as a Centre and would position TERU as a centre of excellence in the field of conservation and ecological research. TERU's name was changed to the *Centre for African Conservation Ecology, ACE*.

ACE comprises staff and postgraduate students of the Zoology, Botany and Geography Departments, with an Advisory Board comprising representatives of State, NGO and private conservation and environmental management interests.

This is the seventeenth Annual Report, and deals with the activities of ACE during 2008.

VISION

The Vision of ACE is to build its national and international recognition as a centre of excellence in the fields of ecological and conservation research, and postgraduate training, and to expand this role in Africa.

MISSION

The Mission of ACE is to develop scientific knowledge of the ecology and conservation of African ecosystems, especially in the Eastern Cape and adjacent regions of high biodiversity, which will enable society to make wise environmental management decisions. In achieving its Mission, ACE will build human capacity through postgraduate training.

The mission and vision of the Centre for African Conservation Ecology is aligned with the Nelson Mandela Metropolitan University's mission and strategic directions, in the context of the fields in which ACE operates.

DIRECTOR'S REPORT

Reporting on the activities and outputs of the Centre for African Conservation Ecology (ACE) is a complex process given the number of role players, but is also extremely rewarding, as this report reflects on the outputs of a dedicated and enthusiastic group of staff and students. So it is with pleasure that I confirm that during 2008, high levels of productivity were achieved, including 11 refereed scientific papers, 5 book chapters, 1 paper in a published proceedings, 5 technical reports, and 33 conference presentations. Postgraduate students included 4 Honours, 12 MSc and 9 PhD students. The increase in the latter group of students is an excellent indicator of the relevance of ACE to our student body. Congratulations to those students who were awarded their degrees.

Providing the resources for this research and training is always a challenge, but overall income remained healthy with total resources exceeding R2 million again. There has been a decline in contract research income, reflecting the variability in such opportunities. This is, however, probably a reasonably healthy reflection of the fact that ACE is not a consulting agency and selects such opportunities in relation to scientific interest rather than income potential. It is noteworthy that bursary income exceeds half a million rand for the first time (and further bursary opportunities are built into some of the project budgets), indicative of the focus on attracting and supporting students as a key aspect of ACE's strategy to achieve our objectives. It is disappointing that our attempts to attract corporate sponsorship for ACE have yet to be successful, although it must be recognized that the NMMU did provide a contribution to this.

Staff and students of ACE played a key role in the National Elephant Assessment in 2008. This was a rigorous process that aimed to provide the most current and robust understanding of all issues relevant to elephants and their management, as tool for the South African government to develop policy and legislation around elephant management. The invited input by ACE staff and students highlights the relevance of ACE to broader society, and the recognition of ACE by government as a centre of excellence in this field.

In 2008 we also focused on developing our staff and student capacity, with two important thrusts. The first is the involvement of external researchers with ACE through the Research Associate process. Wayne Linklater (Victoria University of Wellington, New Zealand) has shown really valuable input over the last couple of years, and Tony Palmer (Agricultural Research Council) has started to build his involvement. In 2008 we were also able to welcome Matt Hayward (Australian Wildlife Conservancy), a former ACE Postdoc, as a Research Associate, and we look forward to him contributing his ideas and enthusiasm as part of this programme. The other aspect has been the growth in international students, particularly those from Africa. I am pleased to report that in 2008, ACE students included representatives from 6 African nations, including Botswana, Kenya, Namibia, Tanzania, Uganda and Zimbabwe. This is a very positive step, given our commitment to serve Africa in this respect.

Overall, ACE is in a strong and healthy position and we have remained focused on achieving our objectives. This success reflects a team effort and I would in particular like to thank André Boshoff, Eileen Campbell, Derek Du Preez and Vincent Kakembo for their contribution. Nokubonga Mgqatsa provided administrative support, while Margot Collett has played a key role in developing strategic opportunities. Pieter van Breda of the NMMU contributed invaluable advice and support for ACE. My thanks to the numerous funding agencies and supporters who have provided the resources to make this all happen, in particular the Nelson Mandela Metropolitan University.

Prof. G I H KERLEY

DIRECTOR: CENTRE FOR AFRICAN CONSERVATION ECOLOGY

AWARDS

- Wayne Linklater was awarded an early career research excellence award at Victoria University of Wellington, New Zealand.
- Rachel Cooper was awarded a Thicket Forum Bursary for her Hons project, and then went on to win a “Young Thicketeer” award for her presentation at the Thicket Forum.

RESEARCH ACTIVITIES

Research activities are grouped into themes, and are reported within these on a biome or project specific basis.

CONSERVATION BIOLOGY

This theme seeks to identify priorities in terms of areas and implementation options for the efficient and effective long-term conservation of populations, species, habitats, and the ecological and evolutionary processes that maintain them.

Elephant: Katie Gough (PhD candidate) continued her study on the association patterns and competitive interactions of the Addo elephants. She focused on the high rate of intraspecific deaths due to fighting within the male population, finding links to available area, male density and number of breeding females. These findings were presented at the 12th Congress of the International Society for Behavioural Ecology, Ithaca, USA and at the South African Wildlife Management Association. She also contributed to the chapter on Elephant biology population and ecology in the *Assessment of South African Elephant Management*. She continues to monitor the Addo population and maintain the long-term demographic data set.

Linus Munishi started up his PhD study on the elephants in Tarangire National Park, in Tanzania. He is focusing on the roles of relatedness in fitness of this highly social species and will also be able to use some of the existing data from the Addo elephants. He spent the year developing his project proposal and initiated his field work at the end of the year.

Cape Vulture: Good progress was made with André Boshoff's study of factors affecting recolonisation by the threatened Cape Vulture of its historical range in the Eastern Cape. This 30 month project was commissioned by Eskom Holdings Ltd in response to concerns that the electrocution of vultures on powerlines, and collisions between vultures and powerlines, could be a major factor in preventing the species from recolonising its former range in the Eastern Cape. In addition, vulture-powerline incidents often cause power failures, resulting in disruptions to the local economy and dissatisfaction amongst Eskom's customers. The project comprises three phases: (1) determination of the current range and site (breeding and roost sites) status of the species in the province, and the construction and testing of habitat and spatial foraging models to identify high, medium and low vulture occurrence areas, (2) estimation of the relative importance of selected factors that are known to be key vulture mortality drivers, (3) use of the information from (1) and the Eskom powerline network data to identify priority areas for mitigating actions by Eskom to (a) avert or reduce vulture mortality from powerline and (b) increase the quality of Eskom's service to its customers by reducing the number of power outages caused by vulture-powerline incidents.

A report on the current range and site (breeding and roost sites) status of the species in the province was completed and a scientific paper, based on this report was submitted, and accepted, for publication (in 2009). Data collection and analysis for an investigation of apparent seasonal migratory movements of Cape Vultures in the region has been completed; the final report on this aspect has been prepared.

MSc. student Johan Minnie completed his study on habitat and spatial foraging models as aids to identifying areas of predicted high, medium and low vulture occurrence/density in the Eastern Cape, and the combination of this spatial information with the occurrence of unsafe electricity transmission and distribution structures, in order to identify priority powerlines for mitigation action by Eskom.

Good progress was made with data collection, via extensive field and questionnaire surveys, and desktop studies, for the component dealing with the estimation of the relative importance, or impact, of selected factors that are known key vulture mortality drivers, for example, food shortage, drowning, electrocution, collisions and poisoning. Preliminary data analyses and interpretation were conducted. This component will be completed in early 2009, after which the write-up of the final project report will commence.

Black rhinoceros: PhD candidate Roan Plotz and RA Wayne Linklater continued investigations of source population and post-release performance of black rhinoceros. Investigations have identified the importance of early calf mortality, particularly depredation by lion, and suggest that Hluhluwe-iMfolozi Park population's fecundity is better than thought and not resource limited. Post-release survival and fecundity appear to be largely influenced by conflict and competition amongst conspecifics leading to recommendations about selecting more carefully amongst rhino and reserves to receive them.

Red paperflower conservation:

Syncarpha recurvata seeds have been lodged in the National Seed Bank as a contribution to the conservation of this endangered species. Mapping of suitable habitat continues to assist in conservation planning for this species.

Fluffy honeybush tea conservation:

A draft conservation plan has been developed. This has been distributed widely and comments received. The plan has already been used to inform development in the western areas of Port Elizabeth.

ANIMAL-PLANT INTERACTIONS

This theme seeks to develop an understanding of the nature of the interactions between animals and plants, and a predictive understanding of perturbations associated with animal impacts on communities and ecosystems.

Feeding impacts of megaherbivores: Marietjie Landman (PhD student) is in the process of preparing her research on the resource use and implications of elephant and black rhinoceros in succulent thicket for publication. She has shown that black rhinoceros have a broad diet that reflects the variation in food availability, only a small proportion of the Important Plants previously thought particularly vulnerable to elephant browsing occur in their diet, black rhinoceros foraging does not reflect browse availability at a landscape-level and black rhinoceros foraging opportunities are compromised by elephant and goat browsing. The focus of this work has been expanded to investigate the impacts of elephants and identify potential indicators of elephant induced change on vegetation composition and structure in the Addo Elephant National Park. In particular, elephant impact sites established by Dr Hall-Martin during 1977 have now been re-measured as part of a fourth survey. The results are striking and show large declines in plant richness, volume and density, particularly around water. Marietjie presented this work at the Society for Conservation

Biology's Annual Meeting, Chattanooga, USA, and contributed to the chapter on the impacts of elephant on biodiversity as part of the National Elephant Assessment.

Benedikt Gehr, University of Zurich, Switzerland, assessed the foraging heights of elephants in the Addo Elephant National Park as part of his Masters project. He showed that elephant foraging height was positively correlated with plant height, decreasing with period of elephant occupation. Generally, elephant preferred to forage on plants below 2 m, with 41% of all foraging events occurring below 50cm. These results suggest limited opportunities through feeding height separation for resource partitioning between elephant and other browsers, and also challenges the dogma of elephant as top-down foragers in thicket vegetation.

Body condition of elephant: Christelle de Klerk investigated the body condition of six populations of elephant across the Eastern Cape. Her data show that body condition varies seasonally and in relation to the life history status of the animals, with so-called "energy stressed" (e.g. lactating cows) having poorer body condition than non-stressed sectors of the population. She showed that the Addo main camp elephants are in poorer body condition than other populations, and this is best explained by the density and period of occupation of the site for each population. She further showed that the mechanism for this was through declining food quality for the Addo elephants, with these animals having lower protein and higher fibre levels in the faeces, and the proportion of animals in poor condition in each population being a function of these resources. This is therefore a first indication of declining resource quality for the Addo elephants and may be the first measure of density dependence.

Resource use by grysbok: Stephanie de Beer assessed the response of Cape grysbok to varying availability of forage species for her Hons project. She was able to show that their diet is much richer than previously thought and that when Australian acacias are removed from an area, grysbok respond by broadening their diet. She was also able to show for the first time that grysbok can include a substantial proportion of grass in their diet.

RESOURCE ECOLOGY

This theme seeks to develop a predictive understanding of the responses of biota to different forms of utilization, and of how these natural resources are utilized.

Many of the projects listed under other themes also contribute towards the goals of this theme.

National Elephant Assessment: ACE was well represented on the panel of 63 scientists and other experts who contributed to the National Elephant Assessment, which was undertaken at the request of the National Minister of Environmental Affairs and Tourism. André Boshoff contributed to the chapter on the history and distribution of elephants, and Katie Gough and Marietjie Landman contributed to the chapters on elephant biology and elephant impacts on biodiversity, respectively. Graham Kerley served as lead author for the chapter on elephant impacts on biodiversity, and co-authored the chapters on culling and elephant management, as well as the summary for policy makers. This product will have a strong influence on elephant research and management, both in South Africa and further afield.

Leopard-stockfarmer interactions: Liaan Minnie has continued his MSc studies on leopard stock farmer interactions in the Baviaanskloof Mega-Reserve, and has now interviewed 73 land owners, representing over 270 000 ha of agricultural land. His findings show that black-backed jackal and caracal are the main predators of livestock, with leopards being equivalent to baboons and birds in terms of stock losses that they bring about. Liaan also estimated that there were probably less than 20 leopards in the area, based on prey

availability models, highlighting the precarious status of this population. He submitted his MSc for examination at the end of the year.

Lion-human conflict in Botswana: Gosiamo Neo-Mahupeling has initiated a PhD level study on the interactions between lions and humans on the Chobe area of Botswana. He spent most of this year developing his PhD proposal, and started fieldwork at the end of the year.

Perceptions of visitors to the Addo Elephant National Park: André Boshoff and his team have wrapped up this project on how tourists perceive conservation issues, with a publication of a paper on the attitudes towards alien and indigenous species. This paper highlights the negative attitude of a significant proportion of visitors to Addo as regards non-indigenous species.

Patch selection and feeding dynamics of herbivores: This work was led by Adrian Shrader in a postdoctoral position, and he has now moved to an academic position at UKZN. Two papers were published in 2008, including a good empirical paper on landscapes of fear as demonstrated by goats, and an analysis of the role of water availability on patch selection. Adrian continues to prepare manuscripts from this work.

PREDATOR PREY INTERACTIONS

This theme seeks to understand the nature and consequences of predator prey interactions, to provide guidelines for the management of predators and their prey.

Impacts of reintroduced predators in Thicket: Matt Hayward has continued his work on reintroduced predators, and has now become a Research Associate of ACE. During 2008 he published a further paper on the dietary niche breadth of African carnivores, which highlights that more specialized species are more likely to be threatened. He also has a paper in press that highlights that the fence around Addo Elephant National Park has not constrained the movements of large predators, in an evolutionary sense.

Carnivore-Buffalo interactions: Dave Druce continued the work on the lion and spotted hyaena impacts on buffalo in the Addo Elephant National Park, and then moved to a research position with Ezimvelo KZN Wildlife. The work was picked up by Craig Tambling and he has been focusing on rounding off this project. Data to date suggest that the buffalo are responding to the carnivore introductions by greater use of open habitat, larger herd sizes and group defence, and the outcome is increased juvenile survival. Julia Wentworth is undertaking the analysis of the diet of the lion and spotted hyena using scats analysis for her Hons project and will complete this in 2009.

Prey use by the Cape Leopard: This project focused on describing the diet of leopard in the Cederberg and Gamkaberg areas, and formed the basis for Tess Rautenbach's MSc study. She demonstrated that camera traps underestimated the availability of small prey (rodents, birds and insects) but effectively sampled the prey spectrum of large and medium sized prey. Her data show that leopards in these areas consume few domestic stock and have shifted their diet from the previous study in the 1980's, largely to reflect changing hyrax availability. Tess submitted her MSc for examination at the end of the year.

Jackal and Springbok interactions: Black-backed jackal have frequently been blamed for poor population performance of springbok, and Tanya van der Ven is testing this concept for her Honours project. She has been collecting and analyzing jackal scat from Samara Private Nature Reserve, and will complete this in 2009.

TRANSFORMATION AND RESTORATION ECOLOGY

This theme seeks to understand the causes and consequences of ecosystem transformation across all levels of integration, to provide guidelines for the restoration of biodiversity and ecosystem function.

Impacts of introduced species on Subtropical Thicket: Evert Jacobs MSc project on the impact of giraffe in the Eastern Cape identified the diet of this species at five sites across a rainfall gradient, and he showed that a few species are consistently selected for. And that as conditions become dryer, giraffe feed on fewer plant species. He was also able to show that giraffe alter the leaf size and branchlet morphology of the boerboen tree, although the implications of this are currently not understood. Evert submitted his MSc for examination and this was approved, so he will graduate in April 2009.

Warthog as an invasive species: Kanyisa Nyafu continued her MSc studies on the warthog as an invasive species in the Eastern Cape. She was able to show that the extinct Cape warthog was a more specialized grazer than the introduced common warthog, using an elegant study based on carbon isotopes. She also described the diet of the common warthog in the Great Fish River, where it is largely a grazer, but with an increase in browse in the diet in winter. Using a questionnaire based approach she collected data on the distribution and impacts of warthogs, and showed how they have spread rapidly through the Eastern Cape, and that there are considerable concerns about their impacts on grazing, soil and fences. Kanyisa submitted her MSc for examination at the end of the year, and we look forward to the outcome of that process. In a parallel study, Nokubonga Mggatsa started her MSc study on the warthogs in the Addo Elephant National Park, focusing on the population response and resource use (diet and selectivity). Of particular interest here is the opportunity to assess the effects of predators on warthog population trends, given the reintroduction of lion and spotted hyena. She has managed to obtain a large sample of skulls for aging purposes, and will be able to compare her data to that collected for the Great Fish River population.

Identifying resource use by Fallow deer: Despite the fact that they are widely recognized as a highly invasive species in South Africa, there are no studies on the ecology of fallow deer in this country. Rachel Cooper evaluated the diet of fallow deer in order to identify what plants may be at risk. She showed that they are specialized grazers, with a very wide diversity of grasses and some browse species in their diet.

White rhinoceros as an extralimital species in the Eastern Cape: Although white rhinos have been extensively introduced into the Eastern Cape, largely for conservation and ecotourism purposes, little is known about the populations here or their impacts. Manqhai Kraai is investigating this for her MSc, and has already identified over 40 separate populations ranging from a few individuals to over 20 rhinos. She is collecting population performance data to assess the effectiveness of the conservation of this species in the Eastern Cape, and is also describing their diet at Shamwari to identify plant species at risk through the introduction of white rhino.

Effect of impala on Thicket: Animals were released from their enclosure during May 2008. A vegetation survey was conducted at the time and follow-up surveys will continue annually to follow recovery. A total of 22 animals were recorded (16 were put into the enclosure) and all were in good condition. The trampling effects were the most obvious. Interclump areas were most affected. Changes in the grassy areas were expected, but there were also changes in the thicket clumps.

Thicket rehabilitation: Research on optimal methods for propagation and establishment of plant species other than the *Portulacaria afra* (spekboom) commenced. The aims of this project are: To optimise ramet propagation of selected Thicket species; To compare the stress

physiology of selected Thicket species in terms of light, heat and drought stress; To determine the plant reaction to stress associated with transplanting of ramets into a rehabilitation site, and To compare seedling with ramet plantings into a rehabilitation site.

Hypotheses to be tested are:

- Introduction of Thicket species and the subsequent increase in biodiversity in Spekboom plantings, is most effective and economical by ramet propagation.
- Seedlings and cuttings planted into Spekboom plantings survive better if mulched with Thicket litter and planted in sheltered positions provided by Spekboom truncheons, than in exposed positions.
- Succulent Thicket species will survive being transplanted into Spekboom plantings better than woody Thicket species.
- Cuttings will survive transplantation into Spekboom plantings better than seedlings.
- Succulent Thicket species survive light, heat and drought stresses better than woody Thicket species, due to their succulence and CAM.

Thicket seedling survival: A project on the seedling survival in the mesic thickets of the Eastern Cape, South Africa was completed and submitted as an MSc. The aim of this study was to further the understanding of seed and seedling dynamics in Thicket, and in this way contribute to its successful regeneration.

Plants are most vulnerable in their life histories during the seed germination and seedling establishment phases. This vulnerability originates from seedlings being smaller, less competitive, less protected against predators, and more susceptible to unfavourable environmental conditions compared to fully grown plants. Seedling survival may be greatly increased by avoiding times and places where mortality risk is high. This may occur if germination that is sensitive to environmental cues are selected for, as well as dispersal mechanisms that will deposit seeds into “safe sites”. The improved ability to tolerate the dominant environmental stressors, such as drought and shade resistance, will also promote establishment of seedlings. Thus the recovery of Thicket in areas that have been transformed is most dependent on recruitment by the successful germination of seeds and survival of seedlings in a relatively hostile environment. Where Thicket has not been degraded or overutilised, it is maintained through vegetative regeneration. This study has contributed to the understanding of seed germination and seedling dynamics of Thicket focusing on the higher rainfall Thicket types. The focus of this study was the dominant germination and dormancy mechanisms of woody and succulent Thicket species, the germinable seed bank, as well as the response of seedlings to drought and shade. These topics were then related to seed dispersal, as well as the regeneration niche of species.

All forms of Thicket (dune, mainland mesic and mainland xeric) lack a persistent germinable seed bank. This severely limits the rate of regeneration of vegetation, as recovery will only occur once seeds have been dispersed back into an area. Thus the germination requirements of recently dispersed seeds must be explored and understood. Hard seeded species were found to respond to hot water to break seed coat-imposed dormancy, which is equivalent in the environment to imbibition during periods of high temperatures in the open. Few other species exhibited seed dormancy, and can thus be qualified as quiescent, with only shade having a large effect on germination. Even though low light conditions are usually a requirement for species that require burial for germination and the species that responded significantly to shade (*Burchellia bubalina*) had very small seeds, low light conditions under the canopy (1% of ambient light) may be just as effective. As most species do not have specific dormancy breaking requirements, germination should not be a hindrance to the supply of seedlings. Germinability of seeds, as well as seedling growth and survival, needs to be taken into account when identifying possible “nurse” species, as well as identifying pioneer species in the succession of Thicket.

Knowledge of the tolerance of seedlings to prevailing environmental conditions is essential. Thicket species were found to respond differently to shade and drought, indicating that species may have various regeneration niches, as some would be able to establish on the edge of Thicket, as well as in openings in mesic Thicket, whereas other species will only establish underneath the canopy. This has important implications for rehabilitation, as well as developing an understanding of the assembly rules of Thicket.

This study supports the prediction that seedling regeneration is greater in Thicket that receives higher rainfall, compared to xeric forms where vegetative regeneration dominates. Seed germination and seedling survival may be site specific and opportunistic, responding to rainfall, similar to arid systems. As rainfall is relatively unreliable, using it as a dormancy breaking mechanism may not be beneficial, especially if seeds do not remain viable for a protracted period of time. Instead, a possible strategy whereby seeds germinate slowly and irregularly may allow the plant to “strike it lucky” and germinate during a season of above-average rainfall, a possible form of “bet hedging”.

Even though regeneration may occur naturally in more mesic Thickets, a lack of dispersal to “safe sites” may occur in mammal-dispersed species, as most indigenous mammals have been replaced by livestock, which are inferior in terms of seed dispersal of Thicket species. Although birds continue to be effective and efficient dispersers, some plant species have exhibited a specific disperser requirement, resulting in poor dispersal in areas where livestock dominate. Therefore, a lack of dispersers may explain the low number of seedlings in mesic Thicket, and poor establishment conditions may be the cause of poor recruitment in xeric Thicket. However, vertebrate-dispersed seeds were found in the seed bank of open areas. Although mammals may spend much of their time in the dense cover, they do need to move between Thicket clumps, resulting in the dispersal of seeds into openings. It was observed in this study that some gaps contained latrines that improve establishment conditions for seedlings, thus facilitating their establishment within small gaps formed by herbivores in Thicket.

The main solution to Thicket’s problems may be the removal of man. However, as this is not probable, and considering the damage already done, the future of Thicket, especially in the inland drier forms, is bleak without intervention, and active rehabilitation and restoration is required urgently. The information gained in this study will hopefully contribute to the maintenance and preservation of Thicket for many generations to come.

Rehabilitation of Bontveld: A further rehabilitation survey of mined Bontveld was done in spring 2008. The grassy dwarf-shrubland areas rehabilitate well as predicted. Translocated bushclumps appeared to be developing into thicket clumps, although slowly. This method delivered surprisingly good results. Conserved (perched) clumps show no deleterious effects yet.

Special effort was focused on artificial dolines in kick-starting rehabilitation of bushclumps. A number of treatments were applied to a randomized block design of artificial dolines placed in a recently rehabilitated area of the PPC Grassridge mine. The first three sets of vegetation analysis of these shows substantial promise.

Hypotheses to be tested in this study are:

- Dolines form in regions of geological stresses on the calcrete layer.
- Rehabilitation of mined Bontveld bushclumps using artificial dolines depends on sufficient soil depth and thicket nurse plant establishment.
- Elevated (conserved) bushclumps results in amended soil moisture conditions that alters species composition.
- A natural weathering process fills the dolines with soil.

Rehabilitation of eroded grasslands: Following the successful testing of rehabilitation options for severely eroded hillslopes over a period of five years in the Ngqushwa rural municipality, Vincent Kakembo conducted a Community Workshop on 26 and 27 September 2008 at Mgwalana village to provide feedback to the local community as to the effective methods of restoring degraded hillslopes. Field plots were visited and techniques were explained to community representatives. A joint proposal with the local community to rehabilitate eroded landscapes invaded by *P. incana* is to be submitted to the Landcare programme of the Department of Land Affairs.

Patterns of transformation in the former Ciskei: Mhangara, P. a PhD student applied the Revised Universal Soil Loss Equation (RUSLE) module and the GIS-based Sediment Assessment Tool for Effective Erosion Control (SATEEC) to estimate soil loss and sediment yield for any location within the Keiskamma catchment. Preliminary results indicate that abandoned and overgrazed lands in the communal areas have a high erosion potential and vegetation cover in mega conservancy areas had a significant effect in curtailing soil loss. The effect of rainfall was noted as two pronged; the positive effect of higher rainfall amounts received in the escarpment is that it promotes vegetation growth and vigour in the Amatole mountain range which in turn provides a protective cover to shield the soil from soil loss. Model validation is underway in 2009 by way of extensive fieldwork within the catchment.

Using multi-temporal High Resolution Imagery to separate *P. incana* invaded areas: dindi, J.O. who completed his PhD studies at the end of 2008 used laboratory and field spectroscopy to validate results of multi-temporal high resolution imagery which was used to separate *P. incana* invaded areas from other surfaces. Clear separability between bare surfaces, green vegetation and *P. incana* was achieved using spectral reflectance measurements of the different wavelengths. The study also entailed monitoring soil moisture flux on a hillslope under the patchy *P. incana*, grass and bare areas. A six-months experimental set-up comprising soil moisture sensors and a data logger was installed in November 2007 in the *P. incana* invaded section of Amakhala Game Reserve. Results indicated significant soil moisture retention and flux variations between grass, *P. incana*, and bare areas. Despite their greater retention capability, grass surfaces lost soil moisture more rapidly than *P. incana* and bare surfaces. Bare areas on the other hand recorded longer moisture retention before breakpoints than the *P. incana* and grass surfaces. This could be attributed to soil surface crusting that locks moisture in the soil. Two publications from this work have been accepted in an international and local journal.

Vegetation change and slope processes on Mt. Elgon slopes: Mr. Mugagga (PhD student) has done fieldwork on landslides on Mt. Elgon and environs. In order to characterize the soils on the mountain as “problem soils” laboratory analyses of soil samples collected from landslide sites viz. shear strength tests using shear boxes, atterberg limits, particle size analyses were carried out. Aerial photography, Landsat and SPOT imagery for 1960, 1970 and 2006 respectively have been acquired to assess relationships between vegetation changes, land use and slope processes. Mr Mugagga will be presenting his results in the course of 2009.

Landscape connectivity: Ms Ndlela, an MSc student investigating landscape connectivity on degraded hillslopes of Ngqushwa rural municipality has collected data regarding runoff and run-on hillslope components. She conducted measurements in the field during intensive rainstorms, enabling the estimation of thresholds and connectivity in degradation and hydrological processes. She is also assessing vegetation patchiness changes in a temporal framework using high resolution imagery. She conducted joint fieldwork with Niels Weiss, an MSc student from the University of Amsterdam. The latter is co-supervised by Vincent Kakembo and Prof Erik Cammeraat (University of Amsterdam) who is Vincent’s research partner under the SANPAD programme. Niels’ work focuses on the effect of *Pteronia incana* invasion on infiltration characteristics, soil water repellency and soil surface conditions.

Rainfall simulation experiments were conducted in the field in November and December 2008; useful results from the analyses are anticipated.

Physiological responses of ungulates to transformation: Robyn Hetem (Phd at Wits) has completed her work on the effects of desertification on ungulate physiology, using a Angora goats in transformed thicket. In contrast to the previous concerns around cold stress in this species, it was found that these animals are probably heat stressed, and that shearing in summer can considerably alter their ability to thermoregulate. A manuscript on this topic has been submitted for publication

BIODIVERSITY

This theme seeks to gain a predictive understanding of the patterns, determinants and functions of biodiversity.

Second Edition of CJ Skead's book on the historical distribution of the larger mammals in the Eastern Cape (first published in 1987): The distribution of copies of the Second Edition of CJ Skead's 'Historical Incidence of the Larger Land Mammals in the broader Eastern Cape' (2007) to appropriate organizations (e.g. government conservation departments and parastatals) and institutions (e.g. research agencies, research libraries) was completed. Nearly 200 copies of this book have been sold to the general public, with funds earmarked for another print run. The book received highly favorable reviews in the scientific journals *Pachyderm* and *African Zoology*.

An initiative to produce a Second Edition of CJ Skead's "Historical Incidence of the Mammals of the Western and Northern Cape" (First Edition published in 1980) was launched, with the initial emphasis being on fund-raising. By the end of 2008, R900 000 had been secured; this forms 75% of the total project budget. Work on the project will commence when 100% of the funds have been secured.

FUNDAMENTAL RESEARCH

This theme seeks to encourage research on any intellectually interesting ecological or evolutionary question.

Physiological consequences of springbok colour: This project is being undertaken in collaboration with a team from the Department of Physiology of the Medical School of the University of Witwatersrand, led by Duncan Mitchell. The team compared the physiological response of the three naturally occurring springbok colour morphs (the so-called normal, white and black morphs) showed that black springbok are better suited to cold conditions whereas white springbok perform better under hot conditions, while normal springbok are intermediate. A paper arising from this project has now been accepted for publication.

Nasal turbinate structures as predictors of response to global climate change: Michelle Kietzmann's MSc focused on developing a technique to measure nasal turbinate area using high resolution computed tomography scanning, and she then applied this technique to a variety of ungulate species varying in body size and ecology attributes. She was able to show that nasal turbinate area increases allometrically, but declines when it is standardised for body size, with the Cape grysbok being a significant outlier. She has submitted her MSc for examination, and the further exploration of her findings will require a strong phylogenetically based approach.

CONTRACT RESEARCH

Major contracts this year included an assessment of the impacts of carnivores (lion and spotted hyaena) on buffalo in the Addo Elephant National Park, and another on the impacts of elephant on biodiversity in the AENP. These are both proceeding well, and will be completed early in 2009. In addition, a project on the impact of large mammals on powerlines was undertaken on behalf of Eskom, and this was successfully concluded.

SCIENCE MANAGEMENT

ACE staff and students contributed to the following activities focused on Science Management:

- Provides grant and professional assessments for, *inter alia*, the National Research Foundation, National Geographic Society.
- As authors and reviewers for the South African elephant management assessment (co-ordinated by the CSIR), as indicated above.
- As reviewers for the journals: *African Journal of Ecology*, *Animal Conservation*, *Austral Ecology*, *Australian Journal of Zoology*, *Behavioral Ecology and Sociobiology*, *Biodiversity and Conservation*, *Biological Conservation*, *Biology Letters*, *Biotropica*, *Conservation Biology*, *Current Anthropology*, *Endangered Species Research*, *Journal of Tropical Ecology*, *Journal of Zoology*, *Oecologia*, *Oikos*, *Ostrich*, *PLoS One*
- On the Editorial Boards of *Acta Theriologica*, *Journal of Arid Environments*, *African Zoology*, *South African Journal of Wildlife Research*, *African Journal of Ecology*, *African Journal of Range & Forage Science*. *The Open Conservation Biology Journal*.

In addition, Graham Kerley was appointed to Chair the Conference Committee of the Society for Conservation Biology, and as such serves on the Board of Governors in an *ex officio* capacity.

COMMUNITY SERVICE

- Andre Boshoff acted in an advisory capacity to the Wildlife and Energy Interaction Group, Endangered Wildlife Trust, Johannesburg.
- Vincent Kakembo organized a Community workshop was conducted at Mgwala village community centre, Ngqushwa rural municipality to provide feedback to the local community as to the effective methods of restoring degraded hillslopes. This was based on results of successful plot trials during the year.
- Graham Kerley continues to serve on the National Advisory Committee of the SciFest, and ACE again operated an educational stall at the Scifest in Grahamstown.
- Graham Kerley's tenure as a non-executive Director of the Eastern Cape Parks Board was extended, and he continued to Chair the Biodiversity Committee of this Board.
- Graham Kerley manages the NMMU Gysbok Environmental Education Trail.
- ACE is represented on the Steering Committee of the Baviaanskloof Mega-reserve Project and on the Addo Planning Forum.

External Student Supervision

ACE members served as supervisors for students registered at universities besides the Nelson Mandela Metropolitan University, reflecting the levels of collaboration being achieved. These included:

- HETEM, R. Physiological responses of free ranging ungulates to transformed habitats. PhD thesis, University of Witwatersrand, with co-supervision by Graham Kerley.
- PLOTZ, R. The reproductive performance and ecology of black rhinoceros, *Diceros bicornis minor*. PhD thesis, Victoria University of Wellington, NZ, with co-supervision by Graham Kerley.

2008 PRODUCTS

REFEREED SCIENTIFIC PUBLICATIONS

1. LANDMAN, M., KERLEY, G.I.H. & SCHOEMAN, D.S. 2008. Relevance of elephant herbivory as a threat to Important Plants in the Addo Elephant National Park, South Africa. *J. Zool., Lond.* 274:51-58.
2. HETEM, R.S., MITCHELL, D., MALONEY, S.K., MEYER, L.C.R., FICK, L.G., KERLEY, G.I.H. & FULLER, A. 2008. Fever and sickness behavior during an opportunistic infection in a free-living antelope, the greater kudu (*Tragelaphus strepsiceros*). *Am J Physiol Regul Integr Comp Physiol.* 294:R246-R254.
3. MACDONALD, E.A., LINKLATER, W.L., STEINMAN, K.J. & CZEKALA, N.M. 2008. Rapid colour-change pregnancy test for rhinoceros using faeces. *Endangered Species Research* 4: 277-281.
4. SHRADER, A.M, KOTLER, B.P., BROWN, J.S & KERLEY, G.I.H. 2008. Providing water for goats in arid landscapes: effects on feeding effort with regard to time period, herd size and secondary compounds. *Oikos* 117:466-472.
5. KIGOZI, F., KERLEY, G.I.H. & LESSING, J.S. 2008. The diet of Cape grysbok (*Raphircerus melanotis*) in Cape St Francis Fynbos/Thicjkey Mosaic habitat, Port Elizabeth, South Africa. *S. Afr. J. Wildl. Res.* 38:79-81.
6. SHRADER, A.M, BROWN, J.S., KERLEY, G.I.H. & KOTLER, B.P. 2008. Do free-ranging domestic goats show 'landscapes of fear'? Patch use in response to habitat features and predator cues. *Journal of Arid Environments* 72:1811-1819
7. BOSHOFF, A.F., LANDMAN, M., KERLEY, G.I.H. & BRADFIELD, M. 2008. Visitors' views on alien animal species in National Parks: a case study from South Africa. *South African Journal of Science.* 104:326-328.
8. LECHMERE-OERTEL, R. G., KERLEY, G. I. H., MILLS, A. J. & COWLING, R. M. 2008. Litter dynamics across browsing-induced fenceline contrasts in succulent thicket, South Africa. *S. Afr. J. Botany* 74:651-659.
9. HAYWARD, M.W. & KERLEY, G.I.H. 2008. Prey preferences and dietary overlaps amongst Africa's large predators. *South African Journal of Wildlife Research.* 38:93-108.
10. LINKLATER W, SWAISGOOD R. 2008. Reserve size, conspecific density, and translocation success for black rhinoceros. *Journal of Wildlife Management* 72:1059-1068.
11. KAKEMBO, V. 2008. Vegetation patchiness and implications for landscape function: The case of *Pteronia incana* invader species in Ngqushwa Rural Municipality, Eastern Cape, South Africa. *Catena*, doi:10.1016/j.catena.2008.12.014

BOOK CHAPTERS

1. CARRUTHERS, J., BOSHOFF, A.F., SLOTOW, R., BIGGS, H.C., AVERY, G., & MATTHEWS, W. 2008. The elephant in South Africa: history and distribution. In: RJ Scholes and KG Mennell (eds) *Assessment of South African Elephant Management*. Witwatersrand University Press, Johannesburg. 23-85.
2. VAN AARDE, R., FERREIRA, S, JACKSON, T., PAGE, B., JUNKER, J., GOUGH, K., OTT, T., TRIMBLE, M., OLIVIER, P., GULDEMOND, R., & DE BEER, Y. 2008. Elephant Population biology and ecology. In: RJ Scholes and KG Mennell (eds) *Assessment of South African Elephant Management*. Witwatersrand University Press, Johannesburg. 84-143.
3. KERLEY, G.I.H., LANDMAN, M., KRUGER, L., OWEN-SMITH, N., BALFOUR, D., DE BOER W.F., GAYLARD, A., LINDSAY, K., & SLOTOW, R. 2008. Effects of elephant on ecosystems and biodiversity. In: RJ Scholes and KG Mennell (eds) *Assessment of South African Elephant Management*. Witwatersrand University Press, Johannesburg. 146-205.
4. SLOTOW, R., WHYTE, I., HOFMEYR, M., KERLEY, G.I.H., CONWAY, T., & SCHOLES, R.J.2008. Lethal management of elephant. In: RJ Scholes and KG Mennell

(eds) *Assessment of South African Elephant Management*. Witwatersrand University Press, Johannesburg. 370-405.

- BIGGS, H.C., SLOTOW, R., SCHOLES, R.J., CARRUTHERS, J., VAN AARDE, R., KERLEY, G.I.H., TWINE, W., GROBLER, D.G., BERTHSCHINGER, H., GRANT (RINA), C.C., LOTTER, H., BLIGNAUT, J., HOPKINS, L. & PEEL, M. 2008. Towards integrated decision-making for elephant management. In: RJ Scholes and KG Mennell (eds) *Assessment of South African Elephant Management*. Witwatersrand University Press, Johannesburg. 537-586.

REPORTS

- BOSHOFF, A. 2008. The Baviaanskloof Mega-reserve. From concept to implementation. *Centre for African Conservation Ecology Report* 58. 60 pp.
- DRUCE, D., HAYWARD, M.H. & KERLEY, G.I.H. 2008 Influence of carnivores on the buffalo population in Addo Elephant National Park: A review of existing carnivore buffalo interaction data for Addo Elephant National Park. *Centre for African Conservation Ecology Report* C118:1-20.
- LESSING, J. 2008. Large mammal interactions with Eskom Infrastructure in the Eastern Cape. *Centre for African Conservation Ecology Report* C119:1-50.
- LINKLATER W, LAW P, CZEKALA N. 2008. Understanding the mechanism and causes of male-biased birth sex ratios (BSR) in captivity: capitalizing on preliminary findings from investigations of black rhinoceros translocations. Final report to International Rhino Foundation (Grant File No. R-2005-3). 79 pp.
- LINKLATER W, SWAISGOOD R, REID C, KERLEY G. Black rhinoceros translocation biology: monitoring and experiments in donor, translocated, and post-release population management. Final report to US Fish & Wildlife Service: Rhinoceros and Tiger Conservation Fund (Grant agreement number: 98210-6-G102). 16 pp.

CONFERENCE PROCEEDINGS

- ODINDI, J.O & KAKEMBO, V. 2008. Determination of *Pteronia incana* spectral trends using laboratory and field spectroscopy. Proceedings of the 7th conference of the African Association of Remote Sensing of the Environment (AARSE), 27th-31th October, Accra, Ghana.

CONFERENCE PRESENTATIONS

- KERLEY, G.I.H., GOUGH, K.E. & LANDMAN, M. SLOTOW, R. Fencing of elephants: shifting from external to internal threats. **Invited Oral presentation**, 22nd Annual Conference of the Society for Conservation Biology, Chatanooga, TN, July.
- LANDMAN, M., KERLEY, G.I.H. HALL-MARTIN, A.J. & KNIGHT, M.H. From water to desert: understanding elephant piospheres to manage impacts. Oral presentation, 22nd Annual Conference of the Society for Conservation Biology, Chatanooga, TN, July.
- MINNIE, L., KERLEY, G.I.H. & BOSHOFF, A.F. Socio-economic and ecological correlates of leopard-stock farmer conflict in the Baviaanskloof Mega-Reserve. Oral presentation, Interfaces Conference, Oudsthoorn, August.
- RAUTENBACH, T.R., KERLEY, G.I.H. & MARTINS, Q. The utility of camera traps for determining prey preference of leopards (*Panthera pardus*) in the Cederberg mountains, South Africa. Oral presentation, Interfaces Conference, Oudsthoorn, August.
- GOUGH, K.F, KERLEY, G.I.H., SCHOEMAN, D.S., SHRADER A.M. & WHITEHOUSE. A.M. Fences and fighting: causes and effects of elephant bull intraspecific killings in Addo Elephant National Park, South Africa. Oral presentation: 12th Congress of the International Society for Behavioral Ecology, Ithaca, NY, USA. (9 – 15 August).
- COOPER, R., KERLEY, G.I.H. & LANDMAN. M. (2008) Plants at risk to the alien invasive fallow deer (*Dama dama*). Oral Presentation, Thicket Forum, Grahamstown, August (**Young Thicketeers Award**).
- KERLEY, G.I.H., LANDMAN. M. & GOUGH, K.F. (2008) Conserving thicket today for tomorrow can we rely on elephants to do the job. **Keynote presentation**, Thicket Forum, Grahamstown, August.

8. LANDMAN, M., KERLEY, G.I.H., HALL-MARTIN, A.J., SCHOEMAN, D.S. & KNIGHT, M.H. (2008) Does water bring about desert? Understanding elephant piospheres to manage impacts. Oral Presentation, Thicket Forum, Grahamstown, August.
9. CAMPBELL, E.E. (2008) Bontveld, a vegetation type distinct from bushclump-savanna in the Eastern Cape. Oral Presentation, Thicket Forum, Grahamstown, August.
10. SCHMIDT, J. (2008) A preliminary investigation into the carbon sequestration potential of *Portulacaria afra* in the Central Little Karoo. Oral Presentation, Thicket Forum, Grahamstown, August.
11. LOUW, M. (2008) Propagation and stress physiology of thicket species: towards increasing biodiversity at rehabilitation sites. Poster Presentation, Thicket Forum, Grahamstown, August.
12. DE KOCK, R. (2008) Bushclump rehabilitation after limestone mining at Grassridge. Poster Presentation, Thicket Forum, Grahamstown, August.
13. WAKEFORD, S. (2008) Seed dispersal mechanisms in Bontveld, a thicket mosaic vegetation type. Poster Presentation, Thicket Forum, Grahamstown, August.
14. BOSHOFF, A.F. & KERLEY, G.I.H. How useful are historical mammal distribution data? Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
15. NYAFU, K. & KERLEY, G.I.H. Warthogs as an invasive species in the Eastern Cape, South Africa: isotopic clues as to why *P. aethiopicus* disappeared so rapidly. Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
16. MINNIE, L., KERLEY, G.I.H. & BOSHOFF, A.F. What's on the menu? Estimated prey availability for leopards in the Baviaanskloof Mega-Reserve. Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
17. RAUTENBACH, T., KERLEY, G.I.H. & MARTINS, Q. Diet of the Cape leopard (*Panthera pardus*) in the Cederberg Mountains, South Africa. Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
18. LESSING, J. S. & KERLEY, G.I.H. A power struggle: Large mammals and power line infrastructure. Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
19. GOUGH, K. F., KERLEY, G.I.H., SCHOEMAN, D.S., SHRADER, A.M. & WHITEHOUSE, A. Elephant bull intraspecific killings in Addo Elephant National Park: causes and implications for small reserves. Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
20. DE KLERK, C. & KERLEY, G.I.H. Elephant body condition as a potential early indication of resource change. Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
21. LANDMAN, M., KERLEY, G.I.H., HALL-MARTIN, A.J., KNIGHT, M.K. & SCHOEMAN, D.S. Assessing the spatial and temporal variations of elephant impacts in the Addo Elephant National Park using a 30-year long term survey. Oral presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
22. KRAAI, M. & KERLEY, G.I.H. Distribution of white rhinoceros in the Eastern Cape as a contribution to *ex situ* conservation. Poster presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
23. SUTHERLAND, K., KERLEY, G.I.H. & LANDMAN, M. The influence of lions on buffalo diet in the Addo Elephant National Park. Poster presentation, S A Wildlife Management Association Annual Conference, Mpekweni, September.
24. JEDRZEJEWSKI, W., HAYWARD, M. W., JEDRZEJEWSKA, B. Wolf – moose relationships in the Holarctic zone. Oral presentation, VIth International Moose Symposium, Yakutsk, Russia.
25. HAYWARD, M. W. (2008). Fencing for conservation – keeping things in or out? An introduction to fencing-related conservation issues with four case studies. Oral presentation, Society for Conservation Biology meeting, Chattanooga, Tennessee, USA.
26. DE TORES, P.J., MARLOW, N. & HAYWARD, M. W. Localised and landscape scale introduced predator control in Western Australia: can it deliver the same results as

- predator exclusion fencing? Oral presentation, Society for Conservation Biology meeting, Chattanooga, Tennessee, USA.
27. HAYWARD, M. W. Costs of fencing for conservation. Oral presentation, Society for Conservation Biology meeting, Chattanooga, Tennessee, USA.
 28. KOWAŁCZYK, R., HAYWARD, M. W., JĘDRZEJEWSKI, W., JĘDRZEJEWSKA, B. & SCHMIDT, K. The impact of fencing on fauna in the Białowieża Primeval Forest, Poland. Oral presentation, Society for Conservation Biology meeting, Chattanooga, Tennessee, USA.
 29. CHURSKI, M., KUIJPER, D., JEDRZEJEWSKA, B., JEDRZEJEWSKI, W., HAYWARD, M. W., & MISCICKI, S. Forest regeneration and the limiting roles of light and large herbivores – introduction and preliminary results. Oral presentation, 1st PhD Student Symposium, Institute of Zoo and Wildlife Conservation, Berlin, Germany.
 30. CHURSKI, M., KUIJPER, D., JEDRZEJEWSKA, B., JEDRZEJEWSKI, W., HAYWARD, M. W., & MISCICKI, S. Herbivory effects on tree regeneration in a natural diverse temperate forest system. Oral presentation, VII International Meeting of SNS Network Natural Disturbance Dynamics Analysis for Forest Ecosystem Management – 6-10/10/08 Białowieża, Poland.
 31. MARNEWICK, K., HAYWARD, M. W., CILLIERS, D., & SOMERS, M. J. Survival of cheetahs relocated from rangeland to fenced protected areas: conservation & management implications. Oral presentation, South African Journal of Wildlife Management Conference, Port Alfred, Eastern Cape, South Africa.
 32. KAKEMBO, V & ODINDI, J.O. A comparative assessment of soil moisture dynamics under altered vegetation cover conditions: Implications for landscape functionality. Oral presentation, Biennial Conference of the Society of Southern African Geomorphologists, Pretoria, 26 – 28 September 2008.
 33. ODINDI, J.O & KAKEMBO, V. Determination of *Pteronia incana* spectral trends using laboratory and field spectroscopy. Oral presentation, 7th Conference of the Association of African Remote Sensing of the Environment (AARSE), 27th-31th October, Accra, Ghana.

POST-GRADUATE TRAINING

Honours Projects

1. COOPER, R. 2008. Plants at risk by the alien invasive fallow deer (*Dama dama*). BSc Hons project, Nelson Mandela Metropolitan University.
2. DE BEER, S. 2008. How do small herbivores deal with a change in resources?. BSc Hons project, Nelson Mandela Metropolitan University
3. VEN, VAN DE T.M.F.N. 2009. Is the decline in springbok on Samara Private Nature Reserve due to jackal?. BSc Hons project, Nelson Mandela Metropolitan University.
4. WENTWORTH, J.C. 2009. Addo Lion and Spotted Hyaena Prey Selection. BSc Hons project, Nelson Mandela Metropolitan University.

Postgraduate degrees in progress

MSc

1. KIETZMANN, M. Ecological correlates of nasal turbinate structure and function. MSc thesis, Nelson Mandela Metropolitan University.
2. XANGA, W.W. The relationship between land use, sediment delivery and hillslope form in Ngqushwa (formerly Peddie) district, Eastern Cape. MSc thesis, Nelson Mandela Metropolitan University.
3. NYAFU, K. The warthog as an introduced species in the Eastern Cape, South Africa. MSc thesis, Nelson Mandela Metropolitan University
4. DE KLERK, C. Body condition and resource limitations in elephants. MSc thesis, Nelson Mandela Metropolitan University.
5. MINNIE, L. Leopard stock farmer interactions in the Baviaanskloof. MSc thesis, Nelson Mandela Metropolitan University.

6. MINNIE, J. Habitat and foraging models as aids to identify priority areas for mitigation against the electrocution of Cape Griffons *Gyps coprotheres* on powerlines. MSc thesis, Nelson Mandela Metropolitan University.
7. NDLELA, S. Landscape connectivity, dysfunction and restoration in a communal catchment. MSc thesis, Nelson Mandela Metropolitan University.
8. HAINDONGO, P. An investigation of the factors influencing vegetation stress in a section of the Keiskamma Catchment, Eastern Cape. MSc thesis, Nelson Mandela Metropolitan University.
9. WEATHERALL-THOMAS, C.R. Seed germination and seedling survival in mesic thickets of the Eastern Cape. MSc thesis, Nelson Mandela Metropolitan University.
10. RAUTENBACH, T. Diet and prey availability of leopards in the Cederberg and Gamka Mountains. MSc thesis, Nelson Mandela Metropolitan University.
11. KRAAI, M. White rhinoceros as a subsidised invasive species in the Eastern Cape: population establishment and identifying plants at risk. MSc thesis, Nelson Mandela Metropolitan University.
12. MGQATSA, N. Population growth and impact of warthog in the Addo Elephant National Park. MSc thesis, Nelson Mandela Metropolitan University.

PhD

13. LANDMAN, M. Megaherbivores in Subtropical Thicket: resource use and implications. PhD. thesis, Nelson Mandela Metropolitan University.
14. GOUGH, K.F. Association patterns of elephants: do behavioural patterns reflect genetic relationships? PhD thesis, University Nelson Mandela Metropolitan University.
15. ODINDI, J.O. The invasion of *Pteronia incana* (Blue bush) along a range of gradients in the Eastern Cape Province: Its spectral characteristics and implications for soil moisture flux. PhD thesis, Nelson Mandela Metropolitan University.
16. MUGAGGA, F. Vegetation change, geomorphic processes and livelihood strategies on mountain Elgon and its environs. PhD thesis, Nelson Mandela Metropolitan University.
17. MANJORO, M. Modelling the impact of land cover/land use change on soil erosion in the communal areas of Mashonaland Central Province, Zimbabwe. PhD thesis, Nelson Mandela Metropolitan University.
18. NYAMUGAMA, A. Modeling the impact of land use/cover change and its impact on soil organic carbon in the Thicket Biome of Southern Africa. PhD thesis, Nelson Mandela Metropolitan University.
19. PLOTZ, R. The reproductive performance and ecology of black rhinoceros, *Diceros bicornis minor*. PhD thesis, Victoria University of Wellington, New Zealand.
20. NEO-MAHUPELENG, G. Lion human interactions in the Chobe District Botswana. PhD thesis, Nelson Mandela Metropolitan University.
21. MUNISHI, L. Elephant social interactions, Tarangire National Park, Tanzania. PhD thesis, Nelson Mandela Metropolitan University.

Postgraduate degrees completed

1. MILNE, T.A. 2008. Dietary response to habitat transformation by small ungulates. MSc thesis, Nelson Mandela Metropolitan University.
2. FENWICK, R.M. 2008. Diet selection of indigenous herbivores and domestic livestock in the Little Karoo. MSc thesis, Nelson Mandela Metropolitan University
3. NOHOYEKA, B.T. 2008. Degradation of the Thicket Biome in the Eastern Cape: The Case of Keiskamma Catchment. MSc thesis, Nelson Mandela Metropolitan University.

FINANCIAL SUPPORT 2008

Research Grants	Programme	Amount (R)
Eskom	Cape Vulture	220 535
National Research Foundation*	Megaherbivores in Thicket	82 000
CIB*	Invasive species	160 000
Table Mountain Fund*	Leopard Stockfarmer interactions	90 000
Distell	Addo Elephants	50 000
Cape Leopard Trust*	Cape leopard diet	25 000
NMMU Research Office	G Kerley	231 549
NMMU	ACE	30 000
NMMU	Biodiversity-based economy RNA	50 000
International Rhino Fund	Black rhino conservation biology,	51 921
US Fish and Wildlife,	Victoria University of Wellington	112 579
SANPAD	Vegetation invasions	193 952
NRF*	NRF Focus Area (V Kakembo)	118 600
Research Grants total		1 416 136
Contract research (various) total		127 000
Bursary Support		
Eastern Cape Parks (K Nyafu)		21 000
National Research Foundation (R Cooper)		30 000
NMMU (R Cooper, C de Klerk, K Gough, M Kraai, L Minnie, M Munyaradzi, N Mgqatsa, K Nyafu, A Nyamugama)		231 500
Wildlife Conservation Society (L Munishi)		84 250
Oliver Foundation (N Mgqatsa, M Kraai)		50 000
Thicket Forum (R Cooper)		6 000
Eskom (J Minnie)		15 000
SANPAD		80 000
Bursary support total		517 750
TOTAL		2 060 886

* Amounts include bursaries for postgraduate students.

In Kind Contributions

- The Mazda Wildlife Fund continues to provide a fully-serviced 4x4 twincab for research support.
- Budget Rent-a-Car have again provided a 4x4 bakkie, which has primarily been used for research on predators in the Addo Elephant National Park
- Everready (Pty) Ltd donated batteries for the work on carnivore/buffalo interactions in the Addo Elephant National Park.

ADVISORY BOARD, STAFF AND ASSOCIATED STUDENTS

Advisory Board 2007

Dr P van Breda, Research Management, NMMU (Chair)
Prof T Wooldridge,
Dr M Knight, South African National Parks
Mr L. Els, Department of Economic Development & Environmental Affairs (Eastern Cape)
Dr J. Gambiza, Rhodes University
Dr W Fowlds, Indalo - Eastern Cape Private Nature Reserves Association
Dr L Dziba, Agricultural Research Council
Ms R le Roux, National Research Foundation
Mr Frank Mazibuko, National Research Foundation
Ms N Maswana, Eastern Cape Parks Board

Staff

Prof. G. I. H. Kerley, (Director)	Dr. A. F. Boshoff
Prof. E. E. Campbell (Deputy Director)	Dr. S. L. Wilson
Prof. V. Kakembo	Ms M. Collett
Dr. D. du Preez	Ms N. Mggatsa

Research Associates

Dr W Linklater (NZ)	Dr A R Palmer (SA)
Dr MW Hayward (Aus)	

Postdoctoral Researchers

Dr D Druce (SA)	Mr C Tambling (SA – PhD under examination)
Dr A Shrader (USA)	

Postgraduate students (and their academic departments)

MSc			
Ms C de Klerk	Zoology	Mr C Weatherall-Thomas	Botany
Ms P. Haindongo	Geosciences	Mr WW Xanga	Geosciences
Mr EP Jacobs	Zoology	Ms K Wolmarans	Botany
Ms M Kietzmann	Zoology		
Ms M Louw	Botany		
Mr J Minnie	Geosciences/Botany/ Zoology	Ms M Landman	PhD Zoology
Mr L Minnie	Zoology	Mr. P. Mhangara	Geosciences
Ms N Mggatsa	Zoology	Ms K Gough	Zoology
Ms K Nyafu	Zoology	Mr F. Mugagga	Geosciences
Ms B.T. Nohoyeka	Geosciences	Mr M. Manjoro	Geosciences
Ms T Rautenbach	Zoology	Mr. A. Nyamugama	Geosciences
Ms S. Ndlela	Geosciences	Mr L Munishi	Zoology
Mr P Haindongo	Geosciences	Mr G Neo- Mahupeleng	Zoology
Ms S van Niekerk	Geosciences	Mr O Odindi	Geosciences

External Students (PhD)

Ms R. Hetem	University of Witwatersrand	Mr R Plotz	Victoria University of Wellington
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