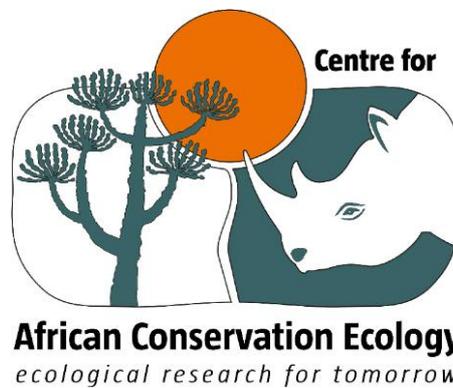


# CENTRE FOR AFRICAN CONSERVATION ECOLOGY

## ANNUAL REPORT 2009

Nelson Mandela Metropolitan University



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## 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 eighteenth Annual Report, and deals with the activities of ACE during 2009.

### 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.

***This report is dedicated to the memory of the late Dr Shaleen Els, who in her capacity as Director: Research Capacity Development, was unfailing in her support of students within ACE***

## DIRECTOR'S REPORT

The Centre for African Conservation Ecology has enjoyed another very productive year, with strong growth over 2008 outputs. These include 23 refereed scientific publications, 6 technical reports, and 12 conference proceedings, with 9 Hons, 6 MSc and 11 PhD students busy with their degrees, while 1 PhD and 8 MSc students graduated during 2009. It is gratifying to report that in three key respects these measures are all moving in the right direction over 2008 statistics: scientific publications doubled, conference presentations decreased by more than 50% (while remaining healthy), graduating students more than doubled and the ratio of MSc to PhD students is for the first time strongly skewed towards PhD students. The latter measure is particularly important given the national priority of increasing PhD graduates, and these students also tend to provide high value through the production of publications. Well done to all the staff and students for this sterling effort, and congratulations to those students who graduated, especially Christelle de Klerk and Clayton Weatherall-Thomas, who were awarded their MSc degrees *cum laude*.

Maintaining these levels of productivity requires considerable resources, and funding has shown a marked increase over 2008 figures, the 2009 total exceeding R3 million Rand, of which a very healthy figure of nearly half a million Rand represents bursary funding to support students. In-kind support has also been healthy, and ACE is fortunate to have two vehicles provided on loan, one from the Mazda Wildlife Fund and the other from Budget Rent a Car, while Continental were very generous in providing tyres and Everready provided batteries. Contract research income has grown considerably over the previous year, but it is important to note that these contracts largely represent research and student training opportunities, this being in line with the commitment by ACE to focus on these fields, rather than become a commercial consulting entity.

A large proportion of the funding reported here represents funding provided by a variety of sponsors for the project to revise the out-of-print book by Jack Skead on the historical incidence of mammals in the Western and Northern Cape Provinces. This is very much a flagship product for ACE and follows on the very well received revision of Skead's book on the Eastern Cape. Due recognition must go to André Boshoff, assisted by Margot Collett, for his leadership and enthusiasm for this mammoth task.

I am pleased to also draw attention to the number of students who have been recognized for their achievements this year – students dominate the lists of awards recorded in this report, and this is a very healthy indicator of the quality of our students and the support and supervision that they receive.

I was able to enjoy a very rewarding sabbatical during 2009, and was able to do so on the basis that ACE is well-set up and supported by the staff and students. Eileen Campbell, in her role as Deputy-Director was on standby during this period, and I would like to thank her for that. Critical to the smooth operation of ACE during my sabbatical was the hard work and commitment of Dr Shirley Parker-Nance, who took over as ACE administrator from Ms Nokubonga Mqgatse, and the communication power of Skype™. In addition I would like to thank André Boshoff, Derek du Preez and Vincent Kakembo for their contribution. Marietjie Landman and Craig Tambling played a key role in the two large research contracts in Addo. The Dean of the Faculty of Science, Prof Andrew Leitch, who also chairs the ACE Advisory Board, provided valuable advice and guidance. The NMMU departments of Research Management, Research Capacity Development and Finances supported ACE activities through their service input. 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

- Christelle de Klerk was awarded the GSSA Best Student Prize in Rangeland Science for her MSc on elephant feeding and body condition.
- Marietjie Landman was awarded a full bursary to attend the BIOSEB Summer School in Ecology and Biodiversity, Mammal Research Institute, Polish Academy of Sciences, Bialowieza, Poland, and while there was awarded the prize for the Best Student Poster presentation.
- Kristi Maciejewski was awarded a prestigious South African Netherlands Research Programme on Alternatives in Development (SANPAD) Research Capacity Initiative Pre-Doctoral Scholarship.
- Anton Schmidt was awarded the prize for the best poster at the SA Wildlife Management Association Conference in September.
- Graham Kerley was awarded a Marie Curie Fellowship at the Mammal Research Institute, Polish Academy of Sciences.

## RESEARCH ACTIVITIES

Research activities are grouped into themes, and are reported within these on a biome or project specific basis. A unifying feature of these themes is that global change serves as a cross-cutting theme.

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### CONSERVATION BIOLOGY

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*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 student) continued her research on the association patterns, competitive interactions and population dynamics of the Addo elephants. She developed a visual key for assigning body condition scores to elephants, and determined that the energetically constrained (lactating) and older females had consistently poorer body condition scores. This may be a subtle effect of density dependence. Her opportunistic observations of elephant responses to a dead male elephant were published in *Pachyderm*. She continues to monitor the Addo population and maintain the long-term demographic data set, and is preparing her thesis for submission.

**Cape Vulture:** André Boshoff's three-year study of factors affecting recolonisation by the threatened Cape Griffon of its historical range in the Eastern Cape was completed. This project was commissioned by Eskom Holdings Ltd, in response to concerns that the electrocution of griffons on powerlines, and collisions between griffons 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 ensuing dissatisfaction amongst Eskom's customers. A final project report, containing the scientific findings and a set of management recommendations, was presented to Eskom at the end of October.

Other important products include published papers on the distribution and breeding status of the Cape Griffon in the Eastern Cape, and on the occurrence of partial migratory behaviour by the species. A key finding of the study is that griffon-unfriendly powerlines, alone, have the potential to drive the species to extinction in the region; thus, such powerlines are a

major impediment to recolonisation. Manuscripts on this and other outcomes are being prepared for publication.

**Cape Mountain Zebra:** Halska Hrabar joined ACE as a postdoctoral research fellow during 2009 and has been focussing on a study of Cape Mountain Zebra. The endangered Cape mountain zebra appears to have an unusual social system and life-history for an ungulate, which is still not fully understood. The transmission of female dominance and the effect of female social rank on reproductive sex allocation (opposite to the trend for ungulates) have, for example, been reported. This study looks at what drives this behaviour and reproductive strategy and how does this influence population performance? She also completed a status survey for this species, and has been able to show that through a combination of state and private conservation initiatives, the global population of Cape Mountain Zebra is over 2700, with about a third being on private land. The significance of this figure is that it exceeds the IUCN conservation target for this species of 2500 zebra. Given that the IUCN target is below the generally accepted numbers of a species required for population viability, her study suggests that it is desirable to revise this target upwards.

**Black rhinoceros:** Roan Plotz (PhD student at Victoria University of Wellington, NZ) has been closely monitoring individual black rhino cows in Hluhluwe-Imfolozi in order to test hypotheses regarding mortality of calves. He completed his fieldwork midyear, and Andre Stringer took over the monitoring for him. Wayne Linklater has completed an extensive analysis of the causes of post-translocation in black rhino and showed that much of this can be explained in terms of the age and sex structure of animals being moved.

**Red paperflower conservation:** Further studies on *Syncarpha recurvata* (L.f.) B. Nord. showed that seeds age poorly, as shown by a severe loss of viability within two years of collection. The loss of viability is exacerbated by seeds dropping into the soil. If seed is to be used for reestablishment, this must be done in early summer, from freshly harvested seed.

**Fluffy honeybush tea conservation:** Investigations during 2009 focused on identification of pollinators as well as faunal impacts. Plants suffer heavy damage from insect feeding (caterpillars & phloem feeders) and branch breaking by cattle. One of the two remaining populations has been severely reduced in number due to faunal impacts.

**European bison:** Graham Kerley focused on the concept of refugee species, with the European bison as a model, during his sabbatical at the Mammal Research Institute of the Polish Academy of Sciences. His analysis suggests that the current conservation strategy of managing this species in forest habitat is not the most effective approach to increasing bison numbers, and a manuscript to this effect has been prepared.

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## **ANIMAL-PLANT INTERACTIONS**

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*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 only a small proportion of Important Plants previously thought particularly vulnerable to elephant browsing occur in their diet and that black rhinoceros foraging opportunities are compromised by elephant browsing. The focus of this work has expanded to include the impacts of elephants and identify potential indicators of elephant-induced change on vegetation composition and structure in the Addo Elephant National Park (AENP). In particular, monitoring sites established during 1977 were re-measured as part of a fourth survey. Results are striking, showing that plant richness, volume and density continue to decline after 30 years of

elephant browsing. This is most striking in the areas around permanent water. This decline is associated with a loss of ecosystem functioning, eventually resulting in the collapse of the system. Similar trends have been established using remote-sensed images.

Jessica Allen completed her Hons study on the diet and dietary preferences of elephant in the Karoo habitats of the AENP. She showed that elephants in these habitats utilized fewer plant species (c. 65 species) than elephant in more diverse, productive landscapes (c. 146 species). The large woody trees (e.g. *Pappaea capensis* and *Schotia afra*) are principal dietary items and are particularly vulnerable to elephant effects in these habitats. These data contribute towards a larger database on elephant resource use in the Eastern Cape, and may be used to predict elephant impacts across a range of habitats.

**Resource use by grysbok:** The dietary composition data for grysbok was extended by measuring diet quality. Surprisingly, these data do not support the hypothesis that increased Australian acacia consumption increases diet quality in this species and also calls into question the extent to which small ruminants are limited in terms of their fibre intake. A manuscript to this effect has been accepted for publication.

**Determination of carrying capacity for maintenance of plant biodiversity:** Clayton Weatherall-Thomas's PhD study commenced in 2009. This project will use phytosociological investigations, but focus on the dwarf succulents as sensitive indicators of loss of biodiversity due to elephant effects. Questions to be addressed include:

- How do elephants impact the rare and endemic dwarf succulents that are found in Thicket? Does the change in canopy cover as a result of elephants affect the diversity and abundance of dwarf succulents in Thicket?
- At what level of utilization do elephants have a negative influence on the diversity and cover of dwarf succulents in Thicket?
- Do all succulent species respond to elephant utilization in a similar fashion?
- How does elephant spatial use of the landscape affect the distribution of dwarf succulents? Do succulents escape elephant utilization by continuing to occur in refugia?
- Can elephant utilization be related to impact on succulents and determination of carrying capacity based on floral diversity?

A review of the literature, workshops with key stakeholders and assessment of elephant behavior indicate that the experimental design for this study will have to include at least Addo Elephant National Park (Colchester section), and Shamwari Game Reserve but other research in other reserves with elephant and rhino still require planning and logistic arrangements.

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## RESOURCE ECOLOGY

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*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.

**Valuing biodiversity for ecotourism:** Kristi Maciejewski has launched a PhD project which will assess the value of biodiversity to ecotourism-focused private reserves. In the first phase, she has evaluated choices by private reserves in terms of vegetation types purchased, and what influences this. Her results show a high degree of selectivity in terms of the vegetation types included in reserves with a focus on thicket vegetation types. There appears to be little congruence between conservation priorities and land purchases by private reserves. She is extending this study to a landscape and wildlife species-level analysis.

**Leopard-stockfarmer interactions:** Liaan Minnie's study on leopard-stockfarmer interactions in the Baviaanskloof (for which he graduated MSc in 2009) has been extended with further funding from the Table Mountain Fund to test the hypothesis that leopards suppress populations of jackal and caracal. To this end camera trapping is being done at a suite of sites across the Eastern Cape, which vary in the presence and absence of leopards.

**Lion-human conflict in Botswana:** Gosiamo Neo-Mahupeleng's PhD study on the interactions between the large predators (lion and spotted hyena) in the Chobe district of Botswana is continuing and he has been concentrating on fieldwork. He has collected a large database on such conflict incidents, as well as extensive data on husbandry practices as they pertain to predation management. Collaring the large predators is ongoing, and he will soon have extensive spatial data for these species in his area.

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## **PREDATOR PREY INTERACTIONS**

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

**Carnivore-Buffalo interactions:** Craig Tambling rounded off and completed the contractual obligations required for the completion of the World Bank funded carnivore-buffalo project conducted in the Addo Elephant National Park. Following on from the completion of the above mentioned project, monitoring has been continued on the buffalo, lion and hyaena in AENP in light of the future park expansion planned for the middle of 2010. Management related activities resulted in the rapid increase in predation on buffalo at the end of 2009 and this has further enhanced our understanding of carnivore-buffalo interactions within small enclosed reserves. Collection of scats for Julia Wentworth's MSc have continued and adequate sample sizes of both hyaena and lion scats are now available for the completion of the diet shifts in time component of the research. Finally, a new project on Black-backed jackal responses to large predator re-introductions has been approved by the South African National Parks (SANParks) and will cover all National Parks in the Frontier Region (Eastern Cape).

**Prey use by the Cape Leopard:** Theresa Rautenbach successfully complete her MSc investigating the diet of leopards in the Cedarberg and Gamkaberg mountains, in collaboration with the Cape Leopard Trust. She also assessed the utility of camera trap data for estimating prey availability. She was able to show regional diet differences that presumably reflect shifts in prey availability, and also that camera trap data underestimates the availability of smaller prey items for leopards. Theresa's ability to do the MSc in one year reflects the availability of samples that had been collected by the Cape Leopard Trust.

**Jackal and springbok interactions:** Tanya van de Ven completed her Hons project on jackal diet on Samara Private Game Reserve, where springbok numbers have declined substantially. She showed a summer peak in springbok consumption by jackal, and it has been hypothesized that this could reflect jackal predation on springbok kids. Data is now being collected on the seasonality of springbok reproduction in order to test this hypothesis.

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## **TRANSFORMATION AND RESTORATION ECOLOGY**

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*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.*

**Warthog as an invasive species:** Nokubonga Mgqatsa undertook the second year of her MSc study of warthogs in the AENP, where this species has been introduced. Her dietary

analyses confirmed that warthogs are largely grazers, but do increase their consumption of browse in the winter. She was able to show that the introduction of predators did not prevent warthog population numbers in Addo from following the typical exponential growth response after an initial establishment phase. This confirms that this population will need active population regulation by managers. Nokubonga has submitted her dissertation for examination.

**White rhinoceros as an extralimital species in the Eastern Cape:** Manqhai Kraai has submitted her MSc dissertation on white rhinoceros population responses and diet in the Eastern Cape for examination. A key finding of her study is that white rhino intercalving intervals (as an index of population performance) do not differ in the Eastern Cape, where they are extralimital, compared to data for populations in their natural range. She was also able to provide the first description of this species diet in the Eastern Cape. A frustrating aspect of her study was the difficulty of obtaining population level data, as rhino owners were concerned about the security of their animals, and this was elevated by the recent outbreak in poaching of rhino in the Eastern Cape.

**Effect of impala on Thicket:** During 2005, 16 impala were enclosed in 16 ha of thicket. For three years (2005-2007) the impacts of the animals on the thicket were monitored, after which the fence was removed (21 animals were released from the area). Monitoring of recovery of the thicket after removal of the impala has continued (2008-2010). This data will be worked up for publication after the final dataset is collected in May 2010.

**Rehabilitation of Thicket:** Contribution to thicket rehabilitation included the following techniques:

1. Succulent species are more easily propagated i.t.o. root strike and growth rate, than woody species
2. 'Sterile' media i.e. plain poolfilter sand and perlite, promote a better root strike and growth rate than 'non-sterile' media i.e. composted pine bark and thicket soil
3. Treatment with a rooting hormone (Seradix B No. 3) promotes root strike and growth rate in succulent species
4. Succulent species survive extended periods of drought (drought being below the mean maximum field capacity measured (40%)) better than woody species, and show a faster recovery rate after rewatering
5. Species (*Portulacaria afra* and *Crassula ovata*) survive transplantation into the field better when planted into intact and 33 year old rehabilitated stands planted up with 'local' spekboom, compared to control/degraded, 19 and 33 year old 'berg' spekboom stands
6. Greater species richness is found in 33 year old 'local' than 'berg' spekboom stands
7. Soil conditions improve with an increase in age of rehabilitated spekboom stands – and can be correlated with species richness and cutting survival in the different-aged stands (texture, pH, EC, organic content, litter load).

**Rehabilitation of Bontveld:** In 2009, attention focused on setting up a randomized block design experiment for regenerating bush clumps in Bontveld. The hypotheses tested included

- Rehabilitation of mined Bontveld bushclumps using artificial dolines depends on sufficient soil depth.
- Rehabilitation of mined Bontveld bushclumps using artificial dolines depends on the presence of thicket nurse plants.

To this end an experimental revegetation site for development of artificial dolines was developed. In these dolines, the experimental design included components of soil depth, seed sowing, planting of nurse plants, and planting of bird perches (aloes). These dolines were monitored for phytosociology as well as soil conditions (moisture in particular). This monitoring will continue.

**Physiological responses of ungulates to transformation:** Robyn Hetem's PhD study (through the University of the Witwatersrand) was approved and she has been awarded the degree. During 2009 two publications based on her work have appeared, one focus on goat responses to shearing and the other on the physiology of springbok colour morphs.

**Soil carbon sequestration potential:** Rebecca Zengeni (PhD student) is assessing the potential of selected vegetation biomes in Eastern Cape to influence Soil C Sequestration by quantifying the amount of C sequestered under different vegetation biomes (Intact Thicket, Degraded Thicket and Grassland). This will be done by quantifying the pools and fluxes of C in different land-use systems over time. Flux measurements will be done for carbon dioxide, methane and nitrous oxide gases by use of static chambers that will be set up at each site and monitored for about a year. C pools will be quantified by measuring soil organic C; and C12/C13 isotope ratios of selected C3 and C4 plants from each site will also be measured using mass spectrometry to infer the shifts in vegetation that have occurred over time. An addition experiment to assess the effect of erosion on soil carbon sequestration will also be carried out. Climate data (temperature, rainfall) in the study area will also be assessed to see if any significant changes have occurred over the years and compared with measured pools and fluxes of the above gases.

**Factors influencing ecological thresholds in Mosaic Thicket:** Anton Schmidt has started a PhD level study on the effects of herbivory on transformation in Arid Mosaic Thicket of the southern Cape, and will be testing ideas around thresholds of resilience. He has spent the year formulating ideas and reviewing the literature and did well to receive the prize for the best poster at the SA Wildlife Management Conference.

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## BIODIVERSITY

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*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):** Following a successful fund-raising initiative, the project to publish a Second Edition of CJ Skead's *Historical Incidence of the Larger Land Mammals of the Western and Northern Cape* (First Edition published in 1980) was formally launched, with André Boshoff as lead editor and Graham Kerley and Peter Lloyd (Cape Nature) as co-editors. Good progress was made in the first nine months of this project, with the focus being on the location of new distributional information in the published and unpublished literature, and on the geo-referencing of records, in order to be able to prepare distribution maps for many of the species covered in the book. In addition, a start was made on the task of re-structuring and re-editing the original text, and on the acquisition of illustrative material (artworks, photos etc).

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## FUNDAMENTAL RESEARCH

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

**Nasal turbinate structures as predictors of response to global climate change:** Michelle Kietzmann extended the analyses of nasal turbinate area in eleven species of ungulate by using a phylogenetic based approach, in conjunction with Prof A McKenzie of the University of Pretoria. Her results show conflicting outcomes depending on the analytical approach. A traditional approach identified the water dependence and response to predators as important variables to explain the area of the nasal turbinates in these ungulates.

However, a phylogenetic-based analysis showed a lack of such predictive relationships, which means that these structures are of little utility in predicting species responses to climate change. She has submitted her dissertation for examination.

## 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 were completed early in 2009. A specialist faunal study was undertaken for Kadouw Developments.

## SCIENCE MANAGEMENT

ACE staff and students contributed to Science Management through a number of activities. These included:

- Andre Boshoff served on the Conservation Committee of BirdLife South Africa, and also acted as specialist tour guide, to Addo Elephant National Park, for group of scientists attending the 2009 Diversitas Conference in Cape Town.
- Graham Kerley served on the Board of Governors of the Society for Conservation Biology, and on the editorial boards of the *Journal of Arid Environments*, *African Zoology*, *African Journal of Range and Forage Sciences*, *South African Journal of Wildlife Research*. He also reviewed projects for the National Geographic Society and the Netherlands Organization for Scientific Research.
- Staff and students served as manuscript reviewers for the following journals: *Ostrich*, *African Zoology*, *African Journal of Ecology*, *Journal of Zoology London*, *African Journal of Range and Forage Science*, *Pachyderm*, *Biological Conservation*, *Biodiversity & Conservation*, *Acta Theriologica*, *Journal of Vegetation Science*, *Journal of Tropical Ecology*, *Mammalian Biology*

## COMMUNITY SERVICE

- Graham Kerley serves as a member of the Board of Directors of Eastern Cape Parks and South African National Parks.
- ACE continued to operate the Grysbok Environmental Education Trail, with nearly 2000 school-level learners participating in the trail experience in 2009.
- ACE operated a stall at the SciFest in Grahamstown in April, over 40 000 learners attended this event.

## 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.

## • 2009 PRODUCTS

### Refereed Scientific Publications

1. BOSHOFF A. F., PIPER S. E. & MICHAEL M. 2009. On the distribution and breeding status of the Cape Griffon *Gyps coprotheres* in the Eastern Cape Province, South Africa. *Ostrich* 80(2): 85-92.
2. De BRUYN, P. J. N., LANDMAN, M., TAMBLING, C, J & VERBURGT, L. 2009. Does science serve the wildlife industry? A critique of von Brandis & Reilly (2008). *South African Journal of Wildlife Research* 39(1): 103-105.
3. DRUCE, D.J., BROWN, J.S., KERLEY, G.I.H., KOTLER, B.P., MACKEY, R.L. & SLOTOW, R. 2009. Spatial and temporal scaling in habitat utilisation by klipspringers (*Oreotragus oreotragus*) determined using giving-up densities. *Austral Ecology*. 34(5):577-587.
4. FEELY, J. M. 2009. IsiXhosa names of South African land mammals. *African Zoology* 44: 141-150.
5. HAYWARD, M.W. 2009. Conservation management for the past, present and future. *Biodiversity Conservation*. 18:765-775.
6. HAYWARD, M. W. 2009. Bushmeat hunting in Dwesa and Cwebe Nature Reserves, Eastern Cape, South Africa. *South African Journal of Wildlife Research*. 39(1):70-84 .
7. HAYWARD, M.W., & HAYWARD, G.J., 2009. The impact of tourists on lion *Panthera leo* behaviour, stress and energetics. *Acta Theriologica* 54:219-224.
8. HAYWARD M.W., HAYWARD, G.J., DRUCE D.J. & KERLEY, G.I.H. 2009. Do fences constrain predator movements on an evolutionary scale? Home range, food intake and movement patterns of large predators reintroduced to Addo Elephant National Park, South Africa. *Biodivers. Conserv.*18: 887-904.
9. HAYWARD, M.W. & KERLEY, G.I.H. 2009. Fencing for conservation: restriction of evolutionary potential or a riposte to threatening processes? *Biological Conservation* 142:1-13.
10. HAYWARD, M.W. & SLOTOW, R. 2009. Temporal partitioning of activity in large African carnivores: tests of multiple hypotheses. *South African Journal of Wildlife Research* 39(2): 109-125.
11. HETEM, R.S., DE WITT, B.A., FICK, L.G., FULLER, A. KERLEY, G.I.H MEYER, L.C.R., MITCHELL, D., & MALONEY, S.K. 2009. Body temperature, thermoregulatory behaviour and pelt characteristics of three colour morphs of springbok (*Antidorcas marsupialis*). *Comp. Biochem. Physiol. Part A*. 152:379-388.
12. HETEM, R.S., DE WITT, B.A., FICK, L.G., FULLER, A., KERLEY, G.I.H., MALONEY, S.K., MEYER, L.C.R. & MITCHELL, D. 2009. Shearing at the end of summer affects body temperature of Angora goats (*Capra aegagrus*) more than does shearing at the end of winter. *Animal* 3:1025-1036.
13. KAKEMBO, V. 2009. Vegetation patchiness and implications for landscape function: The case of *Pteronia incana* invader species in Ngqushwa Rural Municipality, Eastern Cape, South Africa. *Catena* 77, 180-186.
14. KAKEMBO, V., XANGA, W.W & ROWNTREE, K.M. 2009. Topographic thresholds in gully development on the hillslopes of communal Areas in Ngqushwa Local Municipality, Eastern Cape, South Africa. *Geomorphology* 110:188-194.
15. KERLEY, G.I.H. & WHITFORD, W.G. 2009. Can kangaroo rat graminivory contribute to the persistence of desertified shrublands? *J. Arid Env.* 73:651-657.
16. KERLEY, G.I.H., SIMS-CASTLEY, R. BOSHOFF, A.F. & COWLING, R.M. 2009. Extinction of the blue antelope *Hippotragus leucophaeus*: modeling predicts non-viable global population size as the primary driver. *Biodiversity and Conservation* 18:3235-3242.
17. LANDMAN, M., KERLEY, G.I.H. & SCHOEMAN, D.S. 2009. Evidence-based conservation management of elephants: the case of the Important Plants in Addo Elephant National Park, South Africa. *J. Zool., Lond.* 277:108-110.
18. MERTE, C.E., GOUGH, K.F. & SCHULTE, B.A. 2009. Investigation of a fresh elephant carcass by conspecifics. *Pachyderm*, 45:124-126.

19. MILNE, T.A. & KERLEY, G.I.H. 2009. Testing for a decline in secondary productivity under desertification in subtropical thicket, South Africa using Angora goats: lessons for experimental design. *African Journal of Range and Forage Science* 26:107-110.
20. PLOTZ, R. D. & LINKLATER, W. L. 2009. Black rhinoceros (*Diceros bicornis*) calf succumbs after lion predation attempt: implications for conservation management. *African Zoology* 44:283-287.
21. ODINDI, O. J. & KAKEMBO, V. 2009. The use of laboratory spectroscopy to establish *Pteronia incana* spectral trends and separability from bare surfaces and green vegetation. *South African Geographical Journal* 91, 16– 24.
22. ODINDI, O. J. & KAKEMBO, V. 2009. A comparison of Pixel and sub-Pixel based techniques to separate *P. incana* invaded areas using multi-temporal High Resolution Imagery. *Journal of Applied Remote Sensing*, 3, 033545; doi:10.1117/1.3229983.
23. SIGWELA, A.M. KERLEY, G.I.H. MILLS, A.J. & COWLING R.M. 2009. The impact of browsing-induced degradation on the reproduction of subtropical thicket canopy shrubs and trees. *S. Afr. J. Bot.* 75:262-267.

### Reports

1. HRABAR, H. & KERLEY, G. I. H. 2009. Cape Mountain Zebra 2009 Status Report. *Centre for African Conservation Ecology Report* 59: 1-15.
2. TAMBLING, C.J., HAYWARD, M., DRUCE, D. & KERLEY, G. 2009. The buffalo of the Addo Elephant National Park following the re-introduction of large carnivores How has five years of lion and hyaena predation in the main camp section affected the buffalo population? *Centre for African Conservation Ecology Report* C120:1-56.
3. LANDMAN, M & KERLEY, G. I. H. 2009. Elephant Impacts And Potential Indicators Of Elephant-Induced Change To Vegetation Composition And Structure In Addo Elephant National Park: Baseline assessment of key-plant species in Colchester, Kuzuko Contractual Park and the Darlington monitoring exclosures . *Centre for African Conservation Ecology Report* C121:1-43.
4. LANDMAN, M & KERLEY, G. I. H. 2009. Elephant Impacts And Potential Indicators Of Elephant-Induced Change To Vegetation Composition And Structure In Addo Elephant National Park: Assessing the extent of elephant-induced change to vegetation composition and structure in Addo Main Camp. *Centre for African Conservation Ecology Report* C122:1-128.
5. LANDMAN M. & KERLEY G.I.H. 2009. Faunal Specialist Study for the Kadouw Leisure Estate Private Nature Reserve. Centre for African Conservation Ecology Report C123, Nelson Mandela Metropolitan University, Port Elizabeth.
6. BOSHOFF, A.F. and MICHAEL, M. 2009. Threats to the natural re-colonisation of the Eastern Cape by the Cape Griffon (Vulture): Parts 1 (65 pp.) and 2 (209 pp.). *Gyps coprotheres*. *Centre for African Conservation Ecology Report* C124: 65 + 209 pp.

### Popular Articles

- BOSHOFF, A.F. 2009. Whither the Cape Vulture in the Eastern Cape? *Bee-eater* 60(3):52-55.

### Conference Presentations

1. ALLEN J., KERLEY G.I.H. & LANDMAN M. 2009. Diet and dietary preferences of elephant to limiting resources in the Addo Elephant National Park, South Africa. Poster presentation: 6<sup>th</sup> Annual Meeting of the Thicket Forum, Salem, South Africa.
2. HRABAR, H. & KERLEY, G.I.H. The role of private land owners in Cape Mountain Zebra conservation - first to future efforts. Poster presentation, S A Wildlife Management Association Annual Conference, Golden Gate, September.
3. KAKEMBO, V. Control of invader vegetation induced erosion and restoration of grass species using brush piles and mulching techniques in Ngqushwa District, Eastern Cape, South Africa, Society of South African Geographers' 8<sup>th</sup> Biennial Conference, UNISA Pretoria, 30 August – 3 September 2009.

4. KAKEMBO, V. Land Abandonment in the Eastern Cape, South Africa: Implications for vegetation invasions, soil surface conditions and gully erosion keynote address, European Geosciences Union (EGU) General Assembly, Vienna, (April 19-24, 2009); Special symposium on Soil degradation and Abandoned Lands.
5. KAKEMBO, V. The Integration of GIS into Demographic and Quality of Life Surveying of Informal Settlements: The case of Nelson Mandela Bay Municipality, South Africa; Oral paper presented at the AfricaGIS 2009 International Conference, Kampala, Uganda, October 2009.
6. MACIEJEWSKI, K. & KERLEY, G.I.H. Assessing Biome Level Selection by Private Game Reserves in the Eastern Cape. Oral presentation, S A Wildlife Management Association Annual Conference, Golden Gate, September.
7. MACIEJEWSKI, K. & KERLEY, G.I.H. Estimating the value of biodiversity for ecotourism. Oral Presentation. SANBI Environmental Resource Economics Conference, Cape Town, May.
8. MALAN R., REILLY B. & LANDMAN M. 2009. Food availability and dietary selection of black rhinoceros *Diceros bicornis minor* in the Mokopane Biodiversity Conservation Centre, Limpopo Province. Oral presentation: Southern African Wildlife Management Association, Thaba Nchu, South Africa.
9. SCHMIDT, A., WATSON, L.H. & KERLEY, G.I.H. An approach to assessing herbivory induced thresholds in arid mosaic thicket. Poster presentation, S A Wildlife Management Association Annual Conference, Golden Gate, September. **Best Poster Prize.**
10. SHRADER, A.M., KERLEY, G.I.H., BROWN, J.S. & KOTLER, B.P. Spatial and temporal foraging decisions of a central place mammalian herbivore. Oral presentation, 50<sup>th</sup> Anniversary Conference, Zoological Society of Southern Africa, Illovo Beach, July.
11. TAMBLING, C.J., HAYWARD, M., DRUCE, D.J. & KERLEY, G.I.H. Rapid response to predators: buffalo and lion in Addo Elephant National Park. Poster Presentation. Savanna Network Meeting, Skukuza, April.
12. TAMBLING, C.J., HAYWARD, M., DRUCE, D.J. & KERLEY, G.I.H. Rapid Response to Predators: buffalo and lion in Addo Elephant National Park. Oral presentation, S A Wildlife Management Association Annual Conference, Golden Gate, September.

## **POST-GRADUATE TRAINING**

### **Honours Students 2009**

1. ALLEN, J. Diet of Elephant (*Loxodonta africana*) in the Karoo: do they fit into a unimodal diet selection pattern? BSc Hons project, Nelson Mandela Metropolitan University.
2. ARTHUR, T. 2009. A conservation assessment of the vegetation of the lower catchment of the Van Staden's River. BSc Hons project, Nelson Mandela Metropolitan University.
3. GROBLER, B.A. 2009. The Threatened plants of the Baakens River Valley. BSc Hons project, Nelson Mandela Metropolitan University.
4. KAISER, S. Bilateral directional asymmetry in Cape fur seals. BSc Hons project, Nelson Mandela Metropolitan University.
5. MALHERBE, M. 2009. A conservation plan for the Bontveld of Grassridge. BSc Hons project, Nelson Mandela Metropolitan University.
6. SINGH, K. 2009. The extent of transformation of the lower catchment of the Van Staden's River. BSc Hons project, Nelson Mandela Metropolitan University.
7. VELDKORNET, D. 2009. The impacts of elephants on Southern Cape Fynbos in the Gondwana Nature Reserve. BSc Hons project, Nelson Mandela Metropolitan University.
8. VEN, VAN DE T.M.F.N. 2009. Declining springbok population: are jackal to blame? BSc Hons project, Nelson Mandela Metropolitan University.
9. WENTWORTH, J.C. 2009. Prey Preference of the Spotted Hyaena (*Croucuta croucuta*) in the Addo Elephant National Park, South Africa. BSc Hons project, Nelson Mandela Metropolitan University.

### **Postgraduate degrees completed – M.Sc.**

1. DE KLERK, C. Body condition and resource limitations in elephants. MSc thesis, Nelson Mandela Metropolitan University. **Awarded cum laude.**
2. HAINDONO, P. An investigation of the factors influencing vegetation stress in a section of the Keiskamma Catchment, Eastern Cape. MSc thesis, Nelson Mandela Metropolitan University.
3. JACOBS, E.P. Diet and feeding effects of introduced giraffe in the Eastern Cape. MSc thesis, Nelson Mandela Metropolitan University. 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.
4. MINNIE, L. Leopard stock farmer interactions in the Baviaanskloof. MSc thesis, Nelson Mandela Metropolitan University.
5. NYAFU, K. The warthog as an introduced species in the Eastern Cape, South Africa. MSc thesis, Nelson Mandela Metropolitan University.
6. RAUTENBACH, T. Diet and prey availability of leopards in the Cederberg and Gamka Mountains. MSc thesis, Nelson Mandela Metropolitan University.
7. WEATHERALL-THOMAS, C.R. Seed germination and seedling survival in mesic thickets of the Eastern Cape. MSc thesis, Nelson Mandela Metropolitan University. **Awarded cum laude.**

### **Postgraduate degrees completed – Ph.D.**

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.

### **Postgraduate degrees in progress – M.Sc.**

1. KIETZMANN, M. Ecological correlates of nasal turbinate structure and function. MSc thesis, Nelson Mandela Metropolitan University.
2. 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.
3. LOUW, M. The propagation and ecophysiology of thicket species: in contribution to rehabilitation of Eastern Cape thickets. MSc, Nelson Mandela Metropolitan University.
4. MGQATSA, N, Population growth and impact of warthog in the Addo Elephant National Park. MSc thesis, Nelson Mandela Metropolitan University.
5. NDLELA, S. Landscape connectivity, dysfunction and restoration in a communal catchment. MSc thesis, Nelson Mandela Metropolitan University.
6. 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.

### **Postgraduate degrees in progress – Ph.D.**

1. GOUGH, K.F. Association patterns of elephants: do behavioural patterns reflect genetic relationships? PhD thesis, University Nelson Mandela Metropolitan University.
2. LANDMAN, M. Megaherbivores in succulent thicket: resource use and implications. PhD thesis, Nelson Mandela Metropolitan University.
3. MACIEJEWSKI, K. Valuing biodiversity for ecotourism. PhD thesis, Nelson Mandela Metropolitan University.
4. 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.
5. MUGAGGA, F. Vegetation change, geomorphic processes and livelihood strategies on mountain Elgon and its environs. PhD thesis, Nelson Mandela Metropolitan University.
6. MUNISHI, L. Elephant social interactions, Tarangire National Park, Tanzania. PhD thesis, Nelson Mandela Metropolitan University.

7. NEO-MAHUPELENG, G. Lion human interactions in the Chobe District Botswana. PhD thesis, Nelson Mandela Metropolitan University.
8. 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.
9. PLOTZ, R. The reproductive performance and ecology of black rhinoceros, *Diceros bicornis minor*. PhD thesis, Victoria University of Wellington, New Zealand.
10. SCHMIDT, A.G. Factors affecting ecological thresholds in Mosaic Thicket. PhD thesis, Nelson Mandela Metropolitan University.
11. WEATHERALL-THOMAS, C.R. Utilization threshold for the maintained of thicket floral diversity PhD thesis, Nelson Mandela Metropolitan University.



Linus Munishi (centre) has received support from the NMMU International Office, Wildlife Conservation Society and ACE to spend a period at the University of Washington to undertake genetic analyses of his elephant material as part of his PhD. Wishing him well are Dr Nico Jooste (left), Director of the NMMU International Office and Prof Graham Kerley, Director of ACE.

## FINANCIAL SUPPORT 2009

Research Grants	Programme	Amount (R)
<b>Eskom</b>	Cape Vulture	118 700
<b>National Research Foundation*</b>	Megaherbivores in Thicket	52 000
<b>National Research Foundation*</b>	Valuing Biodiversity	175 000
<b>NMMU</b>	Valuing Biodiversity	67 000
<b>CIB*</b>	Invasive species	90 000
<b>Table Mountain Fund*</b>	Leopard Stockfarmer interactions	20 000
<b>Professional Hunters Association of SA</b>	Cape Mountain Zebra	15 250
<b>National Research Foundation</b>		250 000
<b>E Oppenheimer</b>		50 000
<b>UCT Plant Conservation Unit</b>		10 000
<b>Table Mountain Fund</b>		170 000
<b>Hans Hoheisen Trust</b>	Skead book project	450 000
<b>Mrs June Stannard</b>		3 000
<b>Rupert Nature Foundation</b>		193 000
<b>Skead book sales</b>		45 573
<b>NMMU Research Office</b>	G Kerley, A Palmer, W Linklater	242 258
<b>NMMU</b>	ACE	15 000
<b>Victoria University of Wellington</b>	Black rhino conservation biology	52 576
	<b>Research Grants total</b>	<b>2 019 357</b>
		<b>576 528</b>
<b>Contract research (various) total</b>		<b>576 528</b>
<b>Bursary Support</b>		
NMMU (M Kraai, M Louw, N Mgqatsa, K Maciejewski, H Hrabar)	200 000	
NMMU/Vodacom (N Mgqatsa, M Louw)	70 000	
Wildlife Conservation Society (L Munishi)	80 000	
African Wildlife Foundation (G. Neo-Mahupeleng)	16 500	
Dormehl-Cunningham (M Louw)	10 000	
Oliver Foundation (N Mgqatsa, M Kraai)	50 000	
Thicket Forum (J Allen)	6 000	
	<b>Bursary Support total</b>	<b>433 500</b>
	<b>TOTAL</b>	<b>3 029 385</b>

### 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
- Continental donated off-road tyres to the value of R32 000 for ACE's vehicles.
- Everready (Pty) Ltd donated batteries for the work on carnivore/buffalo interactions in the Addo Elephant National Park.
- The Comanis Foundation donated a Leica Distance Meter, valued at R10 000.

\*Includes bursary amounts

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		Mr C Weatherall-Thomas	Botany
		Ms R Zengeni	Geosciences

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