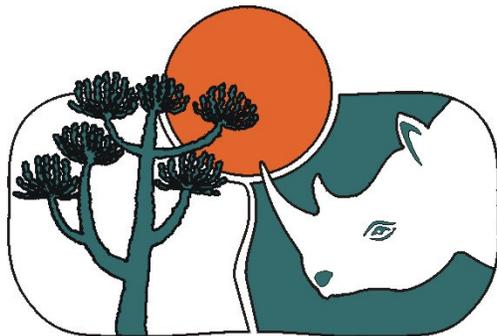


# TERRESTRIAL ECOLOGY RESEARCH UNIT

## ANNUAL REPORT

2001

University of Port Elizabeth



**TERRESTRIAL ECOLOGY  
RESEARCH UNIT**



University of Port Elizabeth, P O Box 1600, Port Elizabeth 6000

Tel: (041) 504 2308

Fax: (041) 504 2317

E-mail: [zlagik@zoo.upe.ac.za](mailto:zlagik@zoo.upe.ac.za)

## **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.

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

This is the tenth Annual Report and deals with the activities of TERU during 2001.

### **Vision**

The Vision of TERU is to achieve, by 2006, national and international recognition as a terrestrial ecology research and postgraduate training unit of excellence

### **Mission**

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

## DIRECTOR'S REPORT

The year 2001 has been another excellent year for TERU, achieving record outputs and staff and student numbers. In terms of outputs, TERU produced a total of 17 refereed scientific publications, 4 technical reports, 8 popular articles and 33 presentations at scientific conferences and workshops. Four honours students, 3 MSc and 7 PhD students participated in TERU research programmes in 2001. In addition, three MSc students and a PhD student graduated in 2001: our congratulations to Janette Koekemoer (MSc), Sarette Slabber (MSc), Wendy Todkill (MSc) and Anna Whitehouse (PhD) on their graduation. TERU staff numbers were boosted by the presence of Nadia Smith, who served in a part-time capacity, and Louise Visagie who joined the Conservation Farming project at the beginning of the year.

A definite highlight of the year has been the production of a Strategic Framework for TERU for the period 2002-2006 (see <http://zoo.upe.ac.za/teru/>). This sets forth a revised Vision and Mission for TERU (see first page of this report) as well as the framework within which TERU operates, and the strategic directions that TERU will take. In addition, an overview of the major research, training community services and consultancy activities that TERU undertakes, are provided. This document will serve as an invaluable aid in guiding TERU in the implementation of its Mission and in achieving its Vision over the next five years. This strategic framework reflects considerable effort, introspection and debate and I would like to thank André Boshoff, Richard Cowling and Shirley Pierce for their hard work in the production of this critical resource.

Appropriately at this stage in TERU's development, it was decided to update the TERU logo. After considerable debate, the logo appearing on this report was agreed upon. The elements of the logo reflects the African sun, the *Euphorbia* tree (which is characteristic of the Eastern Cape) to reflect our floristic interests, and the black rhinoceros, a megaherbivore with an attitude, to represent our faunal interests. These elements are all presented as interlocking pieces to represent TERU's commitment to the components as well as to entire systems. Note also that the rhino and tree extend beyond the boundaries of their pieces, to further emphasize TERU's interests in interactions between elements of the ecosystems. I would like to thank Guy Castley (PhD 1997) for the attractive artwork. I am sure that this logo will serve TERU well into the future.

The TERU facilities were further developed this year with the assistance of the University of Port Elizabeth's Technical Services Department, who installed additional shelving and cupboards, and we are now able to house an impressive collection of reprints, books and maps in our Resource Room. These resources are invaluable not only for research purposes, but also for postgraduate student training, as an increasing number of students consult these resources. Given the demands on the facilities, as well as the pressures to take on additional responsibilities, it is however inevitable that further office space will be needed in the near future.

The record level of financial support in 2001 of R3.3 million (excluding contributions in kind) is a further improvement on our record of the previous year. This indicates that TERU is able to sustain its financial support, and reflects the significant amount of funding that TERU is able to attract from foreign agencies such as the Global Environment Facility. Given the precarious state of the South African Rand, this

foreign funding is going to be increasingly important if TERU is to continue to achieve its goals. Local support has however also increased, reflecting the confidence that local stakeholders have in TERU, as well as their appreciation of the products that TERU generates. The Mazda Wildlife Fund continued to provide a sponsored 4x4 twincab, while Gentyre generously sponsored Continental tyres for our vehicles.

Another year has passed, and has brought about record productivity and recognition for TERU. This, however, requires considerable hard work and commitment, and I am pleased to report that TERU staff and students have all pitched in with considerable enthusiasm to help TERU achieve its goals. I would therefore like to extend my most sincere thanks and appreciation to the students and staff who have done such a magnificent job. In particular, I would like to thank André Boshoff and Richard Cowling who I can always rely upon for support and stimulation. Sharon Wilson and Rebecca Sims-Castley have also played a critical role this year and their enthusiasm for solving problems is much appreciated. A special word of thanks to all the funding agencies, particularly the University of Port Elizabeth, that support TERU's training and research activities.

**Prof. G I H KERLEY**  
**DIRECTOR: TERRESTRIAL ECOLOGY RESEARCH UNIT**



#### **AWARDS**

- Richard Lechmere-Oertel and Richard Cowling were awarded the Compton Prize for the best paper in the South African Journal of Botany.
- Marietjie Landman was awarded a scholarship by the Israeli Government to attend the "Conservation of Desert Biodiversity" course in Israel. This is the third year that TERU students have received this award.
- Richard Lechmere-Oertel, Ayanda Sigwela and Marietjie Landman received "Honourable Mentions" for their presentations at the Zoological Society of Southern Africa Annual Symposium.
- Sharon Wilson's was judged the "Best Student Presentation" at the International conference on Forest Dynamics and Ungulate Herbivory, Davos, Switzerland.
- Richard Cowling and Graham Kerley were both recognized as being amongst the top twenty researchers at the University of Port Elizabeth.
- Graham Kerley was awarded a B rating by the Nation Research Foundation.
- Richard Cowling was cited as one of 2000 Outstanding Scientists of the 21<sup>st</sup> Century by the International Biographical Centre, Cambridge UK
- Richard Cowling was appointed Adjunct Professor, Department of Environmental Biology, Curtin University of Technology, Australia

## 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, as well as the ecological and evolutionary processes that maintain them.*

**Elephant:** Anna Whitehouse was awarded the degree PhD during 2001 for her important research on the Addo elephants, and has been successfully preparing her work for publication, with two refereed articles appearing in 2001, and a number of other papers accepted or submitted for publication. Anna has been working with Graham Kerley and Mike Knight (South African National Parks) on a workshop on elephant conservation and management in the Eastern Cape, planned for early 2002. This workshop will also be useful in developing future directions for elephant research in this region.

**Black rhinoceros:** The black rhino research programme is a collaborative venture between the Centre for Reproduction of Endangered Species (Zoological Society of San Diego) and TERU. Its aims are to improve our understanding of black rhino behaviour and ecology in a way that has direct utility in meta-population management for conservation. Wayne Linklater (Post-doc) has been preparing for the first field season of experimental translocations in collaboration with the Ministry of Environment and Tourism (Namibia) and Onguma, Ongava and Erindi Game Reserves, and work in Addo Elephant National Park continues. Black rhino translocation and olfactory manipulation experiments begin in northern Namibia in April 2002. A manuscript on this work has been accepted for publication. This collaboration also provides support for Marietjie Landman's research (see later).

**Vultures:** André Boshoff has been maintaining his collaboration with Professor Steven Piper of the University of Natal on the demography of the Cape griffon *Gyps coprotheres*.

**STEP (Subtropical Thicket Ecosystem Planning):** This three-year project, co-financed by the Global Environment Facility through the World Bank, and managed by TERU, commenced on 1 July 2000. This project seeks to (a) conduct, together with key stakeholders, a thorough and strategic conservation planning exercise for the Thicket Biome, and (b) work closely with key stakeholders to ensure the implementation of the outcomes of the planning exercise. André Boshoff is the Project Co-ordinator and Sharon Wilson is the Project Administrator.

The project aims to: provide a detailed spatial analysis of the various thicket types; assess the extent of transformation; develop a better understanding of the threats; locate and design conservation areas to achieve explicit representation goals; suggest and prioritise explicit conservation actions; provide information for incorporation into regional and national planning frameworks; provide a capacity building service in GIS-based conservation planning, especially in the institutionally

weakened Eastern Cape; guide investors from the public and private sectors in the selection of land for commercial enterprises, e.g. game-based ventures; create an awareness of the value and plight of the Thicket Biome.

The main project activities for the reporting period include the work of the consultants associated with the spatial analysis component of the conservation planning activity. Here excellent progress has been made on GIS data acquisition, data capture and data management, with some 80 datasets having been acquired and processed. The classification system for thicket vegetation in the planning domain has been extended and refined. The field mapping of the vegetation has proceeded according to schedule and the entire planning domain vegetation map has been completed, with the digitization of the vegetation map nearing completion. Good progress has been made in compiling the 1:250 000 coverages indicating the transformation classes, and the task dealing with the modeling of the distribution of spekboom (*Portulacaria afra*) has been successfully completed.

Highlights of the activities of the conservation planning team are the production of a document describing the conceptual and methodological basis for the STEP project, and a document that identifies and describes the key processes operating in the thicket in the project planning domain. The activities of the stakeholder consultation component of STEP include a series of workshops and focus group meetings with key stakeholders, the compilation of an electronic stakeholder database, and a number of communication and promotional products, including media items, newsletters and a colour brochure. Two independent project reviewers were appointed and their first (favourable) report was tabled in September.

**Baviaanskloof Conservation Area:** After the successful production of a report on the Baviaanskloof Conservation Area in 2000, TERU continues to play a role in the development of this megareserve, largely through the provision of advice. Graham Kerley was invited to give a presentation on the options for this reserve at the 7<sup>th</sup> World Wilderness Congress, held in Port Elizabeth in November.

**GANP:** TERU continues to play a role in this initiative, which arose from a TERU proposal in 1997, and is being implemented by SANParks. GANP has attracted Global Environment Facility funding for a full project proposal. TERU, in collaboration with the CSIR in Stellenbosch, has been developing a conservation plan for this park, and this will be completed in early 2002. A chapter dealing with the contribution of GANP to ecosystem health has been accepted for a book entitled "Healthy Ecosystems", and this will appear in 2002. In addition, a chapter setting forth the lessons in mainstreaming this project has been accepted for a World Bank book entitled "Mainstreaming Biodiversity", and this will also appear in 2002.

**CAPE: A strategic plan for the conservation of the terrestrial biodiversity of the Cape Floristic Kingdom: Cape Action Plan for the Environment:** This project is an extension of the scientific outcomes of the highly successful CAPE Project. Eighteen papers are being prepared for a special double issue of *Biological Conservation* that Richard Cowling and Bob Pressey (New South Wales National Parks) are co-editing. TERU members are author/co-author of 11 of these papers. Eight of the papers have been sent out for review. All papers will be submitted to the journal in May 2002. A symposium on this topic has been accepted for the Society for Conservation Biology Meeting in Canterbury in July 2002, where Richard Cowling has been invited to deliver a keynote plenary address.

The conservation planning for the mammals in the CFR by André Boshoff, Graham Kerley, Richard Cowling and Rebecca Sims-Castley is an ongoing component of this programme. This has developed a unique data set of potential mammal abundances in the planning domain that allows a range of conservation questions to be addressed. Two papers on this work appeared in 2001, a further paper has been accepted and another is in preparation.

**The Nelson Mandela Metropolitan Open Space System: A strategic conservation plan):** Warwick Stewart (MSc), an employee of the Wildlife and Environmental Society of South Africa, is undertaking this project that aims to identify a system of conservation areas for the Metropole that will achieve explicit targets for the conservation of biodiversity patterns and processes. This will be the first time systematic conservation planning approaches have been used in an urban and peri-urban context. Excellent progress has been made with stakeholder consultation and the identification and mapping of land classes and transformation classes.

**The design and development of an ecologically, economically and socially sustainable nature reserve system for the Greater Cape St Francis area:** This project forms part of a larger project that is being funded by the Table Mountain Fund of WWF: SA. The main focus of the project is the restoration, via removal of alien plants, of the threatened St Francis Fynbos/Thicket Mosaic vegetation on proclaimed protected areas in and adjacent to Cape St Francis and St Francis Bay. Richard Cowling is developing a strategic conservation plan for the coastal strip between Aston Bay and Oyster Bay. This plan will guide further interventions in the area. Good progress was made in capturing in digital format all of the data layers.

**Spatial dynamics of current and future threats to biodiversity on Reunion Island:** Richard Cowling has been working with DM Richardson, M Rouget and D Strasberg on this project which is funded by the Joint France/RSA Science and Technology Agreement of the NRF. The project seeks to identify land classes on Reunion that are most vulnerable to future transformation. Ultimately, these data will be used in devising a conservation plan for the island. Richard visited Reunion in June to identify, together with the other participants, an approach for the study and present this to major stakeholders, including senior officials from the island's Ministry of the Environment. Rouget, a PhD student of Richard's based at UCT, is continuing with analyses and will visit Reunion again in 2002.

**Fine-scale conservation planning and prioritisation of areas for conservation action on the lowlands of the south-western Cape Floral Kingdom:** Richard Cowling has been serving as an advisor to D Fairbanks (UCT), N Helme and K Maze of the Botanical Society's Cape Conservation Unit. The project intends to identify a minimum set of areas to fulfil specified conservation targets for the irreplaceable and vulnerable lowland Broad Habitat Units. Good progress was made with survey.

## **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.*

**Thicket:** Sharon Wilson (PhD) will be submitting her PhD thesis on the allometric relations of foraging behaviour in Thicket browsers early in 2002, and has been busy finalizing this work. In addition she was invited to attend the *International conference on Forest Dynamics and Ungulate Herbivory*, held in Davos, Switzerland during October. Her PhD findings are already being used for further research, as Abigail Kamineth (BSc(Hons)) and Mark Ralph (BSc(Hons)) used her data to estimate the costs of habitat transformation (overgrazing) on forage availability of boergoats vs bushbuck and kudu vs duiker, respectively. They showed a large decrease in forage availability in transformed thicket, the first objective demonstration that overgrazing leads to a loss of forage for all these species.

Janet Koekemoer and Sarette Slabber were both awarded their MSc degrees for their work on kudu/impala resource use, and relative impacts of tortoises in relation to other browsers, respectively.

Marietjie Landman (MSc) has been investigating black rhino diet across a rainfall gradient in the Addo Elephant National Park, as well as the effects of thicket transformation, due to overgrazing, on black rhino forage availability, using Sharon Wilson's foraging behaviour data to estimate forage availability. Marietjie has been invited to present this work at the *International Student Conference on Conservation Biology* in the UK in 2002.

**Dunes:** Guy Castley (MSc 1992, PhD 1997) has had two papers published on seed dispersal in coastal dunefields, emphasizing the importance of mammals and birds in this process that is critical to maintain plant communities in dunefields.

**Deserts:** Graham Kerley continued his collaborative work with Walt Whitford of the Jornada Experimental Range, with a short visit to Las Cruces, New Mexico, in August in order to work on manuscripts that they have been preparing. One deals with the impacts of pocket gophers on desert soils and plants, and the other with the impacts of kangaroo rats on grass production.



## **RESOURCE ECOLOGY**

*This theme seeks to develop a predictive understanding of the responses of biota to different forms of utilisation.*

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

**Angora goat physiology and the risk of abortion:** This collaborative project involves Helen Laburn, Duncan Mitchell, Alida Faurie and Graham Mitchell from the University of Witwatersrand Medical School and Graham Kerley of TERU, and seeks to develop an understanding of the factors influencing fetal and maternal body temperatures in Angora goats. This will be used to assess the role of thermoregulatory breakdown in goat abortions. Temperature-recording data loggers

which had been implanted in ten goat fetuses and their mothers in July 2000, were recovered, and replaced in January 2001, and a further 10 ewes and their fetuses were implanted with loggers in July. All these loggers will be recovered in 2002, and will provide fetal temperature data for the last trimester of pregnancy, birth temperatures and the first 18 months in the kids' life, as well as that of the ewes. This project has significant potential to contribute to the economically important mohair industry, as well as developing the techniques for similar applications to wildlife in order to investigate the physiological costs of habitat transformation.



## **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 restoration of biodiversity and ecosystem function.*

**Thicket:** The Global Environment Facility funded project on “Conservation Farming” is being run in collaboration with the National Botanical Institute, and is now in its second year. Richard Lechmere-Oertel (PhD) has been continuing his data collection in order to quantify the loss of ecosystem services in transformed thicket, while Ayanda Sigwela (PhD) has been collecting data on the impacts of transformation on seed dynamics. Both these projects are proceeding well, and both Richard and Ayanda have been presenting their initial findings at conferences.

Wendy Todkill was awarded an MSc for her work on the application of landscape functional ecology to the rehabilitation of transformed thicket, and undertook further sampling of her experimental sites in order to provide a longer timeframe (three years) for data that she wants to include in a paper on this work. She is currently formulating a PhD proposal on remote-sensed measurements of transformation over the last 70 years.

Justin Watson (PhD) finalized his PhD thesis on the functional ecology of bontveld and its rehabilitation after strip mining, and this was submitted for examination.

Kithi Ngesi (BSc(Hons)) completed her honours project on the population structure of the jacket plum in transformed and untransformed thicket, showing elevated mortality of this important tree, in transformed thicket.

**Forest:** Brian Reeves (Bsc(Hons)) completed his honours project on the diet of crowned eagles in transformed forested landscapes, and showed that this species is able to shift its diet to include non-forest prey species, thereby explaining its persistence in transformed landscapes.

The experimental trials on the impact of domestic herbivores on forest habitat structure were maintained with regular fence checks during the year. These trials are now eight years old, and a project to evaluate the effects will be formulated within the next two years.

**Nama Karoo:** Adri Barkhuysen (MSc) has completed the data collection for his MSc (commissioned by ESKOM) investigating avian predator-prey relationships, and the effects of agricultural transformation (croplands) on prey availability for birds that are

vulnerable to electrocutions and collisions with powerlines and conductors. An initial analysis of his data indicates marked increases in prey availability in croplands, providing a mechanistic explanation for increased bird mortalities where powerlines cross croplands.



## **BIODIVERSITY**

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

**National biodiversity - BIOMAP:** BioMAP SA-ISIS underwent a dramatic transformation in 2001. The pilot BioMAP website was fully integrated with the new SA-ISIS site developed by GeoSpace Modelling Services (GMS). A number of spatial data manipulation tools and models were developed for the site. Rebecca Sims-Castley, coordinator of the UPE/TERU node of BioMAP SA-ISIS, programmed a Regional Landscape Classification Model in AML to operate off ESRI ArcInfo GRID. Rebecca was also responsible for the development of the interface providing users with access to the numerous specimen datasets. The BioMAP team held two intensive week-long workshops in Pretoria to achieve full integration of the biodiversity component into SA-ISIS and to ensure complete web-enablement of all the tools and models. A start was made on the development of a national GIS-based protected areas database containing spatial boundaries for all protected areas within South Africa in addition to important attribute information for all these areas. This task will be completed in 2002. On a more local note, Rebecca participated with Graham Kerley, Richard Cowling and Bob Pressey in the development of a systematic conservation plan for mammals in the Cape Floristic Kingdom by carrying out the spatial analysis and Cplan operations. Further to this, she conducted GIS analysis as part of a study by Richard Cowling and the Western Cape Nature Conservation Board to compare priority conservation areas identified by park managers versus reserve selection software. Rebecca presented two talks at the ZSSA Conference held at UPE.

**Changes in community structure and composition of monkey beetle (Scarabaeidae: Hopliini) communities along floristic gradients in Namaqualand:** This project is being undertaken at the University of Cape Town. J Colville is a PhD student and Richard Cowling co-supervises his thesis work (MD Picker is the principal supervisor). Good progress is being made; and a further paper has been accepted for publication.

**Hierarchical floristic structure of abiotically derived land classes in Namaqualand:** Comprising a component of Philip Desmet's PhD research (based at the University of Cape Town), this project aims to identify the hierarchical floristic structure in abiotically derived land classes, using point locality data for selected presence-absence plant taxon data sets. Richard Cowling and Philip worked closely with Simon Ferrier this year, and this project has made good progress and is projected for completion in 2002.

**Biodiversity and rarity in South Africa's south-eastern temperate (upland) grasslands:** The objective of this project is to use the comprehensive phytosociological database that exists for this portion of the grassland biome to

develop a predictive understanding of the patterns of independent diversity components. The data will also be used to model the biological and habitat aspects of rarity. In addition the results will also be used to identify land classes as biodiversity entitles for conservation planning. D Hoare, who is currently employed by the Range and Forage Institute of the ARC, and has been developing this proposal in conjunction with Richard Cowling, will register for a PhD in 2002.



## **FUNDAMENTAL RESEARCH**

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

**Stochastic modelling for geographic diversity of plant species richness in South Africa:** Richard Cowling is working with A Gelfand, H Laurie, AG Rebelo and J Silander on this collaborative project involving researchers from the University of Connecticut, University of Cape Town, National Botanical Institute and TERU. The project is being funded by the Ecology Program of the National Science Foundation and the National Center for Ecological Synthesis and Analysis (NCEAS, UC Santa Barbara) and is being led by Dr J Silander of the University of Connecticut. Major key questions are:

- (i) Can we characterize the importance of different ecological variables as they contribute to environmental heterogeneity at different spatial scales?
- (ii) What is the role of species attributes in explaining species occurrences at particular locations?
- (iii) Can we clarify the nature of spatial associations as they contribute to chance of species co-occurrence?
- (iv) What can we infer about species distribution patterns from phylogenetic relationships?
- (v) To what extent can we explain patterns in diversity from a consideration of population dynamic processes alone?
- (vi) What factors significantly explain the geographical patterns in species distributions?
- (vii) What can we learn about the effects of spatial scale with regard to the foregoing questions?

Richard Cowling attended two workshops, both at NCEAS, in May and December 2001. Good progress is being made with this project.

**Temperature-induced petal movements in Namaqualand wildflowers protects pollen from moisture damage:** Richard Cowling has been working with A Ellis and A von Hause on this project that investigates patterns of petal movement (upright and reflexed), and sensitivity of pollen to moisture, in a winter-flowering flora from the desert coast of Namaqualand. Specifically, they tested the hypothesis that flower closure associated with upright petal movement affords protection to pollen from winter precipitation. Preliminary results indicate that flower opening is entirely temperature-induced, and that upright petal movement and associated flower closure, found among more than 3 500 species in the Cape fynbos and succulent karoo floras, has evolved to protect this predominantly winter- and spring-flowering flora from pollen damage that may result from exposure to rain, dew and fog. Good progress has been made with this project, and a paper will be submitted early in 2002.

**The role of rainfall variability in explaining post-fire regeneration traits and diversification processes in Mediterranean-climate ecosystems:** Richard Cowling has been collaborating with BB Lamont, F Ojeda, and PW Rundel in a project comparing indices of rainfall reliability and plant regeneration traits across all five Mediterranean-climate rainfall regions. Rainfall statistics have now been compiled for all regions. Preliminary analyses show the following hierarchy in reliability of winter rainfall: SW Australia > SW Cape >> Spain/California > Chile. The abundance in local floras of traits linked to obligate post-fire reproduction (serotiny, fire-stimulated germination, non-sprouting etc.) appears to show a similar hierarchy, although analyses must still be carried out. This suggests that the incidence of obligate post-fire reproductive traits may be a consequence of the interactions between fire regime and the reliability of post-fire soil moisture conditions, rather than of fire regime per se. Good progress has been made with this analyses and a draft manuscript is being prepared for submission in late 2002.



### **CONTRACT RESEARCH**

Four contracts, to the total value of R157 295 were undertaken by TERU staff and students. These include two conservation planning contracts, a game ranch development contract and a specialist report.



### **SCIENCE MANAGEMENT**

- Graham Kerley served as President of the Zoological Society of Southern Africa, on the Editorial Board of the *Journal of Arid Environments* and as Associate Editor of *African Zoology*. He also reviewed manuscripts for *Conservation Biology*, *African Zoology*, *Diversity and Distributions*, *Ecology Letters*, *Journal Of Arid Environments*, *Journal of Applied Ecology*, *Koedoe*, *Oecologia*, *Ostrich*, *Plant Ecology* and *South African Journal of Science*. He also undertook project and individual reviews for the National Research Foundation. He served on the University of Port Elizabeth Safety, Health and Environment Committee, and as Chairman of the University of Port Elizabeth Nature Reserve Committee.
- Richard Cowling and Graham Kerley served on the Madiba Bay Task Team: Special Committee of the University of Port Elizabeth (2001).
- Richard Cowling served on the Forest Advisory Group: World Wide Fund International (2000-), Fire Network: GCTE-IGBP (2000-), CABS Climate Change and Reserve Design Working Group (2001-), Board Member: National Botanical Institute (2001-), Scientific Advisory Committee: National Botanical Institute: Chair (2001-), Special Advisory Committee: Conservation International-funded Succulent Karoo Ecosystem Planning (SKEP) Project (2001-), on the Editorial Boards of *South African Journal of Environmental Law and Policy*, *Global Ecology & Biogeography Letters*, and *Ecological Economics*, and as Associate Editor, *Plant Ecology* and *South African Journal of Botany*. He also reviewed manuscripts for *Austral Ecology*, *Biodiversity and Conservation*, *Conservation Ecology*, *Conservation Biology*, *Diversity and Distributions*, *Ecological Economics*, *Ecology Letters*, *Journal of Applied Ecology*, *Journal of Biogeography*, *Journal of BioSciences*, *Journal of Mediterranean Ecology*, *Journal of Vegetation Science*,

*Proceedings of the XVII<sup>th</sup> International Seaweed Symposium, South African Journal of Botany, South African Journal of Science, and Systematic Biology.* He evaluated proposals for International Biodiversity Observation Year, Shamwari Game Reserve, Table Mountain Fund, World Wide Fund: International and evaluated individuals for Ministry of Science and Technology: Spanish Government, National Research Foundation, National Science Foundation, Eureka Prize (Australia), The Nature Conservancy (USA), Tyler Prize (California), University of Cape Town, University of Pretoria, University of Stellenbosch, World Wide Fund: South Africa.

- André Boshoff reviewed manuscripts for the *South African Journal of Science*, and *South African Journal of Wildlife Research*.
- Graham Kerley (Convenor), André Boshoff, Sharon Wilson and Rebecca Sims-Castley all served on the Organising Committee of the highly successful ZSSA2001: the Zoological Society of Southern Africa's Annual Symposium that was held in Port Elizabeth in July.



### **COMMUNITY SERVICE**

- Graham Kerley continued to act as manager of the Grysbok Environmental Education Trail on the UPE Campus, and a total of 779 participants benefited from this trail in 2001, guided by fourteen UPE students who were trained to provide these services.
- Graham Kerley was invited to present the Cecily Niven Memorial Lecture at the SASOL Scifest.
- Public presentations included talks to the Mountain Club of South Africa: Eastern Cape Branch: Port Elizabeth (Richard Cowling, André Boshoff), Botanical Society Valley Thicket Poster Launch: Grahamstown (Richard Cowling), St Francis Friendship Club: St Francis Bay, (Richard Cowling),
- TERU staff and students provided specialist advice to St Francis Coastal Open Space System, Rebels Rus Private Nature Reserve, Walker Bay Conservancy, Samara Private Nature Reserve, Shamwari Game Reserve, and Department of Economic Affairs, Environment & Tourism (Eastern Cape Province).

## 2001 PRODUCTS

### *REFEREED SCIENTIFIC PUBLICATIONS*

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17. BEUKES PC AND COWLING RM 2001. Impact of non-selective grazing on cover, composition, and productivity of Nama- karoo grassy shrubland. *African Journal of Range and Forage Science* 17:27-35.

## REPORTS

1. PRESSEY, R.L. & COWLING, R.M. 2001. Systematic conservation planning for the subtropical thicket ecosystem planning (STEP) project: a conceptual and methodological basis. Terrestrial Ecology Research Unit Report 32: 48pp.
2. BOSHOFF, A.F., KERLEY, G.I.H., COWLING, R.M. & WILSON, S.L. 2001. Conservation planning in the Greater Addo National Park: The potential distributions, and estimated spatial requirements and population sizes, of the medium- to large-sized mammals. TERU Report 33: 88 pp.
3. BOSHOFF, A.F., KERLEY, G.I.H., COWLING, R.M. & WILSON, S.L. 2001. Conservation planning in the Greater Addo National Park: A review of the species-, population- and spatially-driven processes involving the medium- to large-sized mammals. TERU Report 34: 12 pp.
4. COWLING, R.M. & KERLEY, G.I.H. 2001. Subtropical Thicket Ecosystem Planning (STEP) Project: Identity, spatial components, and estimation of irreplaceability of processes required to sustain biodiversity in the Thicket biome. TERU Report 34: 13 pp.

## POPULAR ARTICLES

1. BOSHOFF, A.F., COWLING, R.M., KERLEY, G.I.H. 2001. Baviaanskloof, a conservation and tourism jewel in the Eastern Cape. *Veld and Flora* 87(2): 74-77.
2. COWLING, R. & PIERCE, S. 2001. Namaqualand: plant life in an extraordinary desert. *Plant Talk* 22/23:34-57.
3. COWLING RM 2001. Honingklip shows the conservation way for wildflower growers. *Veld & Flora* 87, 10.
4. COWLING RM 2001. Review of Succulent Flora of Southern Africa by D Court. *Veld & Flora* 87:88.
5. COWLING RM 2001. Plant life. In: Kettlewell J, Kettlewell M and Cowling SM (eds), Our coastal treasure. The Greater St Francis area. *St Francis/Kromme Trust, St Francis Bay*.
6. STEWART, W.I. & ROGERS, G. 2001. Tapping the potential (Nelson Mandela Metropolitan Open Space System Project). *African Wildlife* 55:4.
7. STEWART, W.I. 2001. Nelson Mandela Metropolitan Open Space System (NM MOSS). *East Cape Environmentalist* 4:1.
8. WILSON S.L. 2001. Looking beyond the thicket. *Earthyear* 2:16.

## CONFERENCE PRESENTATIONS

1. COWLING, RM. Systematic conservation planning. Workshop: KwaZulu-Natal Systematic Conservation Planning and Development Project, Pietermaritzburg.
2. COWLING, RM. Patterns and determinants of plant diversity in the Cape Floristic Kingdom. Workshop: Bayesian Macroecology. National Centre for Ecological Analysis and Synthesis, Santa Barbara.
3. LECHMERE-OERTEL, R., KERLEY, G.I.H. and R.M. COWLING. Vegetation structure and micro-climate: the key to ecological functioning in the Succulent Thicket? Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
4. COWLING, R.M., PRESSEY, R.L., SIMS-CASTLEY, R., BAARD, E., BURGERS, C., Le ROUX, A., and G. PALMER. Effectiveness of the conservation system of the Cape Floristic Region. Oral presentation, ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.

5. SIMS-CASTLEY, R. A GIS-based landscape classification model for Mpumalanga Province. Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
6. KERLEY, G.I.H., BOSHOFF, A.F. COWLING, R.M. PRESSY, R.L. and R. SIMS-CASTLEY. Insights arising from mammal conservation planning in the Cape Floristic Region. Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
7. HASHICK-WILSON, S.L. and G.I.H. KERLEY. Body size influences on resource partitioning amongst Thicket Biome browsers. Oral presentation ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
8. SIGWELA, A.M., and G.I.H. KERLEY. Comparative dietary composition of kudu and goats in Thicket vegetation. Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
9. LANDMAN, M., and G.I.H. KERLEY. Dietary shifts: do grazers become browsers in the Thicket Biome? Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
10. WHITEHOUSE, A.M. Tusklessness in the Addo elephant population. Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
11. JOOSTE, J.M., KERLEY, G.I.H., and A.F. BOSHOFF. Niche overlap between indigenous kudu (*Tragelaphus strepsiceros*) and introduced impala (*Aepyceros melampus*) in Thicket vegetation, Eastern Cape. Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
12. LINKLATER, W.L. Science and the conservation of species in crisis: the rhino case study. Oral presentation. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
13. SIMS-CASTLEY, R. SA-ISIS BioMAP: An on-line biodiversity database & virtual workbench. Oral presentation ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
14. REEVES, B., A.F. BOSHOFF and G.I.H. KERLEY. Dietary shifts in transformed habitat by crowned eagles *Stephanoatus coronatus*. Poster ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
15. ROUGET, M., RICHARDSON, D.M. and COWLING, R.M. Future threats to biodiversity in terrestrial ecosystems of the Cape Floristic Region ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
16. CASTLEY, J.G., and KERLEY, G.I.H. Implications of 'random' culling of the kudu *Tragelaphus strepsiceros* population in the Addo Elephant National Park. Poster. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
17. BARKHUYSEN, A., KERLEY, G.I.H., and A.F. BOSHOFF. Does increased prey availability in transformed habitats contribute to increased mortality of large birds on powerlines? Poster ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
18. BOSHOFF, A.F. COWLING, R.M., KERLEY, G.I.H., WILSON, S.L. Conservation planning for mammals in the Thicket Biome. Poster. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
19. RALPH, M., KAMINETH, A., and G.I.H. KERLEY. Thicket transformation and browse availability to indigenous herbivores (Kudu, Bushbuck, Duiker) and boergoats. Poster. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.

20. SNOW, B. and G.I.H. KERLEY. Practical educational experiences: Grysbok Educational Trail, University of Port Elizabeth. Poster. ZSSA2001: Zoological Society of Southern Africa Annual Symposium, Port Elizabeth, July.
21. COWLING, R.M. Tools and methodologies for conservation planning. Strategy Session on Bioregional Planning. National Botanical Institute, Kirstenbosch.
22. COWLING, R.M., PRESSEY, R.L., LE ROUX, A., BAARD, E., BURGERS, C.J., PALMER, G. and R. SIMS-CASTLEY. The expert or the algorithm? - comparison of priority conservation areas in the Cape Floristic Region identified by park managers and reserve selection software. Oral presentation. Fynbos Forum, Calitzdorp Spa, August.
23. ROUGET, M., COWLING, R.M. and RICHARDSON, D.M. To what extent does the current network of protected areas in the Cape Floristic Region cater for ecological processes? Oral presentation. Fynbos Forum, Calitzdorp Spa, August.
24. EUSTON-BROWN, D., BERENS, C., DE GREEF, G. and COWLING, R.M. A model-based GIS map of the Kouga-Baviaanskloof. Poster, Fynbos Forum, Calitzdorp Spa, August.
25. PRIVETT, S. and COWLING, R.M. Thirty years of change in the fynbos vegetation of the Cape of Good Hope Nature Reserve, 1965 – 1995. Oral presentation. Fynbos Forum, Calitzdorp Spa, August.
26. KERLEY, G.I.H., PRESSEY, R.L., BOSHOFF, A.F., COWLING, R.M.C. and SIMS-CASTLEY, R. Conservation planning for medium- and large-sized mammals in the Cape Floristic Region, South Africa. Oral presentation, Ecological Society of America 86th Annual Meeting, Madison, Wisconsin, August.
27. COWLING, R.M. Heterogeneity, speciation/extinction history and climate: explaining regional plant diversity patterns in the Cape Floristic Region. Workshop: Bayesian Macroecology. National Centre for Ecological Analysis and Synthesis, Santa Barbara.
28. HASCHICK-WILSON, S.L. & KERLEY, G.I.H. Bite selection implications for forage quality of thicket browsers of differing body size. Oral presentation, International conference on Forest Dynamics and Ungulate Herbivory, Davos, Switzerland, October. **Judged best student presentation.**
29. KERLEY, G.I.H., BOSHOFF, A.F., COWLING, R.M., ELS, L.M. & CLARK, D. The Baviaanskloof Conservation Area: beyond wilderness. **Invited** oral presentation, 7th World Wilderness Congress, Port Elizabeth, November.
30. COWLING, R.M. Options for wilderness proclamation of private land: lets try and achieve conservation targets. **Invited** oral presentation, 7th World Wilderness Congress, Port Elizabeth, November.
31. STEWART, W. & COWLING, R.M. NM MOSS: Bringing wilderness into the city. Poster, 7th World Wilderness Congress, Port Elizabeth, November.
32. ROUGET M, RICHARDSON DM and COWLING RM 2001. Understanding current and predicted future patterns of alien plant invasions at different spatial scales. Sixth Ecology and Management of Alien Plant Invasions Conference, Longborough, UK, 12-15 Sept.
33. COWLING, R.M. Cape, Succulent Karoo and Maputaland-Pondoland Hotspots: an overview of their biodiversity. Rethinking biodiversity conservation in Africa and Madagascar. Conservation International. Washington DC.

## POST-GRADUATE TRAINING

### HONOURS PROJECTS

1. REEVES, B. 2001. Diet of crowned eagles. Unpubl. BSc(Hons) project, University of Port Elizabeth.
2. KAMINETH, A.L. 2001. Forage available to boergoats (*Capra aegagrus*) and bushbuck (*Tragelaphus scriptus*) in transformed and untransformed sites. BSc(Hons) project, University of Port Elizabeth.
3. RALPH, M.S. 2001. Thicket transformation and its effect on forage availability for Kudu and Duiker. BSc(Hons) project, University of Port Elizabeth.
4. NGESI, K. 2001 Impact of grazing on the mortality and canopy characteristics of *Pappea capensis*. BSc(Hons) project, University of Port Elizabeth.

### POSTGRADUATE DEGREES COMPLETED

1. KOEKEMOER, J.M. 2001. Dietary and habitat resource use of indigenous kudu (*Tragelaphus strepsiceros*) and introduced impala (*Aepyceros melampus*) in Thicket Vegetation, Eastern Cape, MSc thesis, University of Port Elizabeth.
2. SLABBER, S. 2001. The impact of tortoises on the Thicket Biome, Eastern Cape. MSc thesis, University of Port Elizabeth.
3. TODKILL, W. 2001. Towards the rehabilitation of degraded Succulent Thicket in the Addo Elephant National Park. MSc thesis, University of Port Elizabeth.
4. WHITEHOUSE, A.M. 2001. The Addo Elephants: conservation biology of a small, closed population. PhD thesis, University of Port Elizabeth.

### POSTGRADUATE DEGREES IN PROGRESS

1. BARKHUYSEN, A. Habitat transformation and prey availability. MSc thesis, University of Port Elizabeth.
2. HASCHICK, S.L. The influence of body size on the foraging behaviour of Thicket Biome browsers. PhD thesis, Univ. Port Elizabeth.
3. HENLEY, S.R. The predictive value of habitat models: comparing subtropical thicket herbivores. PhD thesis, Univ. Port Elizabeth.
4. LECHMERE-OERTLE, R Quantifying the ecological costs of livestock ranching in Xeric Subtropical Thicket. PhD thesis, Univ. Port Elizabeth.
5. LANDMAN, M. Foraging behaviour of the black rhinoceros (*Diceros bicornis bicornis*) in the Thicket vegetation of the Eastern Cape. MSc. thesis, Univ. Port Elizabeth.
6. SIGWELA, A.M. Animal-seed interactions in the Thicket Biome: consequences of faunal replacement and land use on seed dynamics.. PhD thesis, Univ. Port Elizabeth.
7. SIMELANE, T.S. The role of National Parks in conserving traditional natural resources. PhD thesis, Univ. Port Elizabeth.
8. STEWART, W.I. The Nelson Mandela Metropolitan Open Space System: A strategic conservation planning project. MSc thesis, University of Port Elizabeth.
9. WATSON, J.J. Dynamics of Bontveld and rehabilitation implications. PhD thesis, Univ. Port Elizabeth.
10. TODKILL, W. Patterns and determinants of landscape-level changes in the GAENP planning domain (ca 1930-2000): implications for conservation target achievement PhD thesis, Univ. Port Elizabeth



## FINANCIAL SUPPORT 2001

<b>Research Grants</b>	<b>Programme</b>	<b>Amount</b>
National Research Foundation (G Kerley), (R Cowling)	Thicket	R 134 000 R 102 000
Global Environment Facility STEP	Conservation Planning	R2 022 409
National Botanical Institute	Conservation Farming	R 225 200
SAISIS	BioMap	R 175 259
Zoological Society of San Diego	Black rhino conservation biology	R 301 407
Eskom	Birds & Powerlines	R 79 500
University of Port Elizabeth (Research Committee Grant to G Kerley & R Cowling)	General	R 106 448
Subsidisable Research Outputs (Research Committee Grant to G Kerley)		R 6 400
<b>Contracts</b>		<b>R 157 295</b>
<b>Bursaries*</b>		
University of Port Elizabeth Landman, M		R 4 000
Israeli Government Scholarship (M Landman)		R 20 000
Bursary subtotal		R 24 000
	<b>TOTAL</b>	<b>R3 333 918</b>

\*Note that National Research Foundation Grant-Holder Bursaries are included within the NRF Programme amounts listed above.

### **In Kind Contributions**

The loan and maintenance of the 4x4 pickup by Mazda Wildlife Fund represents a saving of about R20 000 on transport expenses.

Gentyre donated two sets of Continental tyres for the vehicles, valued at R10 000.

South African National Parks provides access and accommodation for TERU research in the Addo Elephant National Park.

## **ADVISORY BOARD, STAFF AND ASSOCIATED STUDENTS 2001**

### **Advisory Board**

Dr M. H. Knight, South African National Parks (Chairman)  
Prof. D Baird, Zoology Department, University of Port Elizabeth  
Dr E. Campbell, Botany Department, University of Port Elizabeth  
Mr P. W. Coetzee, Western District Council  
Dr D Du Preez, Botany Department, University of Port Elizabeth  
Mr L. Els, Ministry for Economic Affairs, Environment & Tourism (Eastern Cape Province)  
Dr F Hobson, Department of Agriculture (Eastern Cape)  
Dr R. Little, WorldWide Fund for Nature-South Africa  
Mr P. Niven, Amanzi Estates  
Dr A.R. Palmer, Agricultural Research Council  
Mr J. Pauw, Foundation for Research Development  
Prof A van Jaarsveld (Center for Environment Studies, University of Pretoria)

### **Staff**

Prof. G. I. H. Kerley, Director  
Dr A. F. Boshoff  
Prof. R. M. Cowling  
Ms R. Sims-Castley  
Ms S. Wilson  
Ms L Visagie  
Ms N Smith

### **Postdoctoral Researchers**

Dr W. Linklater

### **Visiting Scientists**

Dr R Pressey, New South Wales National Parks Service

### **Postgraduate students (and their academic departments)**

Mr S. R. Henley (PhD)	Zoology
Mr R Lechmere-Oertel (PhD)	Zoology and Botany
Mr A Sigwela (PhD)	Zoology and Botany
Mr T. S. Simelane (PhD)	Zoology
Ms W Todkill (PhD)	Botany
Mr J. J. Watson (PhD)	Zoology and Botany
Ms S. L. Wilson (PhD)	Zoology
Mr A Barkhuysen (MSc)	Zoology
Ms M Landman (MSc)	Zoology
Mr W Stewart (MSc)	Botany

### **Function of the Advisory Board**

The function of this Board is to review and advise on the activities of the Terrestrial Ecology Research Unit, and to report back to the Council of the University of Port Elizabeth via the Faculty of Science.

**TERRESTRIAL ECOLOGY RESEARCH UNIT**

**ANNUAL REPORT**

**1993**

Department of Zoology, University of Port Elizabeth

## INTRODUCTION

The Terrestrial Ecology Research Unit (TERU) was established within the Zoology Department, University of Port Elizabeth, during 1991 in response to a need for terrestrial ecology training opportunities for postgraduate students and for terrestrial ecological research by conservation and management agencies. TERU comprises staff and postgraduate students of the Zoology Department, with Dr G Kerley as Director.

The objectives of TERU are:

- 1. To train terrestrial ecologists through the medium of research in consultation with user agencies;**
- 2. To identify research priorities of terrestrial species and habitats, with emphasis on the Eastern Cape;**
- 3. To initiate appropriate research;**
- 4. To transfer information derived from these programmes to appropriate institutions.**

This is the Second Annual Report and deals with the activities of TERU during 1993.

## **DIRECTOR'S REPORT**

After a second successful year, the Terrestrial Ecology Research Unit has established itself as an important research and training organization within the eastern Cape, thereby fulfilling its objectives. Although only one MSc student graduated, this represents a milestone as being the first postgraduate student to be trained within TERU. Furthermore, the fact that this graduate is now employed in a university teaching position affirms TERU's relevance. An additional six MSc and PhD students are currently in training

TERU's considerable research output continues to be both highly relevant and of high quality, with four scientific publications, four reports, four popular articles and seven conference contributions produced during 1993. The popular articles, combined with a 50/50 TV programme and various radio interviews, serve the important function of making research findings more generally available.

A highlight of 1993 for TERU has been the substantial financial support by Mazda Wildlife Fund in the form of a loan of a Mazda 4x4 bakkie for research on endangered species. This vehicle has proved invaluable in providing reliable, safe transport at an affordable cost. The need for this vehicle is illustrated by the fact that it covered a total of 25 000 km in 1993, more than any other vehicle in the Zoology Department.

The research programmes initiated in 1992 (Forests, Dunes, Arid Zone, and General) continued in 1993. The validity of this approach is demonstrated by the fact that the number of agencies providing financial support to TERU doubled in 1993. However the total financial support available increased by only 20 % from 1992 to 1993, barely staying ahead of the inflation rate. Securing additional funds, particularly funds available for a permanent position, must be a future priority. New research initiatives will be needed to attract these types of funds and these should possibly include research on topics which attract community and developmental funding support.

The success of TERU to date can, in part, be attributed to the sound advice provided by the Advisory Board and I would like to thank the members for their input. I would also like to express my appreciation to Prof A. McLachlan who has always been fully supportive of TERU's activities. In addition, Dr A. F. Boshoff of Cape Nature Conservation and Prof J. F. K. Marais of the Zoology Department have provided considerable assistance. Thanks are also due to the Technical Staff of the Zoology Department for their support. Financial support from the Foundation for Research Development, Department of Environment Affairs, Cape Nature Conservation, University of Port Elizabeth, Endangered Wildlife Trust, Southern African Nature Foundation, Pretoria Software Solutions and the East Cape Wildbird Society is acknowledged with thanks. Mazda Wildlife Fund is thanked for the loan of a vehicle. The students are the most important part of TERU, and I would like to thank them for their hard work and hard partying. A special word of thanks to Candice Rickard.

**DR G I H KERLEY**

**DIRECTOR: TERRESTRIAL ECOLOGY RESEARCH UNIT**

## RESEARCH ACTIVITIES

### FOREST PROGRAMME

The Afromontane forests form some of the most species rich areas in Southern Africa. The status of many of the forest species is a matter of concern, and this is compounded by the fact that our knowledge of most of these species is limited. This programme therefore aims to provide information on the factors which influence the diversity of forest vertebrates, as well as an understanding of their ecology.

#### Forest Vertebrate Diversity

Guy Castley's investigation into factors influencing biodiversity within Afromontane forests has been proceeding along three different avenues. The first approach has been to investigate the effect of forest fragmentation on biodiversity, comparing forest fragments of different size and degree of isolation with large intact forest areas. This is still in progress, and a useful product has been an inventory of forest fauna which has already produced a number of new distribution records, particularly for the poorly studied amphibians. Secondly, historical and recent aerial photographs of the coastal Alexandria forests are being analysed in order to confirm the lack of loss of forest area that has been observed for the inland Amatola forests. Finally, this lack of change in forest area suggests that faunal diversity loss is rather due to changes operating within the forest structure, through processes such as domestic herbivory, selective logging, hunting, etc. This issue is being investigated, in part, by means of a grazing enclosure experiment set up in a number of forest patches. After six months, preliminary assessments indicate major differences in vegetation structure of sites grazed by domestic livestock and those protected from such grazing.

#### Ecology of threatened forest vertebrates

The tree hyrax is the least known of the threatened forest vertebrates, and Angela Gaylard has been investigating habitat use and diet of this species by locating latrines. Her analysis indicates that tree hyrax use large hollow trees 4-8 m high, 60-90 cm in diameter and with over 50 % live material as refuges. Cavities commonly had multiple entrances. These refuges sites are also used by other animals, most notably bees which may exclude tree hyrax from suitable cavities. Trees at this stage of decay (snags) are commonly targetted in selective logging programmes. A solution to the possible limiting number of suitable refuges is to provide nesting boxes for these species. Dietary analysis indicates that tree hyrax are browsers feeding on a total of 55 plant species, although they generally concentrated on 5 - 7 species. Diet varied between sites, with the yellowwood being one of the important food items. Angela was awarded the prize for Best Poster Presentation at the South African Wildlife Management Association Symposium on "Biodiversity in Practice". This project is scheduled for completion in January 1994.

## **DUNE PROGRAMME**

The overall objective of this programme, run in close collaboration with the Botany and Geology Departments, is to provide fundamental scientific information on coastal dunes which is necessary for the formulation of a sound management plan and to advance basic knowledge of interactive dune processes.

### **Dune breeding birds**

The impact of offroad vehicles on the dune breeding birds (rare Damara terns, whitefronted plovers, African black oystercatchers) in the Alexandria dunefield is limited to the summer when these birds breed. Oystercatchers are the most vulnerable as they breed closest to the high water mark and flush if a vehicle approaches within 50 m. Thus any vehicle driving along the highwater mark will cause most of these birds to leave their nests. The other two species are less vulnerable as they nest further inland. All three species have cryptic chicks which are brought to the beach to feed where they are susceptible to being driven over. A beach survey of the eastern Cape showed that the Alexandria dunefield Damara tern colony is the only such colony in the eastern Cape and the largest known colony in South Africa. Justin Watson's project on this issue was featured on a 50/50 TV programme which generated a very positive response from the public.

### **Dune succession**

A project on successional processes in coastal dunes has been initiated at Mtunzini in Natal, where the prograding shoreline provides a superb example of succession from the beach to mature forest. Field work, during two extended fieldtrips, comprised bird, small mammal, insect and meiofauna sampling across the successional gradient. In addition, faunal processes, such as granivory, herbivory and seed dispersal are being investigated. The gradient is being characterized in terms of vegetation architecture, soil development and microclimate.

### **Rodents in dunefields**

The specific status of the endemic dune gerbil is being investigated in collaboration with Prof T Robinson of the University of Pretoria. The genetic analyses are still in progress. A survey indicates that the subspecies is limited to the dunefields on the northern shores of Algoa Bay, and is not found in St Francois Bay dunefields.

### **Dune management**

A number of contributions to dune management have been made, including the completion of reports on the status of vertebrates using dunes and the perceptions and needs of coastal management authorities. A workshop on the conservation and management of the Alexandria Dunefield highlighted UPE's contribution to research on this spectacular dunefield. Marianne Forsyth's survey and clean-up of litter in the Alexandria dunefield showed that most of the litter originates from the fishing industry. The involvement of the pupils of Summerwood Primary School served to educate them as to the problem of beach littering.

## **ARID ZONE PROGRAMME**

This programme was not directly funded during 1993, although a number of publications appeared from previous work. A further two manuscripts have been submitted. Graham Kerley made two presentations at the International Theriological Congress in Australia, based on earlier research in the Karoo. He has been invited to serve on the Arid Zone Ecology Forum Planning Committee.

## **GENERAL PROGRAMME**

Sharon Haschick's research into foraging competition between bushbuck and boergoats has shown that the two species differ in their selection of plants, with bushbuck selecting plants with high water content while the goats selected plants that they could ingest faster. Goats are also less deterred by thorny browse. The goats are able to outcompete the bushbuck for trophic resources by virtue of their rapid feeding behaviour and the fact that they can foraging over a greater volume by feeding higher. This project will be completed in January 1994. Colyn Scheltema has undertaken a complimentary study investigating growth and reproduction of goats in relation to the subjective assesment of the animals fitness.

## **RESEARCH PRIORITIES**

Research within TERU continues to focus on forests and dunes, with some activity relevant to Valley Bushveld. Expanding research in Valley Bushveld and on urban and rural development impacts will require additional funding. The increase in the funding base for TERU during 1993 suggests that it may be possible to expand our research activities.

## **INFORMATION TRANSFER**

As set out in TERU's objectives, communication is a key TERU activity, both to identify research priorities and avoid duplication of research effort, as well as to transfer information generated by TERU research activities. In order to achieve this, considerable effort has been directed at attending scientific conferences and workshops, as well as the preparation of scientific publications. Possibly one of the most successful means of communication was the 50/50 TV programme on dune breeding birds and this option needs to be expanded in future. In addition, TERU members have given a number of public talks on their research.

## PUBLICATIONS 1993

### Scientific Publications

- DU PLESSIS, A, KERLEY, GIH, & WINTER, PED. 1993. Refuge microclimate of rodents: a surface nesting *Otomys unisulcatus* and a burrowing *Parotomys brantsii*. *Acta Theriologica*. 37: 351-358.
- KERLEY, GIH, TIVER, F & WHITFORD, WG. 1993. Herbivory of clonal populations: cattle browsing affects reproduction and population structure of *Yucca elata*. *Oecologia*. 93:12-17.
- WHITFORD, WG, FORBES, G, & KERLEY, GIH. 1993. The diversity, spatial variability, and functional roles of invertebrates in desert grassland ecosystems. Proc. Grasslands Ecology Symposium, Tuscon, Arizona.
- HOFMANN, MT, JAMES, CJ, KERLEY, GIH & WHITFORD, WG. 1993. Rabbit herbivory and its effect on cladode, flower, and fruit production of *Opuntia violacea* (Cactaceae) in the northern Chihuahuan desert, New Mexico. *Southwest. Natl.* 38: in press.

### Reports

- CASTLEY, J.G. & KERLEY, G.I.H. 1993. Trends in indigenous forest patch size of the north-eastern Cape. In: The relevance of Island Biogeographic Theory in commercial forestry. (ed.) D.A. Everard. *Environmental Forum Report*: 148-150
- ILLENBERGER, Wk & KERLEY, GIH. (EDS) 1993. Management and conservation of the Alexandria Coastal Dunefield. Institute for Coastal Research Rep. 35:1-43.
- MCGWYNNE, LE, VAN TEYLINGEN, KE. & McLACHLAN, A. 1993. Coastal dune conservation - perceptions and needs of management authorities. Institute for Coastal Research Rep.32:1-23.
- TERU. 1993. Terrestrial Ecology Research Unit 1992 Annual Report. Department of Zoology, University of Port Elizabeth. 10 pp.
- VAN TEYLINGEN, K, McLACHLAN, A, RICKARD, C & KERLEY, GIH. 1993. Conservation status of the vertebrate fauna of coastal dunes in South Africa. Dept Environ. Affairs, *Biodiversity Series Rep.* 1:1-73.

### Popular Articles

- CASTLEY, JG. 1993. Indigenous forests of the eastern Cape and their fauna. *The Naturalist* 37:24-29.
- KERLEY, GIH. 1993. Dunefields: they're not just heaps of sand. *S. Afr. Comm. Mar. Mag.* 2:17-19.
- WATSON, JJ. 1992. Dune breeding birds and off-road vehicles. *The Naturalist* 36:8-12.
- WATSON, JJ. 1993. Off-road vehicles: a danger to dune breeding birds. *Endangered Wildlife Trust 1994 Annual* 1:150-153.

### Conference Presentations

- 1993 CASTLEY, JG & KERLEY, GIH. Zoochory and dunefield biodiversity: management implications. Paper at the S A Wildlife Management Association Symposium on Biodiversity in Practice, Port Elizabeth.
- 1993 GAYLARD, A & KERLEY, GIH. Tree dassies - out on a limb of forest biodiversity. Poster at the S A Wildlife Management Association Symposium on Biodiversity in Practice, Port Elizabeth. **Judged best poster presentation at the Symposium.**
- 1993 HASCHICK, S. & KERLEY, GIH. Selection by bushbuck (*Tragelaphus scriptus*) and boergoats (*Capra hircus*) for Valley Bushveld plants. Poster at the S A Wildlife Management Association Symposium on Biodiversity in Practice, Port Elizabeth.

- 1993 RICKARD, CA, VAN TEYLINGEN, KE, McLACHLAN, A & KERLEY, GIH. Diversity and endemism of coastal dune vertebrates: a dichotomy challenging conservation. Poster at the S A Wildlife Management Association Symposium on Biodiversity in Practice, Port Elizabeth.
- 1993 WATSON, JJ, KERLEY, GIH. & McLACHLAN, A. Human impacts on dune breeding birds. Poster at the S A Wildlife Management Association Symposium on Biodiversity in Practice, Port Elizabeth.
- 1993 KERLEY, GIH. Round-eared elephant shrew *Macroscelides proboscideus*: insectivore, herbivore or omnivore? Paper presented at the "Biology of Elephant Shrews Symposium", 6th International Theriological Congress, Sydney, Australia.
- 1993 KERLEY, GIH. Desert small mammals as granivores: intercontinental variations. Paper presented at the "Comparative Ecology of Desert Small Mammals Symposium", 6th International Theriological Congress, Sydney, Australia.

### POST-GRADUATE TRAINING

#### Honours Projects

- FORSYTH, ML. 1993. Dune litter: ecological impacts with special reference to meiofauna. Unpubl. BSc(Hons) project, University of Port Elizabeth.

#### Postgraduate students in training

- BRAZZALE, OV. Successional patterns across coastal dune chrono-sequences and rehabilitation implications. MSc (1993-)
- CASTLEY, JG. Vertebrate diversity in Afromontane forests. PhD (1992 -).
- GAYLARD, A. The tree dassie (*Dendrohyrax arboreus*) as a rare forest species: habitat and diet. MSc (1992 -).
- HASCHICK, SL. Foraging and digestion by bushbuck *Tragelaphus scriptus* and boergoat *Capra hircus* in captivity. MSc (1992 -).
- SHELTEMA, JC. 'n Evaluasie van produksie en reproduksie gegewens van boerbokke. MSc (1993 -)
- WATSON, JJ. Dune breeding birds and human use of the Alexandria Coastal Reserve. MSc (1993-)

#### Postgraduate degrees completed

- SMITH, M. 1993. Patch use by gerbils *Gerbillurus paeba exilis* in the Alexandria Dunefield. M.Sc. thesis, University of Port Elizabeth.

#### Publications submitted for publication

- KERLEY, GIH & WHITFORD, WG. Desert small mammals as granivores: intercontinental comparisons. *Aust. J. Zool.*
- KERLEY, GIH & WHITFORD, WG. Kangaroo rats, graminivory and desert grasslands. *J. Range Manag.*
- RICKARD, CA, McLACHLAN, A & KERLEY, GIH. The effects of vehicular and pedestrian traffic on dune vegetation in South Africa. *Ocean & Shoreline Manag.*
- CASTLEY, JG & KERLEY, GIH. Seed removal in a coastal dunefield: impact of rodents, ants and birds. *Acta Oecologia*
- GAYLARD, A & KERLEY, GIH. The use of interactive identification keys in ecological studies. *S. Afr. J. Wildl. Res.*

## FINANCIAL SUPPORT 1993

Funding agency	Programme	Amount
Foundation for Research Development & Department of Environment Affairs Joint Venture Special Programme	Forest vertebrates	R80 000
Cape Nature Conservation	Forest vertebrates	R15 000
Southern African Nature Foundation	Forest herbivory	R14 039
Foundation for Research Development Special Programme	Dunes	R40 000
Department of Environment Affairs (via Institute for Coastal Research)	Dunes	R30 000
Natal Town & Regional Planning Commission	Dunes	R26 000
Endangered Wildlife Trust	Dunes	R17 600
Pretoria Software Solutions	Dunes	R 2 900
East Cape Wild Bird Society	Dunes	R 1 000
Agricultural Research Council	Bushveld herbivory	R 7 700
<b>Bursaries</b>		
Foundation for Research Development		
Castley J.G.		R11 000
Brazzale O.V.		R 6 000
Gaylard, A.		R 6 700
Haschick, S.L.		R 7 700
University of Port Elizabeth		
Brazzale, O.V.		R 2 150
Gaylard, A.		R 2 150
Watson, J.J.		R 2 150
Department of Agriculture		
Scheltema, J.C.	R	R
	<b>Total</b>	<b>R</b>

Additional support in the form of the loan of a 4x4 bakkie by Mazda Wildlife Fund represents a saving of about R12 000 on transport expenses.

## OFFICE BEARERS AND STAFF 1993

### **Advisory Committee 1993**

Dr P M Norton, Cape Nature Conservation (Chairman)  
Dr A Aucamp, Agricultural Research Council  
Prof G C Bate, Botany Department, University of Port Elizabeth  
Mr P W Coetzee, Algoa Regional Services Council  
Dr R Ellis, Agricultural Research Council  
Dr N Fairall, Cape Nature Conservation  
Dr J Hanks, Southern African Nature Foundation  
Dr M H Knight, National Parks Board  
Mr P Niven, Amanzi Estates  
Dr P Novellie, National Parks Board  
Dr D Walmsley, Foundation for Research Development

and all members of the Executive

### **Executive**

Dr G I H Kerley, Director  
Dr A F Boshoff, Cape Nature Conservation  
Prof A McLachlan  
Prof J F K Marais

### **Staff**

Miss C A Rickard  
Dr L W McGwynne (part-time)

### **Postgraduate students**

Miss O V Brazzale  
Mr J G Castley  
Miss A Gaylard  
Miss S Haschick  
Mr J J Watson

### **Function of the Advisory Committee**

The function of this committee is to review and advise on the activities of the Terrestrial Ecology Research Unit, and to report back to the Zoology Department.