

TERRESTRIAL ECOLOGY RESEARCH UNIT

ANNUAL REPORT

1992

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. The Unit was activated with the appointment of Dr G Kerley as Director in December 1991 and the inaugural meeting of the Advisory Committee took place in January 1992.

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 report deals with TERU's first year's activities.

DIRECTOR'S REPORT

The Terrestrial Ecology Research Unit has had a successful first year, with significant progress towards fulfilling its objectives. TERU has made a major contribution to the post-graduate programme at UPE, with four MSc degrees awarded during 1992. A further three MSc students and a PhD student are currently in training. Other training activities included the supervision of four Honours student projects and contributions to third year Zoology courses.

The research output has been both productive and of a high quality, with eight refereed papers in international journals. In addition, four popular articles were written, and nine conference presentations delivered.

Four research programmes have been set up and run during the year. (i) The Forest programme was only initiated during 1992 but TERU has already established a strong presence in this biome. Guy Castley's poster was judged best poster at the Forest Biome Forum in Howick, an indication of the impact TERU made at this meeting. (ii) The Dune programme is an extension and expansion of previous research activities conducted in dunes by Zoology Department staff and students. Research conducted by TERU has reinforced this excellent track record of dune research. (iii) The obvious gap in TERU's present research activities is in the Arid Zone, where considerable desert ecology expertise is available that is not utilized due to lack of funding. The acquisition of such funding should be a priority in future. (iv) On a more general basis, there is a need for TERU research to be flexible and not rigidly programme bound, both to satisfy research interests of prospective students and to meet the requirements of funding agencies. A variety of projects, ranging from herbivore ageing and ecology to small mammal ecology were carried out under this General Programme in 1992.

In 1992 TERU fulfilled a clear need for research in terrestrial ecology in the Eastern Cape. The lack of permanence of the Director's position is, however, a handicap and a permanent position is essential to provide stronger commitments to both students and funding agencies. Furthermore, this would strengthen funding applications, and provide for Core Grant support from FRD and access to FRD Special Programme funds.

In conclusion, TERU is thriving and prospects are promising. A number of people and agencies have contributed to this, and I would like to express my appreciation to the members of the Advisory Committee for their input, and particularly Prof A McLachlan, Head of the Zoology Department who has provided unstinting support for TERU. I also thank Dr A Boshoff of Cape Nature Conservation and Prof JFK Marais of the Zoology Department for their assistance. The technical staff of the Zoology Department, and administrative staff of the University of Port Elizabeth have been highly supportive, for which I am grateful. None of these activities would have been possible without the financial support of the Foundation for Research Development, Department of Environment Affairs, Cape Nature Conservation, University of Port Elizabeth and the Agricultural Research Council. Finally, I would like to thank the students who have made TERU research activities so productive and enjoyable.

**DR G I H KERLEY DIRECTOR: TERRESTRIAL ECOLOGY RESEARCH
UNIT**

RESEARCH PROGRESS

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

About 15 % of the rare and endangered terrestrial vertebrates in South Africa are found in forests although these forests represent only 0.02 % of South African habitats by area. This indicates that forest fauna are 75 times more vulnerable than predicted by area. Furthermore, conservation of the forest biome area increased from 37 % in 1986 to 77 % in 1989, presenting a conservation paradox in terms of area conserved and faunal status. This may be due to the fragmented nature of forests. A manuscript on the conservation status of forests and their fauna is in preparation.

The hypothesis that forest vertebrates may be threatened due to loss of forest area was tested. Aerial photographs from 1938 and 1985 were analysed with a scanning digitiser, to monitor changes in forest area in the eastern Cape. Indigenous forests in the eastern Cape cover 21 000 ha, with 8 800 ha of plantations. Most of the forests (12 000 ha) are within the Ciskei. There is no significant variation in the indigenous forest areas of South Africa or Ciskei. There was a significant increase in the extent of commercial forestry areas within the Ciskei but not in South Africa. There was no loss of any forest fragments over the past 50 years. These results indicate that loss of area or patches is not the causal factor behind decreases in faunal species diversity. We propose an alternate hypothesis that faunal species diversity loss is a function of the changes in structural complexity of the forest fragments. Guy Castley was awarded the prize for the Best Poster Presentation at the Forest Biome Meeting for this work. A manuscript on these trends in forest area is in preparation.

Ecology of threatened forest vertebrates

Vertebrates of the Afromontane forests which are listed in the Red Data Books as their status is a cause for concern include the tree dassie, samango monkey, giant golden mole, blue duiker and Cape parrot. Of these we have the least information on the ecology of the tree dassie, and have therefore initially concentrated on this species.

This investigation into the ecology of the tree dassie has been focusing on the location of refuge sites for the quantification of refuge microhabitat availability and to collect fecal samples. Dietary items will be identified by comparing epidermal structures of fecal fragments with that of a reference collection of plants. To date 32 refuges have been located representing populations in the Pirie and Alexandria forests. This project is scheduled to be completed by mid-1993.

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.

Zoochory in dunes

Two projects on mammalian and avian zoochory in the Alexandria dunefield demonstrated that both birds and mammals play important roles as seed dispersers in coastal dunes, dispersing seeds of 19 and 29 plants, respectively. Birds are particularly effective in dispersing seeds of the exotic *Acacia cyclops*, a potentially disastrous invader. Redwinged starlings, important seed dispersers, are highly selective in terms of fruit colour and size and seed retention time is a function of seed size. A number of manuscripts on zoochory in dunes are in preparation.

Dune breeding birds

Monitoring the colony of rare Damara terns in the Alexandria dunefield has been extended to evaluate the breeding biology of the white-fronted sand plovers, African black oystercatchers and Damara terns, and the impact of off-road vehicles on these species. Damara terns are absent from the dunefield in winter, and breed from November to February. Earlier estimates for this species (14 pairs) need to be increased to about 20 breeding pairs, due to more effective monitoring. Oystercatchers nest close to the highwater mark and are heavily impacted by offroad vehicles.

Rodents in dunefields

Patch use by the hairy-footed gerbil, measured in seed removal trays, has shown that this species conforms to optimal foraging theory. This will allow the prediction of the impact by this, a keystone species in terms of its impact on seed predation. Small mammal communities of bush pockets in the Alexandria Dunefield do not conform to the predictions of Island Biogeography theory. These data should be interpreted in terms of the non-equilibrium nature of coastal dunefields, due to the high disturbance regime.

Status of dune vertebrates

A review of the distribution and status of vertebrates using coastal dunes indicates that West Coast dunes have a low diversity of largely endemic vertebrates which are poorly conserved. This contrasts with the low endemism and high diversity of the North-east Coast (Natal) dunes which appear to be adequately conserved. The South-east Coast is conspicuous as a region of both high diversity and poor conservation status of dune vertebrates. A report is in press.

Dune management

A survey of the information requirements of organizations which manage coastal dunes indicates that human pressure on dunefields is increasing. Management expertise is limited, with few inventories of biota and meagre knowledge of the natural patterns of sand movements. Management information requests were limited to information on human impacts and sand dynamics. This suggests a lack of insight on the part of managers regarding the importance of the biota in dunefields. A report is in press.

ARID ZONE PROGRAMME

This programme received no funding during 1992, although with 40 % South Africa being semi-arid and with the increasing awareness of the impacts of desertification and the droughts gripping this country, arid zone research should be a priority. Activities comprised manuscript preparation, and planning future research applications dealing with small mammals as seed predators and the impact of grazing and desertification on plant and animal communities. Six manuscripts were prepared and submitted, of which three have been accepted for publication.

GENERAL PROGRAMME

Research on potential trophic competition between boergoats and bushbuck focused on a comparison of digestive efficiency, browse selection and foraging behaviour of these two species. Initial results indicate differences in plant selection, with the bushbuck eating a broader range of plants. Furthermore, goats are prepared to forage while standing on their hindlegs and can reach up to 180 cm, whereas bushbuck will not stand on their hindlegs and can only reach to a maximum of 130 cm. This project is scheduled to be completed by mid-1993.

An analysis of tooth eruption and attrition of a sample of 270 warthog from the Andries Vosloo Kudu Reserve provided the basis for ageing the population. Lower jaw dimensions were used to distinguish sexes and this discriminant function model may be applied to field collected material of unknown sex. A report has been submitted to Cape Nature Conservation.

A survey of small mammal communities in the Zuurberg National Park indicated few species (6) and low numbers in the five major vegetation types. The highest diversity and abundance of small mammals was recorded in the Fynbos habitat, with the Forest habitat having the lowest. Regression analysis indicated that the abundance of small mammals is a function of the cover of restios, while restio and shrub cover determined species diversity. A report has been submitted to National Parks Board.

RESEARCH PRIORITIES

During the Inaugural Meeting of the TERU Advisory Committee, valley bushveld, forest and dunes were identified as priority research areas. The impacts of urban and rural development on ecosystems and the status of Red Data Book species were also seen as priorities. Research has been initiated in forests and dunes, including work on Red Data Book species. Some dune work is relevant to problems of development. Besides the bushbuck project and some of the dune work which is relevant to valley bushveld, there is at present no major research effort directed towards valley bushveld by TERU. In order to be able to initiate research in valley bushveld funding and manpower will have to be obtained.

INFORMATION TRANSFER

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. Where appropriate, reports have

been submitted directly to institutions, including two to Cape Nature Conservation and one each to National Parks Board and the Department of Environment Affairs.

PUBLICATIONS 1992

SCIENTIFIC PUBLICATIONS

- KERLEY, GIH. 1992. Trophic status of small mammals in the semi- arid Karoo, South Africa. *J. Zool., Lond.* 226:563-572.
- KERLEY, GIH. 1992. Small mammal seed consumption in the Karoo, South Africa: further evidence for divergence in desert biotic processes. *Oecologia.* 89:471-475.
- KERLEY, GIH. 1992. Ecological correlates of small mammal community structure in the semi-arid Karoo, South Africa. *J. Zool., Lond.* 227:17-27.
- KERLEY, GIH, & ERASMUS, T. 1992. Fire and the range limits of the bush Karoo rat *Otomys unisulcatus*. *Global Ecol. Biogeog Lett.* 2:11-15.
- KERLEY, GIH & ERASMUS, T. 1992. Small mammal communities in the semi-arid Karoo, South Africa: biomass and energy requirements. *J. Arid. Environ.* 22:251-260.
- McLACHLAN, A & BURNS, M. 1992. Headland bypass dunes on the South African coast: 100 years of (mis)management. In: *Coastal dunes: Geomorphology, ecology and management for conservation*. Eds: Carter, RWG, Curtis, TGF & Sheehy- Skeffington, MJ. AA Balkema, Rotterdam. pp 71-79.
- VAN DER MERWE, D, McLACHLAN, A & DE RUYCK, AMC. 1992. Partitioning of feeding habitats by whitefronted plovers *Charadrius marginatus* at a dune/beach interface. *Ostrich* 63:49-57.
- MILTON, SJ, DEAN, WRJ & KERLEY, GIH. 1992. Tierberg Karoo Research Centre: history, physical environment, flora and fauna. *Trans. Roy. Soc. S. Afr.* 48:15-46.

POPULAR ARTICLES

- CASTLEY, JG. 1992. The origin of bushpockets: role of mammals and birds. *Naturalist* 36 (2):13-18.
- GAYLARD, A. 1992. The plight of the elusive tree dassie. *Naturalist* 36(1):12-15.
- KERLEY, GIH. 1992. Putting the big five back. *Splash* Nov-Jan:14.
- VAN TEYLINGEN, KE & KERLEY, GIH. 1992. Oribi as a game species in the eastern Cape. *Pelea* 12:in press.

CONFERENCE PRESENTATIONS

- 1992 CASTLEY, JG, KERLEY, GIH & MCLACHLAN, A. Role of mammalian seed dispersers in dunefield vegetation dynamics. Oral presentation. Zoological Society of Southern Africa Symposium on "Populations in time and space", Kimberley, July 1992.
- 1992 MACLEOD, SB, KERLEY, GIH & MCLACHLAN, A. Aspects of habitat utilization and diet of bushbuck in the Alexandria Coastal Reserve. Oral presentation. Zoological Society of Southern Africa Symposium on "Populations in time and space", Kimberley, July 1992.
- 1992 SMITH, M, KERLEY, GIH & MCLACHLAN, A. Optimal foraging in the hairy-footed gerbil, *Gerbillus paeba exilis*: the effect of cover and distance from the burrow. Poster presentation. Zoological Society of Southern Africa Symposium on "Populations in time and space", Kimberley, July 1992.

- 1992 CASTLEY, JG & KERLEY, GIH. Trends in indigenous forest patch size. Poster presentation. Forest Biome Research Meeting, Howick, October.
- 1992 GAYLARD, A. & KERLEY, GIH. Towards a conservation approach for the rare tree dassie. Poster presentation. Forest Biome Research Meeting, Howick, October.
- 1992 KERLEY, GIH & WHITFORD, WG. Does cattle grazing drive desertification in the Chihuahuan Desert? Poster presentation, Arid Zone Forum, De Aar, November.
- 1992 VAN JAARSVELD, AS, APPS, PJ, KERLEY, GIH & KNIGHT, MH. The springbok (*Antidorcas marsupialis*) as a sustainable resource in arid regions. Poster presentation, Arid Zone Forum, De Aar, November.
- 1992 CASTLEY, JG. Vertebrate diversity in Afromontane Forests in the Eastern Cape. Oral presentation, Cape Nature Conservation 1992 Scientific Information Day, Port Elizabeth, November 1992
- 1992 GAYLARD, A. The ecology of a rare forest species: the tree dassie. Oral presentation, Cape Nature Conservation 1992 Scientific Information Day, Port Elizabeth, November 1992

POST-GRADUATE TRAINING

Honours Projects

- BRAZZALE, OV. 1992. Do rodent communities in bush pockets conform to Island Biogeography Theory? Unpubl. BSc(Hons) project, University of Port Elizabeth.
- HOPKINS, GE. 1992. The age and sex structure of the warthog (*Phacochoerus aethiopicus* sundevalli Lonberg, 1908) population in the Andries Vosloo Kudu Reserve, using teeth and jaw measurements as the determining criteria. Unpubl. BSc(Hons) project, University of Port Elizabeth.
- SIEVWRIGHT, ED. 1992. Relationships between vegetation and small mammal communities in the Zuurberg National Park. Unpubl. BSc(Hons) project, University of Port Elizabeth.
- WATSON, JJ. 1992. Fruit selection in the redwinged starling *Onychognathus morio*. Unpubl. BSc(Hons) project, University of Port Elizabeth.

Postgraduate degrees completed

- BRUTON, J-S. 1992. Avian seed dispersal in dunes. MSc dissertation, University of Port Elizabeth.
- CASTLEY, JG. 1992. Mammalian impact on dune seed banks. MSc dissertation, University of Port Elizabeth.
- MACLEOD, S. 1992. Habitat utilization by bushbuck in the Alexandria dunefield. MSc dissertation, University of Port Elizabeth.
- VAN TEYLINGEN, KE. 1992. Resource utilization by oribi *Ourebia ourebia* in the Eastern Cape. MSc dissertation, University of Port Elizabeth.

Postgraduate students in training

- CASTLEY, JG. Vertebrate diversity in Afromontane forests. PhD (1992 -).
- GAYLARD, A. The ecology of a rare forest species, the tree dassie *Dendrohyrax arboreus*. MSc (1992 -).
- HASCHICK, S. Diet and digestion of bushbuck and boergoat. MSc (1992 -).
- SMITH, M. Patch use by gerbils in the Alexandria Dunefield. MSc (1992 -).

FINANCIAL SUPPORT 1992

| Funding agency | Programme() | Amount | |
|--------------------------------------------------------------------------------------------|--------------------|--------------------|-----------------|
| Foundation for Research Development and Department of Environment Affairs Joint Venture | Special Programme | Forest vertebrates | R80 000 |
| Cape Nature Conservation | | Forest vertebrates | R20 000 |
| Foundation for Research Development | Special Programme | Dunes | R40 000 |
| | Core Programme | Dunes | R15 000 |
| UPE Research Committee | | Dunes | R10 000 |
| Department of Environment Affairs (via Institute for Coastal Research) | | Dunes | R15 000 |
| Agricultural Research Council | | Bushbuck | R 7 700 |
| Bursaries | | | |
| Foundation for Research Development | Castley JG. | R11 000 | |
| | Gaylard, A. | R 6 700 | |
| | Haschick, S. | R 7 700 | |
| University of Port Elizabeth | Gaylard, A. | R 1 500 | |
| | Haschick, S. | R 1 750 | |
| | Smith, M. | R 1 500 | |
| Department of Environment Affairs (via Institute for Coastal Research) | Haschick, S. | R 5 000 | |
| | Smith, M. | R 5 000 | R40 150 |
| Total | | | R227 850 |

OFFICE BEARERS AND STAFF

Advisory Committee 1992

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 N Fairall, Cape Nature Conservation

Dr J Hanks, Southern African Nature Foundation

Mr P Niven, Amanzi Estates

Prof B Oelofsen, Chairman: Research Committee, University of Port Elizabeth

Dr R M Randall, 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 Boshoff, Cape Nature Conservation

Prof A M McLachlan

Prof J F K Marais

Staff

Miss KE Van Teylingen (until June 1992)

Postgraduate students

Mr J G Castley

Miss A Gaylard

Miss S Haschick

Mr M Smith

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.